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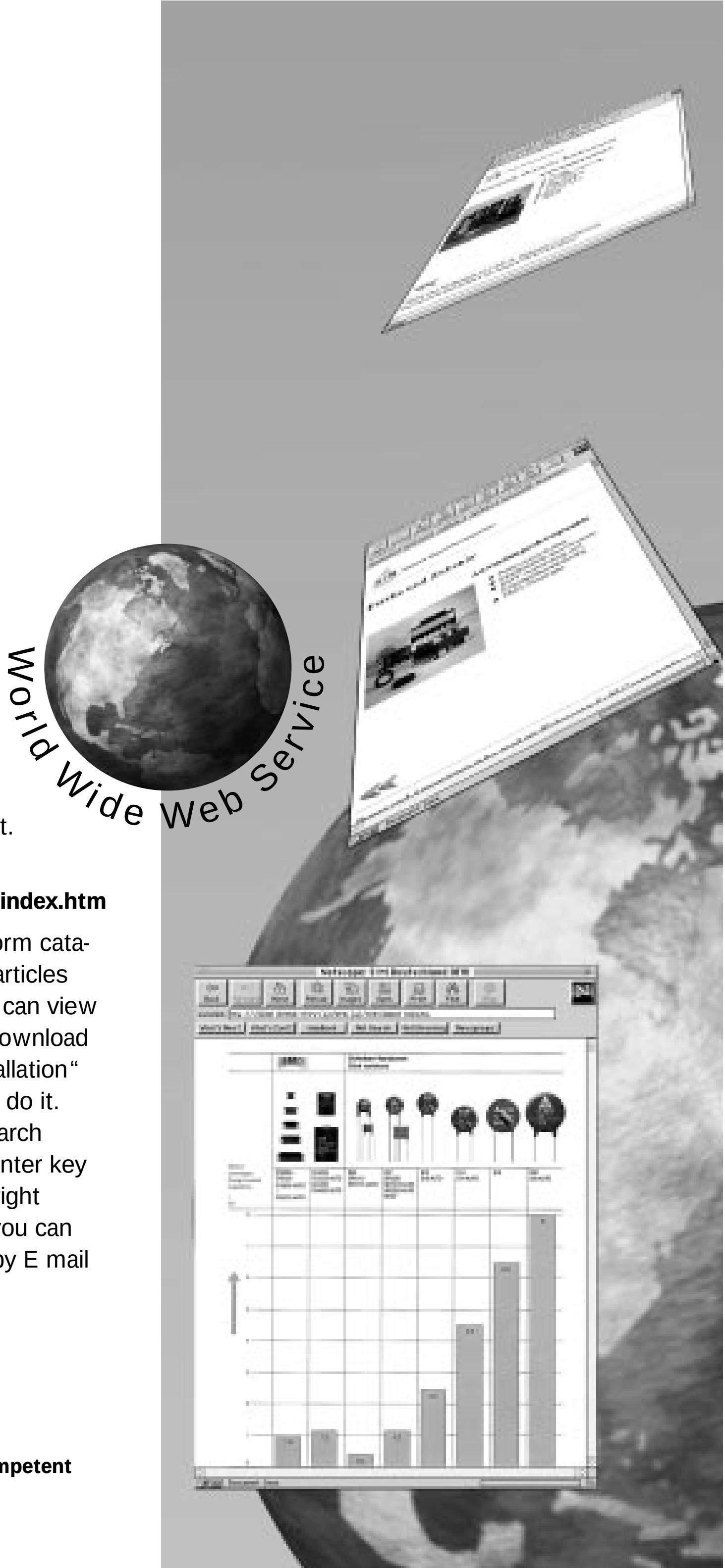

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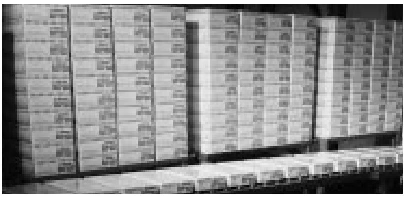

store for you, like SCS depots right there in our plants, extra stock with distributors, and experienced sales engineers on the spot around the world. An extensive range of non-SCS components is available too – just contact us.

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RM cores

Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H[1)]	Individual parts of assembly set	Part number	Page
RM 3			Core	B65817	188
		$7{,}62^2 \times 7{,}5$	Coil former	B65818	189
RM 4	IEC 431		Core	B65803	191
	DIN 41980	$10{,}16^2 \times 10{,}8$	Coil former	B65804	193
			Insulating washers	B65804	193
			Clamp	B65806	194
			Adjusting screws	B65539	195
RM 4 LP			Core	B65803	199
		$10{,}5^2 \times 8{,}1$	Coil former	B65804	200
			Clamp	B65804	201
			Insulating washers	B65804	201
		$14 \times 17{,}5 \times 8{,}1$	SMD coil former/Clamp	B65804	202
RM 5	IEC 431		Core	B65805	204
	DIN 41980	$12{,}7^2 \times 10{,}8$	Coil former	B65806	206
			Clamp	B65806	207
			Insulating washers	B65806	207
		$16{,}5 \times 19 \times 10{,}6$	SMD coil former	B65822	208
			Clamp	B65806	208
			Adjusting screws	B65539/ B65806	209
RM 5 LP			Core	B65805	214
RM 6	IEC 431		Core	B65807	216
	DIN 41980	$15{,}24^2 \times 12{,}8$	Coil former	B65808	218
			Clamp/Insulating washers	B65808	221
			Coil former for SMPS transf.	B65808	219
		$19{,}5 \times 25 \times 12{,}8$	Coil former for power appl.	B65808	220
		$19{,}6 \times 22{,}2 \times 13$	SMD coil former	B65821	222
			Clamp	B65808	222
			Adjusting screws	B65659	223
RM 6 LP			Core	B65807	228
R 6	IEC 431		Core	B65809	230
		$15{,}24^2 \times 12{,}8$	Coil former	B65810	231
			Clamp/Insulating washers	B65808	232
			Adjusting screws	B65810	233

1) Height above mounting plane

Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H[1)]	Individual parts of assembly set	Part number	Page
RM 7	IEC 431	$17{,}78^2 \times 13{,}8$	Core Coil former Clamp/Insulating washers Adjusting screws	B65819 B65820 B65820 B65659	237 239 240 241
RM 7 LP			Core	B65819	244
RM 8	IEC 431	$20{,}32^2 \times 16{,}8$ $26 \times 30 \times 16{,}8$	Core Core for chokes Coil former Coil former for SMPS transf. Coil former for power appl. Clamp/Insulating washers Adjusting screws	B65811 B65811 B65812 B65812 B65812 B65812 B65812	246 248 249 250 251 252 253
RM 8 LP			Core	B65811	257
RM 10	IEC 431 DIN 41980	$25{,}4^2 \times 19$ $31 \times 40 \times 19$	Core Core for chokes Coil former Coil former for chokes Coil former for power appl. Clamp/Insulating washers Adjusting screws	B65813 B65813 B65814 B65814 B65814 B65814 B65679	259 261 262 264 263 265 266
RM 10 LP			Core	B65813	268
RM 12		$30{,}48^2 \times 24{,}9$ $32 \times 45{,}7 \times 24{,}9$ $40{,}3 \times 35{,}6 \times 31$	Core Core for chokes Coil former Coil former for chokes Coil former for power appl. Pile-up coil former Clamp/Insulating washers	B65815 B65815 B65816 B65816 B65816 B65816 B65816	270 272 273 276 274 275 277
RM 12 LP			Core	B65815	278
RM 14		$35{,}56^2 \times 30{,}5$ $44 \times 29 \times 30{,}5$	Core Core for chokes Coil former Coil former for power appl. Clamp/Insulating washers	B65887 B65887 B65888 B65888 B65888	280 282 283 284 285
RM 14 LP			Core	B65887	286
Adjusting tools (see individual data sheets)				B63399, B6580*	

1) Height above mounting plane

PM cores

Core type	Standards	Mounting dimensions (mm) of assembly set $L \times W \times H$[1)]	Individual parts of assembly set	Part number	Page
PM 50/39	IEC 1247 DIN 41990	$65 \times 52 \times 45$	Core Coil former Mounting assembly	B65646 B65647 B65647	289 290 291
PM 62/49	IEC 1247 DIN 41990	$76 \times 64 \times 55$	Core Coil former Mounting assembly	B65684 B65685 B65685	292 293 294
PM 74/59	IEC 1247 DIN 41990	$85{,}5 \times 75 \times 65$	Core Coil former Mounting assembly	B65686 B65687 B65687	295 296 297
PM 87/70	IEC 1247 DIN 41990	$101 \times 87 \times 72$	Core Coil former Mounting assembly	B65713 B65714 B65714	298 296 297
PM114/93	IEC 1247 DIN 41990	$114 \times 92 \times 93$	Core Coil former	B65733 B65734	301 302

1) Height above mounting plane

P cores (pot cores)

Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H[1]	Individual parts of assembly set	Part number	Page
P3,3 × 2,6			Core	B65491	304
P4,6 × 4,1		5,5 × 5 × 5,1 6,8 × 5 × 5,1	Core Coil former Terminal carrier Adjusting screws	B65495 B65496 B65496 B65496	306 307 308 309
P5,8 × 3,3			Core Coil former	B65501 B65502	312 313
P7 × 4		7,5 × 7,5 × 7,1	Core Coil former Mounting assembly Adjusting screws	B65511 B65512 B65512 B65512	315 316 317 318
P9 × 5	IEC 133 DIN 41293 DIN 41294	 12,5 × 12,5 × 7,3 9,9 × 9,9 × 8,3 (4 solder terminals) 9,9 × 12,3 × 8,3 (6 solder terminals) 12,2 × 17 × 6,0	Core Pinned coil former/Clamp Coil former/Insulating washer SMD coil former Mounting assembly Adjusting screws	B65517 B65518 B65522 B65524 B65518 B65518	324 326 327 328 329 330
P11 × 7	IEC 133 DIN 41293 DIN 41294	 15 × 15 × 8,3 12,3 × 12,3 × 9,5 (4 solder terminals) 12,3 × 14,6 × 9,5 (8 solder terminals)	Core Pinned coil former/Clamp Coil former/Insulating washer Mounting assembly Adjusting screws	B65531 B65532 B65532 B65535 B65539	337 338 339 340 341
P14 × 8	IEC 133 DIN 41294	 17,5 × 17,5 × 9,9 16,8 × 15 × 11,3 (4 solder terminals) 16,8 × 19,6 × 11,3 (6 solder terminals)	Core Pinned coil former/Clamp Coil former/Insulating washers Mounting assembly Adjusting screws	B65541 B65542 B65542 B65545 B65549	348 349 350 351 352
P18 × 11	IEC 133 DIN 41294	 22 × 22 × 11,9 19,9 × 20,7 × 13,5	Core Pinned coil former/Clamp Coil former/Insulating washers Mounting assembly Adjusting screws	B65651 B65652 B65652 B65655 B65659	358 359 360 361 362

1) Height above mounting plane

Core type	Standards	Mounting dimensions (mm) of assembly set Base area × H[1)]	Individual parts of assembly set	Part number	Page
P22 × 13	IEC 133 DIN 41293 DIN 41294	24,5 × 26 × 16,6	Core Coil former/Insulating washers Mounting assembly Adjusting screws	B65661 B65662 B65665 B65669	369 370 371 372
P26 × 16	IEC 133 DIN 41293 DIN 41294	27,8 × 28,5 × 19	Core Coil former/Insulating washers Mounting assembly Adjusting screws	B65671 B65672 B65675 B65679	378 380 381 382
P30 × 19	IEC 133 DIN 41293 DIN 41294	32,5 × 33,5 × 22,8	Core Coil former/Insulating washers Mounting assembly Adjusting screws	B65701 B65702 B65705 B65679	387 388 389 390
P36 × 22	IEC 133 DIN 41293 DIN 41294	40 × 41,8 × 27,5	Core Coil former/Insulating washer Mounting assembly Adjusting screws	B65611 B65612 B65615 B65679	394 395 396 397
P41 × 25		39 × 55 × 28,1	Core Coil former Mounting assembly Adjusting screws	B65621 B65622 B65623 B65579	400 401 402 403
Adjusting tools (see individual data sheets)				B63399	

1) Height above mounting plane

P core halves (P cores for proximity switches)

Core type (∅ × height)	Suitable for standard size per DIN EN 50 008	Material	Individual parts of assembly set	Part number	Page
5,6 × 3,7	M 8 × 1	N22, M33	Core	B65931	407
7,35 × 3,6		N22, M33	Core Coil former	B65933 B65512	408 408
8,4 × 4,3	M 12 × 1	M33	Core Coil former	B65924-B B65925	409 409
8,6 × 3,3	M 12 × 1	N22, M33	Core	B65924-A	410
9 × 2,8	M 12 × 1	N22, M33	Core Coil former	B65935-J B65936	411 411
9,4 × 4,6	M 12 × 1	N22, M33	Core Coil former	B65935-A B65522	412 412
14 × 5,3	M 18 × 1	N22, M33	Core	B65926	413
14,4 × 7,5	M 18 × 1	N22	Core Coil former	B65937 B65542	414 414
25 × 8,9	M 30 × 1,5	N22	Core Coil former	B65939 B65940	415 415
30,5 × 10,2	M 40 × 1,5	N22	Core Coil former	B65941 B65942	416 416
35 × 10,8		N22	Core	B65947	417
47 × 14,9		N22	Core Coil former	B65943 B65944	418 418
68 × 14,5		N22	Core Coil former	B65928 B65946	419 419
70 × 14,5		N22	Core Coil former	B65945 B65946	420 420

EP cores

Core type	Standards	Mounting dimensions (mm) of assembly set $L \times W \times H$[1)]	Individual parts of assembly set	Part number	Page
EP7	IEC 51 (SEC) 300	 $7{,}5 \times 10 \times 10$ $13 \times 9{,}2 \times 8{,}8$	Core Coil former/Cover SMD coil former	B65839 B65840 B65840	423 424 425
EP10	IEC 51 (SEC) 300	 $12 \times 14{,}2 \times 12{,}5$	Core Coil former Mounting assembly	B65841 B65842 B65842	426 427 428
EP13	IEC 51 (SEC) 300	 $15 \times 16 \times 13{,}7$ $15 \times 16 \times 13{,}7$ $19{,}5 \times 13 \times 12{,}5$	Core Coil former Coil former for high-voltage applications SMD coil former Mounting assembly	B65843 B65844 B65844 B65844 B65844	429 430 431 433 432
EP17	IEC 51 (SEC) 300	$20 \times 21{,}6 \times 16{,}2$	Core Coil former Mounting assembly	B65845 B65846 B65846	434 435 436
EP20	IEC 51 (SEC) 300	$23 \times 27{,}5 \times 20{,}5$	Core Coil former Mounting assembly	B65847 B65848 B65848	437 438 439

ER cores

ER9,5		$12 \times 10 \times 5{,}7$	Core SMD coil former	B65523 B65527	440 441
ER11		$12{,}8 \times 11{,}7 \times 6$	Core SMD coil former	B65525 B65526	442 443

1) Height above mounting plane

ETD, EFD, DE, EC and ER cores

Core type	Standards Quality assurance	Mounting dimensions (mm) of assembly set L × W × H[1)]	Individual parts of assembly set	Part number	Page
ETD cores					
ETD29	IEC 51 (CO) 295		Core	B66358	450
		35,5 × 35,5 × 25,5	Coil former (horizontal)	B66359	452
		24 × 35,5 × 41,2	Coil former (vertical)	B66359	453
			Yoke	B66359	452
ETD34	IEC 1185		Core	B66361	454
	CECC 25301-001	43 × 40 × 35	Coil former (horizontal)	B66362	456
		27,5 × 40 × 46	Coil former (vertical)	B66362	457
			Yoke	B66362	456
ETD39	IEC 1185 CECC 25301-002	48 × 45 × 38	Core Coil former/Yoke	B66363 B66364	458 460
ETD44	IEC 1185 CECC 25301-003	53 × 50 × 41	Core Coil former/Yoke	B66365 B66366	461 463
ETD49	IEC 1185 CECC 25301-004	58 × 55 × 43,5	Core Coil former/Yoke	B66367 B66368	464 466
ETD54	IEC 51 (CO) 295	62 × 62 × 47	Core Coil former/Yoke	B66395 B66396	467 469
ETD59	IEC 51 (CO) 295	67 × 71 × 50	Core Coil former/Yoke	B66397 B66398	470 472
EFD cores					
EFD10			Core	B66411	474
EFD15			Core	B66413	475
		19,3 × 17 × 8	Coil former	B66414	476
		21 × 16 × 8	SMD coil former	B66414	477
			Yoke	B66414	476
			Cover plate	B66414	477
EFD20		24,3 × 22 × 10	Core Coil former/Yoke	B66417 B66418	478 479
EFD25		29,3 × 27,3 × 12,5	Core Coil former/Yoke	B66421 B66422	480 481
EFD30		34,4 × 32,5 × 12,5	Core Coil former/Yoke	B66423 B66424	482 483

1) Height above mounting plane

Core type	Standards Quality assurance	Mounting dimensions (mm) of assembly set $L \times W \times H$[1)]	Individual parts of assembly set	Part number	Page
DE cores					
DE28			Core Coil former Terminal carrier	B66399 B66400 B66400	484 485 486
DE35			Core	B66409	487
EC cores					
EC35	IEC 647	47 × 36 × 28	Core Coil former (solder tags) Coil former (solder pins)	B66337 B66272 B66272	489 490 491
EC41	IEC 647	 52,5 × 47,5 × 42 47,5 × 42 × 44	Core Coil former (horizontal) Coil former (vertical) Mounting assembly	B66339 B66274 B66274 B66274	492 493 493 493
EC52	IEC 647	 61 × 57,5 × 43,5 54 × 52,5 × 53	Core Coil former (horizontal) Coil former (vertical) Mounting assembly	B66341 B66276 B66276 B66276	495 496 496 496
EC70	IEC 647	 82 × 81 × 48,5 72 × 57,5 × 75	Core Coil former (horizontal) Coil former (vertical) Mounting assembly	B66343 B66278 B66278 B66278	498 499 499 499
ER cores					
ER42		33 × 46 × 55	Core Coil former Pile-up coil former Case	B66347 B66348 B66348 B66348	501 502 503 504
ER49			Core	B66391	505
ER54			Core	B66357	506

1) Height above mounting plane

E cores

Core type[1]	Standards	Mounting dimensions (mm) of assembly set L × W × H[2]	Individual parts of assembly set	Part number	Page
E6,3/2		 8,9 × 8,1 × 5,7	Core SMD coil former, cover	B66300 B66301	508 509
E8,8/2	IEC 1246	 10 × 12,5 × 5,5	Core SMD coil former	B66302 B66302	510 511
E13/7/4 (EF12,6)	DIN 41 985 IEC 1246	 15 × 17 × 12 10 × 15 × 17 13,5 × 19,5 × 9,3	Core Coil former (horizontal) Coil former (vertical) SMD coil former Yoke	B66305 B66202 B66202 B66306 B66202	512 513 513 515 513
E14/8/4			Core	B66219	516
E16/8/5 (EF16)	DIN 41 985 IEC 1246	 18 × 20 × 14 11 × 18 × 20 11 × 18 × 20	Core Coil former (horizontal) Coil former (vertical) Coil former for luminaires Yoke	B66307 B66308 B66308 B66308 B66308	517 518 518 520 518
E16/6/5			Core	B66393	521
E19/8/5 E187[3]			Core	B66379	522
E20/10/6 (EF20)	DIN 41 985 IEC 1246	 22 × 22 × 17 15 × 22 × 24 24 × 21,5 × 14 15 × 22 × 24	Core Coil former (horizontal) Coil former (vertical) Coil former (right-angle pins) Coil former for luminaires Yoke	B66311 B66206 B66206 B66206 B66206 B66206	523 524 524 525 526 525
E20/9/6		 15 × 22 × 22,5	Core Coil former for luminaires	B66312 B66206	527 528
E21/9/5			Core Coil former	B66314 B66314	529 530
E25/13/7 (EF25)	DIN 41 985 IEC 1246	 28 × 28 × 21 18 × 28 × 29 19 × 26 × 30	Core Coil former (horizontal) Coil former (vertical) Coil former for SMPS Yoke	B66317 B66208 B66208 B66208 B66208	531 532 532 534 532/534

1) The E core designations have been brought into line with IEC; the previous designations are given in parentheses.
2) Height above mounting plane
3) US designation (size based on U.S. lam. size E cores)

Core type[1]	Standards	Mounting dimensions (mm) of assembly set $L \times W \times H$[2]	Individual parts of assembly set	Part number	Page
E25,4/10/7 E2425 [3]			Core	B66315	535
E28/13/11			Core	B66403	536
ED29/14/11			Core	B66407	537
E30/15/17	DIN 41 295	 $36 \times 36 \times 12$ $19 \times 36 \times 36$	Core Coil former (horizontal) Coil former (vertical) Yoke	B66319 B66232 B66232 B66232	538 539 539 539
E32/16/9 (EF32)	DIN 41 985 IEC 1246	$35 \times 37 \times 24$	Core Coil former Yoke	B66229 B66230 B66230	541 542 542
E32/16/11			Core	B66233	543
E34/14/9 E375 [3]			Core	B66370	544
E36/18/11		$39 \times 38 \times 31$	Core Coil former	B66389 B66390	545 546
E40/16/12 E21[3]			Core	B66381	547
E42/21/15	DIN 41 295 IEC 1246	$42{,}5 \times 43 \times 33$	Core Coil former	B66325 B66242	548 549
E42/21/20	DIN 41 295 IEC 1246	$38 \times 46 \times 52$	Core Coil former Case	B66329 B66243 B66243	550 551 552
E47/20/16 E625[3]			Core	B66383	553
E55/28/21	DIN 41 295 IEC 1246	$56 \times 57 \times 46$	Core Coil former	B66335 B66252	554 555
E55/28/25			Core	B66344	556
E56/24/19 E75[3]			Core	B66385	557
E65/32/27	DIN 41 295 IEC 1246		Core Coil former	B66387 B66388	558 559
E70/33/32			Core Coil former	B66371 B66372	560 561
E80/38/20			Core	B66375	562

1) The E core designations have been brought into line with IEC; the previous designations are given in parentheses.
2) Height above mounting plane
3) US designation (size based on U.S. lam. size E cores)

U and UI cores

Core type	Standards	Individual parts of assembly set	Part number	Page
U11/9/6		Core	B67366	564
U15/11/6		Core Coil former	B67350 B67350	565 565
U17/12/7		Core	B67364	566
U20/16/7	DIN 41 296 (Dimensions)	Core Coil former	B67348 B67348	567 567
U21/17/12		Core	B67318	568
U25/20/13		Core Coil former	B67352 B67352	569 569
U26/22/16		Core	B67355	570
U30/26/26		Core	B67362	571
U93/76/16 UI93/104/16		Cores	B67345	572
U93/76/20 UI93/104/20		Cores	B67345	573
U93/76/30 UI93/104/30		Cores	B67345	574
UU93/152/30		Core Coil former	B67345 B67345	575
UR29/18/16		Core	B67354	576
UR35/31/13		Core	B67359	577
UR38/32/13		Core	B67313	578
UR39/35/15		Core	B67317	579
UR39/32/22		Core	B67312	580
UR43/34/16		Core	B67368	581
UR46/37/15		Core	B67314	582

Ring cores/Other cores

Core type	Standards	Individual parts of assembly set	Part number	Page
Ring cores R2,5 to R100	R2,5; R4; R6,3; R10 based on IEC 525	Core	B64290	584
CC26		Core Coil former	B66442 B66442	590 591
CC36		Core Coil former	B66443 B66443	592 593
CC50		Core Coil former	B66446 B66446	594 595
Double-aperture cores Core heights 2,5 to 14,5 mm	6,2; 8,3 and 14,5: DIN 41279, shape G	Core	B62152	596
Shielding beads Core lengths 3,3 to 16,0 mm	IEC 220	Core	B62110	597
Cylindrical cores 1,6×12,5 to 10×80	IEC 220 DIN 41291	Core	B61110	598
Tubular cores d_a 3,5 to 10 mm	IEC 220	Core	B62110	600
Rods for RF welding equipment Version A with slots Version B with internal drill hole		Core Core	B61611 B61621	601 601
Threaded cores	Female thread DIN 13, 518, 519	Core	B63310	602

Siemens Matsushita Components

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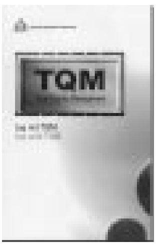
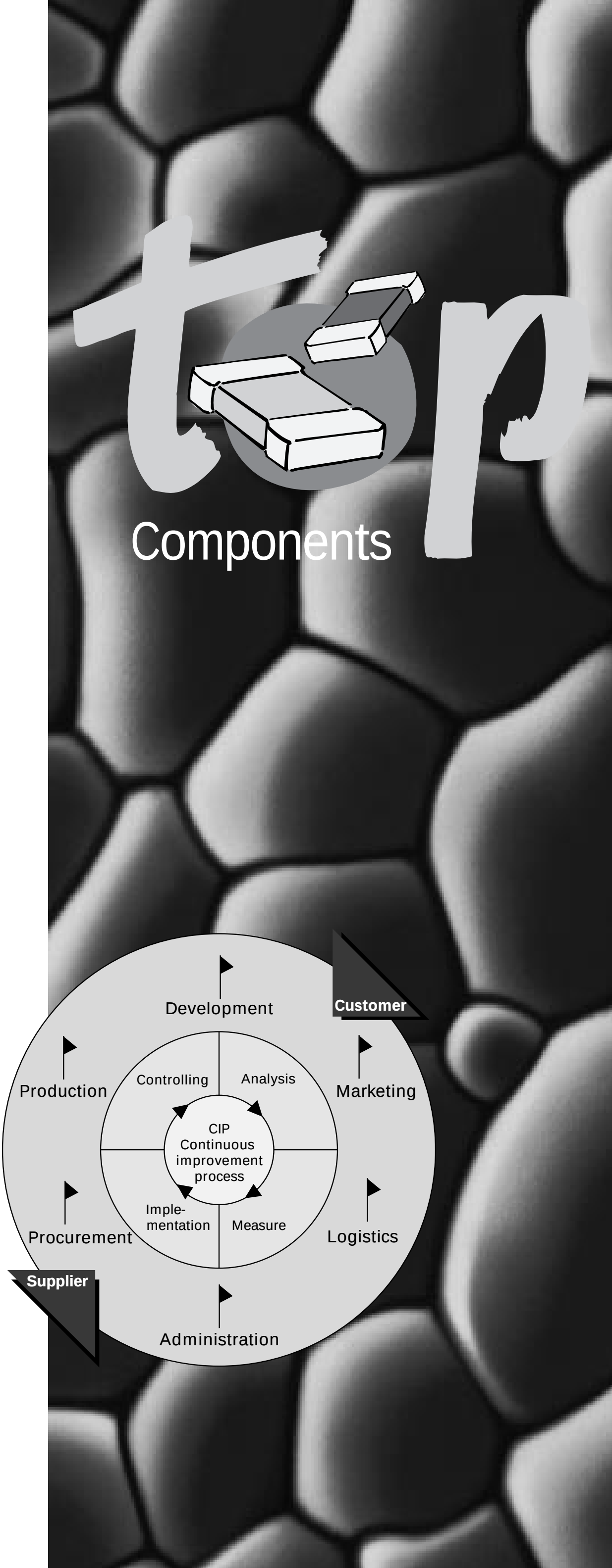
top with TQM

We’re not satisfied until you are. So our quality demands are quite tough. And they don’t start in production, they span the whole field from development to despatch. To watch over it all we implemented Total Quality Management, a system aimed at continuous improvement – in everything. That includes true-to-schedule delivery and service readiness, ISO 9000 for all plants, modern QA, commitment to the environment in manufacturing, materials and packing plus constant training of employees. All embedded in *top*, the worldwide quality campaign of the Siemens organization.



More about “top with TQM“ in this brochure!



SCS – dependable, fast and competent

Index of Part Numbers

(in numerical order)

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

clf. = coil former, ins. = insulating washer, adj. = adjusting screw

Based on IEC 401, the data specified here are typical data for the material in question, which have been determined principally on the basis of ring cores.

The purpose of such characteristic material data is to provide the user with improved means for comparing different materials.

There is no direct relationship between characteristic material data and the data measured using other core shapes and/or core sizes made of the same material. In the absence of further agreements with the manufacturer, only those specifications given for the core shape and/or core size in question are binding.

1 Application survey

Usage	Frequency range	Mate-rial	Specific application	Type
High Q inductors in resonant circuits and filters	up to 0,1 MHz	N 48	Filters in telephony	Gapped P and RM cores
	0,2 - 1,6 MHz	M 33		
	1,5 - 12 MHz	K 1		
	6 - 30 MHz	K 12	VHF filters	
	up to 100 MHz	U 17		
High Q inductors in resonant circuits and open filters	0,001 - 0,2 MHz	N 4		Cylindrical cores, tubular cores, adjusting cores
	0,1 - 2,0 MHz	K 10	Medium-wave intermediate-frequency filters	
	0,2 - 1,6 MHz	M 33		
	0,4 - 2,0 MHz	M 11		
	1,5 - 12 MHz	K 1		
Broadband transformers (e.g. antenna transformers for MW, SW, VHF, TV) ISDN transformers, digital data transformers, current-compensated interference suppression chokes	up to 3 MHz	T 42	ISDN transformers Impedance and matching transformers	RM cores RM, P, ER, EP, Q, ring cores
		T 38		
		T44	Current-compensated chokes	Ring, DE cores
		T 37		
		T 35		
	up to 5 MHz	N 30	Current-compensated chokes	Ring, double-aperture cores
		N 26	Radio-frequency transformers	
	up to 10 MHz	M 33		
	up to 250 MHz	K 1		
		K 12		
	up to 400 MHz	U 17		
Magnetic sensors	up to 1 MHz	N 22	Inductive proximity switches	P core halves
	up to 2 MHz	M 33		

Usage	Frequency range	Material	Specific application	Type
Power transformers, chokes	1 to 100 kHz	N 27	Transformers for flyback converters	E, EC, ETD, U, RM, PM
		N 41	Chokes	Pot cores, RM
		N 61	Pulse power transformers	Small ring, E cores
	up to 200 kHz	N 62	Diode splitting transformers	E, U, UR, ETD, ER
		N 67	High-voltage transformers	
		N 72	Electronic lamp ballast devices	E, ETD
	up to 500 kHz	N 87	Transformers for forward and push-pull converters	ETD, EFD, RM, ER
	0,3 - 1 MHz	N 49	Transformers for DC/DC converters, particularly resonance converters	EFD, ER RM (low profile)
	0,5 - 1 MHz	N 59		

2 Material properties

Preferred application			Resonant circuit inductors					
Material			U 17[1)]	K 12[1)]	K 1	M 11	K 10	M 33[2)]
Base material			NiZn	NiZn	NiZn	NiZn	NiZn	MnZn
Color code (adjuster)	Symbol	Unit	gray	yellow	violet	brown	—	white
Initial permeability (T = 25°C)	μ_i		10 ± 30%	26 ± 25%	80 ± 20%	250 ± 20%	600 ± 20%	750 ± 20%
Meas. field strength Flux density (near saturation) (f = 10 kHz)	H B (25°C) B (100°C)	A/m mT mT	10000 180 170	2000 230 210	5000 310 280	2400 310 230	2000 290 210	2000 400 310
Coercive field strength (f = 10 kHz)	H_c (25°C) H_c (100°C)	A/m A/m	1900 1800	450 410	380 350	90 70	60 45	80 65
Optimum frequency range	f_{min} f_{max}	MHz MHz	10 220	3 40	1,5 12	0,4 2	0,1 1	0,2 1,0
Relative loss factor at f_{min} at f_{max}	$\tan\delta/\mu_i$	10^{-6} 10^{-6}	< 100 < 1700	< 150 < 600	< 40 < 100	< 25 < 50	< 15 < 60	< 12 < 20
Hysteresis material constant	η_B	10^{-6}/mT	< 27	< 45	< 36	< 3,6	< 1,8	< 1,8
Curie temperature	T_C	°C	> 550	> 450	> 400	> 170	> 150	> 200
Relative temperature coefficient at 20 ... 55°C at 5 ... 20°C	α_F	10^{-6}/K	25...50 45...20	3...14 12...0	2...8 7...1	— —	— —	0,5...2,6 —
Mean value of α_F at 20 … 55°C		10^{-6}/K	37	9	4	14	8	1,6
Density (typical values)		kg/m³	4400	4600	4650	4600	4700	4500
Disaccommodation factor at 20°C	DF	10^{-6}	—	—	20	—	—	8
Resistivity	ρ	Ωm	10^5	10^5	10^5	10^5	10^5	5
Core shapes			P, Double apert.	P, Tubular, Cylin-drical, Ring	RM, P, Ring, P core half	Double apert., Cylin-drical, Tubular	Ring, Double apert., Cylin-drical, Tubular	RM, P, Ring, Double apert., P core half
Other material properties (graphs) see page			42	44	46	48	49	50

Material properties (continued)

Preferred application			Res. circuit inductors		Special type	
Material			N 4	N 48	N 22	
Base material			NiZn	MnZn	MnZn	
Color code (adjuster)	Symbol	Unit	—	—	red	
Initial permeability (T = 25°C)	μ_i		2000 ± 20%	2300 ± 25%	2000 ± 25%	2300 ± 25%
Meas. field strength Flux density (near saturation) (f = 10 kHz)	H B (25°C) B (100°C)	A/m mT mT	1200 290 140	1200[3)] 400[3)] 290[3)]	1200 370 260	
Coercive field strength (f = 10 kHz)	H_c'(25°C) H_c'(100°C)	A/m A/m	12 7	19 13	18 14	
Optimum frequency range	f_{min} f_{max}	MHz MHz	0,001 0,2	0,001 0,1	0,001 0,2	
Relative loss factor at f_{min} at f_{max}	$\tan\delta/\mu_i$	10^{-6} 10^{-6}	< 10 < 70	< 0,5 < 2,5	< 2 < 20	
Hysteresis material constant	η_B	10^{-6}/mT	< 4	< 0,4	< 1,4	
Curie temperature	T_C	°C	> 100	> 150	> 145	
Relative temperature coefficient at 20 ... 55°C at 5 ... 20°C	α_F	10^{-6}/K	— —	0,4...1,0 1,0...0,4	— —	
Mean value of α_F at 20 … 55°C		10^{-6}/K	5	0,7	0,9	
Density (typical values)		kg/m^3	5100	4700	4700	
Disaccommodation factor at 20°C	DF	10^{-6}	—	2	4	
Resistivity	ρ	Ωm	10^4	3	1	
Core shapes			Ring, Cylindrical, Tubular, Double aperture	RM, P	Shielding-beads	Ring, P core half, Double aperture
Other material properties (graphs) see page			52	53	55	

1) Perminvar ferrite: irreversible variations in quality and permeability may occur in case of strong fields in the core (> 1500 A/m). In the case of shape-related dimensions, these dimensions may be exceeded by up to 5%.
2) For threaded cores μi = 600 ± 20%

Material properties (continued)

Preferred application			Broadband transformers						
Material			N 26	N 30	T 35	T 37	T 44	T 38	T 42[4)]
Base material			MnZn	MnZn	MnZn	MnZn	MnZn	MnZn	MnZn
	Symbol	Unit							
Initial permeability (T = 25°C)	μ_i		2300 ± 20%	4300 ± 20%	6000 ± 20%	6500 ± 25%	8000 ± 30%	10000 ± 30%	12000 ± 30%
Meas. field strength Flux density (near saturation) (f = 10 kHz)	H B (25°C) B (100°C)	A/m mT mT	1200 390 260	1200 380 240	1200 390 270	1200 380 240	1200 400 280	1200 380 240	1200 400 250
Coercive field strength (f = 10 kHz)	H_c (25°C) H_c (100°C)	A/m A/m	15 12	12 8	12 9	9 8	10 6	9 6	7 6
Optimum frequency range	f_{min} f_{max}	MHz MHz	— —	— —	— —	— —	— —	— —	— —
Relative loss factor at f_{min} at f_{max}	$\tan \delta / \mu_i$	10^{-6} 10^{-6}	< 5 f=100 kHz	— —	— —	— —	— —	— —	— —
Hysteresis material constant	η_B	10^{-6}/mT	< 1,5	< 1,1	< 1,1	< 1,1	< 1,1	< 1,4	< 1,4
Curie temperature	T_C	°C	> 150	> 130	> 130	> 130	> 130	> 130	> 130
Relative temperature coefficient at 20 ... 55°C at 5 ... 20°C	α_F	10^{-6}/K	0...1,5 0...2	— —	— —	— —	— —	— —	— —
Mean value of α_F at 20 … 55°C		10^{-6}/K	0,5	0,6	0,8	- 0,3	0,2	- 0,4	- 0,3
Density (typical values)		kg/m^3	4700	4800	4900	4900	4900	4900	4950
Disaccommodation factor at 20°C	DF	10^{-6}	—	—	—	—	—		
Resistivity	ρ	Ωm	2	0,5	0,2	0,2	0,25	0,1	0,1
Core shapes			RM, P, EP, Q	RM, P EP,Q, E, Ring, Double apert.	RM, P, EP, Ring	Ring, DE	Ring, DE	RM, P, Q, EP, ER, E, Ring	RM, EP, Ring
Other material properties (graphs) see page			56	58	60	62	64	66	68

3) Measured at f = 40 kHz

Material properties (continued)

Preferred application			Power transformers				
Material			N 59[5)]	N 47	N 49	N 62	N 27
Base material	Symbol	Unit	MnZn	MnZn	MnZn	MnZn	MnZn
Initial permeability (T = 25°C)	μ_i		850 ± 25%	1400 ± 20%	1300 ± 20%	1900 ± 20%	2000 ± 20%
Flux density (H = 1200 A/m, f = 10 kHz)	B (25°C) B (100°C)	mT mT	460 370	420 330	430 340	500 410	480 400
Coercive field strength (f = 10 kHz)	H_c'(25°C) H_c'(100°C)	A/m A/m	60 50	33 27	33 27	18 11	27 20
Optimum frequency range	f_{min} f_{max}	kHz kHz	500 1500	200 1000	300 1000	— 300	— 150
Hysteresis material constant	η_B	10^{-6}/mT	—	< 0,8	< 0,8	—	< 1,5
Curie temperature	T_C	°C	> 240	> 200	> 200	> 240	> 220
Mean value α_F at 20 … 55°C		10^{-6}/K	—	1	—	—	3
Density (typical values)		kg/m³	4750	4600	4600	4800	4750
Relative core losses	P_V						
25 kHz, 200 mT, 100°C		mW/g mW/cm³				16 80	32 155
100 kHz, 200 mT, 100°C		mW/g mW/cm³				105 500	190 920
300 kHz, 50 mT, 100°C		mW/g mW/cm³		25 115			
500 kHz, 50 mT, 100°C		mW/g mW/cm³	39 180	60 280	32 145		
1 MHz, 50 mT, 100°C		mW/g mW/cm³	110 510		150 680		
Resistivity	ρ	Ωm	26	20	25	4	3
Core shapes			EFD	RM, Ring, Q	RM, Q, Ring, EFD, ER	ETD, E, U	P, PM, ETD, EC, ED, ER, E, U, CC, Ring
Other material properties (graphs) see page			70	73	76	79	82

4) Material values defined on the basis of small ring cores (≤ R10)

Material properties (continued)

Preferred application			Power transformers				
Material			N 67	N 87	N 72	N 41	N 61[5)]
Base material	Symbol	Unit	MnZn	MnZn	MnZn	MnZn	MnZn
Initial permeability (T = 25°C)	μ_i		2100 ± 25%	2200 ± 25%	2500 ± 25%	2800 ± 20%	3000 ± 20%
Flux density (H = 1200 A/m, f = 10 kHz)	B (25°C) B (100°C)	mT mT	480 380	480 380	480 370	470 380	490 390
Coercive field strength (f = 10 kHz)	H_c' (25°C) H_c' (100°C)	A/m	20 14	16 9	15 11	20 22	17 18
Optimum frequency range	f_{min} f_{max}	kHz kHz	— 300	— 500	— 300	— 150	— 150
Hysteresis material constant	η_B	10^{-6}/mT	< 1,4	< 1,4	—	< 1,4	—
Curie temperature	T_C	°C	> 220	> 210	> 210	> 220	> 220
Mean value α_F at 20 … 55°C		10^{-6}/K	4	4	—	4	—
Density (typical values)		kg/m^3	4800	4800	4800	4800	4850
Relative core losses	P_V						
25 kHz, 200 mT, 100°C		mW/g mW/cm^3	17 80		16 80	35 180	32 165
100 kHz, 200 mT, 100°C		mW/g mW/cm^3	105 500	80 385	110 540	280 1400	220 1100
300 kHz, 50 mT, 100°C		mW/g mW/cm^3	22 105	15 72			
500 kHz, 50 mT, 100°C		mW/g mW/cm^3					
1 MHz, 50 mT, 100°C		mW/g mW/cm^3					
Resistivity	ρ	Ωm	8	8	12	2	2
Core shapes			RM, P, EP, ETD, ER, ED, EFD, E, U, Ring	RM, P, PM, ETD, EFD, E	E, EFD	RM, P	Ring, ≤R12,5 E, ≤E14
Other material properties (graphs) see page			85	88	91	94	97

5) Preliminary data

3 Measuring conditions

The following measuring conditions, which correspond largely to IEC 51 (CO) 282 (revision IEC 401), apply for the material properties given in the table:

Properties (valid only for ring cores of sizes R 10 to R 36)			Measuring conditions			
			Frequency kHz	Field strength (material-dependent) kA/m	Max. flux density mT	Temper-ature °C
Initial permeability	μ_i		≤ 10		≤ 0,25	25
Flux density near to saturation	B	mT	≤ 10	≥1,2		25; 100
Coercive field strength	H_{cB}	A/m kA/m	≤ 10	≥1,2	near to saturation	25; 100
Relative loss factor	$\tan \delta/\mu_i$		—		≤ 0,25	25
Hysteresis material constant	η_B	T^{-1}	 10 ($\mu_i \geq 500$) 100 ($\mu_i < 500$)		B_1 B_2 1,5 3,0 0,3 1,2	25
Curie temperature	T_c	°C	≤ 10		≤ 0,25	
Relative temperature coefficient	α_F	10^{-6}/K	≤ 10		≤ 0,25	5 ... 20 20 ... 55
Density		kg/m^3				25
Disaccommodation factor	DF	10^{-6}	≤ 10		≤ 0,25	25; 60[1)]
Resistivity	ρ	Ωm			—	25

The following properties are given only for materials for power applications:

Power loss	P_V	mW/cm^3 mW/g	25 100 300 500 1000		200 100 50 50 50	100

5) Preliminary data

4 Specific material data

DC magnetic bias

$$H_{\_} = \frac{I_{\_} \cdot N}{l_e}$$

$H_{\_}$ = DC field strength [A/m]
$I_{\_}$ = Direct current [A]
N = Number of turns
l_e = Effective magnetic path length [m]

Explanation of the graphs

The curves of $\mu_{rev} = f(H_{\_})$ allow an approximate calculation of the variation in reversible permeability (μ_{rev}) and A_L value caused by magnetic bias. These curves are of particular interest for cores for transformers and chokes, since magnetic bias should be avoided if possible with inductors requiring high stability (filter inductors etc.). In the case of geometrically similar cores (i.e. in particular the same A_{min}/A_e ratio) the effective permeability of the core in question in conjunction with the given curves suffices to determine the reversible permeability to a close approximation.

For determining the variations of reversible permeability with magnetic bias DC field strength $H_{\_}$, the effective permeability μ_e for the desired A_L value is taken from the data sheets for the individual cores. If the curve $\mu_{rev} = f(H_{\_})$ for the actual effective permeability is not shown, this can be obtained by interpolation from the two curves shown. The associated DC field strength $H_{\_}$ can be calculated from the above equation with the effective magnetic path length l_e similarly obtained from the individual data sheets.

Example for small-signal transformers

P 26 × 16, B65671
SIFERRIT material N26
A_L = 1000 nH
μ_e = 319
l_e = 37,2 mm

Example for power transformers

E 42/15 (B66325-G500-X127
combined with B66325-G-X127)
Air gap dimension g (0,5 ± 0,05) mm
μ_e = 190
l_e = 97 mm

The decrease in permeability caused by magnetic bias begins at a DC field strength of about 300 A/m (P 26 × 16) or about 1000 A/m (E 42/15).

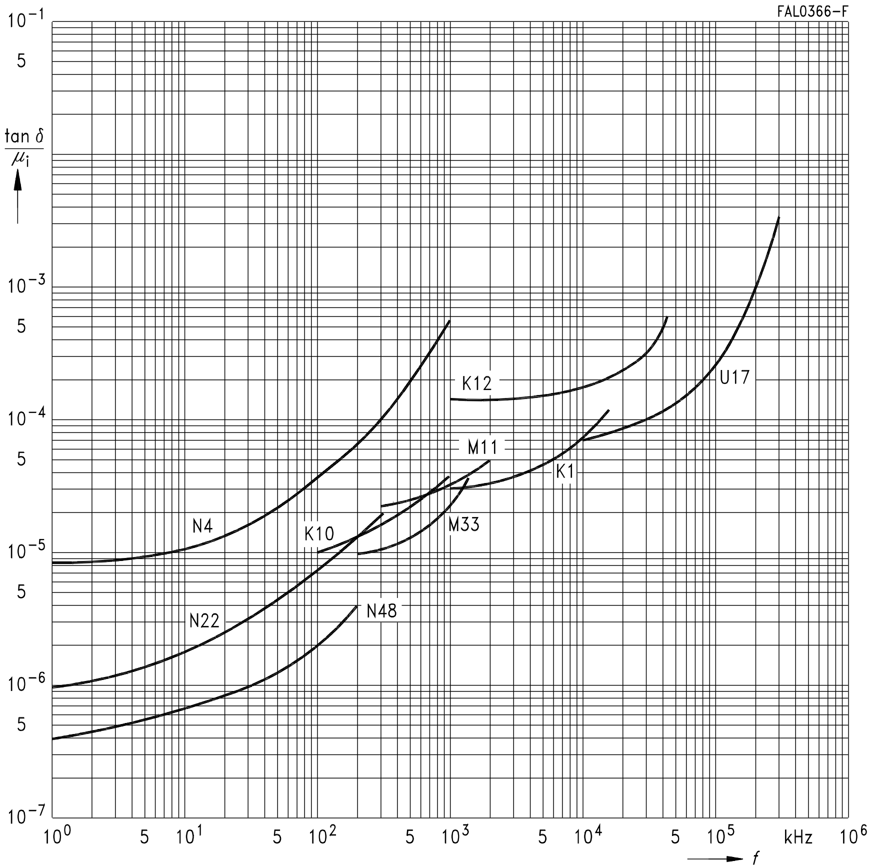
This corresponds to an ampere-turns value of

$I_{\_} \cdot N = H_{\_} \cdot l_e = 300 \cdot 37{,}2 \cdot 10^{-3} = 11{,}2$ [A · turn] (for P 26 × 16)

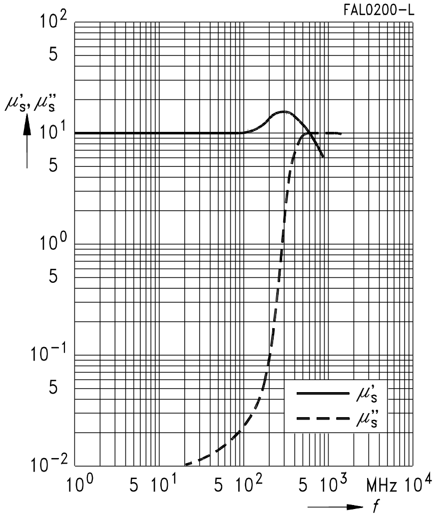
$I_{\_} \cdot N = H_{\_} \cdot l_e = 1000 \cdot 97 \cdot 10^{-3} = 97$ [A · turn] (for E 42/15)

Relative loss factor versus frequency

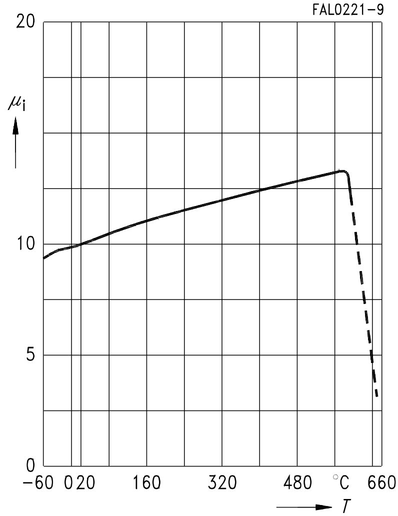
(measured with ring cores, measuring flux density $\hat{B} \leq 0{,}25$ mT)



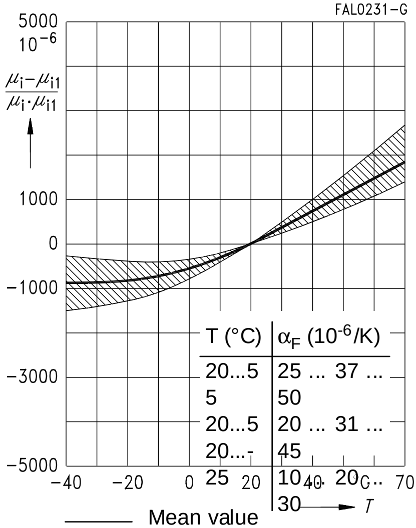
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{B} \leq$ 0,25 mT)



Initial permeability μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq$ 0,25 mT)



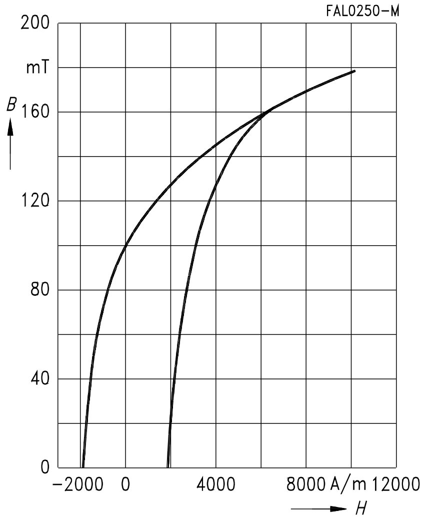
Permeability factor versus temperature
(measured with P and RM cores,
$\hat{B} \leq$ 0,25 mT), $\mu_i \approx 10$



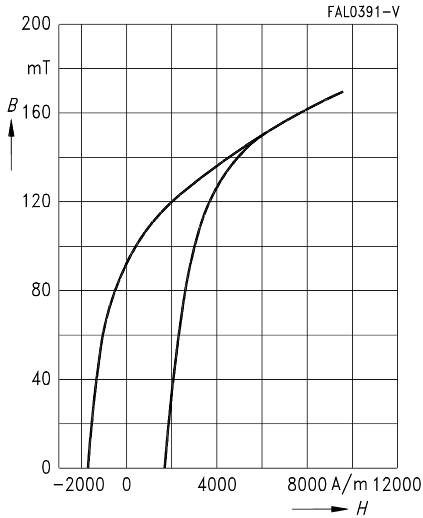
T (°C)	α_F (10^{-6}/K)
20...55	25 ... 37 ... 50
20...5	20 ... 31 ... 45
20...-25	10 ... 20 ... 30

——— Mean value

Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)

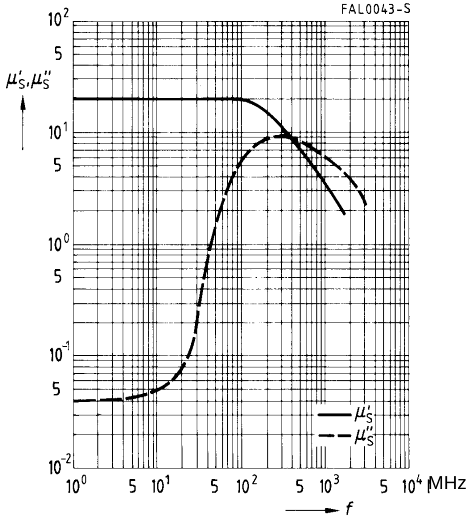


Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)

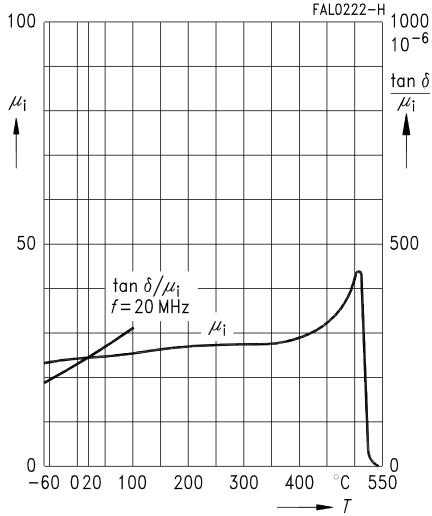


Complex permeability versus frequency

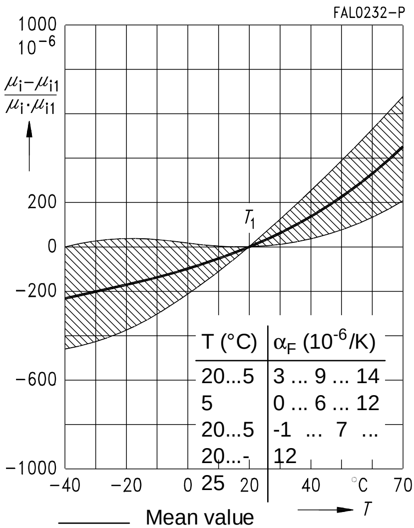
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



Initial permeability μ_i and relative loss factor $\tan \delta/\mu_i$ versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)

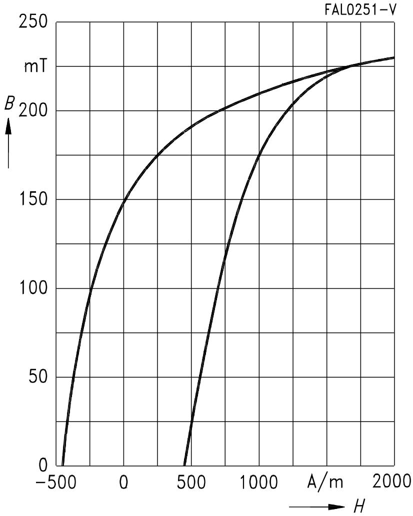


Permeability factor versus temperature
(measured with P and RM cores,
$\hat{B} \leq 0{,}25$ mT), $\mu_i \approx 26$

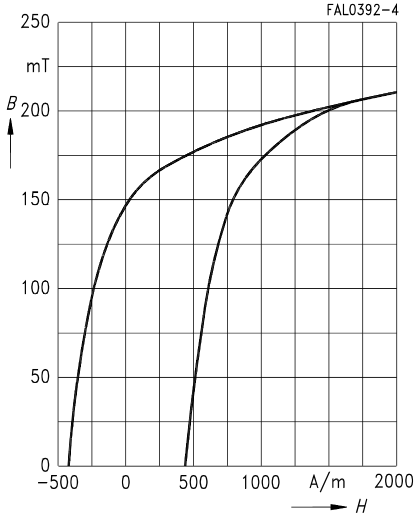


T (°C)	α_F (10^{-6}/K)
20...5	3 ... 9 ... 14
5	0 ... 6 ... 12
20...5	-1 ... 7 ...
20...-	12
25	

Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)

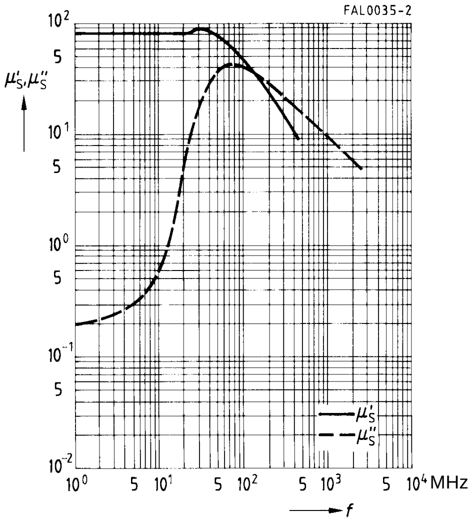


Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)

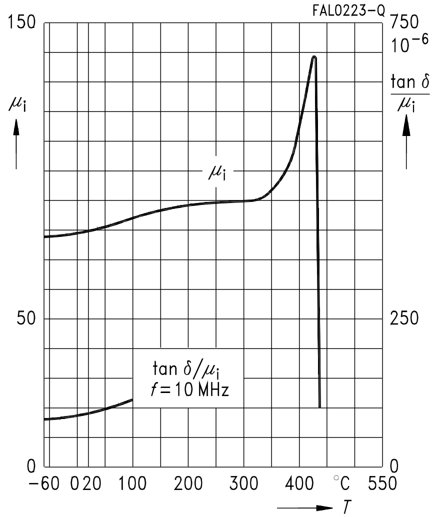


Complex permeability versus frequency

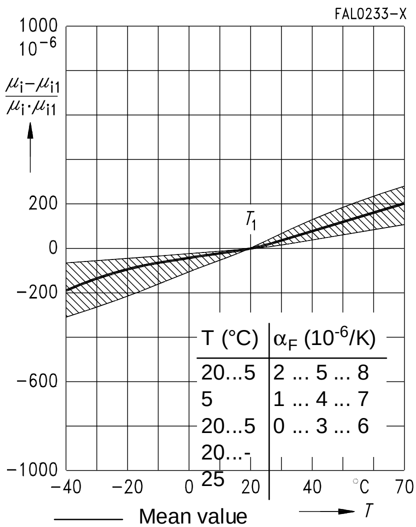
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



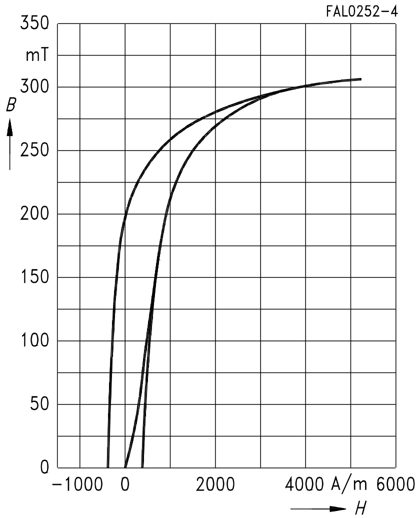
Initial permeability μ_i and relative loss factor tan δ/μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



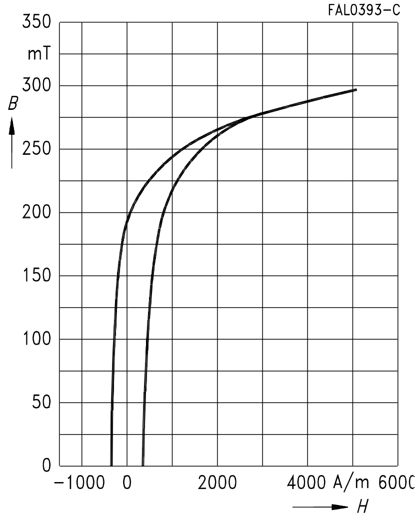
Permeability factor versus temperature
(measured with P and RM cores,
$\hat{B} \leq 0{,}25$ mT), $\mu_i \approx 80$



Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)

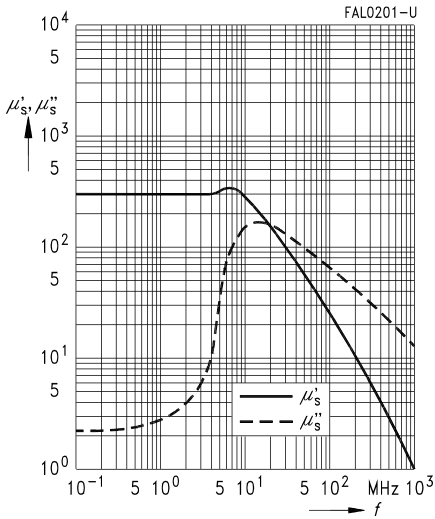


Dynamic magnetization curves
(typical values)
(f = 10 kHz, T =100°C)

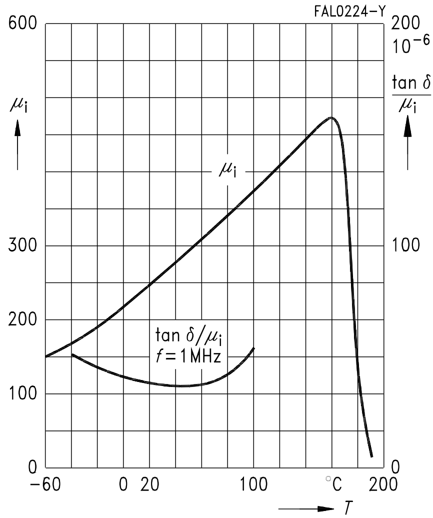


Complex permeability versus frequency

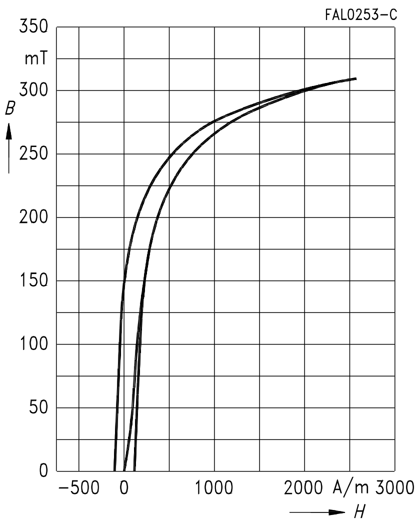
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



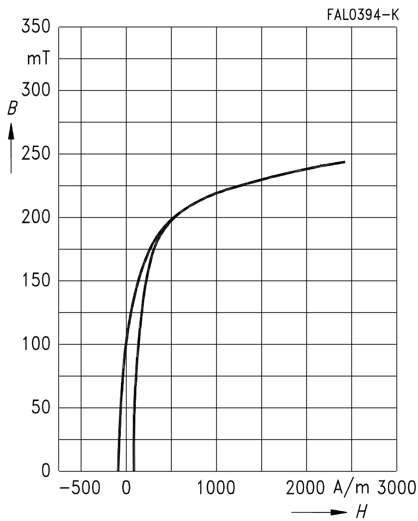
Initial permeability μ_i and relative loss factor $\tan \delta/\mu_i$ versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)

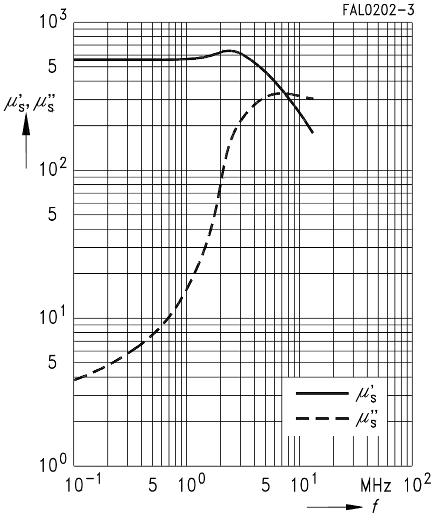


Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)

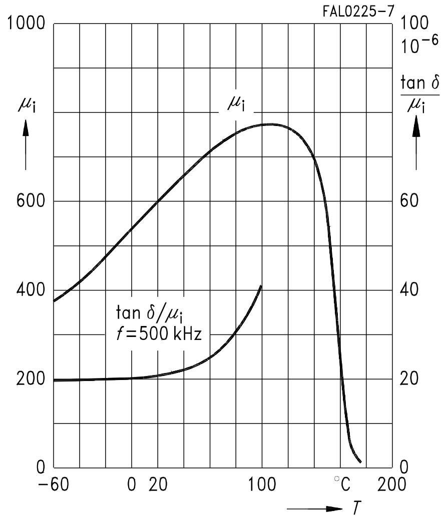


Complex permeability versus frequency

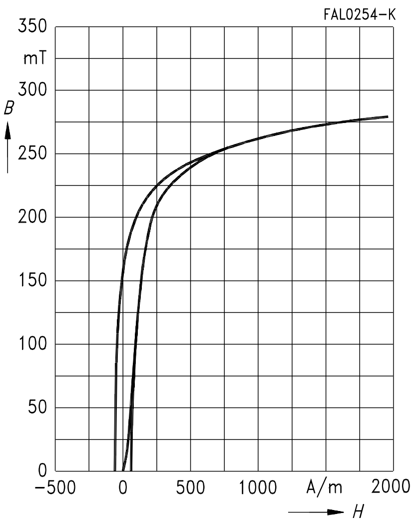
(measured with R10 ring cores, $\hat{B} \leq$ 0,25 mT)



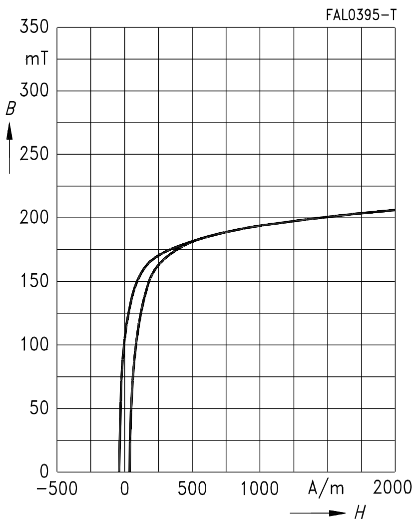
Initial permeability μ_i and relative loss factor $\tan \delta/\mu_i$ versus temperature
(measured with R10 ring cores, $\hat{B} \leq$ 0,25 mT)



Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)

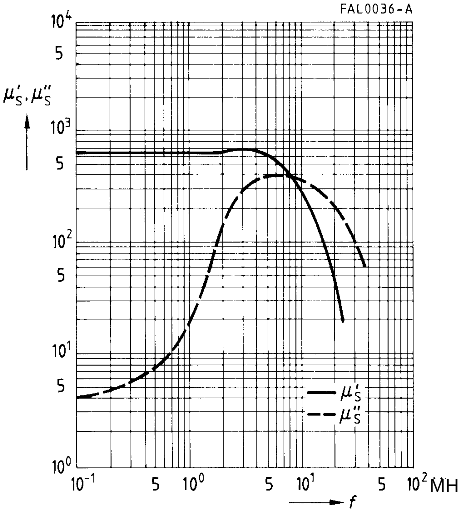


Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)

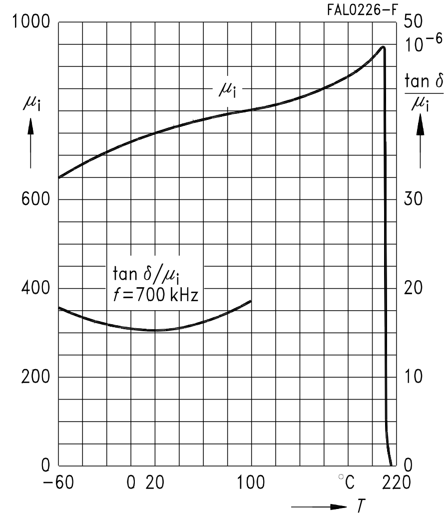


Complex permeability versus frequency

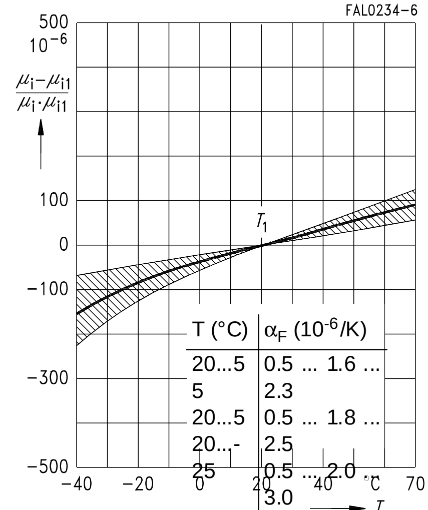
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



Initial permeability μ_i and relative loss factor $\tan\delta/\mu_i$ versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



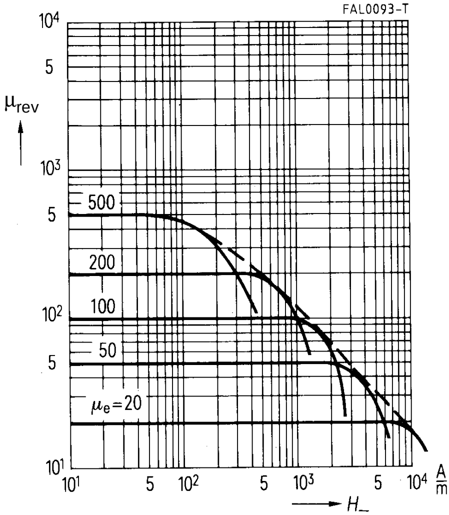
Permeability factor versus temperature
(measured with P and RM cores,
$\hat{B} \leq 0{,}25$ mT), $\mu_i \approx 750$



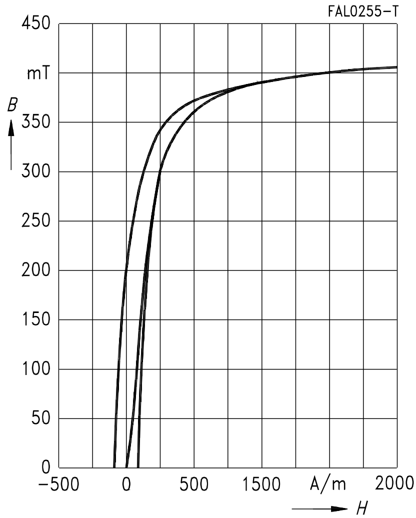
T (°C)	α_F (10^{-6}/K)
20...55	0.5 ... 1.6 ... 2.3
20...5	0.5 ... 1.8 ... 2.5
20...-25	0.5 ... 2.0 ... 3.0

——— Mean value

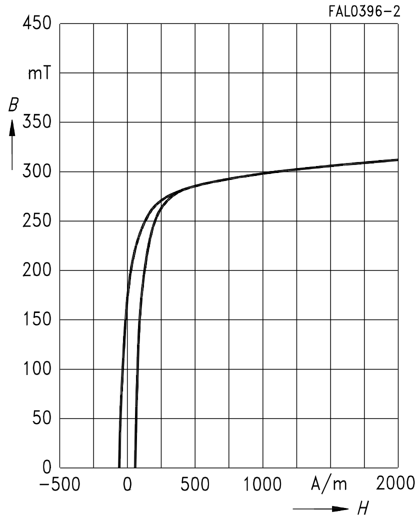
DC magnetic bias of P and RM cores
(typical values)
($\hat{B} \leq 0{,}25$ mT, f = 10 kHz, T = 25°C)



Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)

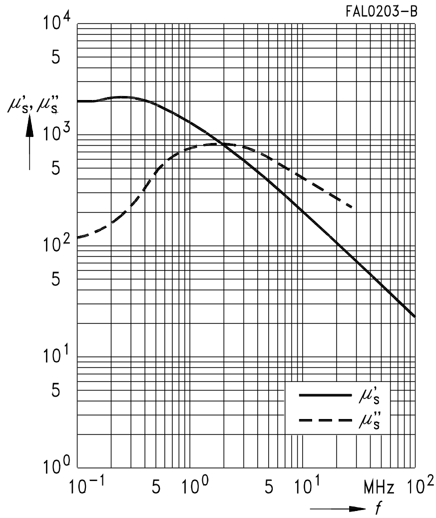


Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)

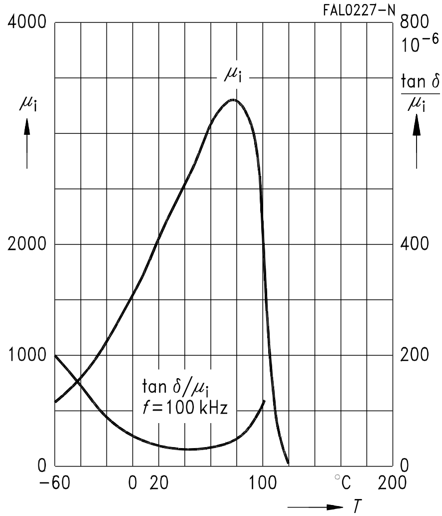


Complex permeability versus frequency

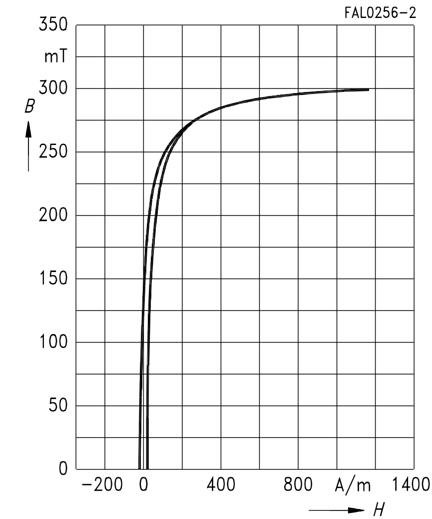
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



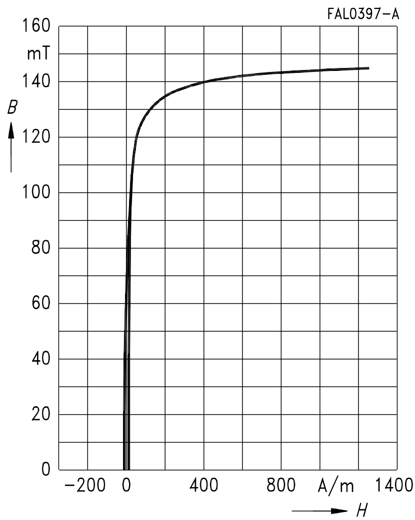
Initial permeability μ_i and relative loss factor $\tan \delta/\mu_i$ versus temperature
(measured with R25 ring cores, $\hat{B} \leq 0{,}25$ mT)



Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)

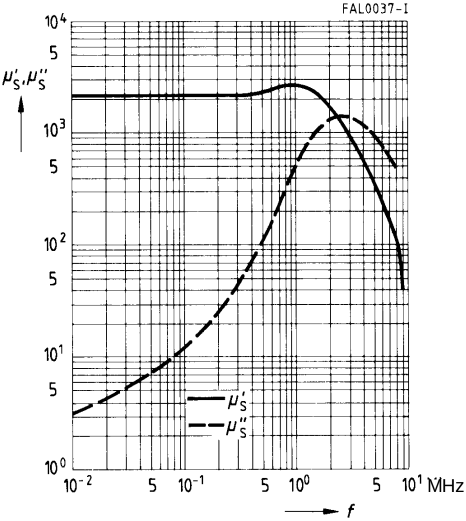


Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)

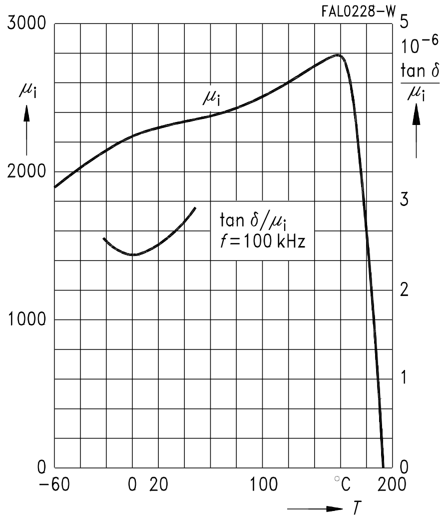


Complex permeability versus frequency

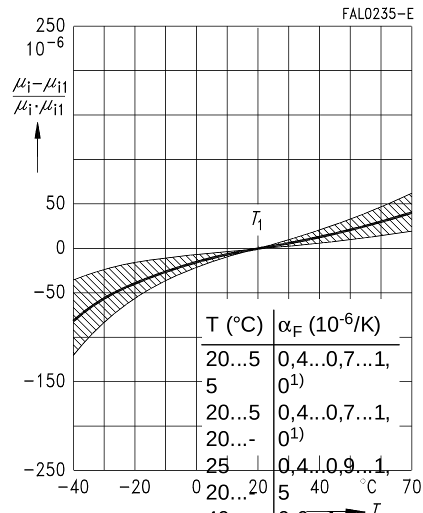
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



Initial permeability μ_i and relative loss factor tan δ/μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



Permeability factor versus temperature
(measured with P and RM cores,
$\hat{B} \leq 0{,}25$ mT), $\mu_i \approx 2300$

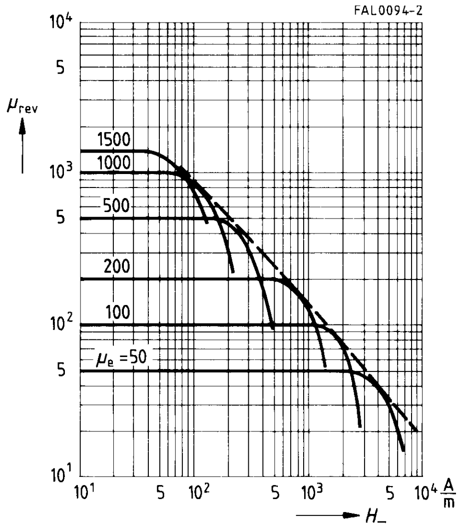


T (°C)	α_F (10^{-6}/K)
20...55	0,4...0,7...1,0[1)]
20...5	0,4...0,7...1,0[1)]
20...-25	0,4...0,9...1,5
20...-10	~ 6...1,25...

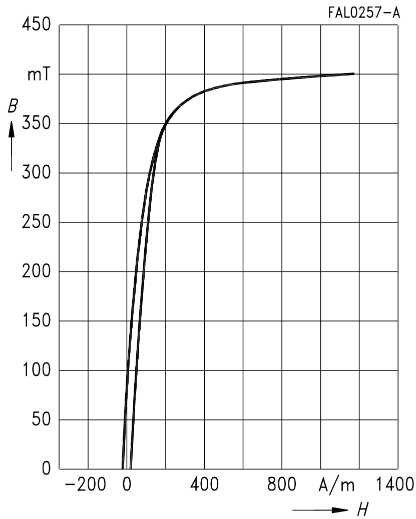
Mean value

1) With P cores ≥ P22 × 13 and RM cores ≥ RM 8 the α_F value may deviate by up to $1{,}2 \cdot 10^{-6}$/K.

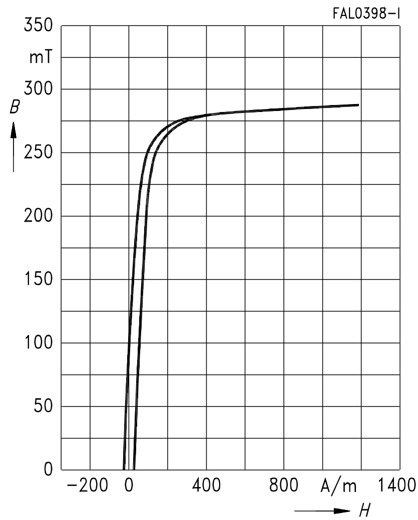
DC magnetic bias of P and RM cores
(typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



Dynamic magnetization curves
(typical values)
(f = 40 kHz, T = 25°C)

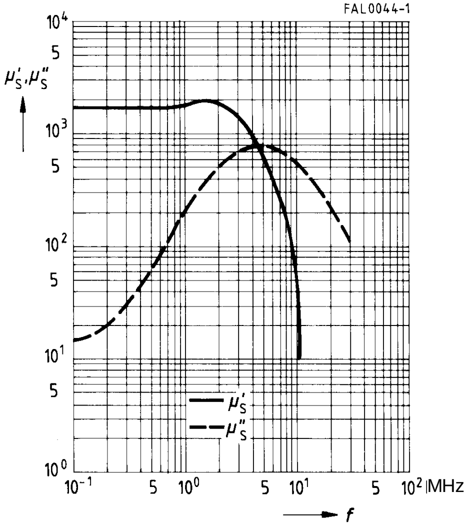


Dynamic magnetization curves
(typical values)
(f = 40 kHz, T = 100°C)

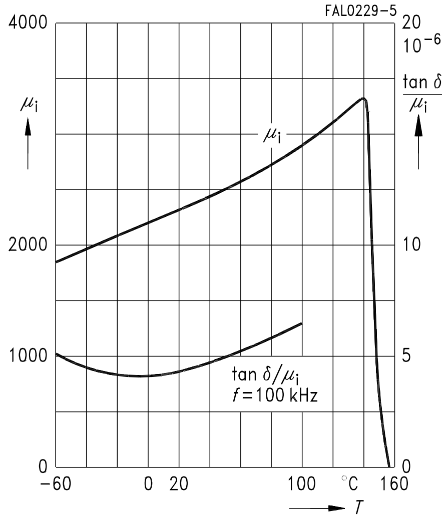


Complex permeability versus frequency

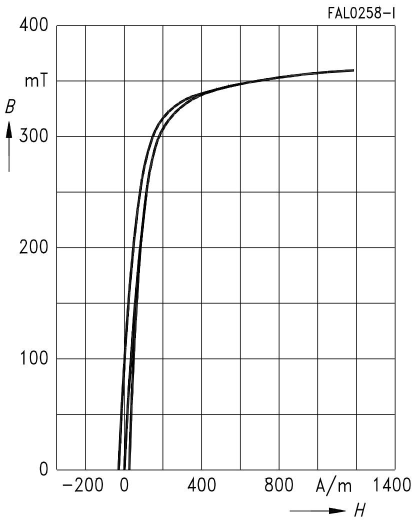
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



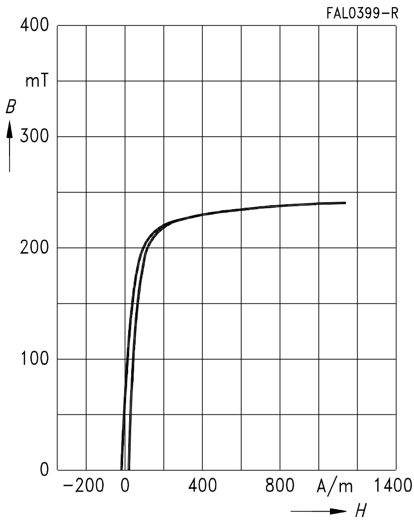
Initial permeability μ_i and relative loss factor $\tan \delta/\mu_i$ versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



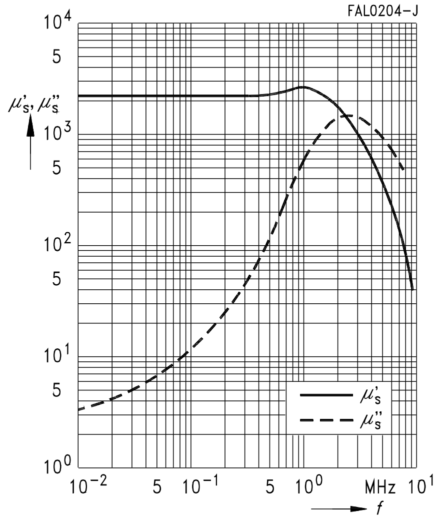
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



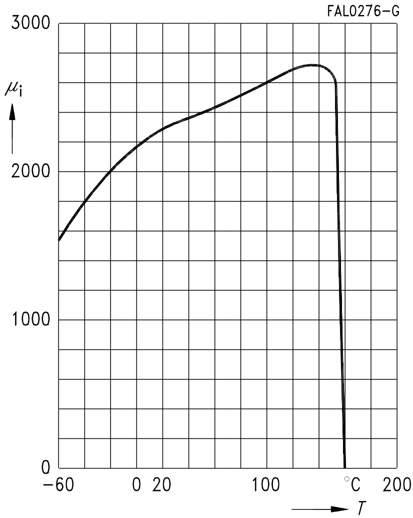
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



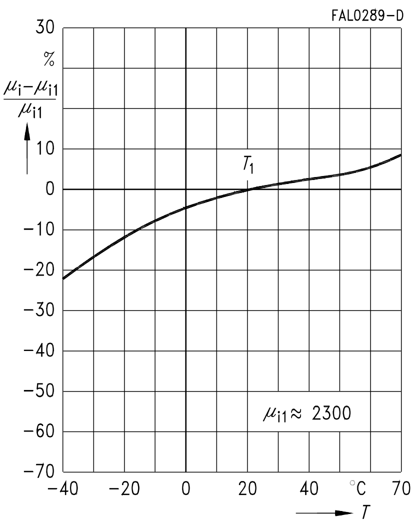
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{L} \leq 0{,}25$ mT)



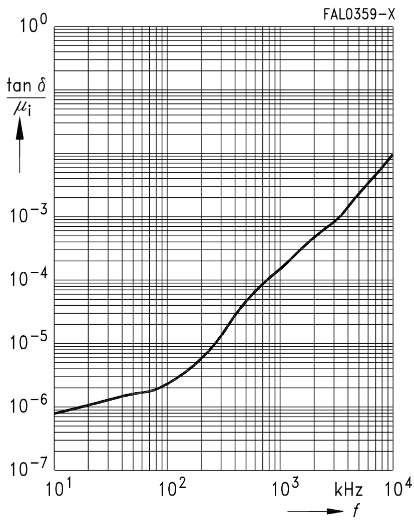
Initial permeability μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



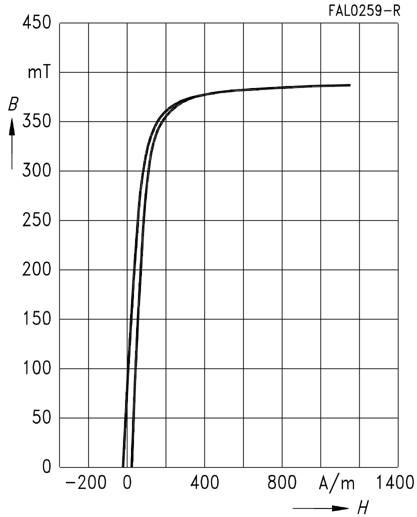
Variation of initial permeability with temperature
(measured with R10 ring cores, $\hat{L} \leq 0{,}25$ mT)



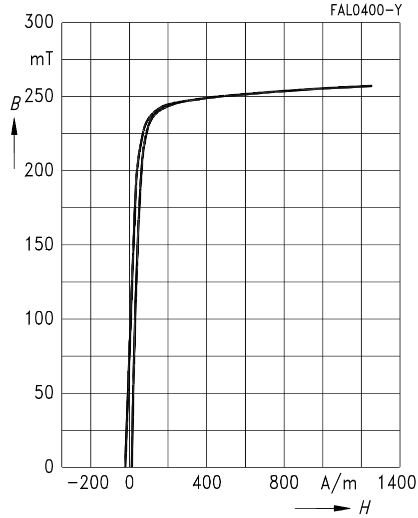
Relative loss factor versus frequency
(measured with R14 ring cores, $\hat{B} \leq 0{,}25$ mT)



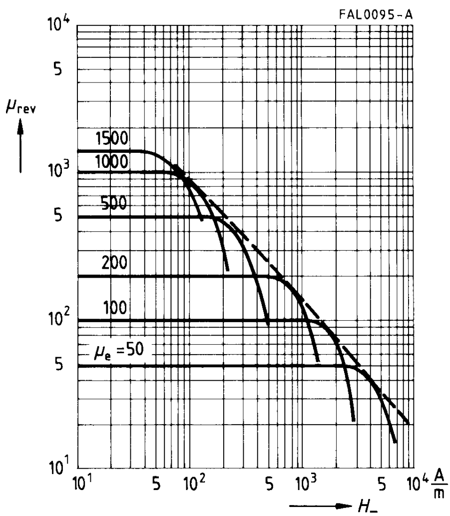
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



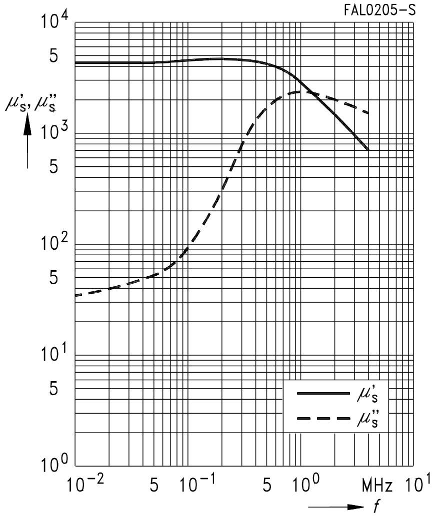
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



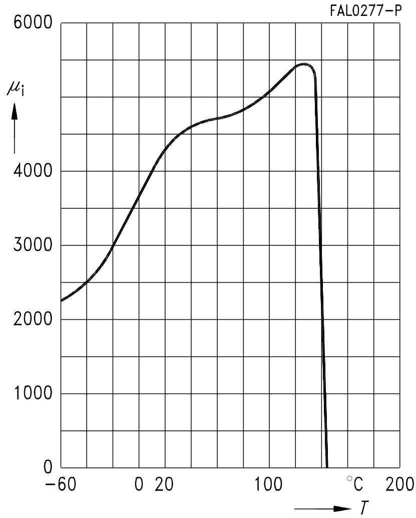
DC magnetic bias of P and RM cores
(typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



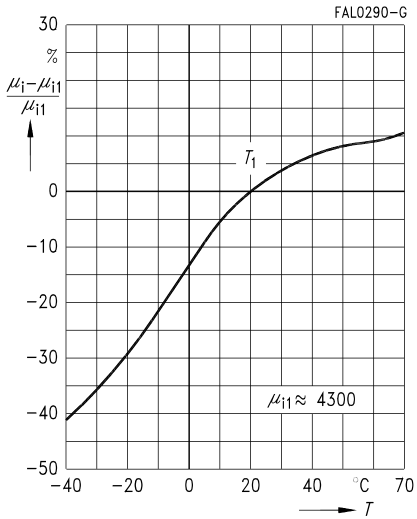
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



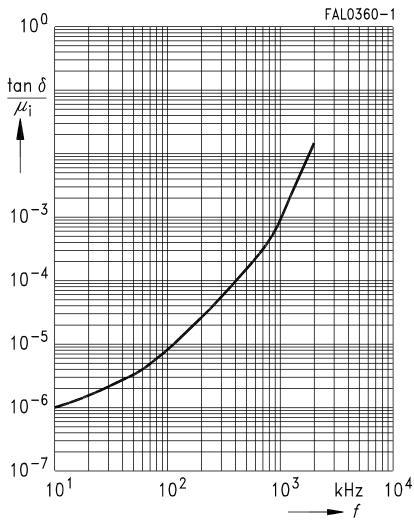
Initial permeability μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



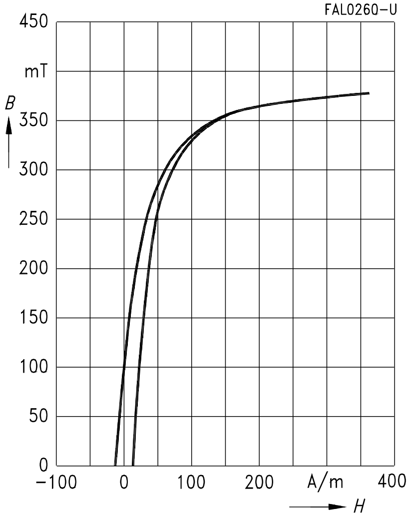
Variation of initial permeability with temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



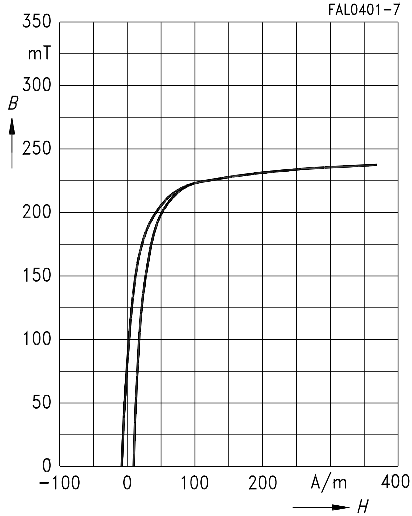
Relative loss factor versus frequency
(measured with R20 ring cores, $\hat{B} \leq 0{,}25$ mT)



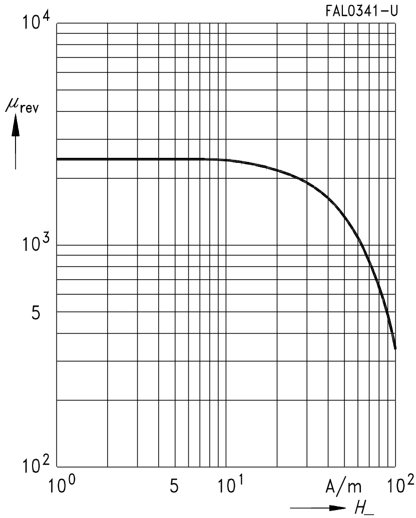
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



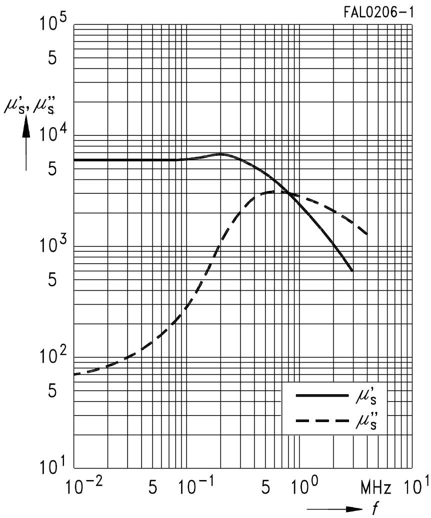
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



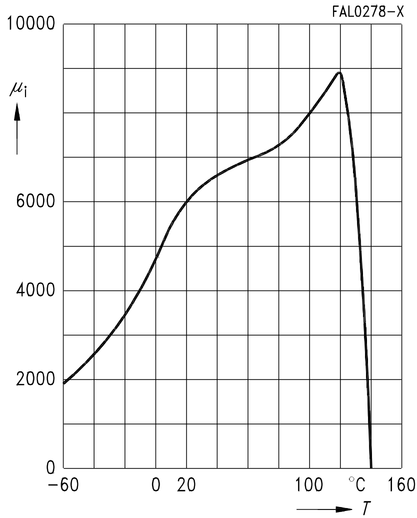
DC magnetic bias of RM cores (typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



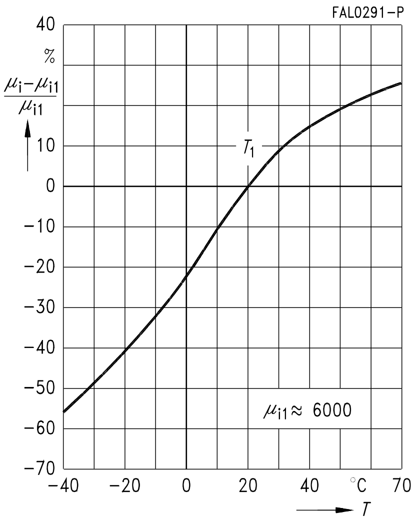
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{B} \leq$ 0,25 mT)



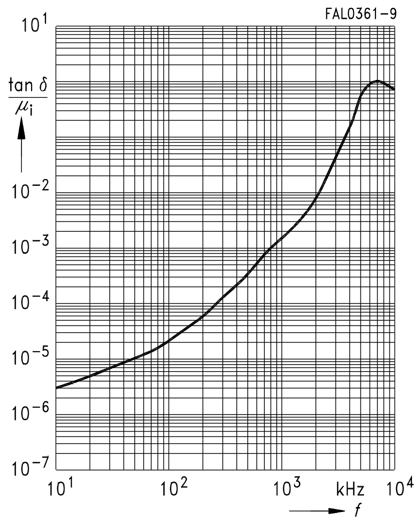
Initial permeability μ_i versus temperature
(measured with R16 ring cores, $\hat{B} \leq$ 0,25 mT)



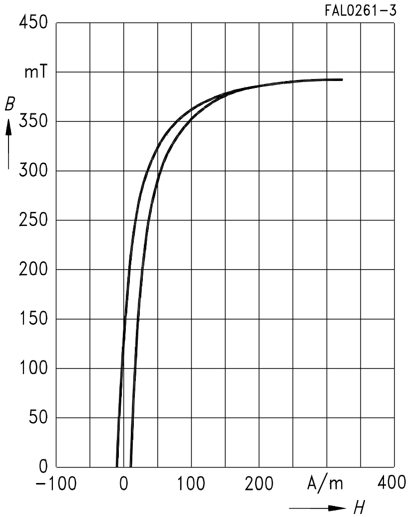
Variation of initial permeability with temperature
(measured with R16 ring cores, $\hat{B} \leq$ 0,25 mT)



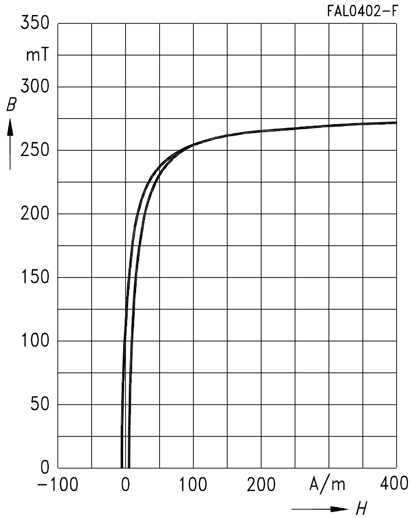
Relative loss factor versus frequency
(measured with R16 ring cores, $\hat{B} \leq$ 0,25 mT)



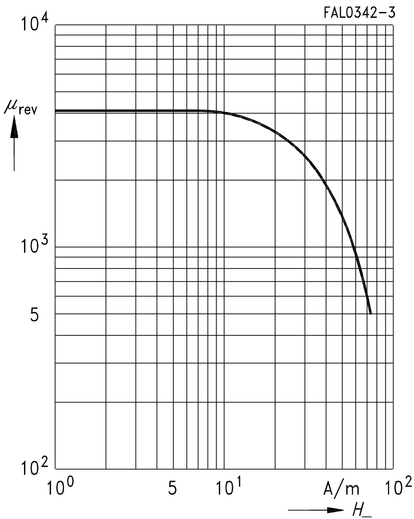
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



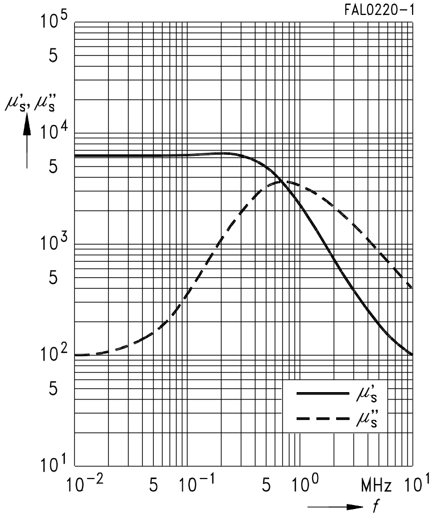
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



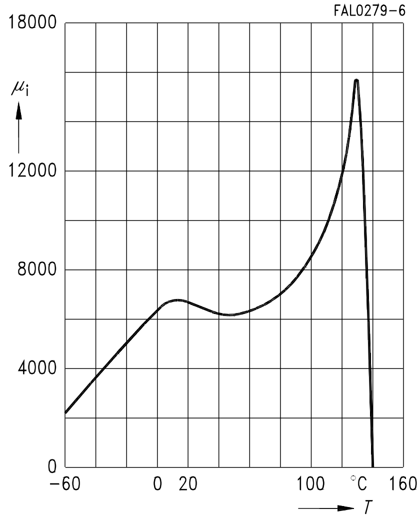
DC magnetic bias of RM cores (typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



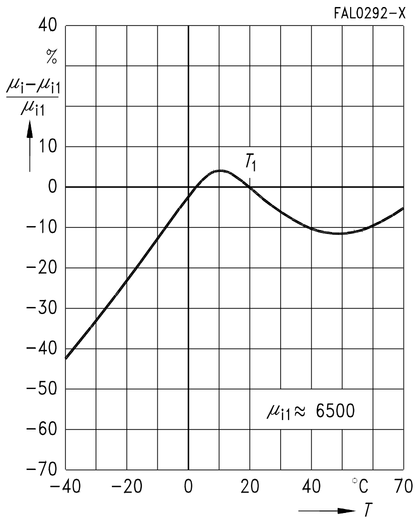
Complex permeability versus frequency
(measured with R16 ring cores, $\hat{B} \leq 0{,}25$ mT)



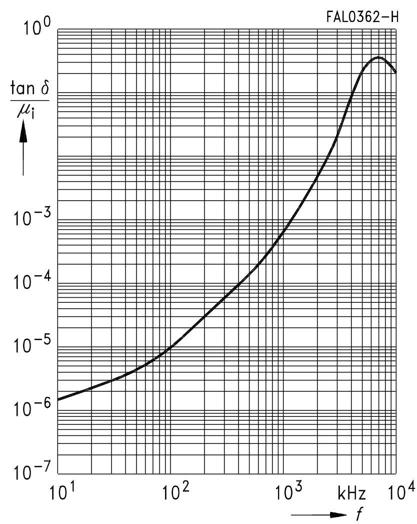
Initial permeability μ_i versus temperature
(measured with R22 ring cores, $\hat{B} \leq 0{,}25$ mT)



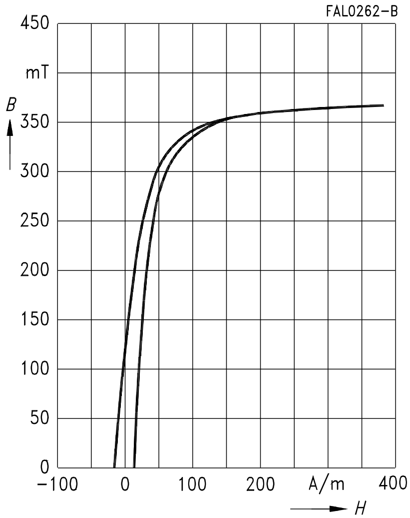
Variation of initial permeability with temperature
(measured with R22 ring cores, $\hat{B} \leq 0{,}25$ mT)



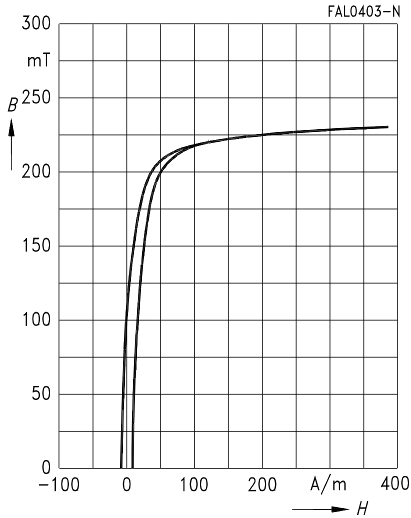
Relative loss factor versus frequency
(measured with R16 ring cores, $\hat{B} \leq 0{,}25$ mT)



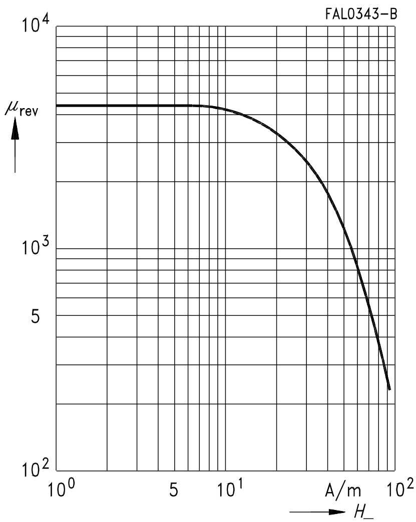
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



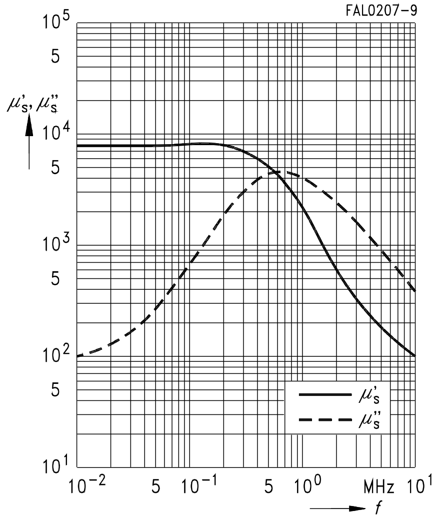
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



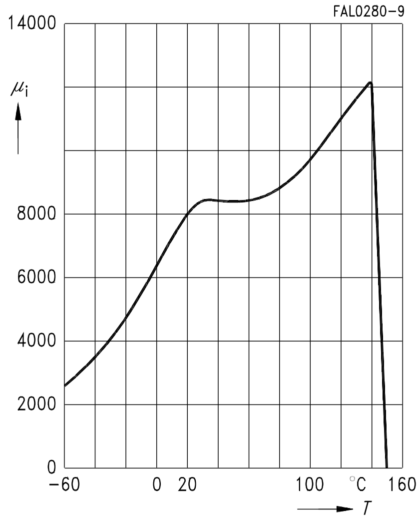
DC magnetic bias of RM cores (typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



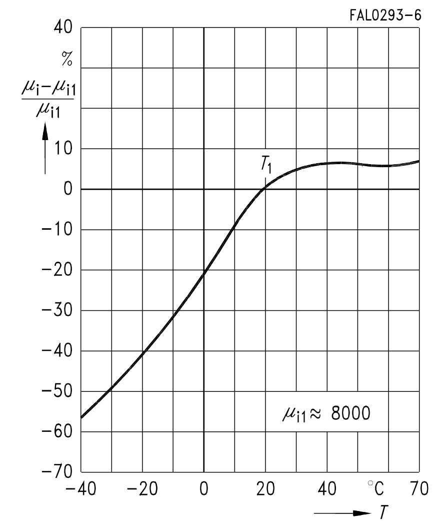
Complex permeability versus frequency
(measured with R17 ring cores, $\hat{B} \leq 0{,}25$ mT)



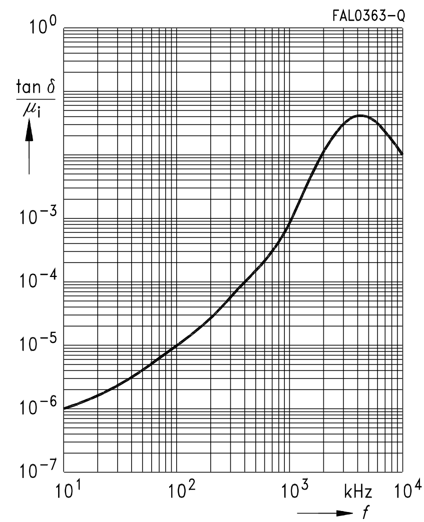
Initial permeability μ_i versus temperature
(measured with R17 ring cores, $\hat{B} \leq 0{,}25$ mT)



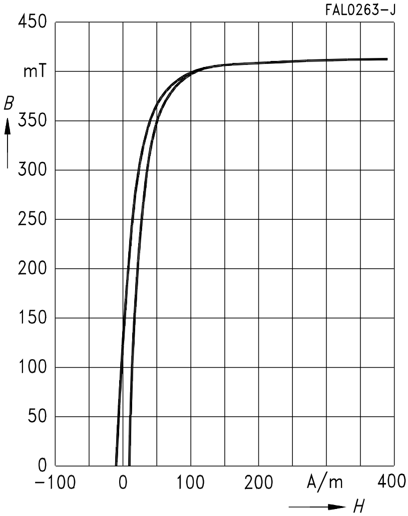
Variation of initial permeability with temperature
(measured with R17 ring cores, $\hat{B} \leq 0{,}25$ mT)



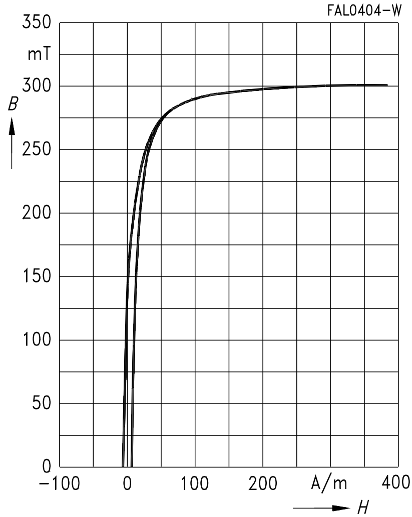
Relative loss factor versus frequency
(measured with R17 ring cores, $\hat{B} \leq 0{,}25$ mT)



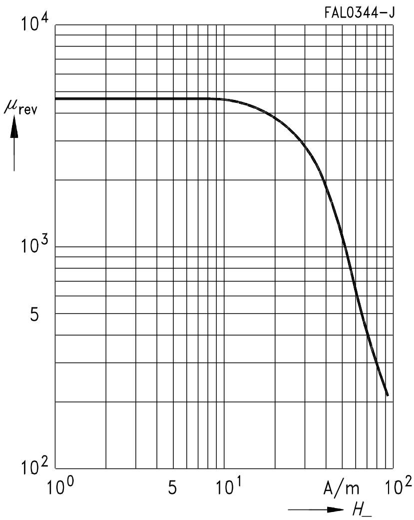
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



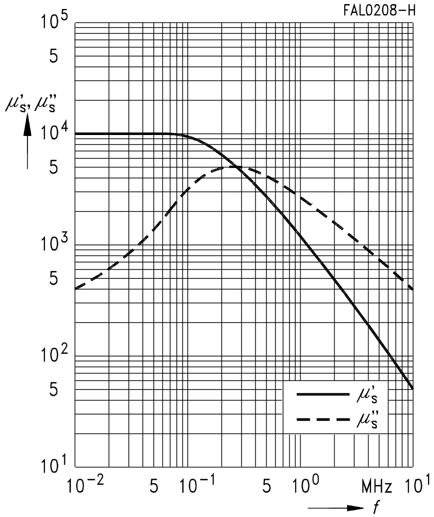
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



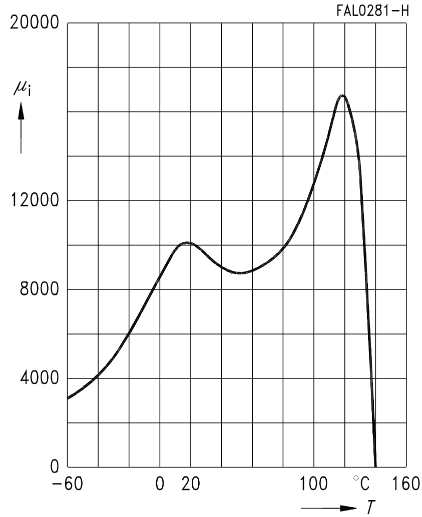
DC magnetic bias of RM cores (typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



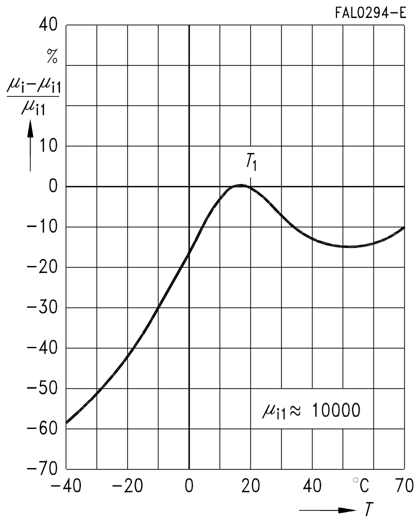
Complex permeability versus frequency
(measured with R14 ring cores, $\hat{B} \leq 0{,}25$ mT)



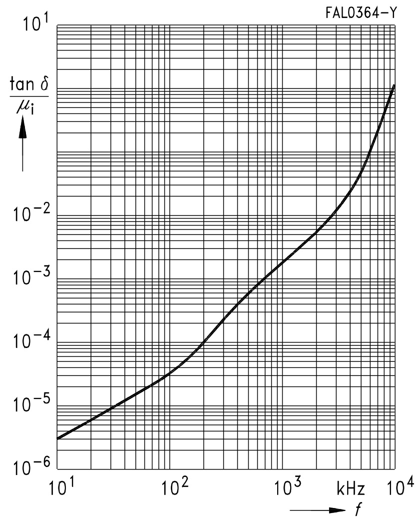
Initial permeability μ_i versus temperature
(measured with R16 ring cores, $\hat{B} \leq 0{,}25$ mT)



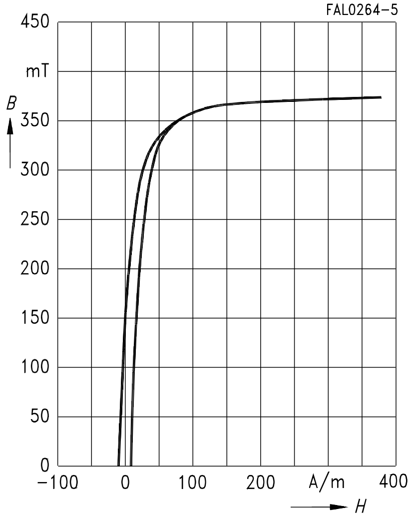
Variation of initial permeability with temperature
(measured with R16 ring cores, $\hat{B} \leq 0{,}25$ mT)



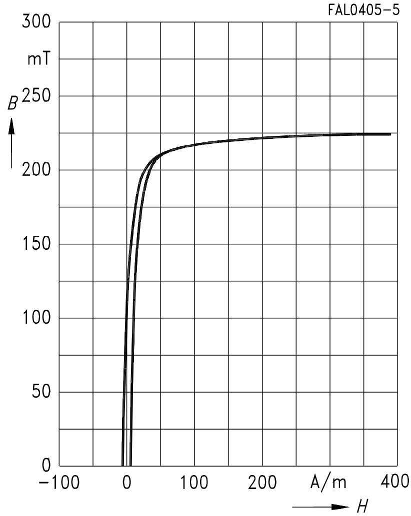
Relative loss factor versus frequency
(measured with R14 ring cores, $\hat{B} \leq 0{,}25$ mT)



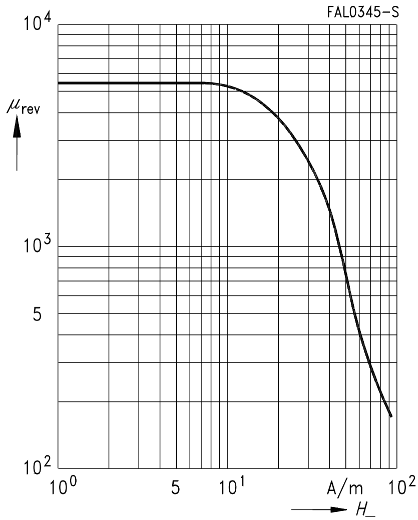
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



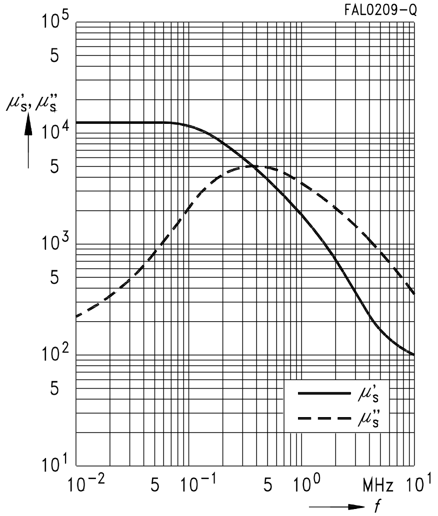
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



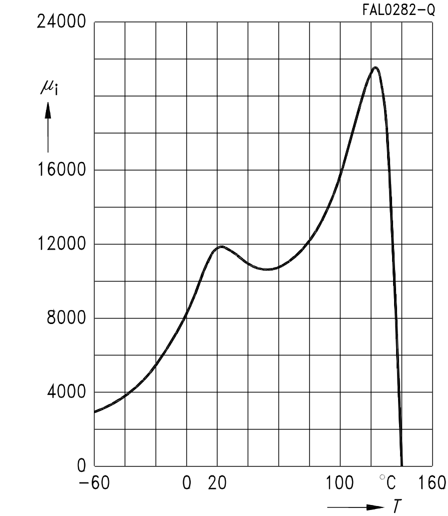
DC magnetic bias of RM cores (typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



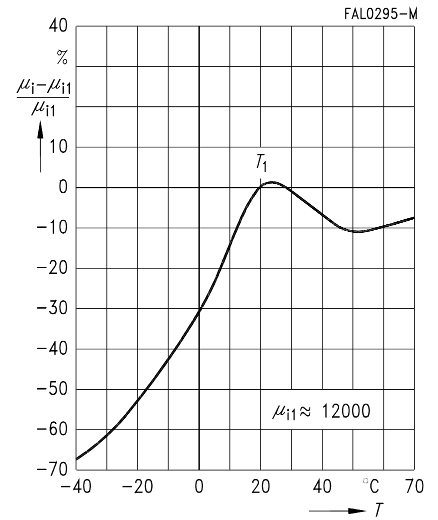
Complex permeability versus frequency
(measured with R9,5 ring cores, $\hat{B} \leq 0{,}25$ mT)



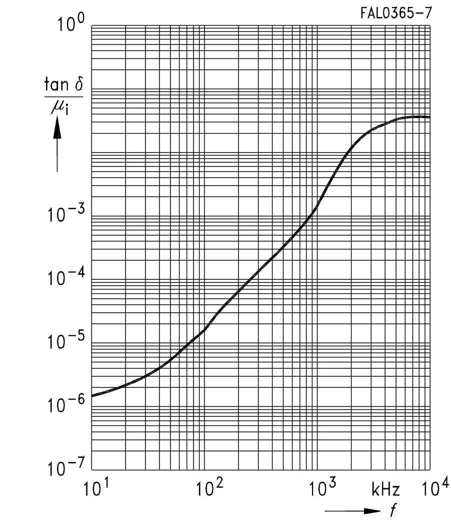
Initial permeability μ_i versus temperature
(measured with R9,5 ring cores, $\hat{B} \leq 0{,}25$ mT)



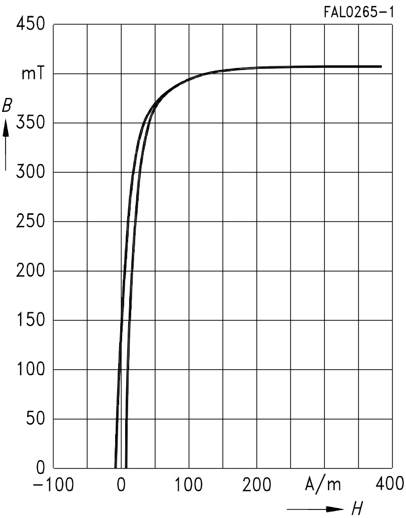
Variation of initial permeability with temperature
(measured with R9,5 ring cores, $\hat{B} \leq 0{,}25$ mT)



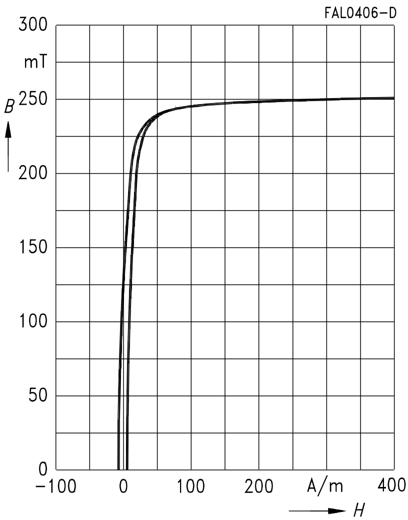
Relative loss factor versus frequency
(measured with R9,5 ring cores, $\hat{B} \leq 0{,}25$ mT)



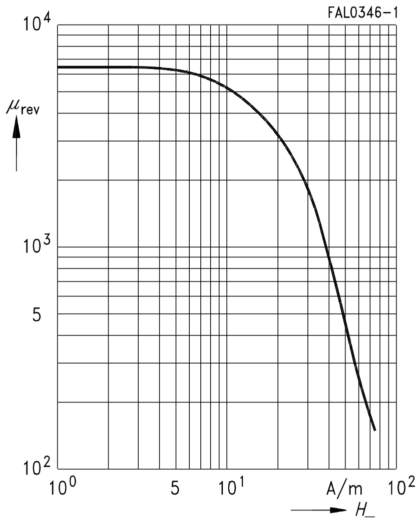
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



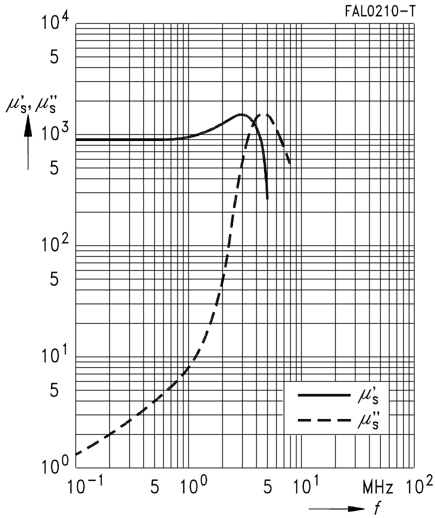
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



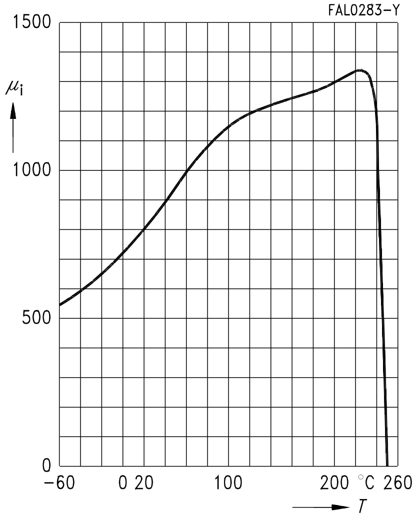
DC magnetic bias of RM cores (typical values)
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



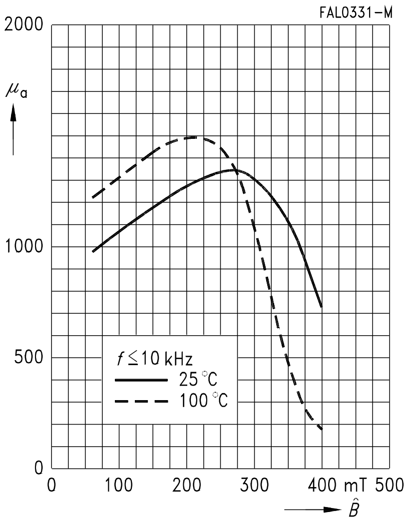
Complex permeability versus frequency
(measured with R29 ring cores, $\hat{B} \leq 0{,}25$ mT)



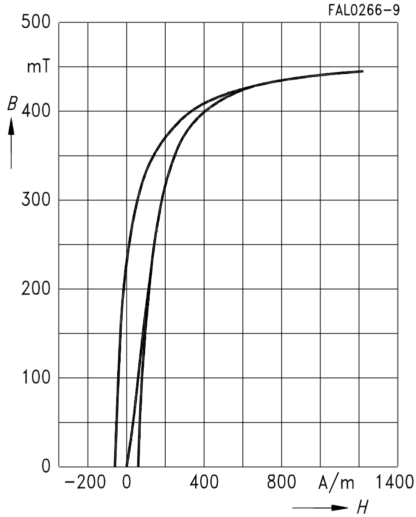
Initial permeability μ_i versus temperature
(measured with R29 ring cores, $\hat{B} \leq 0{,}25$ mT)



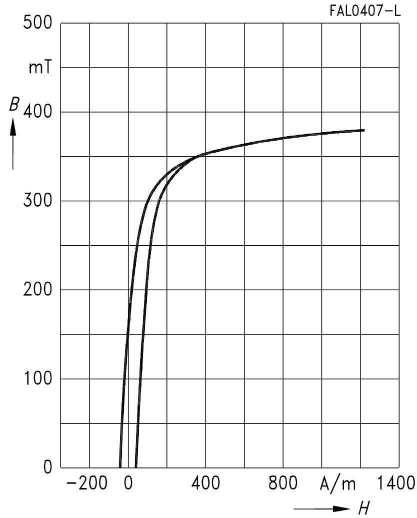
Amplitude permeability versus AC field flux density
(measured with ungapped E cores)



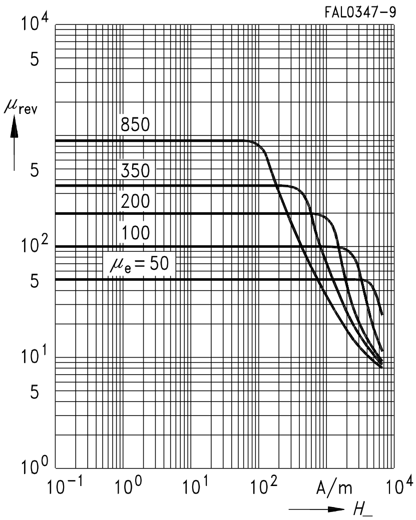
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



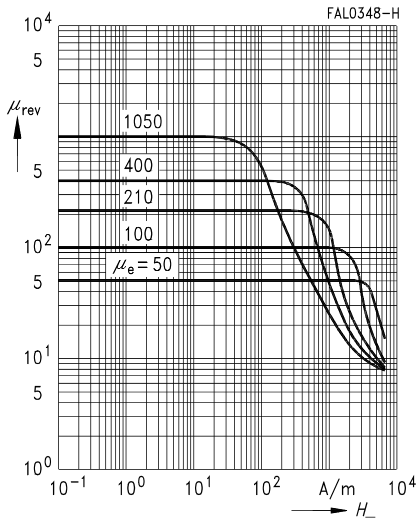
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



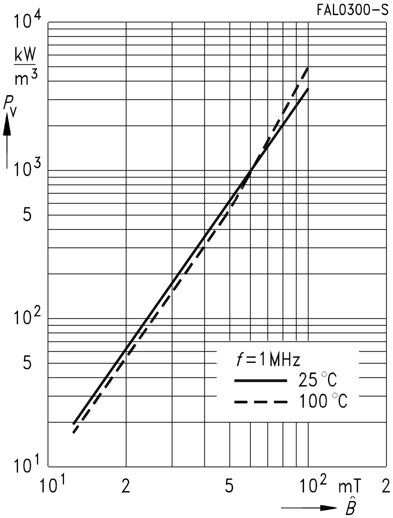
DC magnetic bias of P, RM, PM and E cores
($\hat{B} \le$ 0,25 mT, f = 10 kHz, T = 25°C)



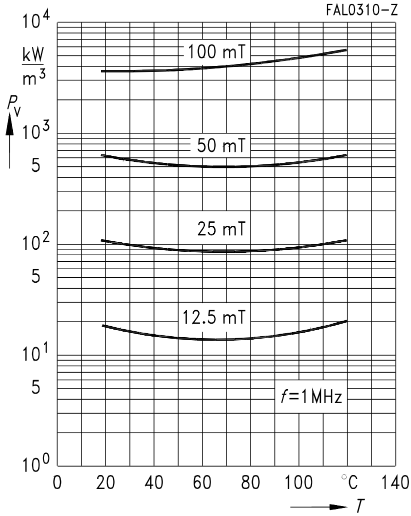
DC magnetic bias of P, RM, PM and E cores
($\hat{B} \le$ 0,25 mT, f = 10 kHz, T = 100°C)



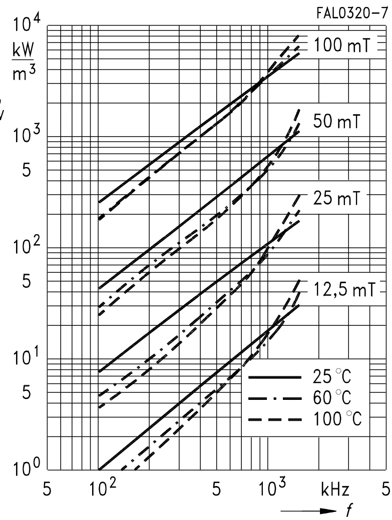
Relative core losses versus AC field flux density
(measured with R29 ring cores)



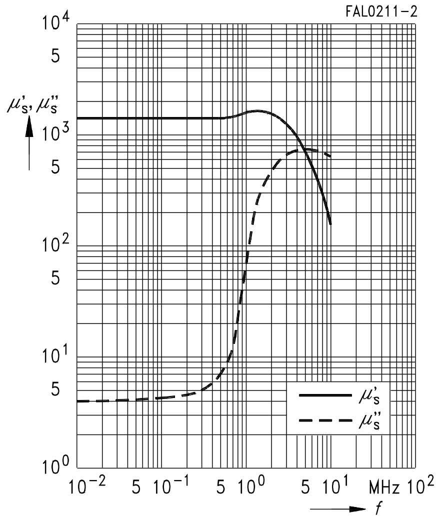
Relative core losses versus temperature
(measured with R29 ring cores)



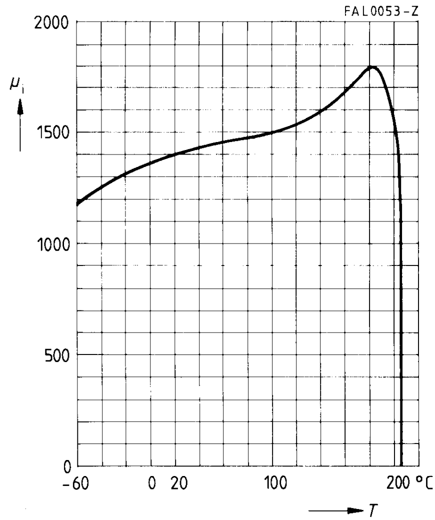
Relative core losses versus frequency
(measured with R29 ring cores)



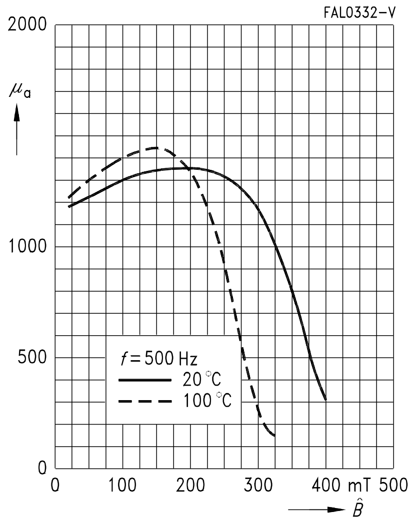
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{B} \leq$ 0,25 mT)



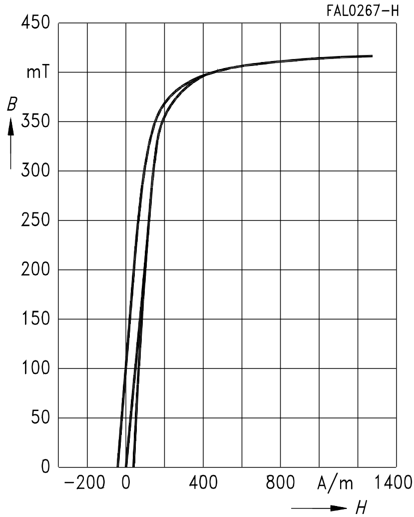
Initial permeability μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq$ 0,25 mT)



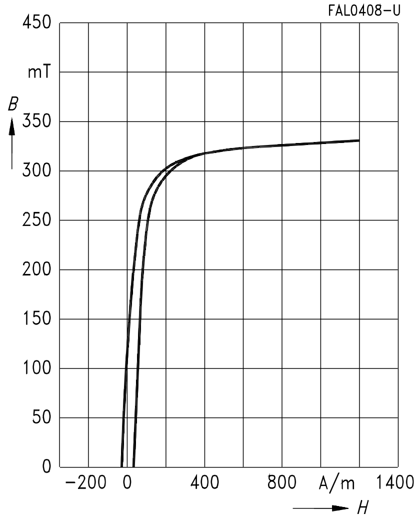
Amplitude permeability versus AC field flux density
(measured with ungapped E cores)



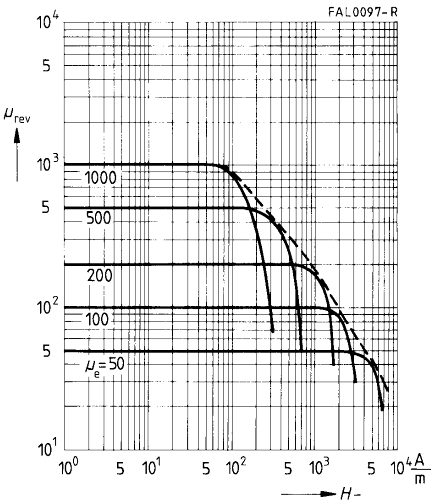
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



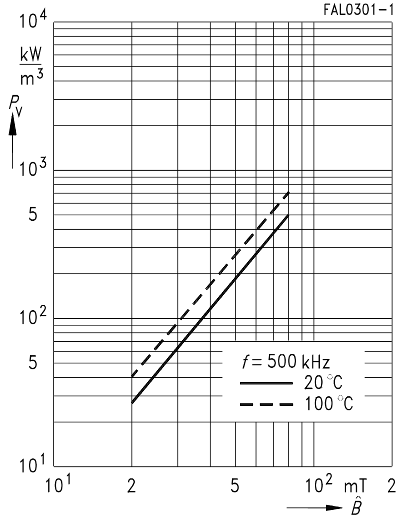
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



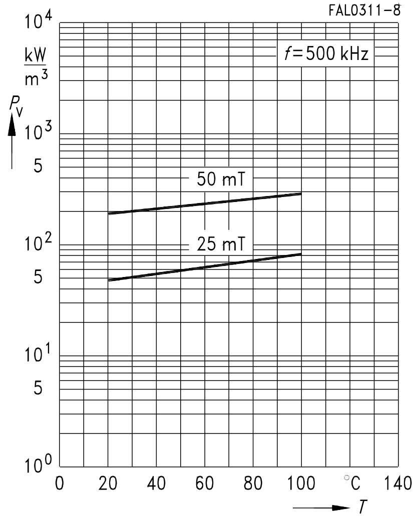
DC magnetic bias of P, RM, PM and E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



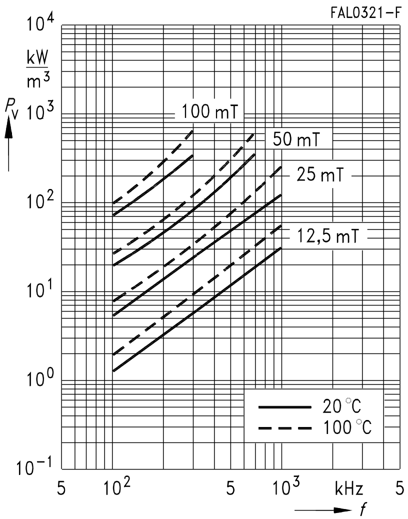
Relative core losses versus AC field flux density
(measured with R16 ring cores)



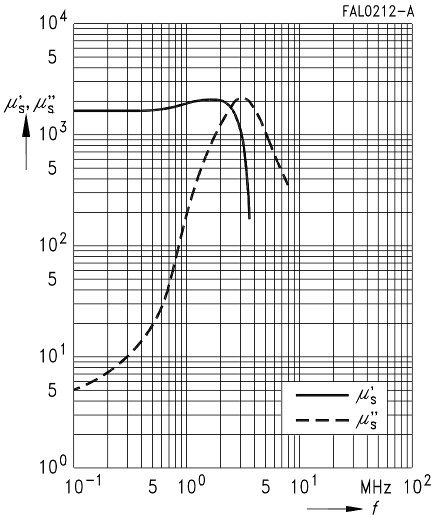
Relative core losses versus temperature
(measured with R16 ring cores)



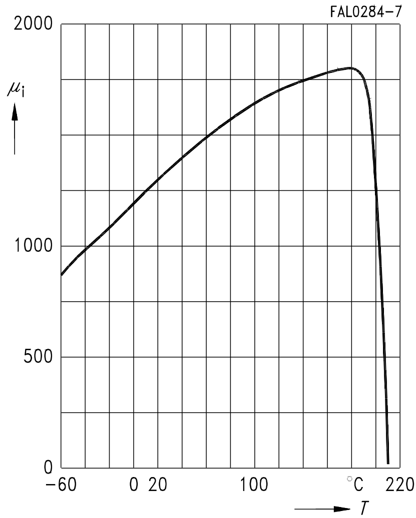
Relative core losses versus frequency
(measured with R16 ring cores)



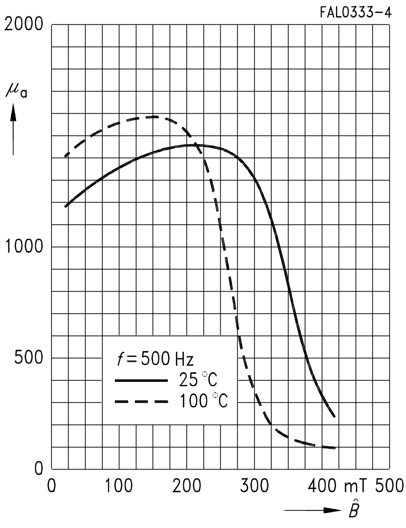
Complex permeability versus frequency
(measured with R17 ring cores, $\hat{B} \leq 0{,}25$ mT)



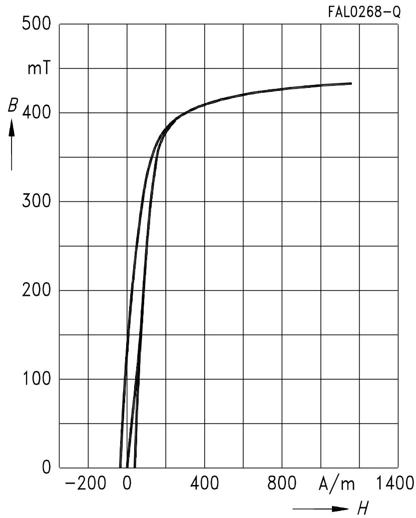
Initial permeability μ_i versus temperature
(measured with R17 ring cores, $\hat{B} \leq 0{,}25$ mT)



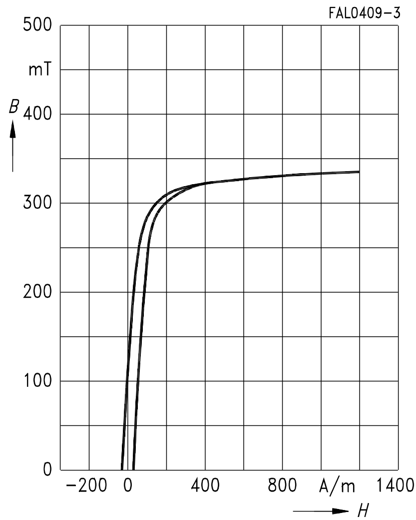
Amplitude permeability versus AC field
flux density
(measured with ungapped E cores)



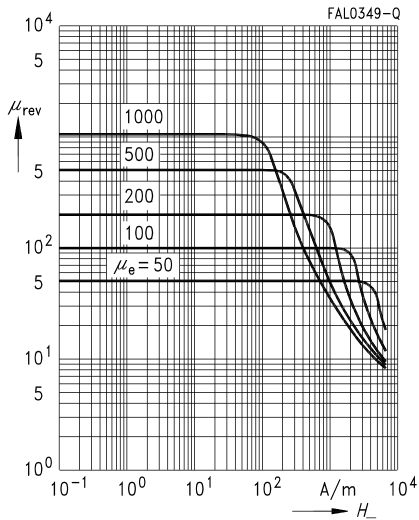
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



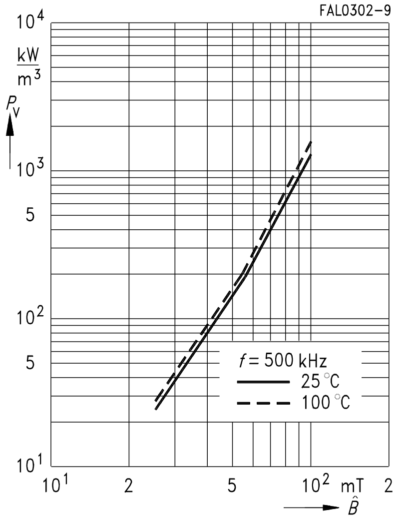
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



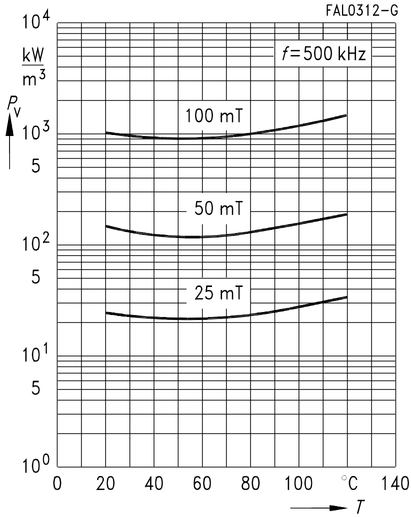
DC magnetic bias of P, RM, PM and E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



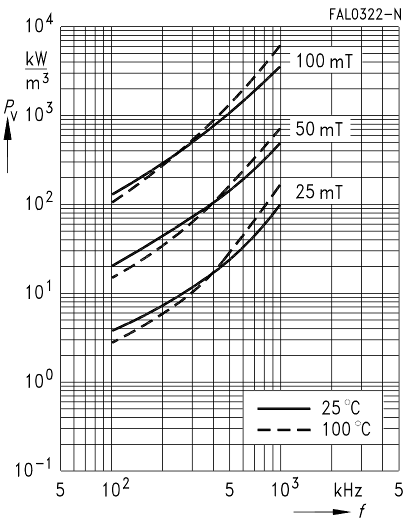
Relative core losses versus AC field flux density
(measured with R17 ring cores)



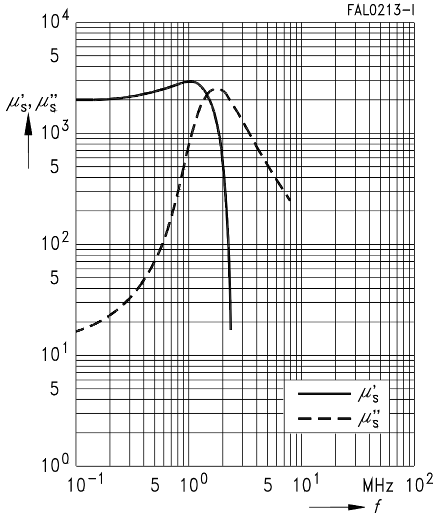
Relative core losses versus temperature
(measured with R17 ring cores)



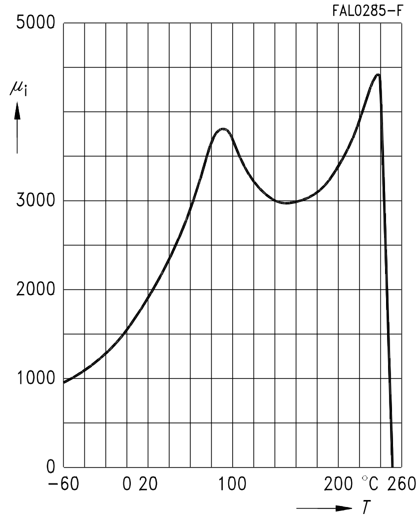
Relative core losses versus frequency
(measured with R17 ring cores)



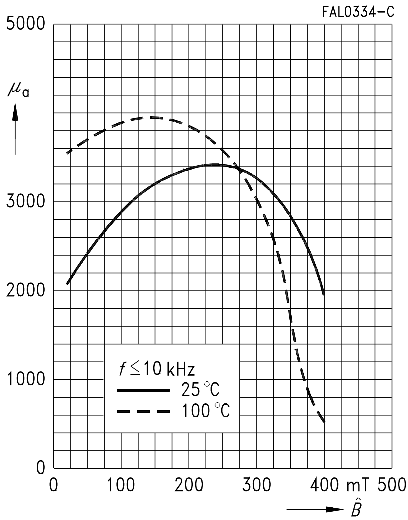
Complex permeability versus frequency
(measured with R29 ring cores, $\hat{B} \leq$ 0,25 mT)



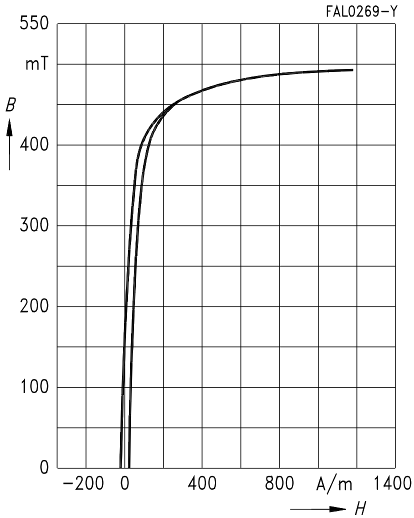
Initial permeability μ_i versus temperature
(measured with R29 ring cores, $\hat{B} \leq$ 0,25 mT)



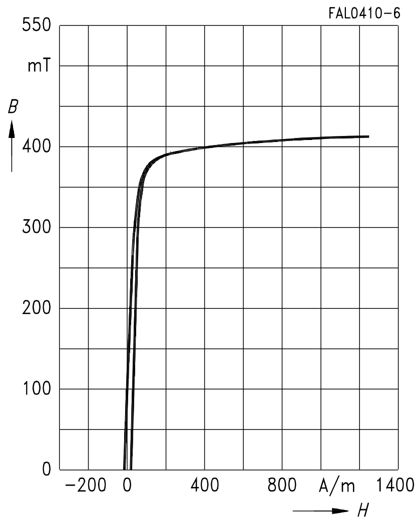
Amplitude permeability versus AC field
flux density
(measured with ungapped U cores)



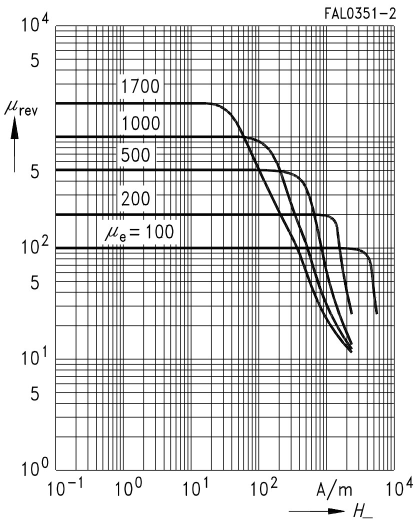
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



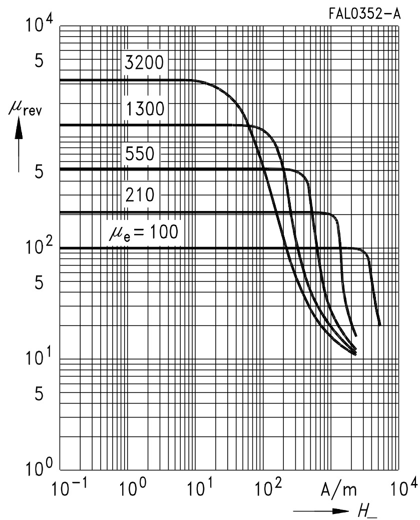
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



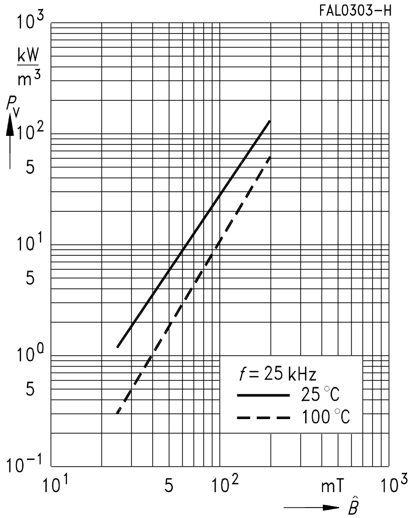
DC magnetic bias of E, ETD and U cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



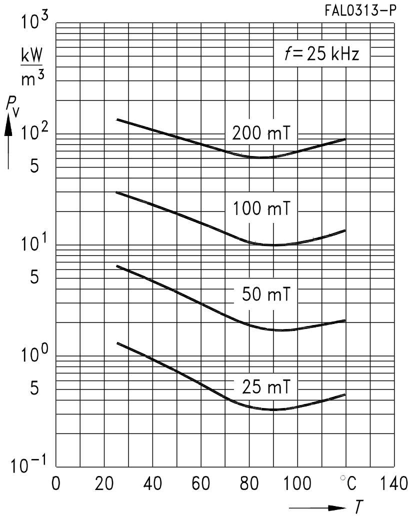
DC magnetic bias of E, ETD and U cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 100°C)



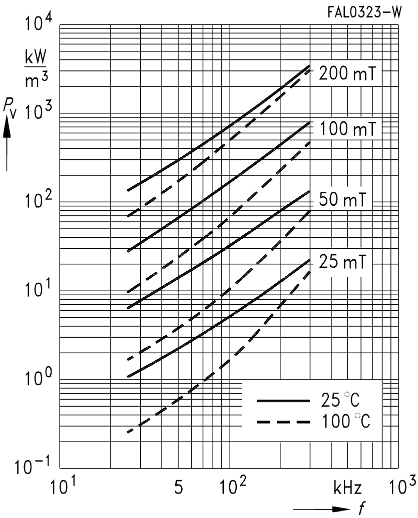
Relative core losses versus AC field flux density
(measured with R29 ring cores)



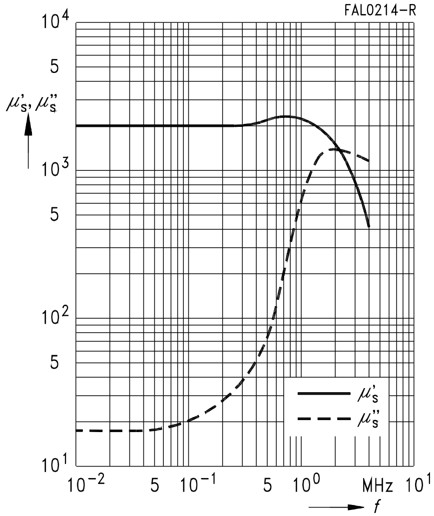
Relative core losses versus temperature
(measured with R29 ring cores)



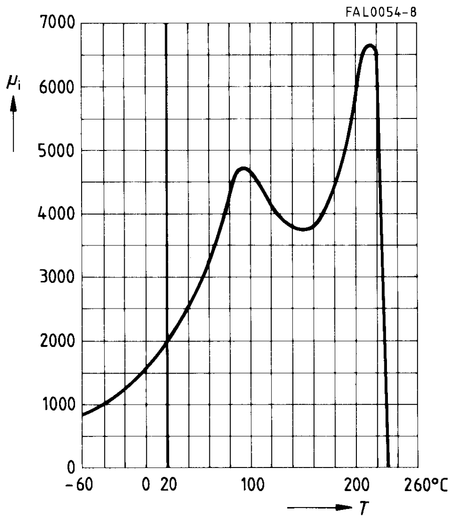
Relative core losses versus frequency
(measured with R29 ring cores)



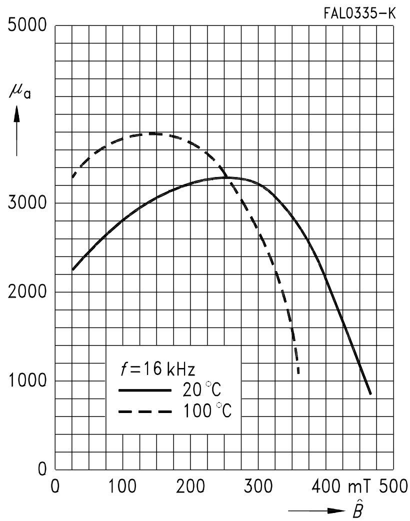
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



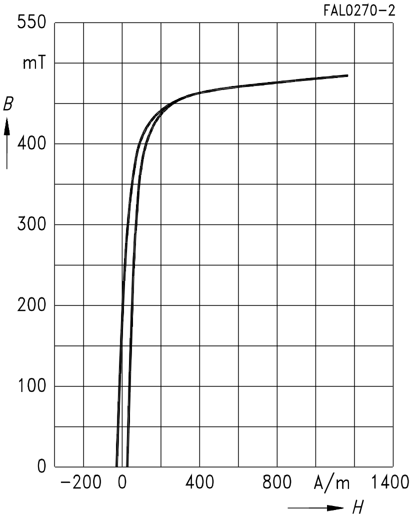
Initial permeability μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



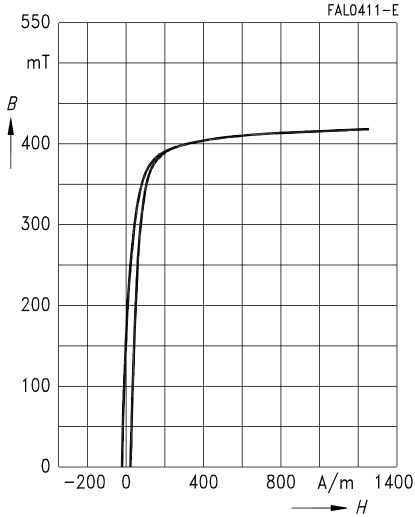
Amplitude permeability versus AC field flux density
(measured with ungapped E cores)



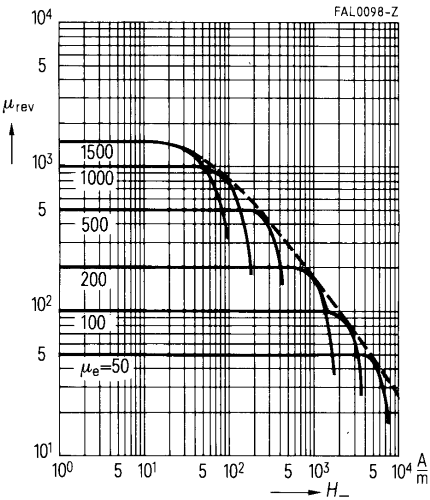
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



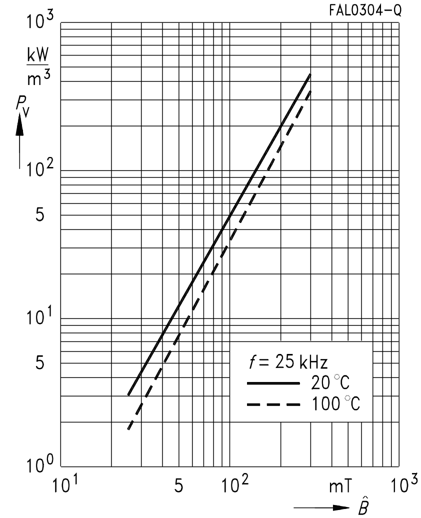
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



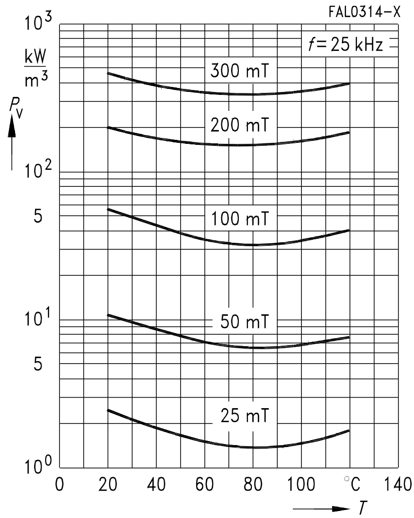
DC magnetic bias of P, PM and E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



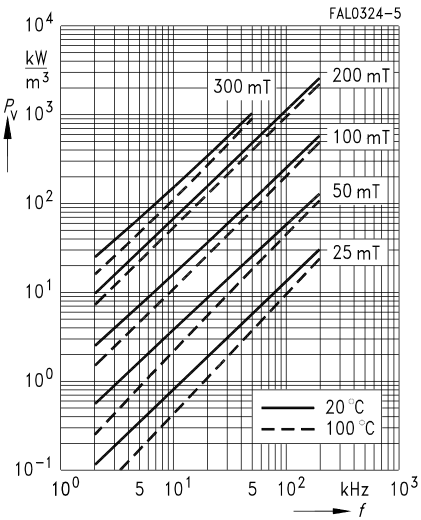
Relative core losses versus AC field flux density
(measured with R16 ring cores)



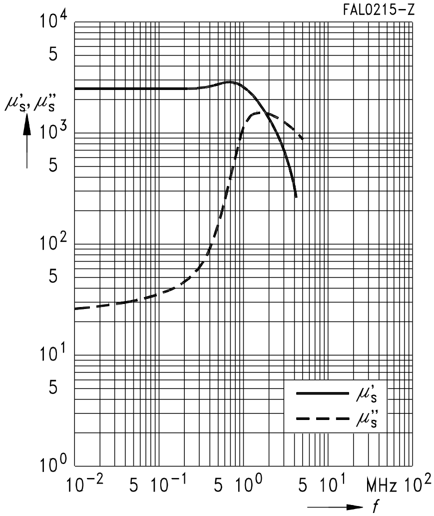
Relative core losses versus temperature
(measured with R16 ring cores)



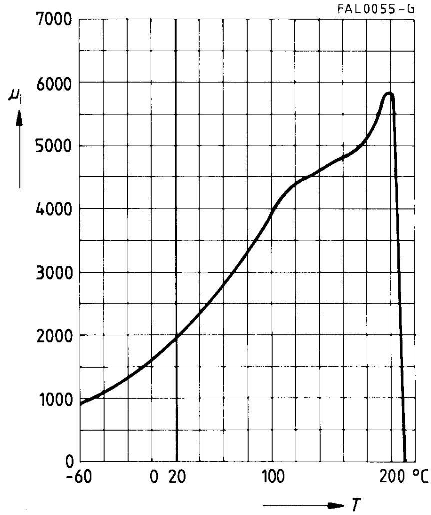
Relative core losses versus frequency
(measured with R16 ring cores)



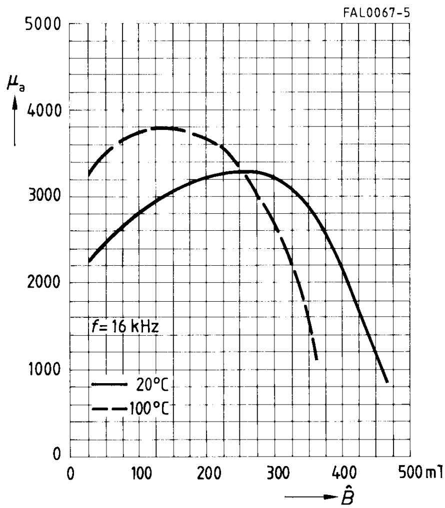
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



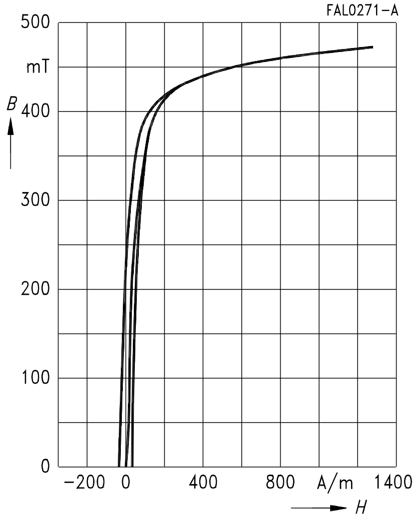
Initial permeability μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0{,}25$ mT)



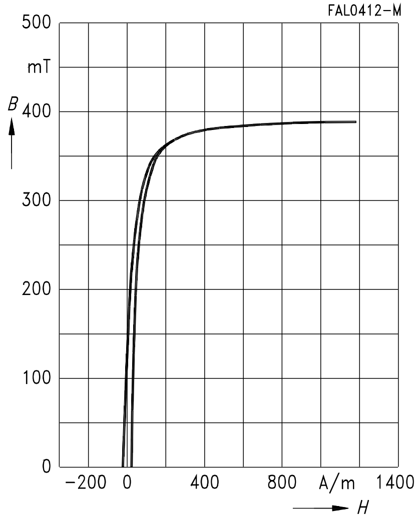
Amplitude permeability versus AC field
flux density
(measured with ungapped E cores)



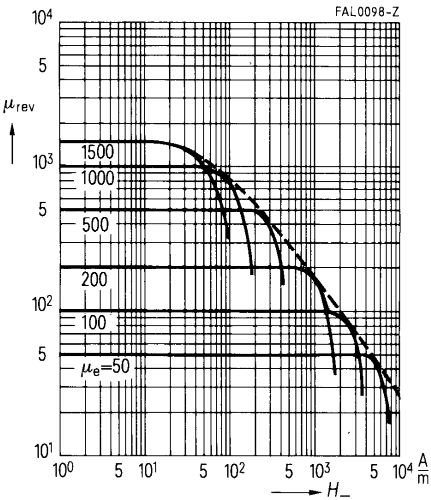
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



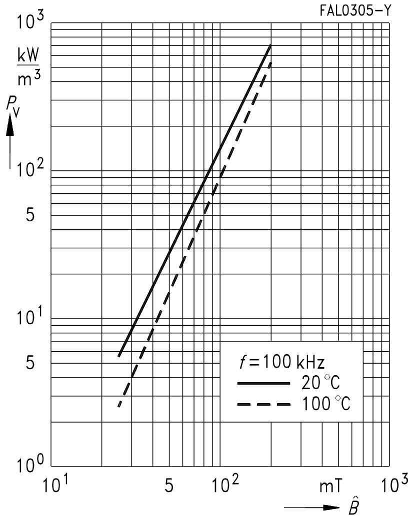
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



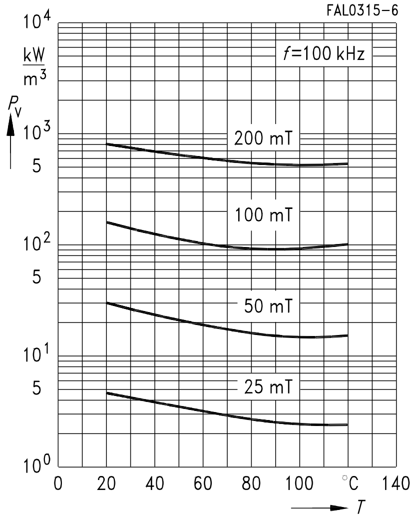
DC magnetic bias of P, RM, PM and E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



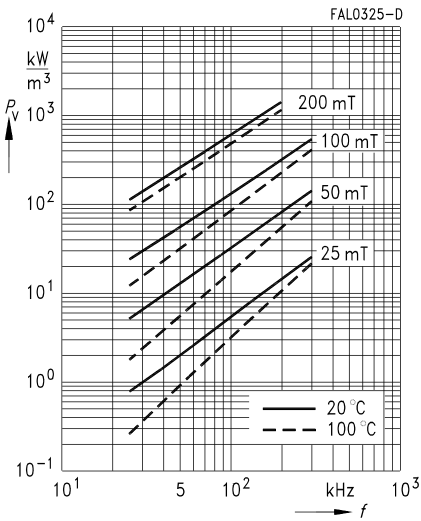
Relative core losses versus AC field flux density
(measured with R16 ring cores)



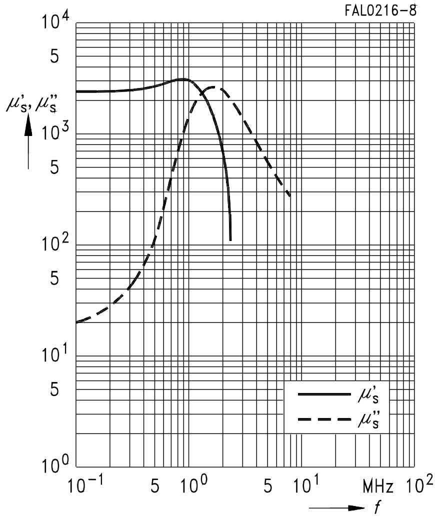
Relative core losses versus temperature
(measured with R16 ring cores)



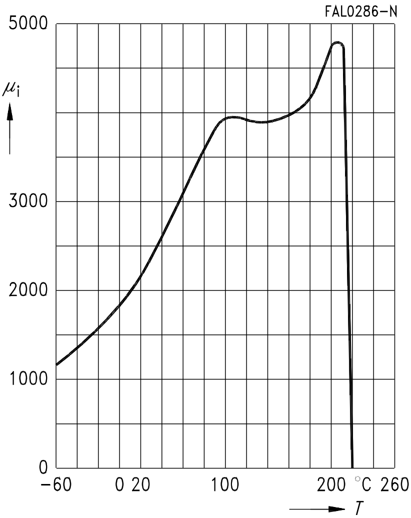
Relative core losses versus frequency
(measured with R16 ring cores)



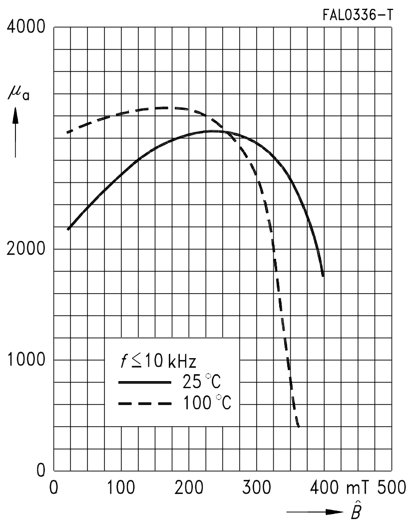
Complex permeability versus frequency
(measured with R29 ring cores, $\hat{L} \leq 0{,}25$ mT)



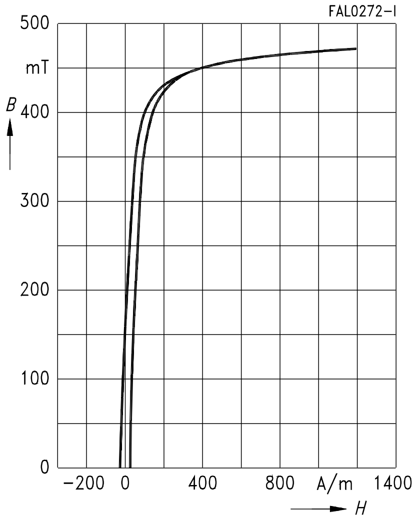
Initial permeability μ_i versus temperature
(measured with R29 ring cores, $\hat{B} \leq 0{,}25$ mT)



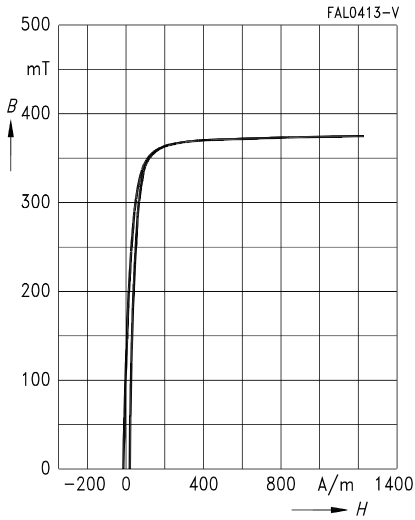
Amplitude permeability versus AC field flux density
(measured with ungapped E cores)



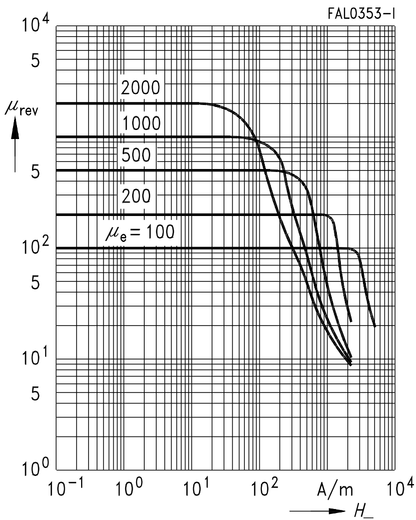
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



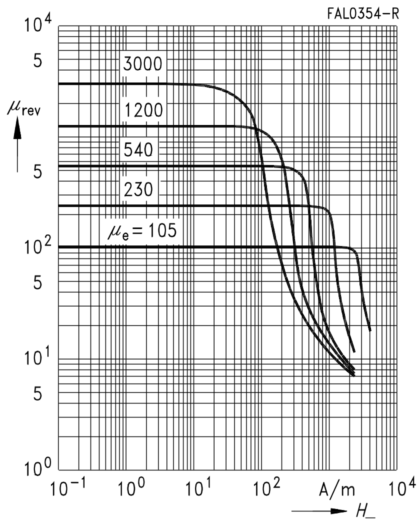
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



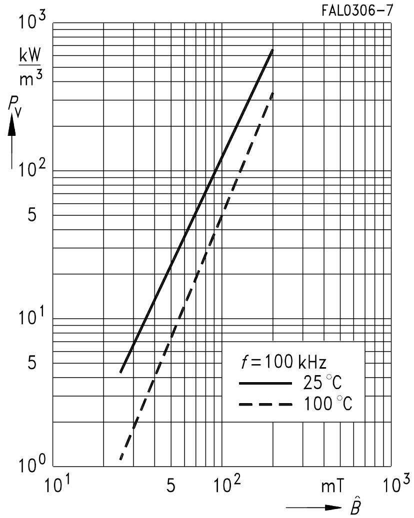
DC magnetic bias of P, RM, PM and E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



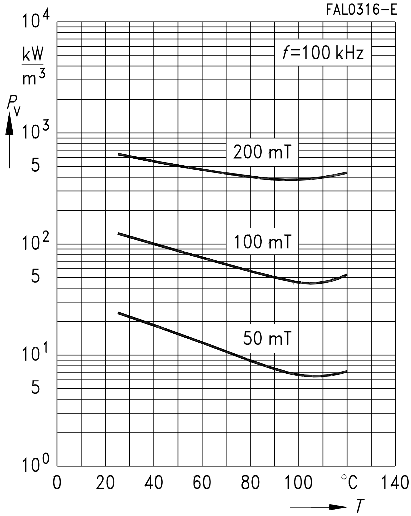
DC magnetic bias of P, RM, PM and E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 100°C)



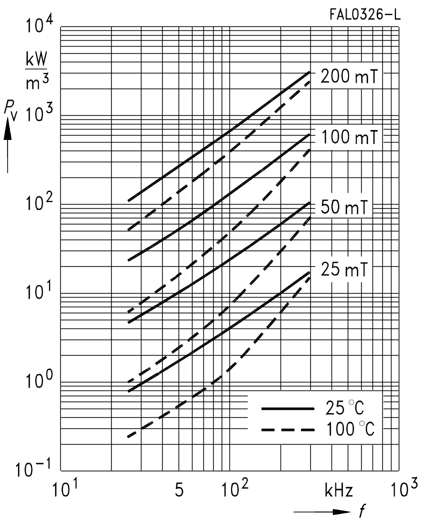
Relative core losses versus AC field flux density
(measured with R29 ring cores)



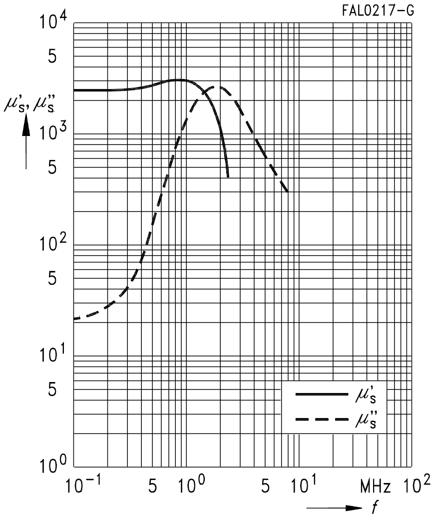
Relative core losses versus temperature
(measured with R29 ring cores)



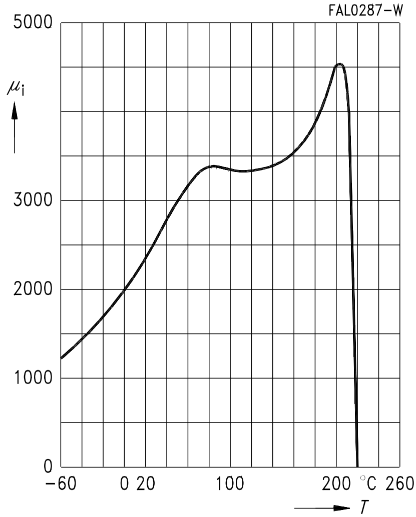
Relative core losses versus frequency
(measured with R29 ring cores)



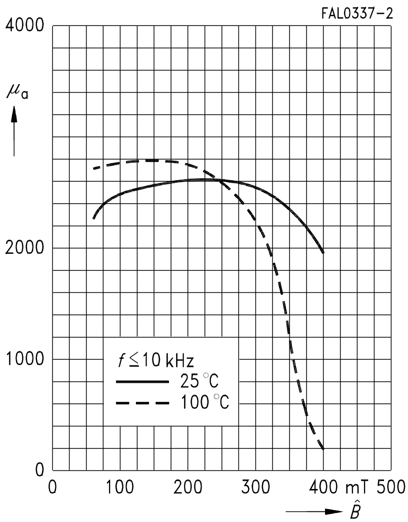
Complex permeability versus frequency
(measured with R29 ring cores, $\hat{B} \leq 0{,}25$ mT)



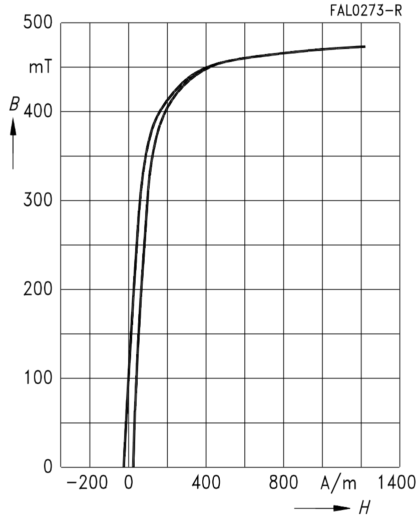
Initial permeability μ_i versus temperature
(measured with R29 ring cores, $\hat{B} \leq 0{,}25$ mT)



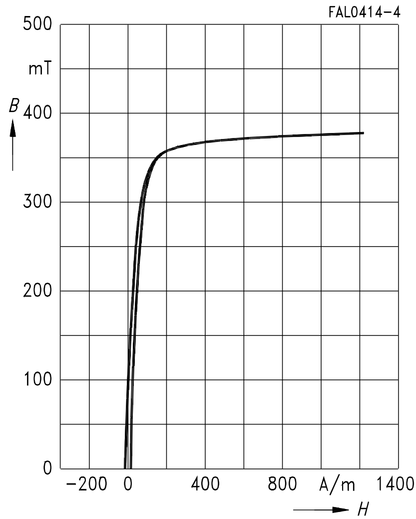
Amplitude permeability versus AC field flux density
(measured with ungapped U cores)



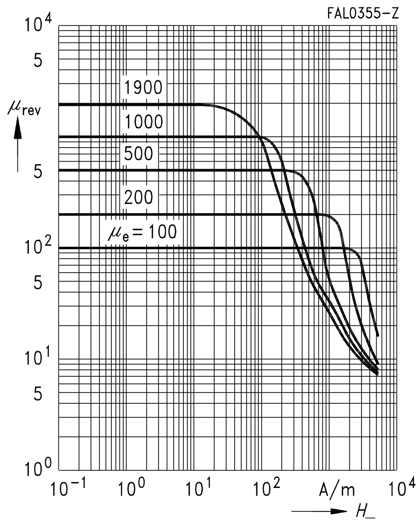
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



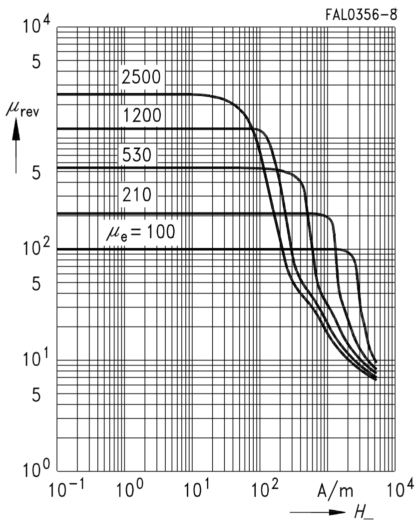
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



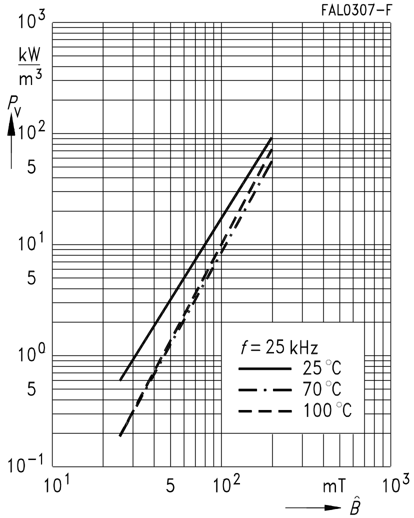
DC magnetic bias of E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



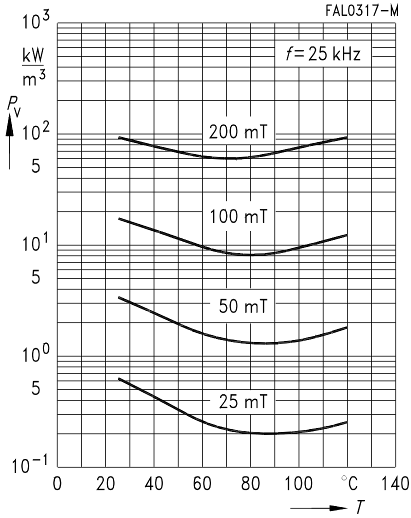
DC magnetic bias of E, ETD and U cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 100°C)



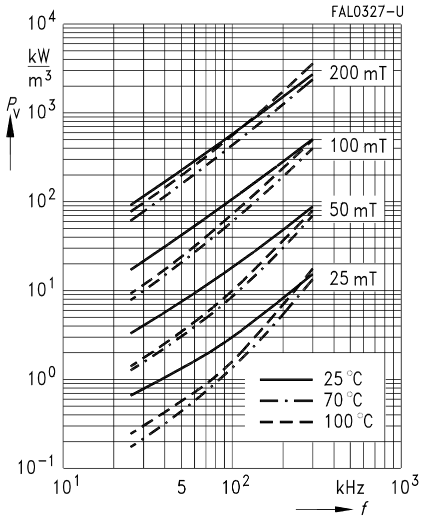
Relative core losses versus AC field flux density
(measured with R29 ring cores)



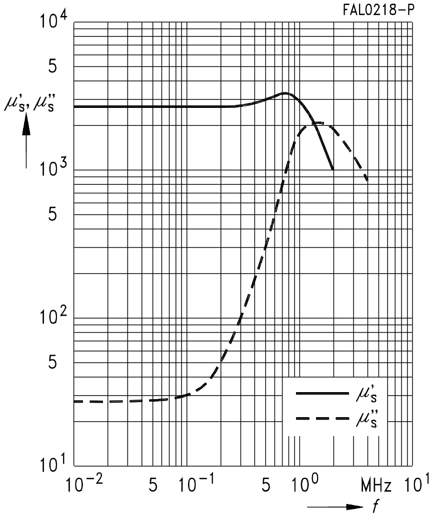
Relative core losses versus temperature
(measured with R29 ring cores R29)



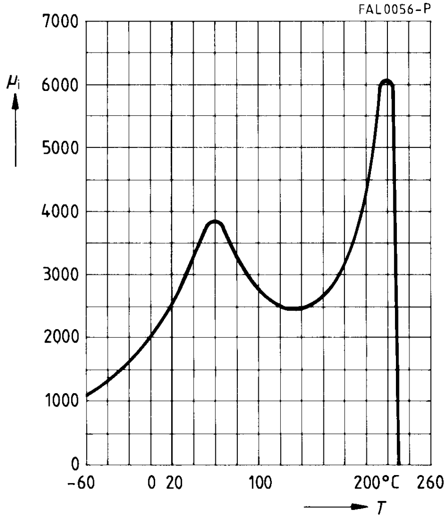
Relative core losses versus frequency
(measured with R29 ring cores R29)



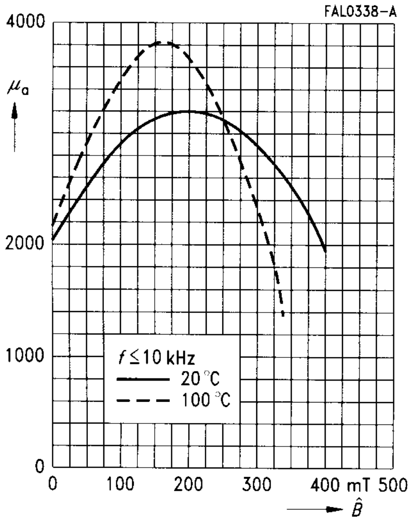
Complex permeability versus frequency
(measured with R10 ring cores, $\hat{B} \leq 0,25$ mT)



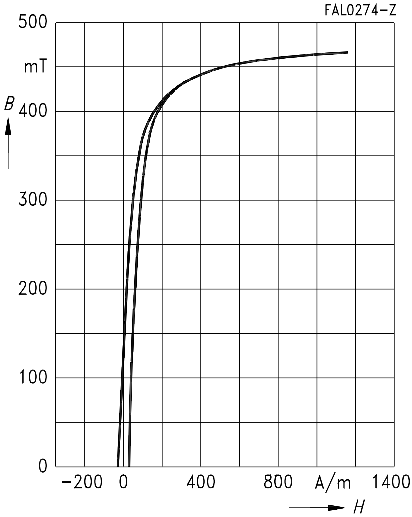
Initial permeability μ_i versus temperature
(measured with R10 ring cores, $\hat{B} \leq 0,25$ mT)



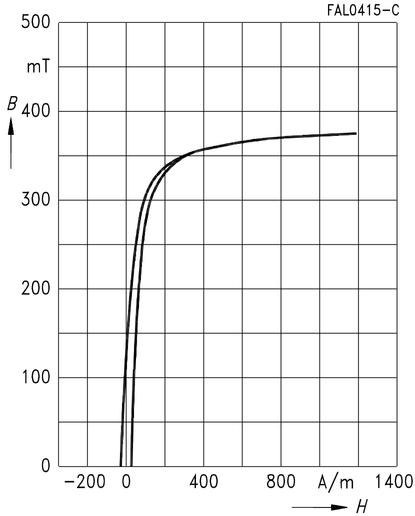
Amplitude permeability versus AC field flux density
(measured with ungapped E cores)



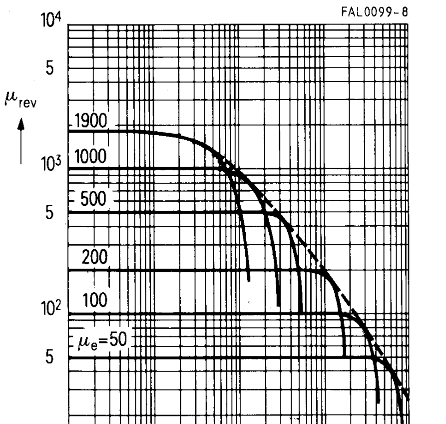
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



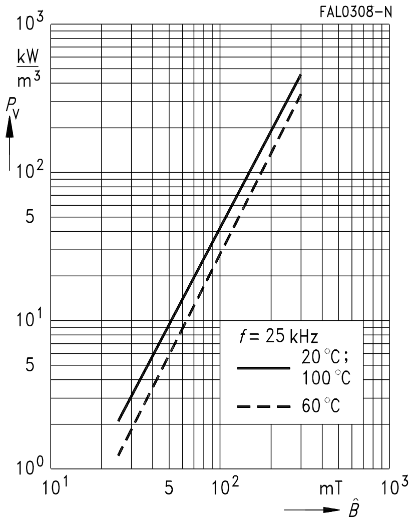
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



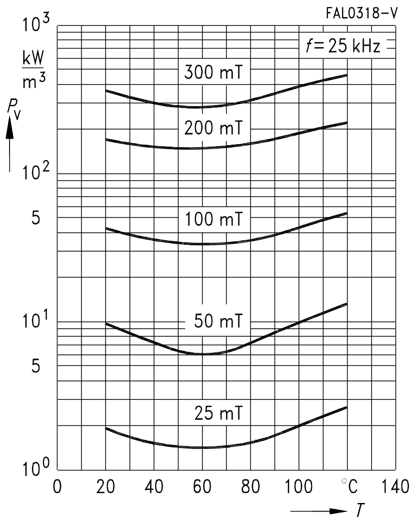
DC magnetic bias of P and RM cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



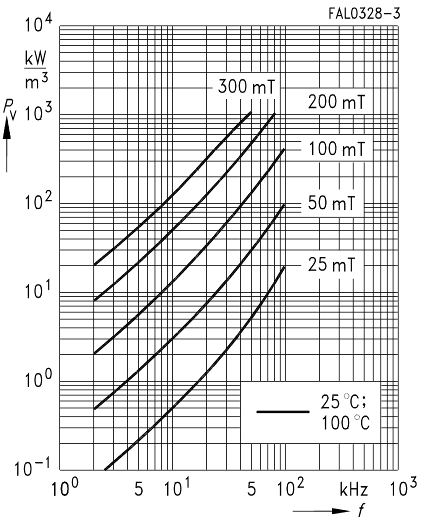
Relative core losses versus AC field flux density
(measured with R16 ring cores)



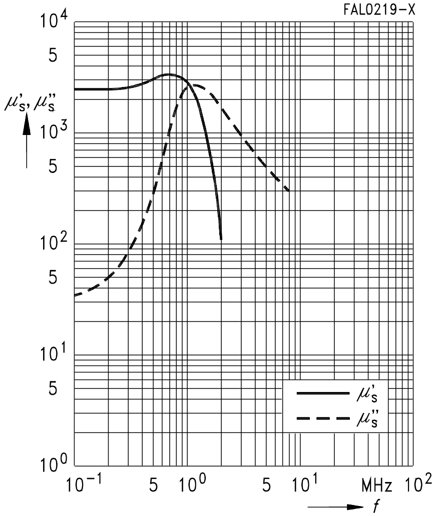
Relative core losses versus temperature
(measured with R16 ring cores)



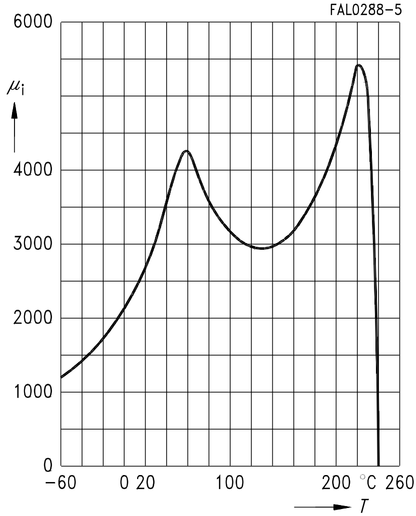
Relative core losses versus frequency
(measured with R16 ring cores)



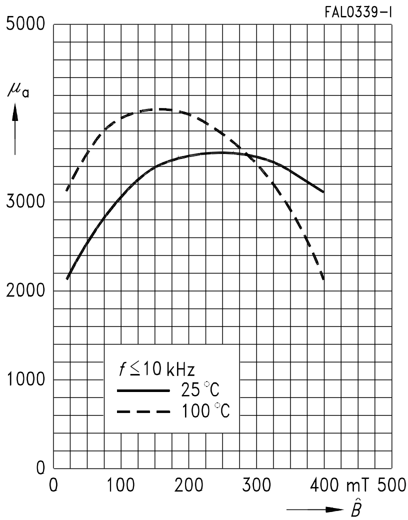
Complex permeability versus frequency
(measured with R34 ring cores, $\hat{B} \leq 0{,}25$ mT)



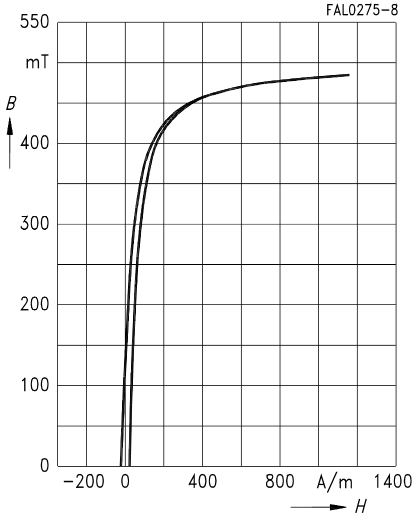
Initial permeability μ_i versus temperature
(measured with R34 ring cores, $\hat{B} \leq 0{,}25$ mT)



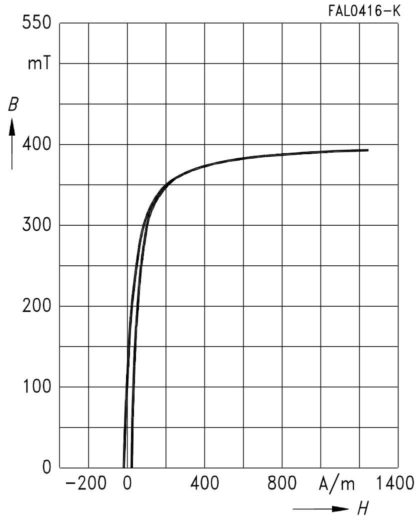
Amplitude permeability versus AC field
flux density
(measured with ungapped E cores)



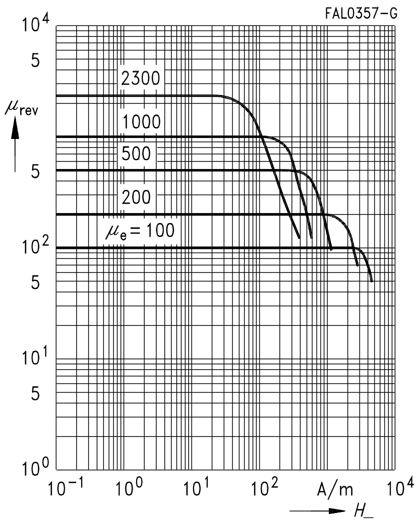
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 25°C)



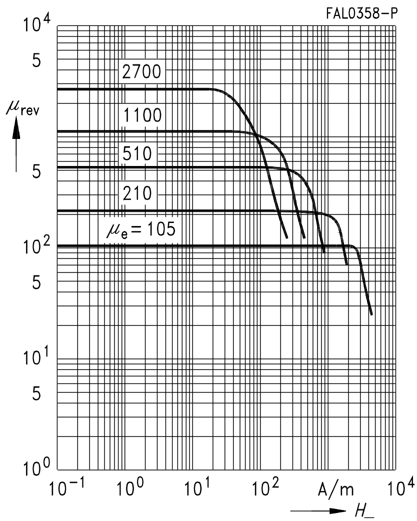
Dynamic magnetization curves
(typical values)
(f = 10 kHz, T = 100°C)



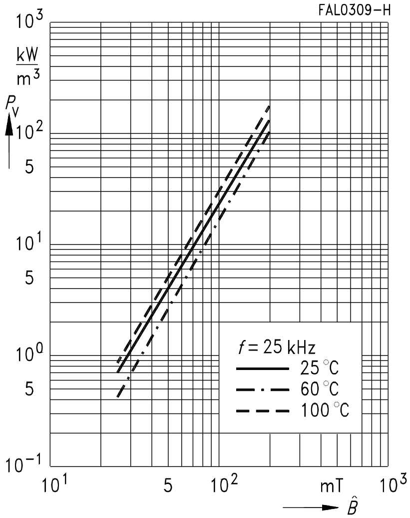
DC magnetic bias of E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 25°C)



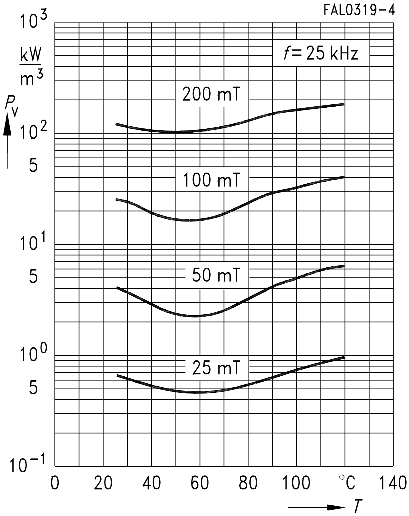
DC magnetic bias of E cores
($\hat{B} \leq$ 0,25 mT, f = 10 kHz, T = 100°C)



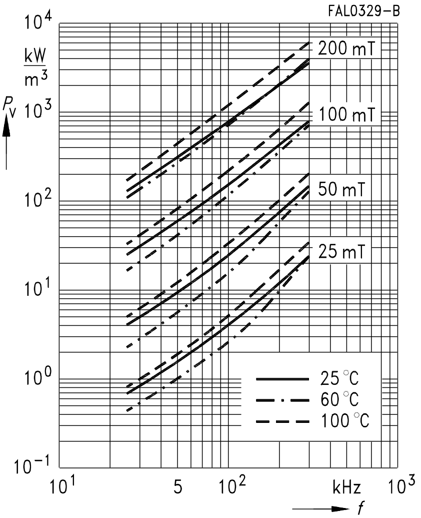
Relative core losses versus AC field flux density
(measured with R34 ring cores)



Relative core losses versus temperature
(measured with R34 ring cores)



Relative core losses versus frequency
(measured with R34 ring cores)



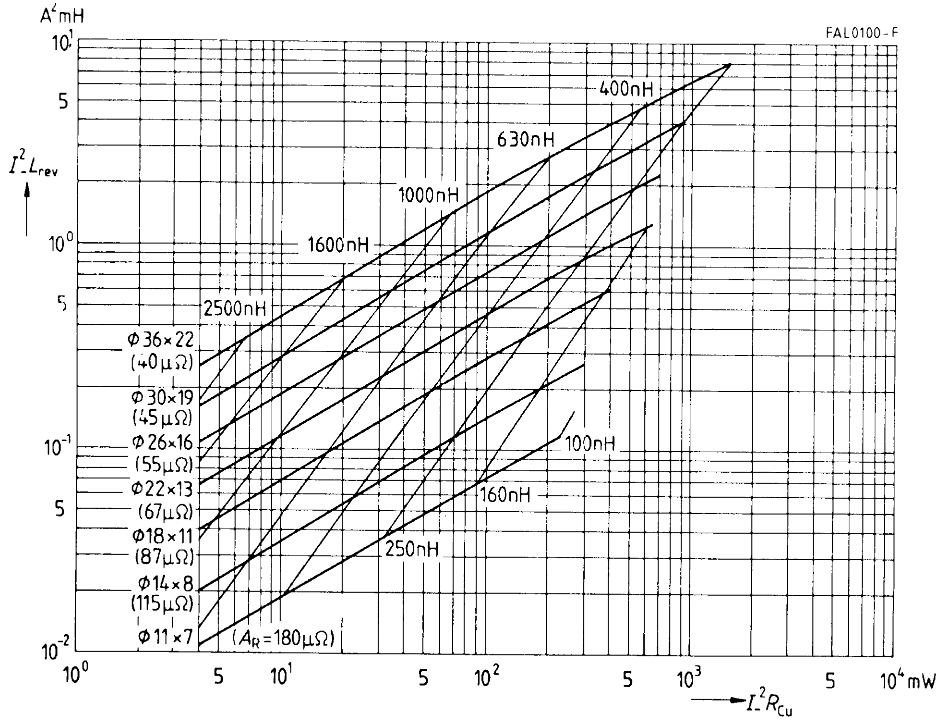
Optimum value of biased P cores, SIFERRIT materials N48 and N26
(Small-signal applications)

The maximum value of the inductance L_{rev} (inductance corresponding to the reversible permeability) or the minimum value of the DC resistance R_{Cu} which can be obtained at a defined magnetic bias current I can be determined from the following diagram for P cores made of SIFERRIT N48 and N26.

Example: At I = 0,1 A, L_{rev} shall be > 10 mH and R_{Cu} < 1 Ω.

Required: The smallest possible P core

Solution: All core sizes contained in a rectangle limited at the bottom by the horizontal $I^2 \cdot L_{rev}$ = 0,1 A^2 mH and at the right by the vertical $I^2 \cdot R_{Cu}$ = 0,01 W are possibilities. Accordingly, the smallest possible core size is 22 mm diameter x 13 mm with A_L = 1000 nH, R_{Cu} approx. 0,86 Ω, L_{rev} approx. 10,6 mH and $N = (R_{Cu}/A_R)^{1/2}$ approx. 114, one-section coil former.



Optimum value of biased EC and E cores, SIFERRIT material N27
(Power applications)

The relationship between magnetic biasing capability $(I^2\ L)_{max}$, copper loss $I^2 R$, effective permeability μ_e (effect of air gap) and overtemperature ΔT between 30 and 50 K is shown in the nomograms below for two different core series. Core losses due to ripple have not been taken into consideration. Type, size, and air gap can be chosen with the help of these nomograms.

Example:

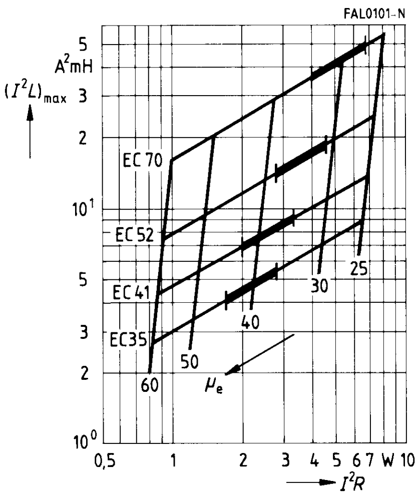
Given: $(I^2\ L)_{max}$ = 8 A^{2}mH and ΔT approx. 40 K

Required: Ferrite core and μ_e

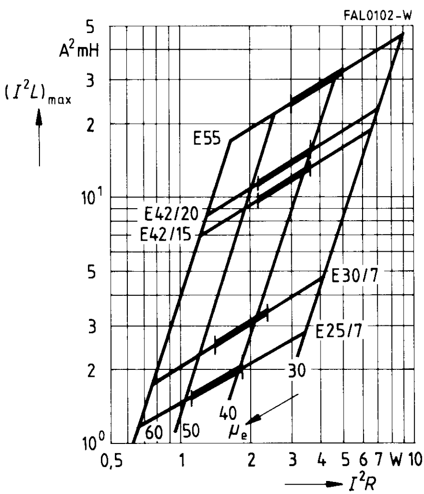
Solution: An effective permeability μ_e of approximately 38 can be obtained from the nomogram for EC cores on the rising straight line of the EC41 core in the height of the ordinate 8 A^{2}mH and in the middle of the plotted temperature range between 30 and 50 K.

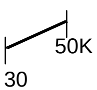
Magnetic biasing capability $(I^2\ L)_{max}$, copper loss $I^2 R$, effective permeability μ_e and overtemperature ΔT of E and EC cores made of SIFERRIT N27.

EC cores



E cores





Operating range 30 ... 50 K
Overtemperature ΔT due to copper losses

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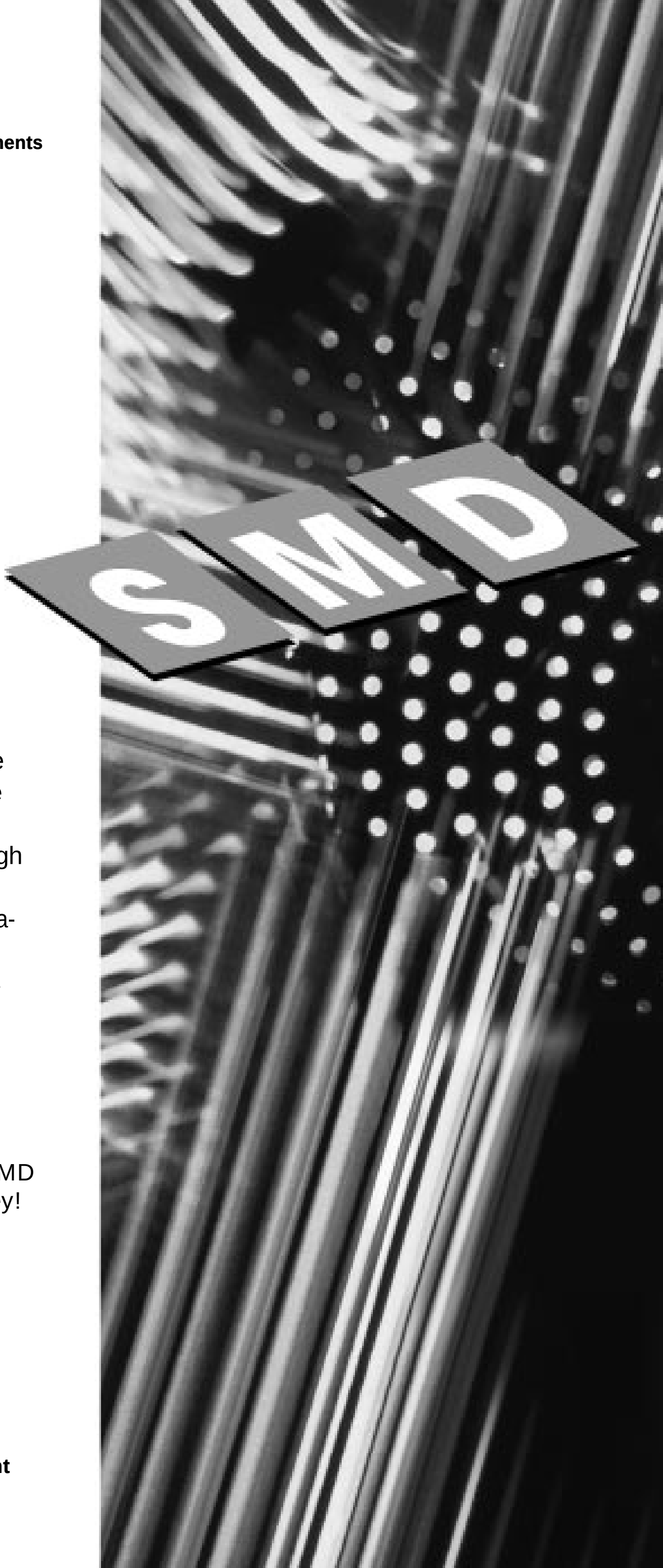

SCS also offers you an extensive range of components for surface mounting. For example you can have HF chokes SIMID 01 through SIMID 04, thermistor chips for temperature compensation, tantalum chips in sizes A, B, C and D plus surface-mount transformers and laboratory assortments of ceramic chip capacitors.

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1 Hysteresis

The special feature of ferromagnetic and ferrimagnetic materials is that spontaneous magnetization sets in below a material-specific temperature (Curie point). The elementary atomic magnets are then aligned in parallel within macroscopic regions. These so-called Weiss' domains are normally oriented so that no magnetic effect is perceptible. But it is different when a ferromagnetic body is placed in a magnetic field and the flux density B as a function of the magnetic field strength H is measured with the aid of a test coil. Proceeding from H and $B = 0$, the so-called initial magnetization curve is first obtained. At low levels of field strength, those domains that are favorably oriented to the magnetic field grow at the expense of those that are not. This produces what are called wall displacements. At higher field strength, whole domains overturn magnetically - this is the steepest part of the curve - and finally the magnetic moments are moved out of the preferred states given by the crystal lattice into the direction of the field until saturation is obtained, i.e. until all elementary magnets in the material are in the direction of the field. If H is now reduced again, the B curve is completely different. The relationship shown in the hysteresis loop (Fig. 1) is obtained.

1.1 Hysteresis loop

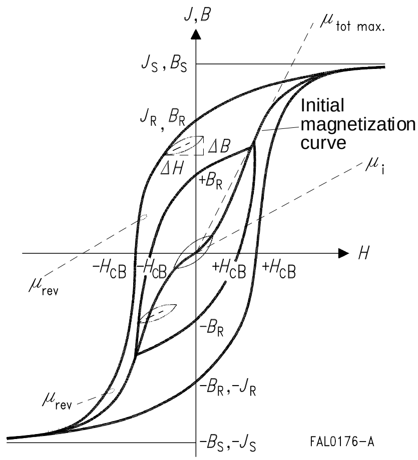

Fig. 1
Magnetization curve
(schematic)

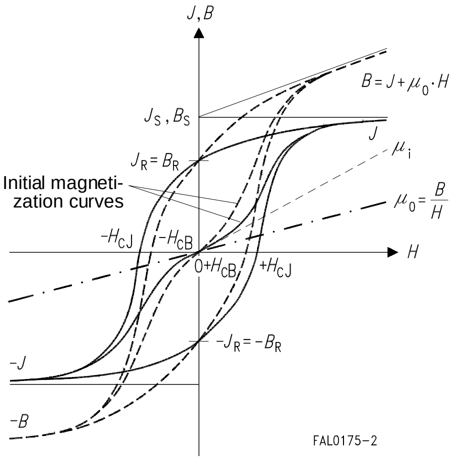

Fig. 2
Hysteresis loops for different
excitations and materials

Magnetic field strength $$H = \frac{I \cdot N}{l} = \frac{\text{ampere-turns}}{\text{length in m}} \quad \left[\frac{A}{m}\right]$$

Magnetic flux density $$B = \frac{\Phi}{A} = \frac{\text{magnetic flux}}{\text{permeated area}} \quad \left[\frac{Vs}{m^2}\right] = [\quad]$$

General

Polarization *J* $B = \mu_0 H + J;$ $(\quad) \ll J \Rightarrow B \approx J$

General relationship between *B* and *H*:

$B = \mu_0 \cdot \quad \cdot H$ μ_0 = magnetic field constant

$\mu_0 = 1.257 \cdot 10^{-6}$ $\left[\frac{Vs}{Am}\right] = \left[\frac{H(Henry)}{m}\right]$

μ_r = relative permeability

In a vacuum, $\mu_r = 1$; in ferromagnetic or ferrimagnetic materials the relation *B*(*H*) becomes nonlinear and the slope of the hysteresis loop $\mu_r \gg 1$.

1.2 Basic parameters of the hysteresis loop

1.2.1 Initial magnetization curve

The initial magnetization curve describes the relationship $B = \mu_r \, \mu_0 \, H$ for the first magnetization following a complete demagnetization. Joining the end points of all „subloops“ (indicated in Fig. 1) from $H = 0$ to $H = H_{max}$ similarly produces the initial magnetization curve.

1.2.2 Saturation magnetization B_S

The saturation magnetization B_S is defined as the maximum flux density attainable in a material (i.e. for a very high field strength); above this value B_S, it is not possible to further increase *B*(*H*) by further increasing *H*. Microscopically, this means that when $B = B_S$ all elementary magnets are aligned.

Technically, B_S is defined as the flux density at a field strength of H = 1200 A/m. As is confirmed in the actual magnetization curves in the chapter on „Materials“, the *B*(*H*) characteristic above 1200 A/m remains roughly constant (applies to all ferrites with high permeability, i.e. where $\mu \geq 100$).

1.2.3 Remanent flux density $B_R(H)$

The remanent flux density (residual magnetization density) is a measure of the degree of residual magnetization in the ferrite after traversing a hysteresis loop. If the magnetic field *H* is subsequently reduced to zero, the ferrite still has a material-specific flux density $B_R \neq 0$ (see Fig. 1: intersection with the ordinate $H = 0$).

1.2.4 Coercive field strength H_C

The flux density *B* can be reduced to zero again by applying a specific opposing field $-H_C$ (see Fig. 1: intersection with the abscissa $B = 0$).

The demagnetized state can be restored at any time by:

a) traversing the hysteresis loop at a high frequency and simultaneously reducing the field strength *H* to $H = 0$.
b) by exceeding the Curie temperature T_C.

0 Permeability

Different relative permeabilities μ are defined on the basis of the hysteresis loop for the various electromagnetic applications.

2.1 Initial permeability μ_i

$$\mu_i = \frac{1}{\mu_0} \cdot \frac{\Delta B}{\Delta H} \qquad (\qquad)$$

The initial permeability μ_i defines the relative permeability at very low excitation levels and constitutes the most important means of comparison for ferromagnetic (ferrimagnetic) materials. According to DIN IEC 401, μ_i is defined using closed magnetic circuits (e.g. a closed ring-shaped cylindrical coil) for $f \leq 10$ kHz, $B < 0{,}25$ mT, $T = 25$ °C.

2.2 Effective permeability μ_e

Most core shapes in use today do not have closed magnetic paths (Only ring, double E or double-aperture cores have closed magnetic circuits.), rather the circuit consists of regions where $\mu_i \neq 1$ (ferrite material) and $\mu_i = 1$ (air gap).

For gapped cores an effective permeability μ_e is defined in practice.

$$\mu_e = \frac{1}{\mu_0} \frac{L}{N^2} \sum \frac{l}{A}$$

$$\sum \frac{l}{A} = \text{ form factor}$$

L = inductance
N = number of turns

It should be noted, for example, that the loss factor tan δ and the temperature coefficient for gapped cores reduce in the ratio μ_e/μ_i compared to ungapped cores.

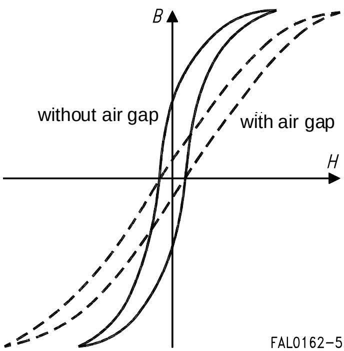

Fig. 3
Comparison of hysteresis loops for a core with and without an air gap

The following approximation applies for an air gap $s \ll l_e$:

$$\mu_e = \frac{\mu_i}{1 + \frac{s}{l_e} \cdot \mu_i}$$

s = width of air gap
l_e = effective magnetic path length

For more precise calculation methods, see for example E.C. Snelling, „Soft ferrites“, 2nd edition.

2.3 Apparent permeability μ_{app}

$$\mu_{app} = \frac{L}{L_0} = \frac{\text{inductance with core}}{\text{inductance without core}}$$

The definition of μ_{app} is particularly important for specification of the permeability for coils with tubular, cylindrical and threaded cores, since an unambiguous relationship between initial permeability μ_i and effective permeability μ_e is not possible on account of the high leakage inductances. The design of the winding and the spatial correlation between coil and core have a considerable influence on μ_{app}. A precise specification of μ_{app} requires a precise specification of the measuring coil arrangement.

2.4 Complex permeability μ

For better comparison of ferrite materials and their frequency characteristics (in order to take into consideration the phase displacement between voltage and current), it is useful to introduce μ as a complex operator, i.e. a complex permeability $\overline{\mu}$, according to the following relationship:

$\overline{\mu} = \mu' + j \cdot \mu''$
where, in terms of a series equivalent circuit,
μ' is the relative real (inductance) component of $\overline{\mu}$
and μ'' is the relative imaginary (loss) component of $\overline{\mu}$.

Using the complex permeability $\overline{\mu}$, the (complex) impedance of the coil can be calculated:
$\overline{Z} = j\,\omega\,\overline{\mu}\,L_0$
where L_0 represents the inductance without core at the same field distribution.
(cf. also section 4.1: information on tan δ)

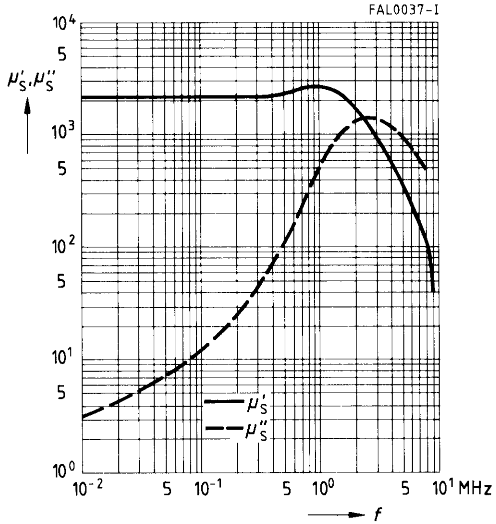

Fig. 4
Complex permeability versus frequency
(measured with R10 ring cores, N 48 material, measuring flux density $B \leq 0{,}25$ mT)

Fig. 4 shows for N 48 material the characteristic curves of μ_s' and μ_s'' (real and imaginary components of μ, expressed in the diagram of the series equivalent circuit) as a function of frequency. Starting at low frequencies, μ_s' is initially constant with increasing μ_s'' because the friction loss resulting from the movement of the magnetic domains increases with frequency. Depending on the material characteristics and core dimensions, resonance occurs at a certain frequency, either gyroresonance, eddy-current resonance or dimensional resonance.

In this frequency range in which the magnetic activity is increasingly unable to follow the field, a steep drop in μ_s' is produced and, accordingly, there is maximum loss. This is the upper frequency limit f_{max} of the material. For higher frequencies the coil designer then has to move on to a material with higher resonance frequency or smaller μ (higher resonance frequency means lower initial permeability μ_i: $\mu_i \sim 1/f_G$).

2.5 Reversible permeability μ_{rev}

$$\mu_{rev} = \frac{1}{\mu_0} \cdot \lim_{\Delta H \to 0} \left(\frac{\Delta B}{\Delta H} \right)_{H_-}$$ (Permeability with superimposed DC field H_-)

In order to measure the reversible permeability μ_{rev}, a small measuring alternating field is superimposed on a DC field. In this case μ_{rev} is heavily dependent on H_-, the core geometry, the temperature and the saturation magnetization.

Important application areas for DC field-superimposed, i.e. magnetically biased, coils are broadband transformer systems (feeding currents with signal superimposition) and power engineering (shifting the operating point) and the area known as „nonlinear chokes“ (cf. chapter on

RM cores). For the magnetic bias curves as a function of the excitation H_{-} see the chapter on „SIFERRIT materials“.

2.6 Amplitude permeability μ_a

$$\mu_a = \frac{\hat{B}}{\mu_0 \hat{H}}$$ (Permeability at high excitation)

The amplitude permeability μ_a is the slope of the initial magnetization curve, i.e. it is not dependent on previous magnetic history. Since the hysteresis loop is strongly nonlinear, μ_a is also a function of the applied field H.

$$\mu_a(\hat{H} \to 0) = \mu_i$$

For frequencies well below resonance, μ_a is not frequency-dependent but there is a strong dependence on temperature and saturation magnetization. The amplitude permeability is an important definition quantity for power ferrites. It is defined for specific core types by means of an A_{L1} value for $f \leq 10$ kHz, B = 0,320 mT (or 200 mT), T = 100 °C (see also introduction to the various core types, e.g. page 186).

$$A_{L1} = \frac{\mu_0 \cdot \mu_a}{\sum \frac{l}{A}}$$

0 Magnetic core shape characteristics

Permeabilities and also other magnetic parameters are generally defined as material-specific quantities. For a particular core shape, however, the magnetic data are influenced to a significant extent by the geometry. Thus, the inductance of a slim-line ring air-core coil is defined as:

$$L = \mu_r \cdot \mu_0 \cdot N^2 \cdot \frac{A}{l}$$

Due to their geometry, soft magnetic ferrite cores in the field of such a coil change the flux parameters in such a way that it is necessary to specify a series of effective core shape parameters in each data sheet. The following are defined:

l_e	effective magnetic length
A_e	effective magnetic cross section
A_{min}	min. magnetic cross section of the core (required to calculate the max. flux density)
$V_e = A_e \cdot l_e$	effective magnetic volume

With the aid of these parameters, the calculation for ferrite cores with complicated shapes can be reduced to the considerably more simple problem of an imaginary ring core with the same magnetic properties. The basis for this is provided by the methods of calculation according to IEC 205, 205A and 205B, which allow the following factors $\Sigma l/A$ and A_L to be calculated:

3.1 Form factor

$$\sum \frac{l}{A} = \frac{l_e}{A_e}$$

The inductance *L* can then be calculated as follows:

$$L = \frac{\mu_0 \cdot \mu_e \cdot N^2}{\sum \frac{l}{A}}$$

where μ_e denotes the effective permeability or another permeability μ_{rev} or μ_a (or μ_i for cores with a closed magnetic path) adapted for the *B*/*H* range in question.

3.2 Inductance factor, A_L value

$$A_L = \frac{L}{N^2} = \frac{\mu_0 \cdot \mu_e}{\sum \frac{l}{A}}$$

A_L is the inductance referred to number of turns = 1. Therefore, for a defined number of turns *N*:

$L = A_L \cdot N^2$

3.3 Tolerance code letters

The tolerances of the A_L are coded by the letters in the third block of the ordering code in conformity with IEC 62.

Code letter	Tolerance of A_L value	Code letter	Tolerance of A_L value
A	± 3%	Q	+30/-10%
G	± 2%	R	+30/-20%
J	± 5%	U	+80/-0%
K	± 10%	X	filling letter
L	± 15%	Y	+40/-30%
M	± 20%	–	–

The tolerance values available are given in the individual data sheets.

0 Definition quantities in the small-signal area

4.1 Loss factor tan δ

Losses in the small-signal area are specified by the loss factor tan δ.

Based on the impedance $\overline{Z}$ (cf. also section 2.4), the loss factor of the core in conjunction with the complex permeability $\overline{\mu}$ is defined as

$$\tan\delta_s = \frac{\mu_s''}{\mu_s'} = \frac{R_s}{\omega L_s} \qquad \text{and} \qquad \tan\delta_p = \frac{\mu_p'}{\mu_p''} = \frac{\omega \cdot L_p}{R_p}$$

where R_s and R_p denote the series and parallel resistance and L_s and L_p the series and parallel inductance respectively.

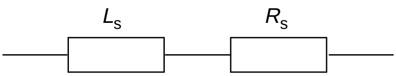

Fig. 5
Lossless series inductor L_s with lossy resistor R_s resulting from the core losses

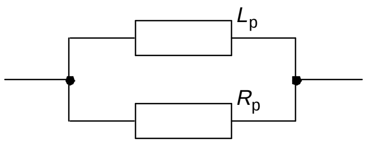

Fig. 6
Lossless parallel inductor L_p with lossy resistor R_p resulting from the core losses

From the relationships between series and parallel circuits we obtain:

$$\mu'_p = \mu'_s \cdot (1 + (\tan\delta)^2)$$

$$\mu''_p = \mu''_s \cdot \left(1 + \left(\frac{1}{\tan\delta}\right)^2\right)$$

4.2 Relative loss factor tan δ/μ$_i$

In gapped cores the material loss factor tan δ is reduced by the factor μ_e/μ_i. This results in the relative loss factor $\tan\delta_e$ (cf. also section 2.2):

$$\tan\delta_e = \frac{\tan\delta}{\mu_i} \cdot \mu_e$$

The table of material properties lists the relative loss factor tan δ/μ_i. This is determined in accordance with IEC 401 at *f* = 10 kHz, *B* = 0,25 mT, *T* = 25 °C.

4.3 Quality factor Q

The ratio of reactance to total resistance of an induction coil is known as the quality factor *Q*.

$$Q = \frac{\omega L}{R_L} = \frac{\text{reactance}}{\text{total resistance}}$$

The total quality factor *Q* is the reciprocal of the total loss factor tan δ; it is dependent on the frequency, inductance, temperature, winding wire and permeability of the core.

4.4 Optimum frequency range

The optimum frequency range is specified primarily in the case of ferrites for broadband transformers and filters.

The curves for tan δ/μ_i versus *f* in the chapter on „SIFERRIT Materials“ provide a quick reference for the selection of inductors with a high Q factor.

Upper frequency limit f_{max}

The upper frequency limit is the frequency at which the loss factor curve has not yet begun to rise too steeply. This is approximately the case when the Q factor of the ring core is about 50 or when tan δ is about 0,02. The Q factor below the frequency limit or for gapped cores is much higher.

Lower frequency limit f_{min}

The lower frequency limit is the frequency at which it is advisable to select the material with the next higher permeability for reasons of the lower loss factor.

4.5 Hysteresis loss resistance R_h and hysteresis material constant η_B

In transformers, in particular, the user cannot always be content with very low saturation. The user requires details of the losses which occur at higher saturation, e.g. where the hysteresis loop begins to open.

Since this hysteresis loss resistance R_h can rise sharply in different flux density ranges and at different frequencies, it is measured in accordance with IEC 401 for μ_i values greater than 500 at B = 1,5 and 3 mT (ΔB = 1,5 mT), a frequency of 10 kHz and a temperature of 25 °C (for μ_i < 500: f = 100 kHz). The hysteresis loss factor tan δ_h can then be calculated from this.

$$\tan \delta_h = \frac{\Delta R_h}{\omega \cdot L}$$

For the hysteresis material constant η_B we obtain:

$$\eta_B = \frac{\Delta \tan \delta_h}{\mu_e \cdot \Delta B} = \frac{\Delta R_h}{\omega \cdot L \cdot \mu_e \cdot \Delta B}$$

The hysteresis material constant η_B characterizes the hysteresis losses; it is not dependent on the air gap. η_B is thus a significant quantity in estimating the material-specific hysteresis losses; it is specified in the table of material properties starting on page 34.

The hysteresis loss factor of an inductor can be reduced, at a constant flux density, by means of an (additional) air gap

$$\Delta \tan \delta_h = \frac{\Delta R_h}{\omega \cdot L} = \eta \cdot \Delta\hat{B} \cdot \mu_e$$

For further details see IEC 367-1 and 125.

0 Defining quantities in the power sector

While in the small-signal sector ($H \leq H_{cmax}$), i.e. in filter and broadband applications, the hysteresis loop is generally traversed only in lancet form (Fig. 2), for power applications the hysteresis loop is driven partly into saturation. The defining quantities are then

μ_{rev} reversible permeability in the case of superimposition with a DC signal (operating point for power transformers)
μ_a amplitude permeability and
P_V core losses.

5.1 Core losses P_V

The losses of a ferrite core or core set P_V is proportional to the area of the hysteresis loop in question. It consists of three components:

$$P_V = P_{V,\,basic} + P_{V,\,hysteresis} + P_{V,\,eddycurrent}$$

Owing to the high specific resistance of ferrite materials, the eddy current losses in the frequency range common today (1 kHz - 2 MHz) may be practically disregarded except in the case of core shapes having a large cross-sectional area. In principle the following applies:

$$P_V = U \cdot \quad \cdot \cos\varphi$$

where U ($\hat{B}$) is the applied voltage, I ($\hat{H}$) the resulting current and φ the phase displacement between them.

The power loss P_V is a function of the temperature T, the frequency f, the flux density B and is of course dependent on ferrite material and core shape.

The temperature dependence can generally be approximated by means of a third-order polynomial, while

$$P_V(\;) \sim f^{(\quad)} \qquad 0 \leq \quad \leq 1$$

applies for the frequency dependence and

$$P_V(\;) \sim B^{(\quad)} \qquad 0 \leq \quad \leq 1$$

for the flux density dependence. The coefficients x and y are dependent on core shape and material, and there is a mutual dependence between the coefficients of the defining quantity (e.g. T) and the relevant parameter set (e.g. f, B).

A transformation program is available for EFD and ETD cores as a design tool which allows core losses to be converted to different operating conditions (specific to core shape / material).

In the case of cores which are suitable for power applications, the total core losses P_V are given explicitly for a specific frequency f, flux density B and temperature T in the relevant data sheets.

When determining the total power loss for an inductive component, the winding losses must also be taken into consideration in addition to the core-specific losses.

$$P_{Vtot} = P_{V\,core} + P_{V\,winding}$$

where, in addition to insulation conditions in the given frequency range, skin effect and proximity effect must also be taken into consideration for the winding.

0 Influence of temperature

6.1 μ(T) curve, Curie temperature T_C

The initial permeability μ_i as a function of T is given for all materials (see chapter on SIFERRIT materials). Important parameters for a $\mu(T)$ curve are the position of the **s**econdary **p**ermeability **m**aximum (SPM) and the Curie temperature. Minimum losses occur at the SPM temperature.

In filter applications, the change of the relative loss factor tan δ/μ_i in the range 5 ... 55°C can generally be disregarded compared to the change in copper resistance.

Above the Curie temperature T_C ferrite materials lose their ferrimagnetic properties, i.e. μ_i drops to $\mu_i = 1$. This means that the parallel alignment of the elementary magnets (spontaneous magnetization) is destroyed by increasing thermal activation. This phenomenon is reversible, i.e. when the temperature is reduced below T_C again, the ferrimagnetic properties are restored.

6.2 Temperature coefficient of permeability α

By definition the temperature coefficient α represents a straight line of average gradient between the reference temperatures T_1 and T_2. If the $\mu(T)$ curve is approximately linear in this temperature range, this is a good approximation; in the case of heavily pronounced maxima, as occur particularly with highly permeable broadband ferrites, however, this is less true. The following applies:

$$\alpha = \frac{\mu_{i2} - \mu_{i1}}{\mu_{i1}} \cdot \frac{1}{T_2 - T_1}$$

μ_{i1} = initial permeability μ_i at T_1 = 25 °C
μ_{i2} = the initial permeability μ_i associated with the temperature T_2

6.3 Relative temperature coefficient α_F

$$\alpha_F = \frac{\alpha}{\mu_i} = \frac{\mu_i - \mu_{i1}}{\mu_i \cdot \mu_{i1}} \cdot \frac{1}{T - T_1}$$

In a magnetic circuit with an air gap and the effective permeability μ_e the temperature coefficient is reduced by the factor μ_e/μ_i (cf. also section 2.4).

6.4 Permeability factor

The first factor in the equation for determining the relative temperature coefficient $\frac{\mu_i - \mu_{i1}}{\mu_i \cdot \mu_{i1}}$ is known as the permeability factor.

In the case of SIFERRIT materials for resonant circuits, the temperature dependence of the permeability factor can be seen from the relevant diagram.

6.5 Effective temperature coefficient α_e

$$\alpha_e = \frac{\mu_e}{\mu_i} \cdot \alpha$$

In the case of the ferrite materials for filter applications, the α/μ_i values for the ranges 20 ... 55°C and 5 .... 20°C are given in table of material properties.

The effective permeability μ_e is required in order to calculate α_e; therefore this is given for each core in the individual data sheets.

6.6 Relationship between the change in inductance and the permeability factor

The relative change in inductance between two temperature points can be calculated as follows:

$$\frac{\Delta L}{L}[\;] = \frac{\alpha}{\mu_i}\left[\frac{10^{-6}}{K}\right] \cdot (T - T_1)[\;] \cdot \mu_e \cdot 100$$

μ_i at temperature T
μ_{i1} at temperature T_1

$$\frac{\Delta L}{L}[\;] = \frac{\mu_i - \mu_{i1}}{\mu_i \cdot \mu_{i1}} \mu_e \cdot 100$$

6.7 Temperature dependence of saturation magnetization

The saturation magnetization B_S drops with temperature and at T_C has fallen to B_S = 0 mT. The drop for B_S(25°C) and B_S(100°C), i.e. the main area of application for the ferrites, can be taken from the table of material properties.

6.8 Temperature dependence of saturation-dependent permeability (amplitude permeability)

It can be seen from the μ_a curves for the different materials that μ_a exhibits a more pronounced maximum with increasing temperature and drops off sooner on account of decreasing saturation.

0 Disaccommodation

Ferrimagnetic states of equilibrium can be influenced by mechanical, thermal or magnetic changes (shocks). Generally, an increase in permeability occurs when a greater mobility of individual magnetic domains is attained through the external application of energy. This state is not temporally stable and returns logarithmically with time to the original state.

7.1 Disaccommodation coefficient d

$$d = \frac{\mu_{i1} - \mu_{i2}}{\mu_{i1} \cdot (\log t_2 - \log t_1)}$$

where μ_{i1} = permeability at time t_1
μ_{i2} = permeability at time t_2 and $t_2 > t_1$

7.2 Disaccommodation factor DF

$$DF = \frac{d}{\mu_{i1}}$$

Accordingly, a change in inductance can be calculated with the aid of *DF*:

$$\frac{L_1 - L_2}{L_1} = DF \cdot \mu_e \cdot \log\frac{t_2}{t_1}$$

0 General mechanical, electrical and magnetic properties of ferrites

8.1 Mechanical stability

If one wishes to describe the mechanical properties or stability of a ferrite core, the best method is to consider the general properties of ceramic bodies.

As is the case with any ceramic, the ferrite core is brittle and sensitive to any shock, bending or tensile load. Therefore its resistance to temperature change (e.g. in an ultrasonic bath) is restricted, as is shown by the following diagrammatic analysis of a thermal shock test.

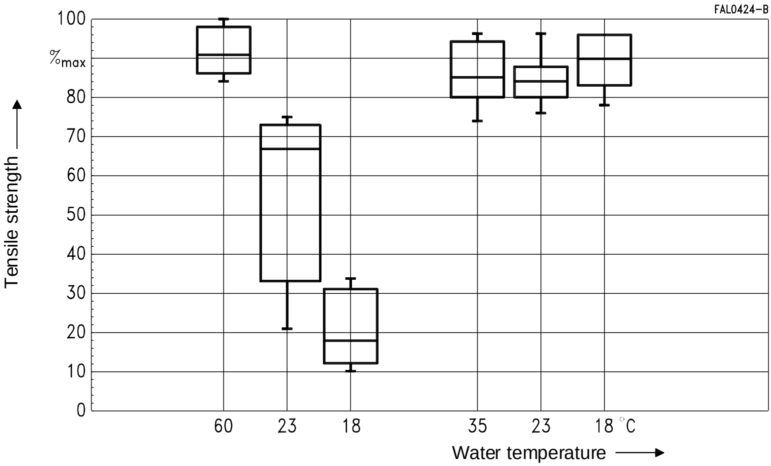

Fig. 7
Tensile strength distribution for ferrite core, resistance to temperature change
box diagram: the respective maximum and minimum values for the tensile strength (vertical lines) at each bath temperature can be seen, 50% of the values for the tensile strength lie within the box, with 25% above and 25% below in each case. The horizontal line in the box gives the median.

As can be seen from the illustration, the tensile strength of the cores under test falls to about 10 to 15% of the initial maximum value in the first test cycle (60°C → 23°C → 18°C). The reason for this behavior lies in the stresses produced in the core as a result of the high cooling rate (medium: water). These stresses are relieved through the formation of cracks in the core material. The tensile strength of the core is thus dramatically reduced. These events are represented in the following relation:

$$\sigma_T = \alpha \cdot \Delta T \frac{E_0}{1 + 2\Pi N l^2}$$

σ_T Actual effective stress
α Coefficient of thermal expansion
E_0 Modulus of elasticity
N Number of temperature changes
l Crack length

In order to quantify the brittleness of a ferrite core, a fracture mechanism quantity must first be found which is also a material property. This quantity is the fracture toughness. It is the quantity which indicates the order of stress magnitude in the core at which a subcritical fracture growth becomes unstable. This relationship is represented in the following

$$K_1 \geq K_{1C} \quad \text{with} \quad K_1 = \sigma\sqrt{l}Y \quad \text{and} \quad K_{1C} = \sqrt{G_C E}$$

K_1 Stress intensity factor
K_{1C} Fracture toughness
Y Factor for fracture/sample geometry
G_C Critical fracture area energy
E E modulus

The K_{1C} value - determined by indentation testing - can be regarded as the desired measure of the brittleness of a material. A typical value for fracture toughness can be obtained from the table below.

Tensile strength	approx. 20 N/mm^2
Compressive strength	approx. 100 N/mm^2
Vickers hardness HV_{15}	approx. 8000 N/mm^2
Modulus of elasticity	approx. 150000 N/mm^2
Fracture toughness K_{1c}	approx. 0,8 ... 1,1 $MPam^{1/2}$

Stresses in the core affect not only the mechanical properties but also the magnetic properties. It is apparent that the initial permeability is dependent on the stress state of the core. With

$$\mu_i \sim \frac{1}{\sigma_T}$$

it can be shown that the higher the stresses are in the core, the lower is the value for the initial permeability. Embedding the ferrite cores (e.g. in plastic) can induce these stresses. A permeability reduction of up to 50% and more can be observed, depending on the material. In this case, the embedding medium should have the greatest possible elasticity.

8.2 Resistance to radiation

SIFERRIT materials can be exposed to the following radiation without significant variation ($\Delta L/L \leq 1\%$ for ungapped cores):

gamma quanta:	10^9 rad
quick neutrons	$2 \bullet 10^{20}$ neutrons/m^2
thermal neutrons	$2 \bullet 10^{22}$ neutrons/m^2

8.3 Resistivity ρ, *dielectric constant* ε

At room temperature, ferrites have a resistivity in the range 1 Ωm to 10^5 Ωm; this value is usually higher at the grain boundaries than in the grain interior. The temperature dependence of the core resistivity corresponds to that of a semiconductor:

$$\rho \sim e^{\frac{E_a}{kT}}$$

E_a Activation energy
k Boltzmann constant
T Absolute temperature [K]

Thus the resistivity at 100°C is less than at 25°C by a factor of 5, which is significant, particularly in power applications, for the magnitude of the eddy-current losses.

The resistivity similarly drops as frequency increases.
Example: Material N 48

f	kHz	10	100	500
ρ	Ωm	1,0	0,95	0.65

The different resistivity values for grain interior and grain boundary result in high (apparent) dielectric constants ε at low frequencies. The dielectric constant ε for all ferrites falls to values around 10 ... 20 at very high frequencies. NiZn ferrites already reach this value range at frequencies around 100 kHz.

SIFFERIT material	Resistivity (approx.)	Dielectric constant ε at (approximate values)				
	Ωm	10 kHz	100 kHz	1 MHz	100 MHz	300 MHz
K1 (NiZn) N 48 (MnZn)	10^5 1	30 $140 \cdot 10^3$	15 $50 \cdot 10^3$	12 $30 \cdot 10^3$	11	11

8.4 Magnetostriction

Linear magnetostriction is defined as the relative change in length of a magnetic core under the influence of a magnetic field. The greatest relative variation in length $\lambda = \Delta l/l$ occurs at saturation magnetization. The values of the saturation magnetostriction (λ_s) of our ferrite materials are given in the following table (negative values denote contraction).

SIFFERIT material	K 12	K 1	N 48
λ_s in 10^{-6}	- 21	- 18	- 1,5

Magnetostrictive effects are of significance principally when a coil is operated in the frequency range < 20 kHz and then undesired audible frequency effects (distortion etc.) occur.

0 9Coil characteristics

Resistance factor A_R

The resistance factor A_R, or A_R value, is the DC resistance R_{Cu} per unit turn, analogous to the A_L value.

$$A_R = \frac{R_{Cu}}{N^2}$$

When the A_R value and number of turns N are given, the DC resistance can be calculated from $R_{CU} = A_R\ N^2$.

From the winding data etc. the A_R value can be calculated as follows:

$$A_R = \frac{\rho \cdot l_N}{f_{Cu} \cdot A_N}$$

where ρ = resistivity (for copper: 17,2 $\mu\Omega$ mm), l_N = average length of turn in mm, A_N = cross section of winding in mm^2, f_{Cu} = copper space factor. If these units are use in the equation, the A_R value is obtained in $\mu\Omega = 10^{-6}\ \Omega$.

For coil formers, A_R values are given in addition to A_N and l_N. They are based on a copper space factor of f_{Cu} = 0,5. This permits the A_R value to be calculated for any space factor f_{Cu}:

$$A_{R(\ )} = A_{R(\ )} \cdot \frac{0{,}5}{f_{Cu}}$$

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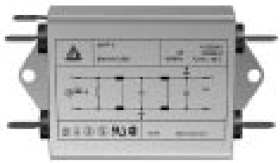

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1 Gapped and ungapped ferrite cores

Even with the best grinding methods known today, a certain degree of roughness on ground surfaces cannot be avoided, so that the usual term „without air gap“ or „ungapped“ does not imply no air gap at all. The A_L values quoted allow for a certain amount of roughness of the ground faces. The tolerance of the A_L value for ungapped cores is – 20 to + 30 % or – 30 to + 40 %. Closer tolerances are not available for several reasons. The spread in the A_L values of ungapped cores practically equal the spread in ring core permeability, and the A_L value largely depends on the grinding quality of the matching surfaces.

The following are normally defined:

precision-ground/lapped cores	$s_{resid} <$ 1 µm
normally ground cores	$s_{resid} \sim$ 10 µm
gapped cores	$s \geq$ 0,01 mm

The residual air gap s_{resid} here is the total of the residual air gaps at the leg or centerpost contact surfaces.

With increasing material permeability the influence of the inevitable residual air gap grows larger. The spreads in the A_L value may also be increased by the mode of core assembly. Effects of mounting and gluing can result in a reduction of the A_L value.

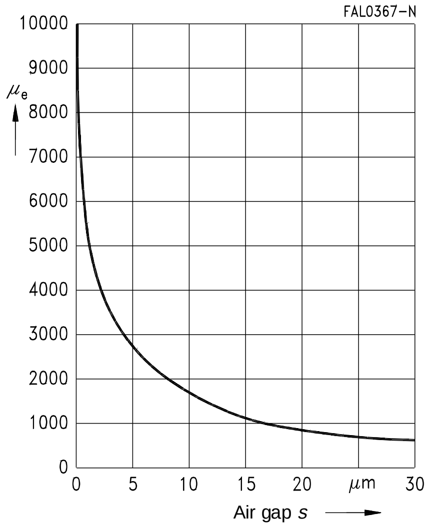
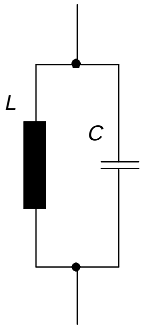


Fig. 8
Relationship between permeability μ_e and air gap s for an RM 4/T 38 ferrite core

0 Cores for filter applications

2.1 Gapped cores for filter/resonant circuits



Basic requirements:

- low tan δ
- close tolerance for A_L value
- close tolerance for temperature coefficient
- low disaccommodation factor *DF*
- wide adjustment range

Gapped cores are therefore always used in high quality circuits (for materials see application survey, page 32).

In the case of small air gaps (max. 0,15 mm for P cores or 0,22 mm for RM cores) the air gap can be ground into only one core half. In this case the half with the ground air gap bears the stamp. The other half is blank.

The gap reduces remanence losses and the temperature coefficient by the factor μ_e/μ_i, and hysteresis losses by the factor $(\mu_e/\mu_i)^2$. Furthermore, closer tolerances of the A_L value can be obtained.

The rated A_L values for cores with ground air gap can be obtained from the individual data sheets. The data for the individual cores also include the effective permeability μ_e used to approximately determine the effective loss factor tan δ_e and the temperature coefficient of the effective permeability α_e from the ring core characteristics (see table of material properties).

It should be noted at this point that in cores with a larger air gap the stray field in the immediate vicinity of the air gap can cause additional eddy current losses in the copper winding. If the coil quality must meet stringent requirements, it is therefore advisable to wind several layers of polystyrene or nylon tape instead of wire in the part of the winding that is in the proximity of the air gap; with a 3-section coil former this would be the part of the center section near the air gap.

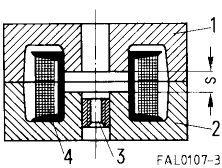


Fig. 9
Schematic drawing showing the construction of a P or RM core set with a total air gap *s*, comprising 2 core halves (1 and 2), threaded part (3) and padded winding (4)

2.2 P and RM cores with threaded sleeves

P and RM cores are supplied with a glued-in threaded sleeve. S+M Components uses automatic machines featuring high reliability in dosing of the adhesive and in positioning the threaded sleeve in the core.

The tight fit of the threaded sleeve is regularly checked - including a humid atmosphere of 40°C/93% r.h. (in accordance with IEC 68-2-3) over 4 days - and also by periodic tests over 3 weeks. The usual bonding strengths of 20 N for ∅ 2 mm holes (e.g. for P 11×7, RM 5) and 30 N for ∅ 3 mm holes (e.g. for P 14×11, RM 6) are greatly exceeded, reaching an average of > 100 N. The threaded sleeve is continuously checked for proper centering (important for a smooth adjustment curve). Overall, the controlled automated procedure guarantees higher reliability than manual gluing with its unavoidable inadequacies. Owing to the porosity of the ferrite, tension of the ferrite structure due to hardened adhesive that has penetrated cannot always be avoided. Hence, the relative temperature coefficient α_F may be increased by approximately $0{,}2 \cdot 10^{-6}$/K.

2.3 Inductance adjustment

Inductance adjustment curves are included in the individual data sheets for P and RM cores. These represent typical values. The indicated percentage change in inductance is referred to *L* (inductance without adjusting screw). For adjustment the air gap is bridged with a cylindrical or threaded core. Consequently, only gapped cores permit adjustment.

The combinations of gapped cores and adjusting screws recommended in the data sheets ensure a sufficient range of adjustment at stable adjustment conditions.

Suitable plastic adjusting tools are also listed in the data sheets.

2.4 Typical calculation of a resonant circuit inductor

The following example serves to illustrate the dependencies to be considered when designing a resonant circuit inductor:

A SIFERRIT pot core inductor is required with an inductance of L = 640 µH and a minimum quality factor Q = 400 ($\tan \delta_L = 1/Q = 2{,}5 \cdot 10^{-3}$) for a frequency of 500 kHz. The temperature coefficient α_e of this inductor should be $100 \cdot 10^{-6}$/K in the temperature range +5 to +55°C.

a) Choice of material

According to the table of material properties and the $\tan \delta/\mu_i$ curves (see chapter „SIFERRIT materials") the material M 33, for example, can be used for 500 kHz.

b) Choice of A_L value

The Q and temperature coefficient requirements demand a gapped pot core. The relative temperature coefficient α_F of SIFERRIT M 33 according to the table of material properties is on average about $1{,}6 \cdot 10^{-6}$/K. Since the required α_e value of the gapped P core should be about $100 \cdot 10^{-6}$/K, the effective permeability is

$$\alpha_F = \frac{\alpha_e}{\mu_e} \qquad \mu_e = \alpha_e \cdot \frac{\mu_i}{\alpha} = \frac{100 \cdot 10^{-6}}{K} \cdot \frac{1 \cdot K}{1{,}6 \cdot 10^{-6}} = 62{,}5$$

With pot core P 18×11 (B65651): μ_e = 47,9 for A_L = 100 nH.
With pot core P 22×13 (B65661): μ_e = 39,8 for A_L = 100 nH.

c) Choice of winding material

RF litz wire 20×0,05 with single natural silk covering is particularly suitable for frequencies around 500 kHz. The overall diameter of the wire including insulation of 0,367 mm and the average resistivity of 0,444 Ω/m are obtained from the litz-wire table (refer to pertinent standard). It is recommended that the actual overall diameter always be measured, and this value used for the calculation.

d) Number of turns and type of core

For an A_L value of 100 nH and an inductance of 640 µH the equation N = $(L/A_L)^{1/2}$ yields 80 turns. The nomogram for coil formers on page 152 shows that for a wire with an external diameter of 0,367 mm the two-section former for core type P 18×11 80 can easily take 80 turns. This type can therefore be used with a two-section former.

e) Length of wire and DC resistance

The length of an average turn l_N on the above former is 35,6 mm. The length of litz wire necessary for the coil is therefore 80•35,6 mm = 2848 mm plus say 2•10 cm for the connections, giving a total length of 3,04 m. The average resistivity of this wire is 0,444 Ω/m; the total DC resistance R_{Cu} is thus 3,04 m • 0,444 Ω/m ≈ 1,35 Ω. It should be noted that the length of an average turn l_N given in the individual data sheets always refers to the fully wound former. If the former is not fully wound, the length of an average turn must be corrected according to the extent of the winding.

f) Quality test

The mathematical calculation of the total loss, i.e. the losses of the core and windings is very laborious and only approximate. At the specified frequency of 500 kHz considerable dielectric and eddy-current losses occur. The quality is therefore checked on a sample coil wound as specified above, in this case the value being about 550 as shown in the Q factor characteristics for P 18×11.

g) Checking the temperature coefficient

The core P 18×11 with A_L = 100 nH has an effective permeability μ_e = 47,9. SIFERRIT M 33 has a relative temperature coefficient $\alpha_F \approx 1{,}6 \cdot 10^{-6}$/K; therefore the following temperature coefficient can be calculated

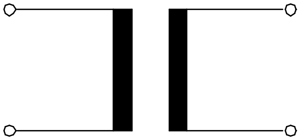
$$\alpha_e = \mu_e \cdot \alpha_F = \qquad = 76{,}6 \cdot 10^{-6}/\mathrm{K}$$

Actual measurement yielded $90 \cdot 10^{-6}$/K.

It should be pointed out that with pot cores the temperature coefficient of the unwound coil has almost no influence since the flux density lies primarily in the core.

For effective permeabilities $\mu_e < 80$, however, due to the influence of the winding an additional temperature coefficient of approx. $(10 \ldots 30) \cdot 10^{-6}$/K must be included in the calculation.

0 Cores for broadband transformers



General requirements:

- high A_L values (≙ high effective permeability) to restrict number of turns
- good broadband properties, i.e. high impedance up to highest possible frequencies
- low total harmonic distortion (≙ low hysteresis material constant η_B)
- low sensitivity to superimposed DC currents (≙ highest possible values for T_C and B_S)
- low tan δ for high-frequency applications

3.1 Precision-ground, ungapped cores for broadband transformers

For fields of application such as matching transformers in digital transmission networks, pulse signal transformers or current-compensated chokes, either cores which form a closed magnetic circuit (ring, double E or double-aperture cores) or paired core sets without air gap are used. In order to achieve the highest possible effective permeability here, these cores are precision ground with residual air gaps s << 1 µm. By selecting the low profile core types, the A_L value can be further increased, and the number of turns reduced.

For this reason, RM and pot cores made of materials N 30, T 35, T 37, T 38 and T 42 are especially suitable for these applications. For high-frequency applications, N 26, M 33, K 1, K 12 and U 17 are suitable.

3.2 Fundamentals for broadband transformers in the range 10 kHz to over 1 GHz - an example

Broadband transformers are constructed primarily using closed core shapes, i.e. ring cores and double-aperture cores. Divided core designs such as P/RM cores or small E/ER cores, which allow more simple winding, are particularly suitable for transformers up to approximately 200 MHz.

The bandwidth $\Delta f = f_{oG} - f_{uG}$ (f_{oG} = upper cut-off frequency, f_{uG} = lower cut-off frequency) is considered the most important transformer characteristic.

Cut-off frequency: Frequency at which the voltage at the transformer drops to 70,7 % (≙ fall of 3 dB)

The following holds true for circuit quality Q > 10 (typical value):

$$\Delta f = \frac{f_r}{R_i} \cdot \sqrt{\frac{L_H}{C_0}}$$

f_r = Resonance frequency
R_i = Internal resistance of generator (normally, R_i << loss resistance of ferrite)
L_H = Principal inductance
C_0 = Winding capacitance

Transmission loss curve

$$\alpha = \ln\frac{U}{U_r}$$

U_r = voltage at f_r
α = attenuation when matched with line impedance (e.g. 50 Ω)

Example: 1 : 1 transformer based on E6,3/T38 with 2 ×10 turns

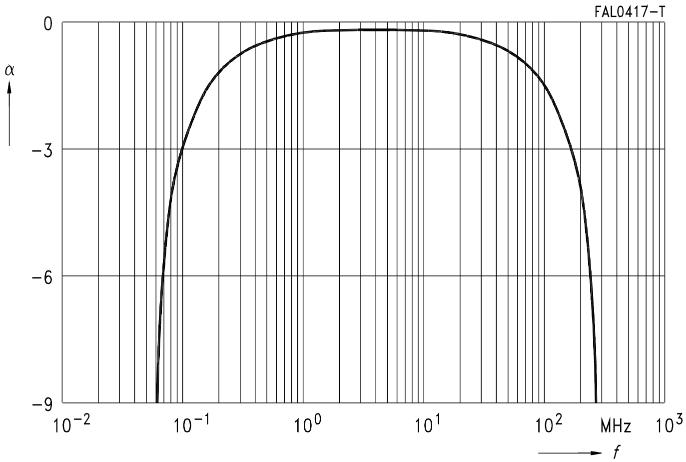


Fig. 10
Transmission loss curve for transformer E6,3/T38 with 2 ×10 turns (parallel)

0 Cores for inductive sensors

The proximity switch, widely used in automation engineering, is based on the damping of a high-frequency LC oscillator by the approach of a metal. The oscillator inductor consists of a cylindrical coil and a ferrite core half whose open side forms what is known as the active area. The function of the ferrite core consists in spatially aligning the magnetic field so as to restrict the interaction area.

The oscillator design must take into account that the inductor forms a magnetically open circuit. The inductance and quality are decisively dependent on the coil design, unlike in the case of closed circuits. The initial permeability plays a subordinate role here, as is shown by the following example:

Core:	P9×5 (B65517-D...)
Coil:	100 turns, 0,08 CuL
Current:	1 mA
Frequency:	100 kHz

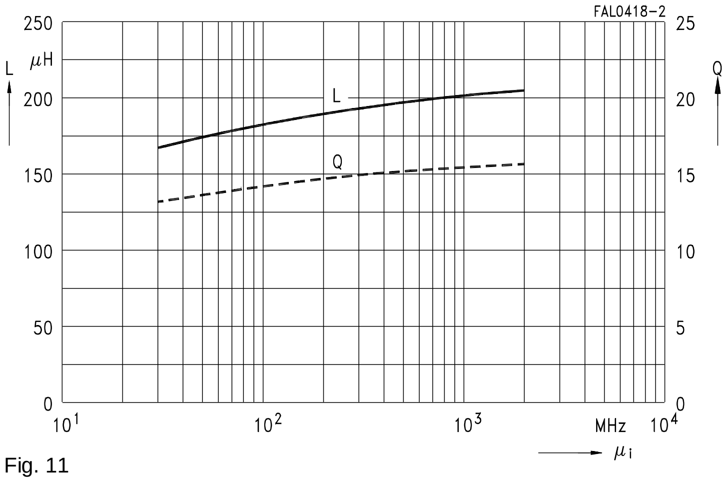


Fig. 11
Inductance and quality versus initial permeability
P9,3×2,7, N = 100, f = 100 kHz, I = 1 mA

Decisive for this application is the attainment of as high a Q as possible, with the lowest possible dependence on temperature at the oscillator frequency. When the distance between the damping lug and the active area changes, the oscillator Q should however change as strongly as possible.

If the relative change in Q ΔQ/Q exceeds a predefined threshold, e.g. 10%, a switching operation is initiated at the so-called operating distance. Attainment of the target values depends on appropriate coil dimensioning and can generally only be performed empirically.

0 Cores for power applications

5.1 Core shapes and materials

The enormously increased diversity of application in power electronics has led to a considerable expansion not only in the spectrum of core shapes but also in the range of materials.

In the case of the rectangular and round-legged E cores as well as in the area of U cores, various new designs have been included in the program. To satisfy the demands of higher-frequency applications, the EFD cores have been developed in sizes EFD10, 15, 20, 25 and EFD30. These are characterized by an extremely flat design, optimized cross-sectional distribution and optimized winding shielding.

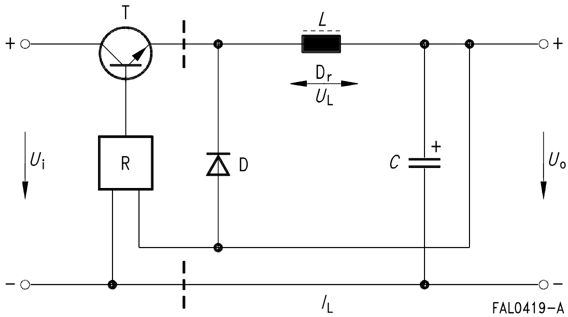
For many standard applications up to 100 kHz, materials N27, N41 and N61 can be used (the latter for pulse power circuits in small core types). For the range up to 200 kHz, materials N62, N67 and N72 are suitable. N87 continues the series up to 500 kHz, while N49 and N59 cover the range from 300 kHz to 1 MHz e.g. for DC/DC (resonance) converters.

For detailed information on core shapes see the individual data sheets, for general information on materials see the chapter on SIFERRIT materials.

5.2 Correlation: Applications - Core shape/Material

5.2.1 Choke converters

Typical circuit diagram (Fig. 12)



Advantages

- only one choke required
- high efficiency
- low radio interference

Disadvantages

- only one output voltage
- restricted short-circuit withstand capability (no line isolation)

Application areas

- providing a constant output voltage, isolated from input voltage
- regulation in a forward converter
- regulated voltage inversion
- sinusoidal line current draw

Core/material requirements

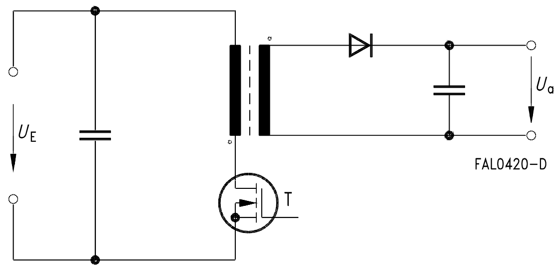
- Standard requirements regarding losses and saturation

S+M recommendations for core shape/material

- E/ETD/U cores made of material N27,
  RM cores made of material N41 (specially suitable for nonlinear chokes)

5.2.2 Single-ended flyback converter

Typical circuit diagram (Fig. 13)



Advantages

- simple circuit variant (low cost)
- low component requirement
- only one inductive component
- low leakage losses
- several easily regulatable output voltages

Disadvantages

- close coupling of primary and secondary sides
- high eddy current losses in the air gap area
- large transformer core with air gap restricts possible applications
- average radio interference
- exacting requirements on the components

Application areas

- low and medium powers up to max. 200 W with wide output voltage range
- maximum operating frequency approx. 100 kHz

Core/material requirements

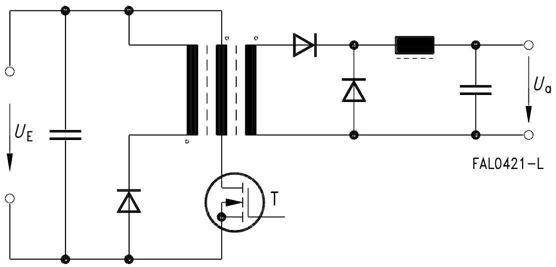
- low power losses at high temperature
- very high saturation with low dependence on temperature
- gapped cores (recently also with A_L value guarantee)

S+M recommendations for core shape/material

- E/U cores in
  N27 (standard)
  N62 (low losses, high saturation)

5.2.3 Single-ended forward converter

Typical circuit diagram (Fig. 14)



Advantages

- higher power range than flyback converter
- lower demands on circuit components
- high efficiency

Disadvantages

- 2 inductive components
- large choke
- demagnetization winding
- high radio interference suppression complexity
- increased component requirement, particularly with several regulated output voltages

Application areas

- medium and high powers (up to 500 W) especially in the area of low output voltages
- PWM (pulse width) modulation up to approx. 500 kHz

Core/material requirements

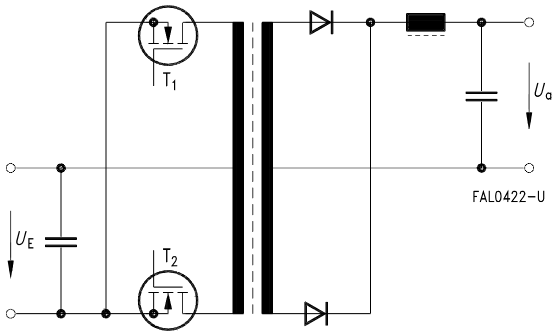
- low losses at high temperatures and at high frequencies (low eddy-current losses)
- generally, ungapped cores

S+M recommendations for core shape/material

- E/ETD, small EFD cores, RM/PM cores made of
  N27, N41 (up to 100 kHz)
  N62, N67, N72 (up to 300 kHz)
  N87 (up to 500 kHz)
  N49, N59 (500 kHz to 1 MHz)

5.2.4 Push-pull converter

Typical circuit diagram (Fig. 15)



Advantages

- powers up to the kW range
- small choke
- high efficiency
- low radio interference suppression complexity

Disadvantages

- 2 inductive components
- complex winding
- high component requirement, particularly with several regulated output voltages

Application areas

- high powers (>>100 W), also at high output voltages
- PWM (pulse width) modulation up to 500 kHz

Core/material requirements

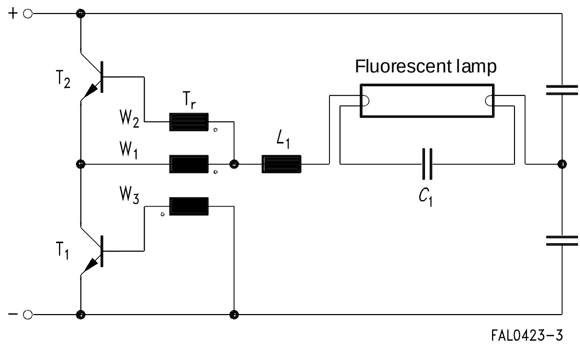
- low losses at high temperatures
- low eddy-current losses since application areas is up to 500 kHz and above
- generally, ungapped cores

S+M recommendations for core shape/material

- large E/ETD, RM/PM cores made of
  N27, N67, N87 (with large core cross sections ($A_e \geq 250\ mm^2$), on account of eddy-current losses N87 must be used even where $f < 100$ kHz)

5.2.5 Electronic lamp ballast device

Typical circuit diagram (Fig. 16)



Advantages

- considerably reduced size compared to 50 Hz line solution
- significantly higher efficiency than line voltage regulator

Disadvantages

- high component requirement

Application areas

- control unit for fluorescent lamps

Core/material requirements

- low losses in the range 50 - 80°C
- pulse power requirements
- gapped and ungapped E cores
- ring cores with defined pulse characteristic

S+M recommendations for core shape/material

- E/ETD/EFD cores made of N62, N72 for L_1
  Ring cores made of N61 for T_r

5.3 Selection of switch-mode power supply transformer cores

The previous section (Correlation: Applications - Core shape/Material) provides a guide for the rough selection of core type and material.

The following procedure should be followed when selecting the actual core size and material:

1) Definition of requirements

– range of power capacities P_{trans}
– specification of the SMPS type
– specification of pulse frequency and maximum temperature rise
– specification of the maximum volume

2) Selection of „possible“ core types/materials on the basis of the „Power capacity“ tables starting on page 134

These tables associate core type/material combinations (and the volume V) with the power capacity of the different converter types at a „typical“ frequency f_{typ} and a „cut-off frequency“ f_{cutoff}.

The typical frequency specified here is a frequency for which specific applications are known, or which serves as the base frequency for the power loss guarantee values.

The cut-off frequency is selected such that the advantages of other materials predominate above this frequency and that it is therefore advisable to switch to a different material which is better optimized for this range.

As a rule, the application-specific operating conditions are found neither at the „typical“ frequency nor at the cut-off frequency. The intermediate values for P_{trans} can be estimated approximately using the following formula.

$$P_{trans} \sim \sqrt{f} \cdot \Delta B$$

3) Final selection of core shape/material

The core shapes/materials selected as possibilities under 2) must now be compared with the relevant data sheets for the specific core types and the material data (typical curves), taking the following points into consideration:

– volume
– accessories (power coil former)
– A_L values of ungapped cores
– A_L values/air gap specifications
– temperature minimum for losses, Curie temperature T_C, saturation magnetization B_S, magnetic bias characteristic, amplitude permeability characteristic

Core shape/material combinations which are not contained in the individual data sheets can be requested from S + M Components.

5.4 Selection tables: Power capacities

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
Core shape	Mate-rial	V Volume mm^3	f_{typ} kHz	f_{cutoff} kHz	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W
RM cores										
RM4	N41	1120	25	100	3	4	1	1	1	1
	N67		100	300	11	19	7	8	6	7
	N87		100	500	16	24	8	9	7	8
	N49		500	1000	15	21	10	15	9	13
	N59		750	1500	30	44	22	31	18	27
RM5	N41	1740	25	100	6	7	2	2	2	2
	N67		100	300	18	31	12	13	10	11
	N87		100	500	25	41	14	15	12	13
	N49		500	1000	23	33	16	23	14	20
	N59		750	1500	47	67	33	48	29	41
RM6	N41	2970	25	100	9	14	5	5	4	4
	N67		100	300	30	53	21	28	18	24
	N87		100	500	42	85	29	33	25	29
	N49		500	1000	39	56	28	40	24	34
	N59		750	1500	80	115	57	81	49	70
RM7	N41	4360	25	100	13	21	7	8	6	7
	N67		100	300	42	74	30	42	25	36
	N87		100	500	58	123	41	49	35	42
	N49		500	1000	54	77	38	55	33	47
	N59		750	1500	110	158	78	112	67	96
RM8	N41	13100	25	100	19	33	12	13	10	11
	N67		100	300	61	108	43	67	37	58
	N87		100	500	85	195	60	81	52	70
	N49		500	1000	79	113	56	80	48	69
	N59		750	1500	162	232	115	165	99	141
RM10	N41	23600	25	100	34	64	22	26	19	22
	N67		100	300	107	190	76	128	65	110
	N87		100	500	150	347	106	162	91	139
	N49		500	1000	139	199	98	141	85	121
	N59		750	1500	284	408	202	290	173	249
RM12	N41	36400	25	100	49	102	35	45	30	39
	N67		100	300	81	144	58	102	50	88
	N87		100	500	220	508	156	282	134	243
	N49		500	1000	203	292	144	207	124	178
	N59		750	1500	417	598	296	425	254	365

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
Core shape	Mate-rial	V Volume mm^3	f_{typ} kHz	f_{cutoff} kHz	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W
RM 14	N41 N67 N87 N49 N59	37400	25 100 100 500 750	100 300 500 1000 1500	77 244 340 315 646	158 433 788 453 928	54 173 242 224 459	71 307 443 321 659	47 149 208 192 394	61 264 380 276 566
PM cores										
PM50	N27 N87	152000	25 100	100 500	177 787	364 1822	126 559	186 1147	108 480	160 986
PM62	N27 N87	268000	25 100	100 500	309 1374	637 3183	219 976	393 2260	188 838	338 1942
PM74	N27 N87	417000	25 100	100 500	502 2234	1035 5173	356 1586	685 3673	306 1363	589 3156
PM87	N27	633000	25	100	678	1398	481	950	414	816
PM114	N27	975000	25	100	1309	2698	929	1916	798	1646
EC cores										
EC35	N27	47400	25	100	76	126	44	48	38	41
EC41	N27	105000	25	100	114	213	75	84	64	72
EC52	N27	153000	25	100	195	382	134	151	115	130
EC70	N27	332000	25	100	424	873	301	365	258	314
E cores										
E20/6	N27 N67 N62 N87	8230	25 100 25 100	100 300 150 500	15 48 29 68	23 86 35 27	8 34 12 46	9 47 13 19	7 30 10 40	7 40 11 17
E25	N27 N67 N62 N87	16500	25 100 25 100	100 300 150 500	25 79 50 110	45 140 71 254	16 56 25 78	18 90 26 112	14 48 21 67	15 78 22 96
E30	N27 N67 N62 N87	13800	25 100 25 100	100 300 150 500	40 128 79 179	60 227 91 369	21 91 32 124	22 123 33 144	18 78 27 107	19 105 28 124
E32	N27 N67 N62 N87	31100	25 100 25 100	100 300 150 500	63 200 127 279	118 355 189 647	41 142 65 198	47 236 69 297	35 122 56 170	40 203 60 255

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
Core shape	Material	V Volume mm^3	f_{typ} kHz	f_{cutoff} kHz	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W
E40	N27 N67 N62 N87	42800	25 100 25 100	100 300 150 500	93 297 189 415	191 528 339 962	66 211 114 295	85 375 126 527	57 181 98 253	73 322 109 453
E42/15	N27 N67 N62 N87	40300	25 100 25 100	100 300 150 500	103 328 209 212	212 582 428 386	73 233 140 132	108 413 164 147	63 200 120 113	93 355 141 126
E42/20	N27 N67 N62 N87	73400	25 100 25 100	100 300 150 500	143 455 289 635	294 807 596 1470	101 323 195 451	151 573 229 917	87 277 167 387	130 492 196 787
E47	N27 N67 N62 N87	36000	25 100 25 100	100 300 150 500	178 568 362 793	367 1008 690 1837	127 403 230 563	174 716 260 1069	109 347 198 484	149 615 224 919
E55/21	N27 N67 N62 N87	70000	25 100 25 100	100 300 150 500	291 927 590 1294	599 1644 1363 2996	206 658 419 919	351 1167 545 2051	177 565 360 789	301 1003 468 1762
E55/25	N27 N67 N62 N87	83500	25 100 25 100	100 300 150 500	386 1229 782 1716	795 2180 1746 3973	274 872 550 1218	446 1548 687 2650	235 750 473 1046	383 1330 590 2277
E65/27	N27 N67 N62 N87	107300	25 100 25 100	100 300 150 500	642 2046 1302 2856	1323 3629 3009 6614	456 1453 924 2028	774 2577 1204 4528	392 1248 794 1742	665 2214 1034 3890
ER cores										
ER42	N27 N67 N87	83500	25 100 100	100 300 500	154 489 683	314 868 1582	109 347 485	138 617 856	94 298 417	118 530 736
ER49	N27 N67 N87	122000	25 100 100	100 300 500	228 726 1014	469 1288 2347	162 515 720	213 914 1318	139 443 618	183 786 1132
ER54	N27 N67 N87	109000	25 100 100	100 300 500	238 380 1060	491 673 2454	169 269 752	225 478 1392	145 232 646	193 411 1196

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
Core shape	Mate-rial	V Volume mm^3	f_{typ} kHz	f_{cutoff} kHz	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W
ETD cores										
ETD29	N59	32100	750	1500	428	614	304	436	261	375
	N49		500	1000	209	300	148	213	127	183
	N62		25	150	103	151	52	55	45	47
	N27		25	100	51	94	33	38	28	32
	N67		100	300	161	286	115	189	98	163
	N87		100	500	225	522	160	237	137	204
ETD34	N59	60200	750	1500	676	970	480	689	412	592
	N49		500	1000	330	473	234	336	201	289
	N62		25	150	162	244	84	89	72	77
	N27		25	100	80	151	53	61	45	52
	N67		100	300	255	452	181	303	155	260
	N87		100	500	356	824	253	383	217	329
ETD39	N59	82100	750	1500	1016	1458	721	1035	620	889
	N49		500	1000	495	711	352	505	302	434
	N62		25	150	244	409	139	152	120	130
	N27		25	100	120	241	84	102	72	88
	N67		100	300	383	680	272	478	234	410
	N87		100	500	535	1239	380	639	326	549
ETD44	N62	109000	25	150	405	703	238	261	205	225
	N27		25	100	200	406	141	176	121	151
	N67		100	300	636	1129	452	801	388	688
	N87		100	500	889	2058	631	1097	542	942
ETD49	N62	139000	25	150	629	1081	367	401	315	344
	N27		25	100	310	629	218	270	188	232
	N67		100	300	989	1754	702	1241	603	1066
	N87		100	500	1380	3197	980	1686	842	1448
ETD54	N62	293000	25	150	943	1700	573	635	492	545
	N27		25	100	411	845	292	376	251	323
	N67		100	300	1482	2629	1052	1871	904	1607
	N87		100	500	2069	4791	1469	2644	1262	2271
ETD59	N62	412000	25	150	1576	2807	948	1046	814	899
	N27		25	100	777	1595	552	703	474	604
	N67		100	300	2478	4395	1759	3127	1511	2687
	N87		100	500	3459	8010	2456	4370	2110	3754

					Power capacities					
					Push-pull converter		Single-ended converter		Flyback converter	
Core shape	Mate-rial	V Volume mm^3	f_{typ} kHz	f_{cutoff} kHz	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W	P_{trans} (f_{typ}) W	P_{trans} (f_{cutoff}) W
EFD cores										
EFD10	N59	1300	750	1500	22	32	16	23	14	20
	N49		500	1000	8	12	6	8	5	7
	N87		100	500	12	15	5	5	4	5
EFD15	N59	2688	750	1500	52	75	37	53	32	46
	N49		500	1000	25	36	18	26	15	22
	N87		100	500	27	40	14	15	12	13
EFD20	N59	5350	750	1500	132	190	94	135	81	116
	N49		500	1000	64	92	46	66	39	56
	N67		100	300	50	88	35	46	30	40
	N87		100	500	70	139	47	55	40	47
EFD25	N59	8450	750	1500	223	319	158	227	136	195
	N49		500	1000	125	179	88	127	76	109
	N67		100	300	96	171	68	104	59	90
	N87		100	500	134	301	96	127	82	109
EFD30	N59	11625	750	1500	234	335	166	238	142	205
	N49		500	1000	159	228	113	162	97	139
	N67		100	300	123	218	87	141	75	121
	N87		100	500	205	482	148	214	127	184
U cores										
U11	N27	1400	25	100	10	12	4	5	4	4
U15	N27	4500	25	100	20	28	10	10	9	9
U17	N27	6800	25	100	25	35	12	13	11	11
U20	N27	10000	25	100	40	67	23	26	20	22
U21	N27	11800	25	100	44	80	28	32	24	27
U25	N27	26000	25	100	106	202	71	81	61	70
U26	N27	29300	25	100	140	279	97	117	84	100
U30	N27	77300	25	100	568	1055	370	420	318	361
U93/20	N27	518000	25	100	1081	2228	767	1174	659	1009
U93/30	N27	518000	25	100	2445	5040	1736	2711	1492	2330

The material-specific values on which the table calculations (for the „power capacities") are based should be taken from the following table. The overtemperature ΔT here is the sum of the temperature rises resulting from core and winding losses.

	ΔT_{max} K	f_{typ} kHz	f_{cutoff} kHz
N59	30	750	1500
N49	20	500	1000
N62	40	25	150
N27	30	25	100
N67	40	100	300
N87	50	100	500
N72	40	25	150
N41	30	25	100
N61	30	25	150

The following conditions were also applied:

– The application area for flyback converters was restricted to $f < 150$ kHz.

– The power specifications for N49/N59 should be read as applicable to DC/DC (quasi) resonance converters (single-ended forward operation).

– The maximum flux densities were defined as follows:
For flyback converters: $\Delta B \leq 200$ mT ($\Delta B \leq 50$ mT for materials N49, N59)
For push-pull converters: $\Delta B \leq 400$ mT

The typical value specified in the tables for the power capacity at a „typical" f_{typ} and a cut-off frequency f_{cutoff} are based on the assumption that the temperature rise and the losses in core and winding are evenly distributed. Generally, the following relationship with the thermal resistance R_{th} applies, and is listed specifically for core types below.

$$P_{V,tot} = \frac{\Delta T}{R_{th}}$$

5.4.1 Thermal resistance for the main power transformer core shapes:

Core shapes	R_{th} (K/W)	Core type	R_{th} (K/W)	Core type	R_{th} (K/W)
E 20/6	50	ETD 29	28	PM 50/39	15
E 25	40	ETD 34	20	PM 62/49	12
E 30/7	23	ETD 39	16	PM 74/59	9,5
E 32	22	ETD 44	11	PM 87/70	8
E 40	20	ETD 49	8	PM 114/93	6
E 42/15	19	ETD 54	6	U 11	46
E 42/20	15	ETD 59	4	U 15	35
E 47	13	ER 42	12	U17	30
E 55/21	11	ER 49	9	U 20	24
E 55/25	8	ER 54	11	U 21	22
E 65/27	6	RM 4	120	U 25	15
EC 35	18	RM 5	100	U 26	13
EC 41	15	RM 6	80	U 30	4
EC 52	11	RM 7	68	U 93/20	1,7
EC 70	7	RM 8	57	U 93/30	1,2
EFD 10	120	RM 10	40	UI 93	5
EFD 15	75	RM12	25	UU 93	4
EFD 20	45	RM14	18		
EFD 25	30				
EFD 30	25				

The thermal resistances specified should be regarded as typical values based on a measurement in which the influence of the winding was minimized as far as possible. Free convection of heat at room temperature without cooling facilities was employed. The thermal resistance of a particular coil design can only be determined by measurements on the transformer, e.g. through the temperature-rise curve with DC magnetization.

The power losses of the winding are calculated as follows:

$$P_{Cu} = \left(\quad \cdot \quad \right)^2 \cdot A_R$$

The core-type-specific ferrite losses can be calculated in two ways:

a) by transformation of the core-specific limit value with the general material curve families
Problem: Core influences are not taken into consideration → highly prone to errors

b) by using a Product Design Support System from S+M Components: In this case a calculation module is provided which can be used to transform the power losses specified in the Data Book to the relevant operating conditions. The program is currently available for ETD and EFD cores and runs on MS-DOS computers.

5.5 Calculation examples for magnetic components in switch-mode power supplies

The first part of this section summarizes the design fundamentals for an energy storage choke; in the second part, a concrete requirement is used to compare the calculation for a flyback converter with a forward converter.

5.5.1 Design fundamentals for energy storage chokes

The most important aspects for designing energy storage chokes are briefly explained, taking the most usual switch-mode power supply - step-down mode - as an example.

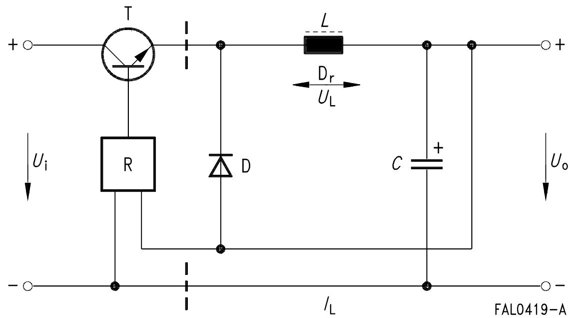
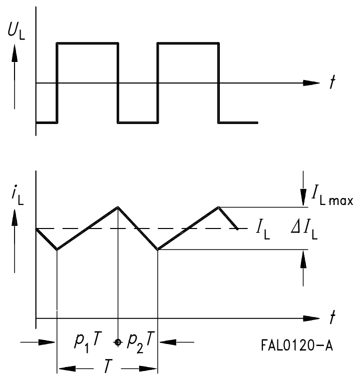


Fig. 17 Switch-mode power supply with energy storage choke (step-down mode)
--- Interface for incorporating a transformer

If the choke voltage U_L is a rectangular waveform, the choke current i_L will have a sawtooth waveform (Fig. 18)



p_1 = rise time/cycle T
p_2 = fall time/cycle T

Fig. 18 Voltage U_L and current i_L waveforms of energy storage chokes

Depending on the current ripple ΔI_L - for step-down SMPS generally below 0,3 I_L - the maximum choke current $I_{Lmax} = I_L + 0{,}5\ \Delta I_L$.

The maximum magnetic biasing capability $(I^2L)_{max}$ of the core is used with optimum design. The inductance - under worst conditions (at maximum operating temperature) - must not decrease by more than 5%. The inductance for the step-down SMPS is calculated as follows

$$L = \frac{(\qquad\qquad)U_0}{\Delta I_L \cdot \quad \cdot U_i}$$

with the given operating conditions U_i = input voltage, U_0 = output voltage, f = switching frequency. When the maximum magnetic biasing capability $(I^2L)_{max}$ of the core has been ascertained with the aid of $I_{L\ max}$ and L, core type, core size and air gap can be determined. With increasing air gap, the magnetic biasing capability rises, but also the associated copper loss I^2R and hence the heating of the choke. An optimum gapping is attained when the overtemperature ΔT just reaches the permissible value.

5.5.2 Calculation example: Theoretical comparison: forward converter - flyback converter

To demonstrate the different transformer concepts the design of a 600 W forward converter in a balanced half-bridge circuit is compared with a flyback converter. In this case, the data for the forward converter are taken as the basis for the flyback converter, but the air gap and winding are adapted.

As can be seen, when for example the air gap leakage losses are ignored for the sake of simplification, only about 500 W can be transferred using a flyback converter of the same basic design. Of course it should be pointed out that an SMPS with a 500 W power range will not generally be designed as a flyback converter because various other problems not mentioned here occur as a result of the simple component design.

– The comparison of the calculations is performed analogously in the following as far as possible.
– Consideration of the inductance, which is supplementary for the flyback converter, is necessary for the forward converter since an ungapped core is used.
– There is no need to consider the power in the case of the forward converter, transferrable power is 600 W.

a) Requirements

	Forward converter 600 W	**Flyback converter 520 W**
Output:	U_A = 30 V, I_A = 20 A	U_A = 27 V, I_A = 19 A
Input:	U_E = 220 Vac • (1 ± 20%)	U_E = 220 Vac • (1 ± 20%)
Operating freq.:	f =100 kHz	f = 100 kHz
Converter type:	single-ended forward converter in asymmetric bridge circuit	flyback converter
Transformer core:	ETD49/25/16 (B66367-G-X167)	ETD49/25/16 (B66367-A90-J67) (≈ 4 mm air gap)
Material:	N67	N67
Min. cross section:	A_{min} = 209 mm^2	A_{min} = 209 mm^2

A_L value:	A_L = 3800 nH +30/-20%	A_L = 90 nH ± 10%	(10% results from design)
Coil former:	B66368-A1020-T1	B66368-A1020-T1	
Mounting assembly:	B66368-A2000	B66368-A2000	

b) Calculation of the heat transfer resistance R_{th} and the maximum total power loss of the transformer P_{Vtot}

Specified: surface A ≈ 100 cm²

maximum permissible overtemperature: ΔT = 40 K

$$R_{th} = \left(\quad \right) \text{K/W} \sim 9,5\ \text{K/W}$$

Empirical equation (parameter to be inserted: only area)

$$P_{Vtot} = \frac{\Delta T}{R_{th}} = \frac{40\ \text{K}}{9,5\ \text{K/W}} = 4,2\ \text{W}$$

c) Calculation of input voltage

Specified: Line voltage U = 220 V with ΔU/U = ± 20% (f_{line} = 50 Hz)

Max. peak voltage U_{ESmax} = 220 V • $\sqrt{2}$ (1+20%) = 373 V

Min. peak voltage U_{ESmin} = 220 V • $\sqrt{2}$ (1-20%) = 249 V

Assumed: Efficiency η = 0,8

Power input P_E = 600 W/0,8 = 750 W

Selected value of input smoothing capacitor C_E = 1000 µF

This gives the minimum input voltage:

Forward converter

$$U_{Emin} = \sqrt{(U_{ESmin})^2 - \frac{P_E}{C_E \cdot f_{line}}}$$

$$= \sqrt{(\quad)^2 - \frac{750\text{W}}{1000\mu\text{F} \cdot 50\text{Hz}}} \approx 217\text{V}$$

Flyback converter

For the flyback converter, U_{Emin} must also be reduced by the voltage drop at the power rectifier and at the winding resistances under maximum load (steady state):

Empirical value ≈ 10 V

$U_{Emin(prim)}$ = 217 V - 10 V = 207 V

d) Calculation of the maximum permissible flux density deviation ΔB_{max}

Specified: Power loss in square-wave mode: $P_{V\Pi} = 0{,}8 \cdot P_{Vsin}$, $K_{Form} = 0{,}8$

Power loss in single-ended mode compared to push-pull mode:

$K_{hyst} = P_{Vsingle\text{-}end}/P_{Vpush\text{-}pull} = 0{,}33$

The output assumption means that:

$P_{Vtot} = P_{VFe} + P_{VCu}$ (P_{VFe} = core losses, P_{VCu} = winding losses)

and $P_{VFe} = 1/2\ P_{Vtot} = 2{,}1\ \text{W}$

The material-specific power loss (weight of the ETD49 set: $m_{Fe} = 2 \cdot 62$ g) can thus be calculated:

$$P_{Vmat} = \frac{P_{VFe}}{K_{Form} \cdot K_{hyst} \cdot m_{Fe}} = \frac{2{,}1\ \text{W}}{0{,}8 \cdot\ \cdots\ 62\ \text{g}} = 64\ \frac{\text{mW}}{\text{g}}$$

From the diagram for N67 $P_V = f(f)$ (see page 87), where T = 100°C and f = 100 kHz ΔB_{max} = 160 mT can be read off for parameter B.

e) Calculation of the number of primary turns

Forward converter

Pulse duty factor: $t_V = 0{,}4$
(because of demagnetization time)

Maximum turn-on time

$$t_{onmax} = T \cdot t_V = \frac{1}{f} \cdot t_V$$

$$= 4\ \mu\text{s}$$

Flyback converter

$t_V = 0{,}5$

$$t_{onmax} = 5\ \mu\text{s}$$

$$N_{prim} = \frac{U_{Emin} \cdot t_{onmax}}{\Delta B \cdot A_{min}}$$

$$N_{prim} = \frac{217 \cdot\ \cdots\ \cdot 10^{-6}}{160\ \text{mT} \cdot 209\ \text{mm}^2} \approx 26\ \text{Wdg}$$

$$N_{prim} = \frac{207 \cdot\ \cdots\ \cdot 10^{-6}}{160\ \text{mT} \cdot 209\ \text{mm}^2} \approx 31\ \text{Wdg}$$

f) Calculation of the DC resistance of the primary winding at 100°C

Specified: Half of winding cross-section A_N available for each of primary/secondary windings used (empirical value)
Copper space factor f_{Cu} = 0,25
Average length of turn l_N = 86 mm
Usable winding cross-section A_N = 269,4
Resistivity of copper ρ_{Cu} = 0,0172 Ωmm^2/m at room temperature (20°C)
Temperature increase at operating temperature ΔT = 80 K
Temperature coefficient of resistance of copper $\alpha_{Cu} = 4{,}3 \cdot 10^{-3}$/K

$$R_{prim(\quad)} = \frac{N_{prim}^2 \cdot \quad \cdot \rho_{Cu}}{0{,}5 \cdot \quad \cdot f_{Cu}} \cdot (\quad\quad)$$

$R_{prim(\quad)} = 39{,}9\ m\Omega$ $\quad$ $R_{prim(\quad)} = 56{,}8\ m\Omega$

g) Calculation of the numbers of secondary turns

Specified: Maximum output voltage U_A = 30 V
Voltage drop across rectifier diode (secondary) U_{Vsek} = 2 V
Voltage drop over switching transistors on primary side U_{Vprim} = 10 V

$$N_{sek} = \frac{U_A + U_{Vsek}}{U_{AEmin} - U_{Vprim}} \cdot \frac{1}{\eta_V} \qquad N_{sek} = \frac{(\quad) \cdot \quad \cdot N_{prim}}{U_{Emin,prim} \cdot \eta_V}$$

$N_{sek} = 10\ Wdg$ $\quad$ $N_{sek} = 4\ Wdg$

h) Calculation of the conductor cross-sections of primary/secondary winding

Specified: Winding area primary side $\Leftarrow\Rightarrow$ Winding area secondary side

$$A_{Cu,prim,sek} = \frac{0{,}5 \cdot \quad \cdot f_{Cu}}{N_{prim,sek}}$$

$$A_{Cu,prim} = \frac{0{,}5 \cdot \quad \cdot 0{,}25}{26} = 1{,}30\ mm^2 \qquad A_{Cu,prim} = \frac{0{,}5 \cdot \quad \cdot 0{,}25}{31} = 1{,}08\ mm^2$$

$$A_{Cu,sek} = \frac{0{,}5 \cdot \quad \cdot 0{,}25}{10} = 3{,}37\ mm^2 \qquad A_{Cu,sek} = \frac{0{,}5 \cdot \quad \cdot 0{,}25}{4} = 8{,}40\ mm^2$$

i) Calculation of the primary currents

Trapezoidal current waveform in primary winding is approximated by a rectangular current waveform. The magnetization current Δi_{mag} is taken into consideration.

$$L_{prim} = N_{prim}^2 \cdot A_L$$

$$= 26^2 \cdot 380\ \text{nH} = 2{,}57\ \text{mH}$$

$$\Delta i_{mag} = \frac{U_{Emin} \cdot t_{onmax}}{L_{prim}}$$

$$= \frac{216{,}8\ \text{V} \cdot 4\ \mu\text{s}}{2{,}57\ \text{mH}} = 0{,}337\ \text{A}$$

$$I_{prim,\,max} = I_A \cdot \frac{N_{sek}}{N_{prim}} + \frac{1}{2}\Delta i_{mag}$$

$$I_{prim,\,max} = 20\ \text{A} \cdot \frac{10}{26} + \frac{1}{2} 0{,}337\ \text{A} = 7{,}86\ \text{A}$$

$$I_{prim,\,eff} = 7{,}86 \cdot \sqrt{0{,}4} = 4{,}97\ \text{A}$$

Triangular current waveform in primary winding

Assumed:

$P_{VCU} = P_{VCUprim} + P_{VCUsek}$

$P_{VCUprim} = P_{VCUsek}$

$\Rightarrow P_{VCU}(\text{prim}) = 0{,}5\ (2{,}1\ \text{W}) = 1{,}05\ \text{W}$

$$I_{prim,\,rms} = \sqrt{\frac{P_{VCU\,prim}}{R_{prim(\qquad)}}}$$

$$= \sqrt{\frac{1{,}05\ \text{W}}{56{,}8 \cdot 10^{-3}\,\Omega}} = 4{,}3\ \text{A}$$

$$I_{prim,\,max} = \frac{I_{prim,\,rms}}{\sqrt{\frac{t_{onmax}}{3\,T}}}$$

$$= \frac{4{,}3\ \text{A}}{\sqrt{\frac{5 \cdot 10^{-6}\,\text{s}}{3 \cdot \quad \cdot 10^{-6}\,\text{s}}}}$$

$$I_{prim,\,max} = 10{,}5\ \text{A}$$

j) Power consideration for the flyback converter

Calculation of the maximum primary inductance

$$L_{prim,\,max} = \frac{\Delta B_{max} \cdot \qquad \cdot A_{min}}{I_{prim,\,max}}$$

$$L_{prim,\,max} = \frac{160\ mT \cdot \qquad \cdot 209\ mm^2}{10,5\ A} = 98,7\ \mu H$$

Calculation of the maximum A_L value:

$$A_{Lmax} = \frac{98,7\ \mu H}{31^2} \approx 103\ nH$$

$\frac{\Delta A_L}{A_L} = 10\ \%$ maximum permissible A_L value variation (empirical value)

$$A_L = A_{Lmax} - (\qquad _{Lmax})$$

$$= [\qquad]\,nH = 92,7\ nH \approx 90\ nH$$

$$A_L = 90\ nH \pm 10\ \%$$

Power stored in transformer:

$$P_{Trafo,\,max} = \frac{I^2_{prim,\,max} \cdot \qquad \cdot f}{2}$$

$$= \frac{(\qquad)^2 \cdot \quad \cdot \qquad \cdot \quad \cdot 10^3 Hz}{2} = 544\ W$$

Calculation of the maximum output power (secondary):

$$\eta = \frac{P_{Trafo,\,max} - P_{V,\,Trafo} - P_{V,\,diode}}{P_{Trafo,\,max}} \qquad \text{(efficiency)}$$

$$P_{V,\,diode} = 1{,}0\ \text{V} \cdot 33{,}3\ \text{A} \qquad \text{(power loss of secondary-side) diode}$$

$$= 33{,}3\ \text{W}$$

$$\eta = \frac{544\ \text{W} - 4{,}2\ \text{W} - 33{,}3\ \text{W}}{544\ \text{W}} \approx 0{,}93$$

$$P_{sek,\,max} = P_{Trafo,\,max} \cdot \eta = 506\ \text{W}$$

1 Processing notes for the manufacture of wound products for small-signal and power applications

1.1 Winding design

For the most common core types the maximum number of turns for the individual coil formers can be seen from the following nomograms. Common wires and litz wires are specified in the pertinent standards (DIN 46 447 part 1, DIN 46 435 part 2 and DIN 46 436 part 2).

As can be seen from Fig. 19, as high a winding level as possible should be employed because at low μ_e values in particular a low winding level (*h*/*H* ratio) can cause an A_L drop of up to 10% compared to the maximum value with full winding. (By IEC definition, the A_L values are always related to fully wound 100-turn coils.)

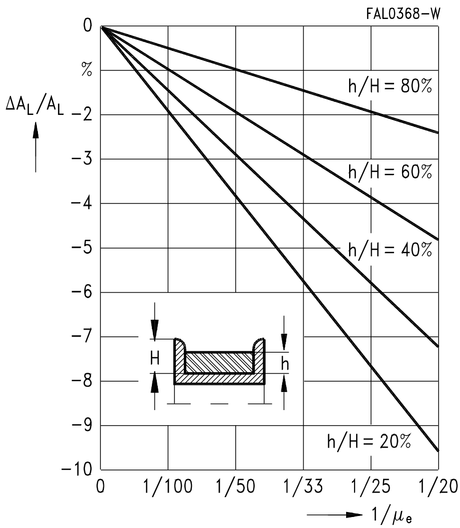
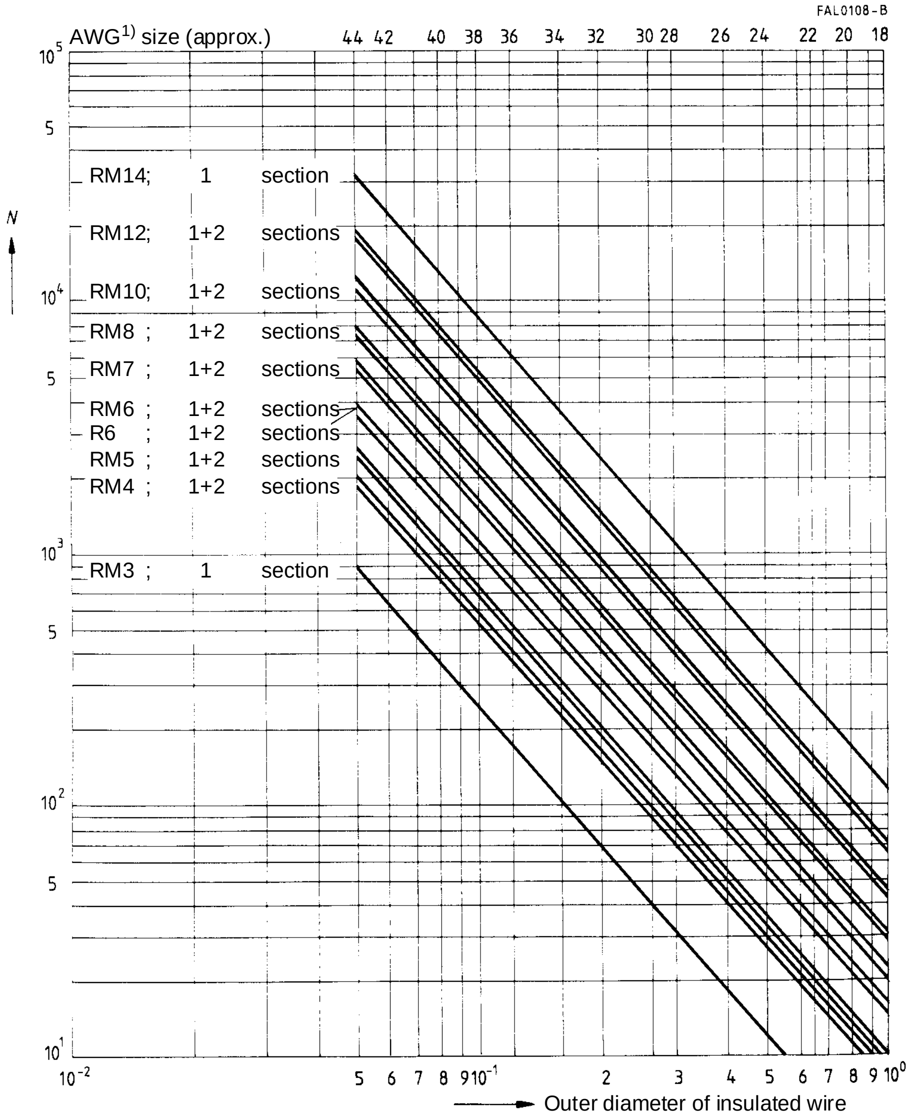


Fig. 19
Percentage change in A_L value versus relative winding height *h/H*

RM cores

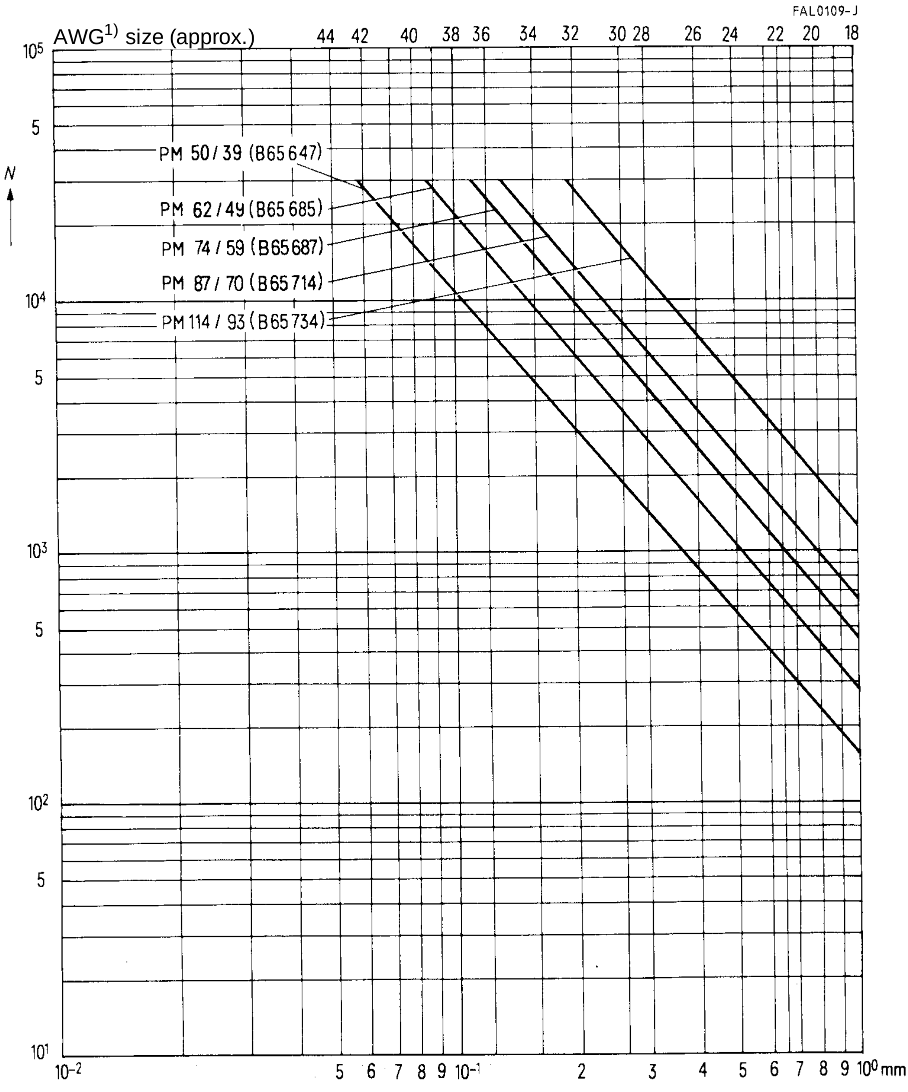
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

PM cores

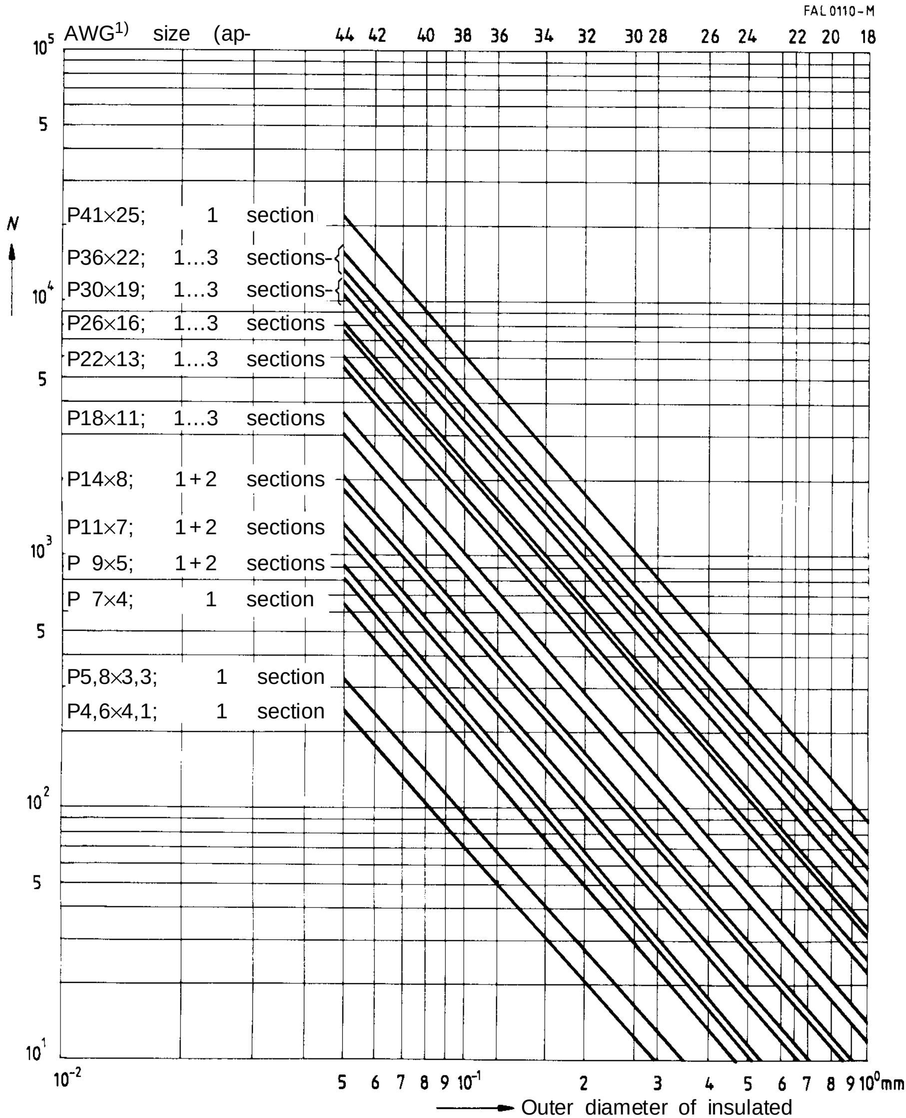
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

P cores

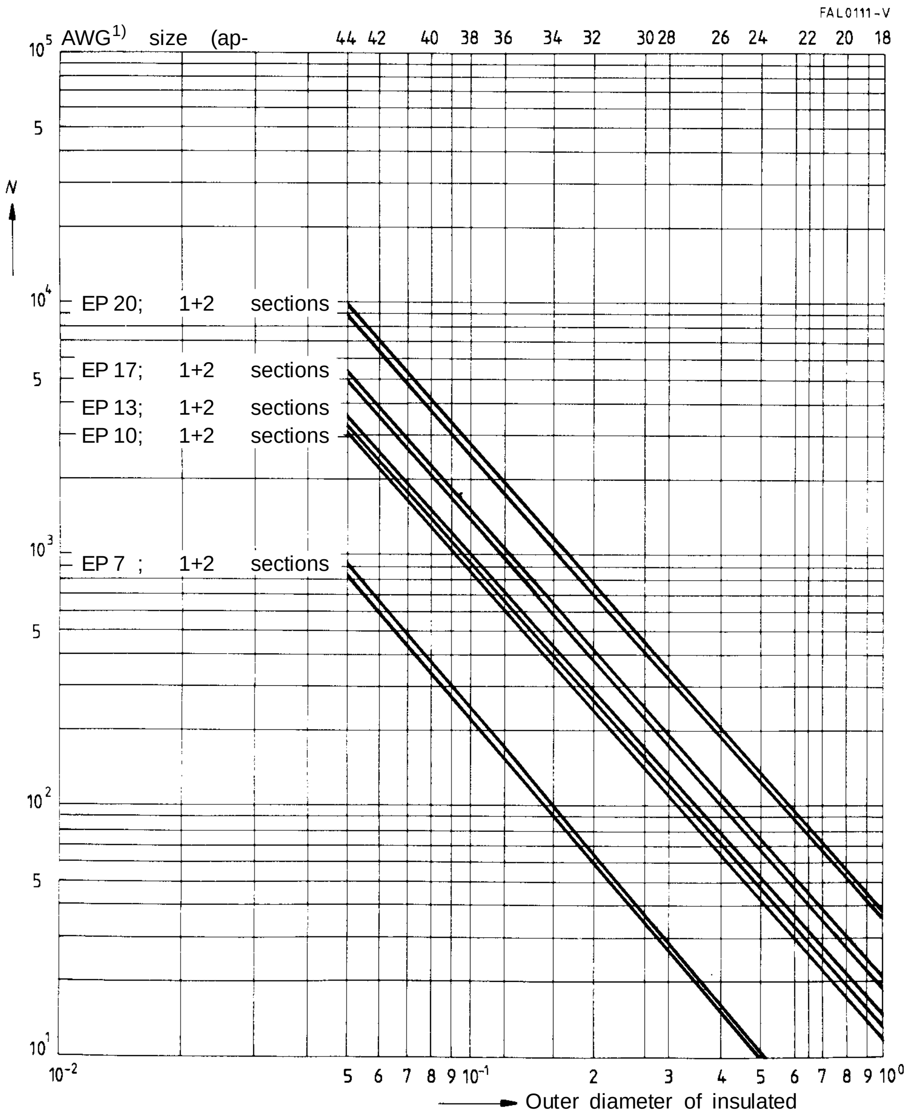
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

EP cores

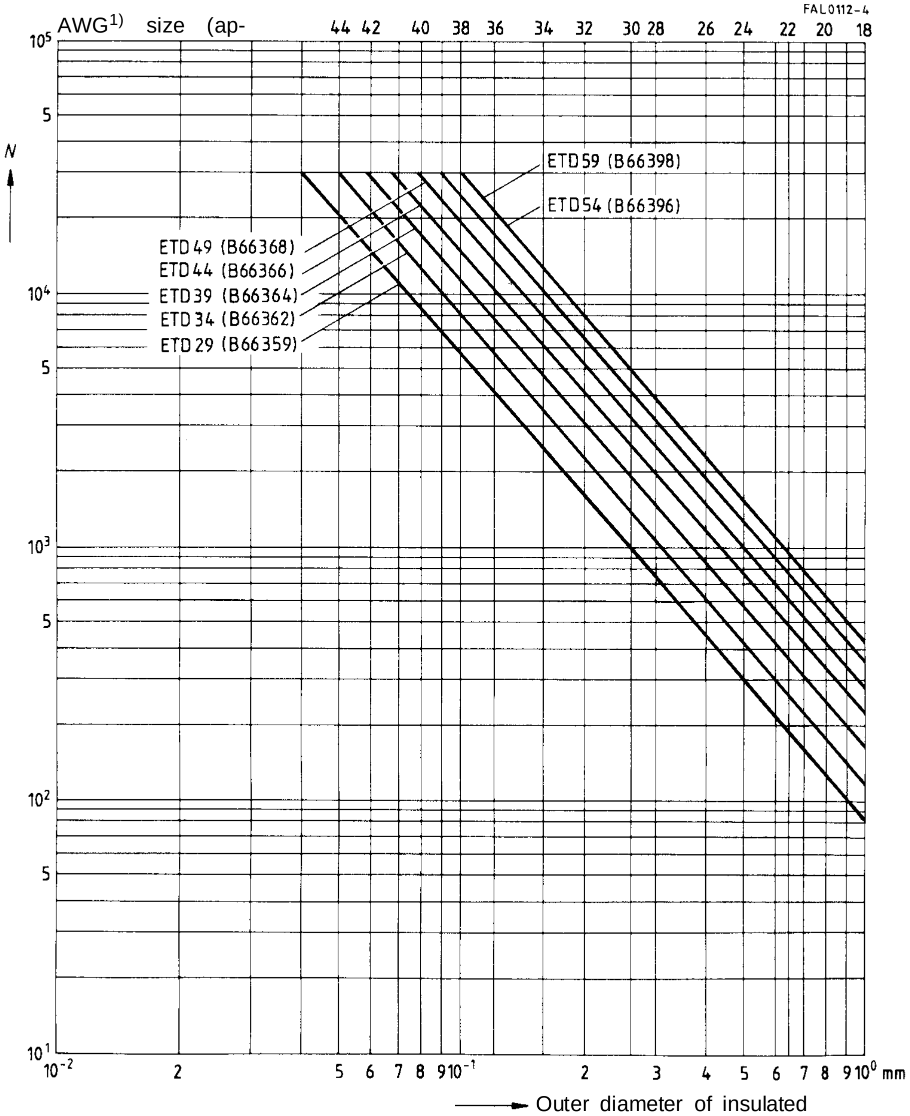
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

ETD cores

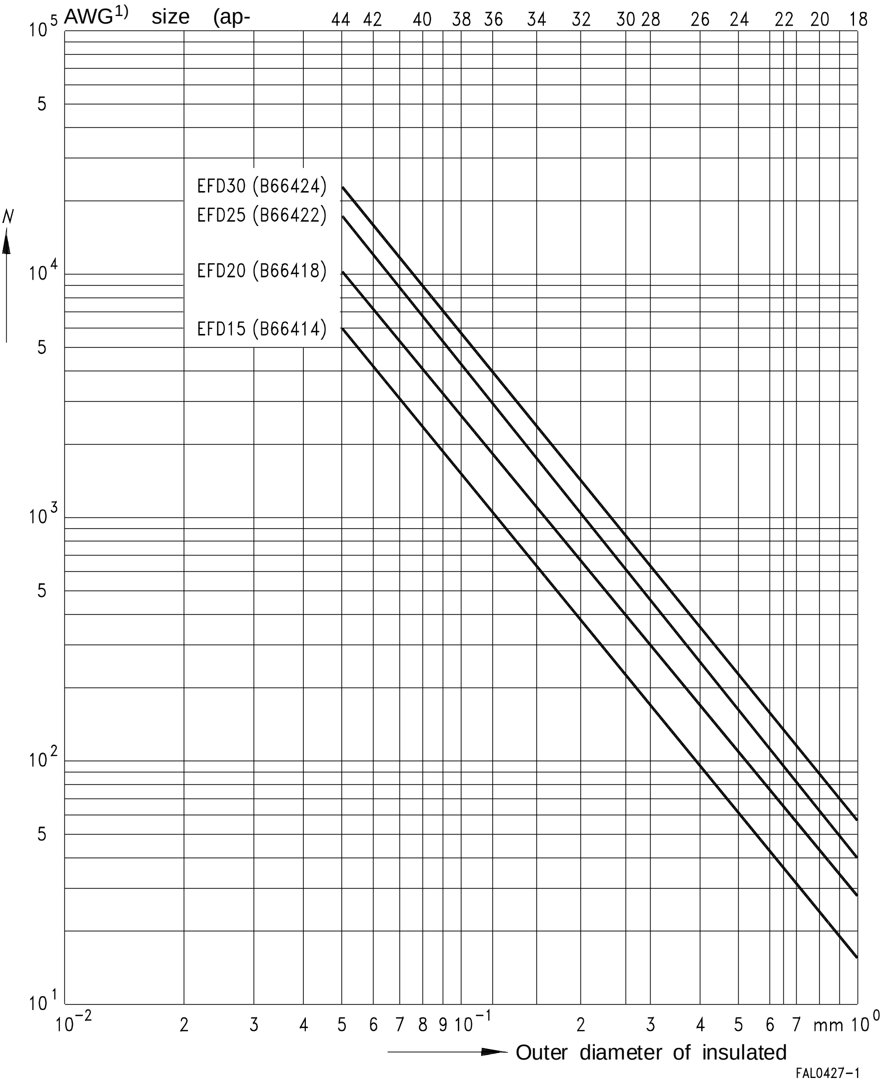
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

EFD cores

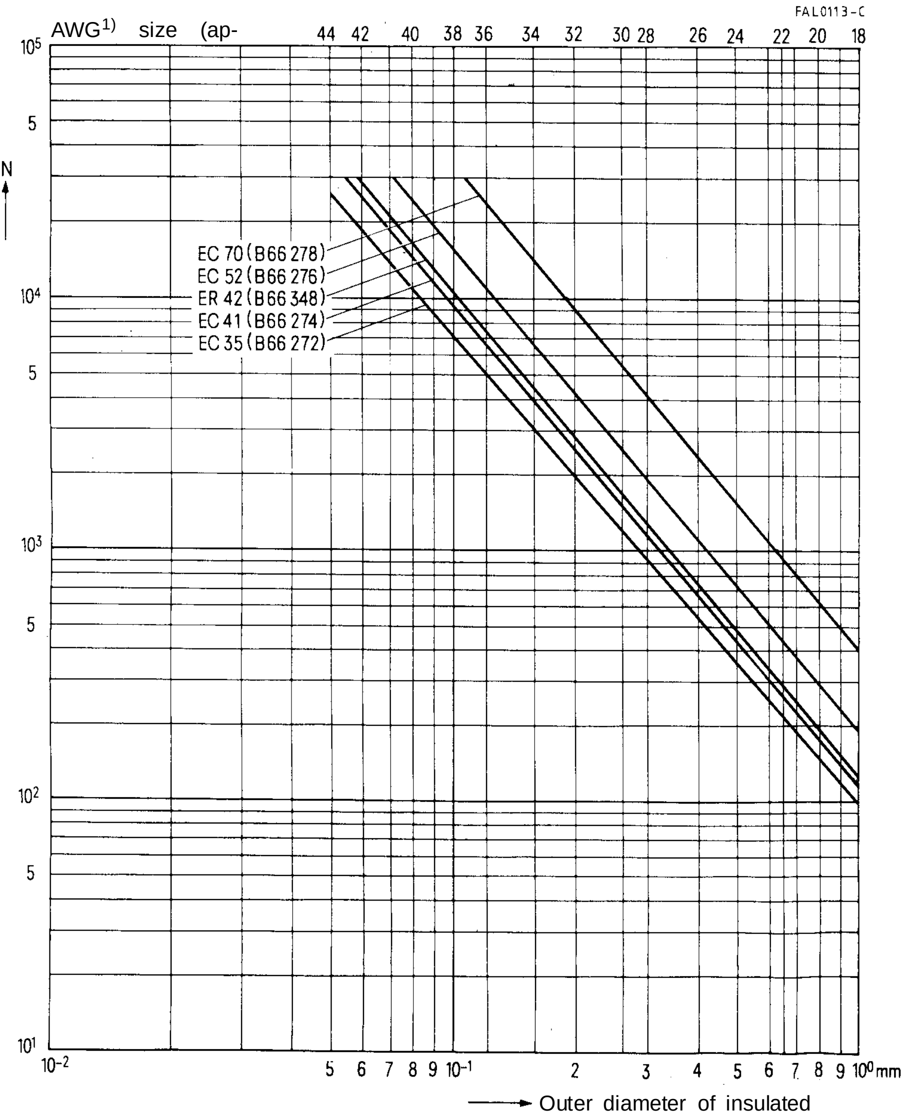
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

EC and ER cores

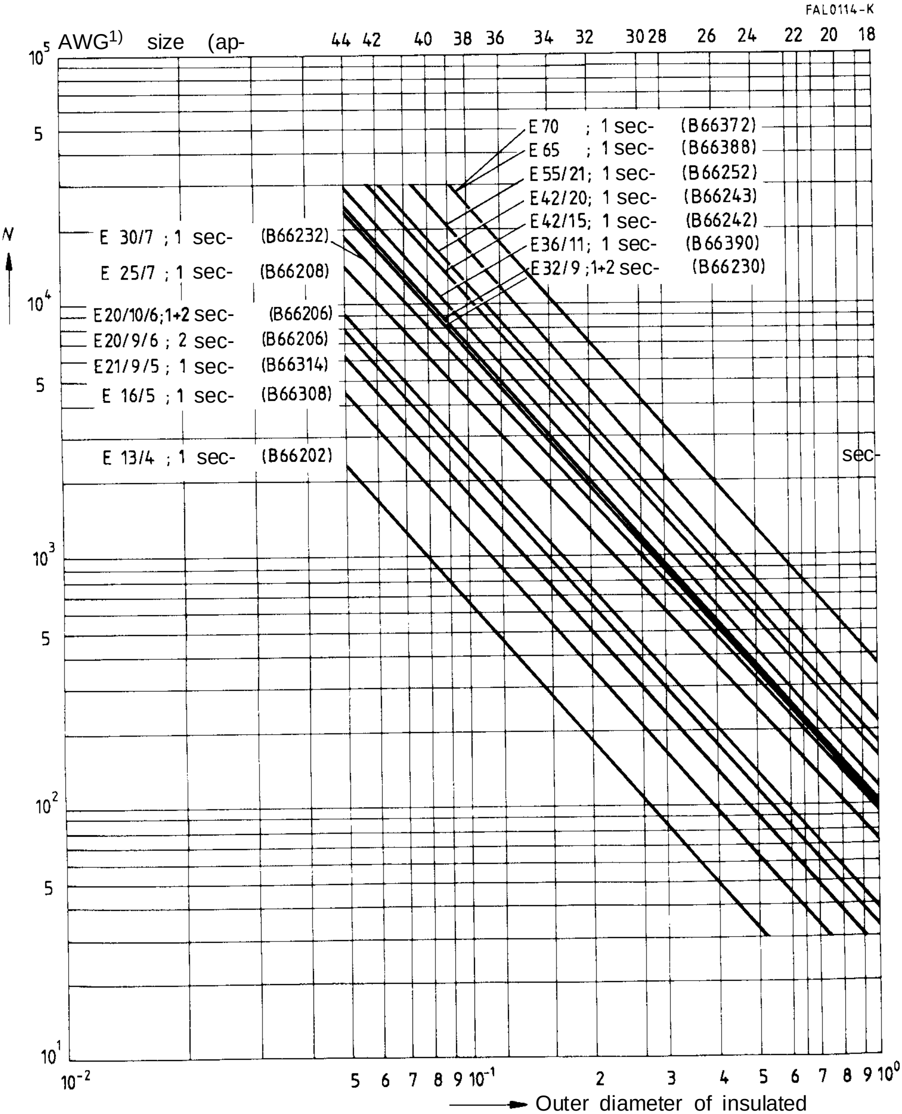
Maximum number of turns N for coil formers



1) American Wire Gauge (AWG)

E cores

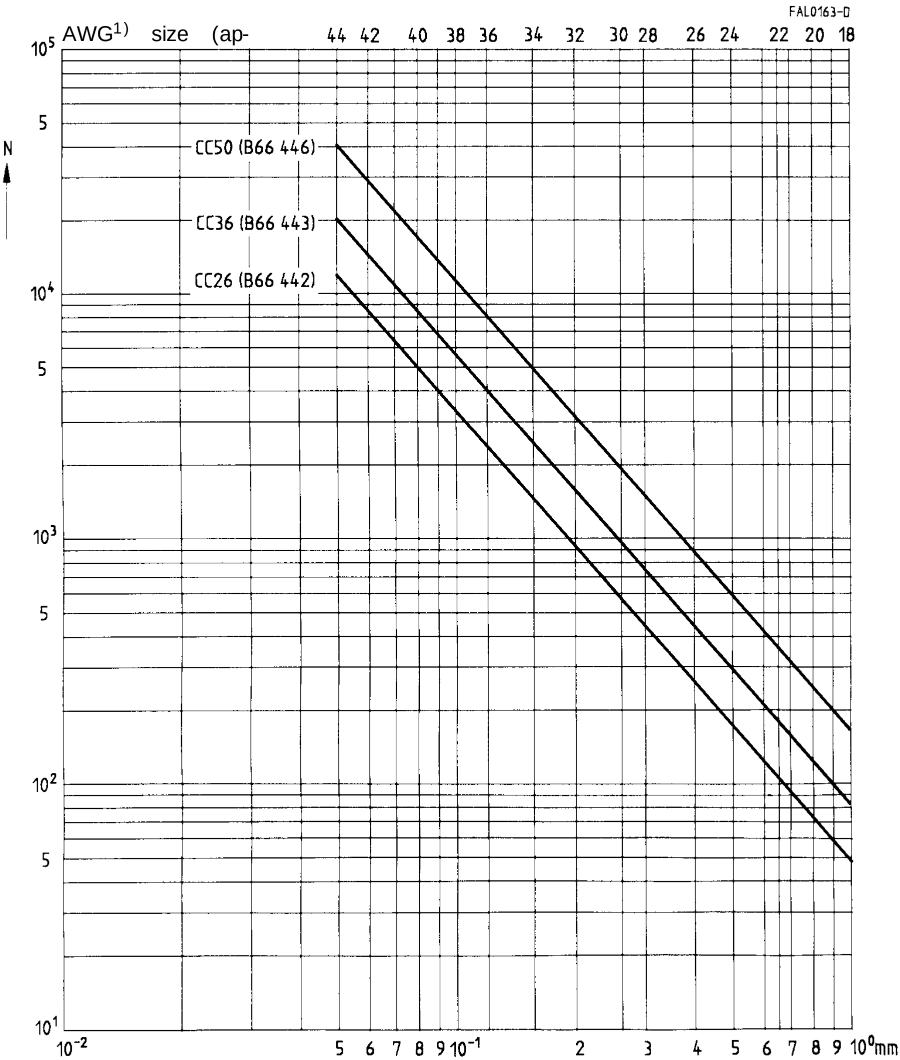
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

CC cores

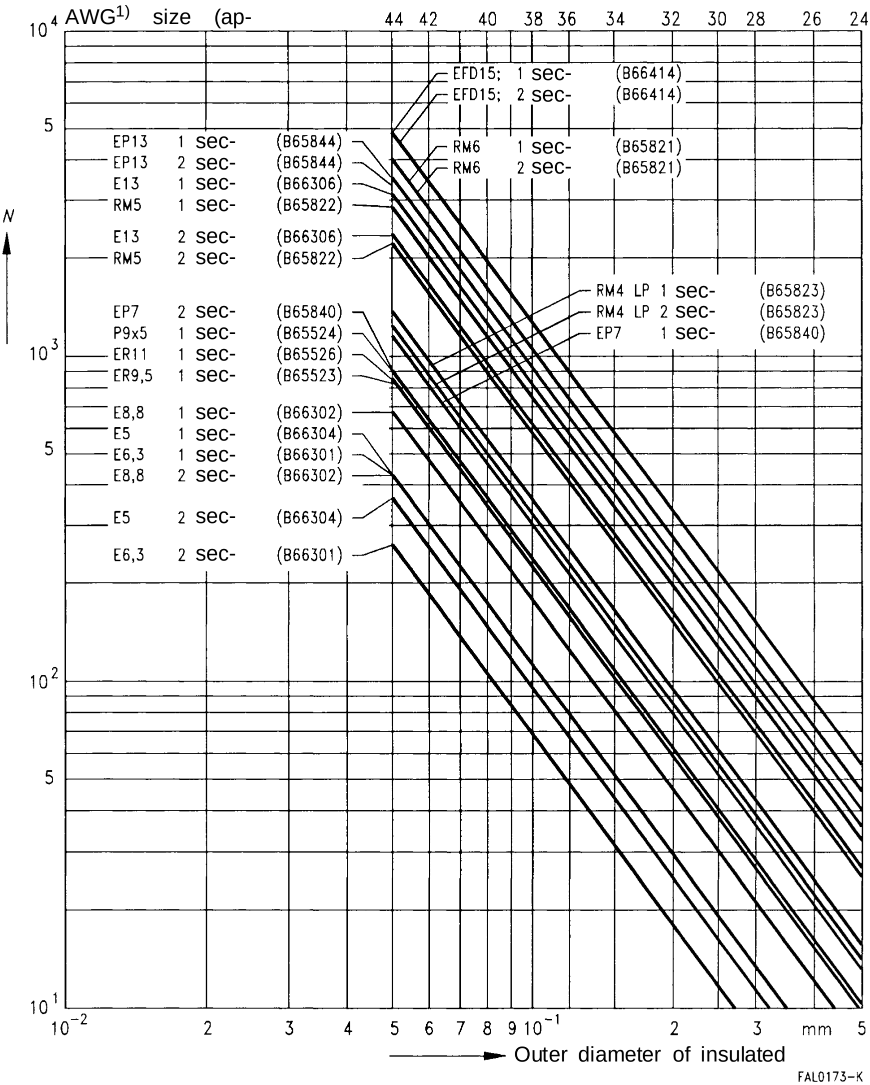
Maximum number of turns *N* for coil formers



1) American Wire Gauge (AWG)

SMD types

Maximum number of turns *N* for coil formers

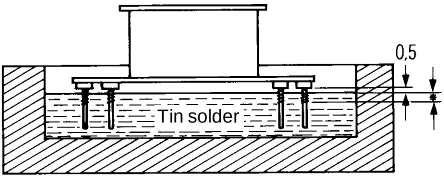


1) American Wire Gauge (AWG)

1.2 Soldering/Inductor assembly

The winding wires are preferably connected to the pins by dip soldering. Note the following when soldering:

– Prior to every dip soldering process the oxide film must be removed from the surface of the solder bath.
– 2 to 3 turns of the wire are dipped into the solder bath; the coil former must not be allowed to come too close to the solder or remain there for too long (see diagram).
– The following are typical values:
  Bath temperature: 400°C, soldering time: 1 s



FAL0115-T

For inductor assembly, it is advisable to clamp the cores with the associated relevant mounting assemblies for the coil formers and cores. In this way it is possible to avoid the effects of external mechanical stress.

1.3 Gluing

The mating surfaces must be free of dust, grease and fibers. From the numerous adhesives available, epoxy resins with appropriate hardeners have proved particularly suitable. The following adhesives can be recommended:

a) for cores:
100 g Araldite AY 103
16 g hardener HY 956
Pot life 1 hour max.
Curing 3 hours at 60°C
Thermal stability of the glued joint 60°C
(for a short period 90°C)

b) for cores:
100 g Araldite AY 103
7 g hardener HY 992
Pot life approx. 8 hours
Curing 3 hours at 100°C
Thermal stability of the glued joint 90°C
(for a short period 120°C)

c) for cores:
100 g Araldite AY 103
40 g hardener HY 991
Pot life 1 hour
Curing 60 minutes at 80°C
Thermal stability of the glued joint 80°C

d) for cores:
100 g Araldite AY 105
50 g hardener HY 991
Pot life approx. 1 hour
Curing 45 minutes at 80°C
Thermal stability of the glued joint 100°C

e) for coil formers:
100 g adhesive A
200 cm^3 filler Aerosil 200
Curing same as a)

f) for external gluing:
Single-component adhesive AV 118
Open pot life
Curing 10 minutes 180°C,
20 minutes 160°C,
45 minutes 140°C
Thermal stability of the glued joint 120°C

(manufacturer of adhesives a) – f): Ciba Geigy)

1.4 Adhesive application and core mating

A quantity of adhesive appropriate to the area in question is applied to the cleaned surface of the core's side walls. The centerpost must remain free of adhesive. The two core halves without coil former are then placed on a mandrel and rotated against each other two or three times to spread the adhesive. A slight ring of adhesive exuding around the edges indicates that sufficient adhesive has been applied.

On porous, low-permeability SIFERRIT materials (U and K) the adhesive should be applied and spread twice.

The next step should follow immediately since the adhesive film easily attracts dust and absorbs moisture. Therefore, the core pair with adhesive already applied is opened for a short time and the wound coil is inserted without touching the mating surfaces.

The wound coil is then fixed into position. This can be done by using resilient spacers which must be inserted before applying the adhesive. Appropriate spacers are available on request.

The coil former can also be fixed by gluing, e.g. using adhesive e), but only at one spot on the core bottom to avoid any mechanical stress caused by the difference in thermal expansion of core and coil former.

Adhesive f) is suitable for external gluing, which implies only four dots of adhesive at the joints on both sides of the openings. Because of the somewhat lower torsional strength, it should be noted that this kind of gluing should only be used with mounted cores.

1.5 Holding jigs

The core assembly is cured under pressure in a centering jig. The core center hole - where present - is used for centering, and two to eight coils can be held in one jig with a pressure spring. Spacers will ensure that the pressure is only exerted on the side walls of the core.

Single jigs facilitate the coil inductance measurement, which has proved useful for checking cores with small air gaps before the adhesive has hardened. Small inductance corrections can be made by slightly turning the core halves relative to each other.

1.6 Final adjustment

(possible only with adjustable cores)
With all assembled ferrite cores, a magnetic activation takes place as a result of mounting influences such as clamping, gluing and soldering, i.e. a disaccommodation process commences. Therefore the final adjustment for high-precision inductors should take place no earlier than one day after assembly; preferably, one week should first elapse.

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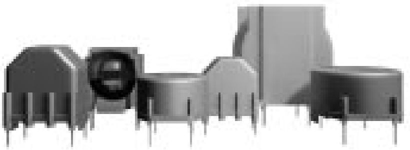
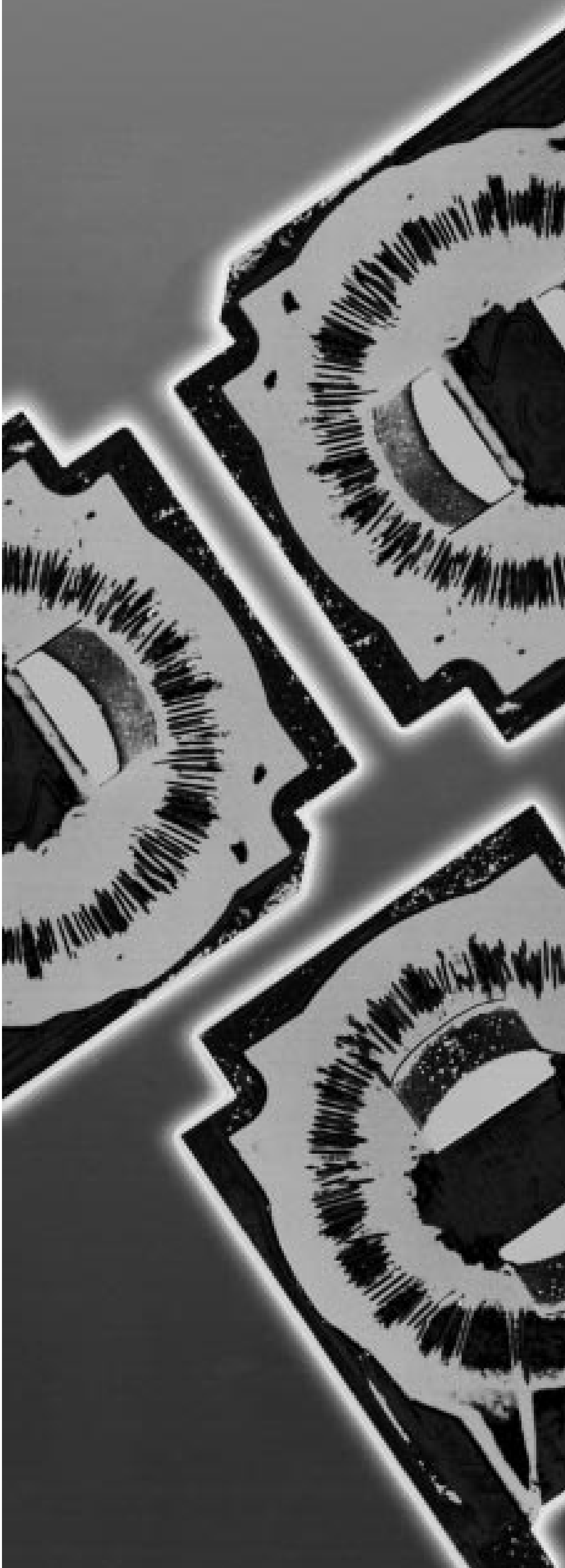
Chokes to your choice

You urgently need particular ring core chokes? That’s no problem, we have 200,000 pieces in stock and deliver reliably through SCS. Our automated production guarantees



the best of reliability too. It turns out chokes in different versions: flat and upright, with current rated from 0.4 to 16 A. UL and VDE approved, and complying with the latest EMC standards of course.

SCS – dependable, fast and competent



Survey of packing modes

Ferrites

	Type	Packing	Para.	Page
RM cores	RM 3 to RM 10 RM 12, RM 14	Blister tapes Standard trays	3.2 2.2.1	168 166
PM cores	PM50/39 to PM114/93	Standard trays	2.2.1	166
P cores	all P cores P 9 × 5 to P 22 × 13	Standard trays Blister tapes on request	2.2.1 3.2	166 168
Core halves	5,6 × 3,7 to 70 × 14,5	Standard trays	2.2.1	166
EP cores Q cores	EP 7 to EP 20 Q 10, Q 15	Standard trays Blister tapes on request Standard trays	2.2.1 3.2 2.2.1	166 168 166
E cores	E 6,3 and E 8,8 Core length 12,6 ... 36 mm Core length > 36 mm	Bags Block packs Standard trays	2.3.1 2.2.2 2.2.1	167 166 166
EC cores ER cores ETD cores EFD cores		Standard trays	2.2.1	166
CC cores Disks		Standard trays Block packs	2.2.1 2.2.2	166 166
U and I cores	U15, U17, U25, U26, U43 others	Block packs Standard trays	2.2.2 2.2.1	166 166
Ring cores	Packing depends on size and version (coated/uncoated)	Standard trays Boxes	2.2.1 2.3.2	166 167
Double-aperture cores Shielding beads Cylindrical/tubular cores Rods for RF welding equipment Threaded cores		Bags Bags Bags and standard trays Standard trays Bags	2.3.1 2.3.1 2.3.1/ 2.2.1 2.2.1 2.3.1	167 167 167/ 166 166 167

Accessories

Coil formers with pins	Polystyrene boards Stick magazines (for automatic processing)	2.2.3 3.3	166 171
Coil formers without pins	Boxes Bags	2.3.2 2.3.1	167 167
Mounting assemblies	Boxes Bags	2.3.2 2.3.1	167 167
Clamps	Bags (individual clamps) Reels (for automatic processing)	2.3.1 3.4	167 172
Insulating washers	Bags (individual washers) Reels (for automatic processing)	2.3.1 3.5/3.6	167 173/174
Adjusting screws	Boxes Magazines (for automatic processing)	2.3.2 3.7	167 175

0 General information

Our product packaging modes ensure maximum protection against damage during transportation. Moreover, our packing materials are selected with environmental considerations in mind. They are marked with the appropriate recycling symbols.

Because of the large variety of types and sizes, we use five basic kinds of packing, which are described in points 2 and 3 below:

- blister tape
- tray
- container
- reel
- magazine

The packing units are based on the following system:

1.1 Packing unit (PU)

A packing unit is a collection of a number of basic packages. The size of the packing unit is stated for the particular components in their data sheets. When ordering, please state complete packing units if possible. We reserve the right to round the ordered quantity accordingly.

1.2 Dispatch unit

A number of packing units are combined to form a dispatch unit. Standard dispatch units for large quantities are a Europallet or pallet carton. For small quantities, folding corrugated cardboard boxes are used in standard sizes. In the case of small quantities a dispatch unit may also include packages with other components.

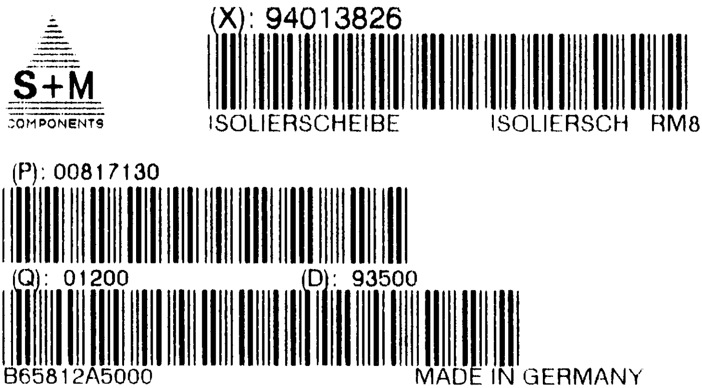
1.3 Bar-code standard label

On the product packing label (standard label) we include bar-code information in addition to plain text. In addition to benefits relating to the internal flow of goods, this provides above all a more rapid and error-free means of identification checking for the customer.

The bar code used is Code 39 (medium density). Two different versions of the label are available.

a) Example of a label with vendor code number (L), quantity (Q) and date code (D) in bar code

b) Example of a label with customer code number (P), quantity (Q) and date code (D) in bar code



In this case the vendor code number is imprinted at bottom left in plain text.

0 Modes of packing

2.1 Blister tape

Blister packing was specially devised for handling by automatic systems but has also proved to be very good for conventional handling, especially where small quantities are concerned. See point 3.2 for a detailed description and a list of the core types that can be supplied in this type of packing.

2.2 Tray (pallet)

2.2.1 Individual tray

The polystyrene tray (basic package) is the standard packing for most types of core. The area of 200 mm × 300 mm corresponds to the module dimensions of DIN 55 510 and is based on the area of the 800 mm × 1200 mm Europallet. Depending on the overall height of the trays and the numbers contained, several trays will be stacked to form a packing unit and provided with a corrugated cardboard cover. For the protection of the cores the entire stack is also shrink-wrapped in polyethylene film.

Each core is enclosed in a separate compartment. When P cores and similar types are packed in sets, the halves of the core pairs are packed so that their pole faces are opposite one another. As a rule their association is identified by markings in the polystyrene (recessed webs, thinner webs). In the case of P3,3 ×2,6 and P4,6 ×4,1 cores the halves of a set are not located in a single tray but in different trays of a packing unit.

2.2.2 Block packing

For E and U core and disks we prefer block packing in trays with the dimensions 200 mm × 300 mm. The symmetry, position, length and spacing of the blocks are always the same. The height of the tray is dependent on the size of the core. For the makeup of a packing unit see point 2.2.1.

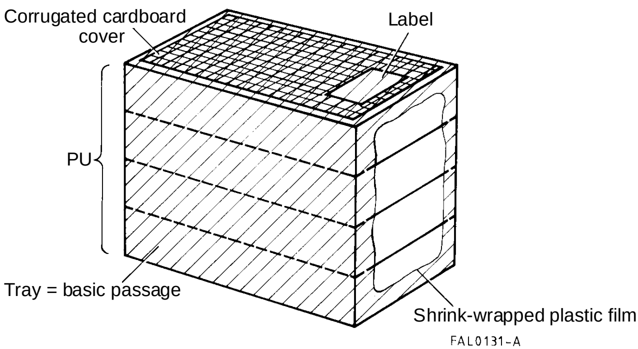
Block packing can be supplied in boxes of corrugated cardboard (special packing unit!) on request.

Block packing permits highly rationalized handling and is designed for automatic processing. For interested customers we have proposals available for different kinds of extraction.

2.2.3 Board for coil formers with pins

For coil formers with pins, a polystyrene board is generally used. The coil formers are inserted in the board with the pins downwards. A number of stacked boards (packing unit) are enclosed in a jacket of cardboard, or packed in a folding box, and in some cases are shrink-wrapped in plastic.

Packing unit for individual or block packing



2.3 Container

2.3.1 Bag

Small ferrite parts are packed in flat polyethylene bags. The number per bag depends on the volume of the parts. Generally four bags in a corrugated cardboard box form a packing unit.

Small accessories (clamps, mounting assemblies, and also pinless and SMD coil formers) are also packed in this way. The size of the bag depends on the volume of the parts (packing unit).

2.3.2 Box

Coated ring cores of medium size are packed in cardboard boxes with cardboard or polyethylene foam inlays. Box dimensions: 190 mm × 145 mm × 90 mm. The number per box depends on the volume of the cores.

Accessories (large mounting assemblies, coil formers etc.) are packed in boxes of cardboard or corrugated cardboard.

0 Delivery modes for automatic processing

3.1 General information on inductor production

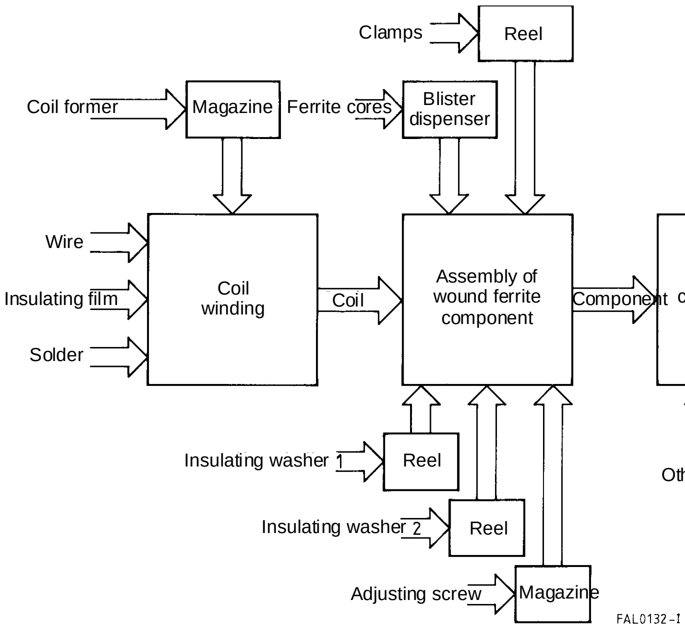
The inductor parts described in the following can be handled by automatic manufacturing systems. In addition to automatic winding machines - which can be combined with wrapping, fluxing and soldering stations - flexible, high-performance automatic assembly lines are available. Design and packing of the individual parts (ferrite cores, coil formers, clamps, insulating washers and adjusting screws) have been optimized for automatic processing and permit easy feeding to the various stations of production lines.

Our coil formers for RM4 to RM10 cores are packed in magazines to ensure safe transportation; the magazines can be used not only for transportation of the wound coil formers to the next production station but also as space-saving final packing.

We supply RM cores up to RM10 (P and EP cores on request) blister-taped in dispenser boxes, coil formers in reusable stick magazines, clamps and insulating washers (2 versions) on reels, and adjusting screws already positioned in magazines. By inserting a plate-shaped resilient insulating washer between core and coil former, gluing can be dispensed with.

We also provide consulting services with examples of implementations to customers planning to introduce automatic production lines.

Production sequence



3.2 Cores in blister tape

The cores are packed in sets ready for assembly, i.e. a stamped core with the base upwards and an unstamped core (possibly with a threaded sleeve) with the pole face upwards. The blister tapes have a hole at one end for orientation purposes (see also illustration). The tapes are sealed with a paper cover. Looking at a tape with the hole on the left and the stamped paper cover on top, then after removing the paper cover the stamped cores will be in the upper row and the unstamped cores of the sets in the lower row.

Several blister tapes are combined in a box with a perforated tear-off cover (dispenser pack) to form a packing unit. The tapes are packed so that the orientation hole appears in the dispenser opening. The box is shrink-wrapped in polyethylene film.

Packing

The following table lists the core types which are available in blister tape:

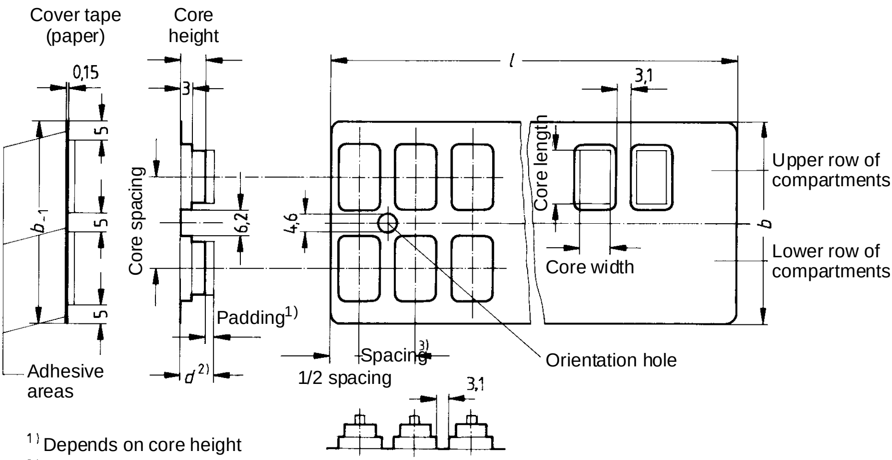
Type	Dimensions of blister tape *l* × *b* × *d* mm	Spac-ing mm	Spacing upper/ lower row mm	Dimensions of dispenser pack *l* × *b* × *h* mm	Sets/ tape	Tapes/ box	Sets/ box	Approx. net weight g
RM cores [1]								
RM 3 [2]	340 × 60 × 4,4	17,0	10,65	347 × 63 × 46	40	10	400	220
RM 4	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	30	500	1000
RM 4 LP	340 × 60 × 4,4	17,0	27,5	349 × 63 × 203	20	40	800	
RM 5	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	1550
RM 5 LP[3]	340 × 60 × 5,0	17,0	27,5	349 × 63 × 203	20	40	800	
RM 6	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	2550
RM 6 LP[3]	340 × 60 × 5,7	17,0	27,5	349 × 63 × 203	20	35	700	
R 6	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	2550
RM 7	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	1925
RM 7 LP[3]	295 × 82 × 5,9	29,5	38,5	301 × 85 × 240	10	40	400	
RM 8	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	2600
RM 8 LP[3]	295 × 82 × 7,9	29,5	38,5	301 × 85 × 240	10	30	300	
RM10	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	4600
RM10 LP[3]	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	
EP cores [4]								
EP 7	340 × 60 × 4,4	17,0	27,5	349 × 63 × 203	20	45	900	1260
EP 10	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	1375
EP 13	340 × 60 × 8,0	17,0	27,5	349 × 63 × 203	20	25	500	2550
EP 17	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	2220
EP 20	295 × 82 × 11,8	29,5	38,5	301 × 85 × 240	10	20	200	5640
P cores [4]								
P 9 × 5	340 × 60 × 4,0	17,0	27,5	349 × 63 × 203	20	50	1000	800
P 11 × 7	340 × 60 × 4,0	17,0	27,5	349 × 63 × 203	20	50	1000	1700
P 14 × 8	295 × 82 × 5,9	29,5	38,5	301 × 85 × 240	10	40	400	1280
P 18 × 11	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	1500
P 22 × 13	295 × 82 × 9,4	29,5	38,5	301 × 85 × 240	10	25	250	3250

For ordering codes refer to the individual data sheets.
Dimensions are nominal; tolerances given in design drawings.

1) Box without tear-off cover
2) Blister packing is standard
3) Blister packing for RM 5 LP to RM 10 LP in preparation
4) Polystyrene tray is standard (blister packing on request)

Packing

Blister tape



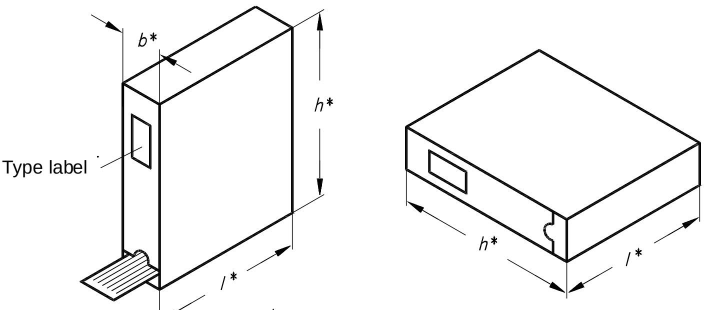
1) Depends on core height

2) Thickness incl. cover tape

3) For RM3: 2 sets per spacing

FAL0133-R

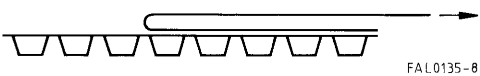
Dispenser pack



*External dimensions

FAL0134-Z

To open a blister tape manually, peel back the paper cover tape smoothly but not too quickly, along the axis of the tape as shown in the following illustration.



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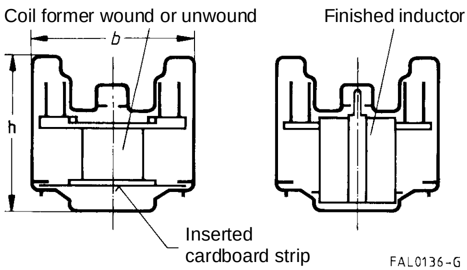
When opening a blister tape automatically, it is advisable not to completely remove the paper cover. Rather, the cover paper should be divided up by means of 4 longitudinal cuts so that the mating surfaces remain on the blister (cf. blister tape illustration). The paper strips produced above the two rows of compartments can then be easily lifted. This avoids malfunctions resulting from fluctuations in the adhesive properties of the paper sealing tape.

3.3 RM coil formers in stick magazines

RM coil formers can be supplied in transparent plastic stick magazines which are particularly suitable for feeding the coil formers to automatic winding machines. When the magazine is inclined at about 45°, the coil formers slide automatically for acceptance in the winding tool. After removal of the inserted cardboard strip (see illustration), the magazines can be reused as packing for the completely assembled inductor.

Type	Dimensions of magazine *b* h mm	Coil formers Pieces/ magazine	Finished parts Pieces/ magazine	Magazines/ box	Coil formers/ box	Sections	Ordering code [1] (individual coil formers in the stick magazine)
RM 4	15 × 17,2	75	40	21	1575	1 2	B65804-K****-D11 B65804-K****-D12
RM 5	18,8 × 19,4	60	30	18	1080	1 2	B65806-K****-D11 B65806-K****-D12
RM 6	22,8 × 22,2	50	25	15	750	1 2	B65808-K****-D11 B65808-K****-D12
RM 8	27,4 × 27,1	35	20	8	280	1 2	B65812-K****-D11 B65812-K****-D12
RM 10	32,1 × 30,1	30	17	8	240	1 2	B65814-K****-D11 B65814-K****-D12



Length of magazine 520 mm

1) Replace the asterisks by the code numbers given in the individual data sheets.

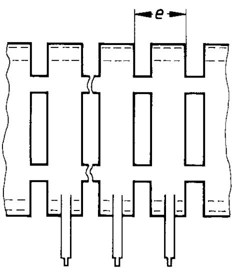
3.4 Clamps for RM cores on reels

Clamps can be supplied in strip form for automatic assembly. (Refer to the individual data sheets for description of the clamps.)

The strips are wound on cardboard reels and packed in boxes, with each box containing two reels as a pair; one reel with clamps having the grounding tags on the left side and one reel with clamps having the tags on the right side.

The assembly machine must be equipped with a cutting device for separating the individual clamps.

Type	Spacing *e* mm	Reel Dimension *b* approx. mm	PU = Minimum order quantity Pieces/reel pair	Ordering code for 1 pair of reels
RM 4	3,3	18	72 000	B65806-A2201
RM 5	3,3	18	72 000	B65806-A2201
RM 6	3,5	20	48 000	B65808-A2201
RM 8	5,7	23	30 000	B65812-A2201
RM 10	5,7	26	24 000	B65814-A2201



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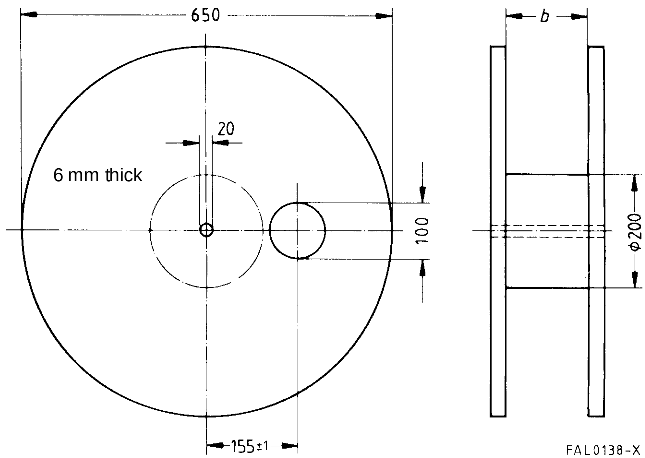


FAL0138-X

3.5 Insulating washers 1 on reels

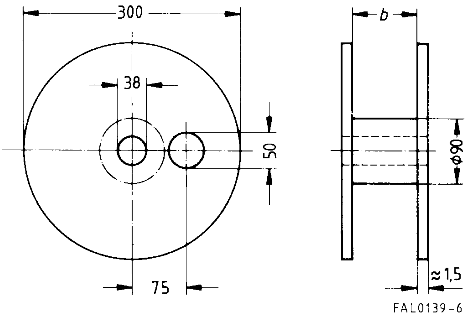
The insulating washers that are inserted between core and coil former are only available taped and reeled (with separation paper between the individual layers). For a description of the insulating washers refer to the individual data sheets.

RM cores

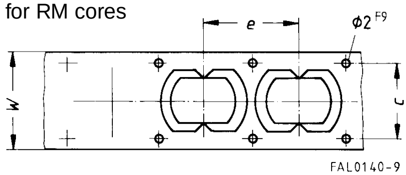
Type	Center-to-center spacing *e* mm	Spacing of sprocket holes *c* mm	Tape width *W* mm	Reel Dim. b approx. mm	PU = Minimum order quantity Pieces/reel	Ordering code (individual washers)
RM 4	13,2	13	18	26	3000	B65804-A5000
RM 5	16,5	13	18	26	2500	B65806-A5000
RM 6	19,7	15	20	26	2500	B65808-A5000
R 6	19,7	15	20	26	2500	B65808-A5000
RM 7	22,4	18	24	29	2000	B65820-A5000
RM 8	26	21	27	35	1200	B65812-A5000
RM 10	32	26	32	35	1200	B65814-B5000
RM 12	41	27	32	35	800	B65816-B5000
RM 14	46	30	35	39	800	B65888-B5000

P cores

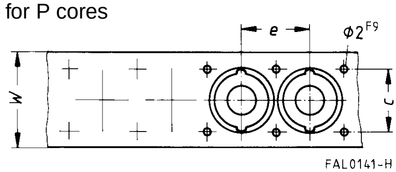
Type	Center-to-center spacing *e* mm	Spacing of sprocket holes *c* mm	Tape width *W* mm	Reel Dim. b approx. mm	PU = Minimum order quantity Pieces/reel	Ordering code (individual washers)
P 9 × 5	11	12	20	22	3500	B65522-A5000
P 11 × 7	13	12	20	22	3000	B65532-A5000
P 14 × 8	15,6	12	20	22	2500	B65542-A5000
P 18 × 11	19,5	18	27	29	2000	B65652-A5000
P 22 × 13	23,5	23,2	32	35	1400	B65662-A5000
P 26 × 16	27,5	23,2	40	42	1000	B65672-B5000
P 30 × 19	32	27	40	42	800	B65702-B5000
P 36 × 22	38	35	48	50	500	B65612-B5000



for RM cores



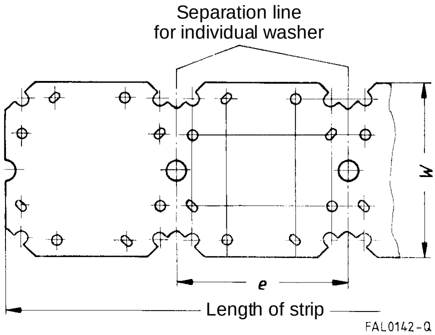
for P cores

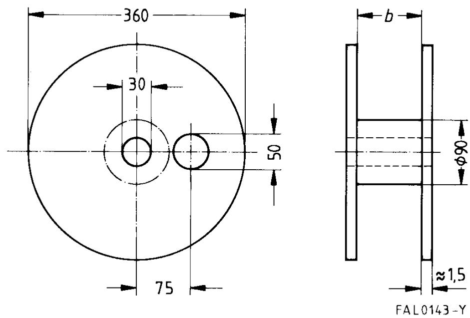


3.6 Insulating washers 2 on reels

For automatic assembly the insulating washers that are inserted between core and printed circuit board can be supplied in strip form (wound on cardboard reels). For a description of the insulating washers refer to the individual data sheets.

The assembly machine must be equipped with a cutting device for separating the individual insulating washers.





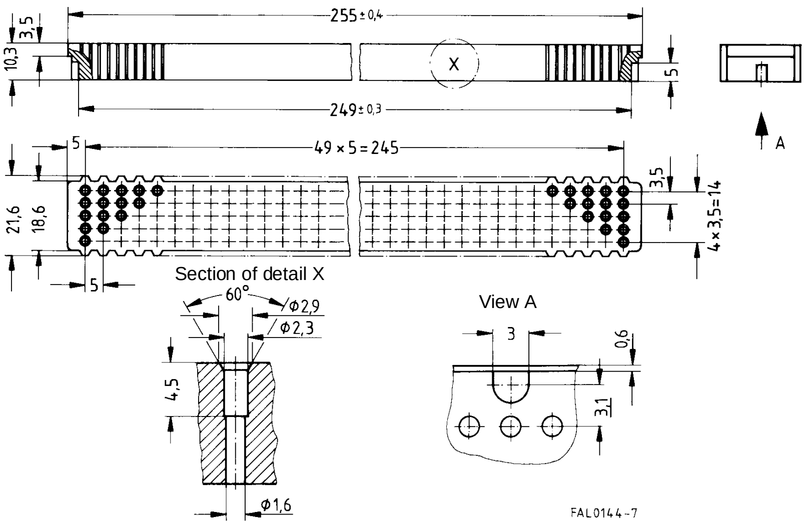
Type	Spacing *e* mm	Tape width *W* mm	Reel Dim. b approx. mm	PU = Minimum order quantity Pieces/reel	Ordering code for reel pack
RM 4	10,0	10,0	12	20 000	B65804-A2025
RM 5	12,5	12,5	15	20 000	B65806-A2025
RM 6	15,0	15,0	17	20 000	B65808-A2025
RM 8	20,0	20,0	22	12 000	B65812-A2025
RM 10	21,5	29,2	32	10 000	B65814-A2025

3.7 Adjusting screws in magazines

Core type	Pieces per magazine	Packing unit	Ordering code[1] (Individual screws in magazines)
RM 4	250	5 magazines ≙ 1250 pieces	B65539-M...
RM 5	250	5 magazines ≙ 1250 pieces	B65539-M... B65806-M...
RM 6	200	5 magazines ≙ 1000 pieces	B65659-M...
RM 8	100	4 magazines ≙ 400 pieces	B65812-M...

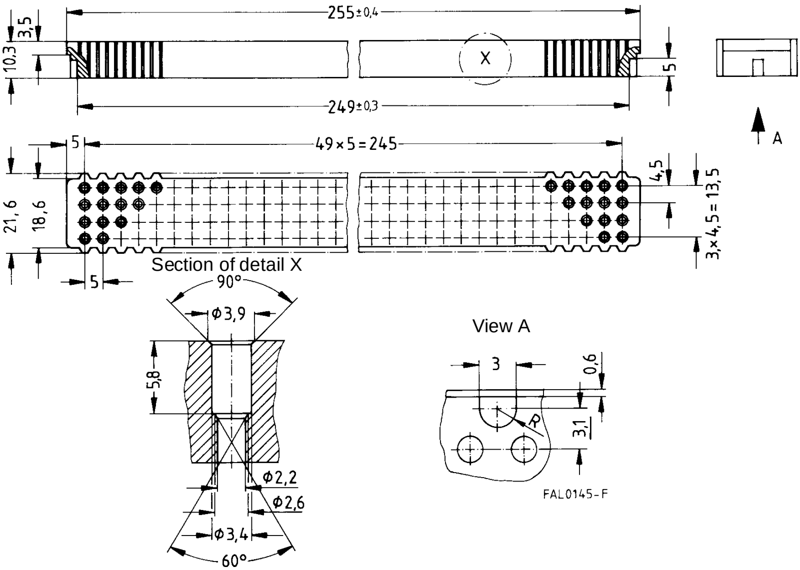
Adjusting screws can be supplied in polyterephtalate magazines for handling by automatic assembly machines. The magazines have a lateral toothing for accurate feed and precise positioning. They are fed to the assembly machine by means of a central recess at the front end.

for RM 4 and RM 5

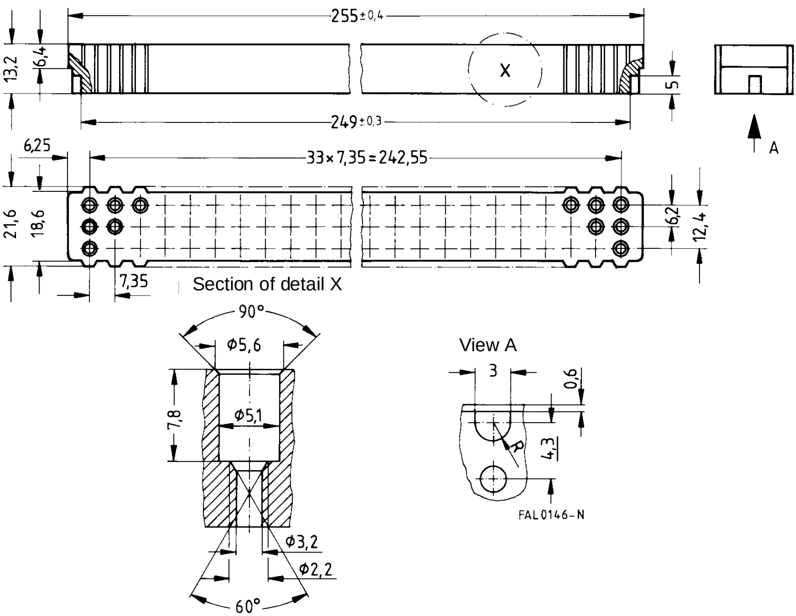


1) Complete the ordering code with the code numbers given in the individual data sheets.

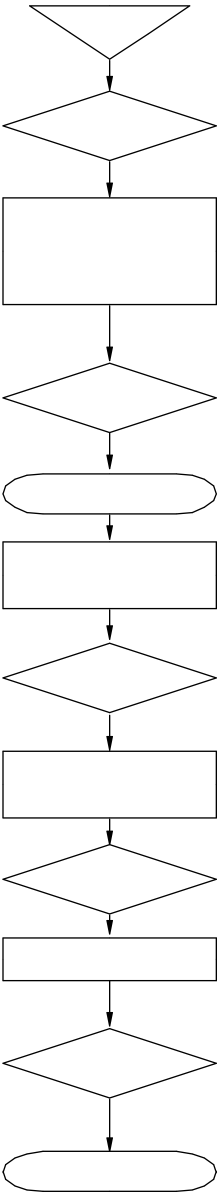
for RM 6



for RM 8



1 Production sequence and quality assurance during ferrite manufacture (schematic)



	Quality records Traceability
Raw materials (powder)	
Incoming inspection Analysis of chemical comp. (X-ray fluorescence analysis)	X-ray fluorescence analysis reports
Granulate production Weighing, mixing, presintering, grinding, stirring in binder. Homogenization, spraying incl. process control checks	
Bulk mix release Chemical analysis Manufacture and testing of sample cores	Bulk mix release report
Granulate storage	
Parts production Pressing, decarbonizing, sintering incl. process control checks	
Sinter check Testing of electrical and mechanical properties	Sinter check test report
Parts processing e.g. surface grinding, AL grinding, etc. incl. process control checks	
Final inspection/Monitoring Testing electr./mech. properties	Final inspection reports
Packing in PU (factory packing)	
Delivery release Outgoing inspection, checking of reports and finish Labeling with „FER QA Release“	„FER QA Release“ label or date code on pack
Sales warehouse	

Quality Considerations

2 General information

2.1 Ferrites quality objectives

Quality plays a central role in the competition for the better and more favorable product. As a guiding principle for the continual improvement of product and service quality, the Ferrites Business Unit has set quality objectives which are regularly updated and successively extended to all products. These serve as target criteria for new developments and are similarly required of current products.

To realize the objectives for existing products, projects involving teams of staff from all areas are working on product and process improvements without regard to departmental boundaries.

2.2 Total quality management and zero-defect concept

The aim of Total Quality Management (TQM) is to gear the entire organization to optimally satisfying customer requirements.

Following the principle of „quality from the very start“, everyone in our company is involved in realizing this objective. Systematic planning, careful selection of our suppliers and mastery of the development and production processes are the most important guarantors for maintaining a high quality level.

Internal measures to promote quality, such as training courses, quality group work, working committees and Q audits, strengthen the sense of responsibility of every employee and help to recognize and avoid errors.

Modern quality instruments such as FMEA[1)] and SPC[2)] supplement and support our quality assurance and enhancement measures.

3 Ferrites quality assurance system

The documented QA system of the Ferrites Business Unit forms the basis for all quality assurance activities. At all locations the Ferrites QA systems satisfy the international QA standard ISO 9000, as witnessed by certificates from the DQS (Deutsche Gesellschaft zur Zertifizierung von Qualitätssicherungssystemen) or the AFAQ (Association Française pour l‘Assurance de la Qualité).

3.1 Quality assurance for incoming goods

To ensure the quality of raw materials and bought-in parts, the ferrite plants of S+M Components work only with suppliers who can establish proof of both a high quality product and an effective quality assurance system.

Where it is necessary for process control - as in the case of the iron oxide for example - the plants perform their own incoming inspections.

3.2 Quality assurance in production

The production processes are monitored and controlled by constant examination of the process parameters and (intermediate) products. These inspections are included in the company-wide statistical process control (SPC).

At the conclusion of each major production stage a release inspection („quality control gate“) is performed to establish proof of the quality.

1) FMEA Failure Mode and Effects Analyses
2) SPC Statistical Process Control

3.3 Traceability

By recording the lot or batch numbers on the documentation accompanying the process, complete traceability is maintained in the production sequence.

After delivery, traceability to the internal release inspections („quality control gates“) is ensured by the „FER QA Release“ stickers applied to the factory packing to identify the delivery release or by the date code given on the label.

4 Delivery quality

The quality level of the products released for delivery is constantly monitored, recorded and evaluated. These data for ferrite cores are available on request.

5 Classification of defects, AQL values

A product is considered defective if it does not comply with the specifications given in the data sheets or in the agreed technical purchase specification.

Use of the sampling plan according to IEC 410/DIN ISO 2859 (previously DIN 40 080, contents identical to MIL STD 105 D) is recommended where incoming inspections are carried out by the user.

5.1 Electrical properties

The measuring conditions can be found in the chapter „SIFERRIT materials“. The product data and relevant tolerance limits are defined in the respective data sheets. The material data given in the chapter „SIFERRIT materials“ are to be understood as typical values.

Measuring conditions deviating from the data book require agreement between the customer and the S+M Ferrites plant.

5.2 Dimensions

The dimensioned drawings in the individual data sheets are definitive for the dimensions. The dimensions are checked in production using gauges based on DIN 7162, ISO tolerance series 8.

5.3 Finish

Assessment of the finish of ferrite cores is performed in accordance with S+M finish specifications. These are based on IEC 421 and have been introduced by S+M Components as a proposed standard. Detailed drawings, which are available on request, specify the maximum permissible limit values for damage which can never be totally excluded with ceramic components. Assessment of the solderability of terminal pins for coil formers and clamps is carried out according to IEC 68, part 2-20, test Ta, method 1 (aging 3).

5.4 AQL values

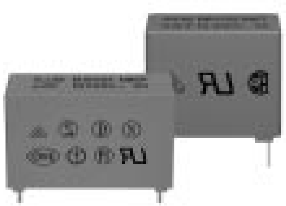
The AQL values to be applied for an incoming inspection carried out by the customer are being reduced in steps to 0,1 and 0,065 within the scope of our quality objectives. Currently valid values are obtainable on request.

Siemens Matsushita Components

EMI suppression capacitors

Play it safe

Whether video recorder, television, refrigerator or toaster – our EMI suppression capacitors do a grand job in every possible kind of entertainment and consumer electronics appliance. They've also proven their worth in switch-mode power supplies for PCs. No wonder, because the advantages of film technology are there to be seen: low cost, no risk of failure through damp, and optimum self-



healing capability. The result – less destruction of equipment and ensuing fires. Plus the line is safeguarded against surges. In this way our capacitors satisfy the user's need for safety, and the new EMC standards too of course.

SCS – dependable, fast and competent

1 General information

Ferrite parts from S+M Components are manufactured in accordance with IEC and DIN specifications. The relevant standards are quoted in the selector guide and in the individual data sheets.

It would take up too much space here to enumerate all standards dealing with ferrites. In the supplement to DIN 41 280 (Soft Magnetic Ferrite Cores: Material Properties) all relevant DIN, CECC and IEC standards are listed. This supplement is regularly updated.

The EC's standardization system currently being set up is exclusively restricted to the harmonization of international standards. A binding CE identification mark is envisaged for components having a safety implication.

The following standards should be mentioned because of their general significance:

DIN IEC 68	Basic environmental testing procedures
IEC 85	Thermal evaluation and classification of electrical insulation
IEC 367-1	Cores for inductors and transformers for telecommunications Part 1. Measuring methods
IEC 401 (1993)	Information on ferrite materials appearing in manufacturers' catalogues of transformer and inductor cores
IEC 410 and DIN ISO 2859	Sampling plans and procedures for inspection by attributes
DIN 40 040	Application categories and reliability
DIN EN 50 008	Industrial low-voltage switchgear Inductive proximity switches, type A, for DC voltage, 3 or 4 terminals
UL 94	Tests for flammability of plastic materials for parts in devices and appliances
DIN ISO 9000 to DIN ISO 9004	Quality management and quality assurance standards

2 Quality assessment

The DIN and IEC standards mainly specify dimensions, designations and magnetic characteristics, whereas the European system of quality assessment CECC and the harmonized DIN-CECC standards additionally define methods of measurement and quality levels.

Since 1982 the IEC has been establishing the so-called IEC Q-system, which will have worldwide applicability. German DIN IEC standards are being harmonized with this quality system.

CECC and IEC-Q standards have a similar structure: they are subdivided into generic specifications (GS), sectional specifications (SS) and blank detail specifications (BDS). The numbering system of QC is analogous to that of CECC.

The detail specifications of CECC and IEC do not fully correspond to each other.

A quality assessment system of „Capability Approval“ for the production of ferrite parts is being established.

2.1 DIN-CECC system

GS	DIN 45 970 Part1 (CECC 25 000)	Inductor and transformer cores for telecommunications
SS/BDS	DIN 45 970 Part 11 (CECC 25 100)	Magnetic oxide cores for inductor applications
SS/BDS	DIN 45 970 Part 12 (CECC 25 200)	Magnetic oxide cores for linear transformers
SS/BDS	DIN 45 970 Part 13 (CECC 25 300)	Magnetic oxide cores for power applications
SS	DIN 45 970 Part 14 (CECC 25 400)	Adjusters used with magnetic oxide cores for use in inductors and tuned transformers
BDS	DIN 45 970 Part 141 (CECC 25 401)	Adjusters used with magnetic oxide (ferrite) cores for use in inductors and tuned transformers
GS	CECC 26 000	Custom-built transformers and inductor cores

2.2 DIN-IEC system

GS	DIN IEC 723 Part 1 QC 250 000 (IEC 723-1)	Inductor and transformer cores for telecommunications
SS	DIN IEC 723 Part 2 QC 250 100 (IEC 723-2)	Magnetic oxide cores for inductor applications
BDS	DIN IEC 723 Part 2-1 QC 250 101 (IEC 723-2-1)	Magnetic oxide cores for broadband transformer applications; quality assessment level A
SS	DIN IEC 723 Part 3 QC 250 200 (IEC 723-3)	Magnetic oxide cores for broadband transformers
BDS	DIN IEC 723 Part 3-1 QC 250 201 (IEC 723-3-1)	Magnetic oxide cores for broadband transformer applications; quality assessment level A
SS	DIN IEC 723 Part 4 QC 250 300 (IEC 723-4)	Magnetic oxide cores for transformers and chokes for power applications
BDS	DIN IEC 723 Part 4-1 QC 250 301 (IEC 723-4-1)	Magnetic oxide cores for transformers and chokes for power applications; quality assessment level A
SS	DIN IEC 723 Part 5 QC 250 400 (IEC 723-5)	Ferrite adjusters for adjustable inductors and transformers
BDS	DIN IEC 723 Part 5-1 QC 250 401 (IEC 723-5-1)	Ferrite adjusters for adjustable inductors and transformers; quality assessment level A

2.3 Detail specifications

DIN 45 970 (CECC) contains the following detail specifications for P and RM cores, material classes J4, J5 and M1 (DIN 41 280).

Part 114	P 9 × 5	J 4
Part 115	P 11 × 7	J 4
Part 116	P 14 × 8	J 4
Part 117	P 18 × 11	J 4
Part 118	P 22 × 13	J 4
Part 119	P 26 × 16	J 4
Part 1110	P 30 × 19	J 4
Part 1111	P 36 × 22	J 4
Part 1112	RM 5	J 5
Part 1113	RM 6	J 5
Part 1114	RM 8	J 5
Part 1115	P 11 × 7	J 5
Part 1116	P 14 × 8	J 5
Part 1117	P 18 × 11	J 5
Part 1118	P 22 × 13	J 5
Part 1119	P 26 × 16	J 5

Part 121	RM 5	M 1	
Part 122	RM 6	M 1	
Part 123	RM 8	M 1	
Part 124	RM 5	M 1)	without
Part 125	RM 6	M 1)	center
Part 126	RM 8	M 1)	hole

The material properties of J4 and J5 can be implemented with N48 and those of M1 with materials N30 and T35.

Further specifications that are relevant for S+M Components products are the French UTE standards:

UTE 83313-001	CECC 25301-001	ETD 34	8P
UTE 83313-002	CECC 25301-002	ETD 39	8P
UTE 83313-003	CECC 25301-003	ETD 44	8P
UTE 83313-004	CECC 25301-004	ETD 49	8P

Class 8P can be implemented with N27.

3 New standards

The IEC standardization of E, ETD and PM cores and also RM cores has been concluded:

IEC 1246	E cores
IEC 1185	ETD 34 - 49
IEC 51(CO)295	ETD 29, 54, 59
IEC 1247	PM cores
IEC 431	RM 4 to RM 10

Standards for a new ring core series and for EP cores are nearing completion.

Please refer to the latest CO publications.

S+M COMPONENTS **Siemens Matsushita Components**

New lab assortments in film capacitors

Five at a stroke

To save you the trouble of inquiring for individual ratings to put into your design, there are now five practical sets of film capacitors:

- ▶ Lead spacing 5: 525 types, 50 to 400 V, 1 nF to 3.3 µF
- ▶ SilverCaps: the lowest-cost models, low in volume, 63 to 400 V, 1 nF to 10 µF
- ▶ MKPs in wound technology: for RF applications, 250 to 2000 V, 1.5 nF to 0.68 µF
- ▶ MKPs in stacked-film technology: 300 types, 160 to 1000 V, 1.5 nF to 1 µF
- ▶ Interference suppression: 150 types with a wide choice of ratings for different applications – X2 with small dimensions, Safe-X for maximum security against active flammability (X2) and Y for suppressing common-mode interference (Y2)

SCS – dependable, fast and competent

1 General information

The demand for coil formers with integrated pins for efficient winding gave rise to the development of compact RM (**R**ectangular **M**odular) cores. Furthermore, this design allows high PCB packing densities. RM coil formers and accessories are suited to automatic processing.

During assembly, RM cores are held in place by clamps which engage in recesses in the core base. The holding forces defined for our further developed RM clamps mean that in the majority of applications the glue bonding usually employed previously (cf. chapter on „Processing notes“, page 160) is no longer required. The various clamping forces defined, which have been verified by S + M Components through measurements, are specified in the individual data sheets.

The core dimensions are matched to standard PCB grids. RM6 means, for example, that the core with coil former fills a square basic area 6 × 6 modules (1 module ≙ 2,54 mm) = 15,24 × 15,24 mm^2. The mainly used core sizes RM4 through RM14 are specified in IEC 431 and in DIN 41980, the coil formers in DIN 41981.

2 Applications

- Originally RM cores from Siemens (today S + M Components) were essentially designed for two major applications, i.e.
  – very low-loss, highly stable filter inductors and other resonance determining inductors (materials N48, M33 and K1) and
  – low-distortion broadband transmission at low signal modulation (materials T38, T35, N30, N26).

  Even today there is still a high demand for RM cores suited to these applications.
- RM cores are increasingly required for power applications. For this purpose our core series made of materials N67, N87 and N47 (ungapped) is particularly well suited. Matching coil formers with larger pin spacings are available. RM cores without center hole (higher A_L value and greater power capacity) are used for transformer applications.
- A new addition to the range are the „low profile“ RM cores whose significantly reduced overall height makes them suitable for small-signal, interface and matching transformers and also for transformer and energy storage chokes in DC/DC converters with a high pulse rate (materials N87 and N49). The low profile types are particularly suited for applications where the winding is printed onto the PCB and the core is fitted to the board from either side.
- In addition to conventional accessories, SMD coil formers are available for RM4 Low Profile, RM5 and RM6 (refer also to the brochure „SMD Transformers, Ferrites and Accessories for SMD Inductors“).
- RM cores with waisted centerpost (RM8 through RM14) are suitable for nonlinear chokes in switch-mode power supplies. For RM10 and RM12 we supply matching coil formers.
  The representation of the A_L value versus the ampere-turns should be considered typical. Other curves can be achieved on request by adapting the geometry.
- RM cores with or without center hole can be supplied in any material on request.
- For power applications, particularly for compact energy storage chokes, we supply the RM12 and RM14 cores with optimized, strengthened base thickness.

3 A_{L1} value

For core types produced from a power material, the minimum A_{L1} value is specified. The A_{L1} value is defined at a flux density of $\hat{E}$ = 320 mT and a temperature of 100°C (exception: material N49: $\hat{E}$ = 200 mT and material N47: T = 25°C). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}.

4 Marking of RM core sets

The material and the A_L value are always stamped on RM cores >RM3, the material and „o, L.“(=without air gap) are stamped onto ungapped cores. Only one core half of the two comprising a set carries the marking. With cores having an unsymmetrical air gap (the total air gap is ground into one half) the ground half carries the marking, with cores including a glued-in threaded sleeve the half without sleeve is marked.

5 Coil formers made from the new material Bakelite blue

The subject of environmental protection has always been taken very seriously in our company. In this respect the new material for RM coil formers satisfies the requirements better than previously used synthetic materials.

Bakelite blue ensures enhanced environmental compatibility for the coil formers since these are now

- formaldehyde-free
- halogen-free
- without free phenols
- UL94-V0 listed.

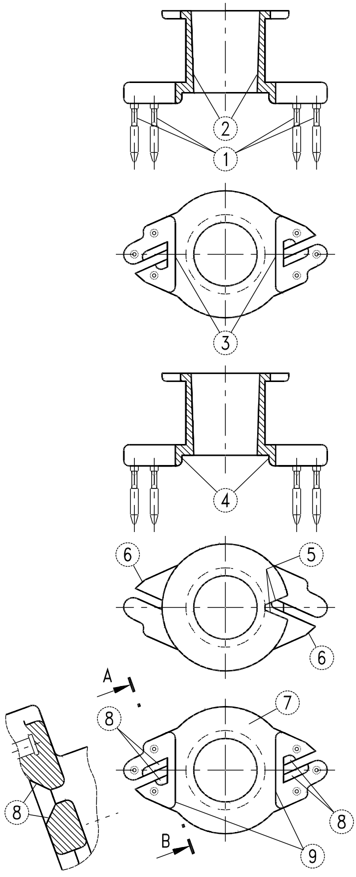
Moreover, they offer the following advantages:

- improved insulation between winding wires and ferrite core by means of an insulation web
- no outgassing impairing solderability
- dimensional thermostability better than defined in IEC 68-2-20, allowing successful processing at solder bath temperatures up to 500°C of winding wires which are difficult to solder (W180).

6 Coil formers for automatic processing

Automated manufacture is gaining more and more importance for the low-cost production of inductive components. The prerequisites are high-performance winding and assembly machines on the one hand, and suitable accessories on the other.

The new S + M Components RM coil formers were developed to meet this demand. These coil formers are not only matched to the versatile concepts of automation, but also offer advantages for manual winding. The essential improvements of the version optimized for automatic processing will be described in the following, taking the example of an RM6 coil former. The consistent utilization of these benefits will in most cases bring about a reduction of production costs for inductors and transformers.



Section A–B FRM0195-3

① Pins squared in the start-of-winding area
Secure restraint of the ends of the winding even with 2 to 3 winding corners; the winding process is considerably accelerated

② Internal diameter slightly conical and highly accurate
Easy and fast slipping-on and snug fit on the winding tools

③ Shortened wire guidance slots
Substantially higher flange breaking strength

④ Almost parallel flanges with minimum radii at the winding cylinder to the flange
Correct winding layers, more turns, neat and rapid winding

⑤ V-shaped slot in the pinless flange
Automatic loading and unloading of winding machine possible. Substantially more accurate fixing and arrangement of the coil formers

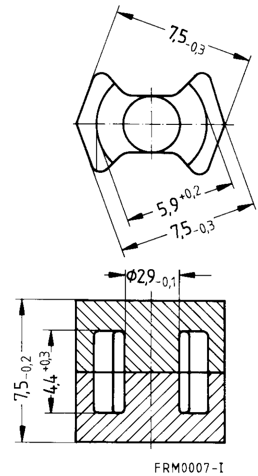
⑥ Lengthened wire catching nose
Leads all wires safely into the wire guidance slots, even at high winding speed

⑦ Pinless flange without marking
Substantially more accurate arrangement of the coil formers for winding and wrapping

⑧ Slot outlet stepped in height
Owing to the transfer of the wire crossing to the level of the slot, short circuit is prevented when soldering the ends of the winding to the pins

⑨ Insulation web
Improved insulation between the winding wires and the ferrite core

● Without center hole for transformer applications



Magnetic characteristics (per set)

$\Sigma l/A$ = 1,8 mm^{-1}
l_e = 15,1 mm
A_e = 8,4 mm^2
A_{min} = 6,4 mm^2
V_e = 128 mm^3

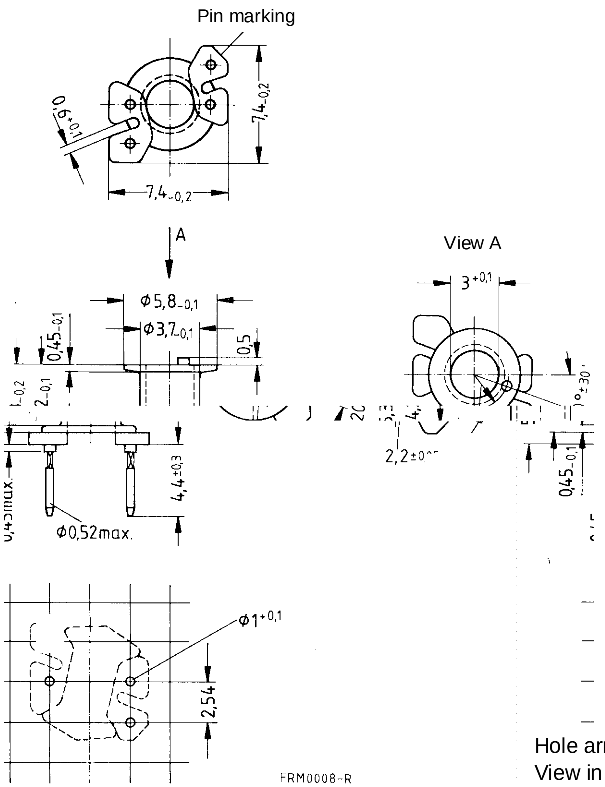
Approx. weight 0,55 g/set

Ungapped

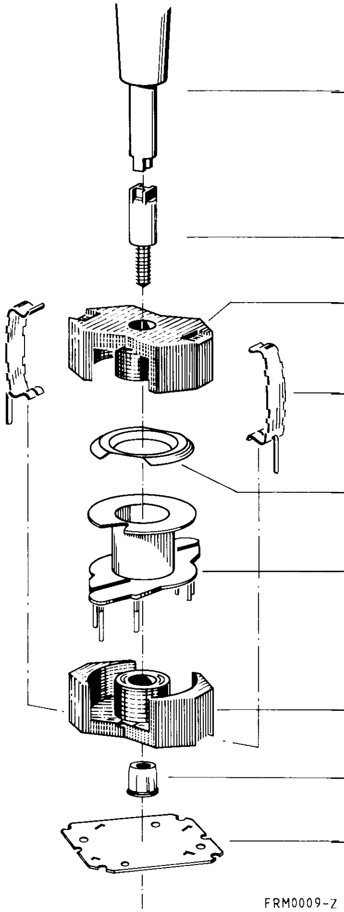
Material	A_L value nH	μ_e	Ordering code	PU Sets
K1	55+40/-30%	79	B65817-J-Y1	400
N26	800+40/-30%	1150	B65817-J-Y26	
N30	1600+40/-30%	2290	B65817-J-Y30	
T38	3000+40/-30%	4300	B65817-J-Y38	

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
Pins squared in the start-of-winding area

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	3,2	14,7	147	4	B65818-K1004-D1	400



Hole arrangement
View in mounting direction



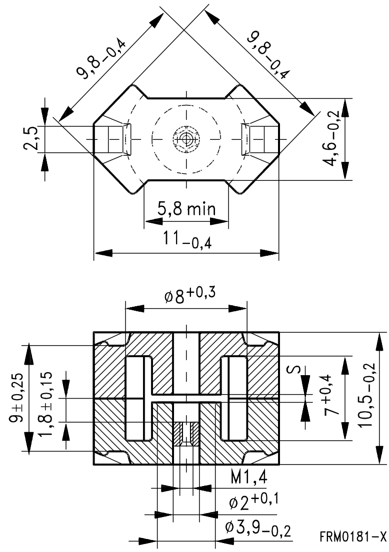
Example of an assembly set

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	195
Matching handle	B63399	195
Centering pin	B65806	195
Adjusting screw	B65539	195
Core	B65803	191
Clamps	B65806	194
Insulating washer 1	B65804	194
Coil former	B65804	193
Core	B65803	191
Threaded sleeve (glued-in)		
Insulating washer 2	B65804	194

Also available:

RM 4 low profile		
core	B65803-P	199
Coil former	B65804-P	200
SMD coil former	B65804-A	202
Clamp	B65804-P	201

- In accordance with IEC 431 and DIN 41 980
- Core without center hole
  for transformer applications



Magnetic characteristics (per set)

	with center hole	without center hole	
Σl/A	1,9	1,7	mm^{-1}
l_e	21	22	mm
A_e	11	13	mm^2
A_{min}	—	11,3	mm^2
V_e	232	286	mm^3

Approx. weight (per set)

m	1,45	1,65	g

Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -N with threaded sleeve	PU Sets
K1	16 ± 3%	1,0	24,2	B65803-N16-A1	500
	25 ± 3%	0,40	37,8	B65803-N25-A1	
M33	40 ± 3%	0,36	60,4	B65803-N40-A33	
	63 ± 3%	0,18	95	B65803-N63-A33	
N48	63 ± 3%	0,16	95	B65803-N63-A48	
	100 ± 3%	0,10	151	B65803-N100-A48	
	160 ± 3%	0,06	242	B65803-N160-A48	

Ungapped

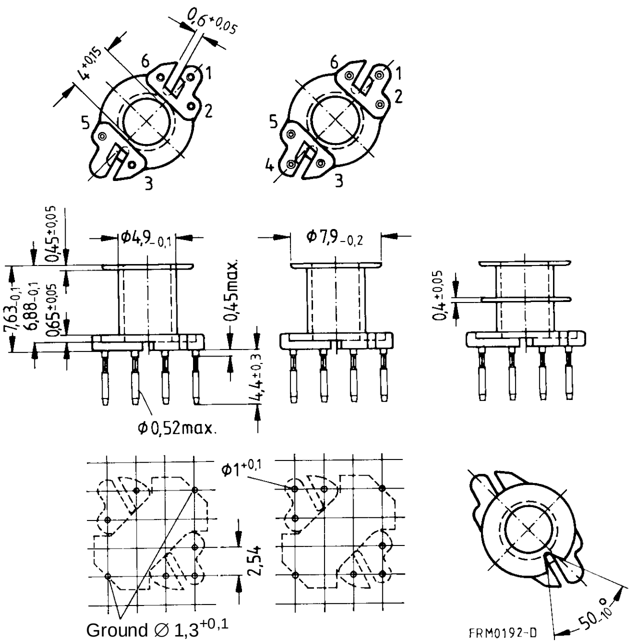
Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -A with center hole -J w/o center hole	PU Sets
K1	55+30/-20%	84			B65803-A-R1	500
N26	800+30/-20%	1210			B65803-A-R26	
N30	1900+30/-20%	2570			B65803-J-R30	
T35	2800+40/-30%	3790			B65803-J-Y35	
T38	3700+40/-30%	5000			B65803-J-Y38	
N47	750+30/-20%	1010	500	0,04 (50 mT, 500 kHz, 25°C)	B65803-J-R47	
N67	1100+30/-20%	1480	650	0,25 (200 mT, 100 kHz, 100°C)	B65803-J-R67	
N87	1100+30/-20%	1480	650	0,20 (200 mT, 100 kHz, 100°C)	B65803-J-R87	

RM 4
Coil Former B65804

Standard: to IEC 431 and DIN 41981
Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
Pins squared in the start-of-winding area
Also available in stick magazines

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	7,7	20	89	5 6	B65804-K1005-D1 B65804-K1006-D1	1000
2	7,3	20	94	5 6	B65804-K1005-D2 B65804-K1006-D2	

5 pins   6 pins



Hole arrangement
View in mounting direction

Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,335 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

Insulating washer 1 between core and coil former

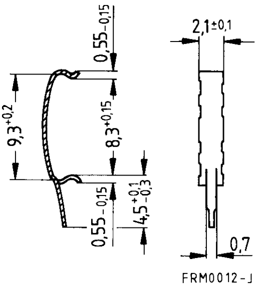
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs

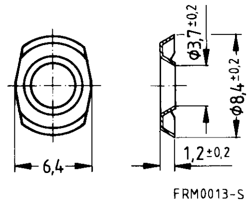
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65806-A2203	1000
Insulating washer 1 (reel packing, PU = 1 reel)	B65804-A5000	3000
Insulating washer 2 (bulk)	B65804-C2005	3000

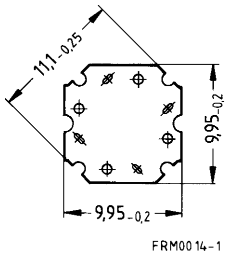
Clamp



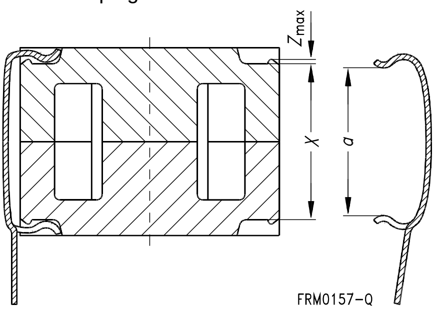
Insulating washer 1



Insulating washer 2



RM clamping forces



F_{min}: Extension of clamp from a to $a_2 = X_{min}$
F_{max}: Extension of clamp from a to $a_1 = X_{max}$

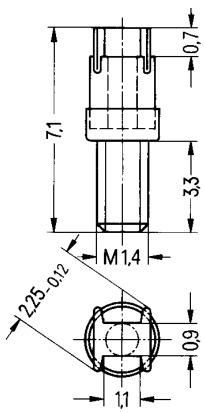
Clamp opening a (mm)		8,3 +0,15
Core nose Z_{max} (mm)		0,15
Height of core pair X (mm)	X_{min} X_{max}	8,75 9,25
Clamping force F (N)	F_{min} F_{max}	5 40

Adjusting screw
- Tube core with thread and core brake made of GFR polyterephthalate
- Also available in magazines

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin as assembly aid for RM core centering

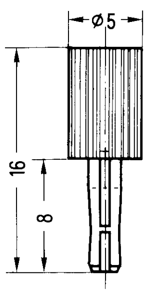
Core RM 4		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Mate-rial	A_L value nH	Tube core ∅ × length mm	Mate-rial	Color code	%		Pcs
K 1	16	1,81 × 2,0	Si 1	black	20	B65539-C1003-X101	500
	25	1,81 × 2,0	K 1	yellow	21	B65539-C1003-X1	
M 33	40	1,81 × 2,0	Si 1	black	17	B65539-C1003-X101	
	63	1,81 × 2,0	K 1	yellow	21	B65539-C1003-X1	
N 48	63	1,81 × 2,0	Si 1	black	12	B65539-C1003-X101	
	100	1,81 × 2,0	K 1	yellow	17	B65539-C1003-X11	
	160	1,81 × 2,7	N 22	red	12	B65539-C1002-X22	
Adjusting screwdriver						B63399-B4	10
Handle						B63399-B5	10
Centering pin						B65806-A2008	500

Adjusting screw



FRM0015-9

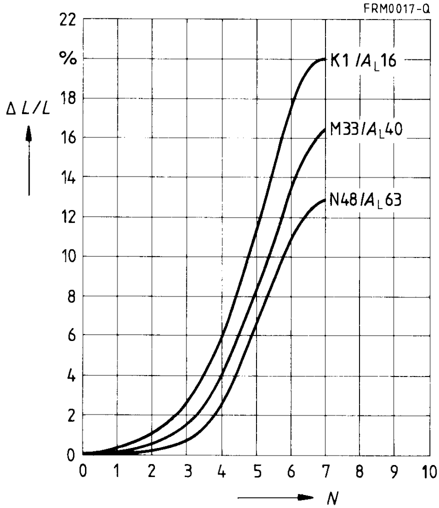
Centering pin



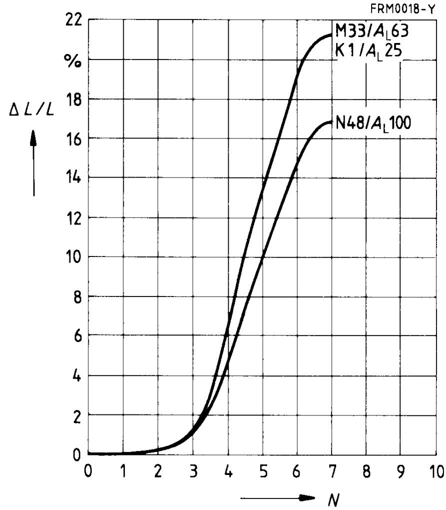
FRM0016-H

Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 1 turn engaged.

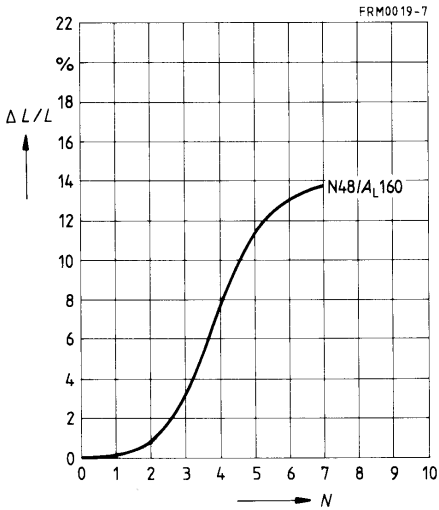
Adjusting screw B65539-C1003-X101
Color code black



Adjusting screw B65539-C1003-X1
Color code yellow

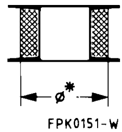


Adjusting screw B65539-C1002-X22
Color code red

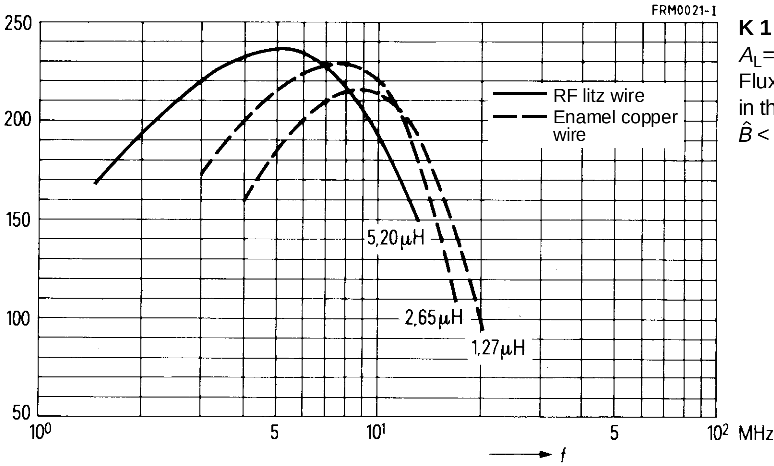


Q factor characteristics (typical values)

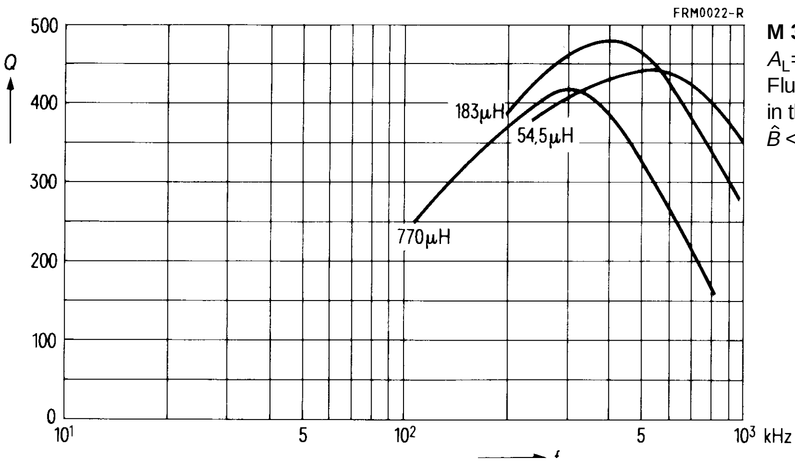
Material	A_L value	L µH	Turns	Wire; RF litz wire	Sec-tions	∅* mm
K 1	25 nH	5,20 2,65 1,27	14 10 7	45 × 0,04 CuLS 0,5 CuL 0,6 CuL	1 1 1	6,6 6,6 6,4
M 33	63 nH	770 183 54,5	100 52 29	20 × 0,04 CuL 45 × 0,04 CuL 90 × 0,04 CuL	1 1 1	— — —



* Pad of polystyrene tape up to diameter ∅



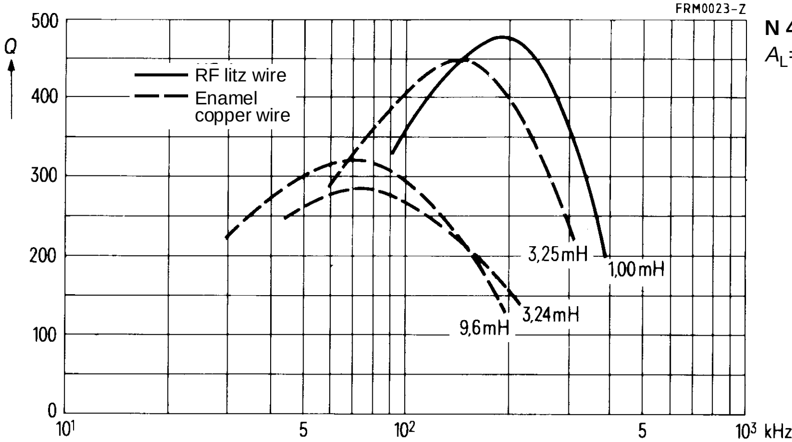
K 1
A_L = 25 nH
Flux density in the core
$\hat{B}$ < 0,5 mT



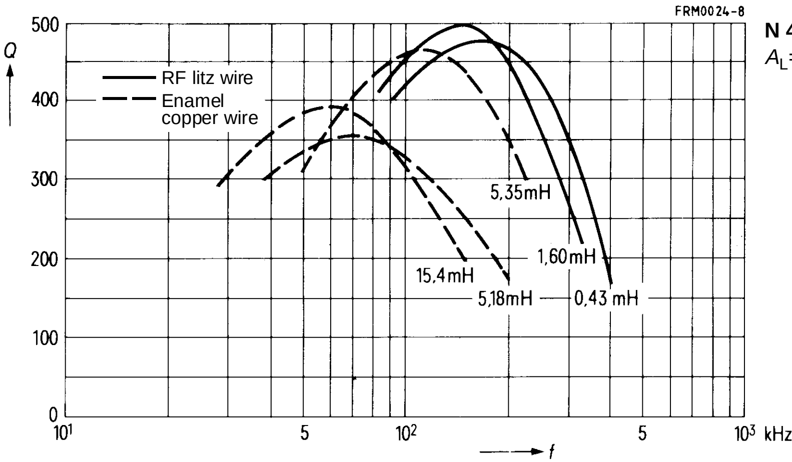
M 33
A_L = 63 nH
Flux density in the core
$\hat{B}$ < 1 mT

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1 mT

Mate-rial	L (mH) for A_L = 100 nH	L (mH) for A_L = 160 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	—	0,43	52	45 × 0,04 CuLS	1
	1,00	1,60	100	20 × 0,04 CuLS	1
	3,24	5,18	180	0,18 CuL	1
	9,60	15,40	310	0,14 CuL	1
	3,25	5,35	183	10 × 0,05 CuL	1

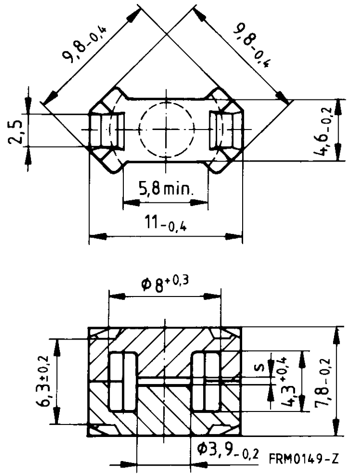


N 48
A_L = 100 nH



N 48
A_L = 160 nH

- For compact transformers with high inductance
- Without center hole



Magnetic characteristics (per set)

$\Sigma l/A$ = 1,2 mm^{-1}
l_e = 17,3 mm
A_e = 14,5 mm^2
A_{min} = 11,3 mm^2
V_e = 251 mm^3

Approx. weight 1,2 g/set

Gapped

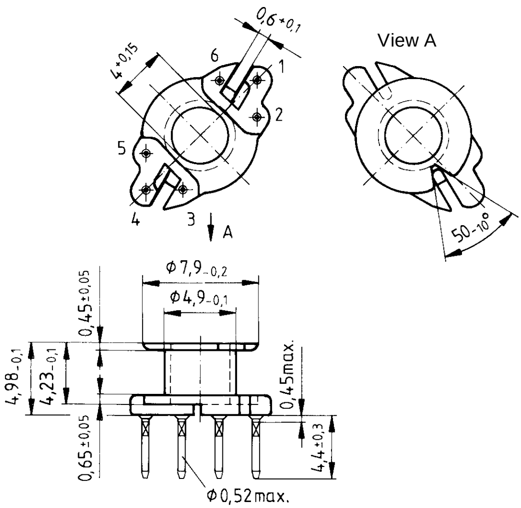
Material	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N67	160 ± 5%	0,05	153	B65803-P160-J67	800

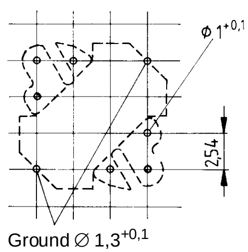
Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
T38	5000+40/-30%	4770			B65803-P-Y38	800
N47	900+30/-20%	860	740	0,04 (50 mT, 500 kHz, 25°C)	B65803-P-R47	
N67	1200+30/-20%	1136	950	0,15 (200 mT, 100 kHz, 100°C)	B65803-P-R67	

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 159 (as SMD coil former)
Pins squared in the start-of-winding area

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	4,7	20,1	147	6	B65804-R1006-D1	1000





Hole arrangement
View in mounting direction

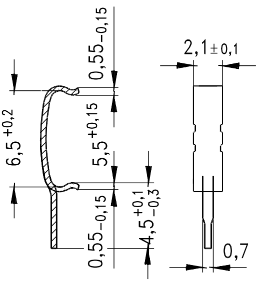
Clamp
- With and without ground terminal, made of stainless spring steel (tinned), 0,35 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 40 N per pair of clamps (typical value)
- Also available as strip clamp on reels on request

Insulating washer 1 between core and coil former
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

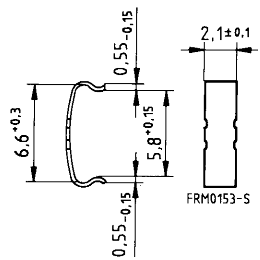
Insulating washer 2 for double-clad PCBs
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp with ground terminal (ordering code per piece, 2 are required)	B65804-P2203	1800
Clamp without ground terminal (ordering code per piece, 2 are required)	B65804-P2204	1800
Insulating washer 1 (reel packing, PU = 1 reel)	B65804-A5000	3000
Insulating washer 2 (bulk)	B65804-C2005	3000

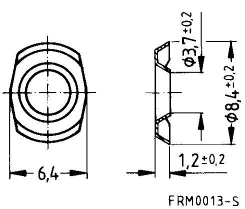
Clamp with ground terminal



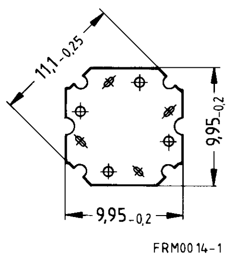
Clamp without ground terminal



Insulating washer 1



Insulating washer 2



SMD coil former

- With J terminals for winding thicker wires (e.g. for power applications)

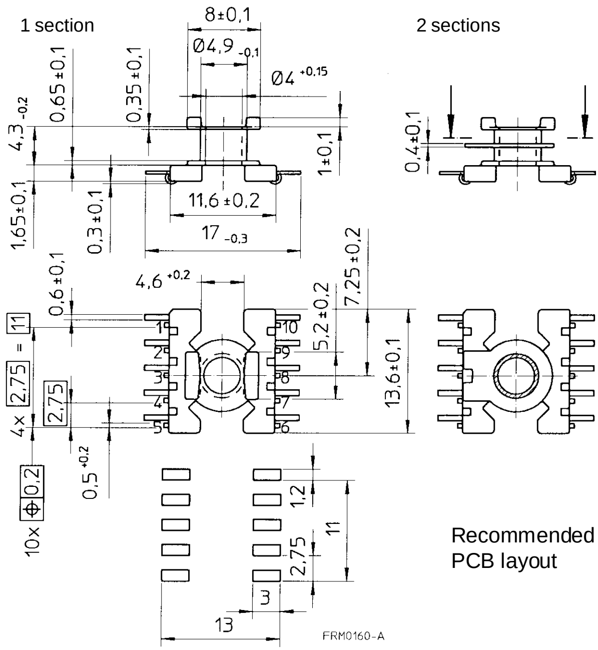
Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:
F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Clamp

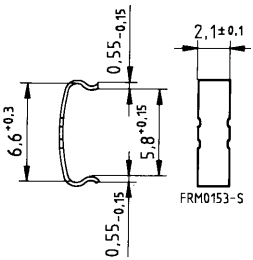
- Without ground terminal, made of stainless spring steel, tinned, 0,35 mm thick
- Also available as strip clamp (each carton containing 2 reels), also on a reel on request

Sections	A_N mm^2	l_N mm	A_R value µΩ	Terminals[1)]	Ordering code	PU Pcs
1	5,0	20,1	138	10	B65804-A6010-T1	900
2	4,4	20,1	157	10	B65804-A6010-T2	
Clamp	(ordering code per piece, 2 are required)				B65804-P2204	1800

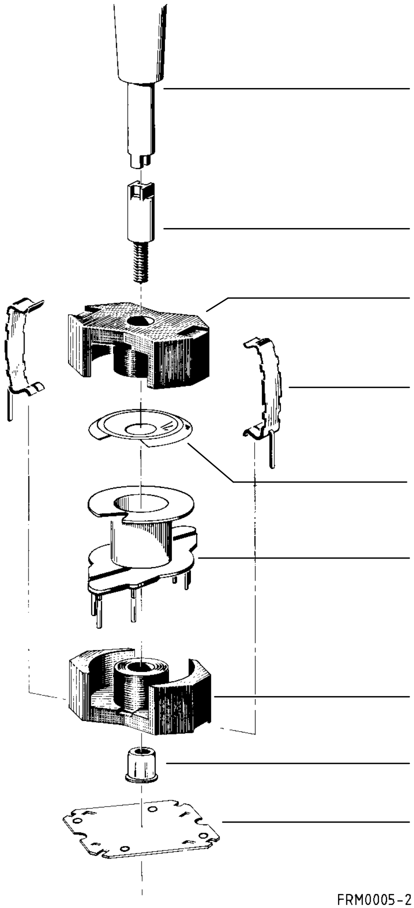
Coil former



Clamp



1) 6 and 8 terminals on request



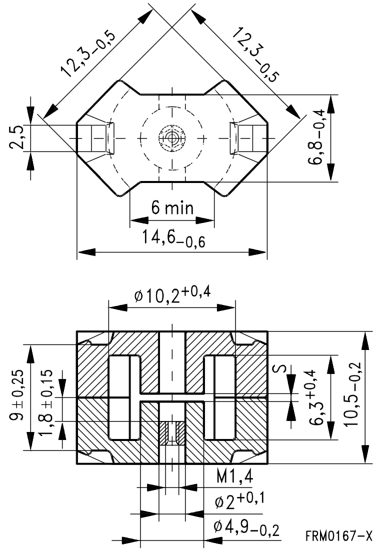
Example of an assembly set

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	209
Matching handle	B63399	209
Centering pin	B65806	209
Adjusting screw	B65539, B65806	209
Core	B65805	204
Clamps	B65806	207
Insulating washer 1	B65806	207
Coil former	B65806	206
Core	B65805	204
Threaded sleeve (glued-in)		
Insulating washer 2	B65806	207

Also available:

SMD coil former	B65822	208
RM 5 low profile core	B65805-P	214

- In accordance with IEC 431 and DIN 41 980
- Cores without center hole for transformer applications



Magnetic characteristics (per set)

	with center hole	without center hole	
Σl/A	1,0	0,93	mm^{-1}
l_e	20,8	22,1	mm
A_e	20,8	23,8	mm^2
A_{min}	15	18	mm^2
V_e	430	526	mm^3

Approx. weight (per set)

m	2,9	3,0	g

Gapped

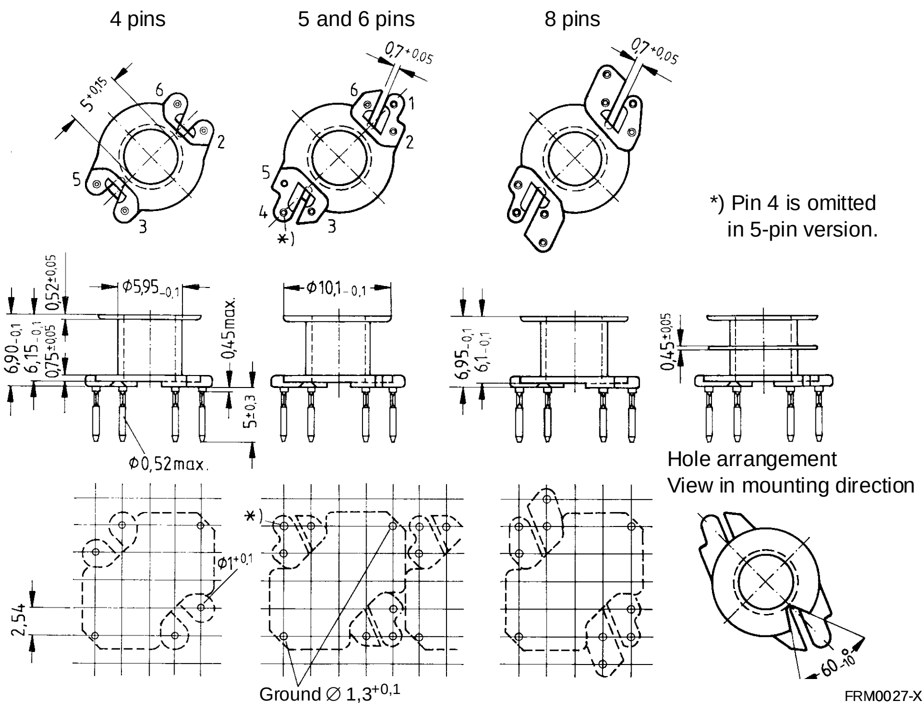
Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -N with threaded sleeve	PU Sets
K1	25 ± 3%	1,0	19,9	B65805-N25-A1	500
	40 ± 3%	0,40	31,8	B65805-N40-A1	
M33	20 ± 3%	1,2	15,9	B65805-N20-A33	
	63 ± 3%	0,4	50,2	B65805-N63-A33	
	100 ± 3%	0,2	79,6	B65805-N100-A33	
N48	125 ± 2%	0,16	100	B65805-N125-A48	
	160 ± 3%	0,12	128	B65805-N160-A48	
	200 ± 3%	0,09	159	B65805-N200-A48	
	250 ± 3%	0,06	200	B65805-N250-A48	
	315 ± 3%	0,03	255	B65805-N315-A48	

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -C with center hole -J w/o center hole	PU Sets
K1	100+30/-20%	80			B65805-C-R1	500
N26	1800+30/-20%	1430			B65805-C-R26	
N30	3500+30/-20%	2590			B65805-J-R30	
T35	5200+30/-20%	3850			B65805-J-R35	
T38	6700+40/-30%	4960			B65805-J-Y38	
T42	9600+40/-30%	7090			B65805-J-Y42	
N47	1400+30/-20%	1030	950	0,06 (50 mT, 500 kHz, 25°C)	B65805-J-R47	
N67	2000+30/-20%	1470	1200	0,40 (200 mT, 100 kHz, 100°C)	B65805-J-R67	
N87	2000+30/-20%	1470	1200	0,32 (200 mT, 100 kHz, 100°C)	B65805-J-R87	
N41	2600+30/-20%	1920	1200	0,10 (200 mT, 25 kHz, 100°C)	B65805-J-R41	

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 151
Pins squared in the start-of-winding area
Also available in stick magazines

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	9,5	25	90	4 5 6 8	B65806-K1004-D1 B65806-K1005-D1 B65806-K1006-D1 B65806-K1008-D1	500
2	8,7	25	94	4 5 6	B65806-K1004-D2 B65806-K1005-D2 B65806-K1006-D2	
1	with 4 special solder terminals for litz wire on request					
2	with 4 special solder terminals for litz wire on request					



FRM0027-X

Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,335 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

Insulating washer 1 between core and coil former

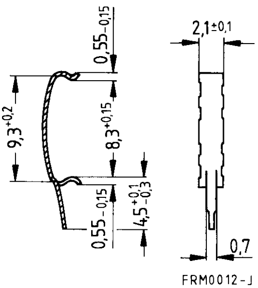
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs

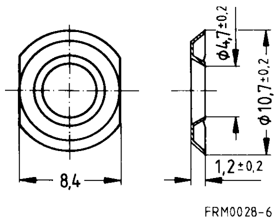
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65806-A2203	1000
Insulating washer 1 (reel packing, PU = 1 reel)	B65806-A5000	2500
Insulating washer 2 (bulk)	B65806-D2005	2500

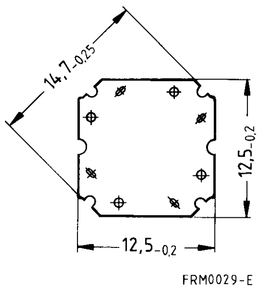
Clamp



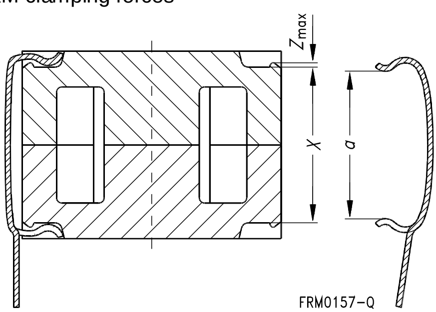
Insulating washer 1



Insulating washer 2



RM clamping forces



F_{min}: Extension of clamp from a to $a_2 = X_{min}$
F_{max}: Extension of clamp from a to $a_1 = X_{max}$

Clamp opening a (mm)	8,3 +0,15
Core nose Z_{max} (mm)	0,15
Height of core pair X (mm) X_{min} X_{max}	8,75 9,25
Clamping force F (N) F_{min} F_{max}	5 40

SMD coil former

- With gullwing terminals

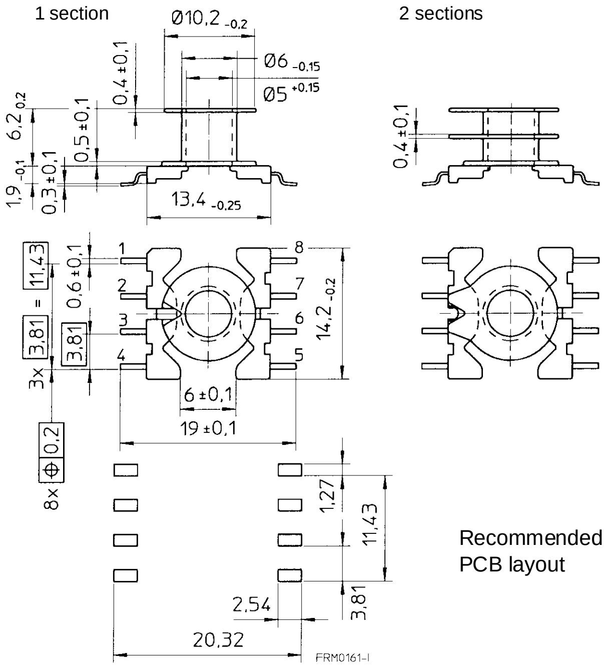
Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Clamp

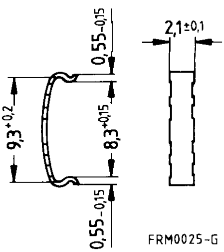
- Without ground terminal, made of stainless spring steel, tinned, 0,35 mm thick
- Also available as strip clamp (each carton containing 2 reels)
- Also available on a reel on request

Sections	A_N mm²	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	11,1	25	77	8	B65822-E1008-T1	500
2	10,2	25	85	8	B65822-E1008-T2	
Clamp	(ordering code per piece, 2 are required)				B65806-J2204	1000

Coil former



Clamp



Adjusting screw

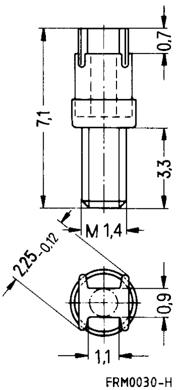
- Tube core with thread and core brake made of GFR polyterephthalate
- Also available in magazines

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin as assembly aid for RM core centering

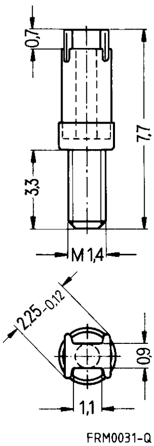
Core RM 5		**Adjusting screw**				Min. adjusting range	Ordering code	PU
Material	A_L value nH	Fig.	Tube core ∅ × length mm	Material	Color code	%		Pcs
K 1	25	a	1,81 × 2,0	Si 1	black	13	B65539-C1003-X101	500
	40	a	1,81 × 2,0	K 1	yellow	16	B65539-C1003-X1	
M 33	63	a	1,81 × 2,7	Si 1	white	11	B65539-C1002-X101	
	100	a	1,81 × 2,0	K 1	yellow	14	B65539-C1003-X1	
N 48	125	a	1,81 × 2,0	K 1	yellow	13	B65539-C1003-X1	
	160 200	a	1,81 × 2,7	N 22	red	15 11	B65539-C1002-X22	
	250 315	b	1,81 × 3,4	N 22	green	13 9	B65806-C3001-X22	
	315	b	1,90 × 3,4	N 22	blue	12	B65806-A3002-X22	
Adjusting screwdriver							B63399-B4	10
Handle							B63399-B5	10
Centering pin							B65806-A2008	10

Adjusting screws

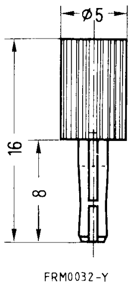
a



b

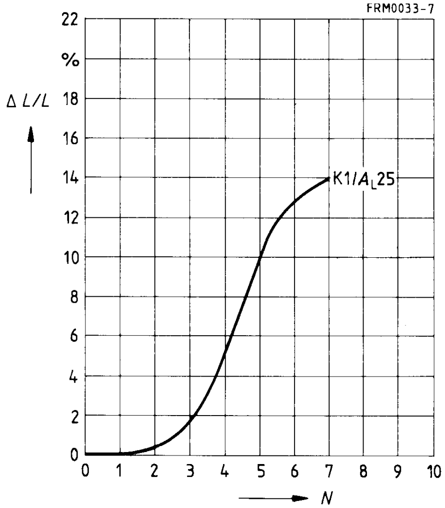


Centering pin

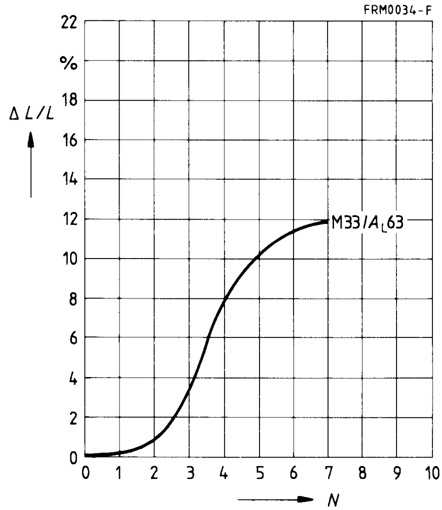


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 1 turn engaged.

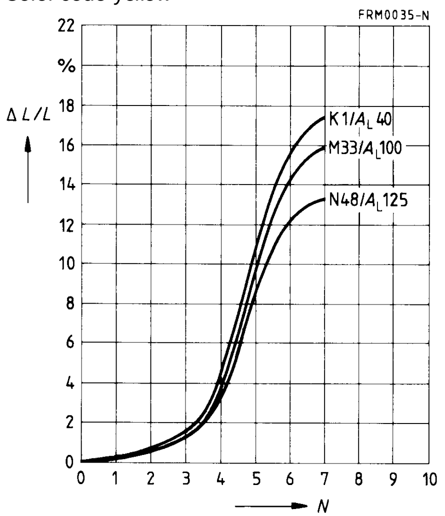
Adjusting screw B65539-C1003-X101
Color code black



Adjusting screw B65539-C1002-X101
Color code white

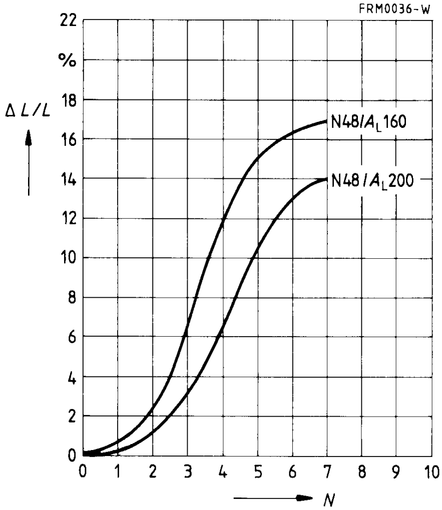


Adjusting screw B65539-C1003-X1
Color code yellow

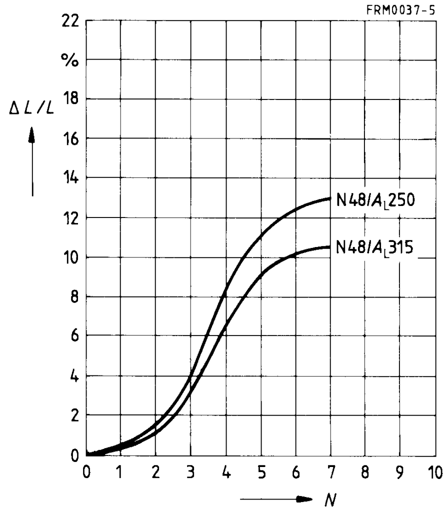


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 1 turn engaged.

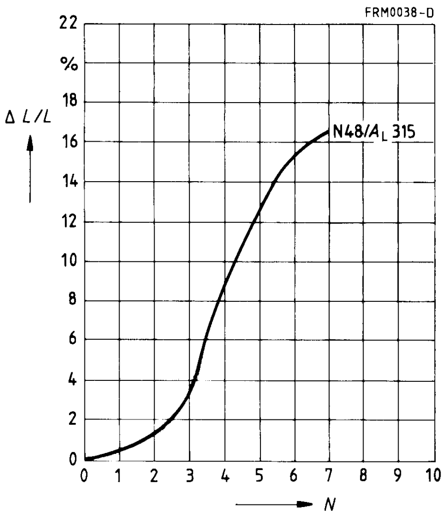
Adjusting screw B65539-C1002-X22
Color code red



Adjusting screw B65806-C3001-X22
Color code green

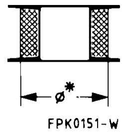


Adjusting screw B65806-A3002-X22
Color code blue

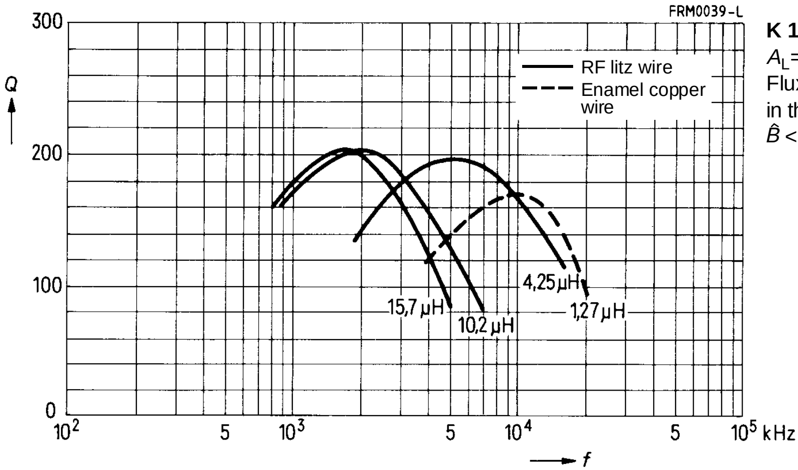


Q factor characteristics (typical values)

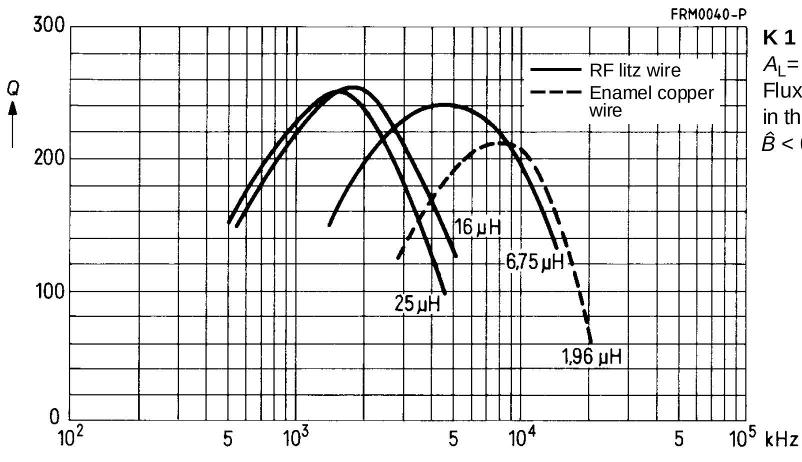
Mate-rial	L (μH) for A_L = 25 nH	A_L = 40 nH	Turns	Wire; RF litz wire	Sec-tions	∅* mm
K 1	1,27	1,96	7	0,6 CuL	1	8,5
	4,25	6,75	13	30 × 0,04 CuLS	1	9,0
	15,7	25	25	30 × 0,04 CuLS	1	8,4
	10,2	16	20	40 × 0,04 CuLS	1	8,2



* Pad of polystyrene tape up to diameter ∅



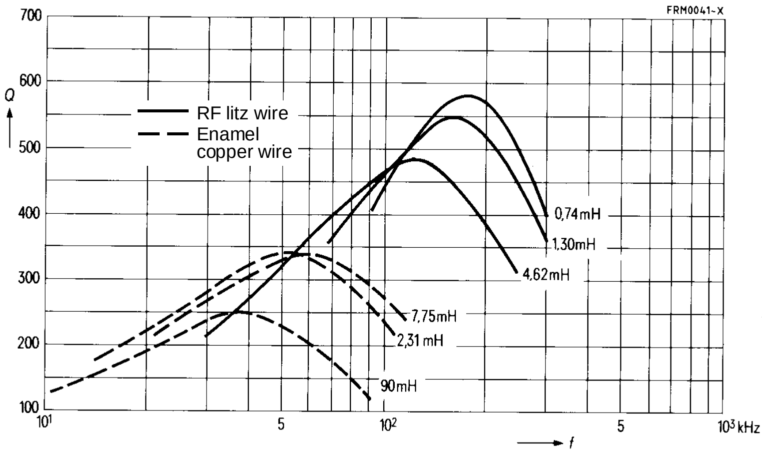
K 1
A_L = 25 nH
Flux density in the core
$\hat{B}$ < 0,5 mT



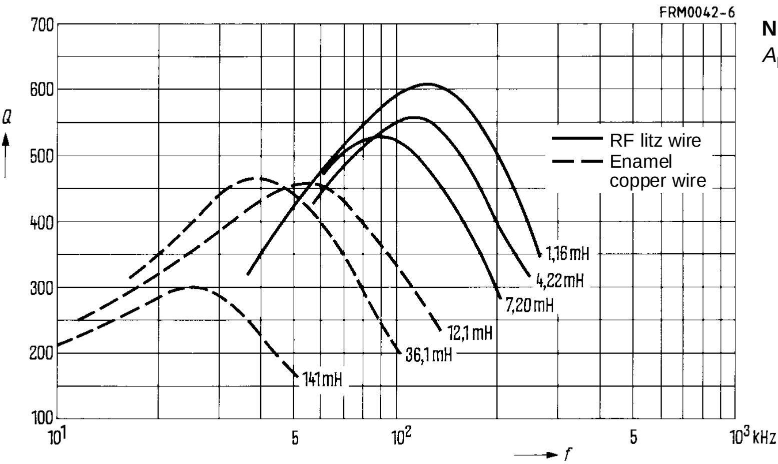
K 1
A_L = 40 nH
Flux density in the core
$\hat{B}$ < 0,6 mT

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 2 mT

Mate-rial	L (mH) for A_L = 160 nH	L (mH) for A_L = 250 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	90	141	750	0,1 CuL	1
	23,1	36,1	380	0,14 CuL	1
	7,75	12,1	220	0,18 CuL	1
	4,62	7,20	170	10 × 0,05 CuLS	1
	—	4,22	130	20 × 0,04 CuLS	1
	1,30	—	90	30 × 0,04 CuLS	1
	0,74	1,16	68	45 × 0,04 CuLS	1

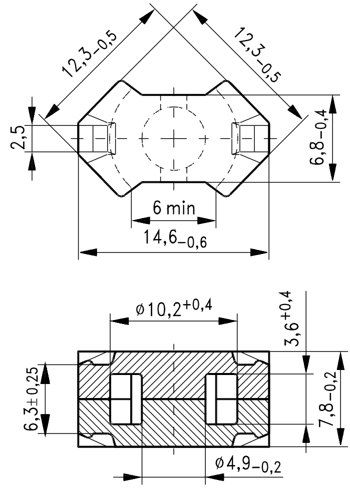


N 48
A_L = 160 nH



N 48
A_L = 250 nH

- For compact transformers
- Without center hole



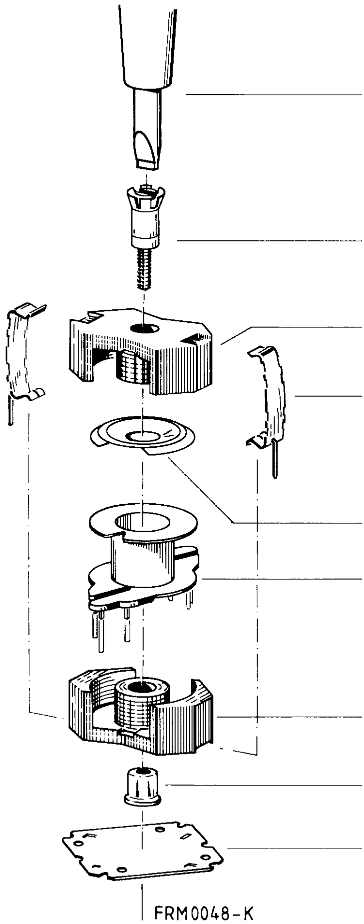
Magnetic characteristics (per set)

$\Sigma l/A$	=	0,71	mm^{-1}
l_e	=	17,50	mm
A_e	=	24,50	mm^2
A_{min}	=	18,00	mm^2
V_e	=	430	mm^3

Approx. weight 2,6 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1}	P_V W/set	Ordering code	PU Sets
N30	4100+30/-20%	2320			B65805-P-R30	500
T38	7700+40/-30%	4360			B65805-P-Y38	
N49	1700+30/-20%	960	80	0,09 (50 mT, 500 kHz, 100°C)	B65805-P-R49	
N67	2400+30/-20%	1360	1430	0,33 (200 mT, 100 kHz, 100°C)	B65805-P-R67	
N87	2400+30/-20%	1360	2590	0,26 (200 mT, 100 kHz, 100°C)	B65805-P-R87	



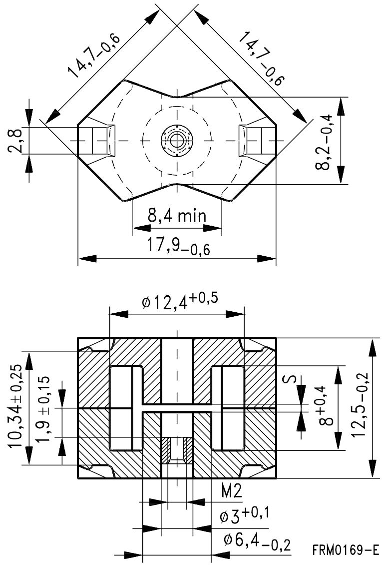
Example of an assembly set

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	223
Matching handle	B63399	223
Centering pin	B65808	223
Adjusting screw	B65659	223
Core	B65807	216
Clamps	B65808	221
Insulating washer 1	B65808	221
Coil former	B65808	218
Core	B65807	216
Threaded sleeve (glued-in)		
Insulating washer 2	B65808	221

Also available:

Coil former for SMPS transf.	B65808	219
Coil former for power applications	B65808	220
SMD coil former	B65821	222
RM 6 low profile core	B65807-P	228

- In accordance with IEC 431 and DIN 41 980
- Cores without center hole
  for transformer applications



Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma l/A$	0,86	0,78	mm^{-1}
l_e	26,9	28,6	mm
A_e	31,3	36,6	mm^2
A_{min}	—	31	mm^2
V_e	840	1050	mm^3

Approx. weight (per set)

m	4,9	5,3	g

Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code -C with center hole -N with threaded sleeve	PU Sets
K1	40 ± 3%	0,80	27,4	B65807-N40-A1	500
M33	63 ± 3%	0,60	43,2	B65807-N63-A33	
	100 ± 3%	0,38	68,5	B65807-N100-A33	
N48	160 ± 2%	0,22	110	B65807-N160-G48	
	200 ± 3%	0,17	137	B65807-N200-A48	
	250 ± 3%	0,12	171	B65807-N250-A48	
	315 ± 3%	0,08	216	B65807-N315-A48	
	400 ± 3%	0,05	274	B65807-N400-A48	
N26	1000 ± 10%	0,006	685	B65807-C1000-K26	

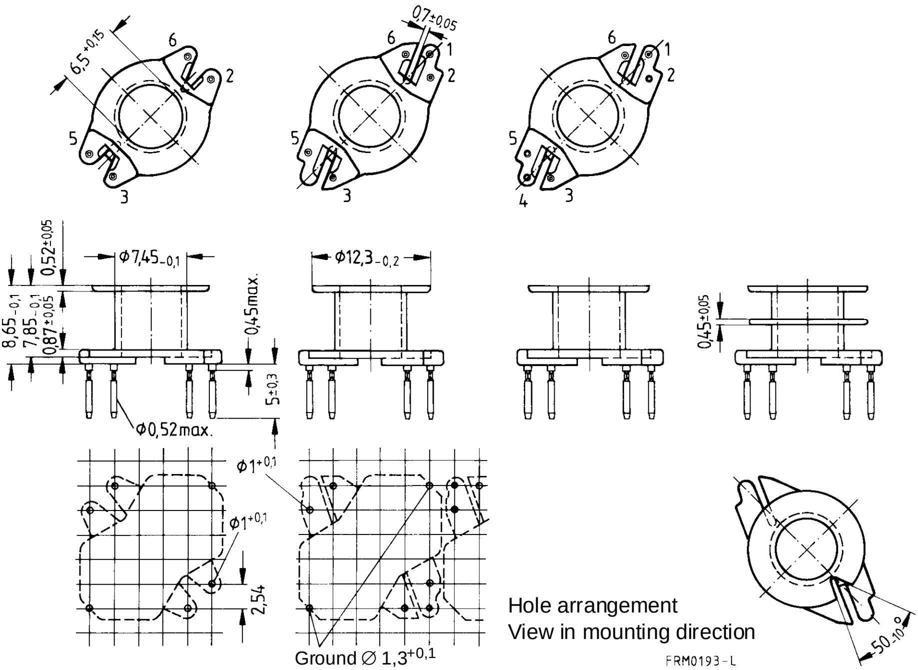
Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -C with center hole -J w/o center hole	PU Sets
K1	120+30/-20%	82			B65807-C-R1	500
N26	2200+30/-20%	1500			B65807-C-R26	
N30	4300+30/-20%	2670			B65807-J-R30	
T35	6200+30/-20%	3850			B65807-J-R35	
T38	8600+40/-30%	5340			B65807-J-Y38	
T42	12300+40/-30%	7630			B65807-J-Y42	
N47	1800+30/-20%	1120	1150	0,15 (50 mT, 500 kHz, 25°C)	B65807-J-R47	
N67	2400+30/-20%	1490	1450	0,64 (200 mT, 100 kHz, 100°C)	B65807-J-R67	
N87	2400+30/-20%	1490	1450	0,51 (200 mT, 100 kHz, 100°C)	B65807-J-R87	
N41	3100+30/-20%	1920	1450	0,16 (200 mT, 25 kHz, 100°C)	B65807-J-R41	

Standard: to IEC 431 and DIN 41981
Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
Pins squared in the start-of-winding area
Also available in stick magazines

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	15	30	69	4 5 6	B65808-K1004-D1 B65808-K1005-D1 B65808-K1006-D1	500
2	14	30	73	4 5 6	B65808-K1004-D2 B65808-K1005-D2 B65808-K1006-D2	
1 or 2	with 4 special solder terminals for litz wire on request					

4 pins 5 pins 6 pins



Hole arrangement
View in mounting direction

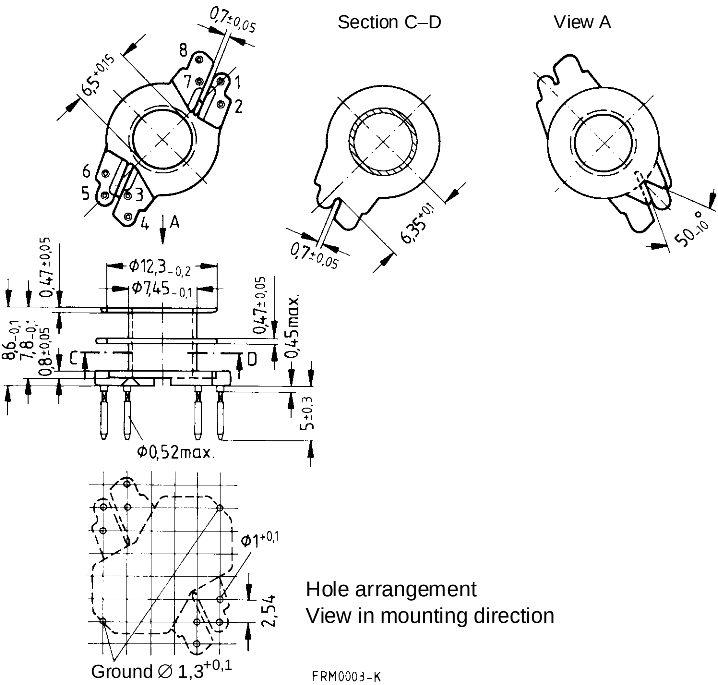
Coil former for SMPS transformers with line isolation

The creepage distances and clearances are designed such that the coil former is suitable for use in SMPS transformers with line isolation.

- Closed center flange with external wire guide
- Pins squared in the start-of-winding area
- Optimized for use with automatic winding machines

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
2	14	30	73	8	B65808-X1108-D2	500



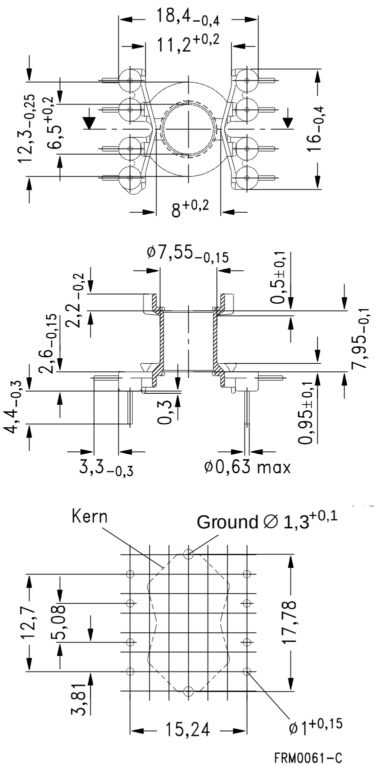
Hole arrangement
View in mounting direction

Coil former for power applications

Optimized for automatic winding
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150

For matching clamp and insulating washer 1 see page 221

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	15	30	69	8	B65808-D1508-T1	500



Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,435 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

Insulating washer 1 between core and coil former

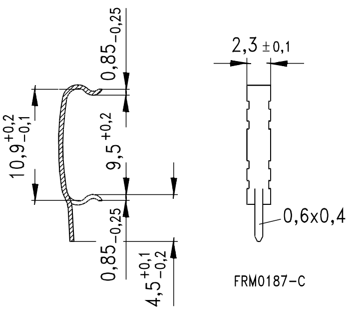
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs

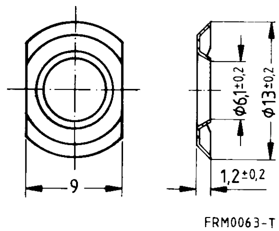
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65808-A2203	1000
Insulating washer 1 (reel packing, PU = 1 reel)	B65808-A5000	2500
Insulating washer 2 (bulk)	B65808-C2005	2500

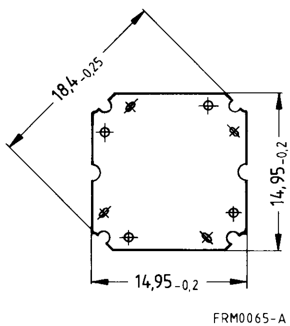
Clamp



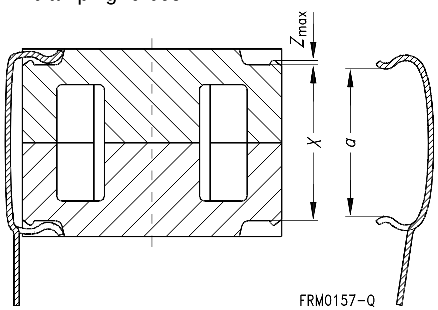
Insulating washer 1



Insulating washer 2



RM clamping forces



F_{min}: Extension of clamp from a to $a_2 = X_{min}$
F_{max}: Extension of clamp from a to $a_1 = X_{max}$

Clamp opening a (mm)		9,5 +0,2
Core nose Z_{max} (mm)		0,22
Height of core pair X (mm)	X_{min}	10,1
	X_{max}	10,6
Clamping force F (N)	F_{min}	7
	F_{max}	50

SMD coil former

- With gullwing terminals

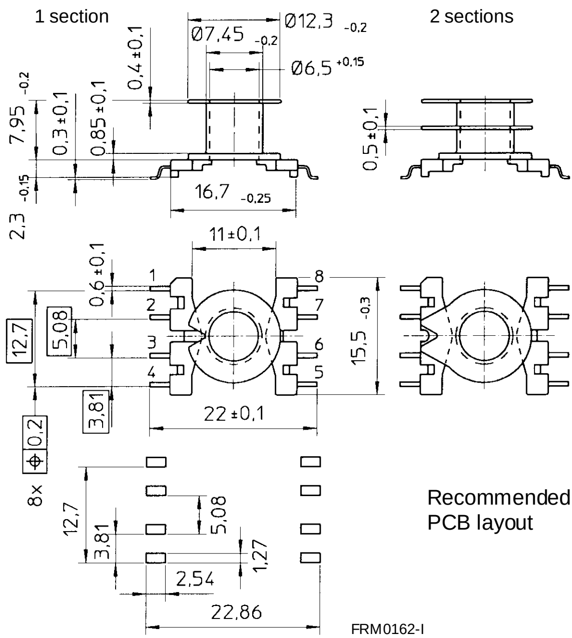
Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Clamp

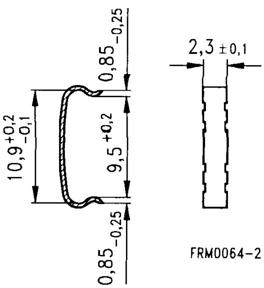
- Without ground terminal, made of stainless spring steel, tinned, 0,3 mm thick
- Also available as strip clamp (each carton containing 2 reels)
- Clamping force 40 N per pair of clamps (typical value)
- Also available on a reel on request

Sections	A_N mm²	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	16,2	31	66	8	B65821-C1008-T1	500
2	15,2	31	69	8	B65821-C1008-T2	
Clamp	(ordering code per piece, 2 are required)				B65808-J2204	1000

Coil former



Clamp



Adjusting screw

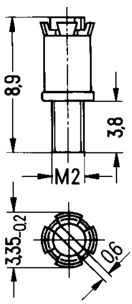
- Tube core with thread and core brake made of GFR polyterephthalate
- Also available in magazines

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin as assembly aid for RM core centering

Core RM 6		**Adjusting screw**				Min. adjusting range	Ordering code	PU
Material	A_L value nH	Fig.	Tube core ∅ × length mm	Material	Color code	%		Pcs
K 1	40	a	2,62 × 3,7	Si 1	white	15	B65659-F1-X101	500
M 33	63	a	2,62 × 3,7	Si 1	white	17	B65659-F1-X101	
	100	c	2,82 × 4,4	Si 1	brown	16	B65659-F4-X101	
N 48	160	a	2,62 × 3,7	K 1	green	17	B65659-F1-X1	
	200 250	a	2,62 × 3,7	N 22	red	16 11	B65659-F1-X23	
	315	b	2,75 × 4,4	N 22	black	13	B65659-F3-X23	
	400	c	2,82 × 4,4	N 22	yellow	11	B65659-F4-X23	
Adjusting screwdriver							B63399-B4	10
Handle							B63399-B5	10
Centering pin							B65808-A2008	500

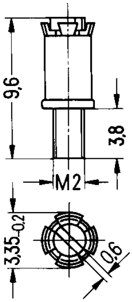
Adjusting screws

a



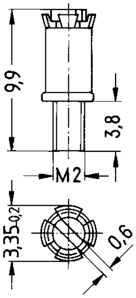
FRM0068-Z

b



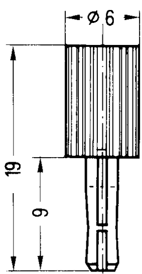
FRM0069-8

c



FRM0066-I

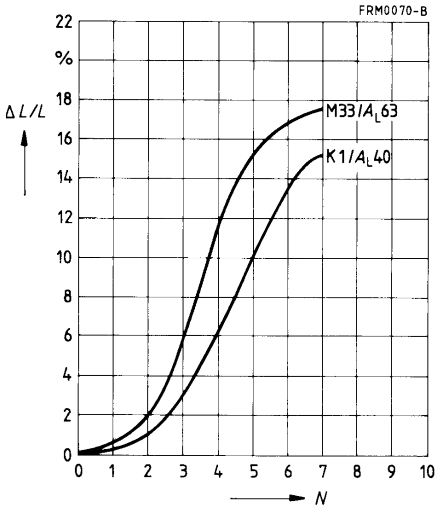
Centering pin



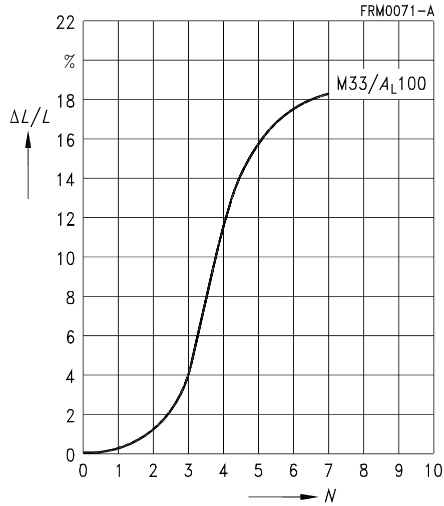
FRM0067-R

Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 1 turn engaged.

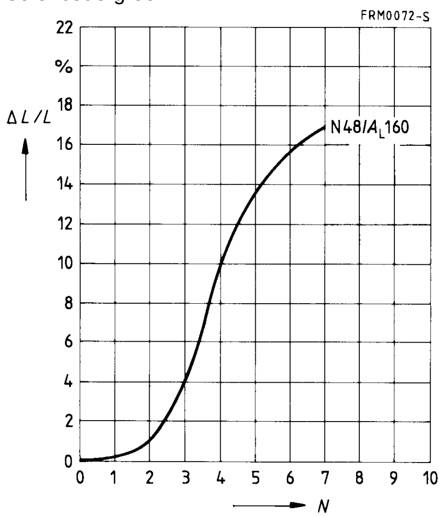
Adjusting screw B65659-F1-X101
Color code white



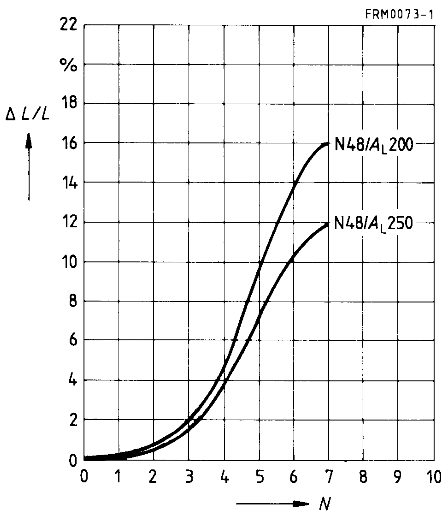
Adjusting screw B65659-F4-X101
Color code brown



Adjusting screw B65659-F1-X1
Color code green

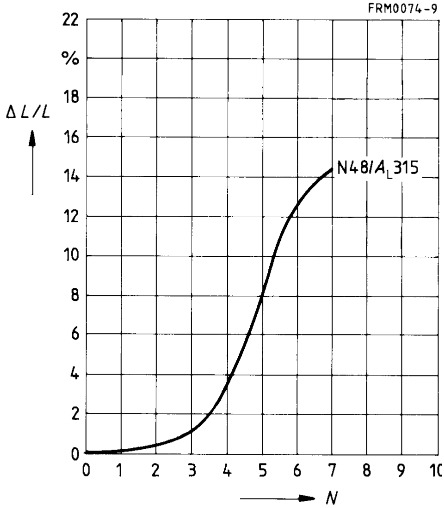


Adjusting screw B65659-F1-X23
Color code red

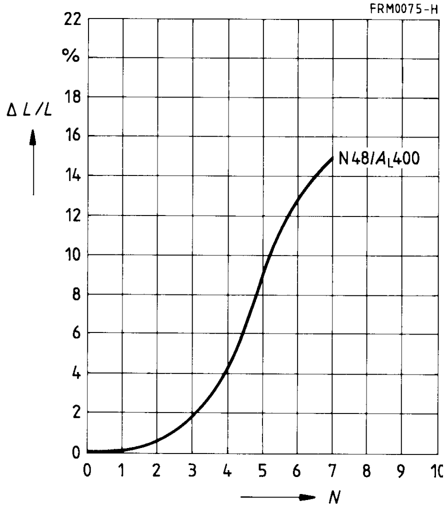


Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 1 turn engaged.

Adjusting screw B65659-F3-X23
Color code black

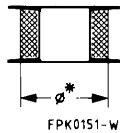


Adjusting screw B65659-F4-X23
Color code yellow

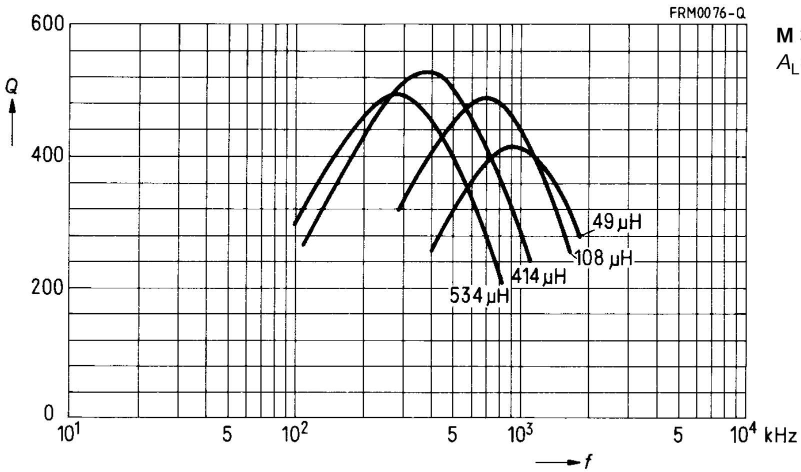


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 2 mT

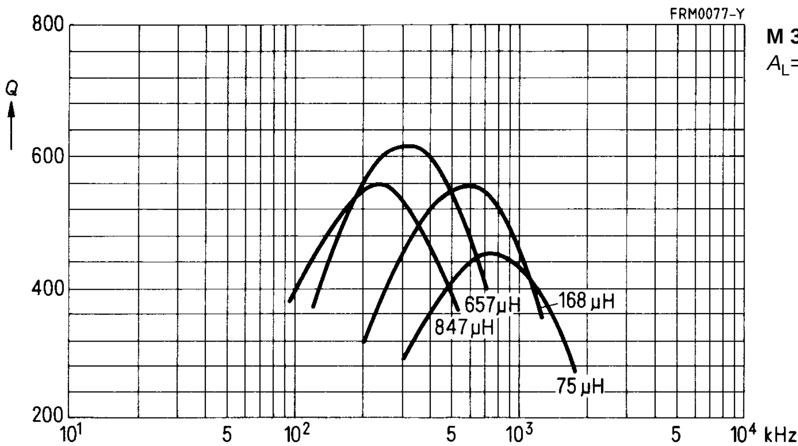
Material	L (µH) for A_L = 63 nH	L (µH) for A_L = 100 nH	Turns	RF litz wire	Sections	Ø* mm
M 33	534	847	92	45 × 0,04 CuLS	1	—
	414	657	81	45 × 0,04 CuLS	2	—
	108	168	41	45 × 0,04 CuLS	2	9,8
	49	75	27	45 × 0,04 CuLS	2	10,6



* Pad of polystyrene tape up to diameter ∅



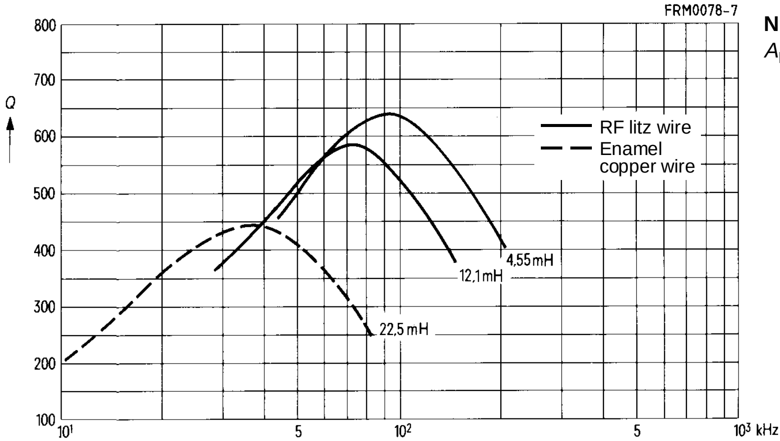
M 33
A_L = 63 nH



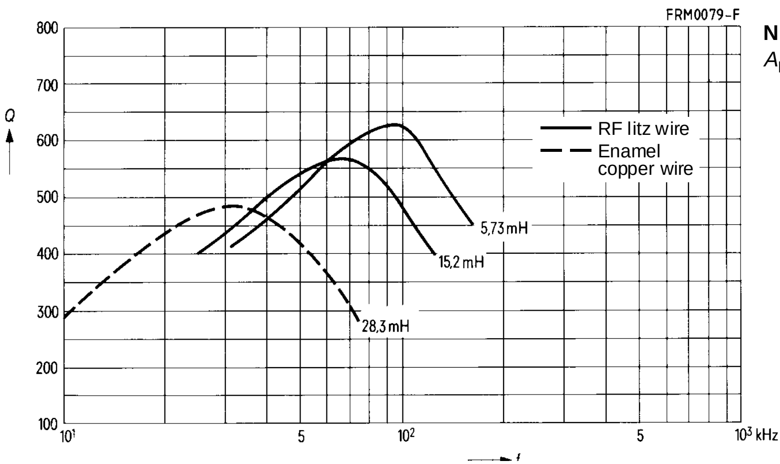
M 33
A_L = 100 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 2 mT

Material	L (mH) for A_L = 250 nH	L (mH) for A_L = 315 nH	Turns	Wire; RF litz wire	Sections
N 48	22,5	28,3	300	0,20 CuL	1
	12,1	15,2	220	6 × 0,07 CuLS	1
	4,55	5,73	135	20 × 0,05 CuLS	1

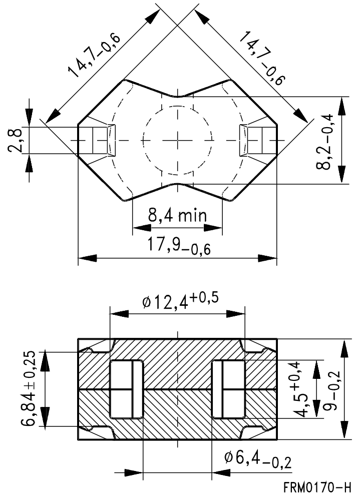


N 48
A_L = 250 nH



N 48
A_L = 315 nH

- For compact transformers
- Without center hole



Magnetic characteristics (per set)

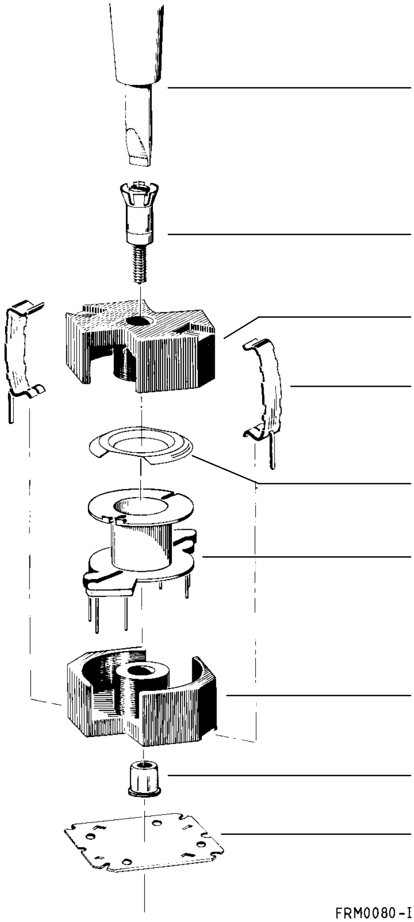
$\Sigma l/A$ = 0,58 mm^{-1}
l_e = 21,8 mm
A_e = 37,5 mm^2
A_{min} = 31,2 mm^2
V_e = 820 mm^3

Approx. weight 4,0 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	5200+30/-20%	2390			B65807-P-R30	500
T38	10500+40/-30%	4830			B65807-P-Y38	
N49	2200+30/-20%	1020	1500	0,14 (50 mT, 500 kHz, 100°C)	B65807-P-R49	
N67	3000+30/-20%	1380	1950	0,50 (200 mT, 100 kHz, 100°C)	B65807-P-R67	
N87	3000+30/-20%	1380	1950	0,40 (200 mT, 100 kHz, 100°C)	B65807-P-R87	

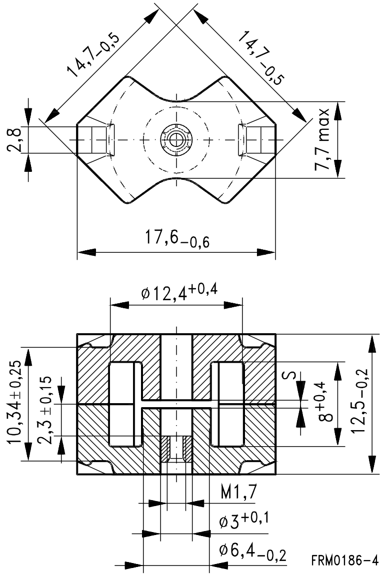
R 6
Core and Accessories



Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	233
Matching handle	B63399	233
Centering pin	B65808	233
Adjusting screw	B65810	233
Core	B65809	230
Clamps	B65808	232
Insulating washer 1	B65808	232
Coil former	B65810	231
Core	B65809	230
Threaded sleeve (glued-in)		
Insulating washer 2	B65808	232

Example of an assembly set

- In accordance with IEC 431



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,8 mm^{-1}
l_e = 25,6 mm
A_e = 32,0 mm^2
V_e = 820 mm^3

Approx. weight 5,1 g/set

Gapped

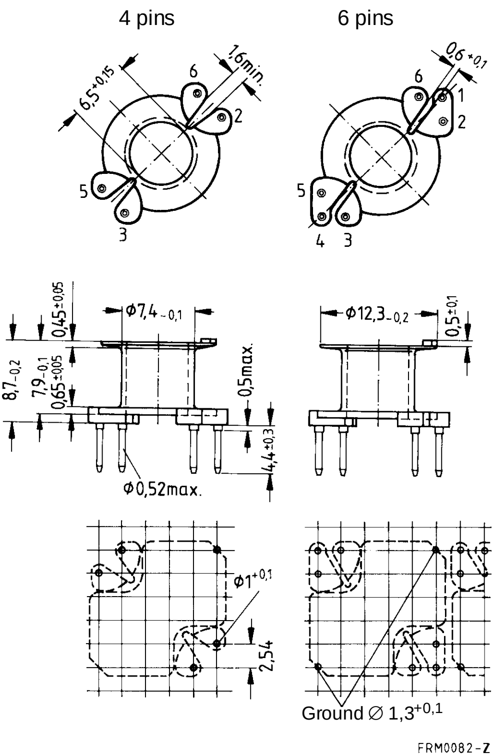
Material	A_L value nH	s approx. mm	μ_e	Ordering code -F with threaded sleeve	PU Sets
M33	63 ± 3%	0,60	40	B65809-F63-A33	500
	100 ± 3%	0,38	64	B65809-F100-A33	
N48	160 ± 3%	0,20	102	B65809-F160-A48	
	200 ± 3%	0,16	127	B65809-F200-A48	
	250 ± 3%	0,11	159	B65809-F250-A48	
	315 ± 3%	0,08	201	B65809-F315-A48	
	400 ± 3%	0,05	255	B65809-F400-A48	

Ungapped

Material	A_L value nH	s approx. mm	μ_e	Ordering code -A with center hole	PU Sets
N26	2300 +30/-20%	--	1460	B65809-A-R26	500
N30	4300 +30/-20%	--	2740	B65809-A-R30	
T35	6000 +30/-20%	--	3820	B65809-A-R35	
T38	8600 +40/-30%	--	5470	B65809-A-Y38	

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
Round pins

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	15,5	30	67	4 6	B65810-C1003-D1 B65810-B1001-D1	500
2	with 4 or 6 pins on request					



Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,4 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Also available as strip clamp on reels

Insulating washer 1 between core and coil former

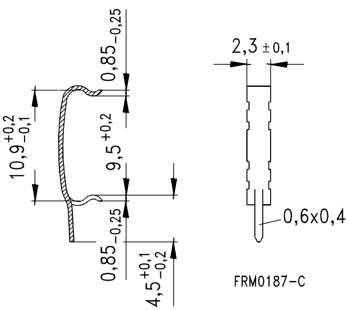
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs

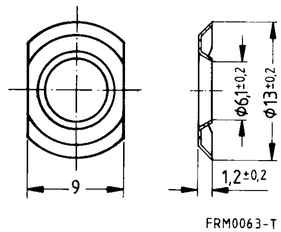
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65808-A2203	1000
Insulating washer 1 (reel packing, PU = 1 reel)	B65808-A5000	2500
Insulating washer 2 (bulk)	B65808-C2005	2500

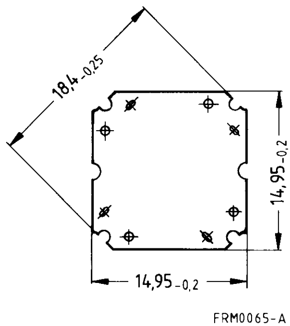
Clamp



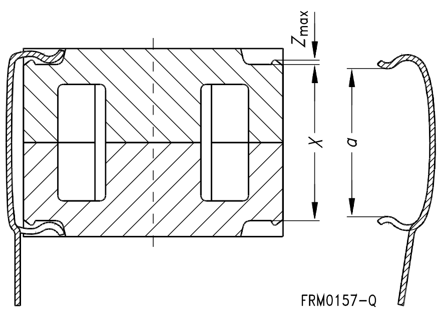
Insulating washer 1



Insulating washer 2



RM clamping forces



F_{min}: Extension of clamp from a to $a_2 = X_{min}$
F_{max}: Extension of clamp from a to $a_1 = X_{max}$

Clamp opening a (mm)		9,5 +0,2
Core nose Z_{max} (mm)		0,22
Height of core pair X (mm)	X_{min}	10,1
	X_{max}	10,6
Clamping force F (N)	F_{min}	7
	F_{max}	50

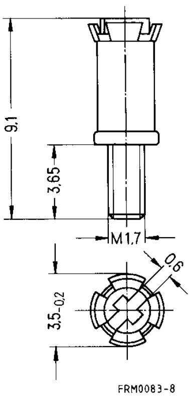
Adjusting screw

- Tube core with thread and core brake made of GFR polyterephthalate

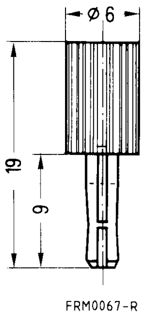
Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin as assembly aid for R core centering

Core R 6		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
M 33	63 100	2,73 × 4,05	Si 31	red	15 10	B65810-C3002-X131	500
N 48	160	2,73 × 4,05	Si 1	yellow	8	B65810-C3002-X101	
	200	2,85 × 4,05	Si 1	white	10	B65810-C3001-X101	
	250	2,73 × 3,45	N 22	brown	16	B65810-C3003-X22	
	315 400	2,73 × 4,05	N 22	black	13 8	B65810-C3002-X22	
Adjusting screwdriver						B63399-B4	10
Handle						B63399-B5	10
Centering pin						B65808-A2008	500

Adjusting screw

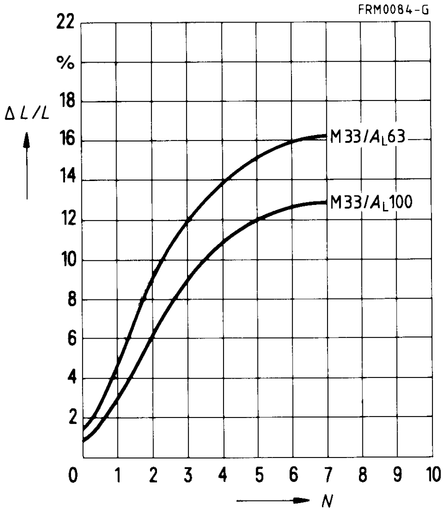


Centering pin

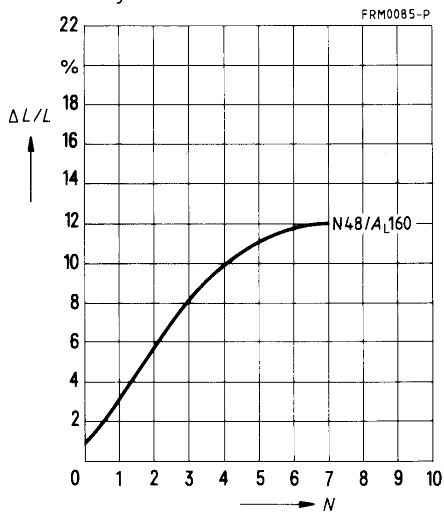


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 1 turn engaged.

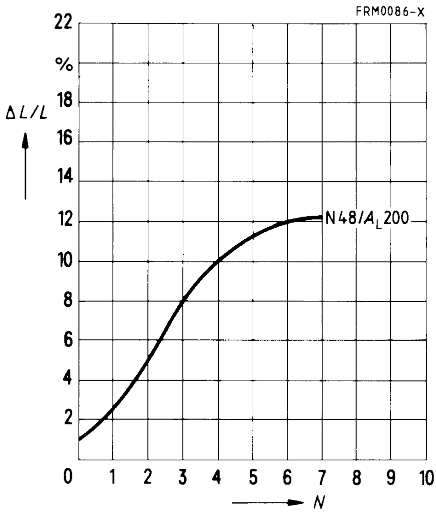
Adjusting screw B65810-C3002-X131
Color code red



Adjusting screw B65810-C3002-X101
Color code yellow

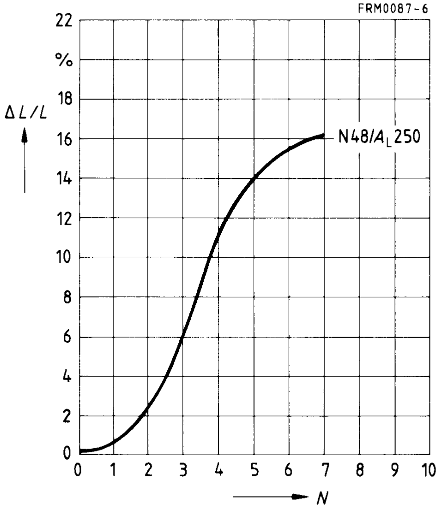


Adjusting screw B65810-C3001-X101
Color code white

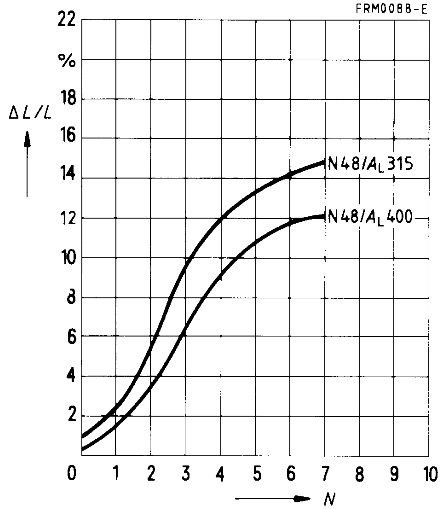


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 1 turn engaged.

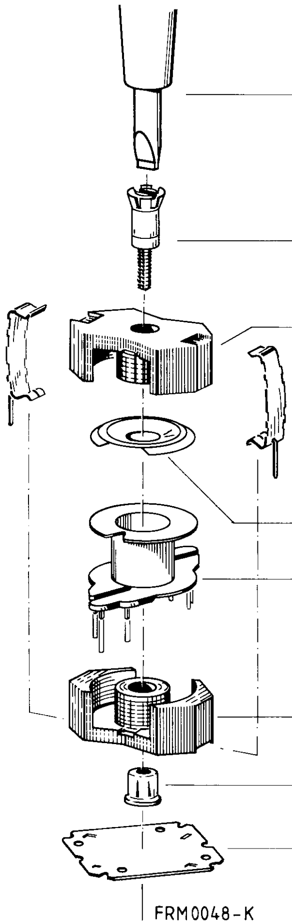
Adjusting screw B65810-C3003-X22
Color code brown



Adjusting screw B65810-C3002-X22
Color code black



RM 7
Core and Accessories



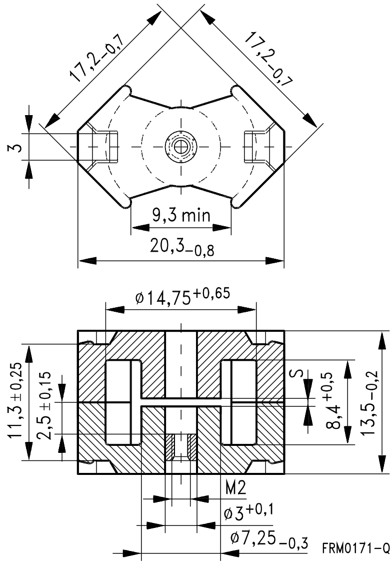
Example of an assembly set

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	223
Matching handle	B63399	241
Centering pin	B65808	241
Adjusting screw	B65659	241
Core	B65819	237
Clamps	B65820	240
Insulating washer 1	B65820	240
Coil former	B65820	239
Core	B65819	237
Threaded sleeve (glued-in)		
Insulating washer 2	B65820	240

Also available:

RM 7 low profile core	B65819-P	244

- In accordance with IEC 431
- Cores without center hole for transformer applications



Magnetic characteristics (per set)

	with center hole	without center hole	
Σl/A	0,74	0,70	mm^{-1}
l_e	29,8	30,4	mm
A_e	40	43,0	mm^2
A_{min}	—	39,0	mm^2
V_e	1200	1340	mm^3

Approx. weight (per set)

m	6,5	7,2	g

Gapped

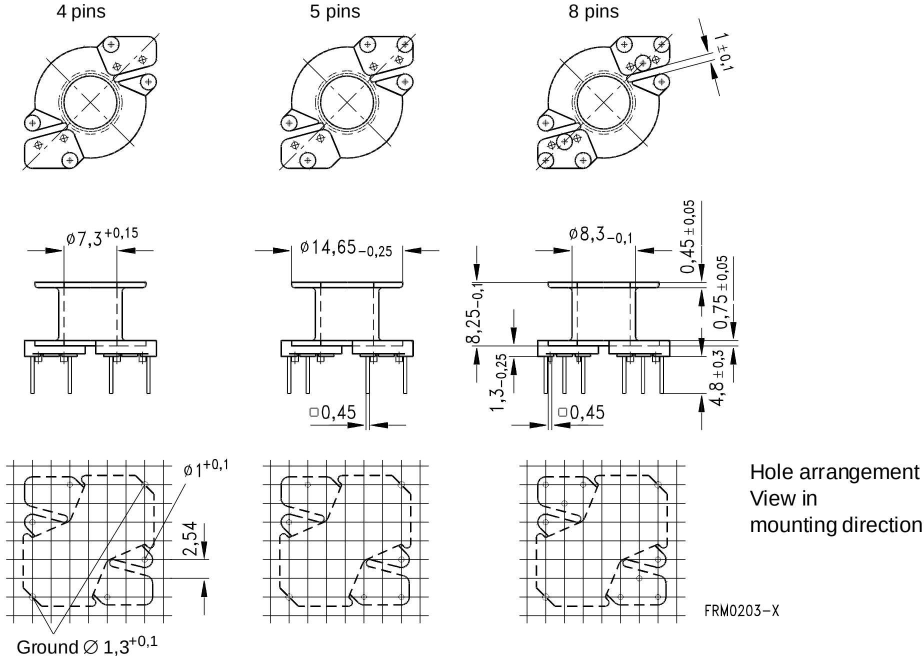
Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -N w. threaded sleeve -J w/o center hole	PU Sets
M33	63 ± 3%	0,70	37,1	B65819-N63-A33	250
	100 ± 3%	0,50	58,9	B65819-N100-A33	
N48	250 ± 3%	0,16	147	B65819-N250-A48	
	315 ± 3%	0,12	186	B65819-N315-A48	
N41	160 ± 5%	0,30	89	B65819-J160-J41	
	250 ± 5%	0,18	139	B65819-J250-J41	

Ungapped

Mate- rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -A with center hole -J w/o center hole	PU Sets
N26	2800+30/-20%	1650			B65819-A-R26	250
N30	5000+30/-20%	2780			B65819-J-R30	
T35	7000+30/-20%	3900			B65819-J-R35	
T38	10000+40/-30%	5570			B65819-J-Y38	
N47	2000+30/-20%	1120	1250	0,20 (50 mT, 500 kHz, 25°C)	B65819-J-R47	
N67	2700+30/-20%	1510	1600	0,96 (200 mT, 100 kHz, 100°C)	B65819-J-R67	
N87	2700+30/-20%	1510	1600	0,77 (200 mT, 100 kHz, 100°C)	B65819-J-R87	
N41	3400+30/-20	1910	1600	0,23 (200 mT, 25 kHz, 100°C)	B65819-J-R41	

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	21,4	35,6	56	4 5 8	B65820-B1004-D1 B65820-B1005-D1 B65820-B1008-D1	250
2	with 5 or 8 pins on request					



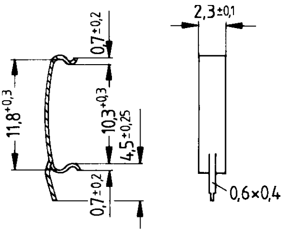
Clamp
- With ground terminal, made of stainless spring steel (tinned), 0,4 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 50 N per pair of clamps (typical value)

Insulating washer 1 between core and coil former
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

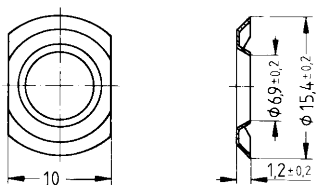
	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65820-B2001	500
Insulating washer 1 (reel packing, PU = 1 reel)	B65820-A5000	2000
Insulating washer 2 (bulk)	B65820-C3005	2000

Clamp



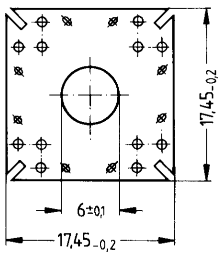
FRM0090-Q

Insulating washer 1



FRM0091-Y

Insulating washer 2



FRM0092-7

Adjusting screw

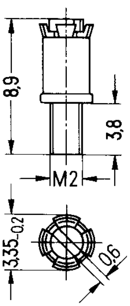
- Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin as assembly aid for RM core centering

Core RM 7		**Adjusting screw**				Min. adjusting range	Ordering code	PU
Material	A_L value nH	Fig.	Tube core ∅ × length mm	Material	Color code	%		Pcs
M 33	63	a	2,60 × 3,7	Si 1	white	16	B65659-F1-X101	500
	100	c	2,82 × 4,4	Si 1	brown	17	B65659-F4-X101	
M 48	250	a	2,60 × 3,7	N 22	red	12	B65659-F1-X23	
	315	b	2,75 × 4,4	N 22	black	16	B65659-F3-X23	
Adjusting screwdriver							B63399-B4	10
Handle							B63399-B5	10
Centering pin							B65808-A2008	500

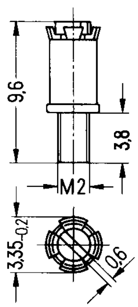
Adjusting screws

a



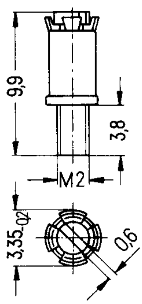
FRM0093-F

b



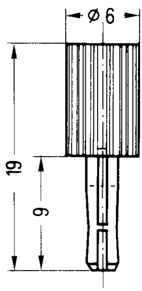
FRM0094-N

c



FRM0095-W

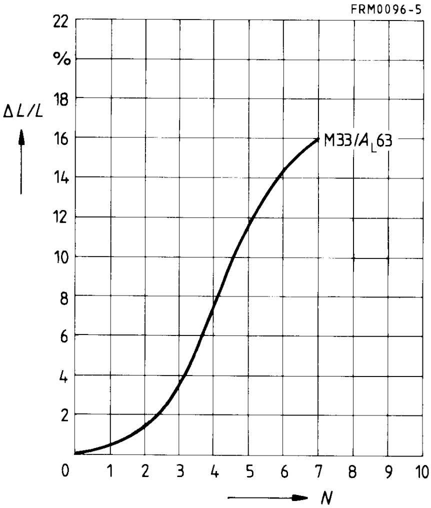
Centering pin



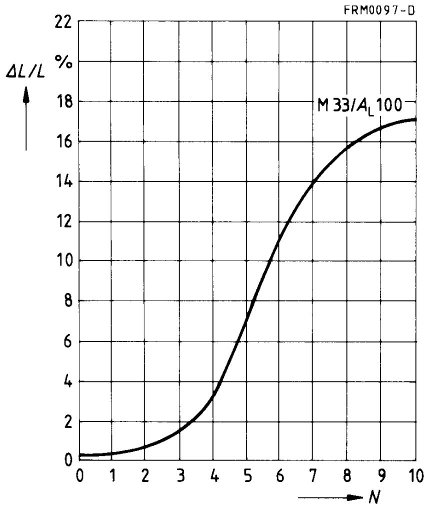
FRM0067-R

Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 2 turns engaged.

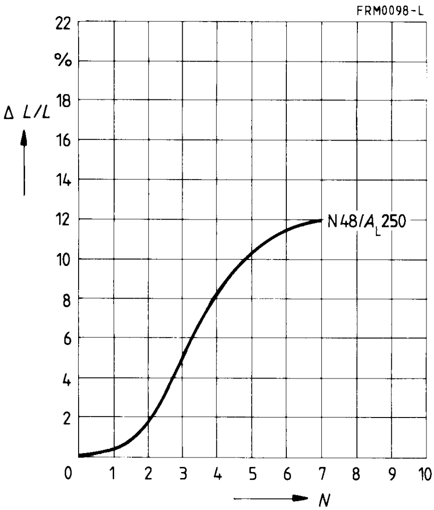
Adjusting screw B65659-F1-X101
Color code white



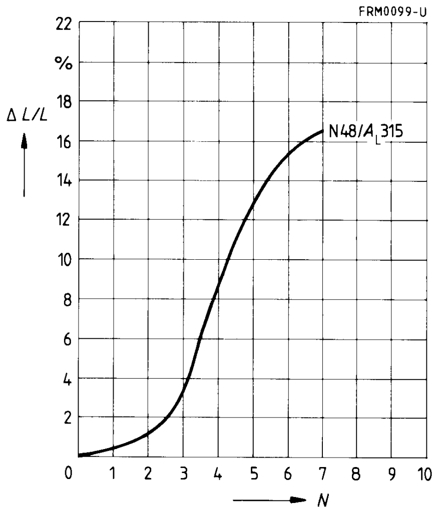
Adjusting screw B65659-F4-X101
Color code brown



Adjusting screw B65659-F1-X23
Color code red

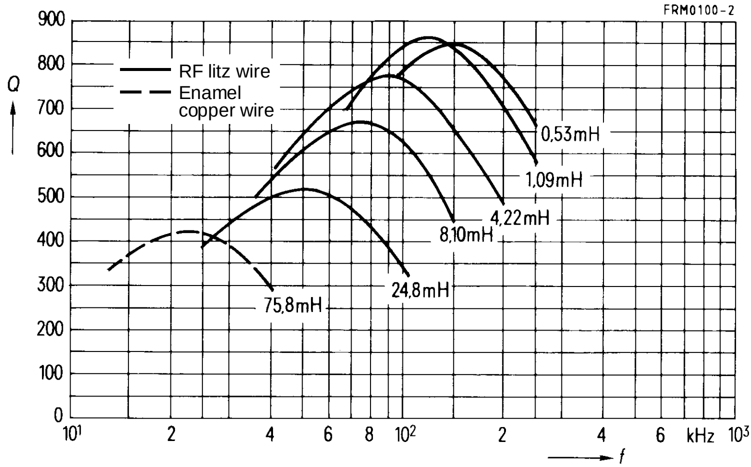


Adjusting screw B65659-F3-X23
Color code black

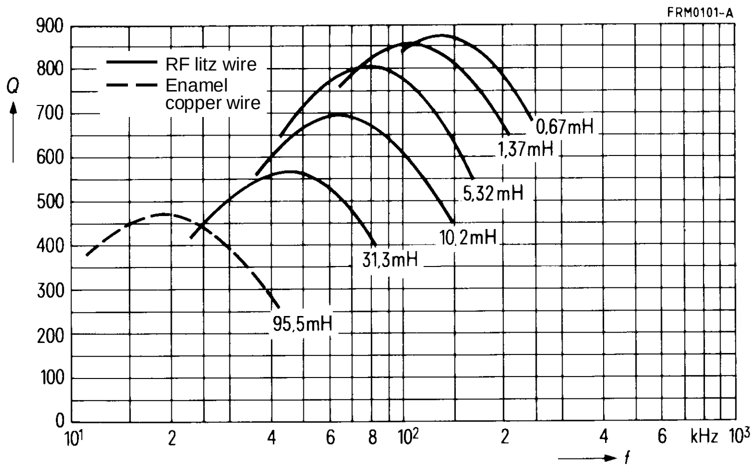


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1,5 mT

Material	L (mH) for A_L = 250 nH	L (mH) for A_L = 315 nH	Turns	Wire; RF litz wire	Sections
N 48	75,80	95,50	550	0,18 CuL	1
	24,80	31,30	315	6 × 0,07 CuLS	1
	8,10	10,20	180	20 × 0,05 CuLS	1
	4,22	5,32	130	45 × 0,04 CuLS	1
	1,09	1,37	66	90 × 0,04 CuLS	1
	0,53	0,67	46	120 × 0,04 CuLS	1



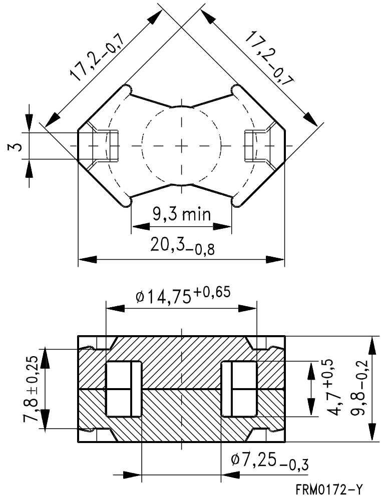
N 48
A_L = 250 nH



N 48
A_L = 315 nH

RM 7 »Low Profile«
Core B65819-P

- For compact transformers
- Without center hole



Magnetic characteristics (per set)

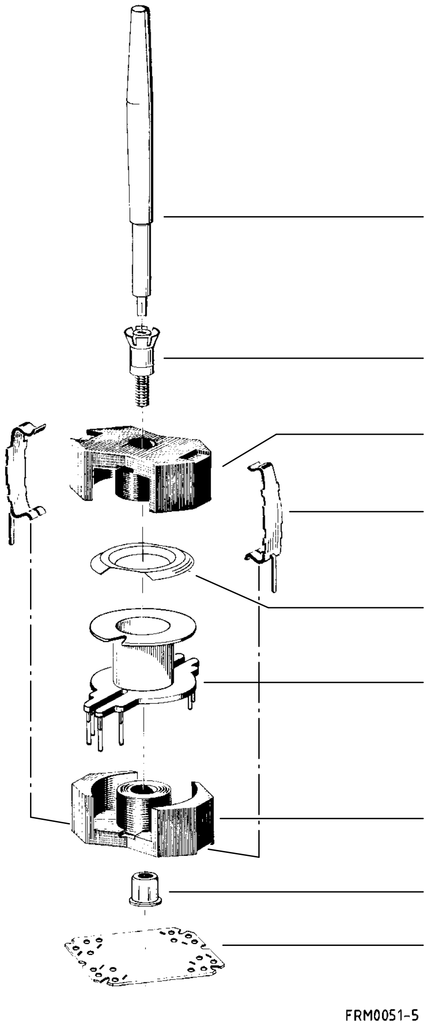
$\Sigma l/A$ = 0,52 mm^{-1}
l_e = 23,5 mm
A_e = 45,3 mm^2
A_{min} = 39,6 mm^2
V_e = 1060 mm^3

Approx. weight 5,7 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	5600+30/-20%	2310			B65819-P-R30	250
T38	11500+40/-30%	4740			B65819-P-Y38	
N49	2400+30/-20%	990	1700	0,21 (50 mT, 500 kHz, 100°C)	B65819-P-R49	
N67	3300+30/-20%	1360	2200	0,71 (200 mT, 100 kHz, 100°C)	B65819-P-R67	
N87	3300+30/-20%	1360	2200	0,57 (200 mT, 100 kHz, 100°C)	B65819-P-R87	

RM 8
Core and Accessories

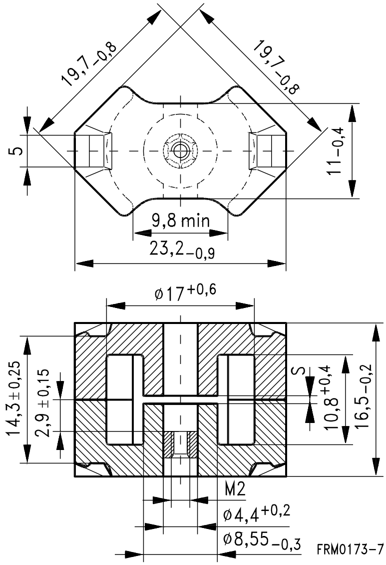


Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	253
Matching handle	B63399	253
Adjusting screw	B65812	253
Core	B65811	246
Clamps	B65812	252
Insulating washer 1	B65812	252
Coil former	B65812	249
Core	B65811	246
Threaded sleeve (glued-in)		
Insulating washer 2	B65812	252

Also available:

Coil former for power applications	B65812	251
Core for nonlinear chokes	B65811-H	248
Coil former for SMPS transformers	B65812	250
RM 8 low profile core	B65811-P	257

- In accordance with IEC 431
- Cores without center hole
  for transformer applications
- For nonlinear chokes see B65811-H



Magnetic characteristics (per set)

	with center hole	without center hole	
Σl/A	0,67	0,59	mm^{-1}
l_e	35,1	38,0	mm
A_e	52,0	64,0	mm^2
A_{min}	—	55,0	mm^2
V_e	1840	2430	mm^3

Approx. weight (per set)

m	10,7	12	g

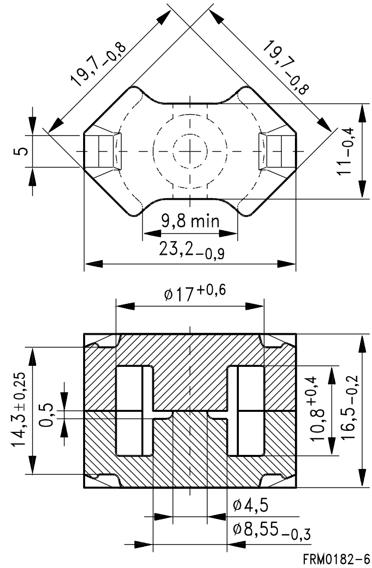
Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -F w. threaded sleeve -J w/o center hole	PU Sets
M33	100 ± 3%	0,7	53	B65811-F100-A33	200
N48	250 ± 3%	0,23	133	B65811-F250-A48	
	315 ± 3%	0,17	168	B65811-F315-A48	
	400 ± 3%	0,14	213	B65811-F400-A48	
	500 ± 3%	0,12	267	B65811-F500-A48	
	630 ± 5%	0,10	336	B65811-F630-J48	
N41	250 ± 5%	0,24	117	B65811-J250-J41	
	1600 ± 10%	0,04	752	B65811-J1600-K41	

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -J w/o center hole	PU Sets
N26	2900+30/-20%	1550			B65811-D-R26	200
N30	5700+30/-20%	2680			B65811-J-R30	
T35	8400+30/-20%	3940			B65811-J-R35	
T38	12500+40/-30%	5870			B65811-J-Y38	
N47	2400+30/-20%	1130	1500	0,33 (50 mT, 500 kHz, 25°C)	B65811-J-R47	
N67	3300+30/-20%	1560	1900	1,50 (200 mT, 100 kHz, 100°C)	B65811-J-R67	
N87	3300+30/-20%	1560	1900	1,20 (200 mT, 100 kHz, 100°C)	B65811-J-R87	
N41	4100+30/-20	1930	1900	0,36 (200 mT, 25 kHz, 100°C)	B65811-J-R41	

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters



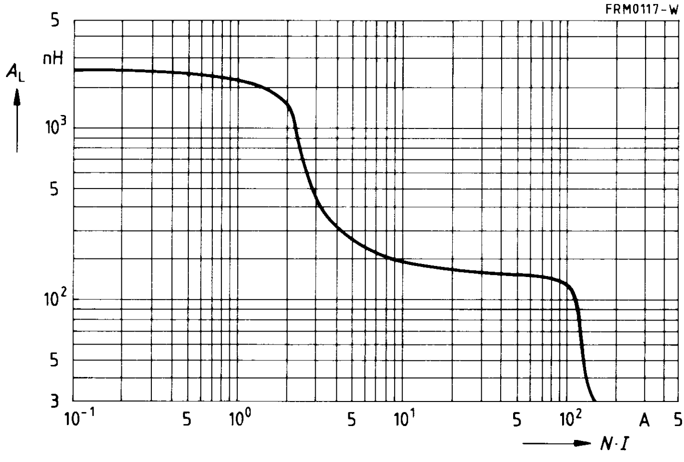
Magnetic characteristics (per set)

$\Sigma l/A$ = 0,59 mm^{-1}
l_e = 38 mm
A_e = 64 mm^2
A_{min} = 55 mm^2
V_e = 2430 mm^3

Approx. weight 12 g/set

Material	A_L value nH	Ordering code	PU Sets
N41	2500 ± 30%	B65811-H2500-X41	200

A_L value versus ampere-turns $N \cdot I$ dc, typical curve
(Measuring flux density $\hat{B} \leq 1$ mT, measuring frequency f = 10 kHz)

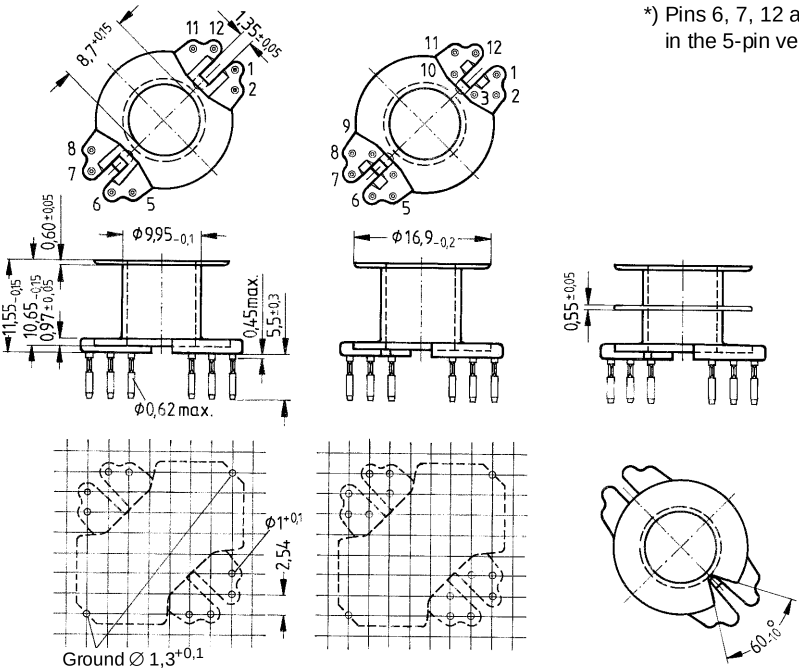


Standard: to IEC 431 and DIN 41981
Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
Pins squared in the start-of-winding area
Also available in stick magazines

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	30	42	47	5 8 12	B65812-K1005-D1 B65812-K1008-D1 B65812-K1012-D1	200
2	28,4	42	50	5 8 12	B65812-K1005-D2 B65812-K1008-D2 B65812-K1012-D2	

5 and 8 pins*) 12 pins

*) Pins 6, 7, 12 are omitted in the 5-pin version



Hole arrangement
View in mounting direction

FRM0194-U

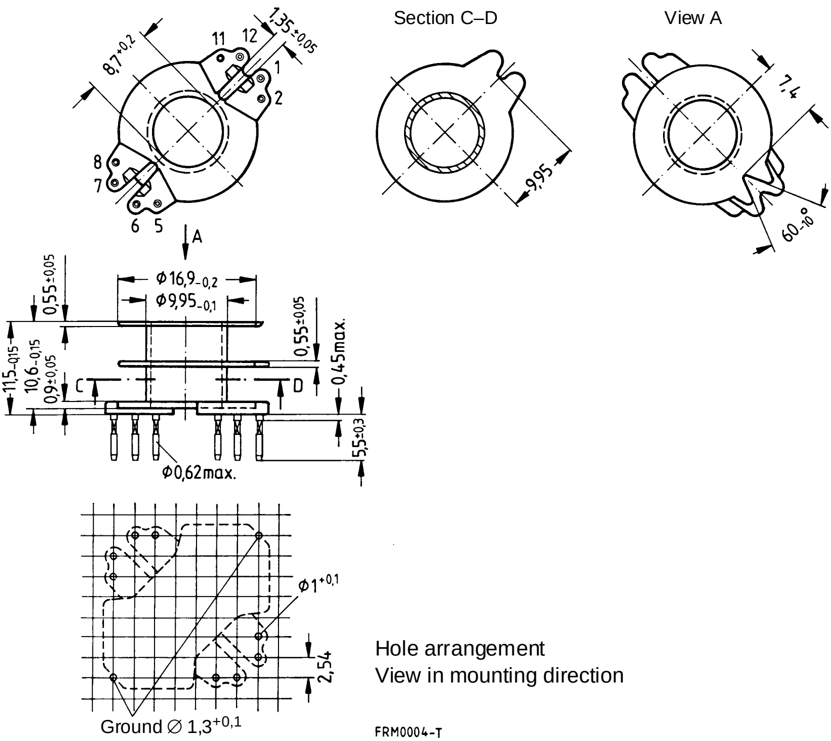
Coil former for SMPS transformers with line isolation

The creepage distances and clearances are designed such that the coil former is suitable for use in SMPS transformers with line isolation.

- Closed center flange with external wire guide
- Pins squared in the start-of-winding area
- Optimized for use with automatic winding machines

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
2	28,4	42	50	8	B65812-X1108-D2	200



Hole arrangement
View in mounting direction

FRM0004-T

Coil former for power applications

Optimized for automatic winding

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

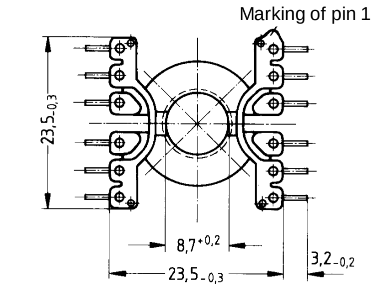
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

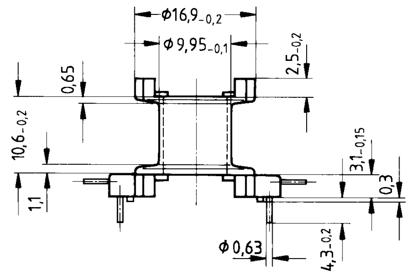
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

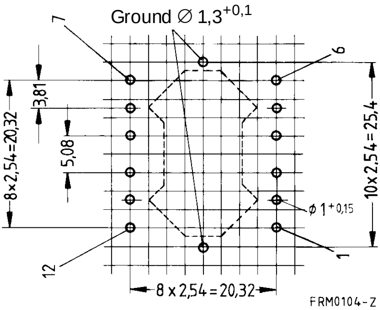
Winding: see page 150

For matching clamp and insulating washer 1 see page 252

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	30	42	47	12	B65812-B1512-T1	200







Hole arrangement
View in mounting direction
(Note half pitch!)

Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,4 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 60 N per pair of clamps (typical value)
- Also available as strip clamp on reels

Insulating washer 1 between core and coil former

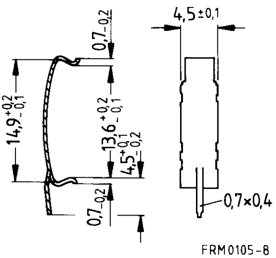
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs

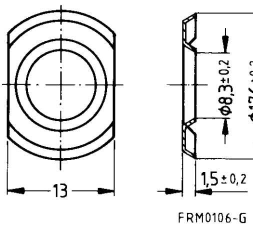
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65812-A2203	400
Insulating washer 1 (reel packing, PU = 1 reel)	B65812-A5000	1200
Insulating washer 2 (bulk)	B65812-C2005	1200

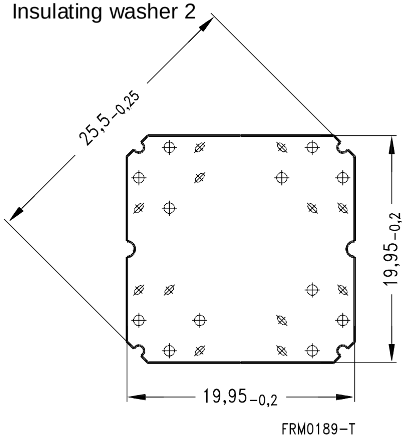
Clamp



Insulating washer 1



Insulating washer 2

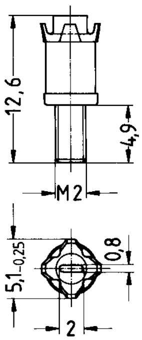


Adjusting screw

- Tube core with thread and core brake made of GFR polyterephthalate
- Also available in magazines

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

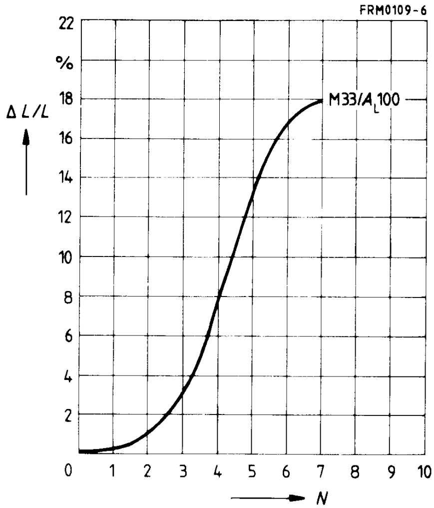
Core RM 8		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
M 33	100	3,85 × 5,0	Si 1	yellow	16	B65812-B3003-X101	200
	100	3,85 × 5,0	Si 31	red	12	B65812-B3003-X131	
N 48	250	4,18 × 5,0	Si 1	white	12	B65812-B3001-X101	
	315	3,85 × 5,0	N 22	gray	13	B65812-B3003-X22	
	400	4,18 × 4,0	N 22	brown	17	B65812-B3002-X22	
	500 630	4,18 × 5,0	N 22	black	13 9	B65812-B3001-X22	
Adjusting screwdriver						B63399-B1	10
Handle						B63399-B5	10



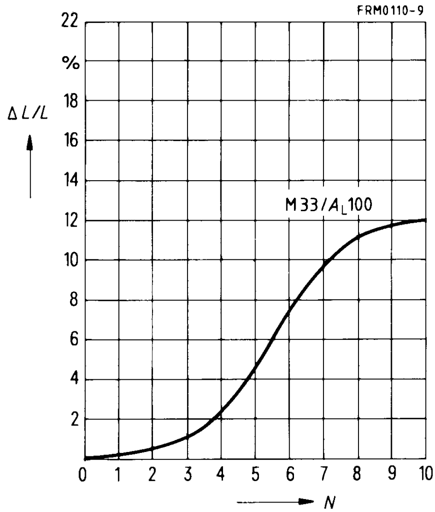
FRM0108-X

Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 2 turns engaged.

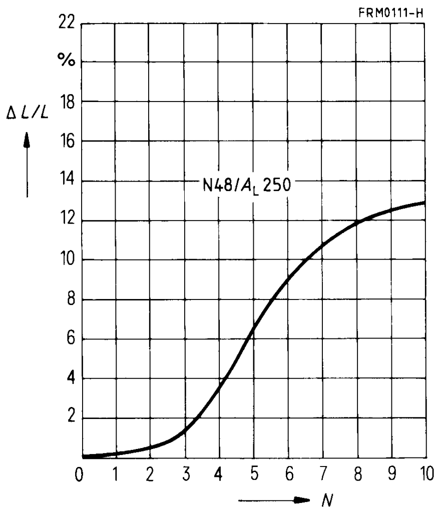
Adjusting screw B65812-B3003-X101
Color code yellow



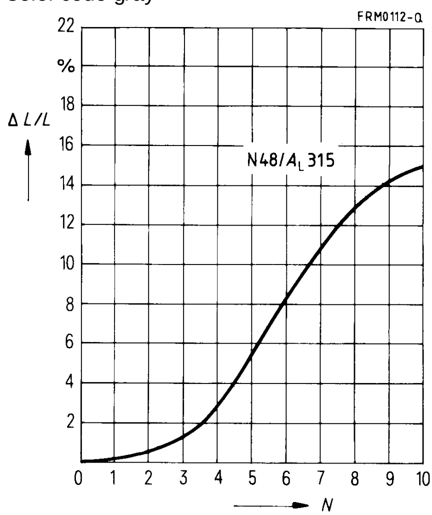
Adjusting screw B65812-B3003-X131
Color code red



Adjusting screw B65812-B3001-X101
Color code white

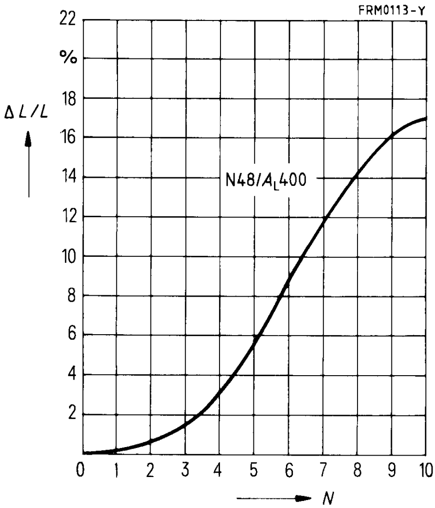


Adjusting screw B65812-B3003-X22
Color code gray

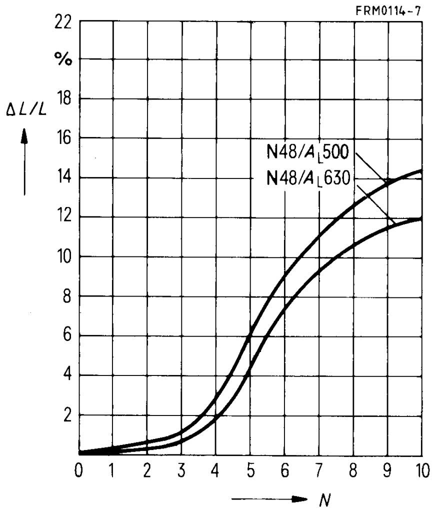


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 2 turns engaged.

Adjusting screw B65812-B3002-X22
Color code brown

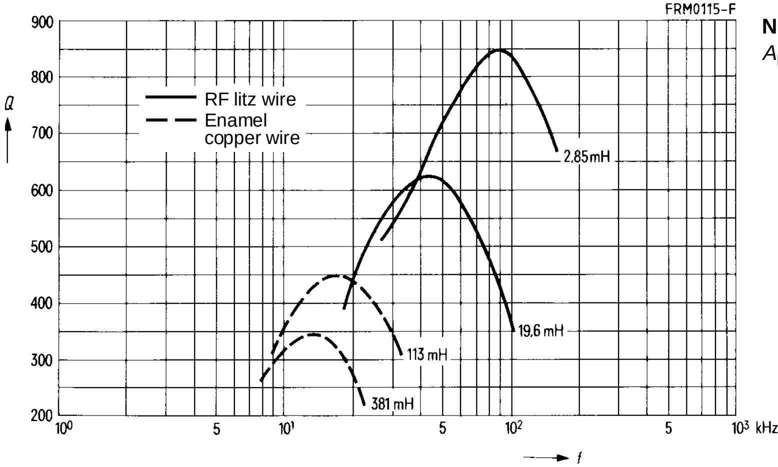


Adjusting screw B65812-B3001-X22
Color code black

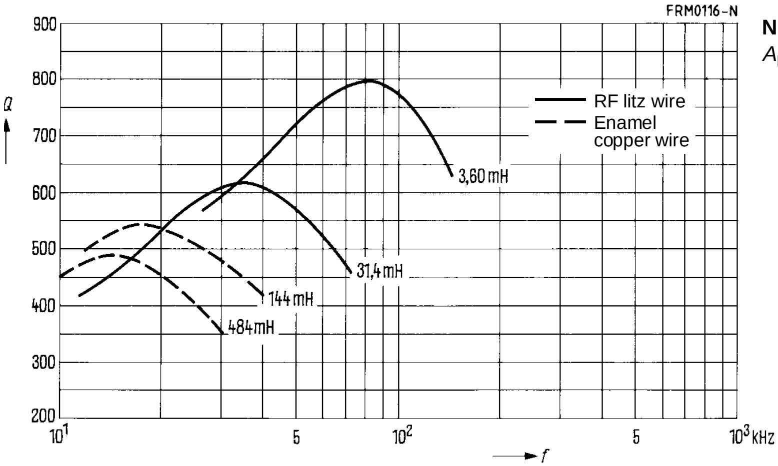


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 2 mT

Material	L (mH) for A_L = 315 nH	L (mH) for A_L = 400 nH	Turns	Wire; RF litz wire	Sections
N 48	381	484	1100	0,15 CuL	1
	113	144	600	0,2 CuL	1
	19,6	31,4	280	20 × 0,05 CuLS	1
	2,85	3,6	95	60 × 0,05 CuLS	1

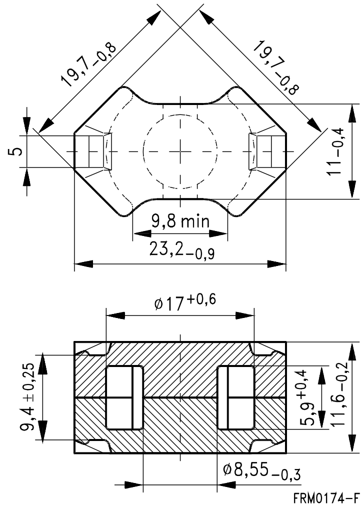


N 48
A_L = 315 nH



N 48
A_L = 400 nH

- For compact transformers
- Without center hole



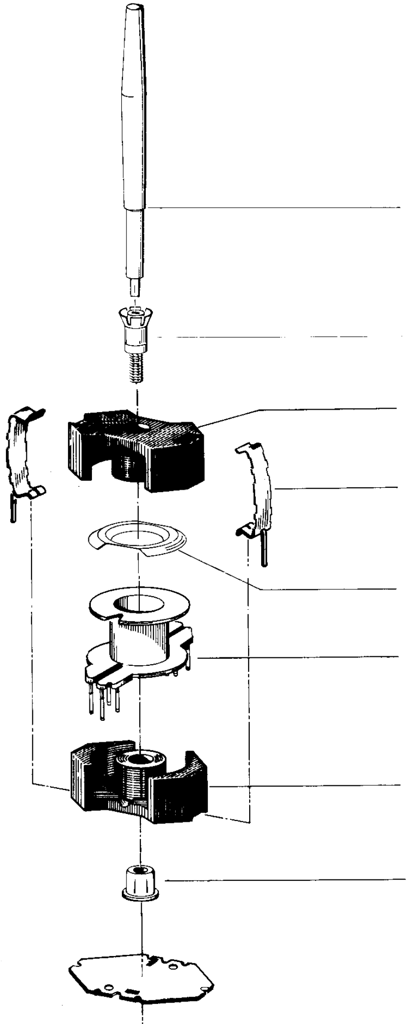
Magnetic characteristics (per set)

$\Sigma l/A$ = 0,44 mm^{-1}
l_e = 28,7 mm
A_e = 64,9 mm^2
A_{min} = 55,4 mm^2
V_e = 1860 mm^3

Approx. weight 9,2 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	6800+30/-20%	2390			B65811-P-R30	200
T38	15000+40/-30%	5270			B65811-P-Y38	
N49	2900+30/-20%	1020	2000	0,33 (50 mT, 500 kHz, 100°C)	B65811-P-R49	
N67	4100+30/-20%	1440	2550	1,15 (200 mT, 100 kHz, 100°C)	B65811-P-R67	
N87	4100+30/-20%	1440	2550	0,92 (200 mT, 100 kHz, 100°C)	B65811-P-R87	

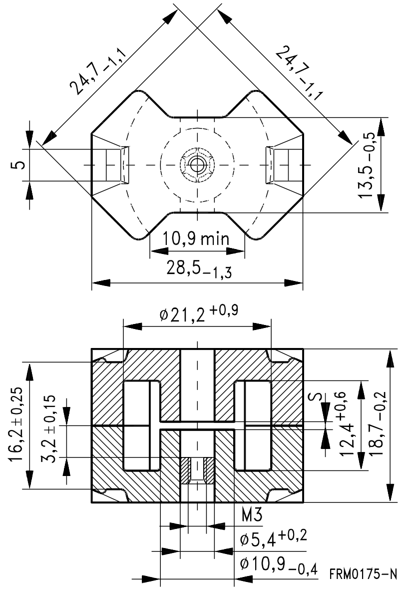


FRM0053-L

Example of an assembly set

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	266
Matching handle	B63399	266
Adjusting screw	B65679	266
Core	B65813	259
Clamps	B65814	265
Insulating washer 1	B65814	265
Coil former	B65814	262
Core	B65813	259
Threaded sleeve (glued-in)		
Insulating washer 2	B65814	265
Also available:		
Coil former for power applications	B65814	263
Core and coil former for nonlinear chokes	B65813-H B65814	261 264
RM 10 low profile core	B65813-P	268

- In accordance with IEC 431 and DIN 41 980
- Cores without center hole for transformer applications
- For nonlinear chokes see B65813-H



Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma l/A$	0,5	0,45	mm^{-1}
l_e	42	44	mm
A_e	83	98	mm^2
A_{min}	—	90	mm^2
V_e	3470	4310	mm^3

Approx. weight (per set)

m	20,7	22	g

Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -N w. threaded sleeve -J w/o center hole	PU Sets
N48	315 ± 3%	0,28	125	B65813-N315-A48	200
	400 ± 3%	0,21	160	B65813-N400-A48	
	630 ± 3%	0,13	250	B65813-N630-A48	
N41	250 ± 3%	0,44	90	B65813-J250-A41	
	630 ± 5%	0,13	226	B65813-J630-J41	
	1600 ± 10%	0,04	573	B65813-J1600-K41	

Ungapped

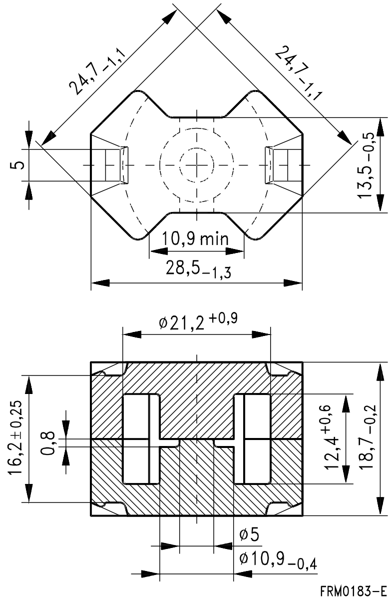
Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -J w/o center hole	PU Sets
N30	7600+30/-20%	2720			B65813-J-R30	200
T35	11000+30/-20%	3940			B65813-J-R35	
T38	16000+40/-30%	5730			B65813-J-Y38	
N47	3100+30/-20%	1100	1950	0,65 (50 mT, 500 kHz, 25°C)	B65813-J-R47	
N67	4200+30/-20%	1500	2550	2,75 (200 mT, 100 kHz, 100°C)	B65813-J-R67	
N87	4200+30/-20%	1500	2550	2,30 (200 mT, 100 kHz, 100°C)	B65813-J-R87	
N41	5500+30/-20	1960	2550	0,80 (200 mT, 25 kHz, 100°C)	B65813-J-R41	

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters

Magnetic characteristics (per set)

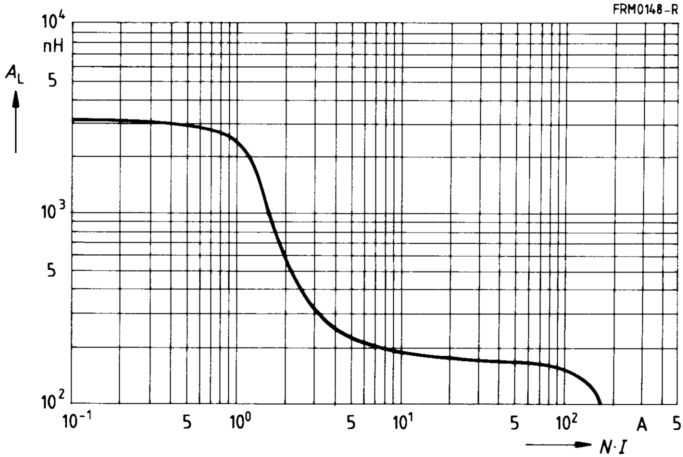
$\Sigma l/A$ = 0,45 mm^{-1}
l_e = 44 mm
A_e = 98 mm^2
A_{min} = 90 mm^2
V_e = 4310 mm^3

Approx. weight 22 g/set



Material	A_L value nH	Ordering code	PU Sets
N41	3200 ± 30%	B65813-H3200-X41	200

A_L value versus ampere-turns $N \cdot I$ dc, typical curve

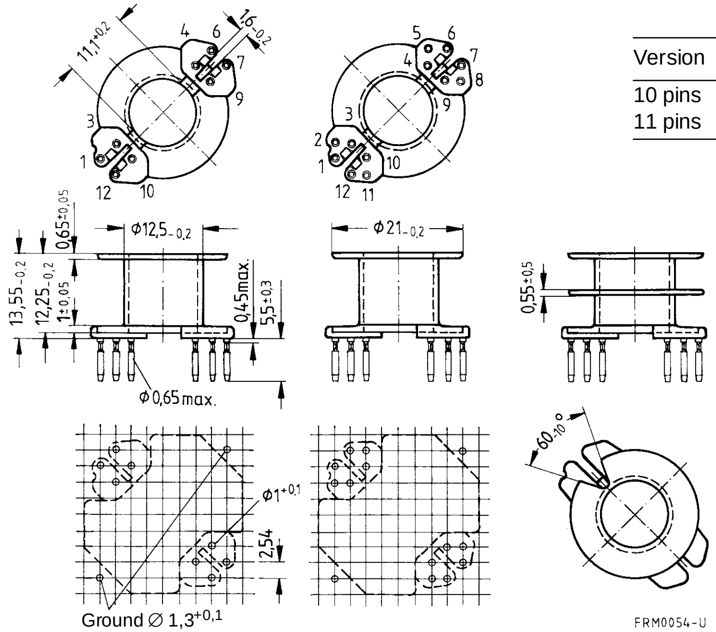


Measuring flux density $\hat{B} \leq 1$ mT,
Measuring frequency f = 10 kHz

Standard: to IEC 431 and DIN 41981
Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
Pins squared in the start-of-winding area
Also available in stick magazines

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	41,5	52	43	8 10 11 12	B65814-K1008-D1 B65814-K1010-D1 B65814-K1011-D1 B65814-K1012-D1	200
2	39	52	46	8 10 11 12	B65814-K1008-D2 B65814-K1010-D2 B65814-K1011-D2 B65814-K1012-D2	

8 pins 10, 11 and 12 pins



Version	Pins omitted
10 pins 11 pins	2, 11 9

Hole arrangement
View in
mounting direction

Coil former for power applications

Optimized for automatic winding

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

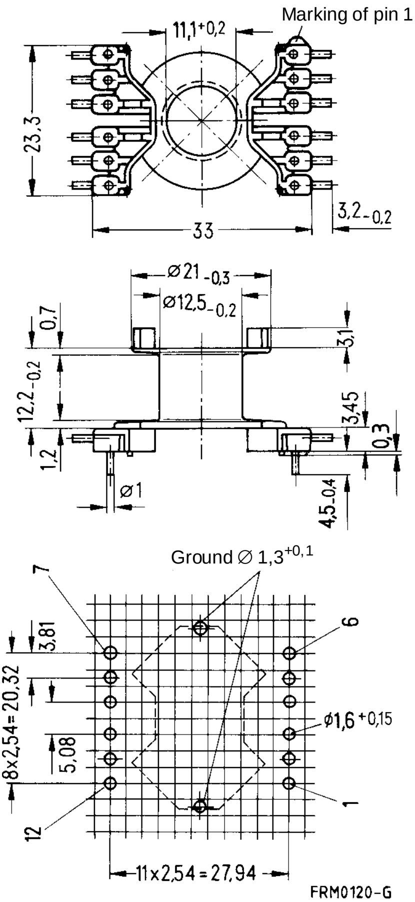
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: see page 150

For matching clamp see page 265

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	41,5	52	43	12	B65814-B1512-T1	200



Hole arrangement
View in mounting direction
(Note half pitch!)

Coil former for nonlinear chokes

- Suitable for wire gauges 0,8 ... 1,5 mm
- The winding wires can be fixed in the coil former to be able to use the standard grid.

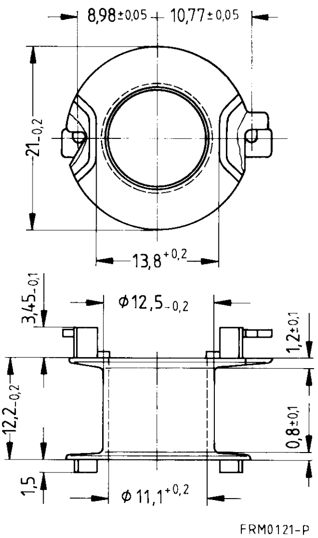
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: see page 150

For matching clamp see page 265

Sections	A_N mm²	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	41,5	52	43	B65814-J1000-T1	200



Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,45 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 60 N per pair of clamps (typical value)
- Also available as strip clamp on reels

Insulating washer 1 between core and coil former

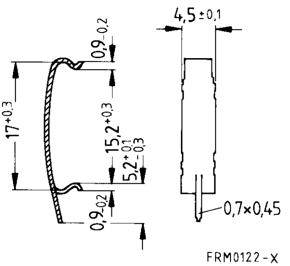
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs

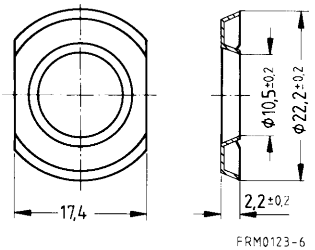
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65814-A2203	400
Insulating washer 1 (reel packing, PU = 1 reel)	B65814-B5000	1200
Insulating washer 2 (bulk)	B65814-B2005	800

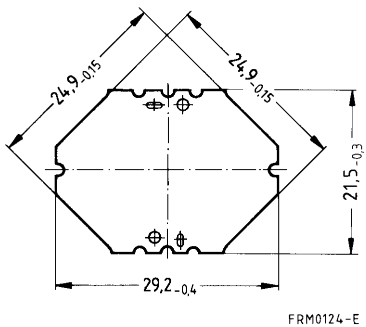
Clamp



Insulating washer 1



Insulating washer 2

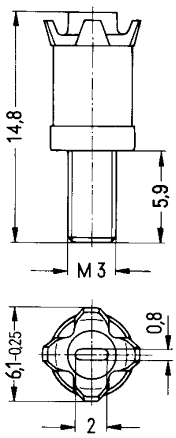


Adjusting screw

- Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

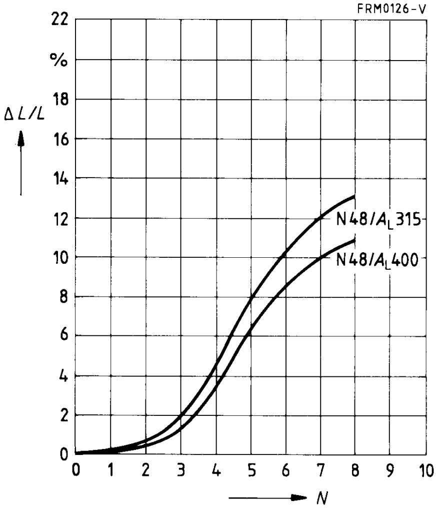
Core RM 10		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
N 48	315 400	4,55 × 6,3	N 22	red	13 10	B65679-E3-X22	200
	400 630	4,98 × 6,3	N 22	black	18 11	B65679-E3-X22	
	630	5,15 × 6,3	N 22	white	17	B65679-E1-X22	
Adjusting screwdriver						B63399-B1	10
Handle						B63399-B5	10



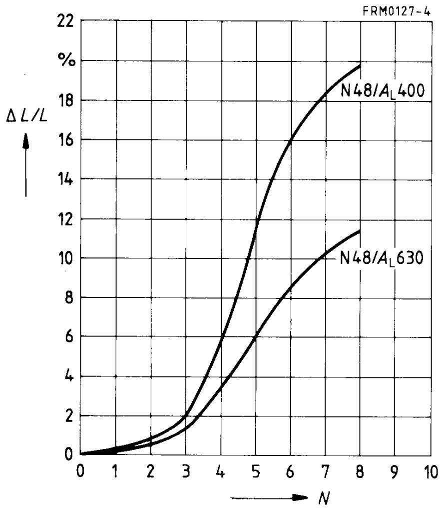
FRM0125-M

Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 2 turns engaged.

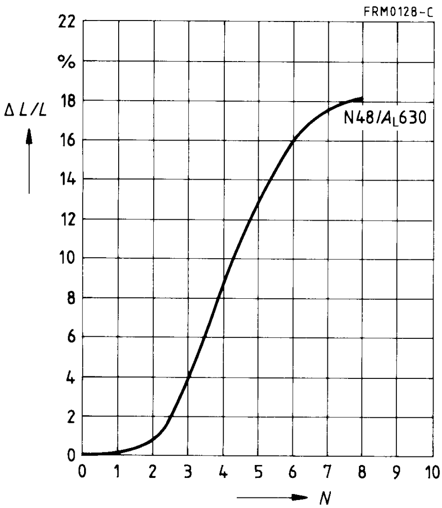
Adjusting screw B65679-E3-X22
Color code red



Adjusting screw B65679-E2-X22
Color code black



Adjusting screw B65679-E1-X22
Color code white

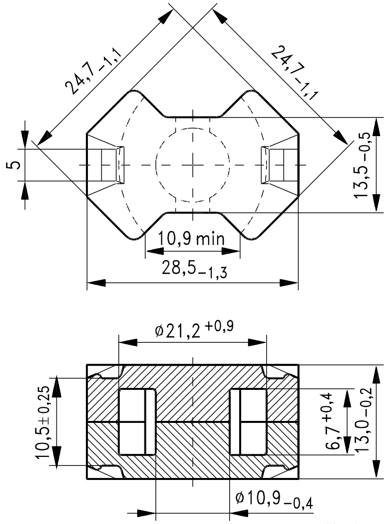


- For compact transformers
- Without center hole

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,34 mm^{-1}
l_e = 33,9 mm
A_e = 99,1 mm^2
A_{min} = 93,3 mm^2
V_e = 3360 mm^3

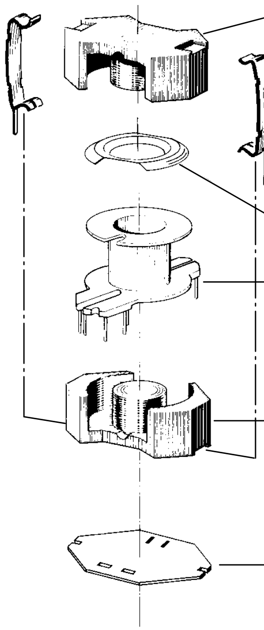
Approx. weight 17,2 g/set



FRM0176-W

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	9100+30/-20%	2470			B65813-P-R30	200
T38	19500+40/-30%	5290			B65813-P-Y38	
N49	3700+30/-20%	1000	2600	0,62 (50 mT, 500 kHz, 100°C)	B65813-P-R49	
N67	5200+30/-20%	1410	3300	2,15 (200 mT, 100 kHz, 100°C)	B65813-P-R67	
N87	5200+30/-20%	1410	3300	1,72 (200 mT, 100 kHz, 100°C)	B65813-P-R87	



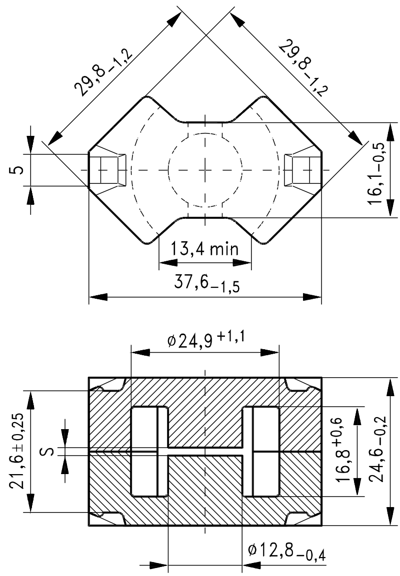
FRM0129-K

Individual parts	Part no.	Page
Core	B65815	270
Clamps	B65816	277
Insulating washer 1	B65816	277
Coil former	B65816	273
Core	B65815	270
Insulating washer 2	B65816	277

Also available:

Coil former for power applications	B65816	274
Pile-up coil former	B65816	275
Core for nonlinear chokes	B65815-H	272
Coil former for nonlinear chokes	B65816	276
RM 12 low profile core	B65815-P	278

- Optimized core cross section and increased thickness of base for power applications
- Without center hole
- For nonlinear chokes see B65815-H



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,39 mm^{-1}
l_e = 57,0 mm
A_e = 146 mm^2
A_{min} = 125 mm^2
V_e = 8340 mm^3

Approx. weight 45 g/set

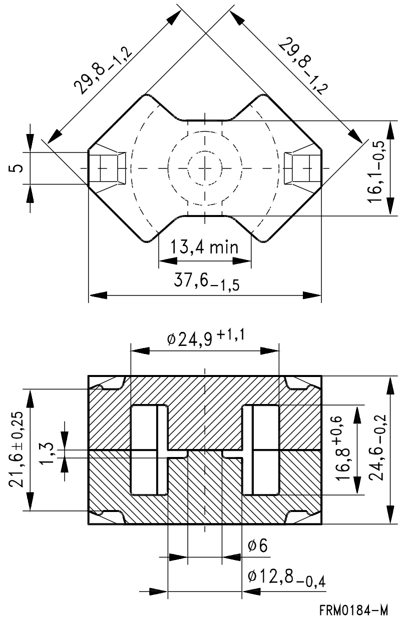
Gapped

Material	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N41	160 ± 3%	1,30	50	B65815-E160-A41	100
	250 ± 3%	0,70	78	B65815-E250-A41	
	400 ± 5%	0,35	124	B65815-E400-J41	
	1000 ± 5%	0,12	310	B65815-E1000-J41	

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	8400+30/-20%	2610			B65815-E-R30	100
T35	12800+30/-20%	3970			B65815-E-R35	
N47	3700+30/-20%	1150	2250	1,1 (50 mT, 500 kHz, 25°C)	B65815-E-R47	
N67	5300+30/-20%	1640	2900	5,5 (200 mT, 100 kHz, 100°C)	B65815-E-R67	
N87	5300+30/-20%	1640	2900	4,5 (200 mT, 100 kHz, 100°C)	B65815-E-R87	
N41	6000+30/-20	1860	2900	1,4 (200 mT, 25 kHz, 100°C)	B65815-E-R41	

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters



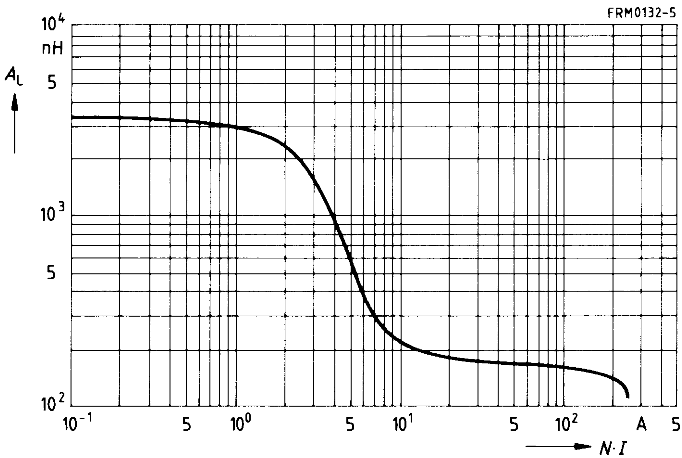
Magnetic characteristics (per set)

$\Sigma l/A$ = 0,39 mm^{-1}
l_e = 57 mm
A_e = 146 mm^2
A_{min} = 125 mm^2
V_e = 8340 mm^3

Approx. weight 44 g/set

Material	A_L value nH	Ordering code	PU Sets
N41	3700 ± 30%	B65815-H3700-X41	100

***A_L* value versus ampere-turns *$N \cdot I$* dc, typical curve**

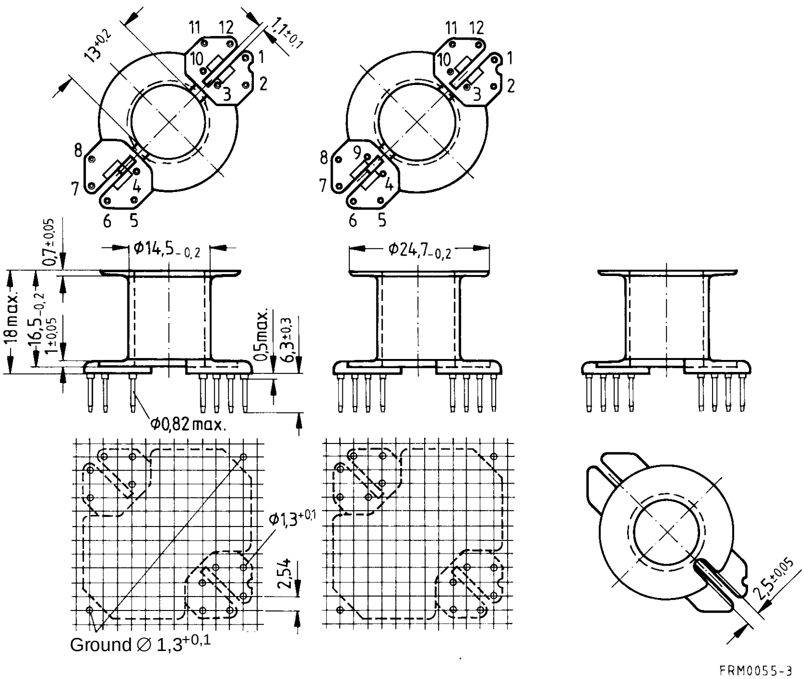


Measuring flux density $\hat{B}$ ≤1 mT,
Measuring frequency f = 10 kHz

Coil former with round pins
Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
For matching clamp and insulating washers see page 277

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	73	61	28,7	11 12	B65816-A1011-D1 B65816-A1012-D1	100
2	with 12 pins on request					

11 pins 12 pins



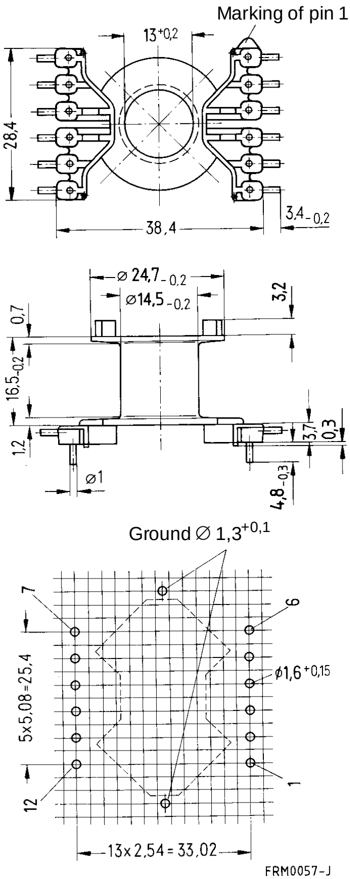
Hole arrangement
View in mounting direction

Coil former for power applications

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150

For matching clamp see page 277

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	72	61	28,7	12	B65816-B1512-T1	100



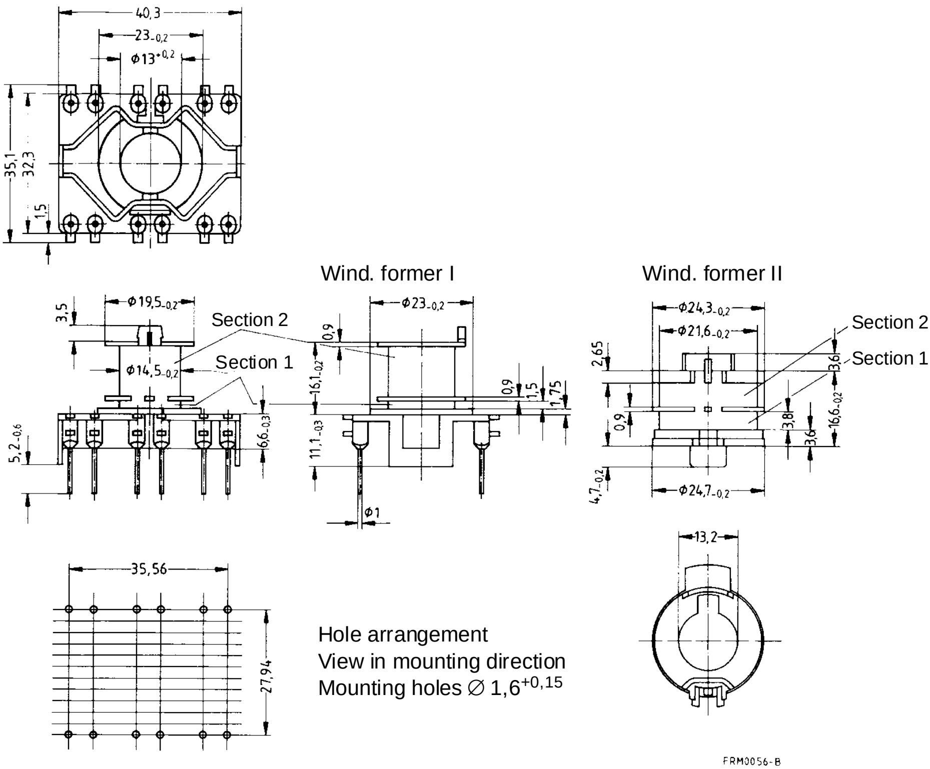
Hole arrangement
View in mounting direction
(Note half pitch!)

Pile-up coil former for power applications

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
For matching clamp see page 277
Pile-up coil former, complete set: Ordering code: B65816-A1212-T102, PU = 100 pieces

Winding former	Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins
I	1 2	3,6 26	53,4 53,4	510 71	12
II	1 2	2,9 4,0	73,5 73,5	872 632	12

Case on request



Coil former for nonlinear chokes

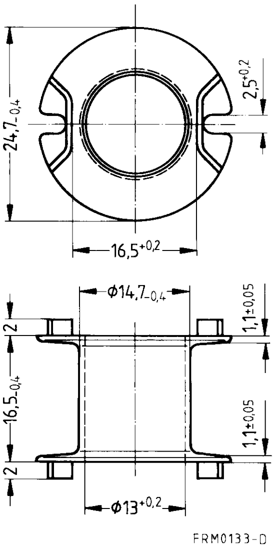
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: see page 150, suitable for wire gauges up to 2 mm

For matching clamp see page 277

Sections	A_N mm^2	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	70,5	31,4	15,3	B65816-J1000-T1	100



Clamp B65816-A2002
- With ground terminal, made of stainless spring steel (tinned), 0,45 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 60 N per pair of clamps (typical value)

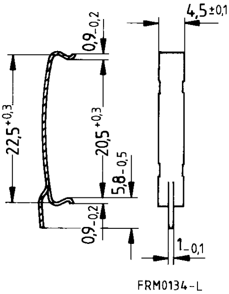
Clamp B65816-A2204 (only for pile-up coil formers)
- Material: stainless spring steel (nickel-plated), 0,45 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 60 N per pair of clamps (typical value)

Insulating washer 1 between core and coil former
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

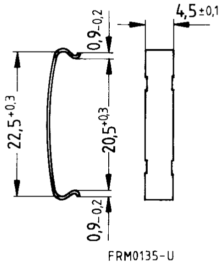
Insulating washer 2 for double-clad PCBs
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65816-A2002	200
Clamp for pile-up coil former (ordering code per piece, 2 are required)	B65816-A2204	200
Insulating washer 1 (reel packing, PU = 1 reel)	B65816-B5000	800
Insulating washer 2 (bulk)	B65816-D2005	400

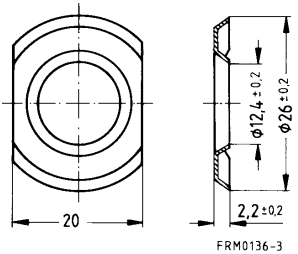
Clamp B65816-A2002



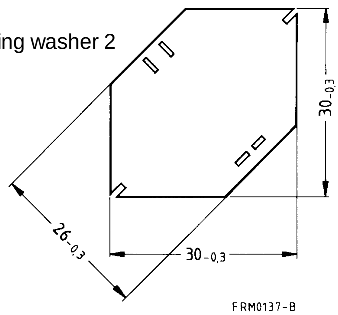
Clamp B65816-A2204 (for pile-up coil former)



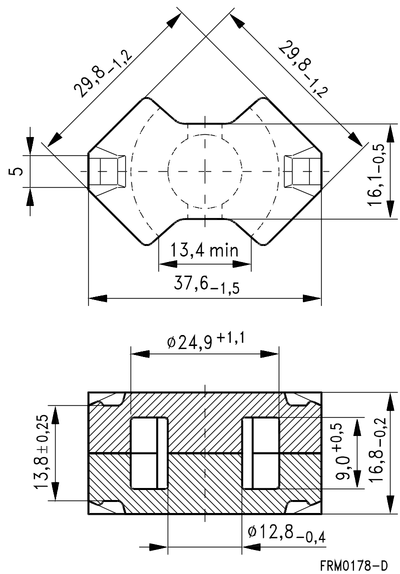
Insulating washer 1



Insulating washer 2



- For compact transformers
- Without center hole



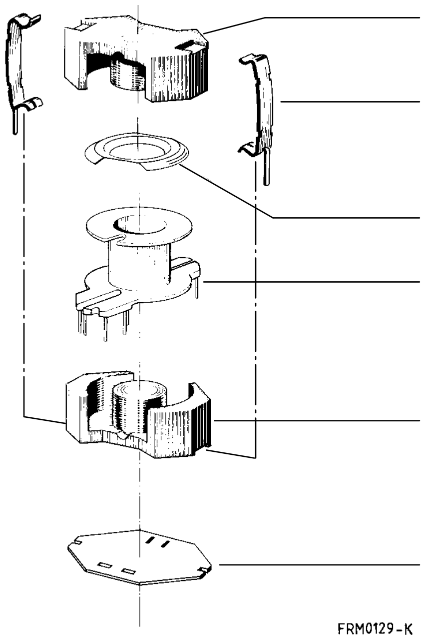
Magnetic characteristics (per set)

$\Sigma l/A$ = 0,28 mm^{-1}
l_e = 42,0 mm
A_e = 147,5 mm^2
A_{min} = 124,7 mm^2
V_e = 6195 mm^3

Approx. weight 33,6 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	10500+30/-20%	2370			B65815-P-R30	100
N49	4500+30/-20%	1010	3100	1,21 (50 mT, 500 kHz, 100°C)	B65815-P-R49	
N67	6300+30/-20%	1420	4000	4,20 (200 mT, 100 kHz, 100°C)	B65815-P-R67	
N87	6300+30/-20%	1420	4000	3,36 (200 mT, 100 kHz, 100°C)	B65815-P-R87	

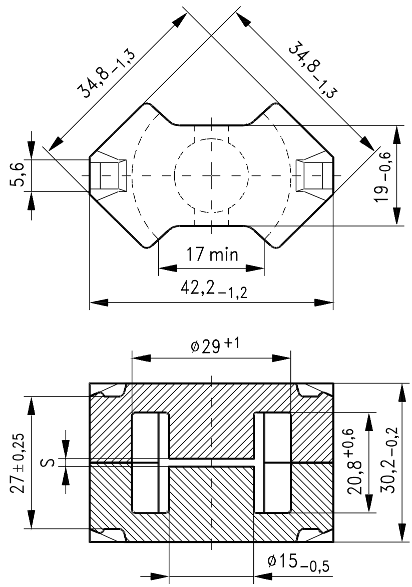


Individual parts	Part no.	Page
Core	B65887	280
Clamps	B65888	285
Insulating washer 1	B65888	285
Coil former	B65888	283
Core	B65887	280
Insulating washer 2	B65888	285

Also available:

Coil former for power applications	B65888	284
Core for nonlinear chokes	B65887-H	282
Low profile core	B65887-P	286

- Optimized core cross section and increased thickness of base for power applications
- Without center hole
- For nonlinear chokes see B 65887-H



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,35 mm^{-1}
l_e = 70,0 mm
A_e = 200 mm^2
A_{min} = 170 mm^2
V_e = 14000 mm^3

Approx. weight 74 g/set

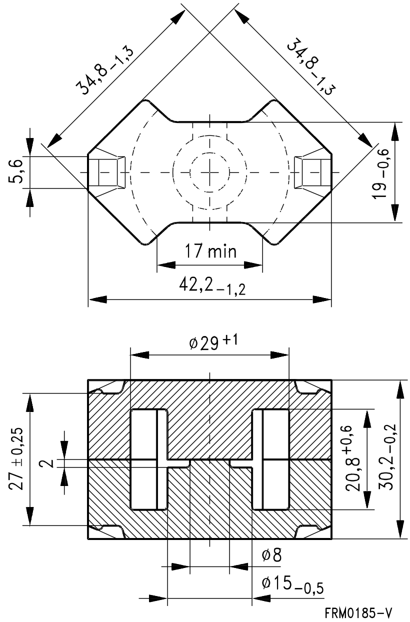
Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N41	160 ± 3%	1,9	45	B65887-E160-A41	60
	250 ± 3%	1,0	70	B65887-E250-A41	
	400 ± 3%	0,5	111	B65887-E400-A41	
	630 ± 5%	0,3	175	B65887-E630-J41	
	1000 ± 5%	0,15	278	B65887-E1000-J41	

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	9500+30/-20%	2650			B65887-E-R30	60
N47	3900+30/-20%	1080	2500	1,8 (50 mT, 500 kHz, 25°C)	B65887-E-R47	
N67	6000+30/-20%	1670	3250	9,0 (200 mT, 100 kHz, 100°C)	B65887-E-R67	
N87	6000+30/-20%	1670	3250	7,4 (200 mT, 100 kHz, 100°C)	B65887-E-R87	
N41	6800+30/-20	1890	3250	2,2 (200 mT, 25 kHz, 100°C)	B65887-E-R41	

- Suitable for nonlinear chokes in switch-mode power supplies, particularly for forward converters and buck converters



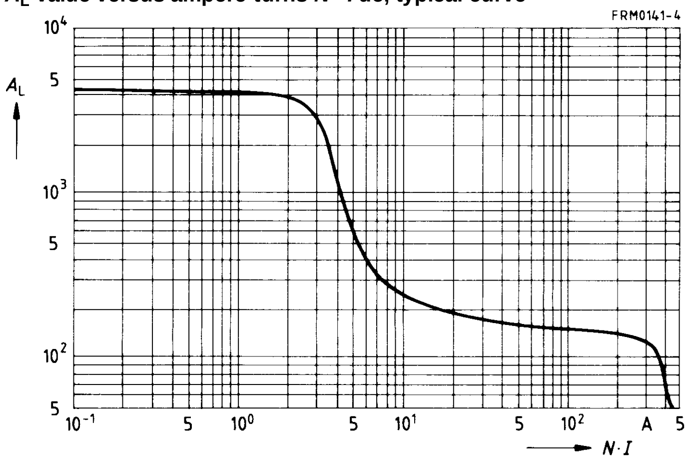
Magnetic characteristics (per set)

$\Sigma l/A$ = 0,35 mm^{-1}
l_e = 70 mm
A_e = 200 mm^2
A_{min} = 170 mm^2
V_e = 14000 mm^3

Approx. weight 74 g/set

Material	A_L value nH	Ordering code	PU Sets
N41	4300 ± 30%	B65887-H4300-X41	60

A_L value versus ampere-turns $N \cdot I$ dc, typical curve

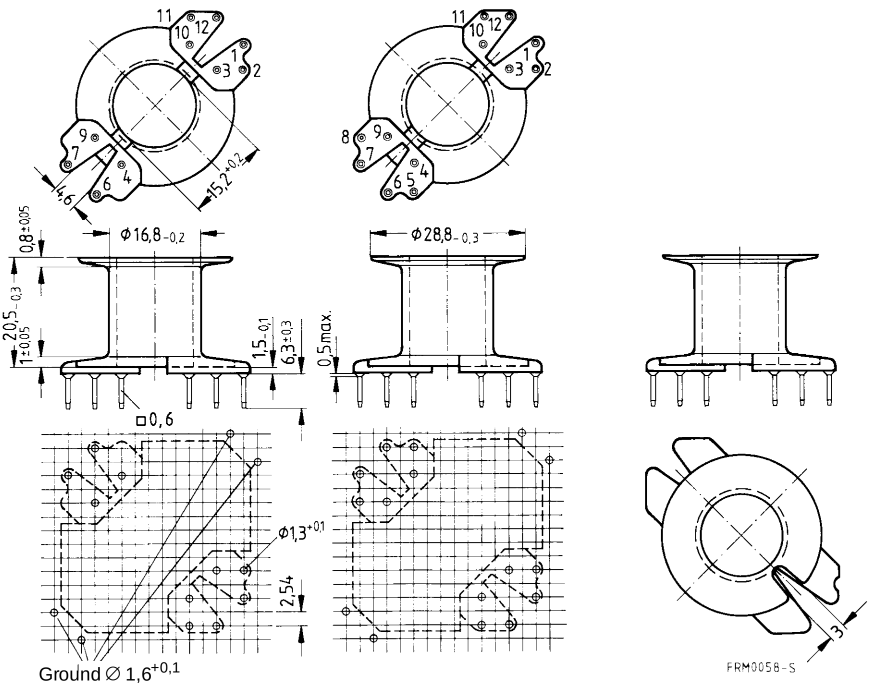


Measuring flux density $\hat{B}$ ≤1 mT,
Measuring frequency f = 10 kHz

Coil former with square pins
Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 150
For matching clamp and insulating washers see page 285

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	107	71,5	23	10 12	B65888-C1010-D1 B65888-C1012-D1	60

10 pins 12 pins



Hole arrangement
View in mounting direction

Coil former for power applications

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

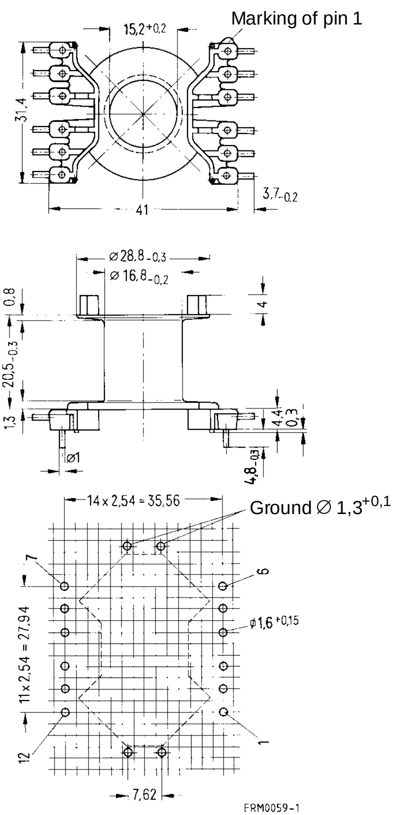
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: see page 150

For matching clamp see page 285

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	106	71,5	23	12	B65888-B1512-T1	100



Hole arrangement
View in mounting direction
(Note half pitch)

Clamp

- With ground terminal, made of stainless spring steel (tinned), 0,5 mm thick
- Solderability to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
- Clamping force 70 N per pair of clamps (typical value)

Insulating washer 1 between core and coil former

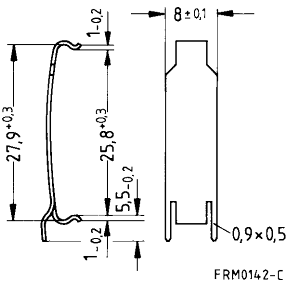
- For tolerance compensation and for insulation
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 for double-clad PCBs

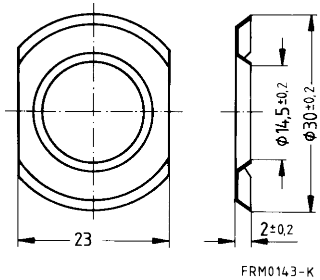
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,3 mm thick

	Ordering code	PU Pcs
Clamp (ordering code per piece, 2 are required)	B65888-A2002	240
Insulating washer 1 (reel packing, PU = 1 reel)	B65888-B5000	800
Insulating washer 2 (bulk)	B65888-B2005	240

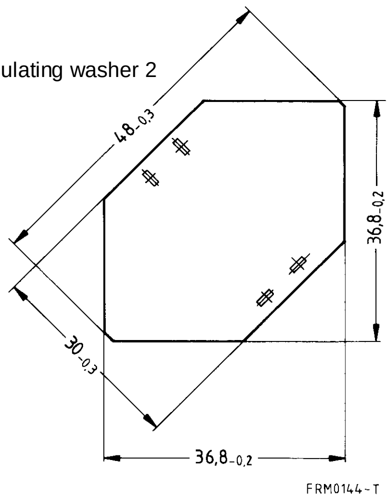
Clamp



Insulating washer 1



Insulating washer 2

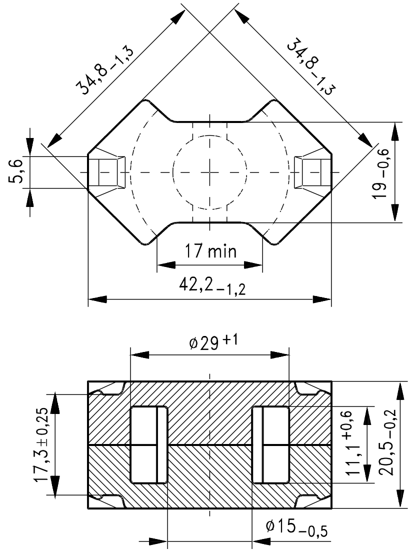


- For compact transformers
- Without center hole

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,25 mm^{-1}
l_e = 50,9 mm
A_e = 201 mm^2
A_{min} = 170 mm^2
V_e = 10230 mm^3

Approx. weight 55 g/set



Ungapped

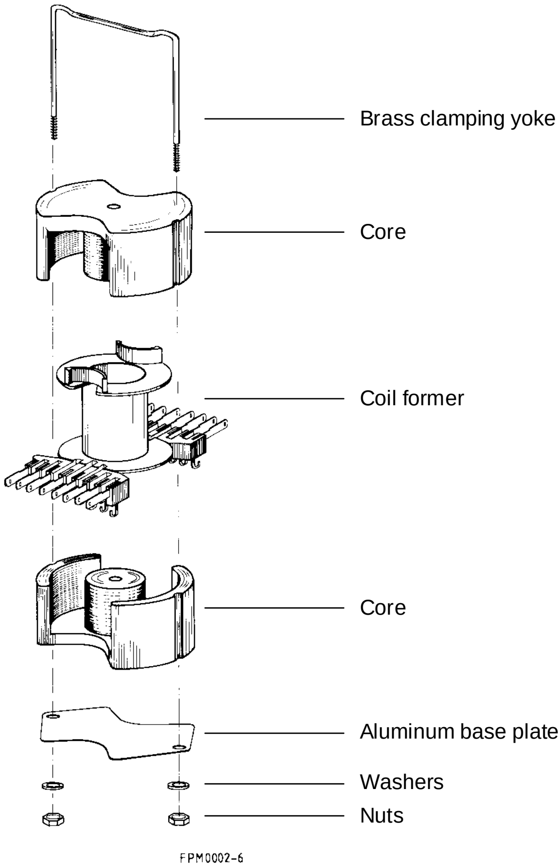
Material	A_L value nH	A_{L1min} nH	μ_e	P_V W/set	Ordering code	PU Sets
N30	11500+30/-20%		2320		B65887-P-R30	60
N49	5100+30/-20%	3500	1020	2,0 (50 mT, 500 kHz, 100°C)	B65887-P-R49	
N67	7100+30/-20%	4500	1430	6,9 (200 mT, 100 kHz, 100°C)	B65887-P-R67	
N87	7100+30/-20%	4500	1430	5,5 (200 mT, 100 kHz, 100°C)	B65887-P-R87	

PM cores are particularly suitable for use in transformers handling high powers in the frequency range up to 300 kHz. For numerous design tasks in telecommunications and industrial electronics (e.g. power pulse transformers in radar transmitters, antenna matching networks, machine control systems, thyristor firing transformers, energy storage chokes in switch-mode power supply equipment and others), the pot core shape offers various advantages: wide flux area for high power at a minimum number of turns, thus causing only low magnetic leakage and stray capacitance, as well as good shielding owing to the closed form, precisely ground air gaps, straightforward assembly and economic mounting.

A family of large pot cores, briefly designated PM cores (for **P**ot core **M**odule), is presented in the following.

Due to the weight of these pot cores, particularly in the case of the large cores 87/70 and 114/93, mounting on PC boards may not always be possible. In these cases, the coil former should be mounted with its terminals upwards.

Example of an assembly set:



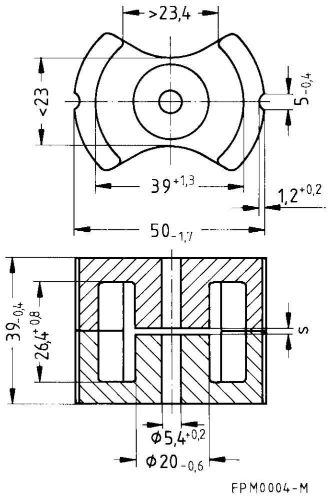
1 A_{L1} value

For each core type, the minimum A_{L1} value is specified. The A_{L1} value is defined at a flux density of $\hat{E}$ = 320 mT and a temperature of 100°C (exception: material N49: $\hat{E}$ = 200 mT). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}.

2 Core losses

For each core type, the maximum dissipation loss is specified in W/set with the relevant measurement parameters. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}.

- In accordance with IEC 1247
- Particularly suitable for power transformers and energy storage chokes



Magnetic characteristics (per set)

$\Sigma l/A =$ 0,227 mm^{-1}
l_e = 84,0 mm
A_e = 370 mm^2
A_{min} = 280 mm^2
V_e = 31000 mm^3

Approx. weight 140 g/set

Gapped

Material	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N27	250 ± 3%	2,0	45	B65646-A250-A27	30
	630 ± 3%	0,63	114	B65646-A630-A27	
	1600 ± 5%	0,20	289	B65646-A1600-J27	
	3150 ± 15%	0,08	569	B65646-A3150-L27	

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N27	7400+30/-20%	1330	5000	4,2 (200 mT, 25 kHz, 100°C)	B65646-A-R27	30
N87	7400+30/-20%	1330	5000	15,5 (200 mT, 100 kHz, 100°C)	B65646-A-R87	

PM 50/39
Coil FormerB65647

Standard:DIN 41 990

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

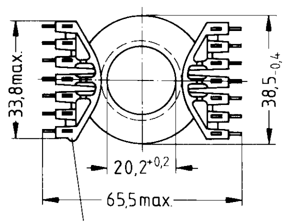
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

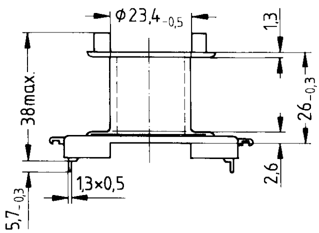
Winding:see page 151

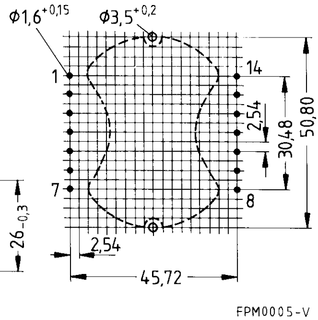
Also available without solder pins

Sections	A_N mm²	l_N mm	A_R value µΩ	Solder pins	Ordering code	PU Pcs
1	154	96,8	21,6	14	B65647-B1014-T1	30
1	154	96,8	21,6	–	B65647-A1000-T1	



Marking of solder pin 1





Hole arrangement
View in mounting direction

Mounting assembly

- For chassis mounting[1)] or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

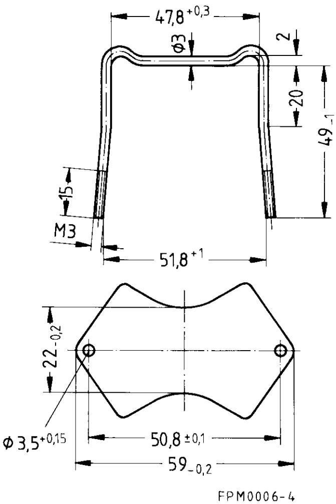
Yoke

Material:Brass clamping yoke (∅ 3 mm) with thread

Base plate

Material:Aluminum (0,6 mm)

	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65647-A2000	30



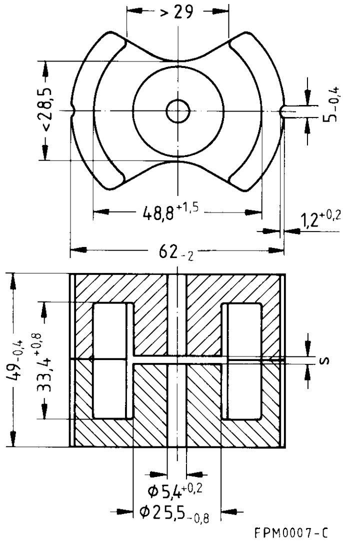
1) On a chassis the coil former must be mounted with its solder pins upward.

- In accordance with IEC 1247
- Particularly suitable for power transformers and energy storage chokes

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,191 mm^{-1}
l_e = 109 mm
A_e = 570 mm^2
A_{min} = 470 mm^2
V_e = 62000 mm^3

Approx. weight 280 g/set



Gapped

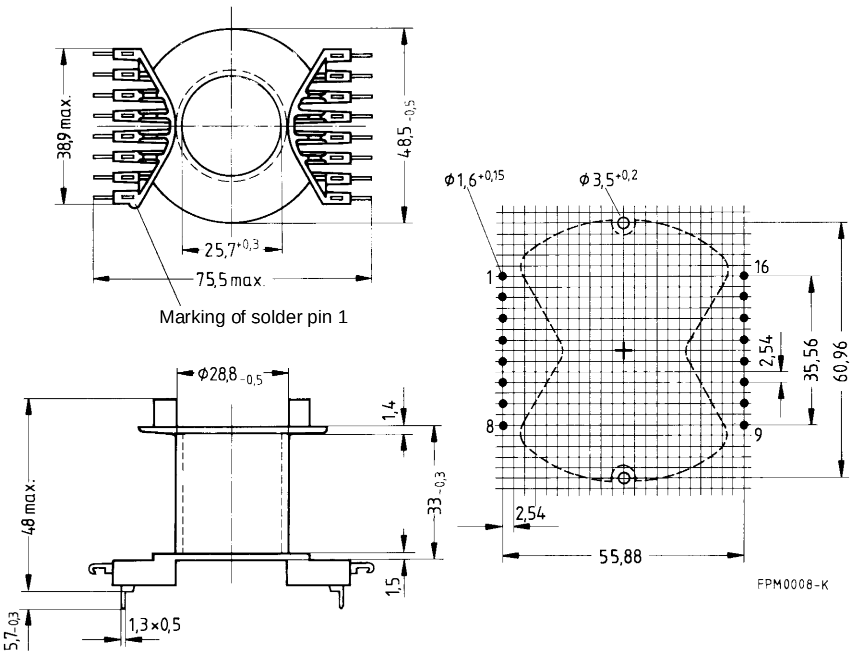
Mate-rial	A_L value nH	*s* approx. mm	μ_e	Ordering code	PU Sets
N27	315 ± 3%	2,6	48	B65684-A315-A27	20
	630 ± 3%	1,1	95	B65684-A630-A27	
	1600 ± 5%	0,34	242	B65684-A1600-J27	
	4000 ± 15%	0,1	605	B65684-A4000-L27	

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N27	9200+30/-20%	1400	5950	8,4 (200 mT, 25 kHz, 100°C)	B65684-A-R27	20
N87	9200+30/-20%	1400	5950	5,8 (100 mT, 100 kHz, 100°C)	B65684-A-R87	

Standard:DIN 41 990
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 151
Also available without solder pins

Sections	A_N mm^2	l_N mm	A_R value µΩ	Solder pins	Ordering code	PU Pcs
1	270	120	15,4	16	B65685-B1016-T1	20
1	270	120	15,4	–	B65685-A1000-T1	



Hole arrangement
View in mounting direction

Mounting assembly

- For chassis mounting[1)] or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

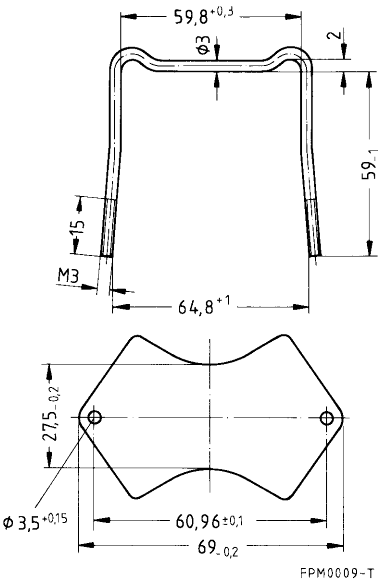
Yoke

Material: Brass clamping yoke (∅ 3 mm) with thread

Base plate

Material: Aluminum (0,6 mm)

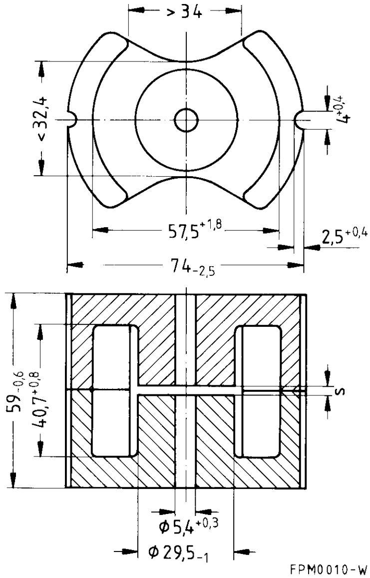
	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65685-A2000	20



1) On a chassis the coil former must be mounted with its solder pins upward.

PM 74/59
CoreB65686

- In accordance with IEC 1247
- Particularly suitable for power transformers and energy storage chokes



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,162	mm^{-1}
l_e =	128	mm
A_e =	790	mm^2
A_{min} =	630	mm^2
V_e =	101000	mm^3

Approx. weight 460 g/set

Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N27	315 ± 3%	3,8	41	B65686-A315-A27	10
	630 ± 3%	1,5	81	B65686-A630-A27	
	2500 ± 5%	0,26	322	B65686-A2500-J27	
	4000 ± 15%	0,14	516	B65686-A4000-L27	

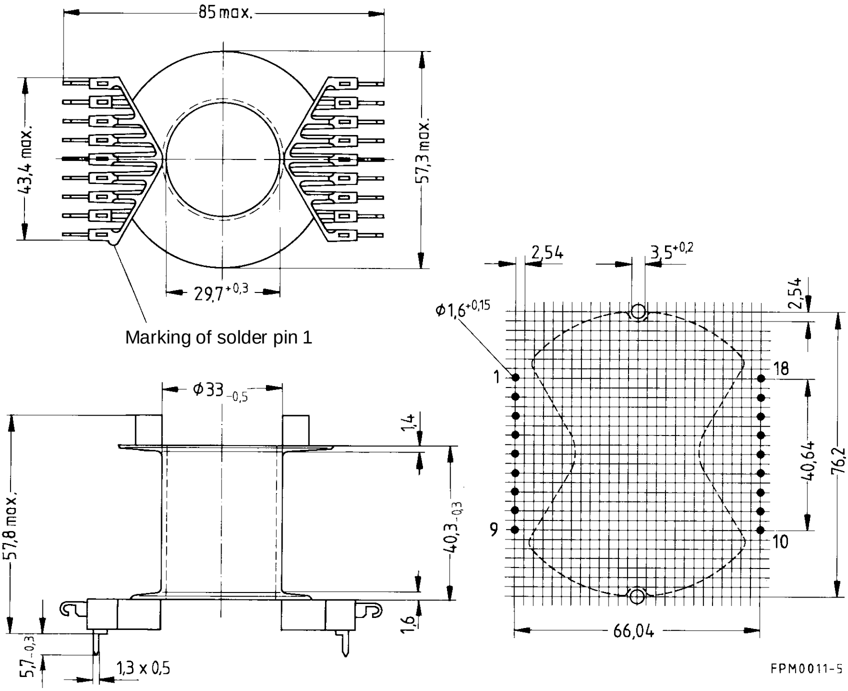
Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N27	10000+30/-20%	1290	7000	7,5 (150 mT, 25 kHz, 100°C)	B65686-A-R27	10
N87	10000+30/-20%	1290	7000	9,6 (100 mT, 100 kHz, 100°C)	B65686-A-R87	

PM 74/59
Coil Former B65687

Standard: DIN 41 990
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 151
Also available without solder pins

Sections	A_N mm²	l_N mm	A_R value µΩ	Solder pins	Ordering code	PU Pcs
1	442	140	10,9	18	B65687-A1018-T1	10
1	442	140	10,9	–	B65687-A1000-T1	



Hole arrangement
View in mounting direction

Mounting assembly

- For chassis mounting[1)] or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

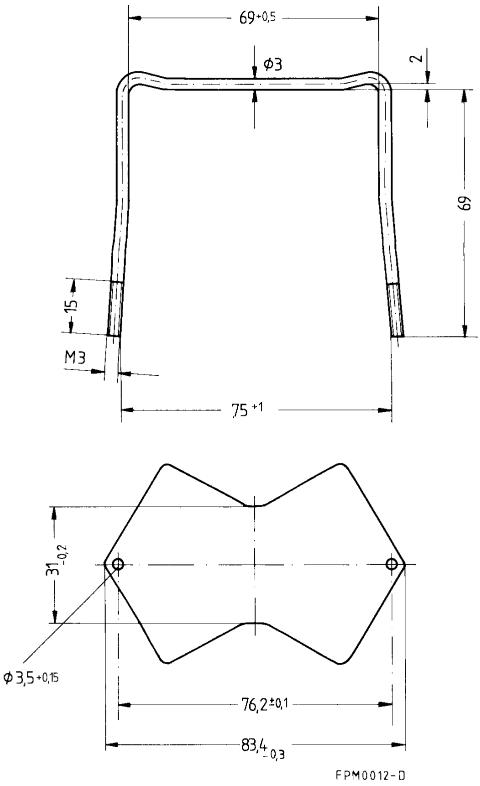
Yoke

Material:Brass clamping yoke (∅ 3 mm) with thread

Base plate

Material:Aluminum (0,6 mm)

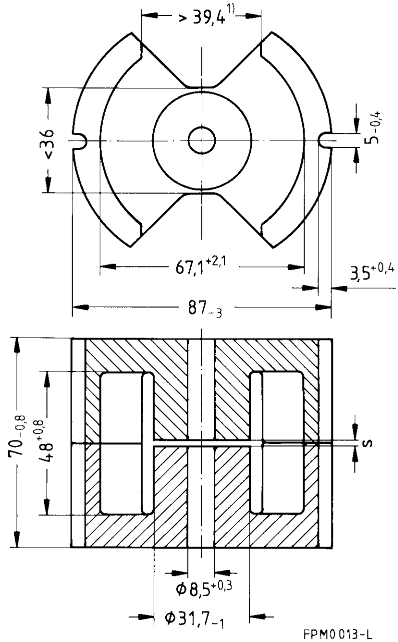
	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65687-A2000	10



1) On a chassis the coil former must be mounted with its solder pins upward.

PM 87/70
CoreB65713

- In accordance with IEC 1247
- For power transformers
  > 1 kW (20 kHz)
  and energy storage chokes



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,161	mm^{-1}
l_e =	146	mm
A_e =	910	mm^2
A_{min} =	700	mm^2
V_e =	133000	mm^3

Approx. weight 770 g/set

Gapped

Material	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N27	400 ± 3%	3,5	51	B65713-A400-A27	4
	1000 ± 3%	1,1	128	B65713-A1000-A27	
	2500 ± 5%	0,34	320	B65713-A2500-J27	
	5000 ± 15%	0,14	640	B65713-A5000-L27	

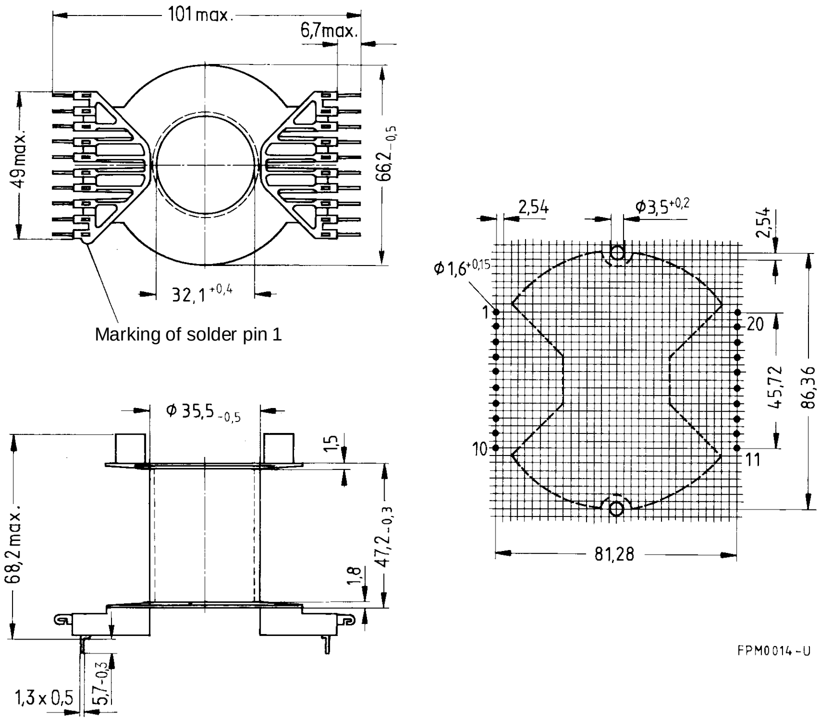
Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N27	12000+30/-20%	1530	7050	12,4 (150 mT, 25 kHz, 100°C)	B65713-A-R27	4

PM 87/70
Coil FormerB65714

Standard:DIN 41 990
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 151
Also available without solder pins

Sections	A_N mm²	l_N mm	A_R value µΩ	Solder pins	Ordering code	PU Pcs
1	657	158	8,27	20	B65714-K1020-T1	4
1	657	158	8,27	–	B65714-J1000-T1	



Hole arrangement
View in mounting direction

Mounting assembly

- For chassis mounting[1)] or printed circuit boards
- The set comprises a yoke and a base plate
- Fixing nuts M3 and washers are supplied

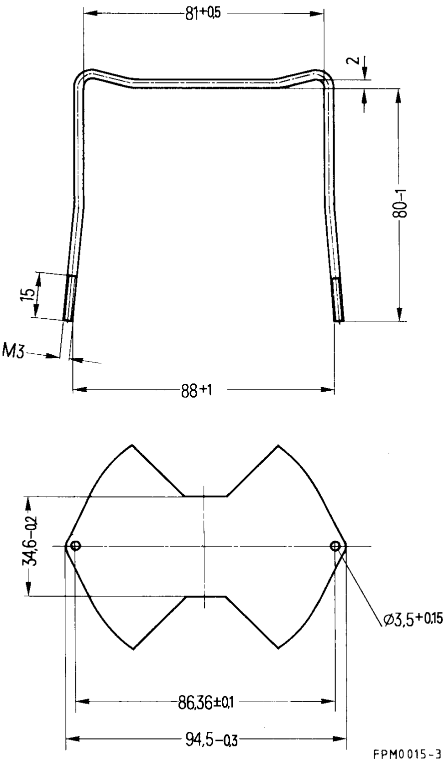
Yoke

Material:Brass clamping yoke (∅ 3 mm) with thread

Base plate

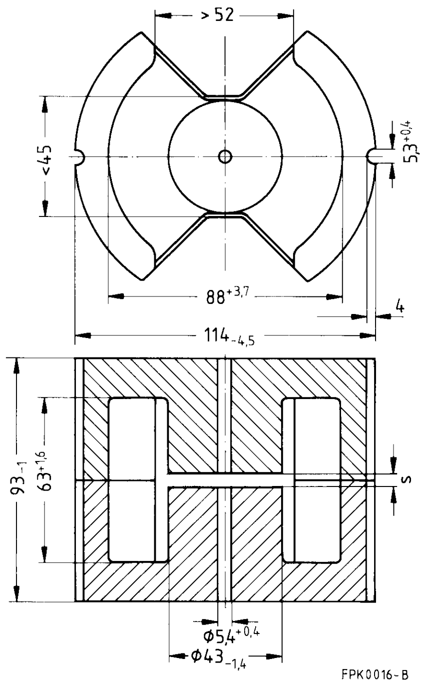
Material:Aluminum (0,6 mm)

	Ordering code	PU Pcs
Complete mounting assembly including nuts and washers	B65714-A2000	4



1) On a chassis the coil former must be mounted with its solder pins upward.

- In accordance with IEC 1247
- For power transformers
  > 1 kW (20 kHz)
  and energy storage chokes



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,116 mm^{-1}
l_e = 200 mm
A_e = 1720 mm^2
A_{min} = 1380 mm^2
V_e = 344000 mm^3

Approx. weight 1940 g/set

Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N27	630 ± 3%	3,8	58	B65733-A630-A27	2
	1000 ± 3%	2,4	92	B65733-A1000-A27	
	2500 ± 5%	0,70	231	B65733-A2500-J27	
	6300 ± 15%	0,22	581	B65733-A6300-L27	

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N27	16000+30/-20%	1480	9750	14,0 (100 mT, 25 kHz, 100°C)	B65733-A-R27	2

PM 114/93
Coil Former **B65734**

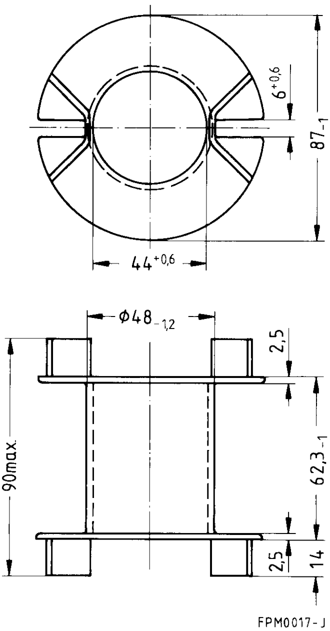
Coil former without solder pins

Standard: DIN 41 990

Material: Polyphenylene sulphide (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code brown

Winding: see page 151

Sections	A_N mm^2	l_N mm	A_R value μΩ	Ordering code	PU Pcs
1	1070	210	6,75	B65734-B1000-T1	2



1 General information

P cores (**P**ot cores) are available in a wide range of sizes from S + M Components; 8 types in our product line comply with IEC 133 and DIN 41293. We offer a choice of different SIFERRIT materials, which permits the cores to be used for a large variety of applications to over 100 MHz. Since the wound coil is completely enclosed by the ferrite core, P cores feature low magnetic leakage. They can be easily and precisely adjusted to the most manifold inductor requirements.

We naturally also supply the appropriate accessories for each core version. Most of the cores are available with threaded sleeves and screws for precision inductance adjustment. Adjustment curves are given for this purpose. These relate to the particular recommended combination of screw core/core material A_L value and must be understood as typical values. Notes on gluing the core halves may be found on page 160.

2 Applications

The cores are suitable for:

- High-quality resonant circuit inductors (filters) with high inductance stability (materials N48, M33, K1, K12, U17)
- Low-distortion broadband small-signal transformers in materials T38 and N30 with high A_L value
- Power applications. Here, pot cores without center hole made of material N67 are used as standard. As a result of their larger effective magnetic cross-sectional area, these types are characterized by a higher A_L value, better flux density distribution and, consequently, a reduced power loss.

Your attention is drawn particularly to the following new developments:

- The pot cores P9×5 through P30×19 have broadened side slots to protect the wires.
- For core sizes P9×5, P11×7, P14×8 and P18×11, pinned coil formers for automatic assembly are available.
- In additional to conventional accessories, an SMD coil former is available for core type P9×5.

3 Marking

The material and the A_L value are always stamped on P cores with a diameter > 5,8 mm, the material and „o, L.“(=without air gap) are stamped on ungapped cores. Only one core half of the two comprising a set carries the marking. With cores having an unsymmetrical air gap (the total air gap is ground into one half) the ground half carries the marking, with cores including a glued-in threaded sleeve the half without sleeve is marked.

4 A_{L1} value

For each core type produced from power materials, the minimum A_{L1} value is specified. The A_{L1} value is defined at a flux density of $\hat{B}$ = 320 mT and a temperature of 100°C (exception: material N49: $\hat{B}$ = 200 mT). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}.

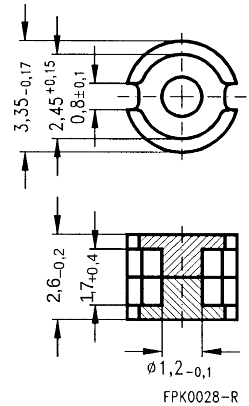
5 Power loss

For each core type with power materials the maximum power loss is specified in W/set. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}.

Magnetic characteristics (per set)

$\Sigma l/A$ = 3,72 mm^{-1}
l_e = 5,1 mm
A_e = 1,37 mm^2
V_e = 7,0 mm^3

Approx. weight 0,06 g/set



Ungapped

Material	A_L value nH	μ_e	Ordering code -B with center hole	PU Sets
K1	25+40/-30%	75	B65491-C-Y1	1000
N30	500+40/-30%	1480	B65491-C-Y30	

Winding data

Usable winding cross section A_N without coil former mm^2	Average length of turn A_N mm	A_R value $\mu\Omega$
0,65	5,8	310

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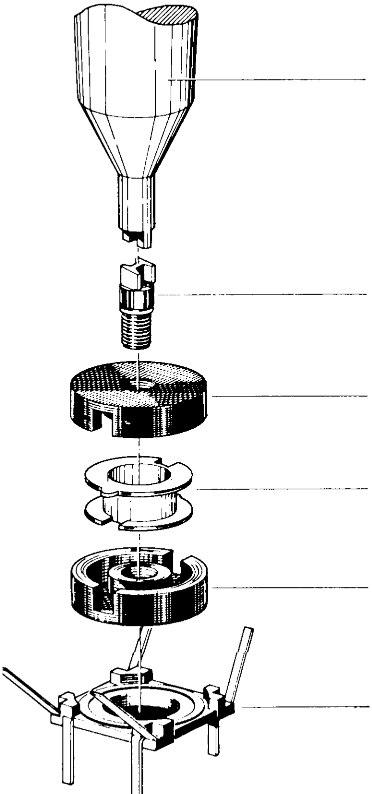
Adjustable miniature assembly set for printed circuit boards and surface mounting

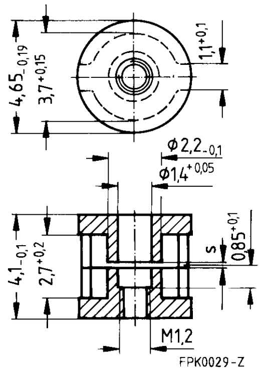


FPK0017-B

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	309
Matching handle	B63399	309
Adjusting screw	B65496	309
Core	B65495	306
Coil former	B65496	307
Core with internal thread	B65495	306
Terminal carrier for PCB through-hole assembly	B65496	308

Miniature pot cores
for adjustable miniature inductors

- One of the two cores is equipped with an internal thread for the adjusting screw
- The unit can be fixed to the terminal carrier by glue
- Space requirements of the inductor 5 × 5,1 mm (without terminals)



Magnetic characteristics (per set)

$\Sigma l/A$ = 2,6 mm^{-1}
l_e = 7,6 mm
A_e = 2,8 mm^2
V_e = 21,3 mm^3

Approx. weight 0,17 g/set

Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code -K with thread	PU Sets
K1	16 ± 3%	0,20	33	B65495-K16-A1	1000
M33	40 ± 3%	0,07	83	B65495-K40-A33	
N48	63 ± 5%	0,04	130	B65495-K63-J48	

Ungapped

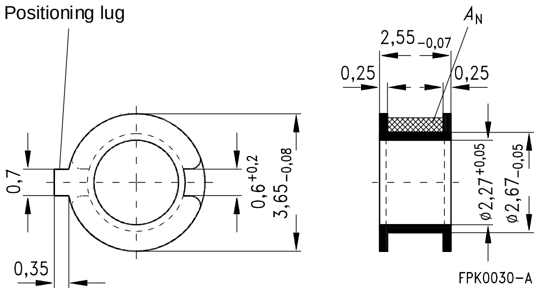
Mate-rial	A_L value nH	μ_e	Ordering code -B with center hole	PU Sets
K1	40+40/-30%	83	B65495-B-Y1	1000
M33	200+40/-30%	414	B65495-B-Y33	
N30	800+40/-30%	1660	B65495-B-Y30	

Coil former with positioning lug

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

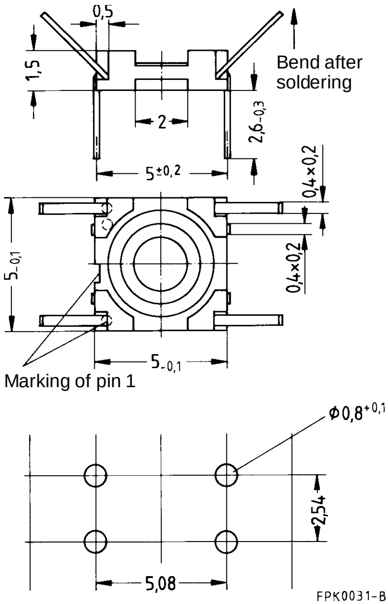
Winding: see page 152

Sections	A_N mm^2	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	0,8	9,5	400	B65496-B1000-T1	1000



Material: GFR polyether ketone (UL 94 V-0, insulation class to IEC 85: H ≙ max. operating temperature 180 °C), color code natural
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Terminal carrier	Ordering code	PU Pcs
With 4 solder terminals for PCB through-hole assembly	B65496-A2002	1000
Also available in mounting strips (6 pieces per strip)		



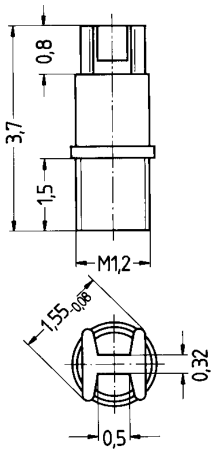
Hole arrangement
View in mounting direction

Adjusting screw

- Tube core with thread and core brake made of polyacetal

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

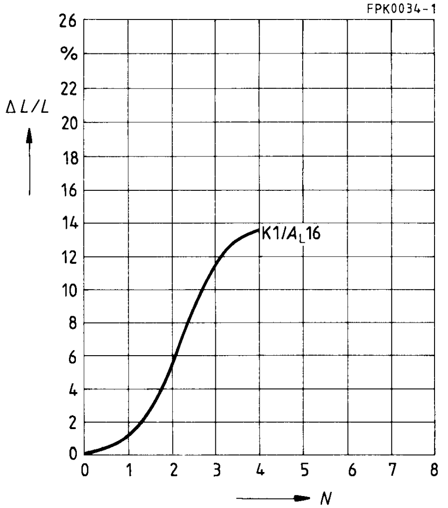
Core P 4,6 × 4,1		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Mate-rial	A_L value nH	Tube core ∅ × length mm	Mate-rial	Color code	%		Pcs
K 1	16	1,25 × 1,2	U 17	brown	11	B65496-A3001-X17	1000
M 33	40	1,25 × 1,2	K 1	blue	12	B65496-A3001-X1	
N 48	63	1,25 × 1,2	N 22	green	12	B65496-A3001-X22	
Adjusting screwdriver						B63399-A1007	10
Handle						B63399-B5	10



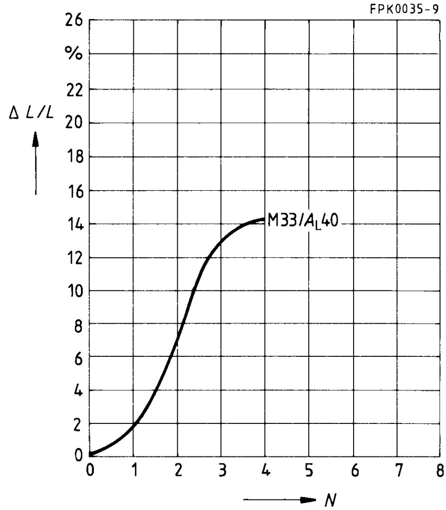
FPK0033-S

Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 1/2 to 1 turn engaged.

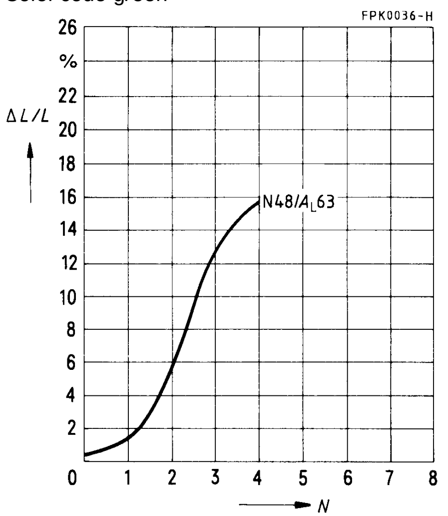
Adjusting screw B65496-A3001-X17
Color code brown



Adjusting screw B65496-A3001-X1
Color code blue

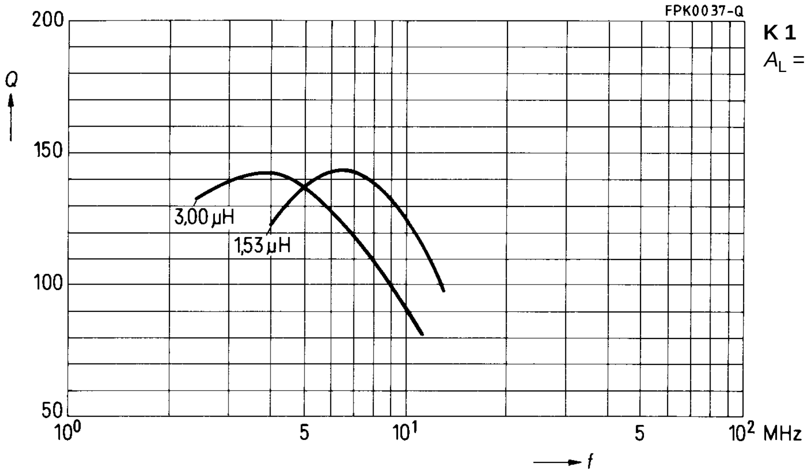


Adjusting screw B65496-A3001-X22
Color code green



Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1 mT

Material	A_L (nH)	L (µH)	Turns	RF litz wire
K 1	16	1,53 3,0	9 13	32 × 0,025 CuLS 15 × 0,04 CuLS

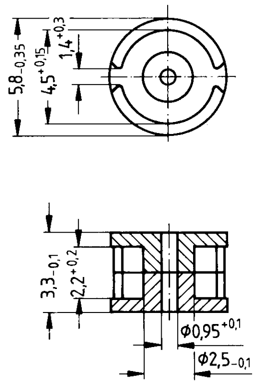


K 1
A_L = 16 nH

Magnetic characteristics (per set)

$\Sigma l/A$ = 1,68 mm^{-1}
l_e = 7,9 mm
A_e = 4,7 mm^2
V_e = 37 mm^3

Approx. weight 0,2 g/set



Ungapped[1)]

Material	A_L value nH	μ_e	Ordering code	PU Sets
K1	60+40/-30%	80	B65501-J-Y1	2000
N26	800+40/-30%	1070	B65501-J-Y26	
N30	1500+40/-30%	2000	B65501-J-Y30	

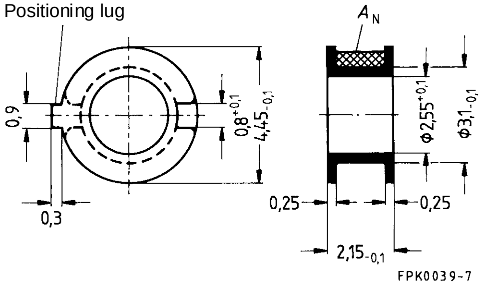
1) Gapped pot cores on request

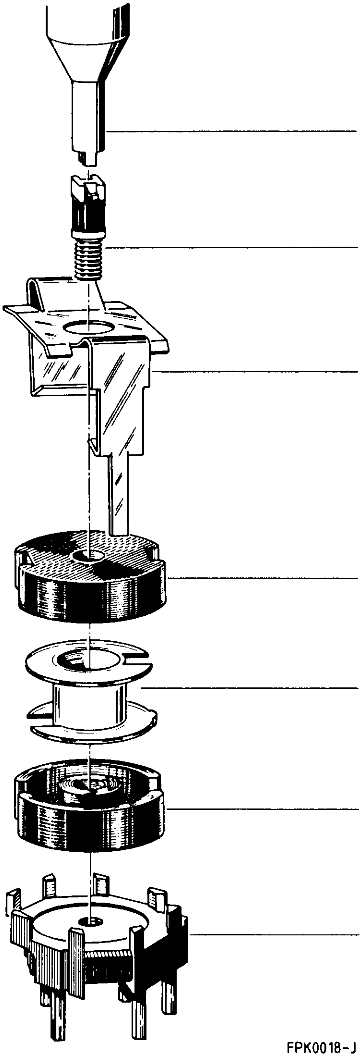
Coil former with positioning lug

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Winding: see page 152

Sections	A_N mm^2	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	0,95	11,7	433	B65502-B-T1	2000





Example of an assembly set for printed circuit boards

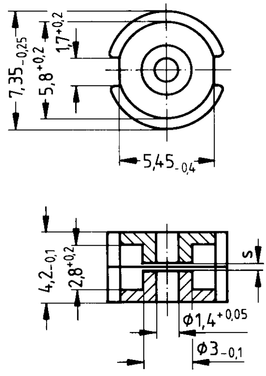
Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	318
Matching handle	B63399	318
Centering pin	—	
Adjusting screw	B65512	318
Yoke	B65512	317
Core	B65511	315
Coil former	B65512	316
Core	B65511	315
Terminal carrier with thread	B65512	317

P 7 × 4
Core   B65511

Magnetic characteristics (per set)

$\Sigma l/A$ = 1,43 mm^{-1}
l_e = 10 mm
A_e = 7 mm^2
V_e = 70 mm^3

Approx. weight 0,5 g/set



FPK0040-A

Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
U17[1]	8 ± 3%	0,80	9,1	B65511-A8-A17	2000
K1	25 ± 3%	0,32	28,5	B65511-A25-A1	
M33	63 ± 3%	0,13	72	B65511-A63-A33	
N48	100 ± 3%	0,10	114	B65511-A100-A48	

Ungapped

Mate-rial	A_L value nH	μ_e	Ordering code	PU Sets
K1	70+40/-30%	80	B65511-A-Y1	2000
N26	1000+40/-30%	1140	B65511-A-Y26	
N30	2000+40/-30%	2280	B65511-A-Y30	

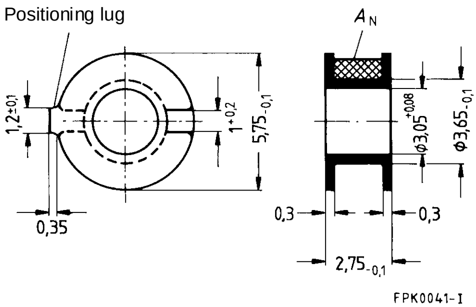
1) The dimensions may be up to approx. 10 % larger.

Coil former with positioning lug

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Winding: see page 152

Sections	A_N mm²	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	2,2	14,6	240	B65512-C-T1	2000



Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connnection

Terminal carrier

- With thread for the adjusting screw

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

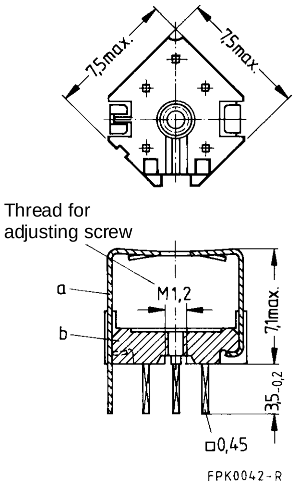
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

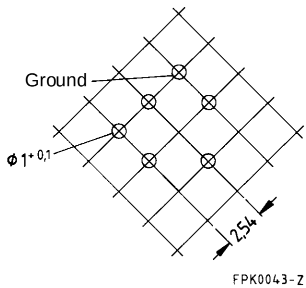
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

Material: Spring yoke, made of tinned nickel silver (0,2 mm), with ground terminal

Complete mounting assembly (5 solder terminals)
Ordering code: B65512-C2001, PU = 2000 sets





a) Yoke
b) Terminal carrier with 5 solder terminals

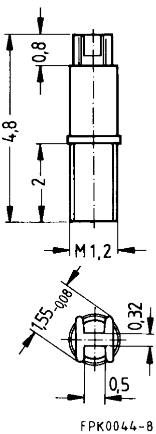
Adjusting screw

- Tube core with thread and core brake made of polyacetal

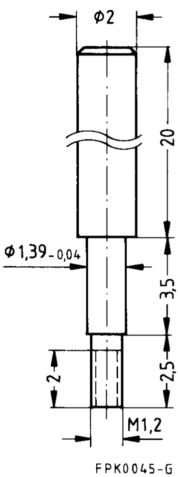
Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin e.g. made of brass (for design proposal see figure below)

Core P 7 × 4		**Abgleichschraube**			Min. adjusting range	Ordering code	PU
Mate-rial	A_L value nH	Tube core ∅ × length mm	Mate-rial	Color code	%		Pcs
U 17	8	1,25 × 1,8	U 17	white	14	B65512-A3001-X17	2000
K 1	25	1,25 × 1,8	U 17	white	12	B65512-A3001-X17	
M 33	63	1,25 × 1,8	U 17	white	8	B65512-A3001-X17	
	63	1,25 × 1,8	K 1	yellow	15	B65512-A3001-X1	
N 48	100	1,25 × 1,8	K 1	yellow	12	B65512-A3001-X1	
Adjusting screwdriver						B63399-A1007	10
Handle						B63399-B5	10

Adjusting screw

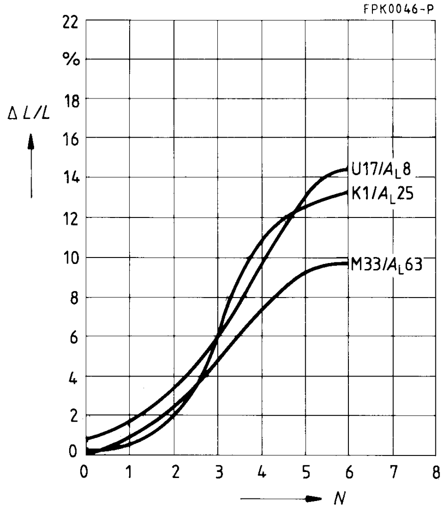


Centering pin

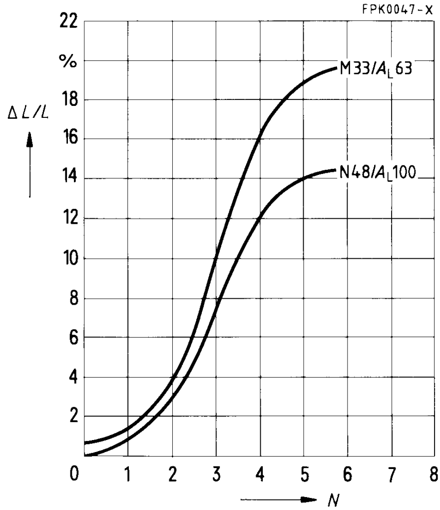


Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ screw completely engaged.

Adjusting screw B65512-A3001-X17
Color code white

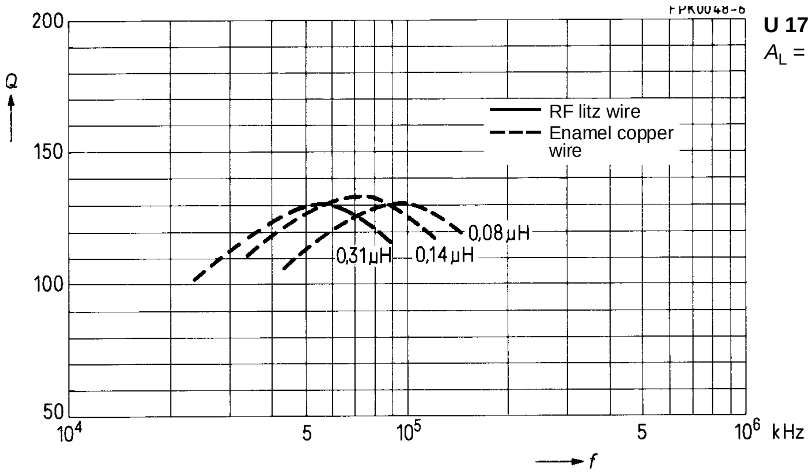


Adjusting screw B65512-A3001-X1
Color code yellow

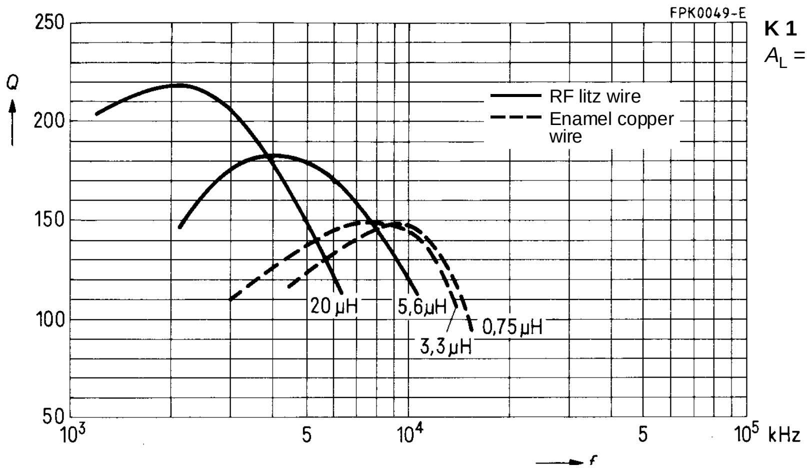


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 2 mT

Material	A_L value	L	Turns	Wire; RF litz wire	No. layers
U 17	8 nH	0,31 µH	6	0,25 CuL	1
		0,14 µH	4	0,30 CuL	1
		0,08 µH	3	0,30 CuL	1
K 1	25 nH	20 µH	28	15 × 0,04 CuLS	4
		5,6 µH	15	12 × 0,04 CuLS	2
		3,3 µH	11	0,3 CuL	2
		0,75 µH	5	0,4 CuL	1



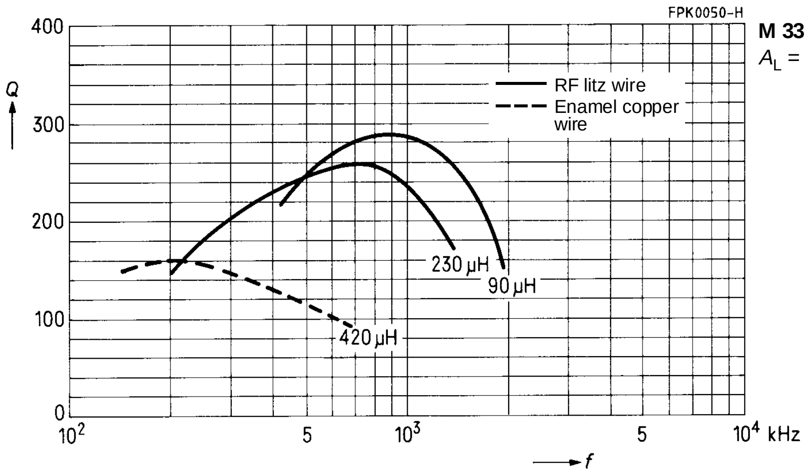
U 17
A_L = 8 nH



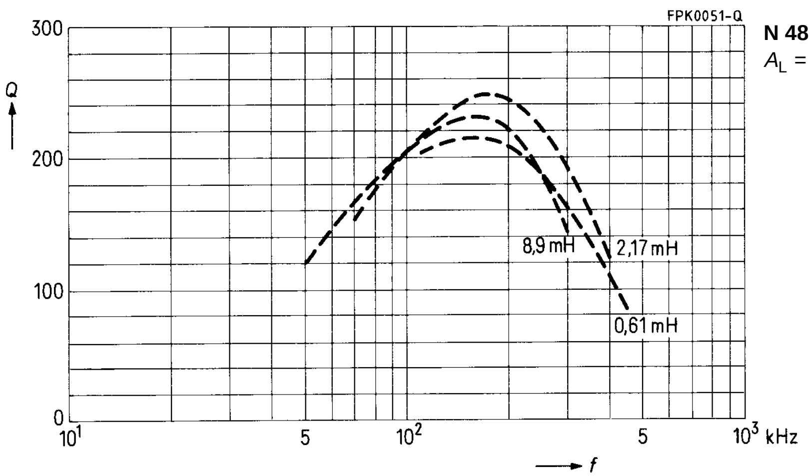
K 1
A_L = 25 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1 mT

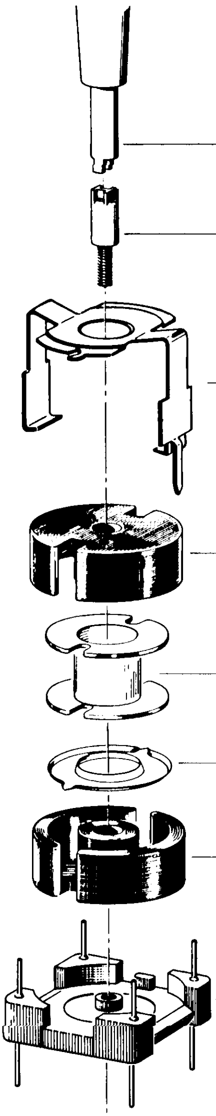
Material	A_L value	L	Turns	Wire; RF litz wire
M 33	63 nH	420 µH 230 µH 90 µH	80 60 37	0,14 CuL 3 × 0,07 CuLS 12 × 0,04 CuLS
N 48	100 nH	8,90 µH 2,17 µH 0,61 µH	300 150 80	0,07 CuL 0,10 CuL 0,15 CuL



M 33
A_L = 63 nH



N 48
A_L = 100 nH

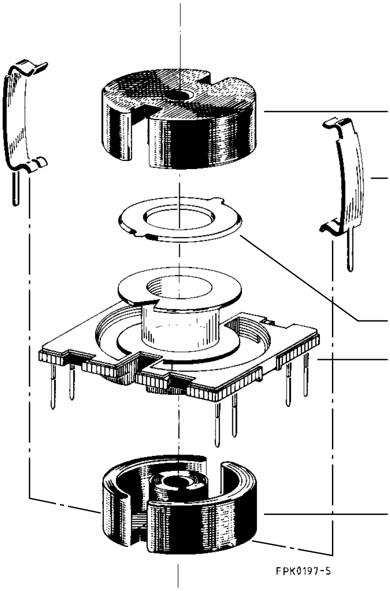


FPK0019-S

Example of an assembly set
for printed circuit boards

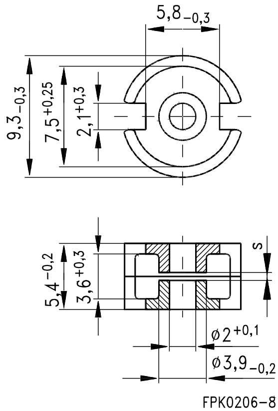
Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	330
Matching handle	B63399	330
Centering pin	—	
Adjusting screw	B65518	330
Yoke	B65518	329
Core	B65517	324
Coil former	B65522	327
Insulating washer 1	B65522	327
Core	B65517	324
Terminal carrier with thread	B65518	329
Also available: SMD coil former	B65524	328

P 9 × 5
Core and Accessories



Individual parts	Part no.	Page
Pot core	B65517	324
2 clamps	B65518	326
Insulating washer	B65522	327
Pinned coil former	B65518	326
Pot core	B65517	324

- In accordance with IEC 133 and DIN 41 293



Magnetic characteristics (per set)

	with center hole	without center hole	
Σl/A	1,25	1,13	mm^{-1}
l_e	12,2	13,4	mm
A_e	9,8	11,9	mm^2
A_{min}	—	9,3	mm^2
V_e	120	159	mm^3

Approx. weight (per set)

m	0,8	1,0	g

Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code[2] -D with center hole -T w. threaded flange	PU Sets
U17[1]	10 ± 3%	1,20	10,0	B65517-D10-A17	1000
K12	16 ± 3%	0,80	15,9	B65517-+16-A12	
K1	25 ± 3%	0,45	24,9	B65517-+25-A1	
	40 ± 3%	0,26	39,8	B65517-+40-A1	
M33	40 ± 3%	0,37	39,8	B65517-+40-A33	
	63 ± 3%	0,20	63	B65517-+63-A33	
N48	100 ± 3%	0,10	100	B65517-+100-A48	
	160 ± 3%	0,06	159	B65517-+160-A48	
	200 ± 3%	0,04	200	B65517-+200-A48	
N26	250 ± 10%	0,03	249	B65517-D250-K26	

1) The dimensions may be up to approx. 10% larger.
2) Replace the + by the code letter „D“ or „T“ for the required version.

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	95+30/-20%	95			B65517-D-R1	1000
N26	1300+30/-20%	1190			B65517-D-R26	
N30	2500+30/-20%	2490			B65517-D-R30	
T38	5500+40/-30%	4945			B65517-W-Y38	
N67	1500+30/-20%	1340	1000	0,11 (200 mT, 100 kHz, 100°C)	B65517-W-R67	

Coil former with solder pins

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 152

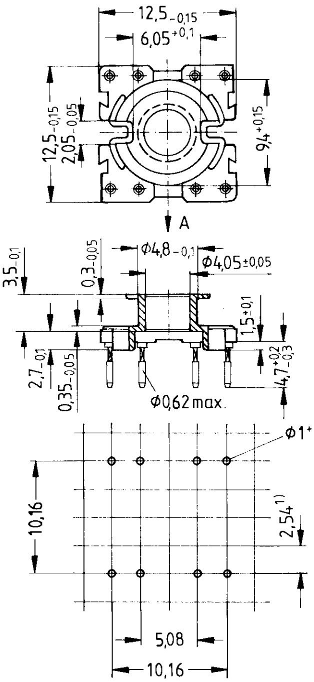
Pins squared in the start-of-winding area

Clamp

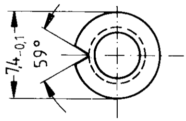
Material: Stainless spring steel (0,25 mm)

Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	3,4	19,2	183	8	B65518-J1008-D1	1000
Clamp (ordering code per piece, 2 are required)					B65518-A2010	2000

Coil former



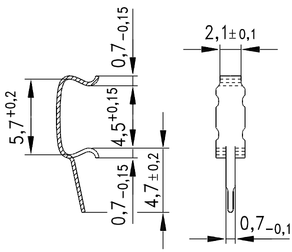
View A
(upper flange only)



Hole arrangement
View in mounting direction

FPK0014-L

Clamp



1) 2,5 mm also permissible

Coil former

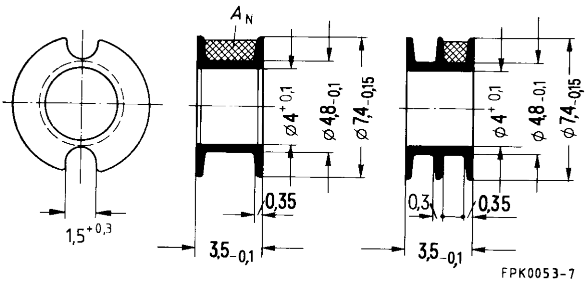
Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

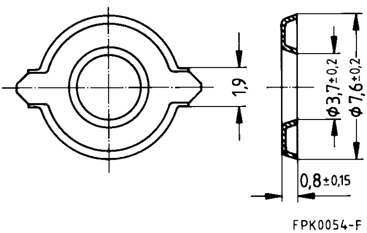
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,04 mm thick

Coil former				Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value μΩ		Pcs
1	3,6	19,2	183	B65522-B-T1	1000
2	3,2	19,2	206	B65522-B-T2	
Insulating washer 1 (reel packing, PU = 1 reel)				B65522-A5000	1000

Coil former



Insulating washer 1



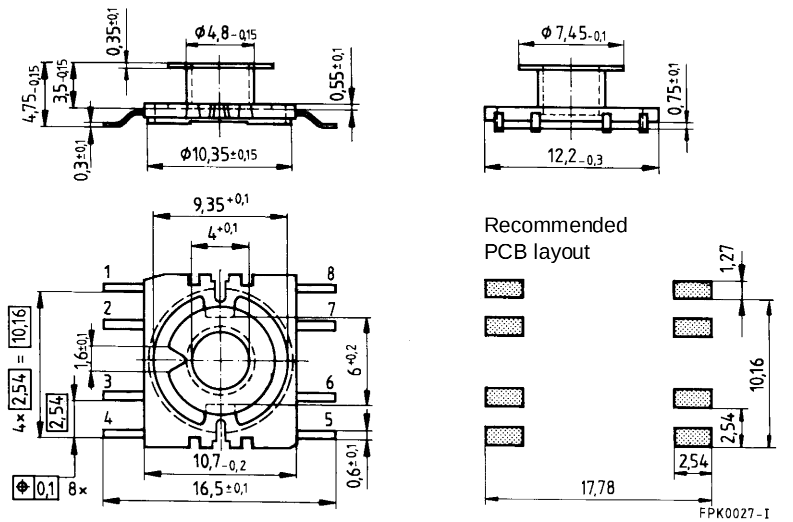
SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Sections	A_N mm^2	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	3,4	19,2	194	4 8	B65524-C1004-T1 B65524-C1008-T1	1000



FPK0027-I

In the 4-terminal version terminals 2, 3, 6 and 7 are omitted.

Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

Terminal carrier

- With thread for the adjusting screw (to be combined with core version „D“)

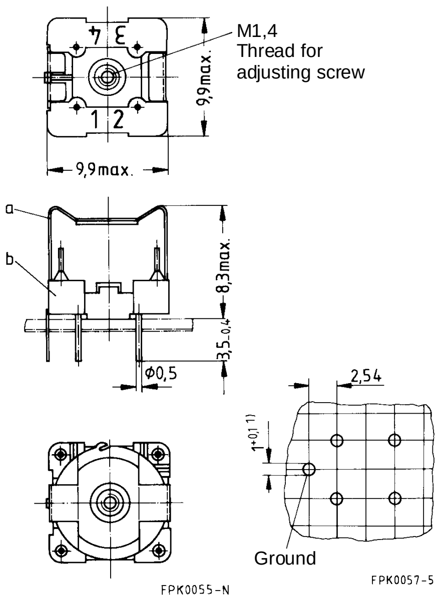
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

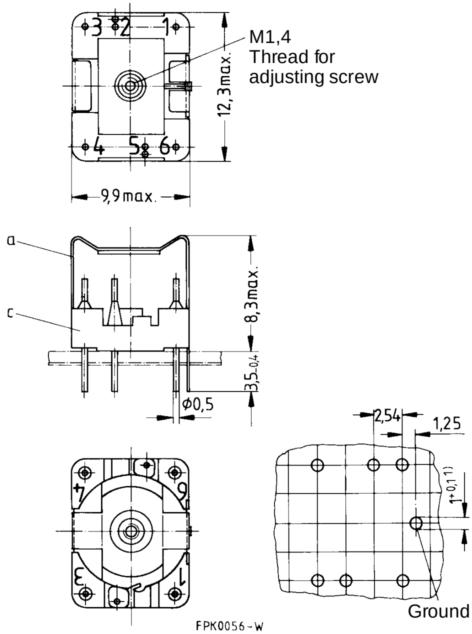
Material: Spring yoke, made of tinned nickel silver (0,25 mm), with ground terminal

Complete mounting assembly (4 solder terminals)	Complete mounting assembly (6 solder terminals)
Ordering code: B65518-D2001, PU = 1000 sets	Ordering code: B65518-D2002, PU = 1000 sets

4 solder terminals



6 solder terminals



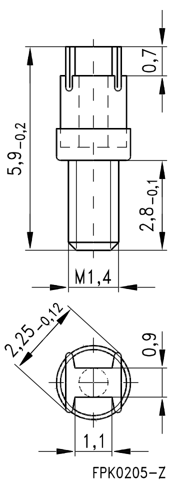
1) 1,3 hole also permissible
a) Yoke
b) Terminal carrier with 4 solder terminals
c) Terminal carrier with 6 solder terminals

Adjusting screw
- Tube core with thread and core brake made of GFR polyterephthalate

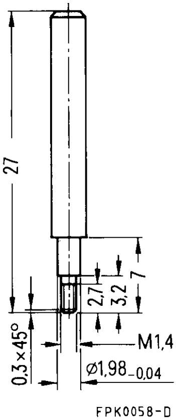
Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin e.g. made of brass (for design proposal see figure below)

Core P 9 × 5		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
U 17	10	1,81 × 2,0	Si 1	brown	6	B65518-C3000-X101	1000
K 12	16	1,81 × 2,0	Si 1	brown	15	B65518-C3000-X101	
K 1	25	1,81 × 2,0	Si 1	brown	17	B65518-C3000-X101	
	40	1,81 × 2,0	K 1	blue	16	B65518-C3000-X1	
M 33	40	1,81 × 2,0	Si 1	brown	16	B65518-C3000-X101	
	63	1,81 × 2,0	K 1	blue	22	B65518-C3000-X1	
N 48	100	1,81 × 2,0	K 1	blue	15	B65518-C3000-X1	
	160 200	1,81 × 2,0	N 22	green	11 8	B65518-C3000-X22	
Adjusting screwdriver						B63399-B4	10
Handle						B63399-B5	10

Adjusting screw

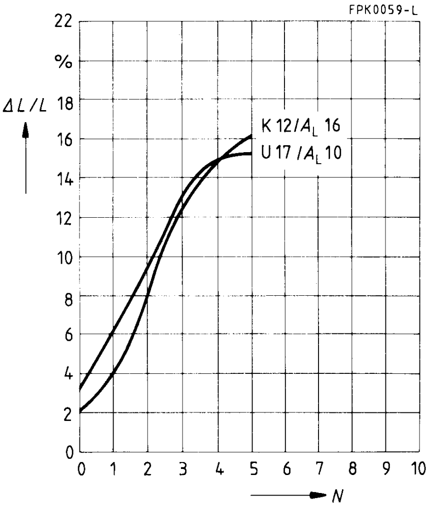


Centering pin

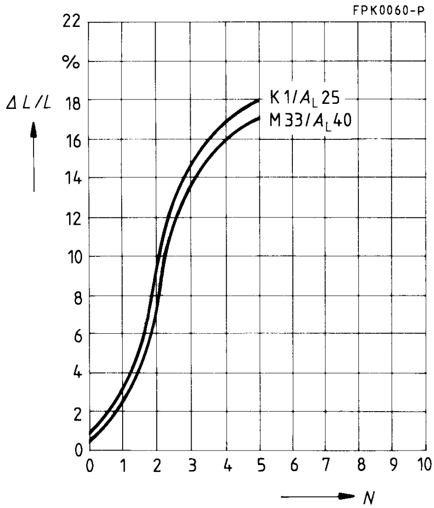


Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 1 turn engaged.

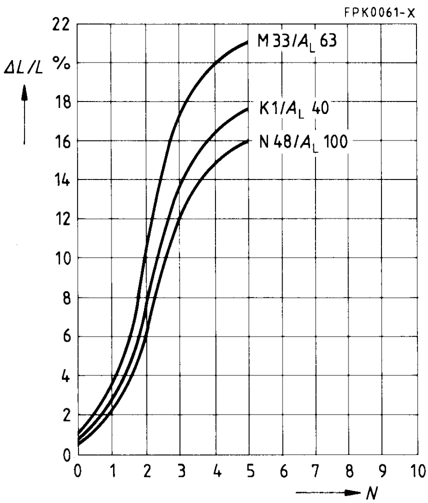
Adjusting screw B65518-C3000-X101
Color code brown



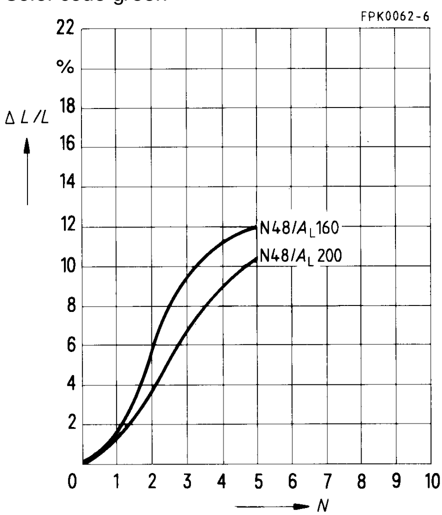
Adjusting screw B65518-C3000-X101
Color code brown



Adjusting screw B65518-C3000-X1
Color code blue

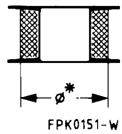


Adjusting screw B65518-C3000-X22
Color code green

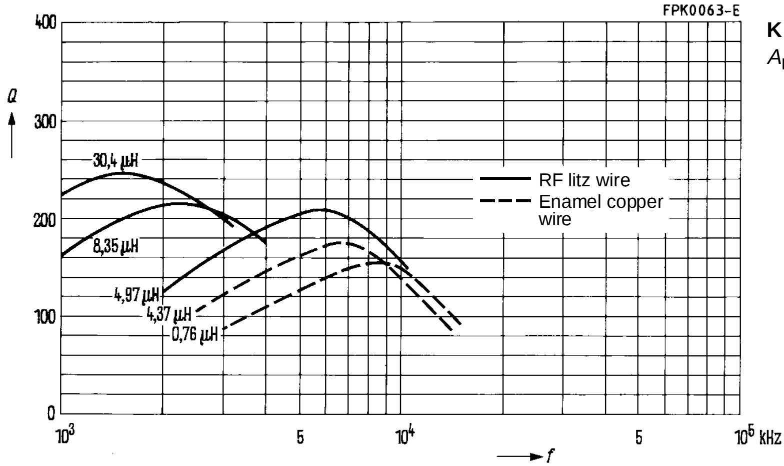


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 0,6 mT

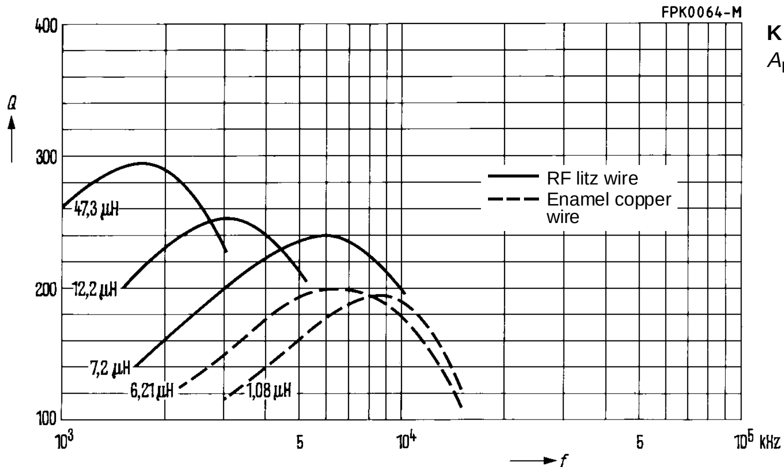
Material	L (µH) for A_L = 25 nH	L (µH) for A_L = 40 nH	Turns	Wire; RF litz wire	Sections	∅* mm
K 1	4,37	6,21	12	0,20 CuL	1	6,7
	0,76	1,08	5	0,50 CuL	1	6,0
	30,40	47,3	35	1 × 20 × 0,04 CuLS	1	—
	8,35	12,2	18	1 × 20 × 0,04 CuLS	1	—
	4,97	7,2	13	1 × 12 × 0,04 CuLS	1	6,7



* Pad of polystyrene tape up to diameter ∅



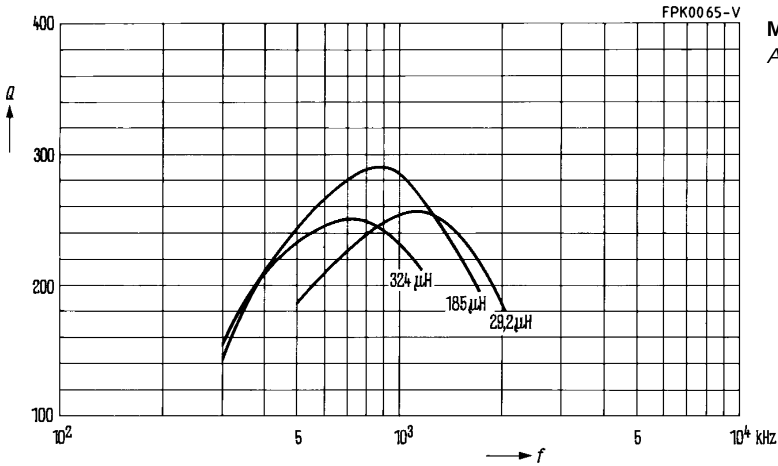
K 1
A_L = 25 nH



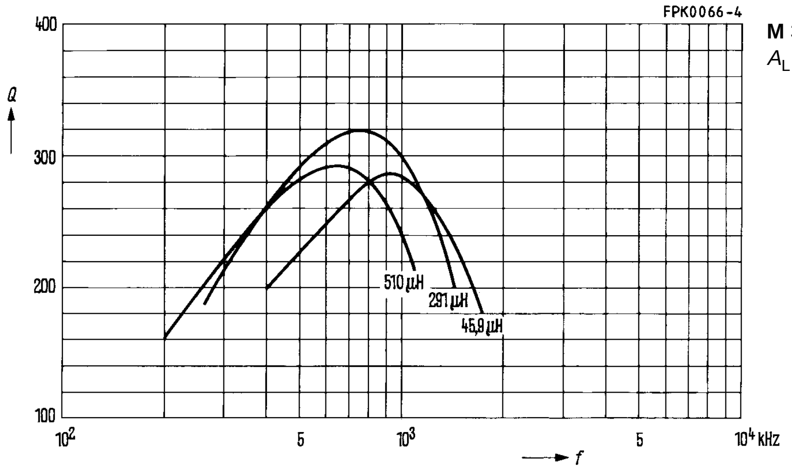
K 1
A_L = 40 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 2 mT

Material	L (µH) for A_L = 40 nH	L (µH) for A_L = 63 nH	Turns	RF litz wire	Sections
M 33	324	510	90	1 × 5 × 0,05 CuLS	1
	185	291	68	1 × 12 × 0,04 CuLS	1
	29,2	45,9	27	1 × 30 × 0,04 CuLS	1



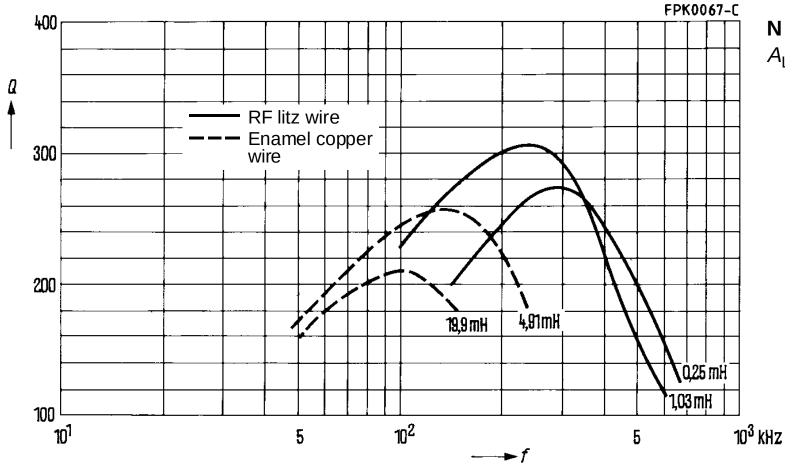
M 33
A_L = 40 nH



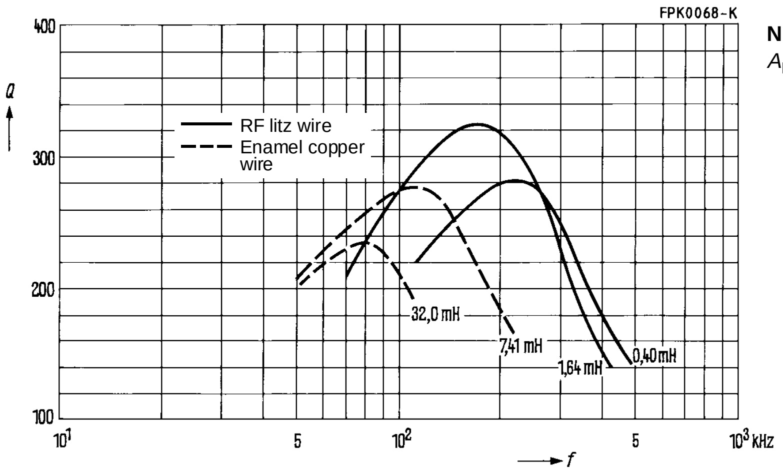
M 33
A_L = 63 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 3 mT

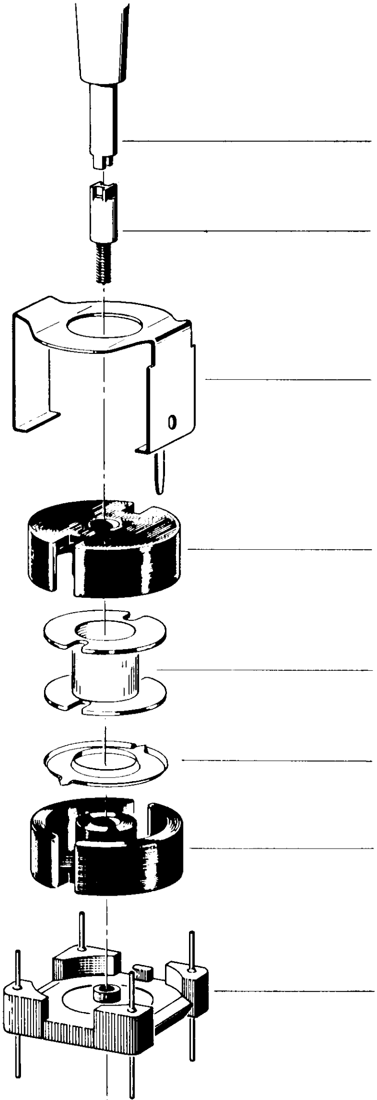
Material	L (mH) for A_L = 100 nH	L (mH) for A_L = 160 nH	Turns	Wire; RF litz wire	Sections
N 48	19,9	32,0	450	0,07 CuL	1
	4,91	7,41	250	0,1 CuL	1
	1,03	1,64	100	1 × 12 × 0,04 CuL	1
	0,25	0,40	50	1 × 15 × 0,04 CuLS	1



N 48
A_L = 100 nH



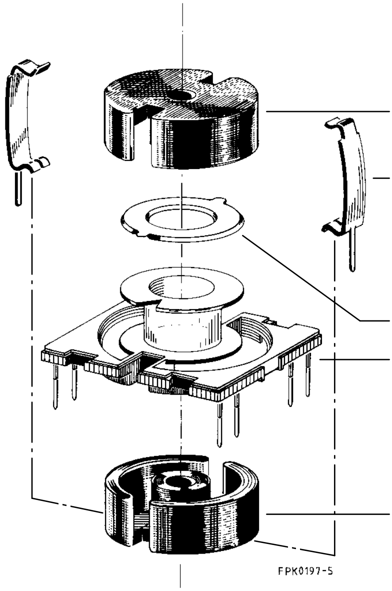
N 48
A_L = 160 nH



Example of an assembly set
for printed circuit boards

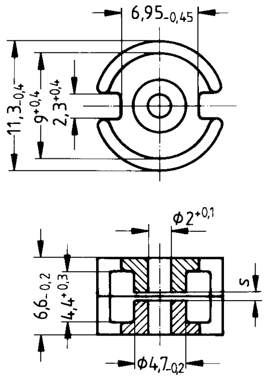
Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	341
Matching handle	B63399	341
Centering pin	—	
Adjusting screw	B65539	341
Yoke	B65535	340
Core	B65531	337
Coil former	B65532	339
Insulating washer 1	B65532	339
Core	B65531	337
Terminal carrier with thread	B65535	340

P 11 × 7
Core and Accessories



Individual parts	Part no.	Page
Pot core	B65531	337
2 clamps	B65532	338
Insulating washer	B65532	339
Pinned coil former	B65532	338
Pot core	B65531	337

- In accordance with IEC 133 and DIN 41 293



FPK0069-T

Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma l/A$	1,0	0,92	mm^{-1}
l_e	15,9	16,3	mm
A_e	15,9	17,7	mm^2
A_{min}	—	14,1	mm^2
V_e	252	289	mm^3

Approx. weight (per set)

m	1,7	1,8	g

Gapped

Mate-rial	A_L value nH	*s* approx. mm	μ_e	Ordering code[1)] -D with center hole -T w. threaded flange	PU Sets
K12	16 ± 3%	0,7	13	B65531-+16-A12	1000
K1	25 ± 3% 40 ± 3%	1,00 0,41	19,1 31,8	B65531-+25-A1 B65531-+40-A1	
M33	40 ± 3% 63 ± 3%	0,64 0,38	31,8 50	B65531-+40-A33 B65531-+63-A33	
N48	100 ± 3% 160 ± 3% 250 ± 3%	0,20 0,10 0,06	80 127 199	B65531-+100-A48 B65531-+160-A48 B65531-+250-A48	
N26	400 ± 10%	0,03	318	B65531-D400-K26	

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	115+30/-20%	92			B65531-D-R1	1000
M33	780+30/-20%	620			B65531-D-R33	
N26	1800+30/-20%	1430			B65531-D-R26	
N30	3500+30/-20%	2560			B65531-W-R30	
T38	7000+40/-30%	5120			B65531-W-Y38	
N67	2000+30/-20%	1460	1250	0,15 (200 mT, 100 kHz, 100°C)	B65531-W-R67	

1) Replace the + by the code letter „D“ or „T“ for the required version.

Coil former with solder pins

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 152

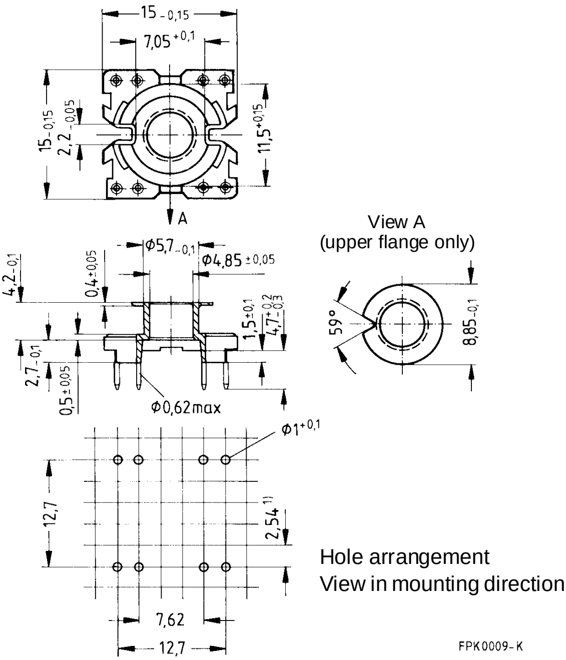
Pins squared in the start-of-winding area

Clamp

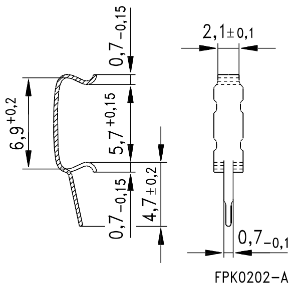
Material: Stainless spring steel (0,30 mm)

Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	4,2	22	180	8	B65532-J1008-D1	1000
Clamp (ordering code per piece, 2 are required)					B65532-A2010	2000

Coil former



Clamp



1) 2,5 mm also permissible

Coil former

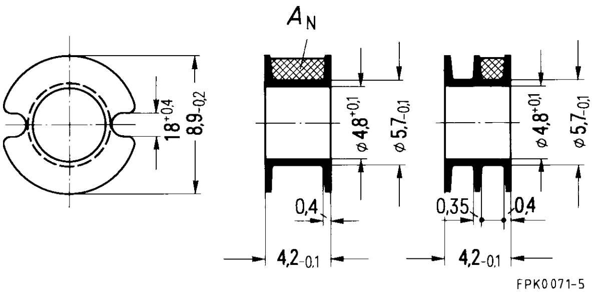
Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

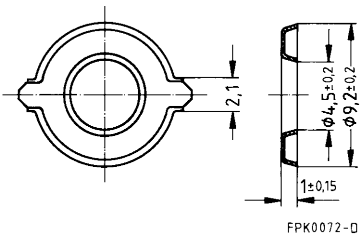
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,04 mm thick

Coil former				Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ		Pcs
1	4,2	22	180	B65532-B-T1	1000
2	3,8	22	200	B65532-B-T2	
Insulating washer 1 (reel packing, PU = 1 reel)				B65532-A5000	3000

Coil former



Insulating washer 1



Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

Terminal carrier

- With thread for the adjusting screw (to be combined with core version „D“)

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

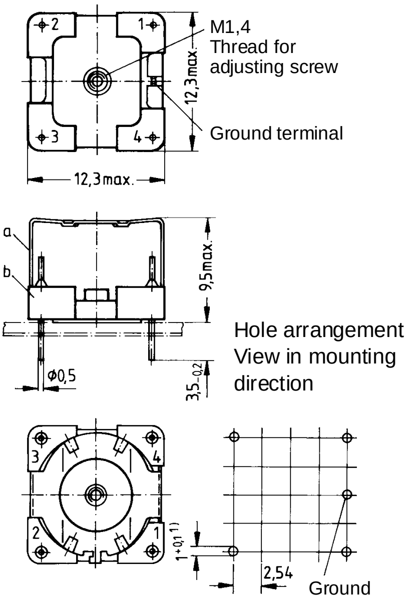
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

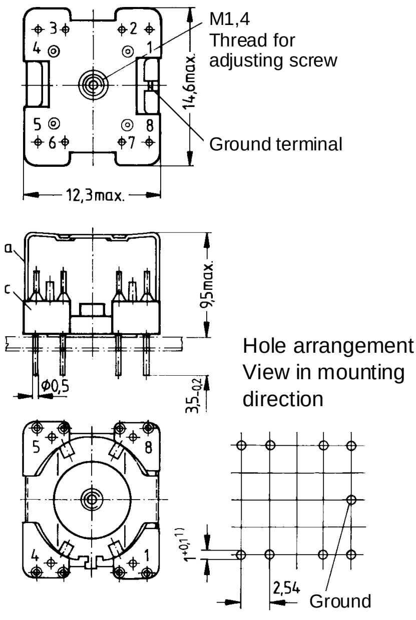
Material: Spring yoke, made of tinned nickel silver (0,25 mm), with ground terminal

Complete mounting assembly (4 solder terminals) Ordering code: B65535-B2, PU = 1000 sets	Complete mounting assembly (6 solder terminals) Ordering code: B65535-B3, PU = 1000 sets

4 solder terminals



8 solder terminals



FPK0073-L

1) 1,3 hole also permissible
a) Yoke
b) Terminal carrier with 4 solder terminals
c) Terminal carrier with 8 solder terminals

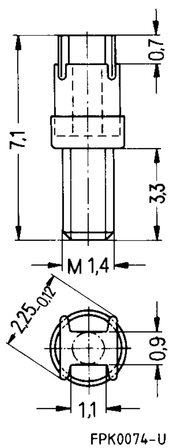
Adjusting screw

- Tube core with thread and core brake made of GFR polyterephthalate

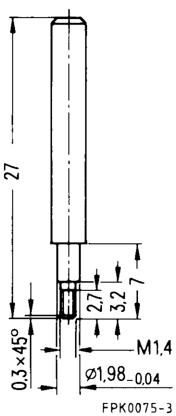
Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)
Centering pin e.g. made of brass (for design proposal see figure below)

Core P 11 × 7		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
K 12	16	1,81 × 2,0	Si 1	black	13	B65539-C1003-X101	1000
K 1	25 40	1,81 × 2,0	K 1	yellow	30 12	B65539-C1003-X1	
M 33	40 63	1,81 × 2,0	Si 1	black	17 11	B65539-C1003-X101	
N 48	100	1,81 × 2,0	K 1	yellow	17	B65539-C1003-X1	
	160 250	1,81 × 2,7	N 22	red	16 8	B65539-C1002-X22	
Adjusting screwdriver						B63399-B4	10
Handle						B63399-B5	10

Adjusting screw

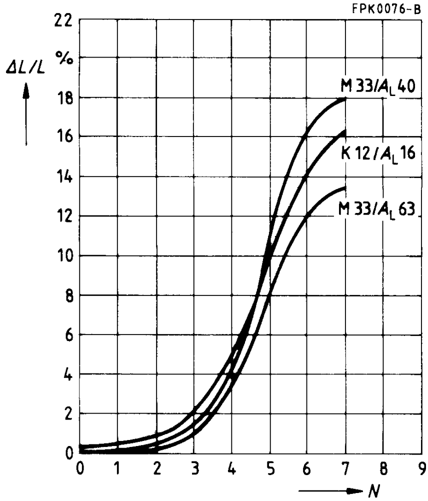


Centering pin

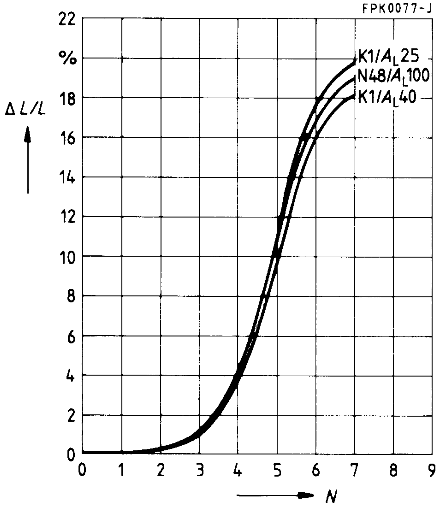


Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 1 turn engaged.

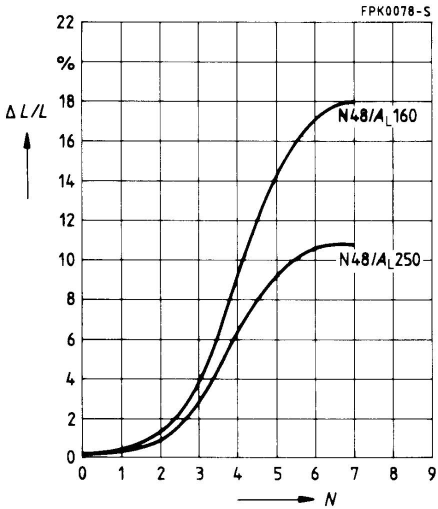
Adjusting screw B65539-C1003-X101
Color code black



Adjusting screw B65539-C1003-X1
Color code yellow

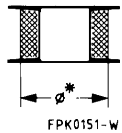


Adjusting screw B65539-C1002-X22
Color code red

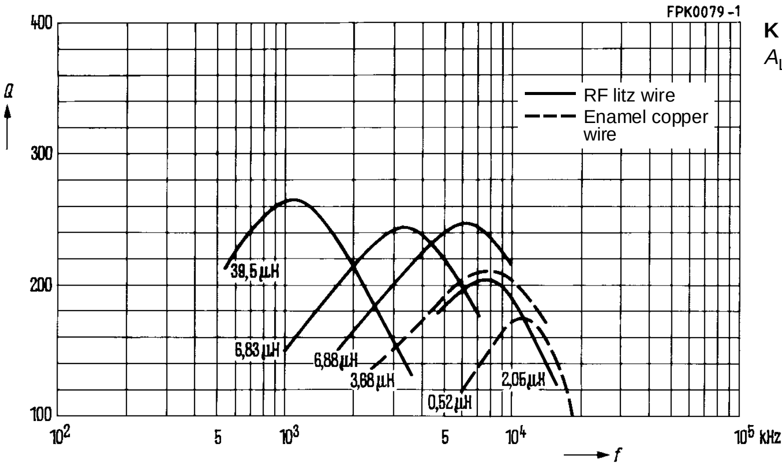


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 0,6 mT

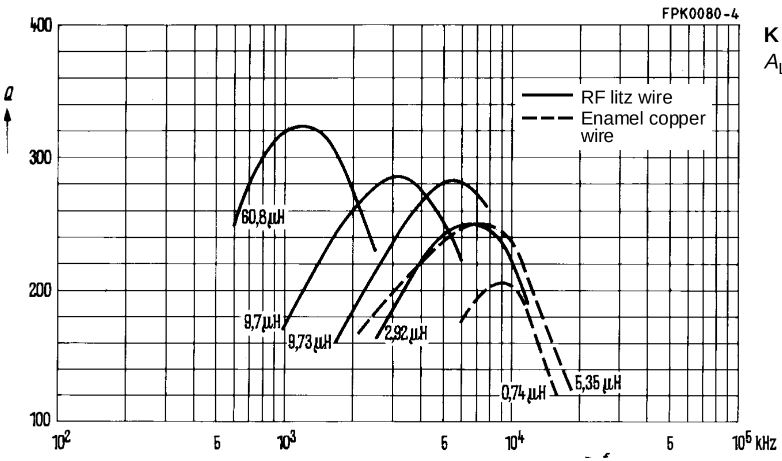
Mate-rial	L (µH) for A_L = 25 nH	L (µH) for A_L = 40 nH	Turns	Wire; RF litz wire	Sec-tions	∅* mm
K 1	3,68	5,35	11	0,25 CuL	1	8,1
	0,52	0,74	4	0,70 CuL	1	7,2
	39,50	60,80	40	1 × 30 × 0,04 CuLS	1	—
	6,88	9,73	15	1 × 12 × 0,04 CuLS	1	8,4
	6,83	9,70	15	1 × 30 × 0,04 CuLS	1	6,9
	2,05	2,92	8	1 × 30 × 0,04 CuLS	1	8,1



* Pad of polystyrene tape up to diameter ∅



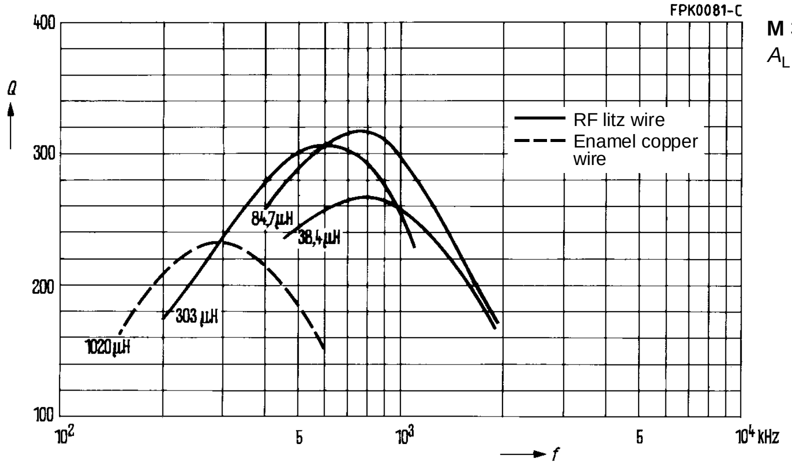
K 1
A_L = 25 nH



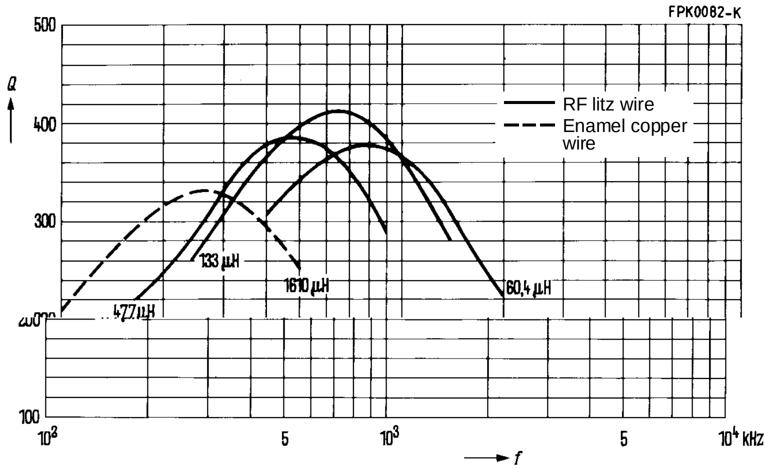
K 1
A_L = 40 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 2 mT

Material	L (µH) for A_L = 40 nH	L (µH) for A_L = 63 nH	Turns	RF litz wire	Sections
M 33	1020	1610	160	1 × 12 × 0,04 CuL	1
	303	477	87	1 × 15 × 0,04 CuLS	1
	84,7	133	46	1 × 30 × 0,04 CuLS	1
	38,4	60,4	31	1 × 45 × 0,04 CuLS	1



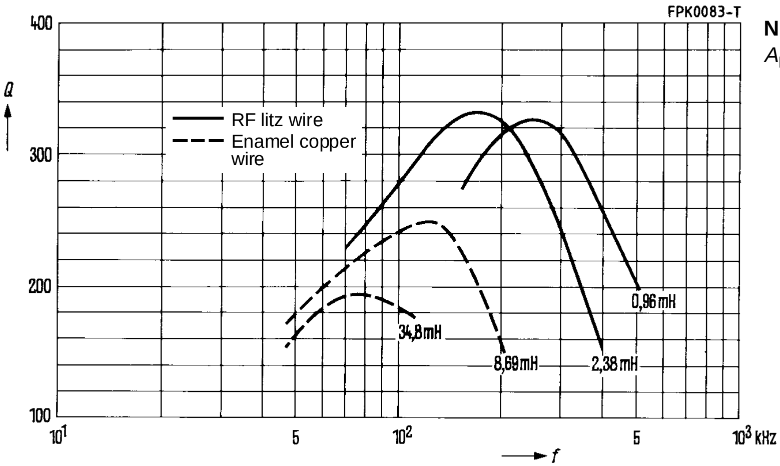
M 33
A_L = 40 nH



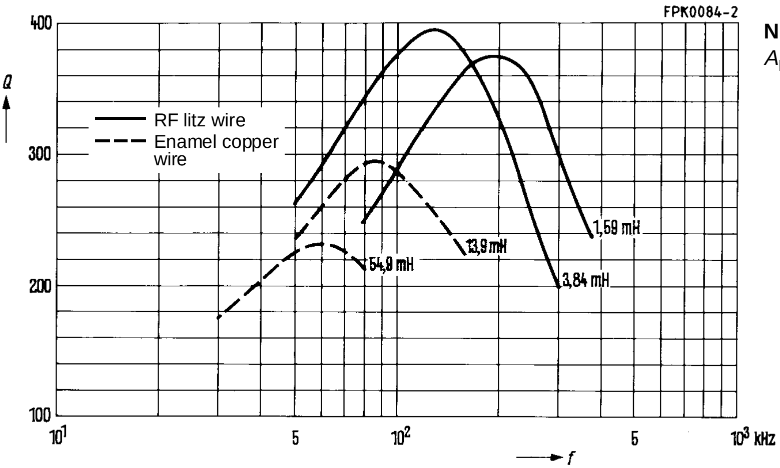
M 33
A_L = 63 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1,5 mT

Mate-rial	*L* (mH) for A_L = 100 nH	*L* (mH) for A_L = 160 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	34,8	54,9	600	0,07 CuL	1
	8,69	13,9	300	0,10 CuL	1
	2,38	3,84	160	1 × 12 × 0,04 CuLS	1
	0,96	1,59	100	1 × 12 × 0,04 CuLS	1

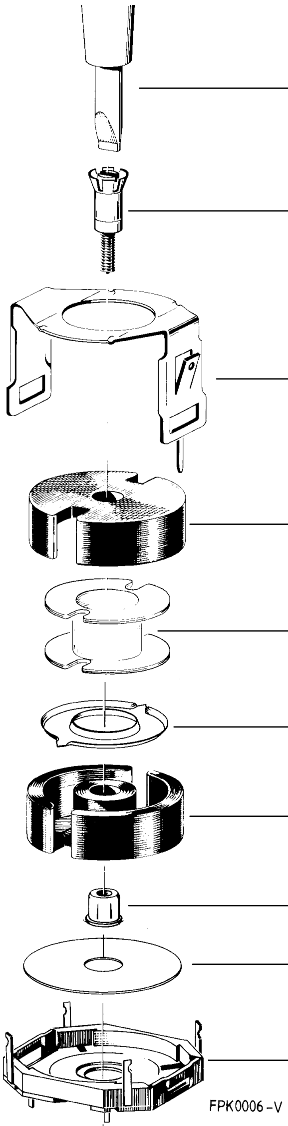


N 48
A_L = 100 nH



N 48
A_L = 160 nH

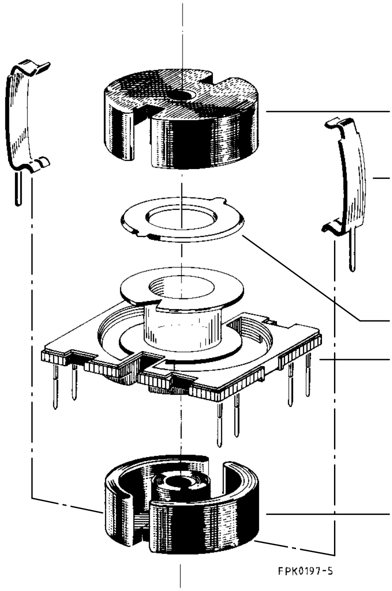
P 14 × 8
Core and Accessories



Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	352
Matching handle	B63399	352
Adjusting screw	B65549	352
Yoke	B65545	351
Core	B65541	348
Coil former	B65542	350
Insulating washer 1	B65542	350
Core	B65541	348
Threaded sleeve (glued-in)		
Insulating washer 2	B65542	350
Terminal carrier	B65545	351

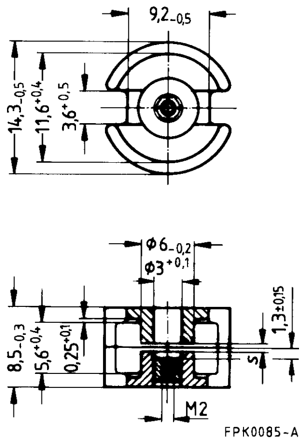
Example of an assembly set for printed circuit boards

Assembly sets for chassis mounting are available on request



Individual parts	Part no.	Page
Pot core	B65541	348
2 clamps	B65542	349
Insulating washer	B65542	350
Pinned coil former	B65542	349
Pot core	B65541	348

- In accordance with IEC 133



Magnetic characteristics (per set)

	with center hole	without center hole	
$\Sigma l/A$	0,8	0,73	mm^{-1}
l_e	20	21,0	mm
A_e	25	28,7	mm^2
A_{min}	20	23,6	mm^2
V_e	500	603	mm^3

Approx. weight (per set)

m	3,2	3,5	g

Gapped

Material	A_L value nH	s approx. mm	μ_e	Ordering code -T with threaded flange	PU Sets
K1	40 ± 3%	1,00	25,4	B65541-T40-A1	500
M33	40 ± 3%	0,90	25,4	B65541-T40-A33	
	100 ± 3%	0,30	64	B65541-T100-A33	
N48	160 ± 2%	0,16	102	B65541-T160-G48	
	250 ± 3%	0,10	159	B65541-T250-A48	
	315 ± 3%	0,08	201	B65541-T315-A48	
	400 ± 3%	0,05	255	B65541-T400-A48	

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	140+30/-20%	89			B65541-D-R1	500
M33	970+30/-20%	617			B65541-D-R33	
N26	2300+30/-20%	1460			B65541-D-R26	
N30	4600+30/-20%	2670			B65541-W-R30	
T38	9800+40/-30%	5690			B65541-W-Y38	
N67	2800+30/-20%	1630	1550	0,33 (200 mT, 100 kHz, 100°C)	B65541-W-R67	
N41	2800+30/-20%	1780	1400	0,08 (200 mT, 25 kHz, 100°C)	B65541-D-R41	

Coil former with solder pins

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 152

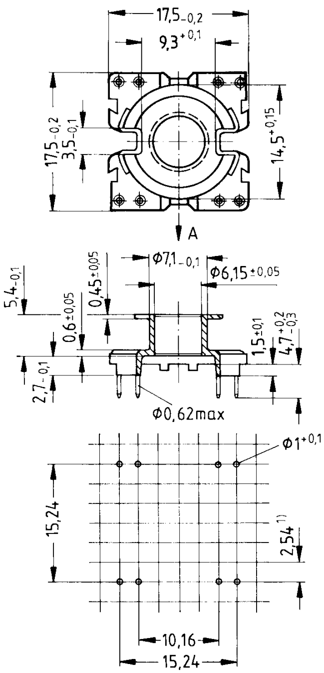
Pins squared in the start-of-winding area

Clamp

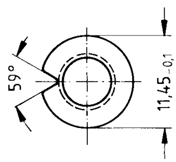
Material: Stainless spring steel (0,35 mm)

Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	8,4	28	115	8	B65542-J1008-D1	500
Clamp (ordering code per piece, 2 are required)					B65542-A2010	1000

Coil former



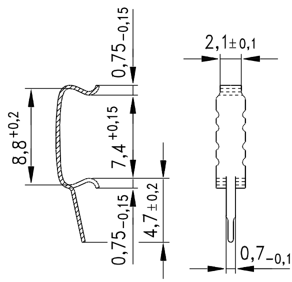
View A
(upper flange only)



Hole arrangement
View in mounting direction

FPK0010-N

Clamp



1) 2,5 mm also permissible

Coil former

Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

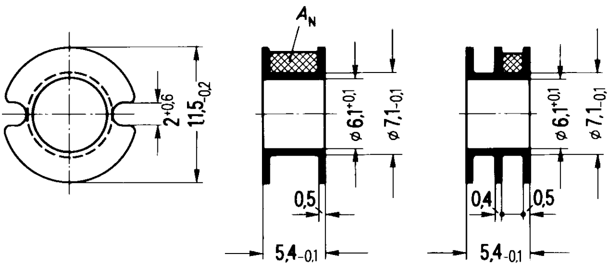
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,04 mm thick

Insulating washer 2 between core and terminal carrier

- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,08 mm thick

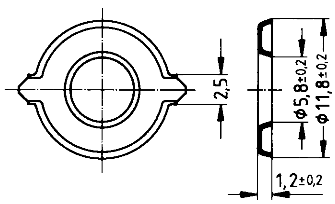
Coil former				Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ		Pcs
1	8,4	28	115	B65542-B-T1	500
2	7,6	28	127	B65542-B-T2	
Insulating washer 1 (reel packing, PU = 1 reel)				B65542-A5000	2500
Insulating washer 2 (bulk)				B65542-A5002	500

Coil former



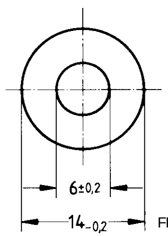
FPK0087-R

Insulating washer 1



FPK0088-Z

Insulating washer 2



FKP0089-8

Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code gray

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

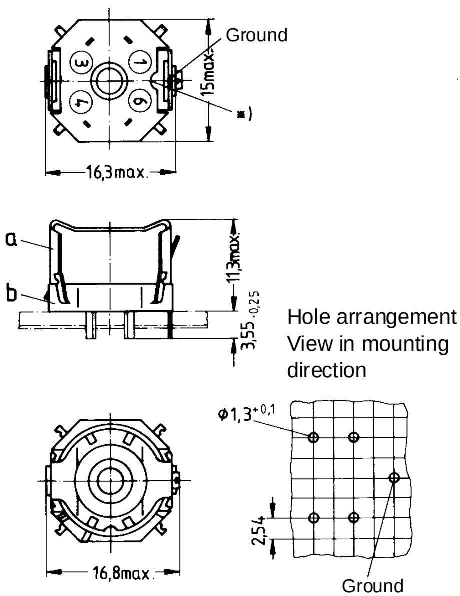
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

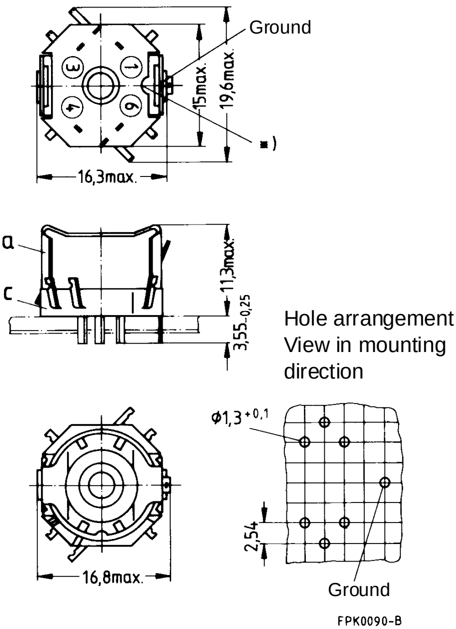
Material: Spring yoke, made of tinned nickel silver (0,3 mm), with ground terminal

Complete mounting assembly (4 solder terminals) Ordering code: B65545-B9 PU = 500 sets	Complete mounting assembly (6 solder terminals) Ordering code: B65545-B10, PU = 500 sets

4 solder terminals



6 solder terminals



*) This recess must be on the side of the grounding pin to ensure that the yoke locks in position.
a) Yoke
b) Terminal carrier with 4 solder terminals
c) Terminal carrier with 6 solder terminals

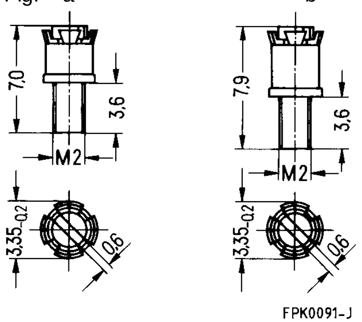
Adjusting screw

- Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

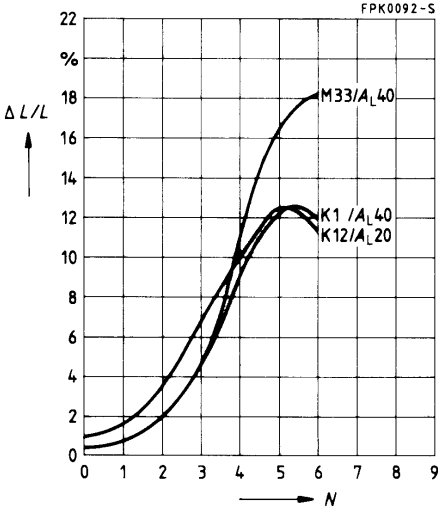
Core P 14 × 8		**Adjusting screw**				Min. adjusting range	Ordering code	PU
Material	A_L value nH	Fig.	Tube core ∅ × length mm	Material	Color code	%		Pcs
K 12	20	a	2,6 × 2,0	Si 1	green	10	B65549-E3-X101	500
K 1	40	a	2,6 × 2,0	Si 1	green	10	B65549-E3-X101	
M 33	40	a	2,6 × 2,0	Si 1	green	15	B65549-E3-X101	
	100	a	2,6 × 2,0	N 22	white	12	B65549-E3-X23	
N 48	160 250 315 400	b	2,76 × 2,9	N 22	black	20 12 11 6	B65549-E4-X23	
Adjusting screwdriver							B63399-B4	10
Handle							B63399-B5	10

Fig. a b

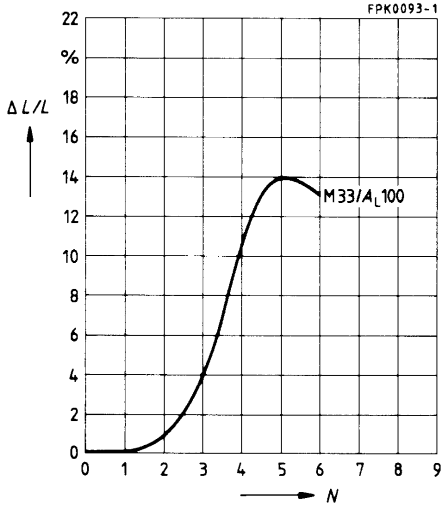


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L*/*L* versus turns *N* of adjusting screw.
0 ≙ at least 1 turn engaged.

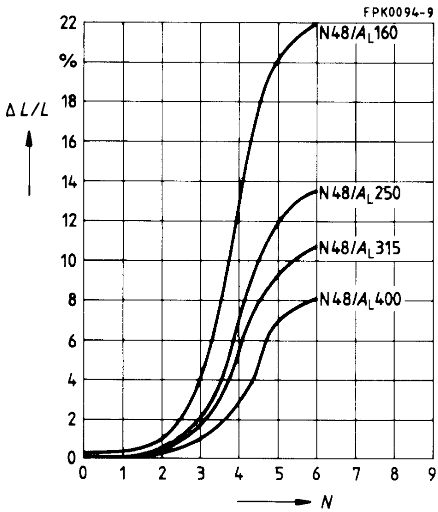
Adjusting screw B65549-E3-X101
Color code green



Adjusting screw B65549-E3-X23
Color code white

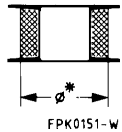


Adjusting screw B65549-E4-X23
Color code black

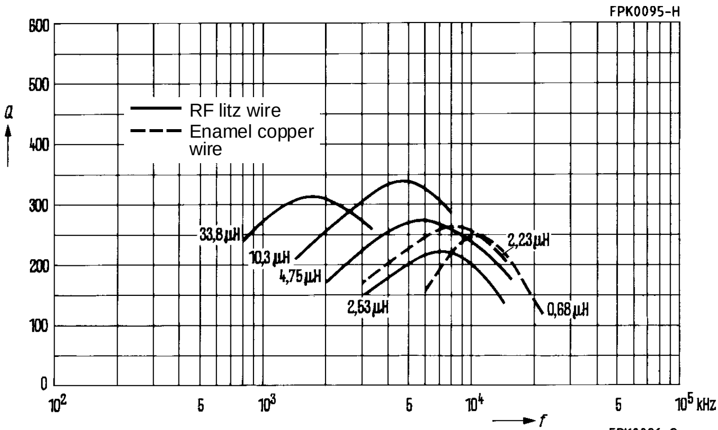


Q factor characteristics (typical values)

Material A_L value	L (µH)	Turns	Wire; RF litz wire	Sec-tions	∅* mm
K 1	2,23	7	0,55 CuL	1	10,1
A_L = 40 nH	0,68	4	1,0 CuL	1	9,2
	33,8	30	1 × 20 × 0,04 CuLS	1	9,5
	10,3	15	1 × 20 × 0,04 CuLS	1	10,8
	4,75	10	1 × 20 × 0,04 CuLS	1	10,8
	2,53	7	1 × 20 × 0,04 CuLS	1	10,8
M 33	1000	100	1 × 15 × 0,04 CuLS	1	—
A_L = 100 nH	325	57	1 × 30 × 0,05 CuLS	1	—
	250	50	1 × 30 × 0,05 CuLS	1	—
	193	22 + 22	1 × 45 × 0,04 CuLS	2	—
	90	15 + 15	1 × 45 × 0,04 CuLS	2	—

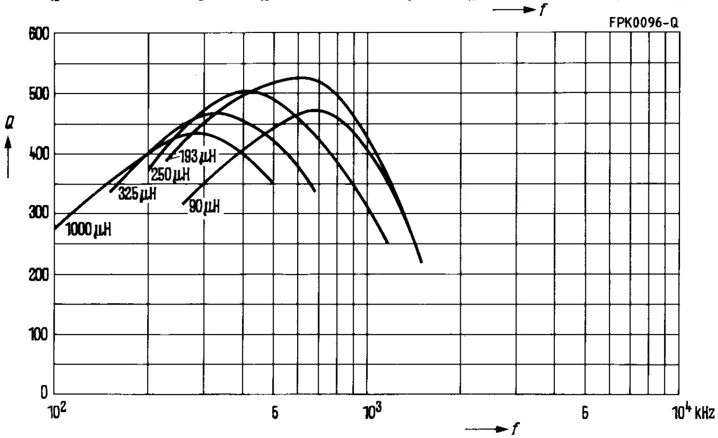


* Pad of polystyrene tape up to diameter ∅



K 1
A_L = 40 nH

Flux density in the core
$\hat{B}$ < 0,6 mT

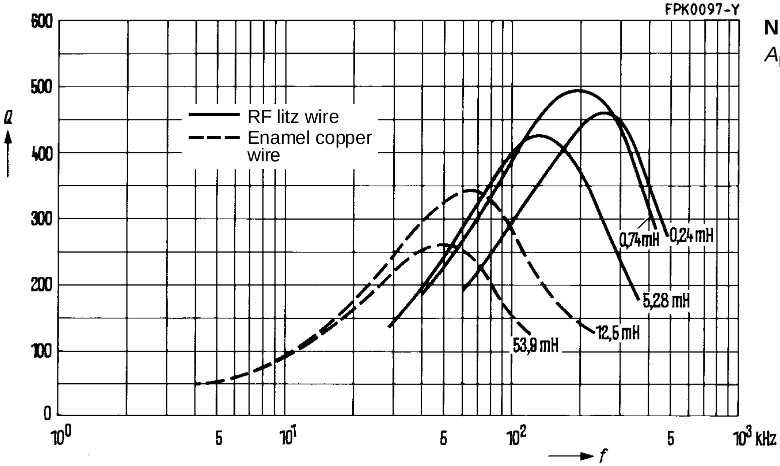


M 33
A_L = 100 nH

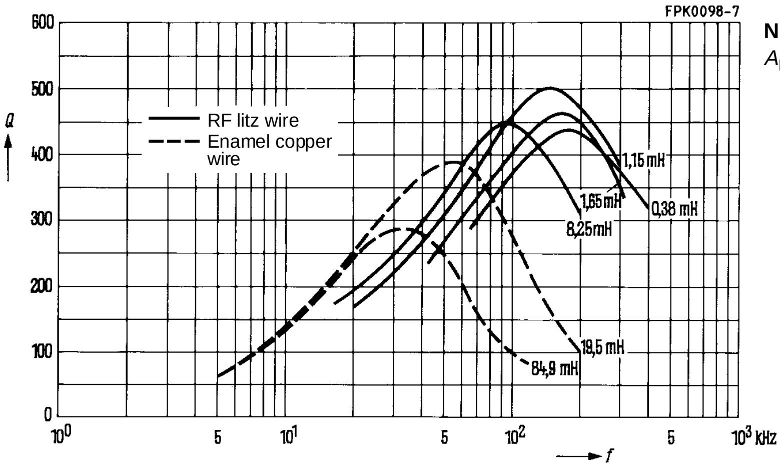
Flux density in the core
$\hat{B}$ < 2 mT

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1,5 mT

Mate-rial	L (mH) for A_L = 160 nH	L (mH) for A_L = 250 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	53,9	84,9	580	0,10 CuL	1
	12,5	19,5	280	0,15 CuL	1
	5,28	8,25	182	1 × 12 × 0,04 CuLS	1
	—	1,65	81	1 × 20 × 0,04 CuLS	2
	0,74	1,15	68	1 × 20 × 0,05 CuLS	2
	0,24	0,38	39	1 × 30 × 0,05 CuLS	2

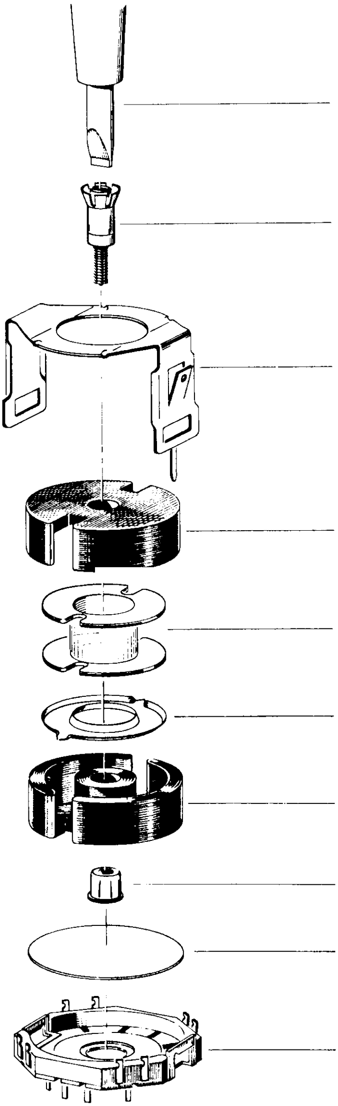


N 48
A_L = 160 nH



N 48
A_L = 250 nH

Core and Accessories



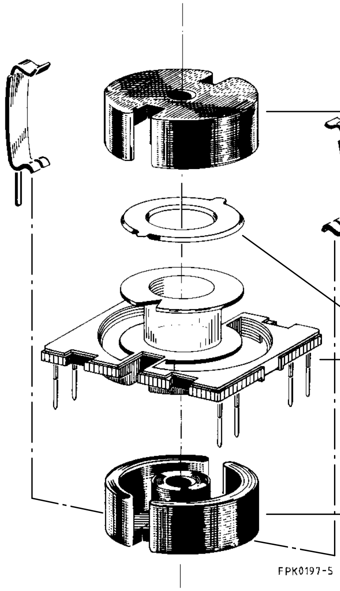
FPK0021-4

Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	362
Matching handle	B63399	362
Adjusting screw	B65659	362
Yoke	B65655	361
Core	B65651	358
Coil former	B65652	360
Insulating washer 1	B65652	359
Core	B65651	358
Threaded sleeve (glued-in)		
Insulating washer 2	B65652	359
Terminal carrier	B65655	361

Example of an assembly set for printed circuit boards [1)]

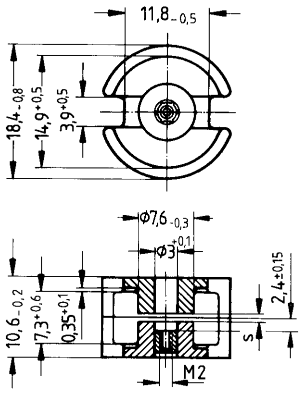
1) Assembly sets for chassis mounting are available on request

P 18 × 11
Core and Accessories



Individual parts	Part no.	Page
Pot core	B65651	358
2 clamps	B65652	359
Insulating washer	B65652	360
Pinned coil former	B65652	359
Pot core	B65651	358

- In accordance with IEC 133



Magnetic characteristics (per set)

	with center hole	w/o center hole	
Σl/A	0,6	0,57	mm^{-1}
l_e	25,9	26,6	mm
A_e	43	46,7	mm^2
A_{min}	—	33,9	mm^2
V_e	1120	1240	mm^3

Approx. weight (per set)

m	6,0	6,6	g

Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -D with center hole -T w. threaded sleeve	PU Sets
K1	40 ± 3%	1,60	19,2	B65651-T40-A1	500
	63 ± 3%	0,90	30,2	B65651-T63-A1	
M33	63 ± 3%	1,10	30,2	B65651-T63-A33	
	100 ± 3%	0,60	47,9	B65651-T100-A33	
	160 ± 3%	0,25	77	B65651-T160-A33	
N48	160 ± 2%	0,32	77	B65651-T160-G48	
	250 ± 3%	0,20	120	B65651-T250-A48	
	315 ± 3%	0,15	151	B65651-T315-A48	
	400 ± 3%	0,10	192	B65651-T400-A48	
	500 ± 3%	0,07	240	B65651-T500-A48	
N26	630 ± 10%	0,05	302	B65651-D630-K26	

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	180+30/-20%	86			B65651-D-R1	500
N26	2900+30/-20%	1380			B65651-D-R26	
N30	5900+30/-20%	2680			B65651-W-R30	
T38	12600+40/-30%	5710			B65651-W-Y38	
N67	3600+30/-20%	1630	2000	0,51 (200 mT, 100 kHz, 100°C)	B65651-W-R67	

Coil former with solder pins

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code blue
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 152

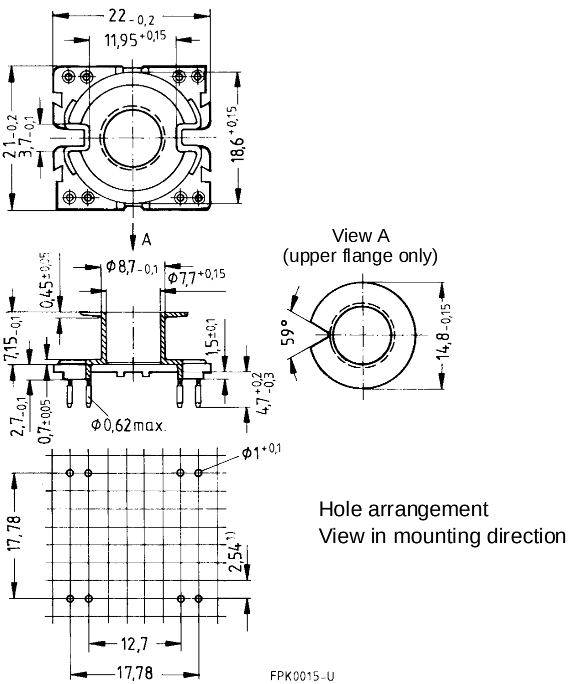
Pins squared in the start-of-winding area

Clamp

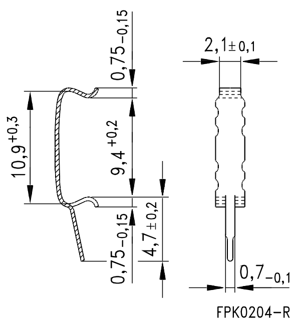
Material: Stainless spring steel (0,35 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	16	35,6	87	8	B65652-J1008-D1	500
Clamp (ordering code per piece, 2 are required)					B65652-A2010	1000

Coil former



Clamp



1) 2,5 mm also permissible

Coil former

Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

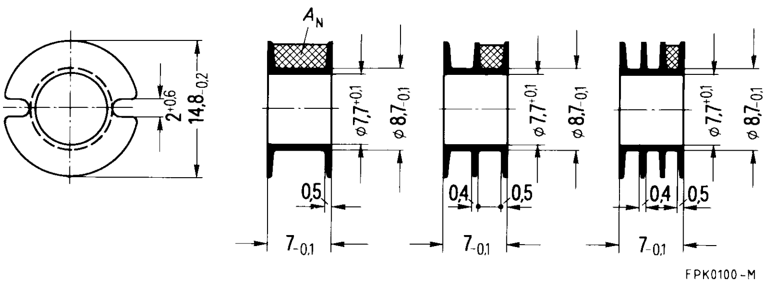
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,04 mm thick

Insulating washer 2 between core and terminal carrier

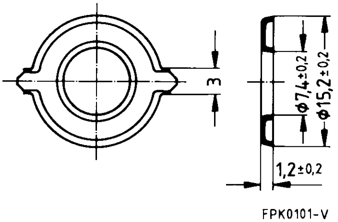
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,08 mm thick

Coil former				Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ		Pcs
1	16	35,6	87	B65652-B-T1	500
2	13	35,6	94	B65652-B-T2	
3	12	35,6	101	B65652-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65652-A5000	2000
Insulating washer 2 (bulk)				B65652-A5002	500

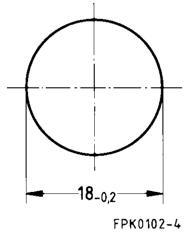
Coil former



Insulating washer 1



Insulating washer 2



Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

Terminal carrier

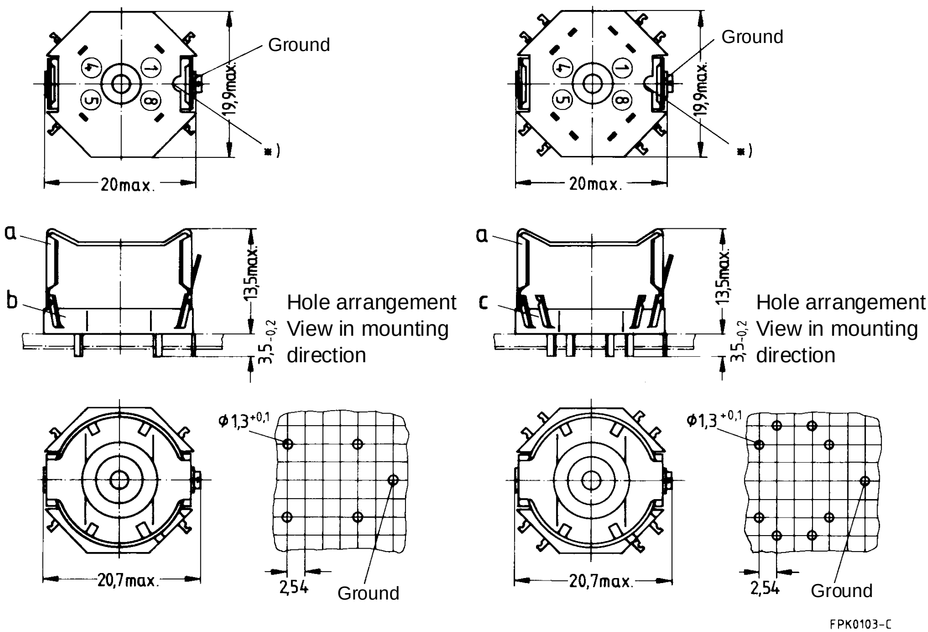
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code gray
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

Material: Spring yoke, made of tinned nickel silver (0,3 mm), with ground terminal

Complete mounting assembly (4 solder terminals) Ordering code: B65655-B9 PU = 500 sets	Complete mounting assembly (8 solder terminals) Ordering code: B65655-B10, PU = 500 sets

4 solder terminals 8 solder terminals



*) This recess must be on the side of the grounding pin to ensure that the yoke locks in position.
a) Yoke
b) Terminal carrier with 4 solder terminals
c) Terminal carrier with 8 solder terminals

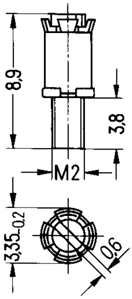
Adjusting screw

- Tube core with thread and core brake made of GFR polyterephthalate

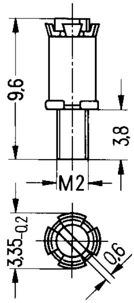
Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

Core P 18 × 11		**Adjusting screw**				Min. adjusting range	Ordering code	PU
Material	A_L value nH	Fig.	Tube core ∅ × length mm	Material	Color code	%		Pcs
K 1	40	a	2,62 × 3,6	Si 1	white	13	B65659-F1-X101	500
	63	c	2,82 × 4,4	Si 1	brown	11	B65659-F4-X101	
	63	a	2,62 × 3,6	K 1	green	17	B65659-F1-X1	
M 33	63 100	a	2,62 × 3,6	Si 1	white	16 10	B65659-F1-X101	
	100	c	2,82 × 4,4	Si 1	brown	17	B65659-F4-X101	
	160	a	2,62 × 3,6	Si 1	white	6	B65659-F1-X101	
N 48	160	a	2,62 × 3,6	Si 1	white	7	B65659-F1-X101	
	160	c	2,82 × 4,4	Si 1	brown	12	B65659-F4-X101	
	250	a	2,62 × 3,6	K 1	green	10	B65659-F1-X1	
	315 400	b	2,75 × 4,4	N 22	black	16 12	B65659-F3-X23	
	400 500	c	2,82 × 4,4	N 22	yellow	16 13	B65659-F4-X23	
Adjusting screwdriver							B63399-B4	10
Handle							B63399-B5	10

Fig. a

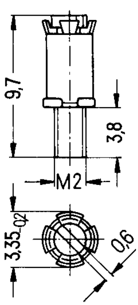


b



FPK0104-K

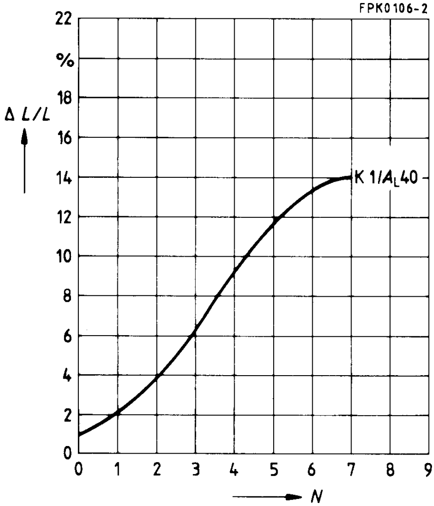
c



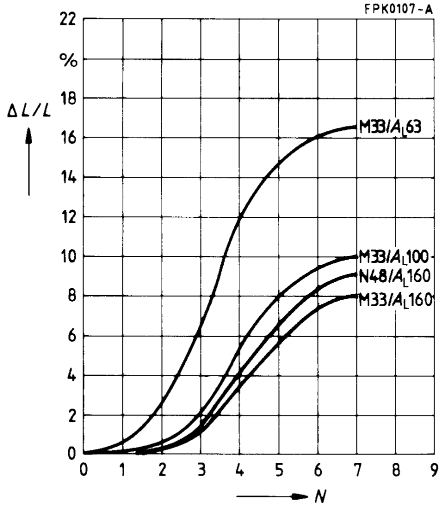
FPK0105-T

Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 1 turn engaged.

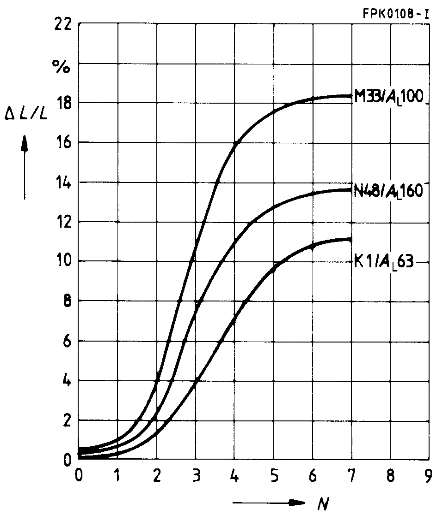
Adjusting screw B65659-F1-X101
Color code white



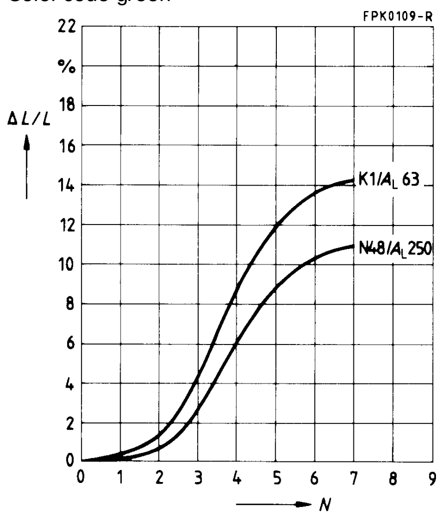
Adjusting screw B65659-F1-X101
Color code white



Adjusting screw B65659-F4-X101
Color code brown

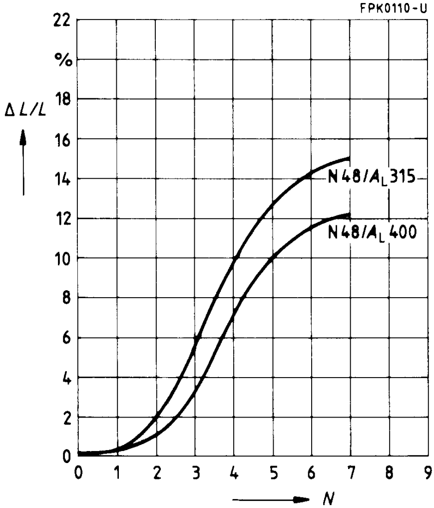


Adjusting screw B65659-F1-X1
Color code green

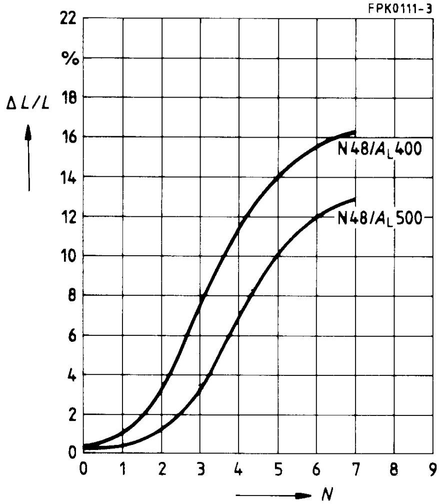


Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 1 turn engaged.

Adjusting screw B65659-F3-X23
Color code black

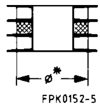


Adjusting screw B65659-F4-X23
Color code yellow

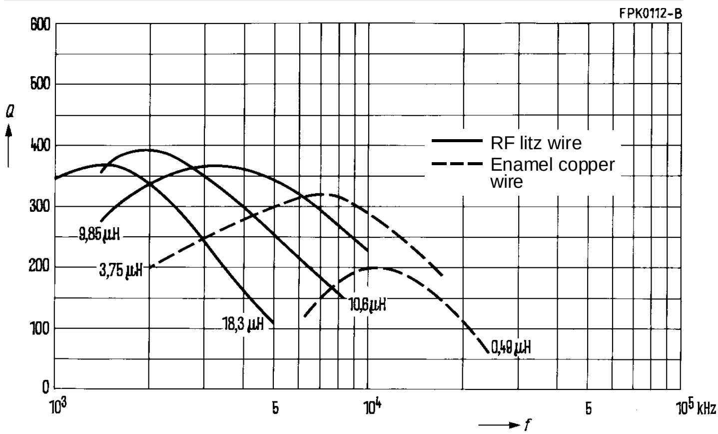


Q factor characteristics (typical values)

Material A_L value	L (µH)	Turns	Wire; RF litz wire	Sec- tions	∅* mm
K 1	3,75	9	0,6 CuL	1	13,0
A_L = 40 nH	0,49	3	1,0 CuL	1	12,2
	18,3	20	3 × 30 × 0,04 CuLS	1	12,8
	10,6	5+5+5	3 × 30 × 0,04 CuLS	3	12,8
	9,85	15	1 × 45 × 0,04 CuLS	1	13,5
M 33	1415	150	1 × 30 × 0,04 CuLS	1	—
A_L = 63 nH	630	100	1 × 45 × 0,04 CuLS	1	—
	403	40+40	1 × 45 × 0,04 CuLS	2	—
	198	25+6+25	1 × 45 × 0,04 CuLS	3	11,7
	72,8	15+4+15	1 × 45 × 0,04 CuLS	3	10,8
	49,4	12+4+12	1 × 45 × 0,04 CuLS	3	10,8

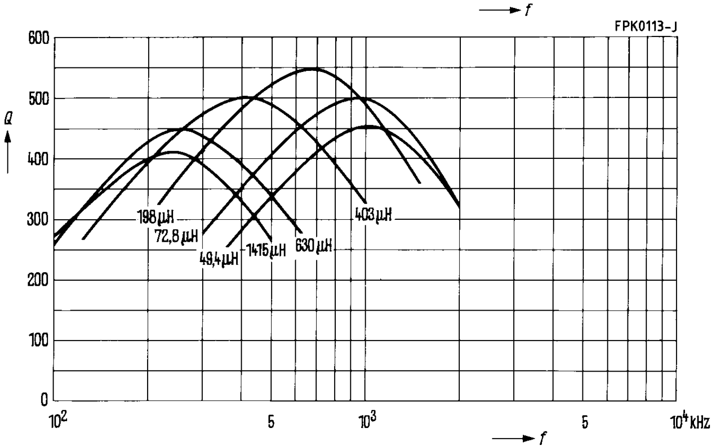


* Pad of polystyrene tape up to diameter ∅



K 1
A_L = 40 nH

Flux density in the core
$\hat{B}$ < 1,6 mT

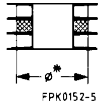


M 33
A_L = 63 nH

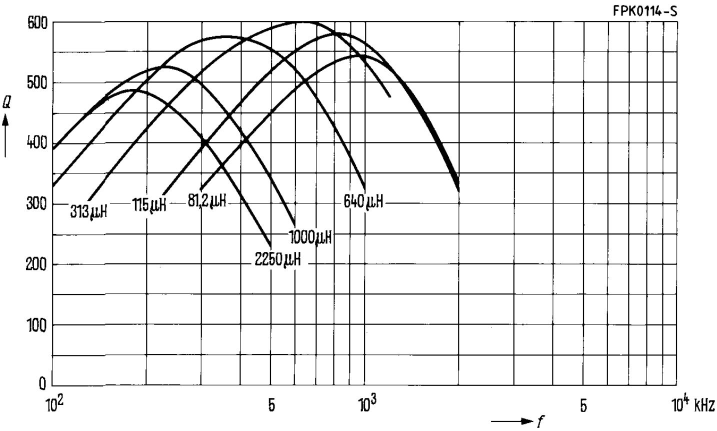
Flux density in the core
$\hat{B}$ < 2 mT

Q factor characteristics (typical values)

Material A_L value	L	Turns	Wire; RF litz wire	Sec- tions	∅* mm
M 33 A_L = 100 nH	2250 µH	150	1 × 30 × 0,04 CuLS	1	—
	1000 µH	100	1 × 45 × 0,04 CuLS	1	—
	640 µH	40+40	1 × 45 × 0,04 CuLS	2	—
	313 µH	25+6+25	1 × 45 × 0,04 CuLS	3	11,7
	115 µH	15+4+15	1 × 45 × 0,04 CuLS	3	10,8
	81,2 µH	12+4+12	1 × 45 × 0,04 CuLS	3	10,8
N 48 A_L = 160 nH	504 mH	1790	0,07 CuL	1	—
	31,9 mH	450	1,15 CuL	1	—
	3,0 mH	138	1 × 20 × 0,05 CuLS	1	—
	1,19 mH	8	1 × 45 × 0,04 CuLS	1	—
	0,53 mH	58	1 × 45 × 0,05 CuLS	1	—

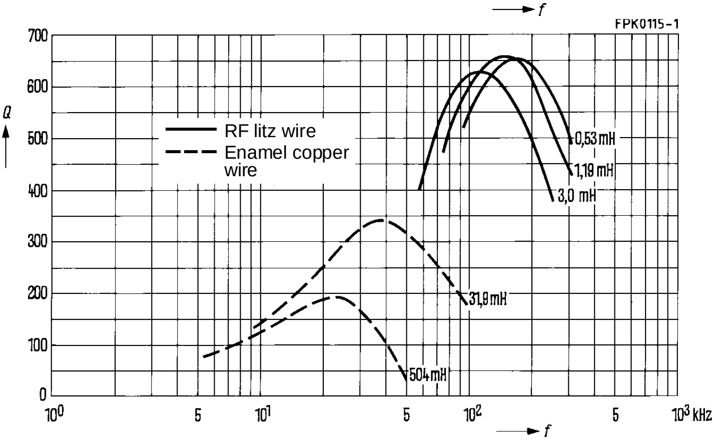


* Pad of polystyrene tape up to diameter ∅



M 33
A_L = 100 nH

Flux density in the core
$\hat{B}$ < 1,6 mT

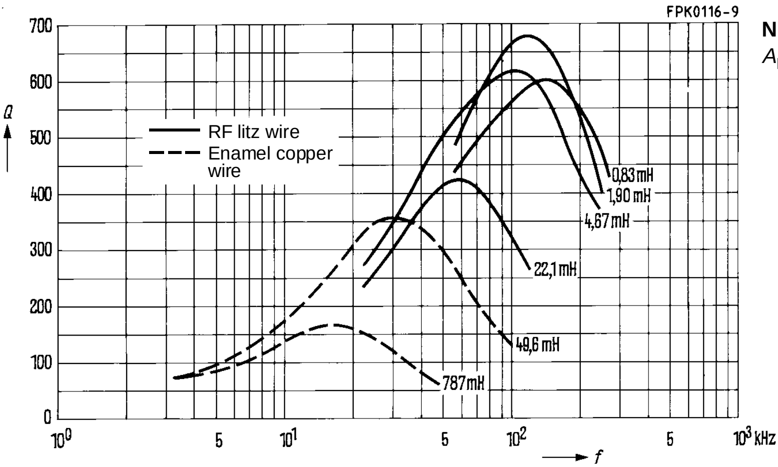


N 48
A_L = 160 nH

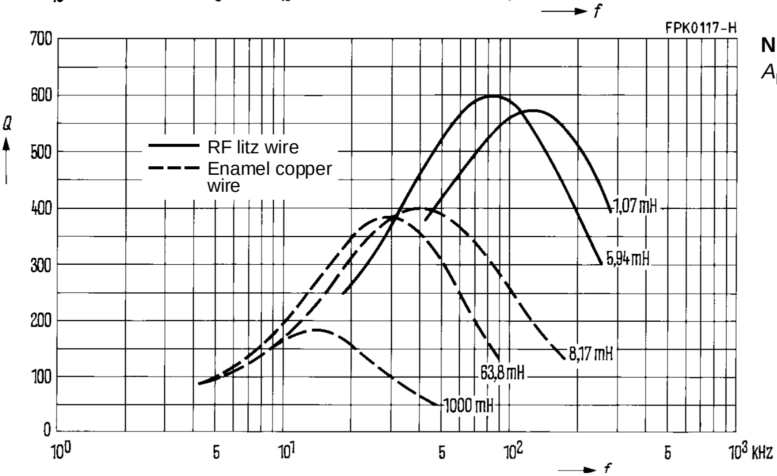
Flux density in the core
$\hat{B}$ < 1,5 mT

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1,5 mT

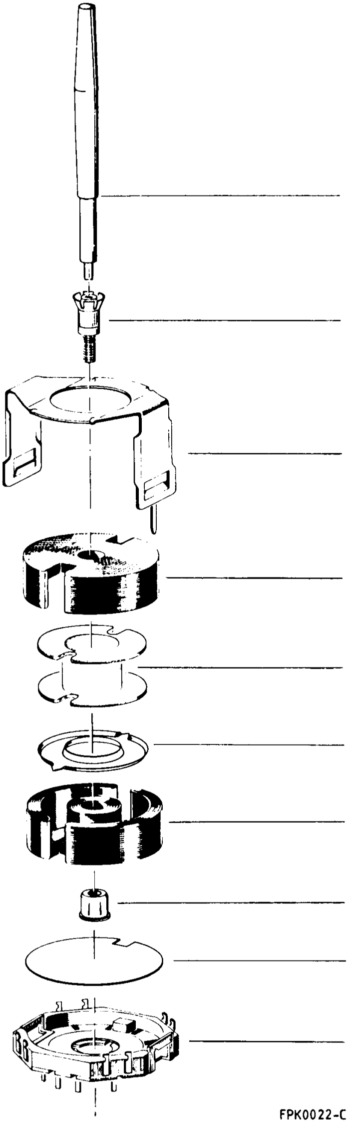
Mate-rial	L (mH) for A_L = 250 nH	L (mH) for A_L = 315 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	787	1000	1790	0,07 CuL	1
	49,6	63,8	450	0,15 CuL	1
	22,1	—	301	1 × 20 × 0,04 CuLS	1
	—	8,17	161	0,25 CuL	1
	4,67	5,94	138	1 × 20 × 0,05 CuLS	1
	1,90	—	87	1 × 45 × 0,04 CuLS	1
	0,83	1,07	58	1 × 45 × 0,05 CuLS	1



N 48
A_L = 250 nH



N 48
A_L = 315 nH

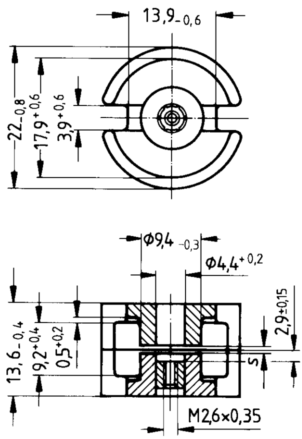


Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	372
Matching handle	B63399	372
Adjusting screw	B65669	372
Yoke	B65665	371
Core	B65661	369
Coil former	B65662	370
Insulating washer 1	B65662	370
Core	B65661	369
Threaded sleeve (glued-in)		
Insulating washer 2	B65662	370
Terminal carrier	B65665	371

Example of an assembly set for printed circuit boards[1)]

1) Assembly sets for chassis mounting are available on request.

- In accordance with IEC 133 and DIN 41 293



Magnetic characteristics (per set)

	with center hole	w/o center hole	
Σl/A	0,5	0,46	mm^{-1}
l_e	31,6	33,2	mm
A_e	63	72,6	mm^2
A_{min}	—	58,1	mm^2
V_e	2000	2410	mm^3

Approx. weight (per set)

m	13	14	g

Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -D with center hole -T w. threaded sleeve	PU Sets
K1	40 ± 3%	1,40	15,9	B65661-T40-A1	400
	63 ± 3%	1,30	25	B65661-T63-A1	
M33	100 ± 3%	0,90	39,8	B65661-T100-A33	
	160 ± 3%	0,70	64	B65661-T160-A33	
N48	160 ± 2%	0,50	64	B65661-T160-G48	
	250 ± 2%	0,26	100	B65661-T250-G48	
	315 ± 3%	0,22	125	B65661-T315-A48	
	400 ± 3%	0,16	159	B65661-T400-A48	
	500 ± 3%	0,14	199	B65661-T500-A48	
	630 ± 3%	0,10	250	B65661-T630-A48	
N26	1250 ± 10%	0,05	498	B65661-D1250-K26	

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	220+30/-20%	86			B65661-D-R1	400
N26	3800+30/-20%	1510			B65661-D-R26	
N30	7600+30/-20%	2780			B65661-W-R30	
T38	17400+40/-30%	6370			B65661-W-Y38	
N67	4400+30/-20%	1600	2500	1,21 (200 mT, 100 kHz, 100°C)	B65661-W-R67	

Coil former

Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

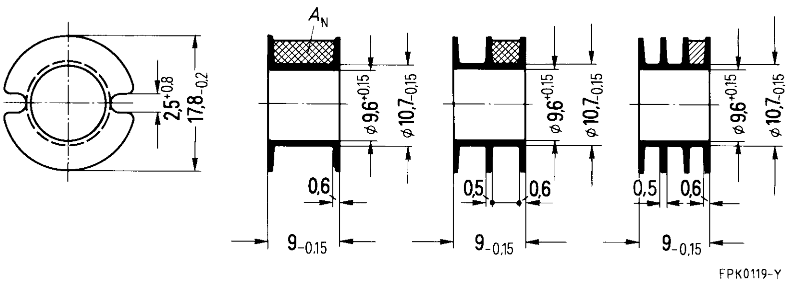
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 between core and terminal carrier

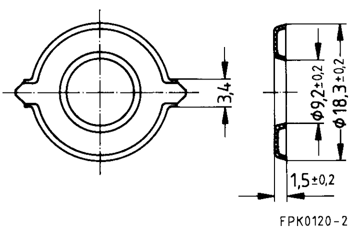
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,08 mm thick

Coil former				Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ		Pcs
1	23,4	44	67	B65662-B-T1	400
2	22,0	44	69	B65662-B-T2	
3	20,0	44	76	B65662-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65662-A5000	1400
Insulating washer 2 (bulk)				B65662-A5002	400

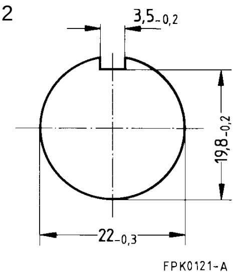
Coil former



Insulating washer 1



Insulating washer 2



Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

Terminal carrier

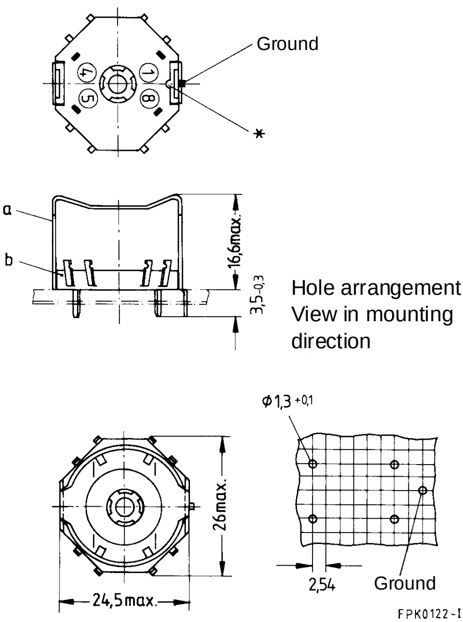
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code gray
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

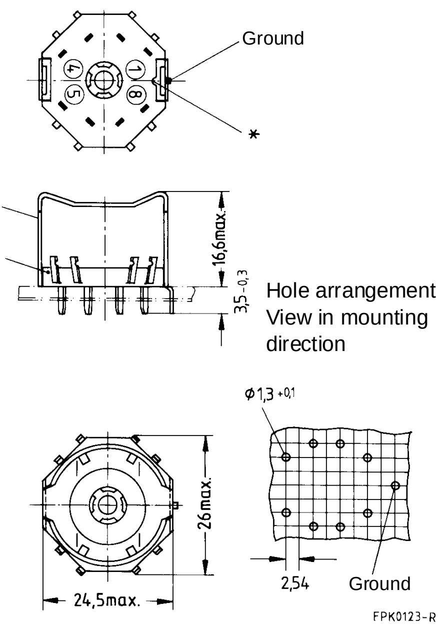
Material: Spring yoke, made of tinned nickel silver (0,4 mm), with ground terminal

Complete mounting assembly (4 solder terminals) Ordering code: B65665-C5 PU = 400 sets	Complete mounting assembly (8 solder terminals) Ordering code: B65665-C4, PU = 400 sets

4 solder terminals



8 solder terminals



*) This recess must be on the side of the grounding pin to ensure that the yoke locks in position.
a) Yoke
b) Terminal carrier with 4 solder terminals
c) Terminal carrier with 8 solder terminals

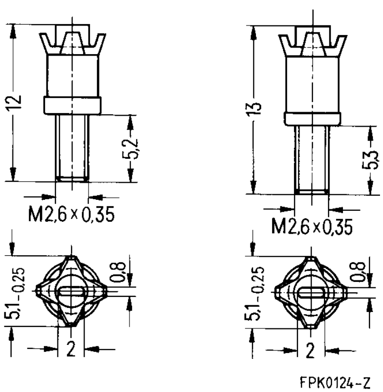
Adjusting screw

- Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

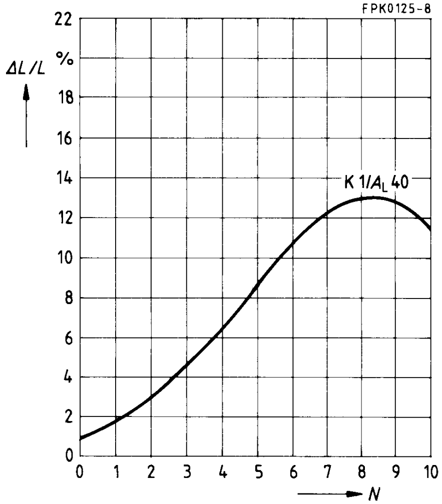
Core P 22 × 13		**Adjusting screw**				Min. adjusting range	Ordering code	PU
Mate-rial	A_L value nH	Fig.	Tube core Ø × length mm	Mate-rial	Color code	%		Pcs
K 1	40	a	3,5 × 3,6	Si 1	brown	11	B65669-D10-X101	400
	63	a	3,5 × 4,3	K 1	blue	17	B65669-D9-X1	
M 33	100	a	3,5 × 3,6	K 1	green	14	B65669-D10-X1	
	160	a	3,5 × 4,3	K 1	blue	11	B65669-D9-X1	
	160	a	3,5 × 4,3	M 25	black	11	B65669-D8-X25	
N 48	160	a	3,5 × 4,3	M 25	black	13	B65669-D8-X25	
	250 315	a	4,1 × 3,6	N 22	yellow	18 13	B65669-D11-X22	
	400	a	4,1 × 4,3	N 22	red	12	B65669-D7-X22	
	500 630	b	4,18 × 5,0	N 22	white	12 10	B65669-E6-X22	
Adjusting screwdriver							B63399-B1	10
Handle							B63399-B5	10

Fig. a b

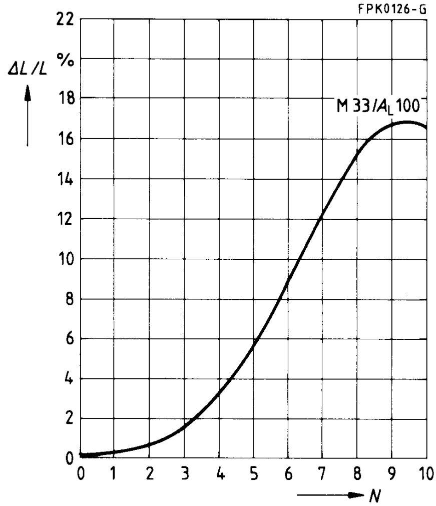


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 2 turns engaged.

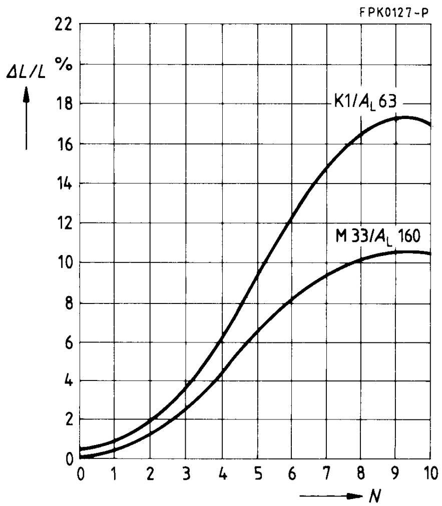
Adjusting screw B65669-D10-X101
Color code brown



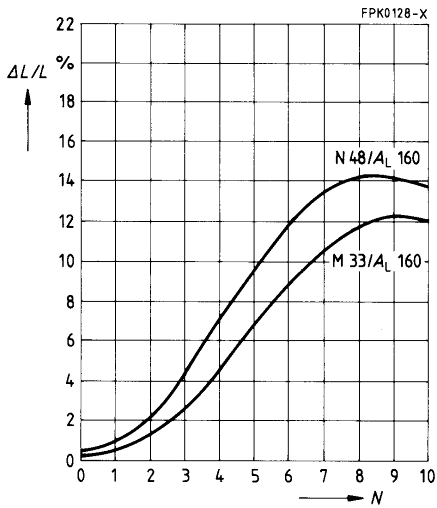
Adjusting screw B65669-D10-X1
Color code green



Adjusting screw B65669-D9-X1
Color code blue

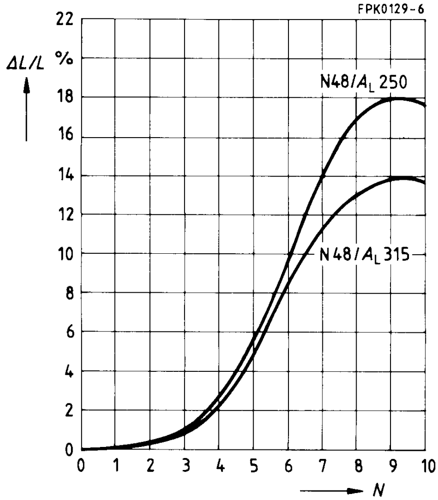


Adjusting screw B65669-D8-X25
Color code black

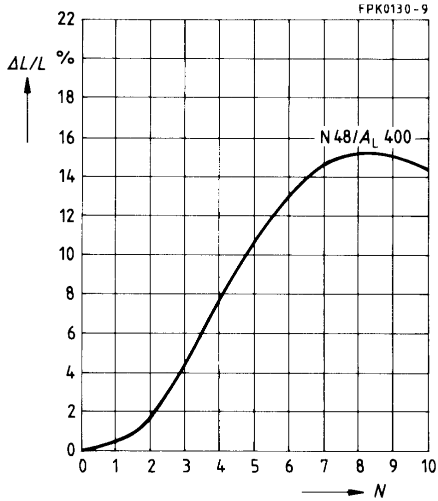


Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 2 turns engaged.

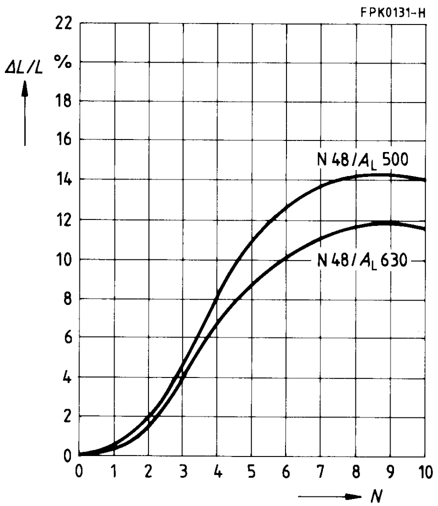
Adjusting screw B65669-D11-X22
Color code yellow



Adjusting screw B65669-D7-X22
Color code red

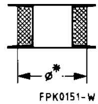


Adjusting screw B65669-E6-X22
Color code white

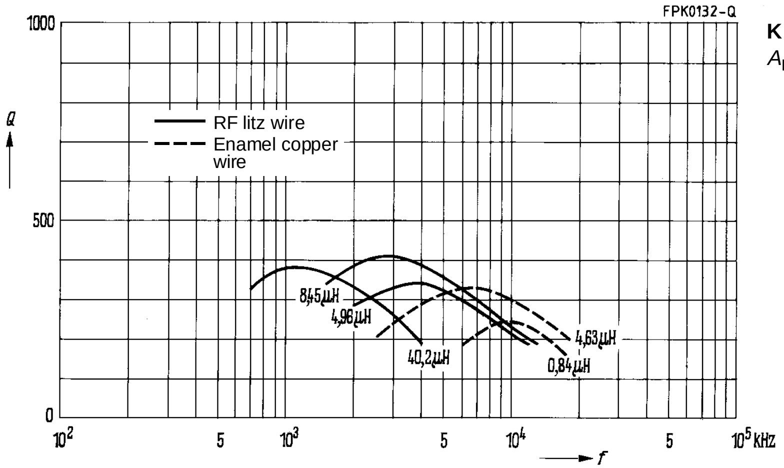


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 0,6 mT

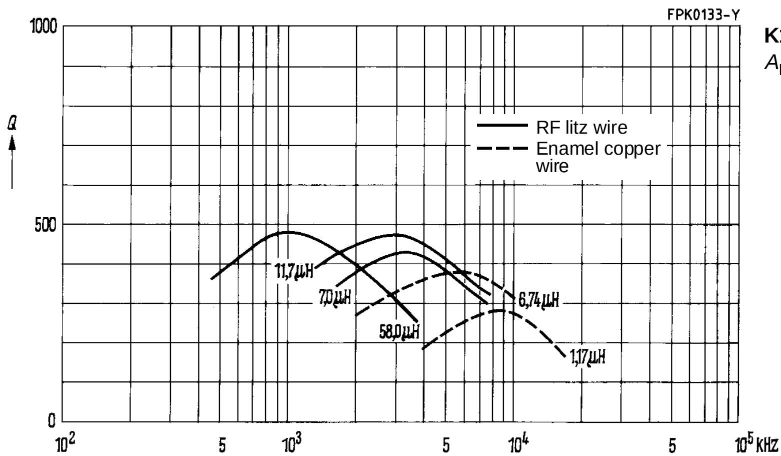
Mate-rial	L (µH) for A_L = 40 nH	L (µH) for A_L = 63 nH	Turns	Wire; RF litz wire	Sec-tions	∅* mm
K 1	4,63	6,74	10	0,7 CuL	1	16,1
	0,84	1,17	4	1,0 CuL	1	15,5
	40,20	58,0	10+10+10	1 × 45 × 0,04 CuLS	3	16,8
	8,45	11,7	13	3 × 30 × 0,04 CuLS	1	16,5
	4,96	7,0	10	3 × 30 × 0,04 CuLS	1	16,5



* Pad of polystyrene tape up to diameter ∅



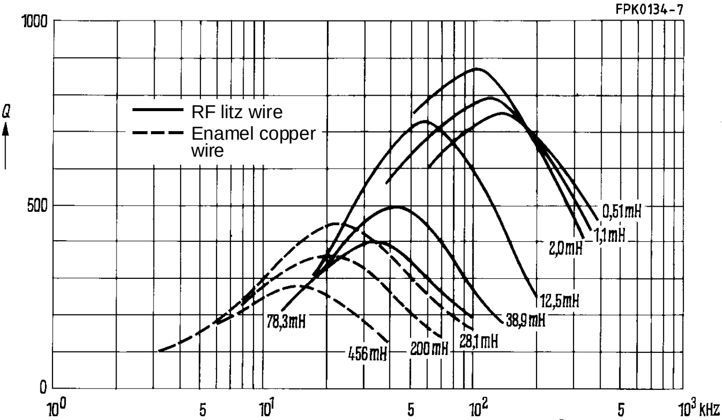
K 1
A_L = 40 nH



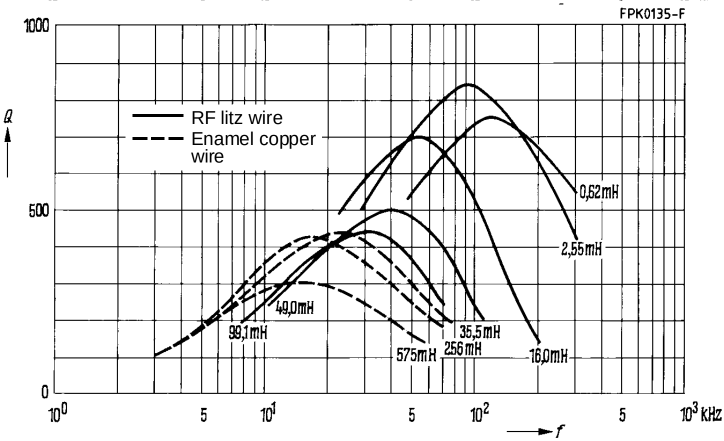
K1
A_L = 63 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1,5 mT

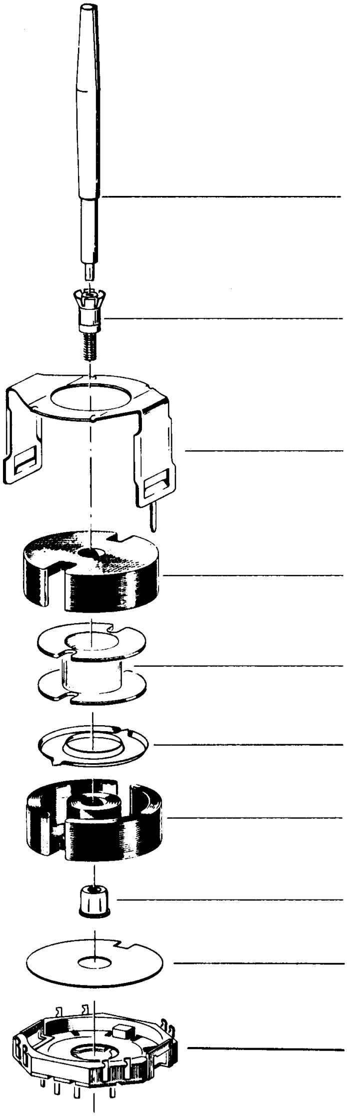
Mate-rial	L (mH) for A_L = 315 nH	A_L = 400 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	456	575	1200	0,12 CuL	1
	200	256	800	0,15 CuL	1
	28,1	35,5	300	0,27 CuL	1
	78,3	99,1	500	1 × 12 × 0,04 CuLS	1
	38,9	49,0	350	1 × 15 × 0,04 CuLS	1
	12,5	16,0	200	1 × 20 × 0,05 CuLS	1
	2,0	2,55	80	3 × 20 × 0,05 CuLS	2
	1,1	—	59	3 × 20 × 0,05 CuLS	3
	0,51	—	40	3 × 20 × 0,05 CuLS	2
	—	0,62	40	3 × 30 × 0,05 CuLS	2



N 48
A_L = 315 nH



N 48
A_L = 400 nH



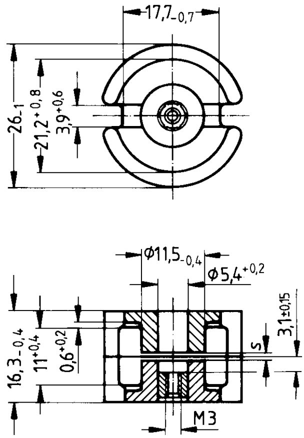
Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	382
Matching handle	B63399	382
Adjusting screw	B65679	382
Yoke	B65675	381
Core	B65671	378
Coil former	B65672	380
Insulating washer 1	B65672	380
Core	B65671	378
Threaded sleeve (glued-in)		
Insulating washer 2	B65672	380
Terminal carrier	B65675	381

FPK0023-K

Example of an assembly set for printed circuit boards[1)]

1) Assembly sets for chassis mounting are available on request.

- In accordance with IEC 133 and DIN 41 293



Magnetic characteristics (per set)

	with center hole	w/o center hole	
Σl/A	0,4	0,37	mm^{-1}
l_e	37,2	40,0	mm
A_e	93,0	108	mm^2
A_{min}	76,5	87,0	mm^2
V_e	3460	4320	mm^3

Approx. weight (per set)

m	21	23	g

Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -D with center hole -T w. threaded sleeve	PU Sets
K1	63 ± 3%	2,28	20,2	B65671-T63-A1	200
	100 ± 3%	0,90	31,9	B65671-T100-A1	
M33	100 ± 3%	1,52	31,9	B65671-T100-A33	
	160 ± 3%	0,78	51	B65671-T160-A33	
N48	160 ± 2%	0,80	51	B65671-T160-G48	
	250 ± 2%	0,40	80	B65671-T250-G48	
	315 ± 2%	0,34	100	B65671-T315-G48	
	400 ± 3%	0,24	127	B65671-T400-A48	
	630 ± 3%	0,15	201	B65671-T630-A48	
	800 ± 3%	0,11	255	B65671-T800-A48	
N26	1000 ± 5%	0,10	319	B65671-D1000-J26	
	1600 ± 10%	0,05	510	B65671-D1600-K26	

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
K1	270+30/-20%	86			B65671-D-R1	200
N26	4900+30/-20%	1560			B65671-D-R26	
N30	9700+30/-20%	2860			B65671-W-R30	
T38	22000+40/-30%	6480			B65671-W-Y38	
N67	5500+30/-20%	1620	3050	2,12 (200 mT, 100 kHz, 100°C)	B65671-W-R67	
N41	6300+30/-20%	2000	2850	0,57 (200 mT, 25 kHz, 100°C)	B65671-D-R41	

Coil former

Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

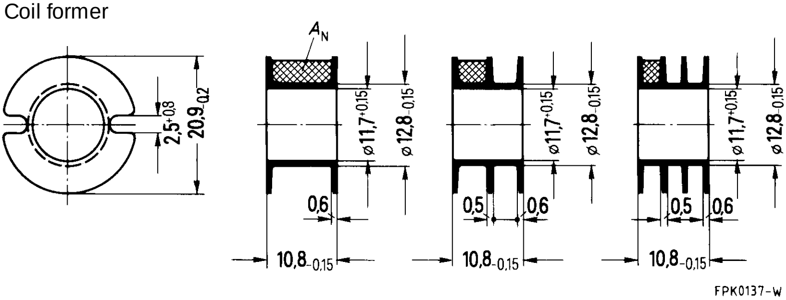
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 between core and terminal carrier

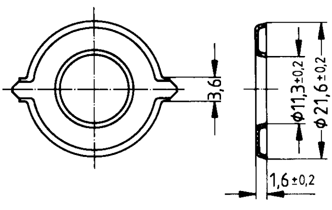
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,08 mm thick

Coil former				Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ		Pcs
1	32	52	55	B65672-B-T1	200
2	30	52	59	B65672-B-T2	
3	28,8	52	61	B65672-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65672-B5000	1000
Insulating washer 2 (bulk)				B65672-A5002	200

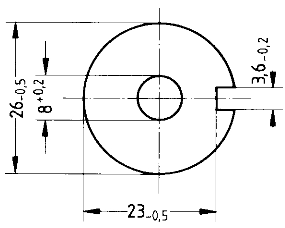
Coil former



Insulating washer 1



Insulating washer 2



Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code gray
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

Material: Spring yoke, made of tinned nickel silver (0,4 mm), with ground terminal

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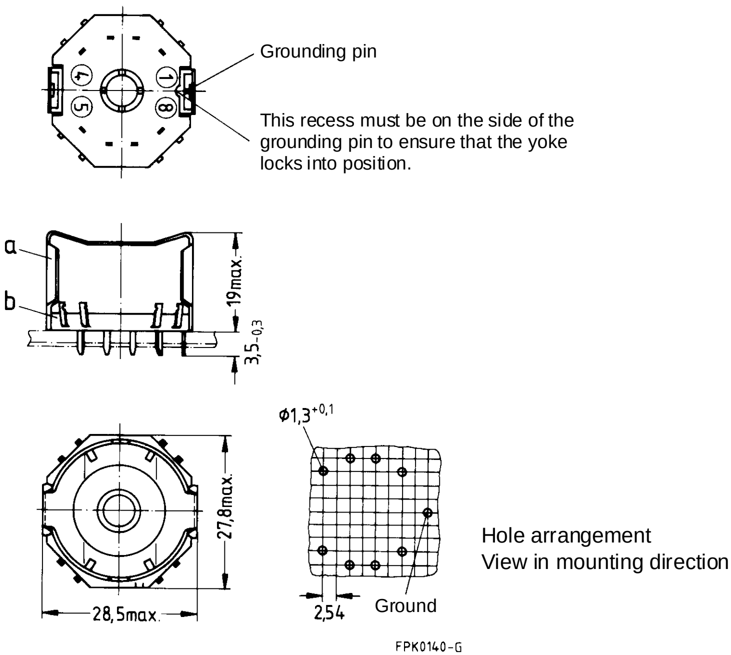
Complete mounting assembly (8 solder terminals)
Ordering code: B65675-B5, PU = 200 sets



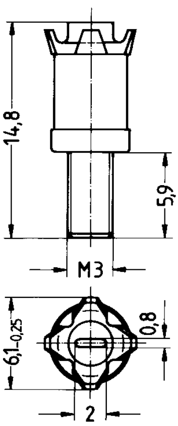
a) Yoke
b) Terminal carrier with 8 solder terminals

Adjusting screw[1)]

- Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

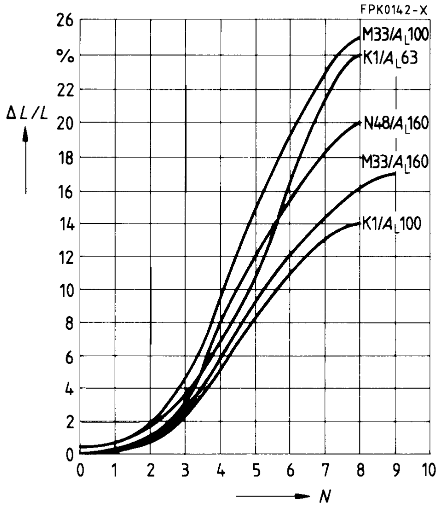
Core P 26 × 16		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
K 1	63	4,98 × 6,3	Si 1	yellow	24	B65679-E2-X101	200
	100	4,98 × 6,3	Si 1	yellow	13	B65679-E2-X101	
M 33	100	4,98 × 6,3	Si 1	yellow	25	B65679-E2-X101	
	160	4,98 × 6,3	Si 1	yellow	17	B65679-E2-X101	
N 48	160	4,98 × 6,3	Si 1	yellow	20	B65679-E2-X101	
	250 315	4,55 × 6,3	N 22	red	16 13	B65679-E3-X22	
	315 400	4,98 × 6,3	N 22	black	23 18	B65679-E2-X22	
	630 800	5,15 × 6,3	N 22	white	16 14	B65679-E1-X22	
Adjusting screwdriver						B63399-B1	10
Handle						B63399-B5	10



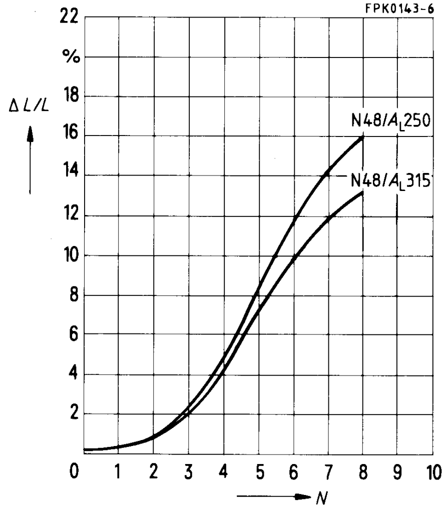
1) Due to the limited distance between adjusting screw and internal borehole, the entire assembly must be accurately centered.

Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 2 turns engaged

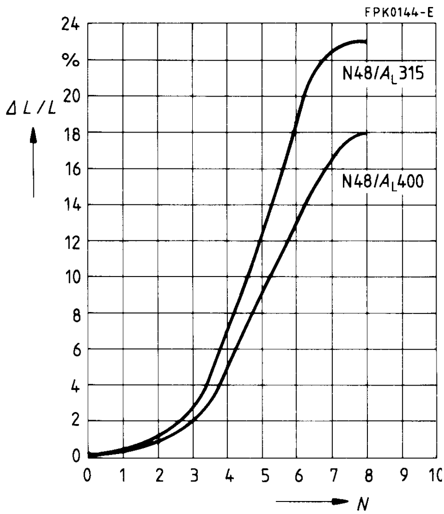
Adjusting screw B65679-E2-X101
Color code yellow



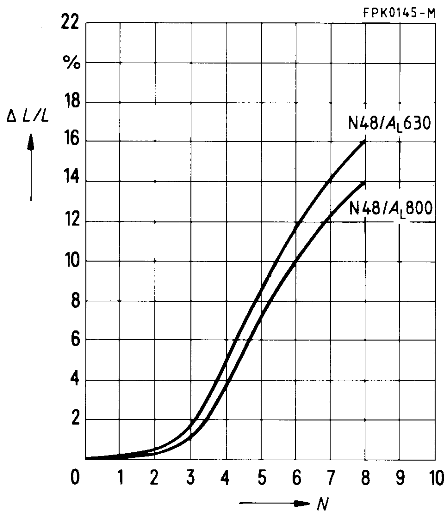
Adjusting screw B65679-E3-X22
Color code red



Adjusting screw B65679-E2-X22
Color code black

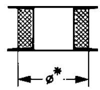


Adjusting screw B65679-E1-X22
Color code white



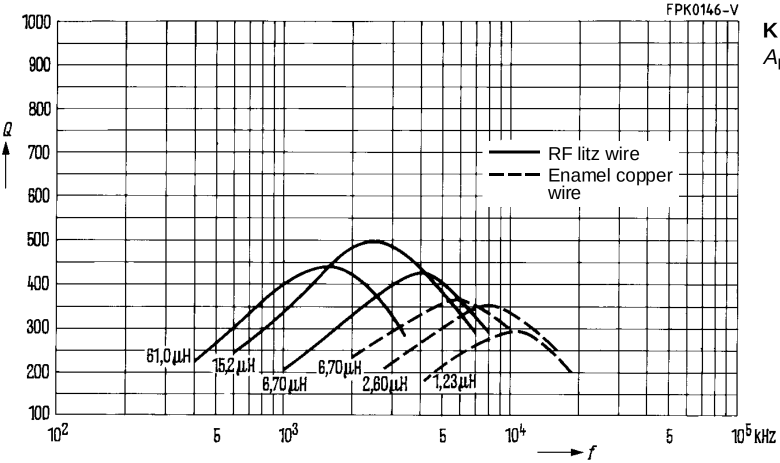
Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 0,6 mT

Mate-rial	L (µH) for A_L = 63 nH	L (µH) for A_L = 100 nH	Turns	Wire; RF litz wire	Sec-tions	∅* mm
K 1	6,70	11,10	10	0,7 CuL	1	18,0
	2,60	4,14	6	1,0 CuL	1	17,5
	1,23	2,0	4	1,0 CuL	1	17,5
	61,0	96,5	10+10+10	1 × 45 × 0,04 CuLS	3	18,5
	15,2	24,1	15	3 × 30 × 0,04 CuLS	1	18,0
	6,7	11,1	3+4+3	3 × 30 × 0,04 CuLS	3	18,0

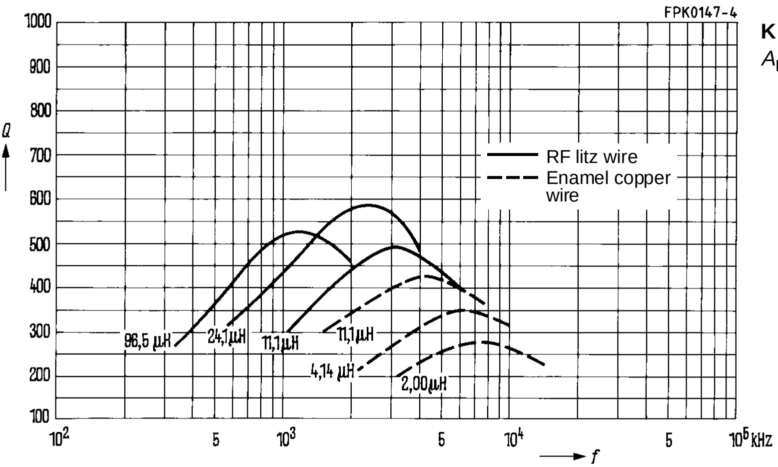


FPK0151-W

* Pad of polystyrene tape up to diameter ∅



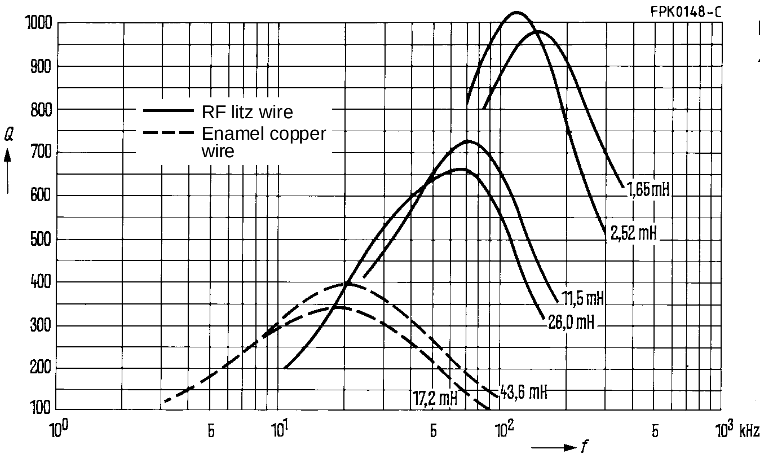
K 1
A_L = 63 nH



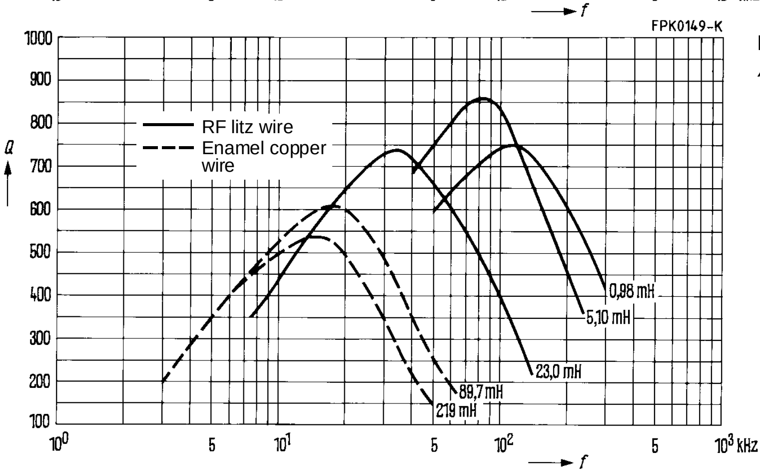
K 1
A_L = 100 nH

Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1,5 mT

Mate-rial	L (mH) for A_L = 315 nH	A_L = 630 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	—	219	600	0,20 CuL	1
	43,6	89,7	385	0,27 CuL	1
	17,2	—	235	0,35 CuL	1
	26,0	—	290	1 × 20 × 0,05 CuLS	1
	11,5	23,0	193	1 × 30 × 0,05 CuLS	1
	2,52	5,10	90	3 × 30 × 0,04 CuLS	2
	1,65	—	78	3 × 20 × 0,05 CuLS	3
	—	0,98	39	3 × 20 × 0,07 CuLS	3

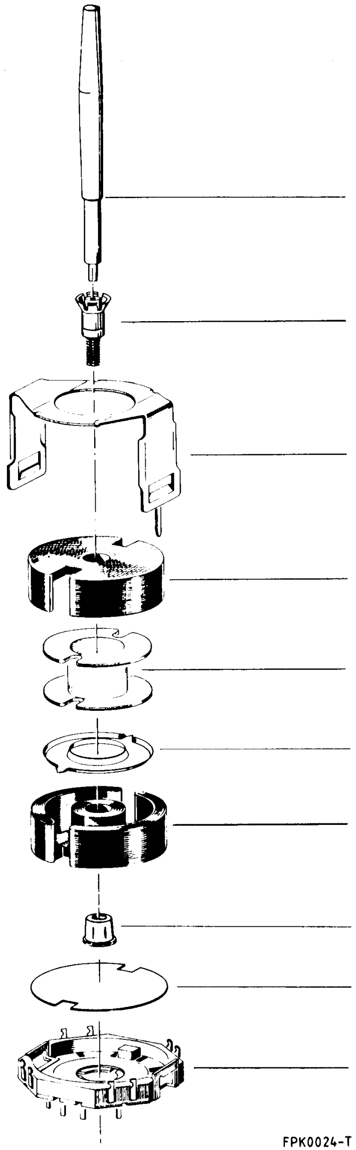


N 48
A_L = 315 nH



N 48
A_L = 630 nH

P 30 × 19
Core and Accessories



Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	390
Matching handle	B63399	390
Adjusting screw	B65679	390
Yoke	B65705	389
Core	B65701	387
Coil former	B65702	388
Insulating washer 1	B65702	388
Core	B65701	387
Threaded sleeve (glued-in)		
Insulating washer 2	B65702	388
Terminal carrier	B65705	389

Example of an assembly set for printed circuit boards[1)]

1) Assembly sets for chassis mounting are available on request.

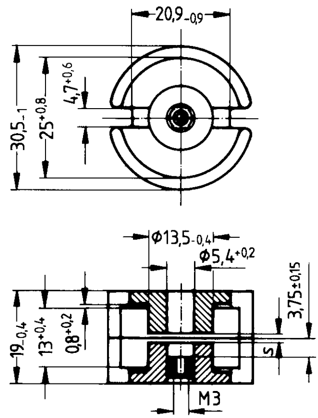
- In accordance with IEC 133 and DIN 41 293

Magnetic characteristics (per set)

	with center hole	w/o center hole	
$\Sigma l/A$	0,33	0,32	mm^{-1}
l_e	45	46	mm
A_e	136	145	mm^2
A_{min}	–	117	mm^2
V_e	6100	6670	mm^3

Approx. weight (per set)

m	36	37	g



FPK0155-U

Gapped

Material	A_L value nH	s approx. mm	μ_e	Ordering code -D with center hole -T w. threaded sleeve	PU Sets
N48	250 ± 2%	0,72	66	B65701-T250-G48	160
	400 ± 3%	0,40	105	B65701-T400-A48	
	630 ± 3%	0,22	166	B65701-T630-A48	
	1000 ± 3%	0,12	263	B65701-T1000-A48	
N26	1250 ± 5%	0,10	328	B65671-D1250-J26	
	2000 ± 10%	0,05	525	B65671-D2000-K26	

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -D with center hole -W w/o center hole	PU Sets
N26	6200+30/-20%	1630			B65701-D-R26	160
N30	11500+30/-20%	2930			B65701-W-R30	
T38	28000+40/-30%	7130			B65701-W-Y38	
N67	6400+30/-20%	1610	3550	3,24 (200 mT, 100 kHz, 100°C)	B65701-W-R67	

Coil former

Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

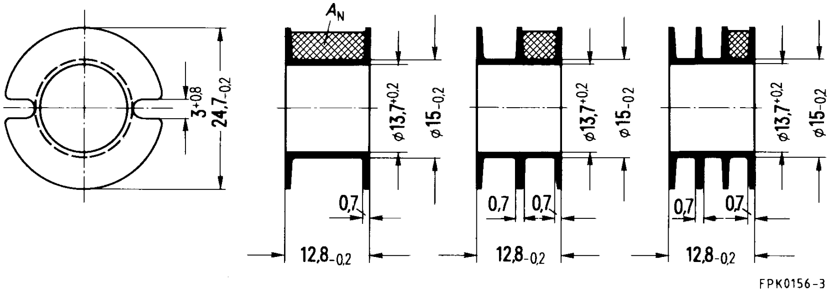
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Insulating washer 2 between core and terminal carrier

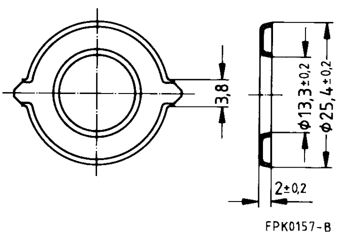
- For increased dielectric strength
- Made of polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,08 mm thick

Coil former				Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ		Pcs
1	48	60	46	B65702-B-T1	160
2	45	60	49	B65702-B-T2	
3	42	60	51	B65702-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65702-A5000	800
Insulating washer 2 (bulk)				B65702-A5002	160

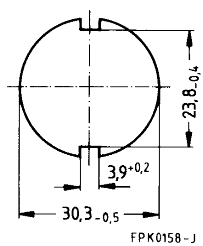
Coil former



Insulating washer 1



Insulating washer 2



Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke
- For snap-in connection

Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code gray

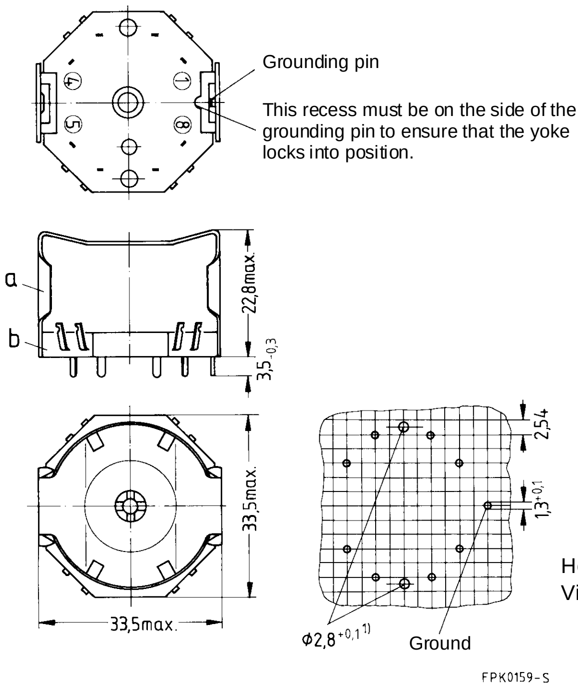
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Yoke

Material: Spring yoke, made of tinned nickel silver (0,5 mm), with ground terminal

Complete mounting assembly (8 solder terminals)
Ordering code: B65705-B3, PU = 160 sets



Hole arrangement
View in mounting direction

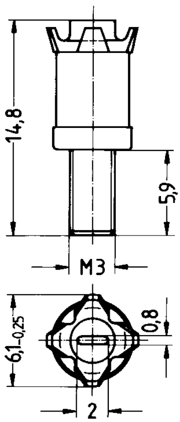
1) The 2,8 mm hole is only necessary for additional fixing with M 2,5 screw.
a) Yoke
b) Terminal carrier with 8 solder terminals

Adjusting screw[1)]

- Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

Core P 30 × 19		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
N 48	250	4,55 × 6,3	N 22	red	16	B65679-E3-X22	160
	400 630	4,98 × 6,3	N 22	black	18 11	B65679-E2-X22	
	630 1000	5,15 × 6,3	N 22	white	18 10	B65679-E1-X22	
Adjusting screwdriver						B63399-B1	10
Handle						B63399-B5	10

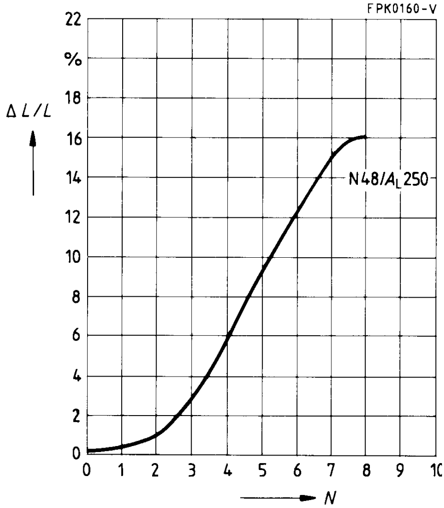


FPK0141-P

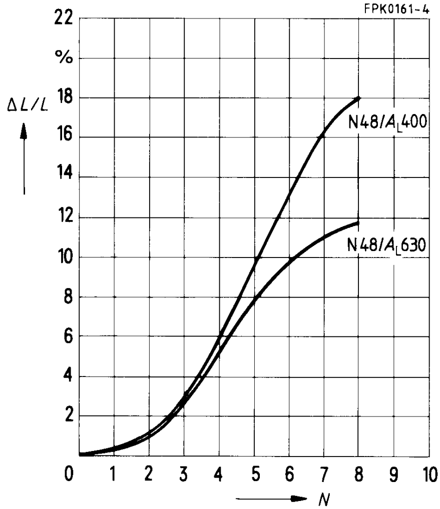
1) Due to the limited distance between adjusting screw and internal borehole, the entire assembly must be accurately centered.

Inductance adjustment curves (nominal values)
Relative inductance change Δ *L/L* versus turns *N* of adjusting screw.
0 ≙ at least 2 turns engaged.

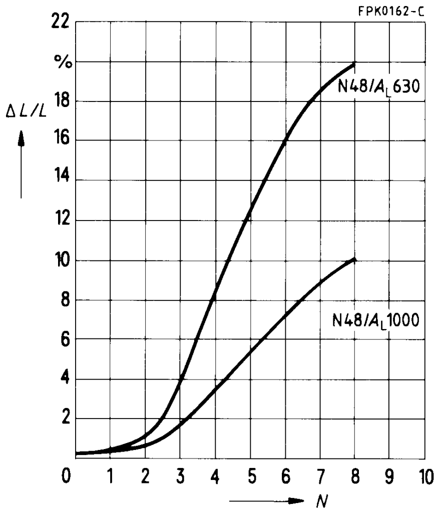
Adjusting screw B65679-E3-X22
Color code red



Adjusting screw B65679-E2-X22
Color code black

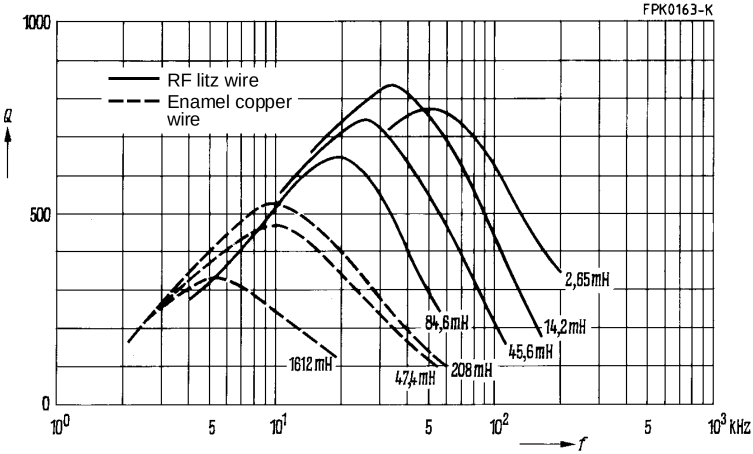


Adjusting screw B65679-E1-X22
Color code white

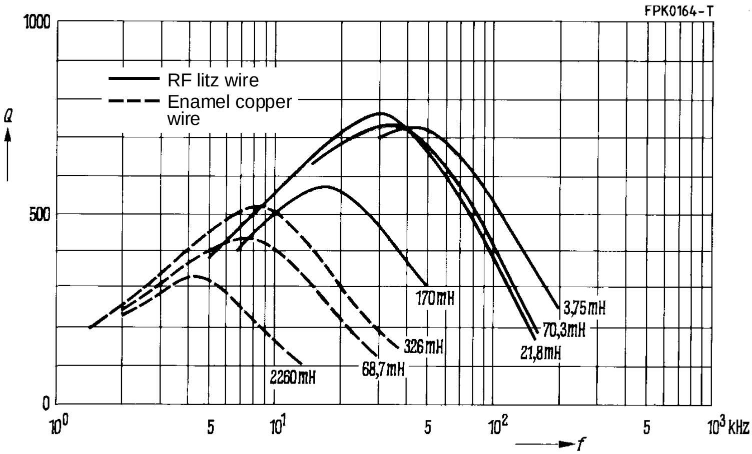


Q factor characteristics (typical values)
Flux density in the core $\hat{B}$ < 1,5 mT

Mate-rial	L (mH) for A_L = 630 nH	A_L = 1000 nH	Turns	Wire; RF litz wire	Sec-tions
N 48	1612	2260	1600	0,15 CuL	1
	208	326	570	0,25 CuL	1
	47,4	68,7	350	0,40 CuL	1
	—	170	420	1 × 12 × 0,04 CuLS	1
	84,6	—	420	1 × 20 × 0,05 CuLS	1
	45,6	70,3	270	1 × 30 × 0,05 CuLS	1
	14,2	21,8	150	3 × 20 × 0,05 CuLS	1
	2,65	3,75	65	3 × 20 × 0,07 CuLS	2

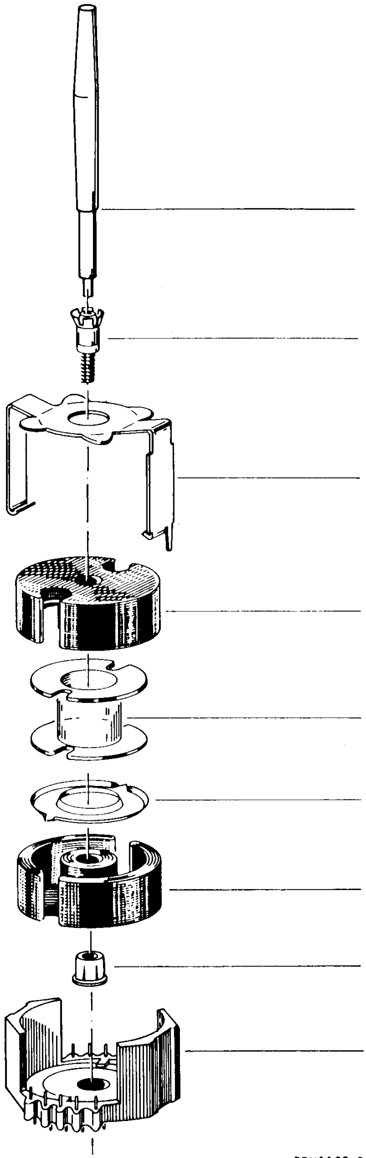


N 48
A_L = 630 nH



N 48
A_L = 1000 nH

P 36 × 22
Core and Accessories



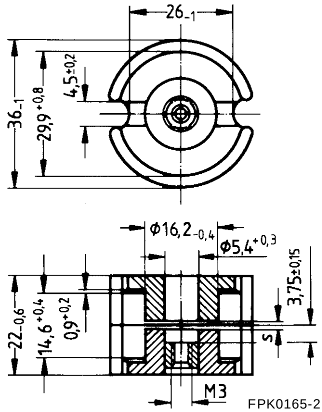
Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	397
Matching handle	B63399	397
Adjusting screw	B65679	397
Yoke	B65615	396
Core	B65611	394
Coil former	B65612	395
Insulating washer 1	B65612	395
Core	B65611	394
Threaded sleeve (glued-in)		
Terminal carrier	B65615	396

FPK0025-2

Example of an assembly set for printed circuit boards[1)]

1) Assembly sets for chassis mounting are available on request.

- In accordance with IEC 133 and DIN 41 293



FPK0165-2

Magnetic characteristics (per set)

	with center hole	w/o center hole	
Σl/A	0,26	0,25	mm^{-1}
l_e	52	53,5	mm
A_e	202	213	mm^2
A_{min}	–	173	mm^2
V_e	10600	11400	mm^3

Approx. weight (per set)

m	57	59,5	g

Gapped

Material	A_L value nH	*s* approx. mm	μ_e	Ordering code -L with center hole -N w. threaded sleeve	PU Sets
N48	250 ± 2%	1,20	52	B65611-N250-G48	50
	400 ± 2%	0,62	83	B65611-N400-G48	
	630 ± 3%	0,35	130	B65611-N630-A48	
	800 ± 3%	0,30	166	B65611-N800-A48	
	900 ± 3%	0,26	186	B65611-N900-A48	
	1000 ± 3%	0,22	207	B65611-N1000-A48	
	1250 ± 3%	0,16	259	B65611-N1250-A48	
N26	1600 ± 5%	0,10	331	B65611-L1600-J26	
	2500 ± 10%	0,05	518	B65611-L2500-K26	

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code -L with center hole -W w/o center hole	PU Sets
N26	7600+30/-20%	1570			B65611-L-R26	50
N30	15200+30/-20%	3020			B65611-W-R30	
T35	21000+30/-20%	4170			B65611-W-R35	
N67	8000+30/-20%	1590	4500	5,47 (200 mT, 100 kHz, 100°C)	B65611-W-R67	

Coil former

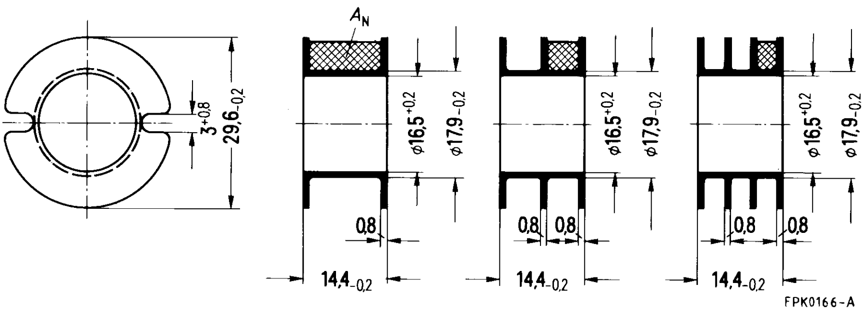
Standard: to IEC 133 and DIN 41 294
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding: see page 152

Insulating washer 1 between core and coil former

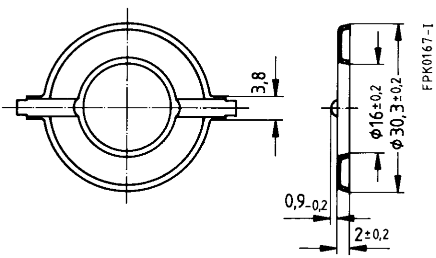
- For tolerance compensation and for insulation
- Polycarbonate spring washer (UL 94 V-0, insulation class to IEC 85: E ≙ 120°C), 0,06 mm thick

Coil former				Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ		Pcs
1	63	73	39	B65612-B-T1	50
2	59	73	42	B65612-B-T2	
3	55	73	44	B65612-B-T3	
Insulating washer 1 (reel packing, PU = 1 reel)				B65612-A5000	500

Coil former



Insulating washer 1



Mounting assembly for printed circuit boards

- The set comprises a terminal carrier and a yoke

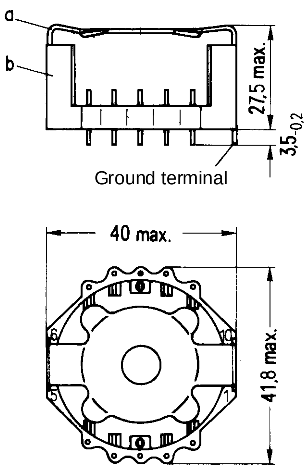
Terminal carrier

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

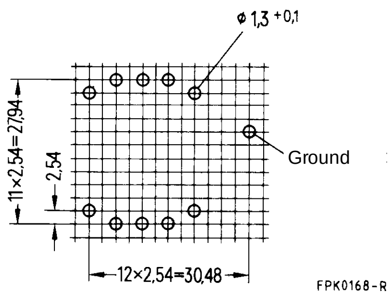
Yoke

Material: Spring yoke, made of nickel silver (0,5 mm), with ground terminal

Complete mounting assembly (10 solder terminals)
Ordering code: B65615-B1, PU = 50 sets



Hole arrangement
View in mounting direction



FPK0168-R

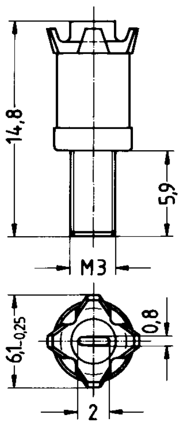
a) Yoke
b) Terminal carrier with 10 solder terminals

Adjusting screw[1)]

- Tube core with thread and core brake made of GFR polyterephthalate

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

Core P 36 × 22		**Adjusting screw**			Min. adjusting range	Ordering code	PU
Material	A_L value nH	Tube core ∅ × length mm	Material	Color code	%		Pcs
N 48	250	4,98 × 6,3	Si 1	yellow	10	B65679-E2-X101	50
	250 400	4,55 × 6,3	N 22	red	15 8	B65679-E3-X22	
	400 630	4,98 × 6,3	N 22	black	15 10	B65679-E2-X22	
	630 800 900 1000 1250	5,15 × 6,3	N 22	white	14 10 8 7 6	B65679-E1-X22	
Adjusting screwdriver						B63399-B1	10
Handle						B63399-B5	10

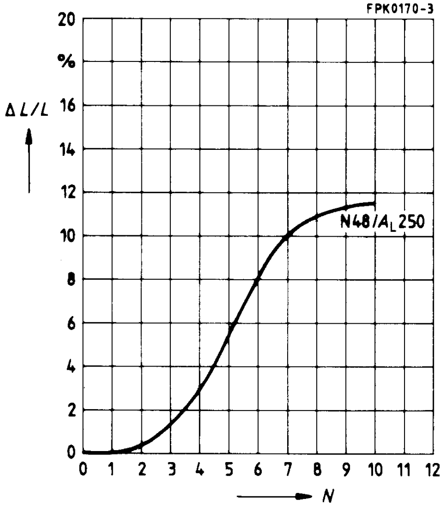


FPK0169-Z

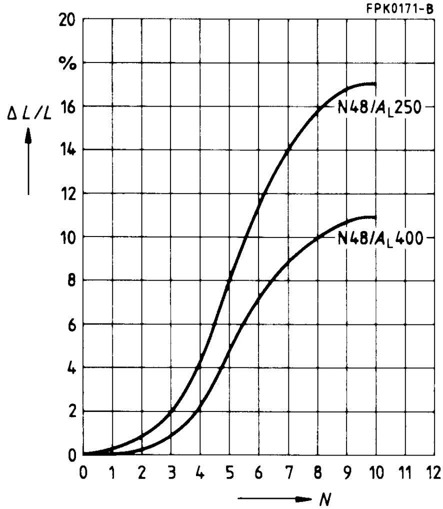
1) Due to the limited distance between adjusting screw and internal borehole, the entire assembly must be accurately centered.

Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
0 ≙ at least 2 turns engaged.

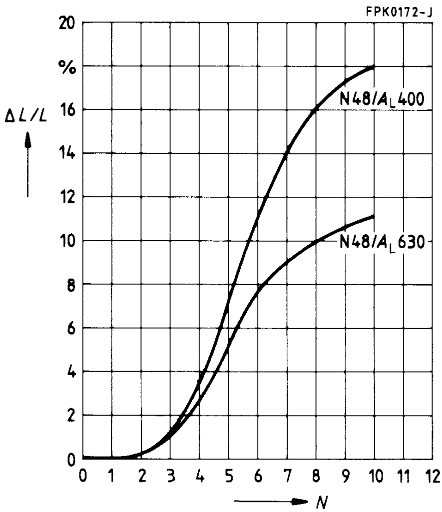
Adjusting screw B65679-E2-X101
Color code yellow



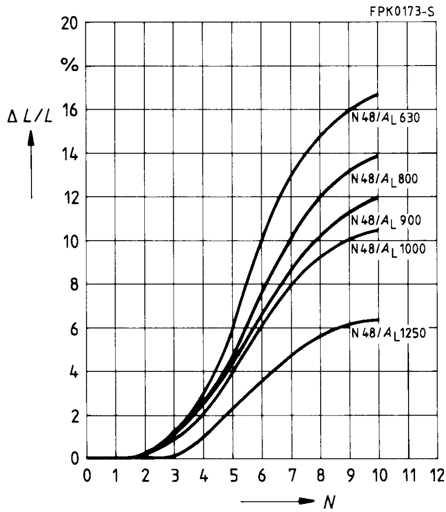
Adjusting screw B65679-E3-X22
Color code red



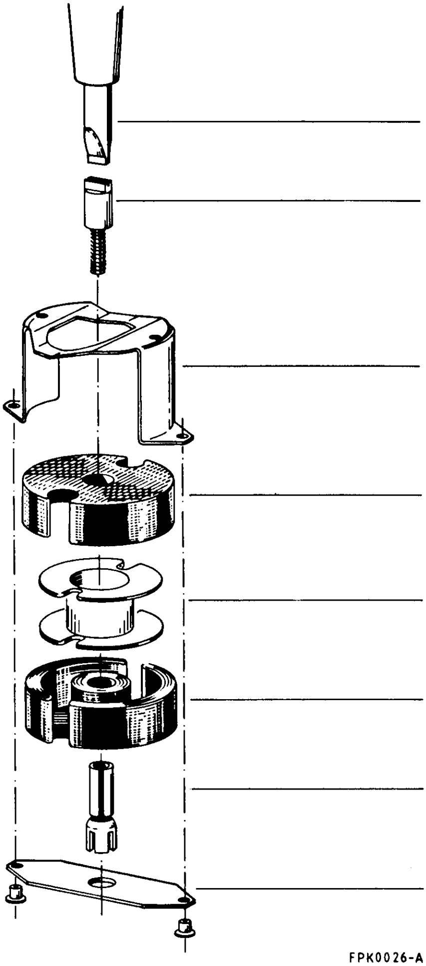
Adjusting screw B65679-E2-X22
Color code black



Adjusting screw B65679-E1-X22
Color code white



Assembly set for chassis mounting



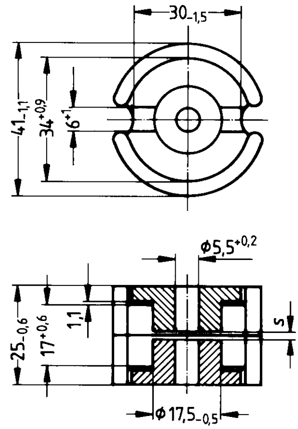
Individual parts	Part no.	Page
Adjusting screwdriver (for assembly only)	B63399	403
Matching handle	B63399	403
Adjusting screw	B65579	403
Yoke	B65623	402
Core	B65621	400
Coil former	B65622	401
Core	B65621	400
Threaded sleeve	B65579	403
Base plate with 2 tubular rivets	B65623	402

Example of an assembly set

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,257 mm^{-1}
l_e = 62,1 mm
A_e = 242 mm^2
A_{min} = 200 mm^2
V_e = 15000 mm^3

Approx. weight 82 g/set



FPK0174-1

Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N48	250 ± 3%	1,35	51	B65621-J250-A48	50
	400 ± 3%	0,78	82	B65621-J400-A48	
	630 ± 3%	0,43	129	B65621-J630-A48	
	1250 ± 3%	0,18	256	B65621-J1250-A48	
N26	2000 ± 5%	0,10	408	B65621-J2000-J26	
	3150 ± 10%	0,05	642	B65621-J3150-K26	

Ungapped

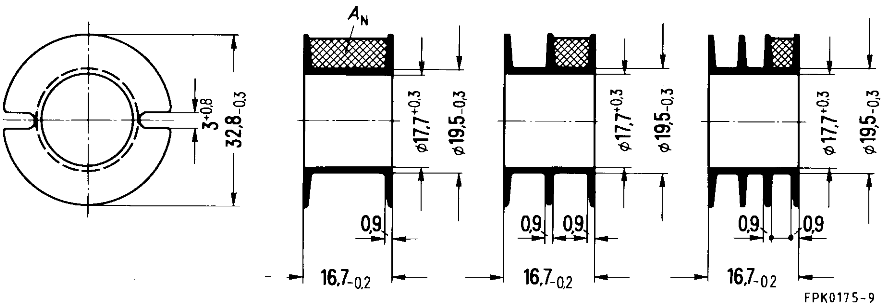
Mate-rial	A_L value nH	μ_e	Ordering code	PU Sets
N26	8400+30/-20%	1720	B65621-J-R26	50

Coil former

Material: GFR polycarbonate (UL 94 V-0, insulation class to IEC 85: E ≙ max. operating temperature 120 °C)

Winding: see page 152

Sections	A_N mm^2	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	85	81	33	B65622-A-M1	50
2	80	81	35	B65622-A-M2	
3	75	81	37	B65622-A-M3	



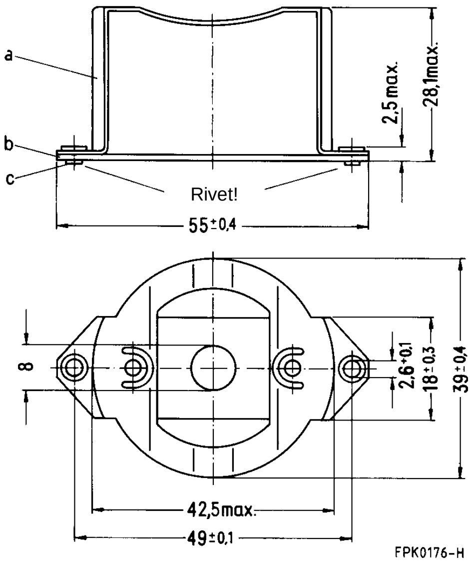
Mounting assembly for chassis mounting

- The set comprises a yoke and a metal base plate
- Fixing by screws or rivets

Yoke

Material: Spring yoke, made of nickel silver (0,5 mm)

Complete mounting assembly (with tubular rivets)
Ordering code: B65623-A1, PU = 50 sets



a) Yoke
b) Base plate
c) Tubular rivets

Adjusting screw

- Tube core with thread made of GFR polyterephthalate

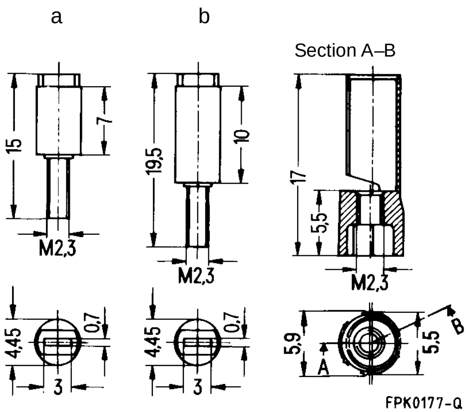
Threaded sleeve

- Made of GFR polyterephthalate
- The slotted shank serves as core brake

Plastic **adjusting screwdriver** (not shown)
Plastic **handle** for adjusting screwdriver (not shown)

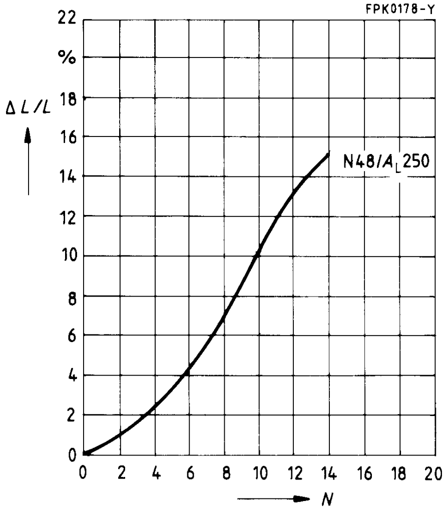
Core P 41 × 25		**Adjusting screw**				Min. adjusting range	Ordering code	PU
Material	A_L value nH	Fig.	Tube core ∅ × length mm	Material	Color code	%		Pcs
N 48	250	a	4,44 × 7	N 22	red	14	B65579-B1-X23	50
	400 630 1250	b	4,44 × 10	N 22	red	12 5 2	B65579-B3-X23	
Threaded sleeve							B65579-K1	50
Adjusting screwdriver							B63399-B4	10
Handle							B63399-B5	10

Adjusting screws　　Threaded sleeve

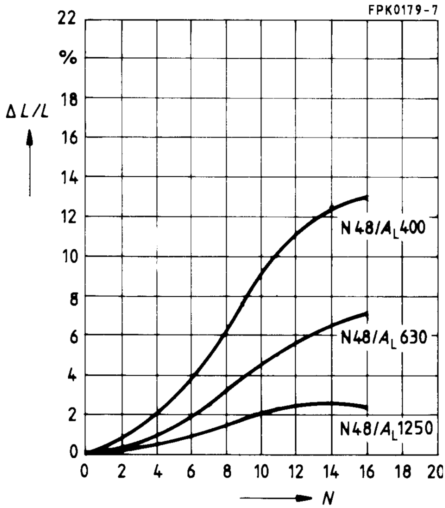


Inductance adjustment curves (nominal values)
Relative inductance change Δ L/L versus turns N of adjusting screw.
Immersion depth 3 mm. 0 ≙ at least 2 turns engaged.

Adjusting screw B65579-B1-X23
Color code red



Adjusting screw B65579-B3-X23
Color code red



Inductive proximity switches can be used as noncontacting motion detectors and output indicators. Possible applications:

– Detection of the final position on conveyor belts

– Counters at rotating parts

– Contactless detection of pointer position of pointer-type measuring and control instruments

The advantages of proximity switches are bounceless switching, no mechanical wear, insensitivity to contamination and detection of metallic parts only.

We supply P cores with diameters ranging from 5,6 to 70 mm for inductive proximity switches. Their dimensions are matched to standardized switches. Maximum operating distances can thus be achieved for the individual P core sizes. The SIFERRIT material N22 is particularly suitable for the frequency range from 0,1 to 0,8 MHz. The material M33 is additionally available for higher frequencies (core types with 5,6 to 14,0 mm diameter).

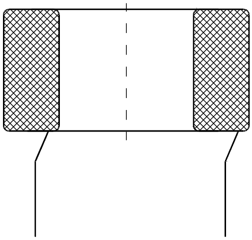
Thermoplastic coil formers can be supplied for most of the core types. This material permits an operating temperature range of – 60 to + 120 °C. Consequently, temperatures of up to + 120 °C are also permissible during encapsulation.

An addition to the range is the core having an $8{,}4 \times 4{,}3$ diameter with a matching pinned coil former, which permits automatic winding with a defined wire termination. The P core is then pressure-locked on the coil former. This new design offers the user new opportunities for rationalized assembly.

Inductive component for proximity switches

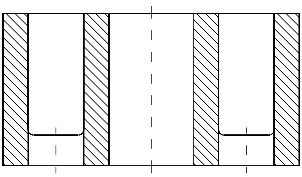
Conventional design

1) Formerless coil
   e.g. 0,05 ∅ baked-enamel wire, encapsulated



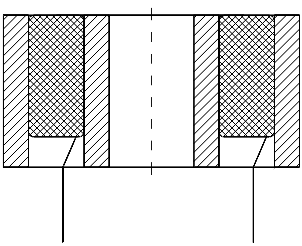
FPK0208-P

2) P core
   e.g. P core half 8,6×3,3 ∅



FPK0209-X

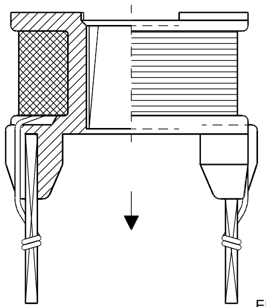
3) Coil glued into P core



FPK0210-1

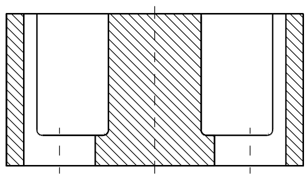
New design (e.g. P core half 8,4× 4,3 ∅ with matching coil former)

1) Coil former for automatic winding



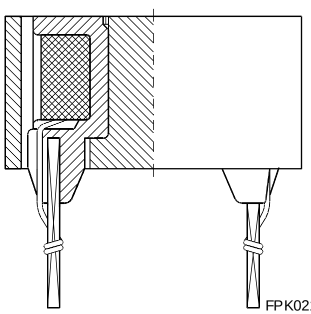
FPK0211-9

2) P core



FPK0212-H

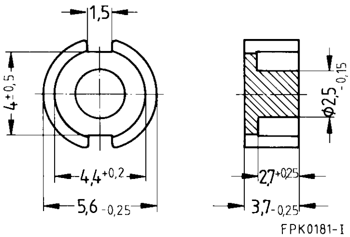
3) Coil former and P core
   pressure-locked



FPK0213-Q

P Core Half 5,6 × 3,7
CoreB65931

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size as per DIN EN 50 008: M 8 × 1



Material	Approx. weight g	Ordering code	PU Pcs
N22	0,15	B65931-C-X22	1000
M33	0,15	B65931-C-X33	

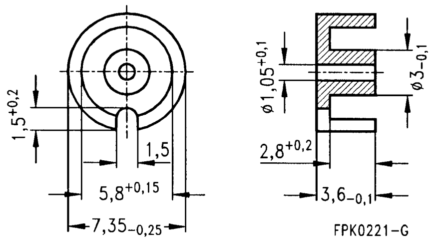
For these cores we recommend formerless winding, e.g. by using an enamel-insulated wire with thermoplastic coating.

Data for winding without coil former

A_N mm^2	l_N mm	A_R value μΩ
ca. 2,08	9,7	160

Core

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz

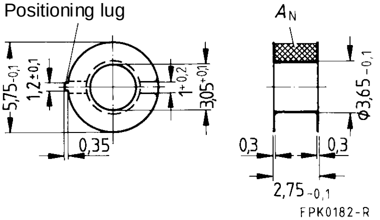


Material	Approx. weight g	Ordering code	PU Pcs
N22	0,3	B65933-A-X22	1000
M33	0,3	B65933-A-X33	

Coil former with positioning lug

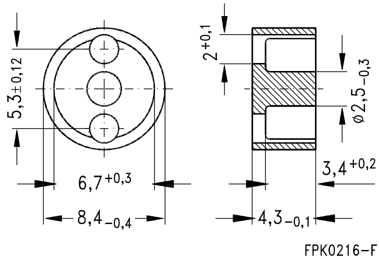
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm^2	l_N mm	A_R value µΩ	Ordering code	PU Pcs
2,2	14,6	240	B65512-C-T1	2000



Core

- For inductive proximity switches
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size per DIN EN 50 008: M 12 × 1



Material	Approx. weight g	Ordering code	PU Pcs
M33	0,5	B65924-B-X33	1000

Pinned coil former

- Suitable for automatic winding
- Core pressure-locked to coil former
- Defined terminal configuration

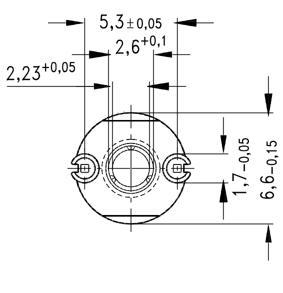
Material: Liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

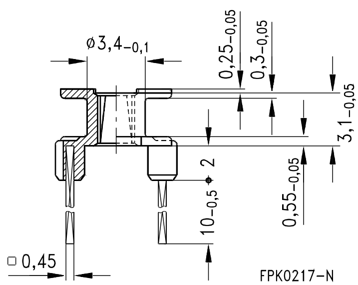
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
3,6	15,7	150	2	B65925-A1002-T1	1000

View from below

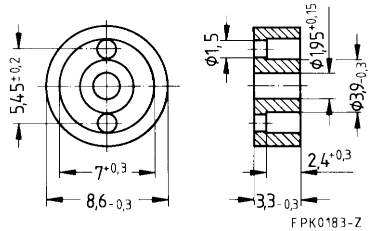


Side view



P Core Half 8,6 × 3,3
CoreB65924-A

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size per DIN EN 50 008: M 12 × 1

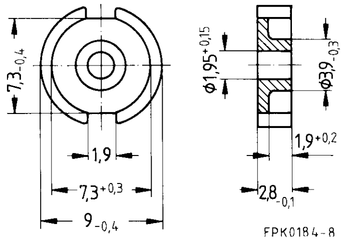


Material	Approx. weight g	Ordering code	PU Pcs
N22	0,5	B65924-A-X22	1000
M33	0,5	B65924-A-X33	

P Core Half 9 × 2,8
Core and Coil Former

B65935-J
B65936

Core



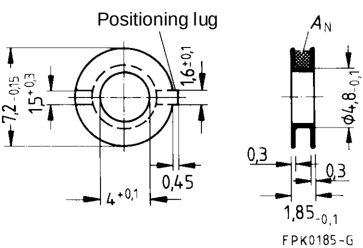
- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size per DIN EN 50 008: M 12 × 1

Material	Approx. weight g	Ordering code	PU Pcs
N22	0,6	B65935-J-X22	2000
M33	0,6	B65935-J-X33	

Coil former with positioning lug

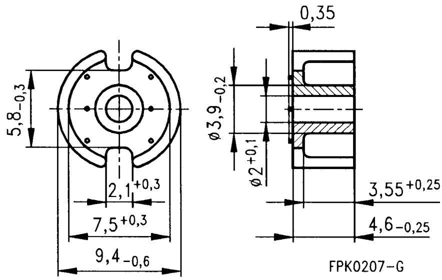
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm^2	l_N mm	A_R value $\mu\Omega$	Ordering code	PU Pcs
1,36	18,6	470	B65936-A-T1	1000



Core

- For inductive proximity switches
- Material N22 for the frequency range from about 80 to 800 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size per DIN EN 50 008: M 12 × 1
- With pimples on the end surfaces (pimple height = 0,35 mm)

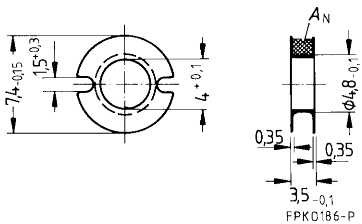


Material	Approx. weight g	Ordering code	PU Pcs
N22	0,6	B65935-A-X22	1000
M33	0,6	B65935-A-X33	

Coil former

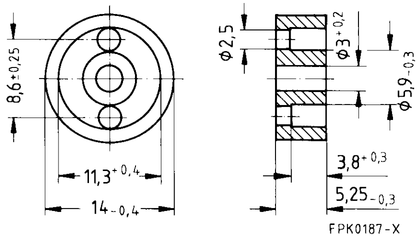
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm²	l_N mm	A_R value μΩ	Ordering code	PU Pcs
2,8	18,5	220	B65522-B-T1	1000



P Core Half 14 × 5,3
Core B65926

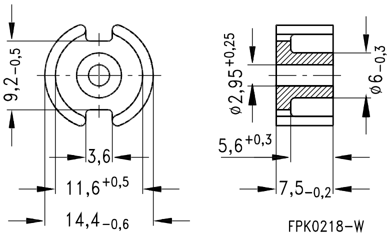
- For inductive proximity switches
- Material N22 for the frequency range from about 70 to 700 kHz
- Material M33 for higher frequencies up to about 1,6 MHz
- Suitable for standard size per DIN EN 50 008: M 18 × 1



Material	Approx. weight g	Ordering code	PU Pcs
N22	1,8	B65926-A-X22	1000
M33	1,8	B65926-A-X33	

Core

- For inductive proximity switches
- Material N22 for the frequency range from about 70 to 700 kHz
- Suitable for standard size per DIN EN 50 008: M 18 × 1

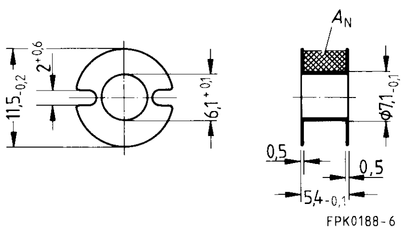


Material	Approx. weight g	Ordering code	PU Pcs
N22	2,5	B65937-A-X22	1000

Coil former

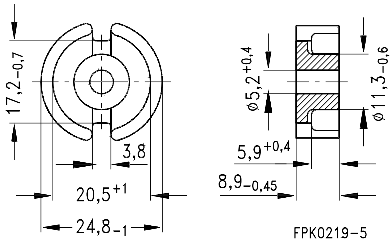
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm²	l_N mm	A_R value µΩ	Ordering code	PU Pcs
8,4	28	115	B65542-B-T1	500



Core

- For inductive proximity switches
- Material N22 for the frequency range from about 60 to 600 kHz
- Suitable for standard size per DIN EN 50 008: M 30 × 1,5

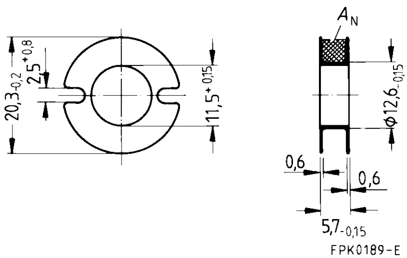


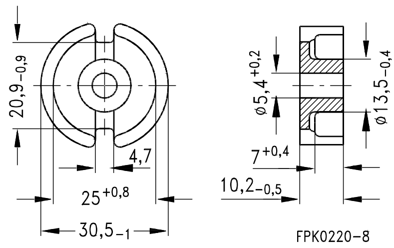
Material	Approx. weight g	Ordering code	PU Pcs
N22	9	B65939-A-X22	400

Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm²	l_N mm	A_R value μΩ	Ordering code	PU Pcs
16,7	51	105	B65940-B-T1	400





Core

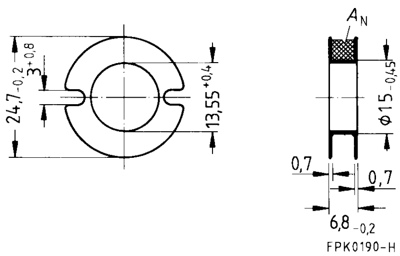
- For inductive proximity switches
- Material N22 for the frequency range from about 50 to 500 kHz
- Suitable for standard size per DIN EN 50 008: M 40 × 1,5

Material	Approx. weight g	Ordering code	PU Pcs
N22	18	B65941-A-X22	200

Coil former

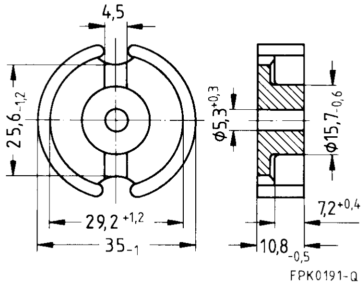
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm^2	l_N mm	A_R value μΩ	Ordering code	PU Pcs
24,4	62	87	B65942-B-T1	200



P Core Half 35 × 10,8
Core B65947

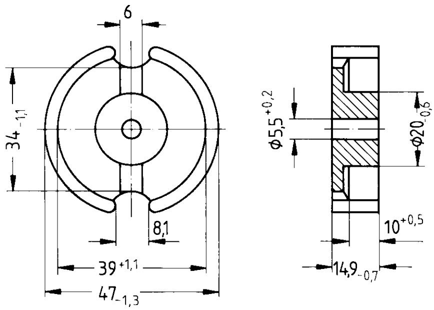
- For inductive proximity switches
- Material N22 for the frequency range from about 40 to 400 kHz



Material	Approx. weight g	Ordering code	PU Pcs
N22	28	B65947-A-X22	100

Core

- For inductive proximity switches
- Material N22 for the frequency range from about 30 to 300 kHz

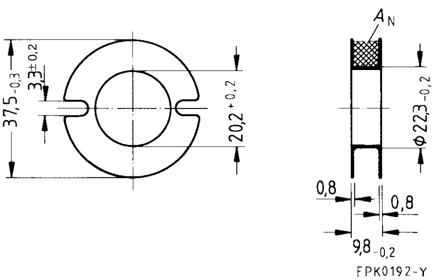


Material	Approx. weight g	Ordering code	PU Pcs
N22	62	B65943-A-X22	50

Coil former

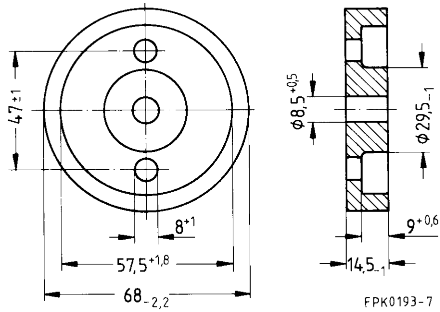
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm²	l_N mm	A_R value μΩ	Ordering code	PU Pcs
62	95	52,5	B65944-B-T1	50



Core

- For inductive proximity switches
- Material N22 for the frequency range from about 20 to 200 kHz

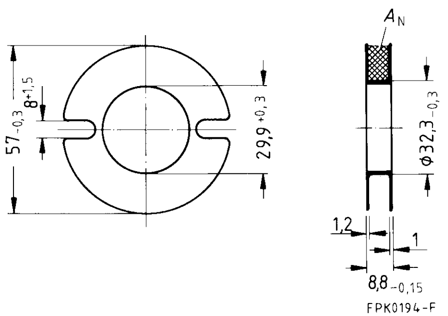


Material	Approx. weight g	Ordering code	PU Pcs
N22	130	B65928-A-X22	40

Coil former

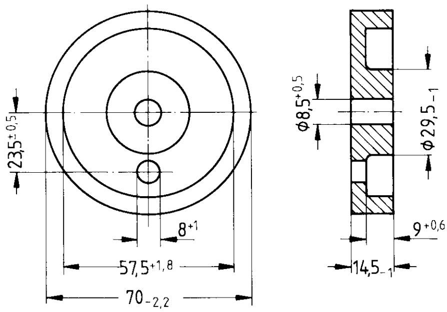
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm²	l_N mm	A_R value µΩ	Ordering code	PU Pcs
77	140	62	B65946-B-T1	40



Core

- For inductive proximity switches
- Material N22 for the frequency range from about 20 to 200 kHz

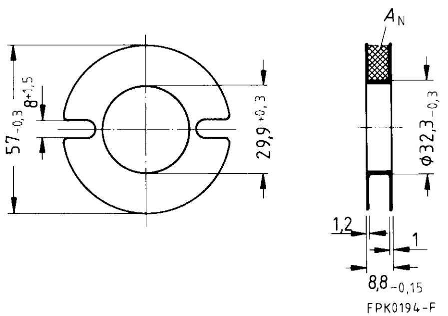


Material	Approx. weight g	Ordering code	PU Pcs
N22	130	B65945-A-X22	40

Coil former

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C); color code black

A_N mm²	l_N mm	A_R value μΩ	Ordering code	PU Pcs
77	140	62	B65946-B-T1	40



General information

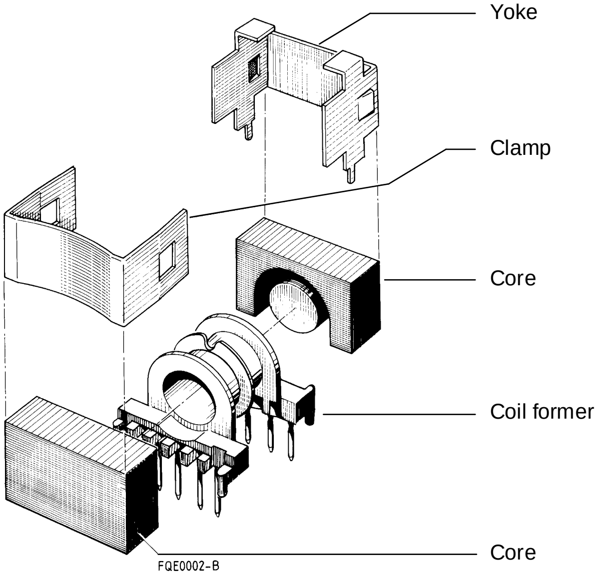
EP cores are typically used for transformer applications. Their cubic shape provides an excellent volume ratio to total space used and permits high PCB packing densities. The compact design and the high-permeability materials used (N30, T35, T38 and T42, all ungapped versions) ensure low magnetic leakage and excellent properties for broadband small-signal transmission. The large-volume types (EP20 and EP17 made of T38) are recommended for low frequencies, while the smaller types (EP7 made of N30) are more suitable for the high-frequency range.

EP cores are increasingly being used for power applications. Here we recommend the series EP7 through EP20 made of N67 for operation up to about 300 kHz.

Matching pinned coil formers suitable for automatic processing and shielding accessories (yoke, clamp or cover) complete the product line.

The ER cores in the sizes 9,5 and 11/5 are particularly suitable for use in transformers with low overall height and high inductance. They are available in material T38 for broadband applications and materials N87 and N49 for power transformers up to frequencies in excess of 500 kHz. SMD coil formers are available as accessories.

Example of an assembly set
EP13



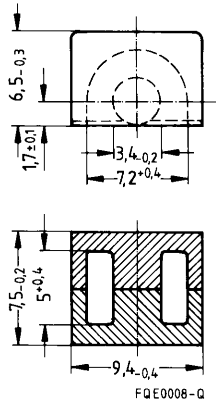
1 A_{L1} value

The minimum A_{L1} value is specified for core types produced from a power material. The A_{L1} value is defined at a flux density of $\hat{B}$ = 320 mT and a temperature of 100°C (exceptions: material N49: $\hat{B}$ = 200 mT and material N47: T = 25°C). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage, referred to the minimum cross-sectional area A_{min}.

2 Core losses

The maximum dissipation loss for each core type employing power materials is specified in W/set together with the measurement parameters. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}.

- In accordance with IEC 51 (SEC) 300
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets.



Magnetic characteristics (per set)

$\Sigma l/A =$ 1,52 mm^{-1}
l_e = 15,7 mm
A_e = 10,3 mm^2
A_{min} = 8,50 mm^2
V_e = 162 mm^3

Approx. weight 1,4 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	2000+30/-20%	2420			B65839-A-R30	2000
T38	5200+40/-30%	6290			B65839-A-Y38	
N67	1100+30/-20%	1330	750	0,11 (200 mT, 100 kHz, 100°C)	B65839-A-R67	

Coil former

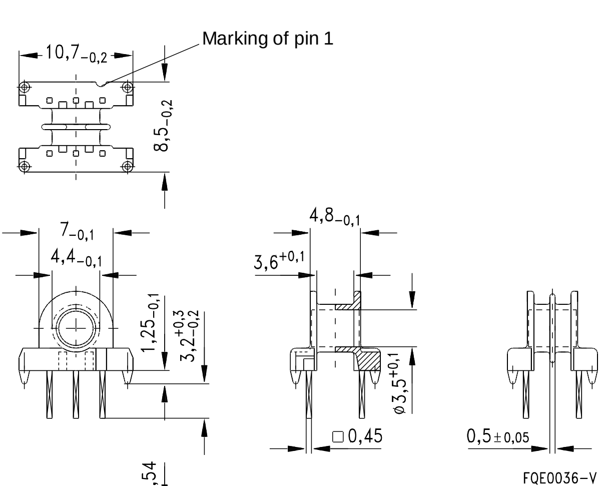
Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 153

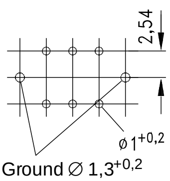
Cover

Material:Nickel silver, 0,25 mm thick (tinned)

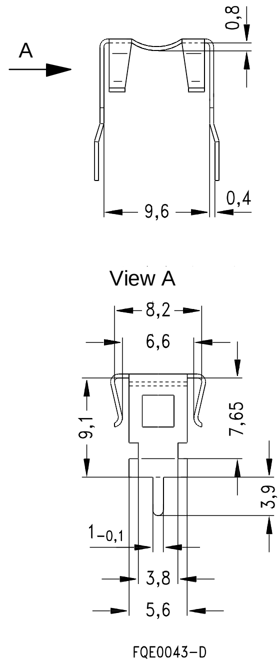
Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	3,7	17,9	166	6	B65840-B1006-D1	2000
2	3,2	17,9	192	6	B65840-B1006-D2	
Cover					B65840-B2000	2000

Coil formerCover





Hole arrangement
View in mounting direction

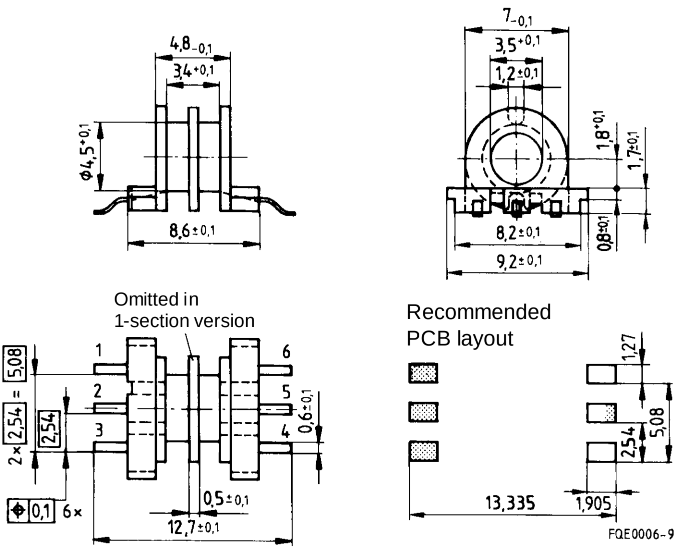


SMD coil former with gullwing terminals

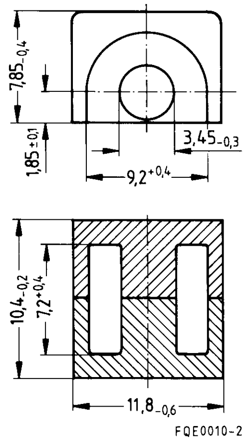
Material:GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Sections	A_N mm²	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	4,0	17,9	154	6	B65840-N1106-T1	2000
2	3,6	17,9	171	6	B65840-N1106-T2	



- In accordance with IEC 51 (SEC) 300
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets.



Magnetic characteristics (per set)

$\Sigma l/A =$ 1,70 mm^{-1}
$l_e =$ 19,2 mm
$A_e =$ 11,3 mm^2
$A_{min} =$ 8,50 mm^2
$V_e =$ 217 mm^3

Approx. weight 2,8 g/set

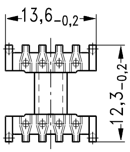
Ungapped

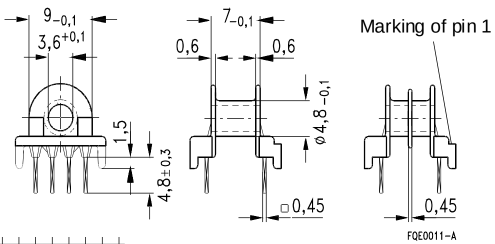
Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	2000+30/-20%	2700			B65841-A-R30	1000
T35	3200+30/-20%	4330			B65841-A-R35	
T38	4800+40/-30%	6490			B65841-A-Y38	
T42	6900+40/-30%	9330			B65841-A-Y42	
N67	1100+30/-20%	1480	650	0,18 (200 mT, 100 kHz, 100°C)	B65841-A-R67	

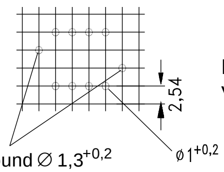
Coil former

Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 153

Sections	A_N mm^2	l_N mm	A_R value μΩ	Pins	Ordering code	PU Pcs
1	11,4	21,5	65	8	B65842-C1008-D1	1000
2	10,0	21,5	74	8	B65842-C1008-D2	







Hole arrangement
View in mounting direction

Mounting assembly

The set comprises a yoke and a clamp

Yoke

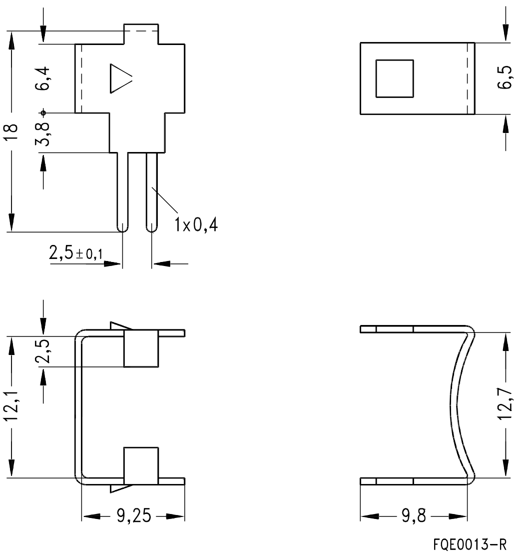
Material:Made of nickel silver (0,4 mm) with ground terminal (additionally tinned)

Clamp

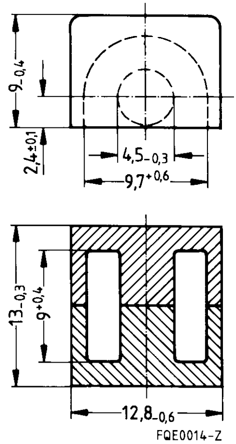
Material:Spring clamp, made of nickel silver (0,3 mm)

	Ordering code	PU Pcs
Complete mounting assembly	B65842-A2000	1000

Yoke Clamp



EP 13
CoreB65843



- In accordance with IEC 51 (SEC) 300
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets.

Magnetic characteristics (per set)

$\Sigma l/A$=	1,24	mm^{-1}
l_e =	24,2	mm
A_e =	19,5	mm^2
A_{min} =	14,9	mm^2
V_e =	472	mm^3

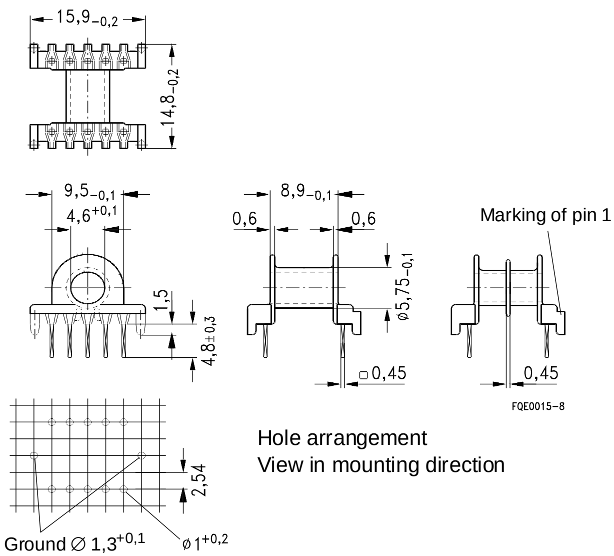
Approx. weight 4,5 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	2800+30/-20%	2760			B65843-A-R30	500
T35	4400+30/-20%	4340			B65843-A-R35	
T38	7000+40/-30%	6910			B65843-A-Y38	
T42	10000+40/-30%	9870			B65843-A-Y42	
N67	1600+30/-20%	1580	900	0,40 (200 mT, 100 kHz, 100°C)	B65843-A-R67	

Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 153

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	13,8	23,8	59,4	10	B65844-C1010-D1	500
2	13,0	23,8	63,2	10	B65844-C1010-D2	

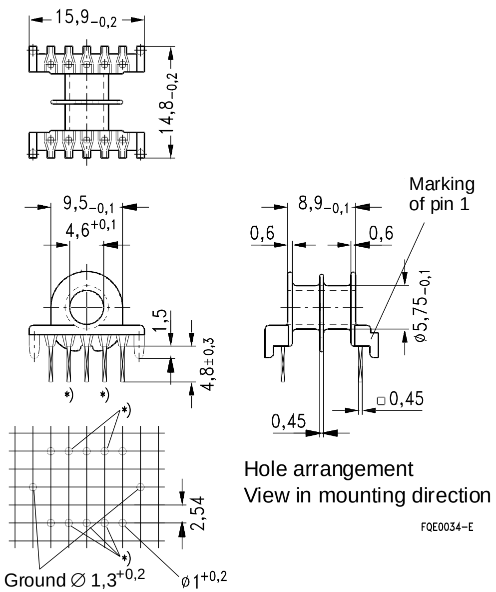


Hole arrangement
View in mounting direction

Coil former with closed center flange for high-voltage applications

Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 153

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
2	13,0	23,8	63,2	5	B65844-K1005-D2	500
2	13,0	23,8	63,2	10	B65844-L1010-D2	



Hole arrangement
View in mounting direction

*) Pins omitted in 5-pin version

Mounting assembly

The set comprises a yoke and a clamp

Yoke

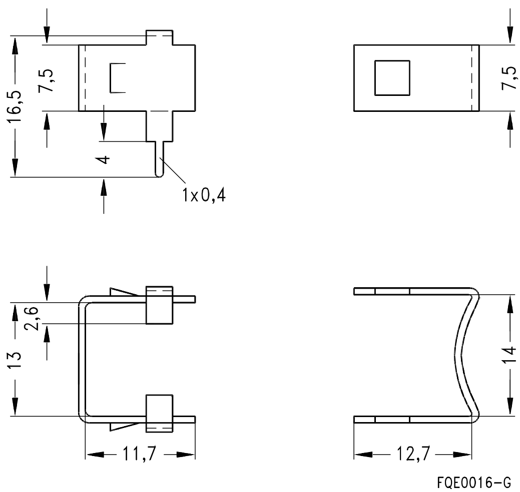
Material:Made of nickel silver (0,4 mm) with ground terminal (additionally tinned)

Clamp

Material:Spring clamp, made of nickel silver (0,4 mm)

	Ordering code	PU Pcs
Complete mounting assembly	B65844-A2000	500

Yoke Clamp

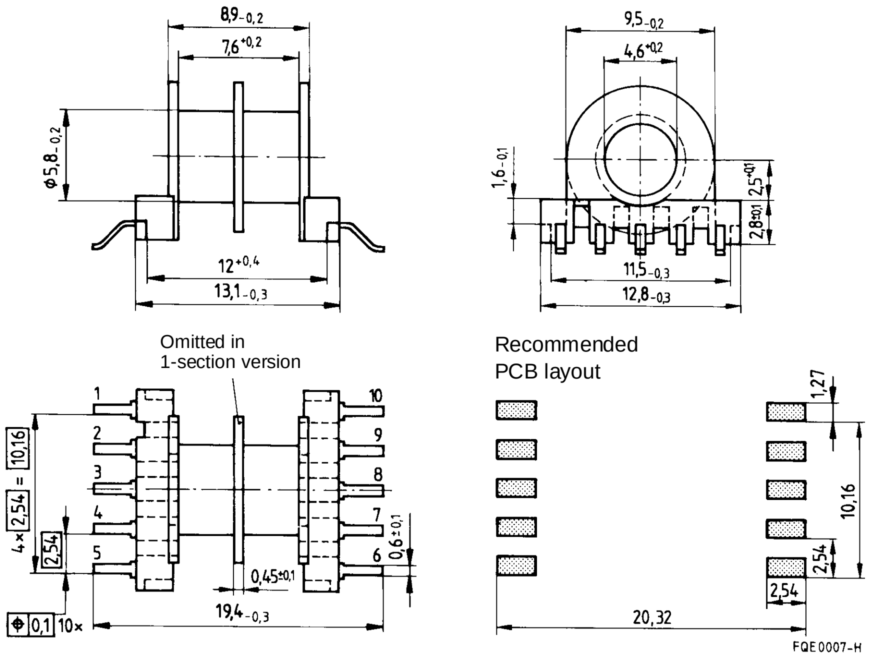


SMD coil former with gullwing terminals

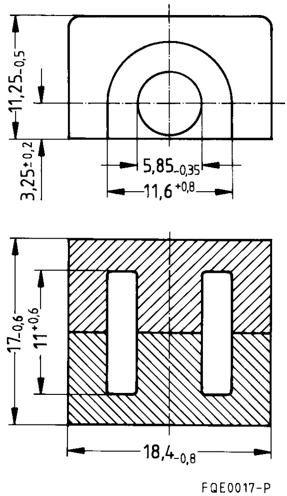
Material:GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code natural or black

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Sections	A_N mm²	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	14,0	23,8	59,4	10	B65844-N1110-T1	500
2	13,2	23,8	63,2	10	B65844-N1110-T2	



- In accordance with IEC 51 (SEC) 300
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets.



Magnetic characteristics (per set)

$\Sigma l/A$=	0,84	mm^{-1}
l_e =	28,5	mm
A_e =	33,9	mm^2
A_{min} =	25,5	mm^2
V_e =	966	mm^3

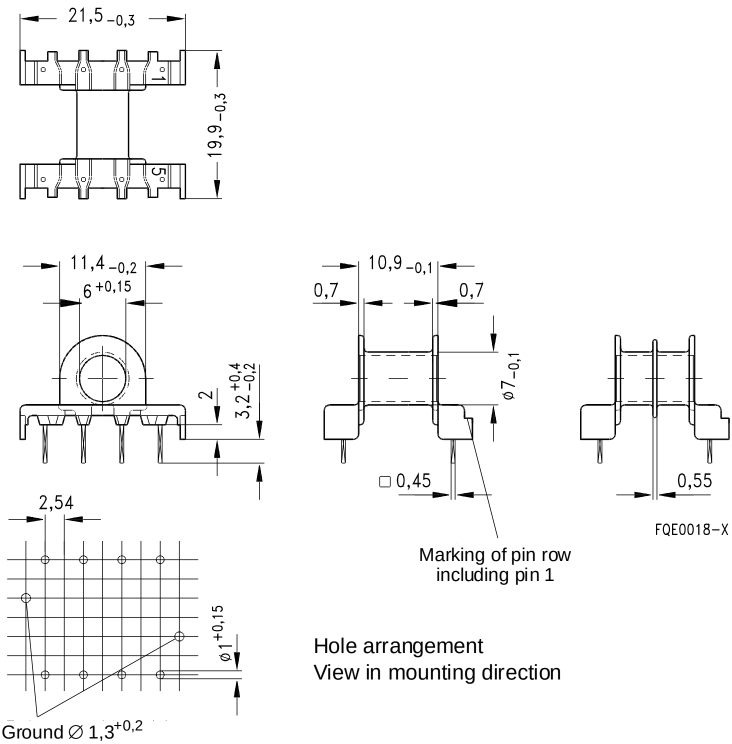
Approx. weight 12 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	4300+30/-20%	2870			B65845-J-R30	200
T35	6900+30/-20%	4610			B65845-J-R35	
T38	10800+40/-30%	7220			B65845-J-Y38	
T42	15400+40/-30%	10300			B65845-J-Y42	
N67	2400+30/-20%	1600	1350	0,68 (200 mT, 100 kHz, 100°C)	B65845-J-R67	

Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 153

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	18,8	28,8	52,7	8	B65846-L1008-D1	200
2	17,7	28,8	55,9	8	B65846-L1008-D2	



Mounting assembly

The set comprises a yoke and a clamp

Yoke

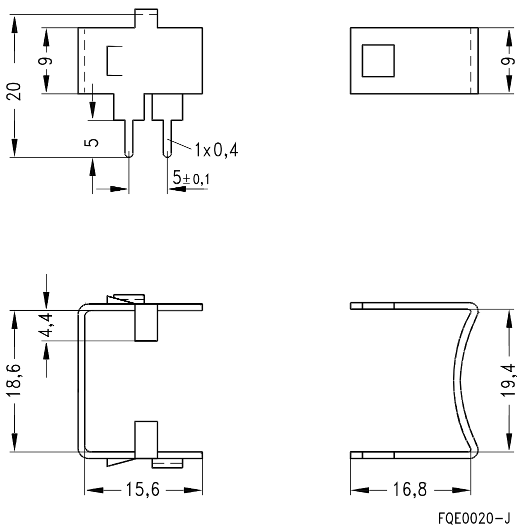
Material:Made of nickel silver (0,4 mm) with ground terminal (additionally tinned)

Clamp

Material:Spring clamp, made of nickel silver (0,4 mm)

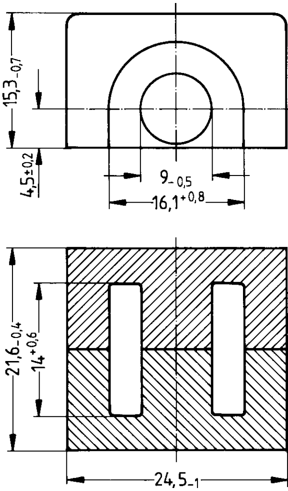
	Ordering code	PU Pcs
Complete mounting assembly	B65846-J2000	200

Yoke Clamp



EP 20
CoreB65847

- In accordance with IEC 51 (SEC) 300
- For transformers featuring high inductance and low overall height
- For power applications
- EP cores are supplied as sets.



FQE0021-H

Magnetic characteristics (per set)

$\Sigma l/A$=	0,51	mm^{-1}
l_e =	40,0	mm
A_e =	78,0	mm^2
A_{min}=	60,0	mm^2
V_e =	3120	mm^3

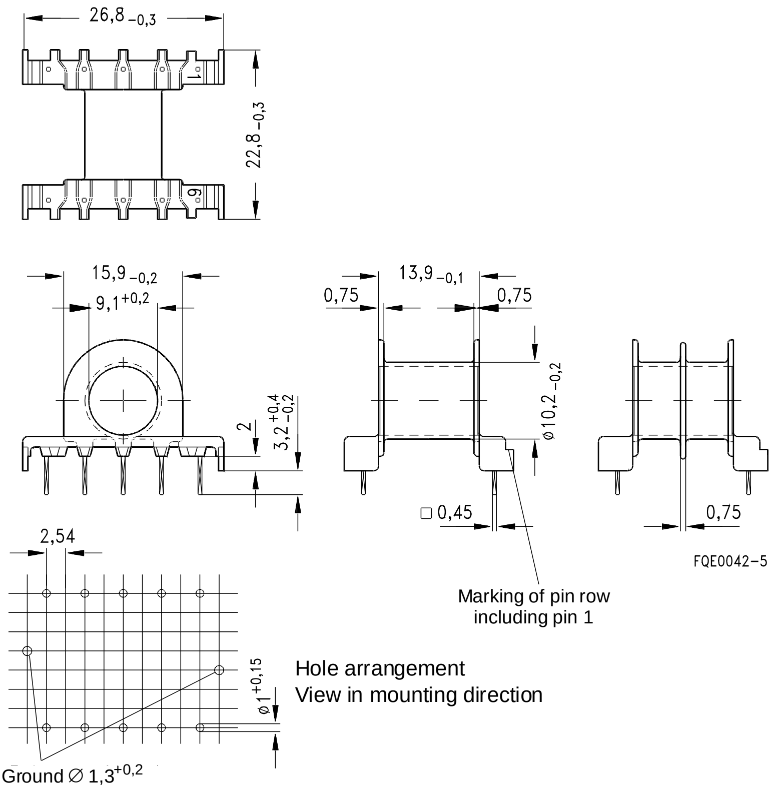
Approx. weight 27,5 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Sets
N30	6700+30/-20%	2720			B65847-A-R30	200
T35	11200+30/-20%	4540			B65847-A-R35	
T38	18700+40/-30%	7590			B65847-A-Y38	
N67	4000+30/-20%	1630	2200	2,32 (200 mT, 100 kHz, 100°C)	B65847-A-R67	

Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code green
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 153

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	33,8	38,9	39,6	10	B65848-D1010-D1	200
2	31,8	38,9	42,1	10	B65848-D1010-D2	



Mounting assembly

The set comprises a yoke and a clamp

Yoke

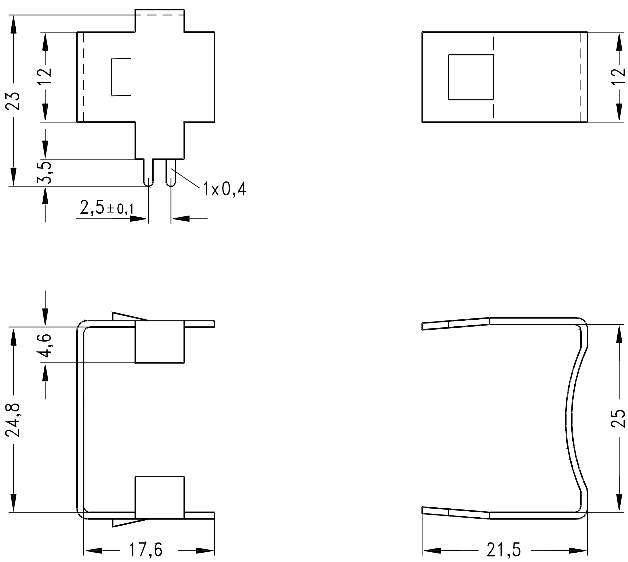
Material:Made of nickel silver (0,4 mm) with ground terminal (additionally tinned)

Clamp

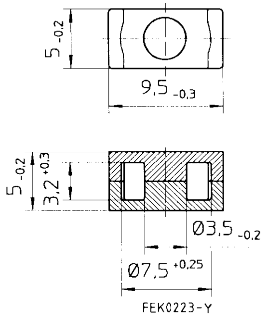
Material:Spring clamp, made of nickel silver (0,4 mm)

	Ordering code	PU Pcs
Complete mounting assembly	B65848 -A2000	200

Yoke Clamp



FQE0024-P



- For transformers featuring high inductance and low overall height
- ER9,5 cores are supplied as sets.

Magnetic characteristics (per set)

$\Sigma l/A$=	1,58	mm^{-1}
l_e =	13,3	mm
A_e =	8,41	mm^2
A_{min}=	—	mm^2
V_e =	120	mm^3

Approx. weight 0,6 g/set

Ungapped

Material	A_L value nH	μ_e	Ordering code	PU Sets
T38	4500+40/-30%	5680	B65523-J-Y38	1000
N87	800+30/-20%	1000	B65523-J-R87	

ER 9,5
Coil FormerB65527

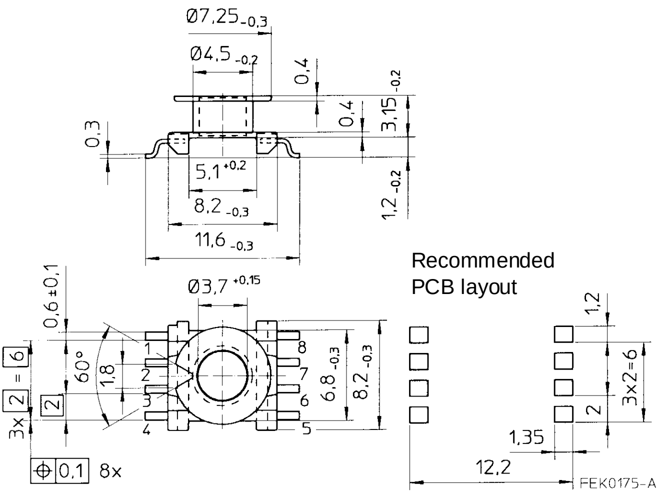
SMD coil former with gullwing terminals

Material:GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

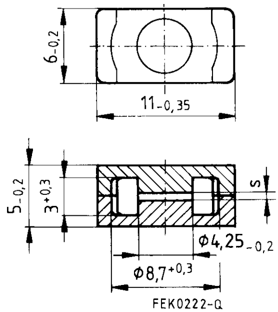
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Sections	A_N mm^2	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	3,23	18,4	196	8	B65527-A1008-T1	1000



- For transformers featuring high inductance and low overall height
- ER11/5 cores are supplied as sets.



Magnetic characteristics (per set)

$\Sigma l/A$ =	1,10	mm^{-1}
l_e =	14,0	mm
A_e =	12,7	mm^2
A_{min} =	—	mm^2
V_e =	178	mm^3

Approx. weight 0,85 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	Ordering code	PU Sets
T38	6400+40/-30%	5600	B65525-J-Y38	1000
N49	800+30/-20%	715	B65525-J-R49	
N87	1200+30/-20%	1050	B65525-J-R87	

Gapped

Mate-rial	A_L value nH	s approx. mm	μ_e	Ordering code	PU Sets
N87	160 ± 3%	0,08	140	B65525-J160-A87	1000

ER 11/5
Coil FormerB65526

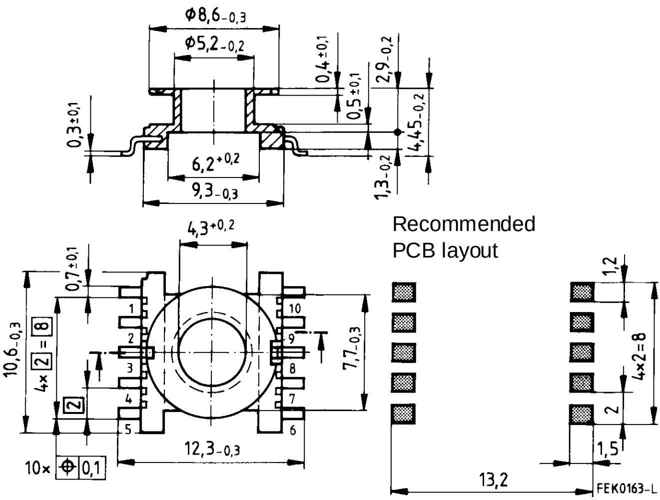
SMD coil former with gullwing terminals

Material:GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Sections	A_N mm^2	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	3,3	21,6	225	10	B65526-A1010-T1	1000



S+M COMPONENTS **Siemens Matsushita Components**

Ferrite inductors from SCS stock

Transformation at its best

Not just one-off solutions but complete ones designed precisely to a requirements profile are more in demand than ever. So we are offering surface-mount transformers for power and broadband applications straight from SCS stock:

- **E 6,3** with small dimensions, low leakage inductance and high electric strength
- **ER 11** flat and with low leakage inductance
- **RM 4 LP** for high DC biasing
- **S interface transformer RM 5** for precise pulse transmission in ISDN terminals
- **U interface transformer RM 6** for ISDN applications
- **Planar inductor RM 7** with high power density and extremely flat for DC/DC applications

SCS – dependable, fast and competent

1 Core shapes and materials

The preferred materials for manufacture of E cores are the SIFERRIT materials N27, N67, N87, N49 as well as N30 and T37. N27 is recommended for power applications in the frequency range up to about 100 kHz, N67 for the frequency range from about 100 to 300 kHz and N87 for the frequency range up to 500 kHz; EFD cores made of N49 are particularly suitable for frequencies f > 500 kHz. These materials feature a high saturation flux density and low power loss.

Material N30 is particularly suitable for broadband small-signal applications and also for interference suppression chokes.

The E core spectrum contained in this data book comprises six basic core shapes, which can be used not only for transformers but also for chokes with a power capacity of up to 10 kW.

a) Types with round center leg

We offer the following types:

- ETD cores in accordance with IEC 51 (CO) 276 (Economic Transformer Design)
- EFD cores (Economic Flat Transformer Design)
- EC cores in accordance with IEC 647
- ER cores

E cores with round center leg offer the advantage of easy winding, particularly when thick winding wires are used, compact mounting dimensions and wide openings on each side. ETD cores have the additional benefit of an almost constant cross section along the magnetic path. A wide variety of optimized accessories is available. With similarly optimized cross sections, EFD cores can be used for extremely flat and compact transformers, also in high-frequency applications.

b) Double E cores

The DE cores are a type of E core with a closed magnetic path. Paired with the magnetic advantages of a ring core, automatic winding can be performed thanks to the accessories specially designed for automatic production. Material T37 can thus be used for the significantly more cost-effective production of current-compensated chokes.

c) Types with rectangular center leg

- E cores in accordance with DIN 41295 or DIN 41985

The conventional E cores with rectangular center leg are available in a wide variety of sizes.

2 Ordering, marking, delivery

E cores are supplied in pieces (not in sets), with each packing unit (PU) exclusively containing cores with or without shortened center leg (air gap dimension „*g*“).

The material and the size of the air gap (dimension „*g*“ in mm) are normally stamped on cores, e.g. for a core made of material N27 with dimension „*g*“ = 1,2 mm, the marking is: 1,20 N27.
Ungapped E cores carry only the designation of the material, e.g. N27.
Core sizes E6,3 and E8,8 are supplied without markings.

E cores with a toleranced A_L value can be supplied on request. In this case it is possible to set a symmetrical air gap distribution (the same air gap size in each core of a set) or an asymmetrical air gap distribution (combinations of a gapped core with an ungapped core). The advantage of the symmetrical air gap distribution lies in the fact that no combination of two different cores occurs during assembly.

Cores with a symmetrical air gap are stamped with the material, the A_L value and optionally with a code for the A_L tolerance (see „General - Definitions“).
Example: Material N27, A_L = 30 nH ± 3 %, marking: N27 30 A.

With asymmetrical air gap distribution, the gapped core half (also in the case of A_L value tolerancing) is stamped with material and air gap dimension *g*, the ungapped core half only with the material.

3 Ungapped cores

Even with the best grinding methods available today, a certain degree of roughness (approx. 6 µm) cannot be avoided on the ground surface in the case of „ungapped“ cores.

The tolerance of the A_L value is + 30/– 20 % for ETD, ER and E cores and ± 25 % for EC cores. The small E cores E6,3 and E8,8, however, may have an A_L value tolerance of + 40/– 30 %.

4 Cores with toleranced air gap

The following tolerances for dimension „*g*“ apply to all E cores:

Dimension *g* mm	Tolerance mm
0,10 mm ≤ *g* < 0,5	± 0,02
g ≥ 0,5	± 0,05

As is the case with ungapped cores, a certain degree of roughness cannot be avoided on the ground surfaces of the outer legs (see point 3).

5 Cores with toleranced A_L value

The tolerance of the A_L value depends on the magnitude of the A_L value and the core shape. Tolerance figures are therefore given only on a core-type-specific basis.

6 Calculation systems

Calculation systems a) and b) apply to the A_L value under the following measuring conditions:

Measuring flux density $\hat{B}$ ≤ 0,25 mT, measuring frequency f = 10 kHz,
measuring temperature T = 25 °C, measuring coil: N = 100 turns, fully wound

a) Air gap and A_L value

The typical A_L value tabulated in the individual data sheets refers to a core set comprising a gapped core with dimension „*g*“ and an ungapped core with „*g*“ approx. 0.

By inserting the core-specific constants *K1* and *K2*, a nominal A_L value can be calculated for the materials N27, N67 and N87 within the relevant quoted air-gap validity range:

Production variations with regard to μ_i and grinding quality should be taken into account additionally.

$$s = \left(A \right)^{\frac{1}{K2}} \qquad s = [\quad] \qquad A_L = [\quad]$$

b) DC magnetic bias I_{DC}

By using the core-shape-related factors *K3* and *K4*, nominal values can be determined for the DC magnetic biasing characteristic of E, ETD, EC and EFD cores made of materials N67, N27 and N87 at temperature 23 °C and 100 °C.

The direct current I_{DC} at which the A_L value drops by 10 % compared to the A_L value without magnetic biasing (I_{DC} = 0 A) is determined.

Calculation of I_{DC} at T = 23 °C:
The factors *K3* and *K4* for T = 23 °C are inserted into the equation for the calculation. The A_L value here corresponds to the value without magnetic biasing.

Calculation of I_{DC} at T = 100 °C:
The factors *K3* and *K4* for T = 100 °C are inserted into the equation for the calculation. The value for T = 23 °C without magnetic biasing should be used here as the A_L value.

$$I_{DC} = \left(0.9 \cdot A \right)^{\frac{1}{K4}} \qquad I_{DC} = [\quad] \qquad A_L = [\quad] \text{ without magnetic biasing}$$

7 Magnetic characteristics

The set characteristics Σl/A, l_e, A_e, A_{min} and V_e required for the calculation of field strength, flux density and hysteresis losses have been determined in accordance with IEC 205 (1966) (A_{min} = minimum cross section relative to the nominal dimensions).

8 Core losses

The maximum power loss for each core type is specified in W/set together with the measurement parameters. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}. In addition, a diskette containing a calculation program for determining power loss as a function of operating conditions is available for ETD and EFD cores.

9 A_{L1} value

The minimum A_{L1} value is specified for each core type. The A_{L1} value is defined at a flux density of $\hat{B}$ = 320 mT and a temperature of 100°C (exception: material N49: $\hat{B}$ = 200 mT). The measuring frequency is less than 20 kHz. The flux density is determined on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min}.

10 Accessories

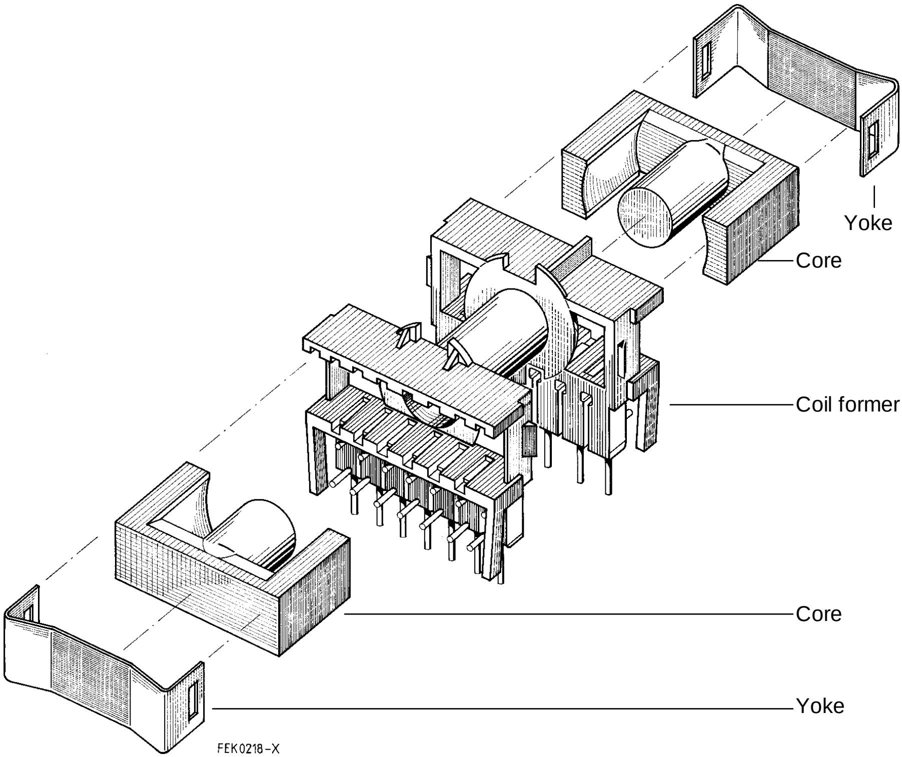
The coil formers for all ETD, EFD, EC and ER cores and most of the E cores are designed so that they can be wound fully automatically.

With the ETD cores and most E cores, each core half and its mounting assembly can be fitted to the coil former from the same side, thus permitting simple fully automatic assembly.

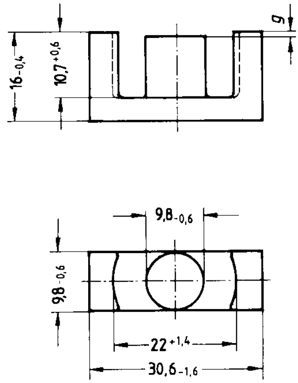
EC coil formers, cores and their mounting assemblies are fixed by means of screws.

If coil formers are used for cores with a rectangular cross section (E cores), the indication of the winding height represents only a theoretical value. The use of thicker wires or litz wires results in a gradual rounding of the winding from layer to layer. In such cases the planned winding design should be verified by means of a winding test.

Example of an assembly set
(ETD 34)



- In accordance with IEC 51 (CO) 295
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces.



FEK0044-8

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,93 mm^{-1}
l_e = 70,4 mm
A_e = 76,0 mm^2
A_{min} = 71,0 mm^2
V_e = 5350 mm^3

Approx. weight 28 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2000+30/-20%	1470	1700	1,04 (200 mT, 25 kHz, 100°C)	B66358-G-X127	200
N67	2100+30/-20%	1530	1700	0,56 (100 mT, 100 kHz, 100°C) 3,5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66358-G-X167	
N87	2200+30/-20%	1610	1700	2,80 (200 mT, 100 kHz, 100°C)	B66358-G-X187	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,10 ± 0,02	621	457	B66358-G100-X1**	200
	0,20 ± 0,02	383	281	B66358-G200-X1**	
	0,50 ± 0,05	201	148	B66358-G500-X1**	
	1,00 ± 0,05	124	91	B66358-G1000-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	124	-0,7	195	-0,847	181	-0,865
N67	124	-0,7	188	-0,82	181	-0,881
N87	124	-0,7	192	-0,796	176	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 2,00 mm
K3, *K4*: 70 nH < A_L < 680 nH

Coil former (magnetic axis horizontal)

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Squared pins

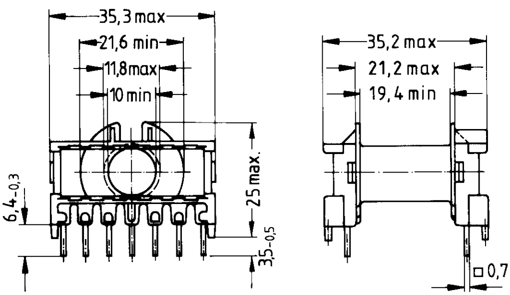
Winding: see page 154

Yoke

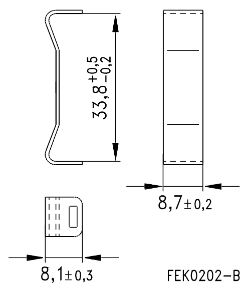
Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	97	52,8	18,7	13	B66359-A1013-T1	200
Yoke (ordering code per piece, 2 are required)					B66359-A2000	200

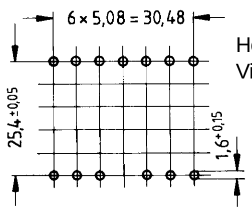
Coil former



Yoke



FEK0202-B



Hole arrangement
View in mounting direction

FEK0046-Q

Coil former (magnetic axis vertical)

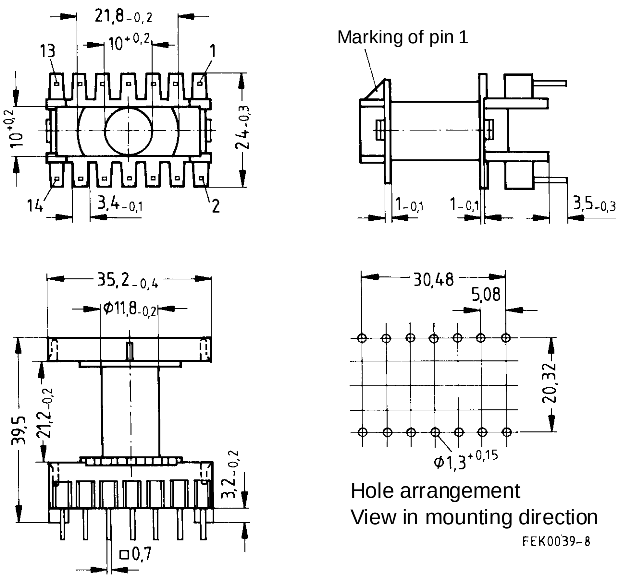
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 154
Squared pins

Yoke

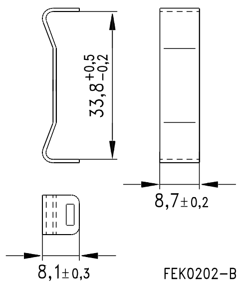
Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value μΩ	Pins		Pcs
1	97	52,8	18,7	14	B66359-J1014-T1	200
Yoke (ordering code per piece, 2 are required)					B66359-A2000	200

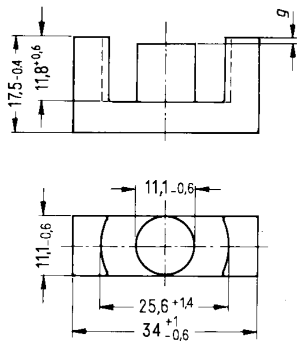
Coil former



Yoke



- In accordance with IEC 1185
- Quality assurance per UTE 83313-001 CECC 25 301-001 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces.



FEK0048-F

Magnetic characteristics (per set

$\Sigma l/A =$ 0,81 mm^{-1}
l_e = 78,6 mm
A_e = 97,1 mm^2
A_{min} = 91,6 mm^2
V_e = 7630 mm^3

Approx. weight 40 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2400+30/-20%	1540	1940	1,48 (200 mT, 25 kHz, 100°C)	B66361-G-X127	200
N67	2450+30/-20%	1580	1940	0,80 (100 mT, 100 kHz, 100°C) 5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66361-G-X167	
N87	2600+30/-20%	1670	1940	4,00 (200 mT, 100 kHz, 100°C)	B66361-G-X187	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,10 ± 0,02	790	508	B66361-G100-X1**	200
	0,20 ± 0,02	482	310	B66361-G200-X1**	
	0,50 ± 0,05	251	161	B66361-G500-X1**	
	1,00 ± 0,05	153	98	B66361-G1000-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	153	-0,713	245	-0,847	227	-0,865
N67	153	-0,713	236	-0,82	229	-0,881
N87	153	-0,713	240	-0,796	222	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 2,50 mm
K3, *K4*: 80 nH < A_L < 780 nH

Coil former (magnetic axis horizontal)

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

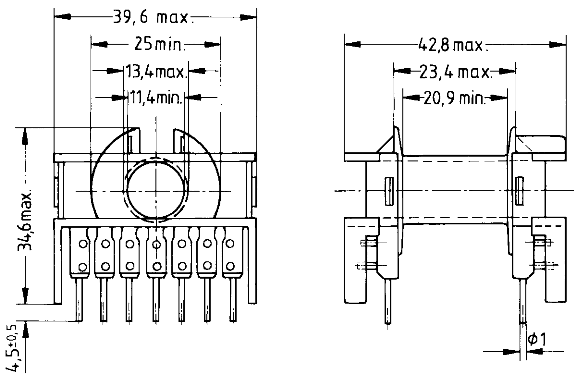
Winding:see page 154

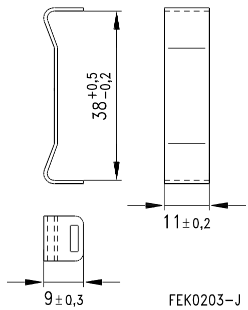
Yoke

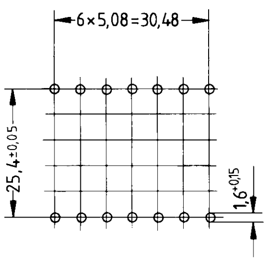
Material:Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	122	60,5	17	14	B66362-A1014-T1	200
Yoke (ordering code per piece, 2 are required)					B66362-A2000	200

Coil formerYoke







Hole arrangement
View in mounting direction

FEK0050-I

Coil former (magnetic axis vertical)

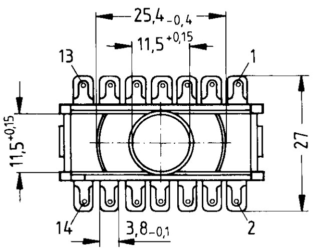
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 154

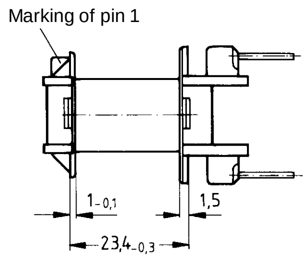
Yoke

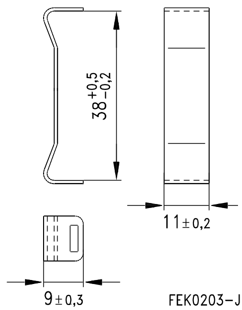
Material:Stainless spring steel (0,4 mm)

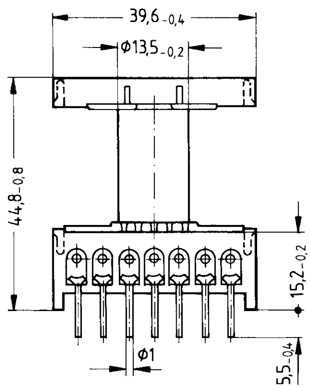
Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	122	60,5	17	14	B66362-L1014-T1	200
Yoke (ordering code per piece, 2 are required)					B66362-A2000	200

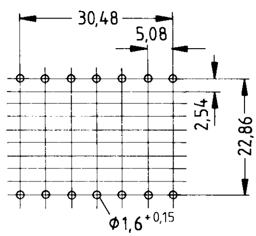
Coil formerYoke





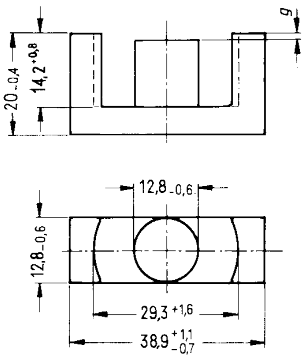






Hole arrangement
View in mounting direction

FEK0016-4



FEK0053-8

- In accordance with IEC 1185
- Quality assurance per UTE 83313-002 CECC 25 301-002 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces.

Magnetic characteristics (per set)

$\Sigma l/A =$	0,74	mm^{-1}
$l_e =$	92,2	mm
$A_e =$	125,0	mm^2
$A_{min} =$	123,0	mm^2
$V_e =$	11500	mm^3

Approx. weight 60 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2550+30/-20%	1500	2140	2,22 (200 mT, 25 kHz, 100°C)	B66363-G-X127	200
N67	2600+30/-20%	1540	2140	1,20 (100 mT, 100 kHz, 100°C) 7,5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66363-G-X167	
N87	2700+30/-20%	1600	2140	6,00 (200 mT, 100 kHz, 100°C)	B66363-G-X187	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,10 ± 0,02	1062	622	B66363-G100-X1**	200
	0,20 ± 0,02	639	374	B66363-G200-X1**	
	0,50 ± 0,05	326	191	B66363-G500-X1**	
	1,00 ± 0,05	196	115	B66363-G1000-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	196	-0,734	308	-0,847	287	-0,865
N67	196	-0,734	295	-0,82	289	-0,881
N87	196	-0,734	300	-0,796	280	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 3,00 mm
K3, *K4*: 90 nH < A_L < 850 nH

Coil former

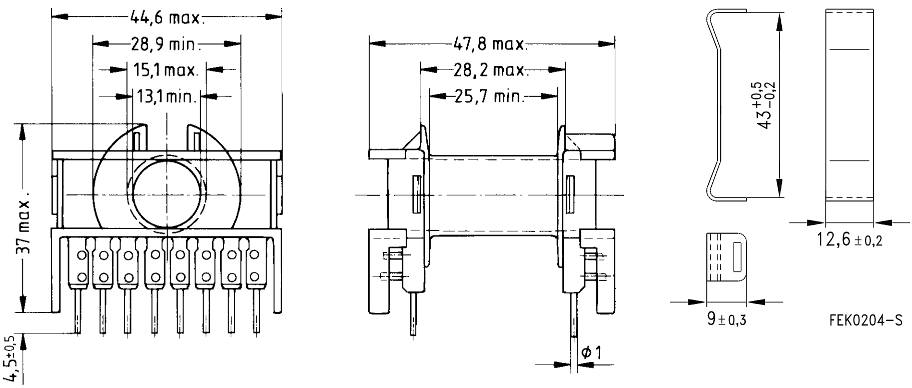
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 154

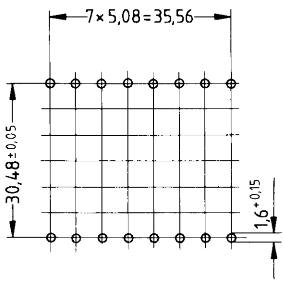
Yoke

Material:Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	178	69	13,3	16	B66364-A1016-T1	200
Yoke (ordering code per piece, 2 are required)					B66364-A2000	200

Coil formerYoke

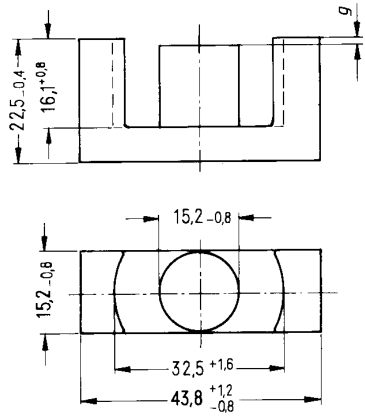




Hole arrangement
View in mounting direction

FEK0055-P

- In accordance with IEC 1185
- Quality assurance per UTE 83313-003 CECC 25 301-003 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces.



FEK0057-6

Magnetic characteristics (per set)

$\Sigma l/A =$ 0,60 mm^{-1}
$l_e =$ 103 mm
$A_e =$ 173 mm^2
$A_{min} =$ 172 mm^2
$V_e =$ 17800 mm^3

Approx. weight 94 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3300+30/-20%	1560	2640	3,48 (200 mT, 25 kHz, 100°C)	B66365-G-X127	100
N67	3350+30/-20%	1600	2640	1,88 (100 mT, 100 kHz, 100°C) 11,8 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66365-G-X167	
N87	3500+30/-20%	1650	2640	9,40 (200 mT, 100 kHz, 100°C)	B66365-G-X187	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,20 ± 0,02	862	407	B66365-G200-X1**	100
	0,50 ± 0,05	438	207	B66365-G500-X1**	
	1,00 ± 0,05	262	124	B66365-G1000-X1**	
	1,50 ± 0,05	194	92	B66365-G1500-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	262	-0,74	420	-0,847	391	-0,865
N67	262	-0,74	400	-0,82	395	-0,881
N87	262	-0,74	406	-0,796	382	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 3,50 mm
K3, *K4*: 110 nH < A_L < 1060 nH

Coil former

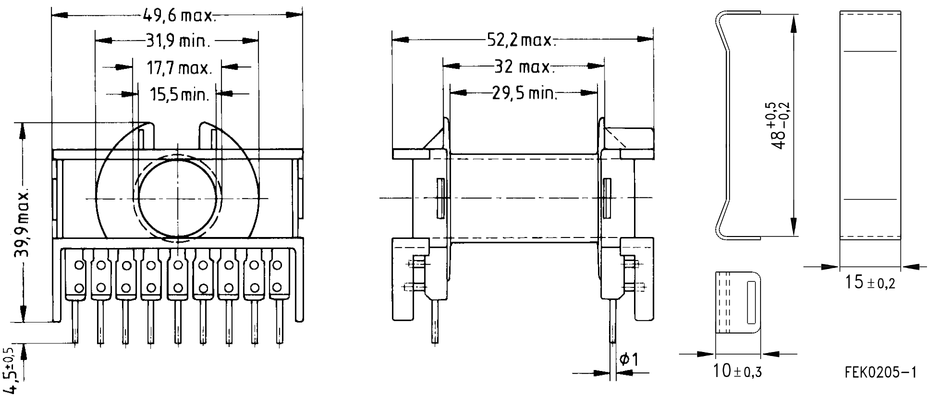
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 154

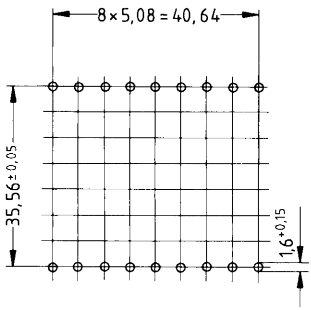
Yoke

Material:Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	210	77,7	12,7	18	B66366-A1018-T1	100
Yoke (ordering code per piece, 2 are required)					B66366-A2000	100

Coil formerYoke



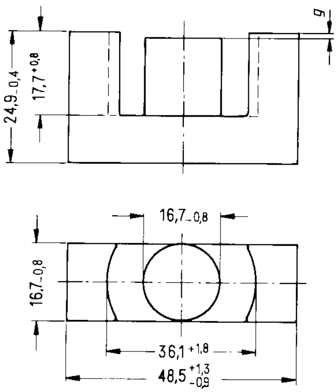


Hole arrangement
View in mounting direction

FEK0059-M

ETD 49
CoreB66367

- In accordance with IEC 1185
- Quality assurance per UTE 83313-004 CECC 25 301-004 (material N27)
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces.



FEK0061-Y

Magnetic characteristics (per set)

$\Sigma l/A$ =	0,54	mm^{-1}
l_e =	114	mm
A_e =	211	mm^2
A_{min} =	209	mm^2
V_e =	24100	mm^3

Approx. weight 124 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3700+30/-20%	1590	2910	4,59 (200 mT, 25 kHz, 100°C)	B66367-G-X127	100
N67	3700+30/-20%	1590	2910	2,48 (100 mT, 100 kHz, 100°C) 15,5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66367-G-X167	
N87	3800+30/-20%	1630	2910	12,4 (200 mT, 100 kHz, 100°C)	B66367-G-X187	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,20 ± 0,02	1035	444	B66367-G200-X1**	100
	0,50 ± 0,05	525	225	B66367-G500-X1**	
	1,00 ± 0,05	314	135	B66367-G1000-X1**	
	2,00 ± 0,05	188	81	B66367-G2000-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	314	-0,741	504	-0,847	470	-0,865
N67	314	-0,741	480	-0,82	476	-0,881
N87	314	-0,741	485	-0,796	460	-0,873

Validity range: $K1$, $K2$: 0,10 mm < s < 3,50 mm
$K3$, $K4$: 120 nH < A_L < 1160 nH

Coil former

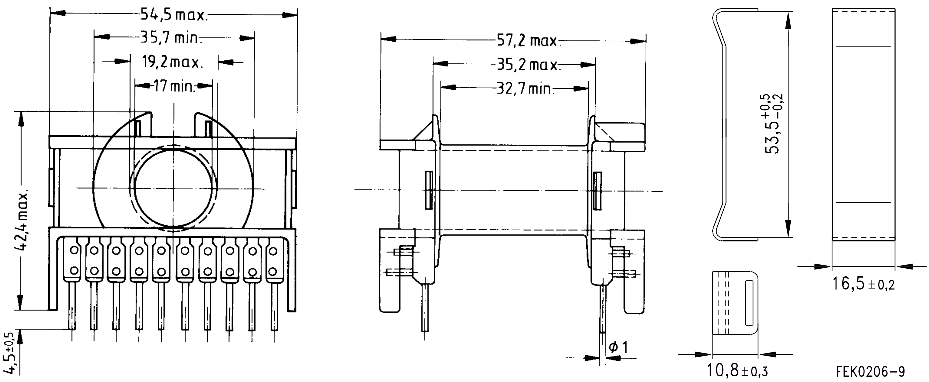
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 154

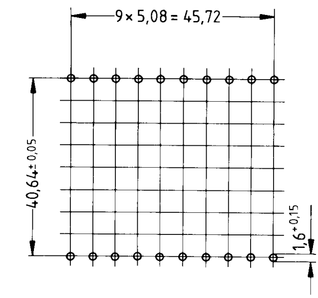
Yoke

Material:Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	269,4	86	11	20	B66368-A1020-T1	100
Yoke (ordering code per piece, 2 are required)					B66368-A2000	100

Coil formerYoke



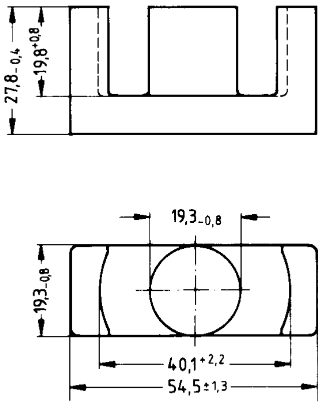


Hole arrangement
View in mounting direction

FEK0063-F

ETD 54
CoreB66395

- In accordance with IEC 51 (CO) 295
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces.



FEK0065-W

Magnetic characteristics (per set)

$\Sigma l/A$ =	0,45	mm^{-1}
l_e =	127	mm
A_e =	280	mm^2
A_{min} =	280	mm^2
V_e =	35600	mm^3

Approx. weight 180 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	4200+30/-20%	1510	3470	6,66 (200 mT, 25 kHz, 100°C)	B66395-G-X127	75
N67	4400+30/-20%	1570	3470	3,60 (100 mT, 100 kHz, 100°C) 22,5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66395-G-X167	
N87	4450+30/-20%	1600	3470	18,0 (200 mT, 100 kHz, 100°C)	B66395-G-X187	

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,20 ± 0,02	1377	496	B66395-G200-X1**	75
	1,00 ± 0,05	393	141	B66395-G1000-X1**	
	1,50 ± 0,05	287	103	B66395-G1500-X1**	
	2,00 ± 0,05	229	82	B66395-G2000-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	393	-0,779	658	-0,847	615	-0,865
N67	393	-0,779	624	-0,82	623	-0,881
N87	393	-0,779	630	-0,796	603	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 3,50 mm
K3, *K4*: 140 nH < A_L < 1390 nH

Coil former

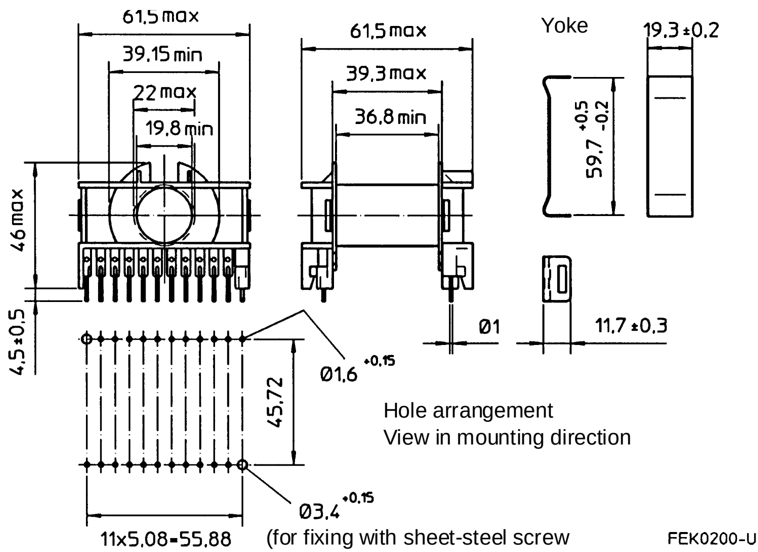
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 154

Yoke

Material: Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	315,6	96,0	10,5	22	B66396-A1022-T1	75
Yoke (ordering code per piece, 2 are required)					B66396-A2000	75

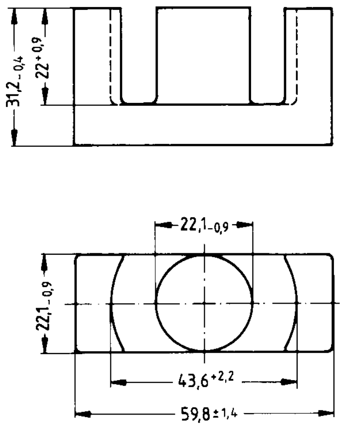
Coil former



Hole arrangement
View in mounting direction

(for fixing with sheet-steel screw DIN 7971-St 2,9 × 6,5–C)

- In accordance with IEC 51 (CO) 295
- For SMPS transformers with optimum weight/performance ratio at small volume
- ETD cores are supplied as pieces.



FEK0066-5

Magnetic characteristics (per set)

$\Sigma l/A =$ 0,38 mm^{-1}
l_e = 139 mm
A_e = 368 mm^2
A_{min} = 368 mm^2
V_e = 51200 mm^3

Approx. weight 260 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	5000+30/-20%	1500	4170	9,62 (200 mT, 25 kHz, 100°C)	B66397-G-X127	40
N67	5200+30/-20%	1570	4170	5,20 (100 mT, 100 kHz, 100°C) 32,5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66397-G-X167	
N87	5300+30/-20%	1590	4170	26,0 (200 mT, 100 kHz, 100°C)	B66397-G-X187	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) = 67 (N67)	PU Pcs
N27, N67	0,20 ± 0,02	1588	476	B66397-G200-X1**	40
	1,00 ± 0,05	508	152	B66397-G1000-X1**	
	1,50 ± 0,05	381	114	B66397-G1500-X1**	
	2,00 ± 0,05	311	93	B66397-G2000-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	508	-0,708	853	-0,847	799	-0,865
N67	508	-0,708	808	-0,82	811	-0,881
N87	508	-0,708	812	-0,796	783	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 3,50 mm
K3, *K4*: 170 nH < A_L < 1660 nH

Coil former

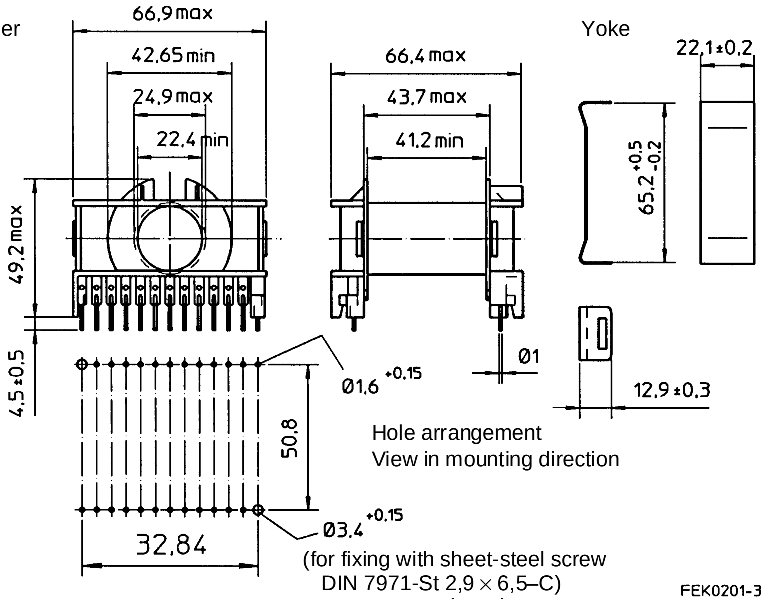
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 154

Yoke

Material:Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value μΩ	Pins		Pcs
1	365,6	106,1	10,0	24	B66398-A1024-T1	40
Yoke (ordering code per piece, 2 are required)					B66398-A2000	40

Coil former

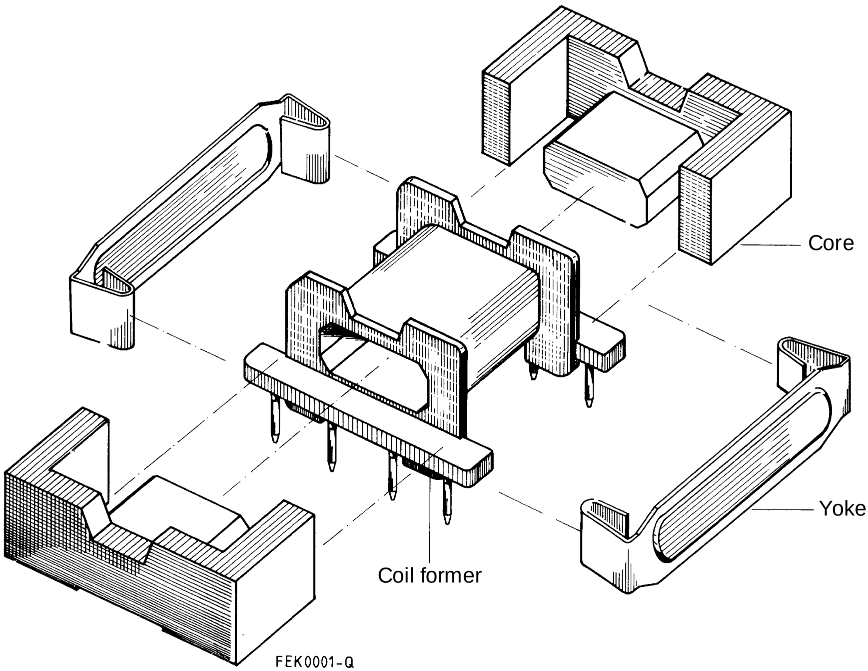


Yoke

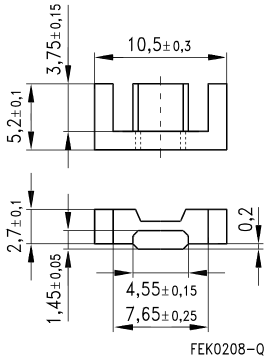
Hole arrangement
View in mounting direction

(for fixing with sheet-steel screw
DIN 7971-St 2,9 × 6,5–C)

Example of an assembly set



- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ = 3,21 mm^{-1}
l_e = 23,1 mm
A_e = 7,20 mm^2
A_{min} = 6,50 mm^2
V_e = 166 mm^3

Approx. weight 0,8 g/set

Ungapped

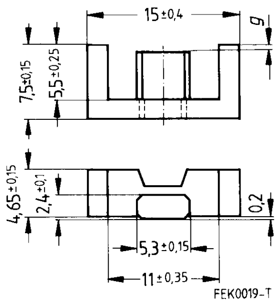
Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N59[1]	260+30/-20%	660	200	0,032 (50 mT, 500 kHz, 100°C)	B66411-G-X159	5880
N49	370+30/-20%	940	300	0,035 (50 mT, 500 kHz, 100°C)	B66411-G-X149	
N87	500+30/-20%	1270	390	0,09 (200 mT, 100 kHz, 100°C)	B66411-G-X187	

Coil former in preparation

1) Preliminary data

EFD 15/8/5
CoreB66413

- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$	2,27	mm^{-1}
l_e =	34	mm
A_e =	15	mm^2
A_{min} =	12,2	mm^2
V_e =	510	mm^3

Approx. weight 2,8 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N49	600 +30/-20%	1080	500	0,11 (50 mT, 500 kHz, 100°C)	B66413-G-X149	1920
N87	780 +30/-20%	1400	560	0,28 (200 mT, 100 kHz, 100°C)	B66413-G-X187	

Gapped

Mate-rial	A_L value nH	μ_e	g approx. mm	Ordering code	PU Pcs
N87	100 ± 10% 160 ± 15%	180 288	0,17 0,08	B66413-U100-K187 B66413-U160-L187	1920

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N87	29,7	-0,676	44,2	-0,796	33,2	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 1,00 mm
K3, *K4*: 30 nH < A_L < 280 nH

Coil former

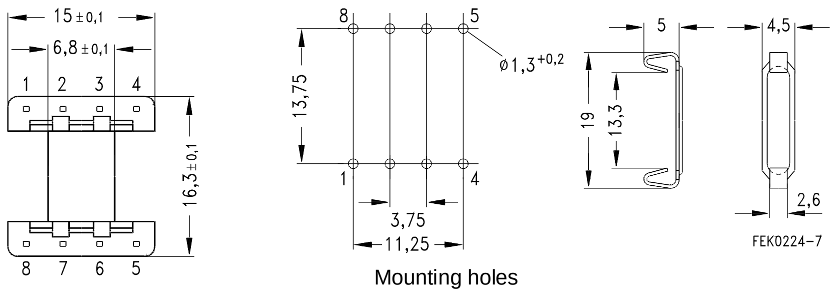
Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max.operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 155
Squared pins

Yoke

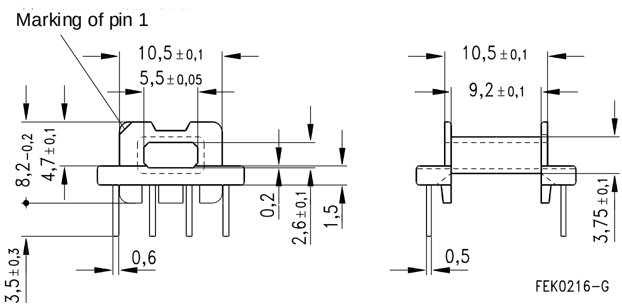
Material:Stainless spring steel (0,25 mm)
Clamping force approx. 10 N/clamp

Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	15,8	29	63,1	8	B66414-V1008-D1	1920
Yoke (ordering code per piece, 2 are required)					B66414-A2000	1920

Coil formerYoke



Mounting holes



SMD coil former

- With J terminals for winding thicker wires

Material:GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85:
F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Clamp

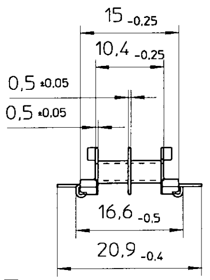
- Without ground terminal, made of stainless spring steel, tinned, 0,25 mm thick
- Clamping force approx. 10 N/clamp

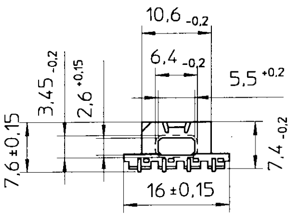
Cover plate

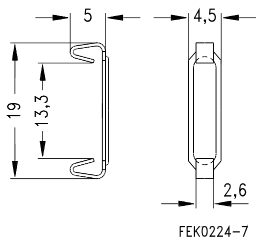
- For marking and improved processing on assembly machines
- See under coil former for material and resistance to soldering heat

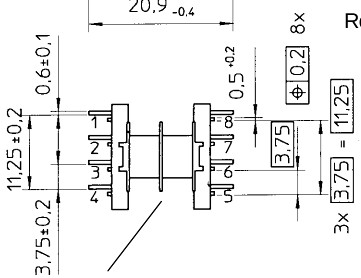
Sections	A_N mm^2	l_N mm	A_R value µΩ	Termi-nals	Ordering code	PU Pcs
1	20,4	36	60	8	B66414-A6008-T1	1920
2	19,5	36	64	8	B66414-A6008-T2	
Clamp(ordering code per piece, 2 are required					B66414-A2000	1920
Cover plate					B66414-A7000	1920

Coil former   Clamp

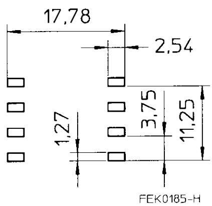


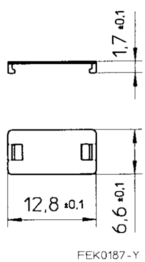






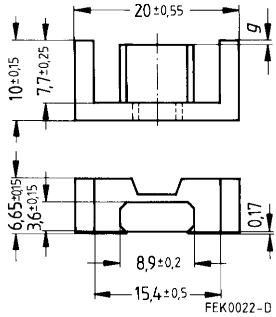
Recommended PCB layout





Center flange omitted for one-section version

- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$	1,52	mm^{-1}
l_e =	47	mm
A_e =	31	mm^2
A_{min} =	31	mm^2
V_e =	1460	mm^3

Approx. weight 7,2 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N49	910+30/-20%	1100	750	0,37 (50 mT, 500 kHz, 100°C)	B66417-G-X149	1260
N87	1200+30/-20%	1440	660	1,05 (200 mT, 100 kHz, 100°C)	B66417-G-X187	

Gapped

Material	A_L value nH	μ_e	g approx. mm	Ordering code	PU Pcs
N87	100 ± 10% 160 ± 10%	120 193	0,49 0,25	B66417-U100-K187 B66417-U160-K187	1260

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N87	61,1	-0,699	85,4	-0,796	75,7	-0,873

Validity range: $K1$, $K2$: 0,10 mm < s < 1,40 mm
$K3$, $K4$: 50 nH < A_L < 410 nH

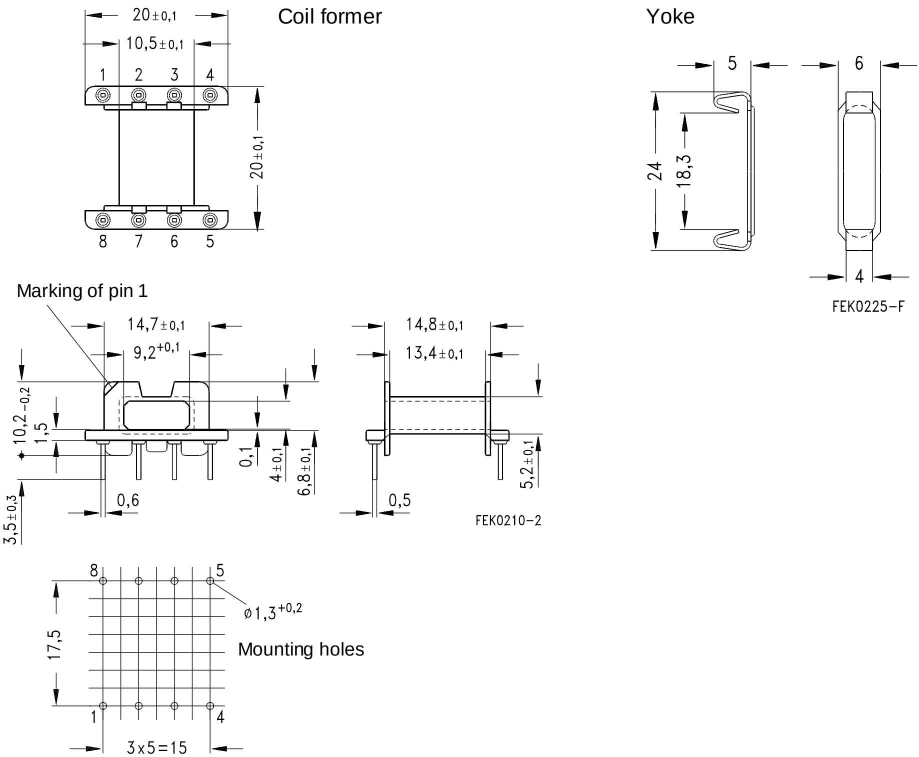
Coil former

Material: GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 155
Squared pins

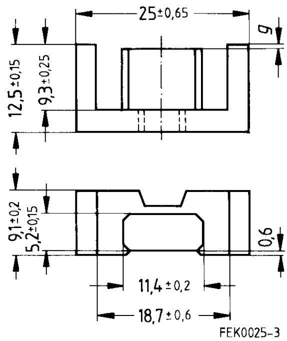
Yoke

Material: Stainless spring steel (0,25 mm)
Clamping force approx. 20 N/clamp

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	28,1	40,2	49,2	8	B66418-V1008-D1	1260
Yoke (ordering code per piece, 2 are required)					B66418-A2000	1260



- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces.



Magnetic characteristics (per set

$\Sigma l/A$=	0,98	mm^{-1}
l_e =	57	mm
A_e =	58	mm^2
A_{min}=	57	mm^2
V_e =	3310	mm^3

Approx. weight 16,6 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N67	2000+30/-20%	1560	1280	0,35 (100 mT, 100 kHz, 100°C) 2,1 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66421-G-X167	650
N87	2000+30/-20%	1560	1280	1,8 (200 mT, 100 kHz, 100°C)	B66421-G-X187	

Gapped

Mate-rial	A_L value nH	μ_e	g approx. mm	Ordering code ** = 67 (N67) = 87 (N87)	PU Pcs
N67, N87	160 ± 10%	125	0,55	B66421-U160-K1**	650
	250 ± 10%	195	0,30	B66421-U250-K1**	
	315 ± 10%	246	0,22	B66421-U315-K1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N67	103	-0,734	150	-0,82	142	-0,881
N87	103	-0,734	154	-0,796	138	-0,873

Validity range: $K1$, $K2$: 0,10 mm < s < 1,70 mm
$K3$, $K4$: 70 nH < A_L < 630 nH

Coil former

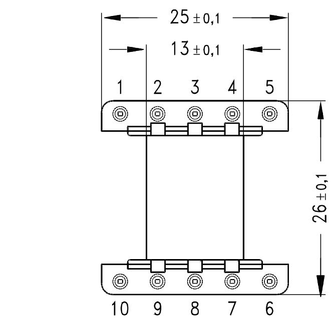
Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max.operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 155

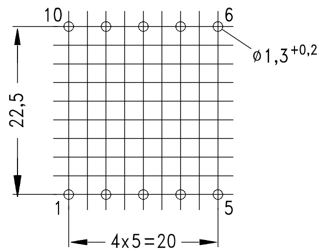
Yoke

Material:Stainless spring steel (0,3 mm)
Clamping force approx. 35 N/clamp

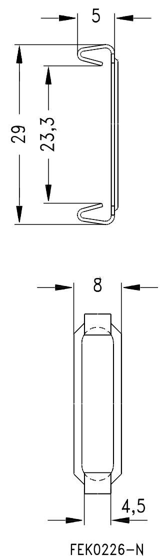
Coil former					Ordering code	PU
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	40,7	50	42,3	10	B66422-V1010-D1	650
Yoke (ordering code per piece, 2 are required)					B66422-A2000	650

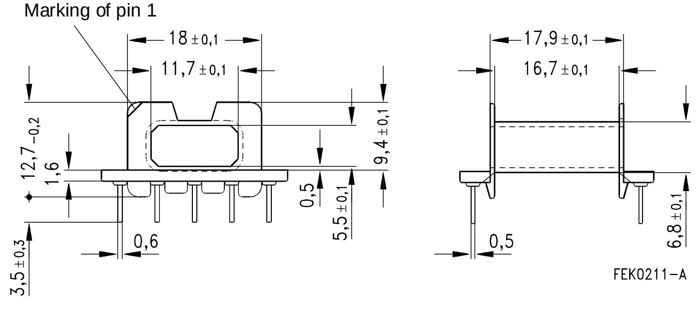
Coil formerYoke





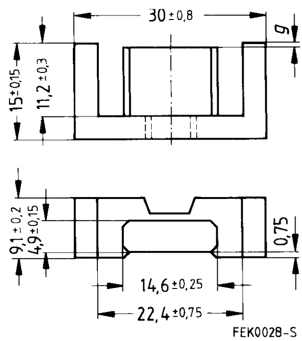
Mounting holes





EFD 30/15/9
CoreB66423

- E core with flattened, lower center leg for especially flat transformer design
- For DC/DC converters
- EFD cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$	0,99	mm^{-1}
l_e =	68	mm
A_e =	69	mm^2
A_{min} =	69	mm^2
V_e =	4690	mm^3

Approx. weight 24 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N67	2050+30/-20%	1610	1280	0,50 (100 mT, 100 kHz, 100°C) 3,0 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66423-G-X167	250
N87	2050+30/-20%	1610	1280	2,6 (200 mT, 100 kHz, 100°C)	B66423-G-X187	

Gapped

Material	A_L value nH	μ_e	g approx. mm	Ordering code ** = 67 (N67) = 87 (N87)	PU Pcs
N67, N87	160 ± 10% 250 ± 10% 315 ± 10%	125 196 246	0,71 0,38 0,27	B66423-U160-K1** B66423-U250-K1** B66423-U315-K1**	250

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N67	125	-0,712	172	-0,82	166	-0,881
N87	125	-0,712	176	-0,796	161	-0,873

Validity range: *K1*, *K2*: 0,10 mm < s < 2,00 mm
K3, *K4*: 70 nH < A_L < 630 nH

Coil former

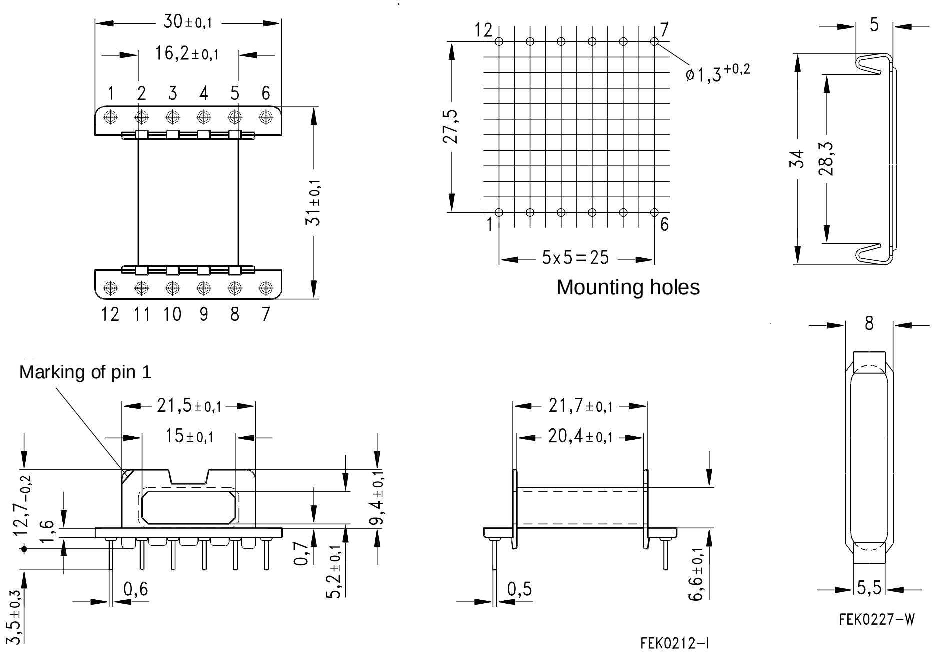
Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Square pins
Winding:see page 155

Yoke

Material:Stainless spring steel (0,3 mm)
Clamping force approx. 40 N/clamp

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	52,3	56,7	37,3	12	B66424-V1012-D1	250
Yoke (ordering code per piece, 2 are required)					B66424-A2000	250

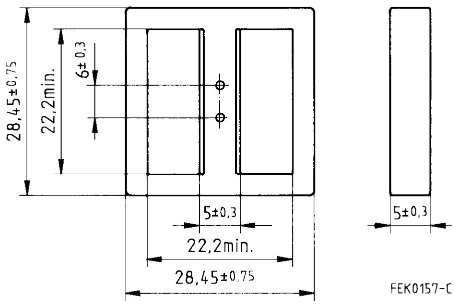
Coil formerYoke



Mounting holes

DE 28
CoreB66399

- Closed E core shape (no gap)
- For broadband transformers and current-compensated chokes



Magnetic characteristics (per piece)

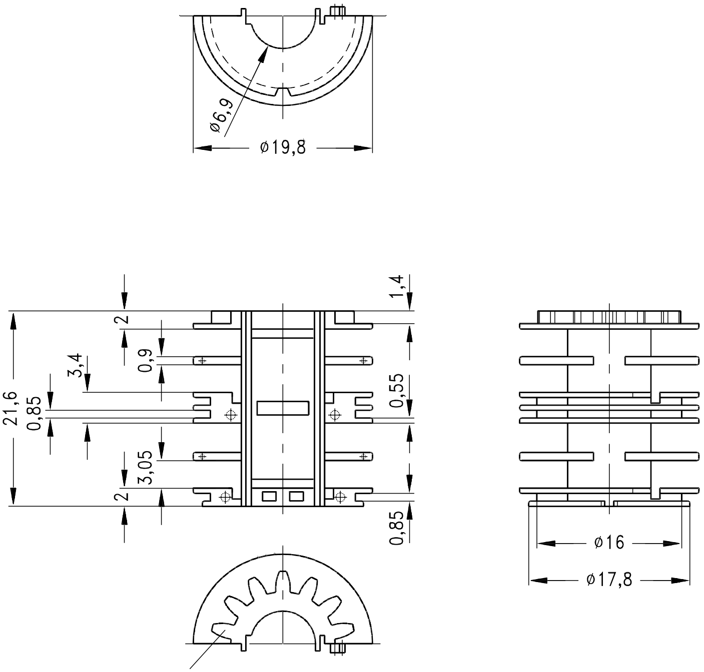
$\Sigma l/A$=	2,59	mm^{-1}
l_e =	70	mm
A_e =	27	mm^2
A_{min} =	27	mm^2
V_e =	1890	mm^3

Approx. weight 15 g/piece

Material	A_L value nH	Ordering code	PU Pcs
T37	3300+40/-30%	B66399-A1-X37	880

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code white

Sections	A_N mm²	l_N mm	A_R value μΩ		Ordering code	PU Sets
4	64,7	45,5	24,2		–	
Coil former (two-part) + terminal carrier, complete set					B66400-V1008-D4	740

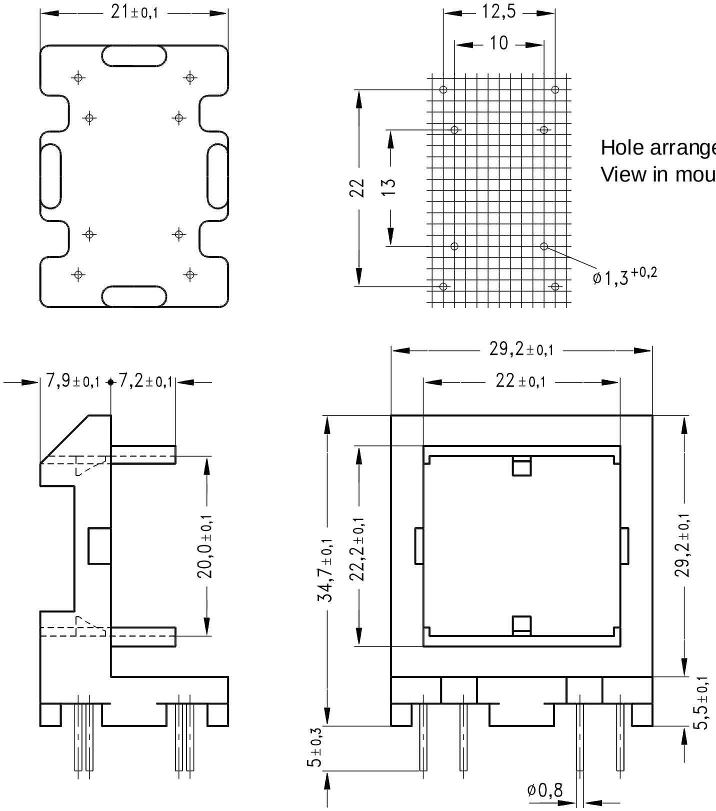


Straight-tooth spur gear
Module m = 1
Outside diameter d_K = ∅ 16
Pitch diameter d_0 = ∅ 14
Number of teeth (per half-shell) z = 7

FEK0213-R

Material:GFR thermosetting plastic (UL 94 V-0, insulation class to IEC 85: F ≙ max.operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

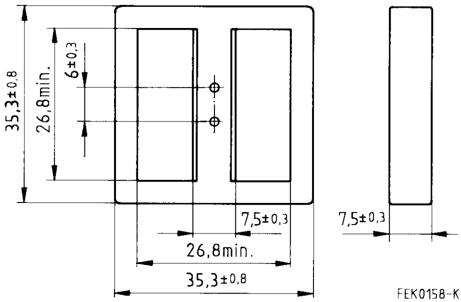
	Ordering code	PU Sets
Terminal carrier with 8 pins	–	
Coil former (two-part) + terminal carrier, complete set	B66400-V1008-D4	740



FEK0214-Z

DE 35
CoreB66409

- Closed E core design guarantees material-specific properties
- For broadband transformers and current-compensated chokes



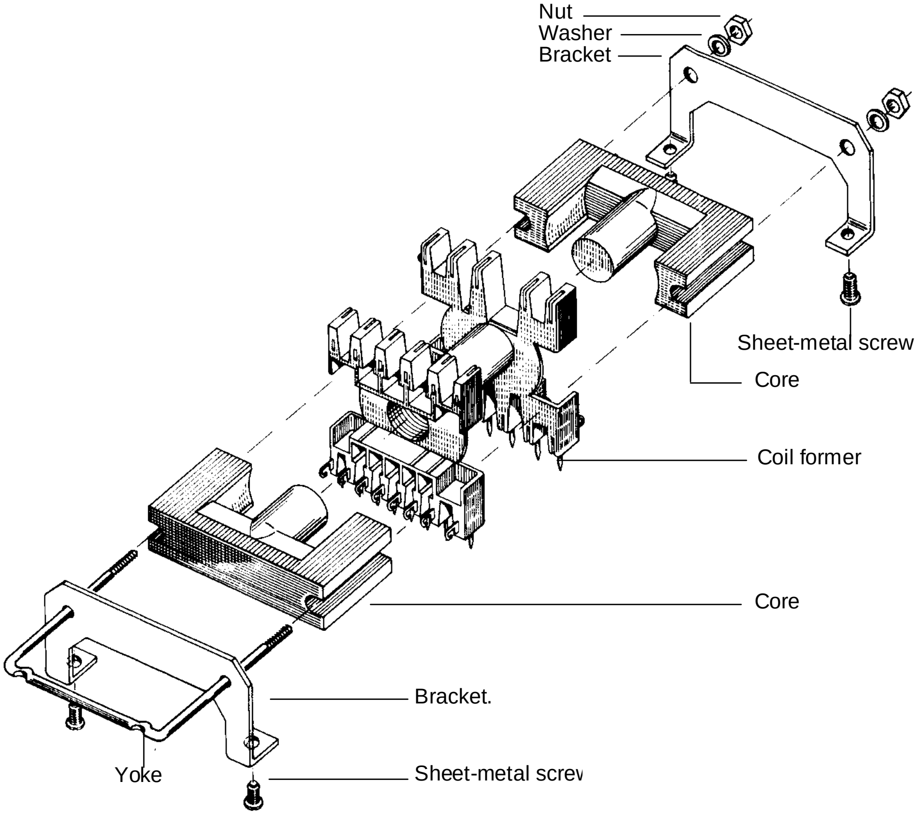
Magnetic characteristics (per piece)

$\Sigma l/A$ =	1,46	mm^{-1}
l_e =	85	mm
A_e =	58	mm^2
A_{min} =	58	mm^2
V_e =	4970	mm^3

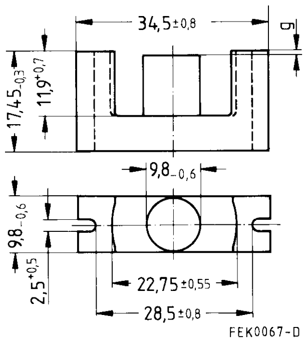
Approx. weight 26 g/set

Material	A_L value nH	Ordering code	PU Pcs
T37	5400+40/-30%	B66409-A1-X37	390

Example of an assembly set



- In accordance with IEC 647
- Compact E core with large winding window
- Round center leg particularly suitable for use of thick winding wires
- EC cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,92 mm^{-1}
l_e = 77,4 mm
A_e = 84,3 mm^2
A_{min} = 71,0 mm^2
V_e = 6530 mm^3

Approx. weight 36 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2100+30/-20%	1530	1710	1,10 (200 mT, 25 kHz, 100°C)	B66337-G-X127	200

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,10 ± 0,02	651	475	B66337-G100-X127	200
	0,25 ± 0,02	336	245	B66337-G250-X127	
	0,50 ± 0,05	203	148	B66337-G500-X127	
	1,00 ± 0,05	123	90	B66337-G1000-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

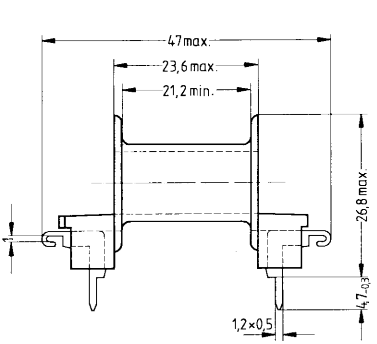
Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	123	-0,724	214	-0,847	198	-0,865

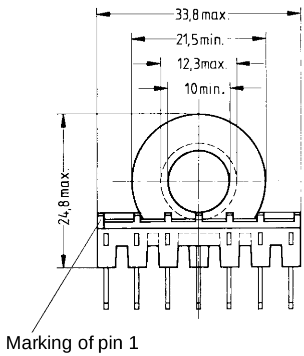
Validity range: $K1$, $K2$: 0,10 mm < s < 2,50 mm
$K3$, $K4$: 70 nH < A_L < 680 nH

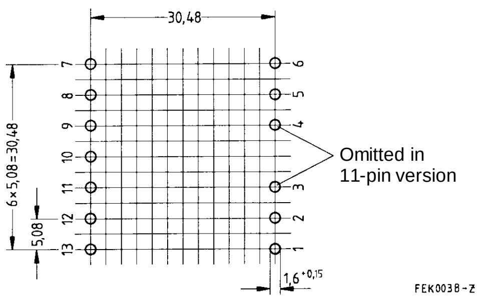
Coil former with solder tags

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Solder tags hot-tin dipped
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 156
Also available without solder terminals

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	97	53	18,8	11 13	B66272-C1001-T1 B66272-C1002-T1	200







Hole arrangement
View in mounting direction

Coil former with solder pins

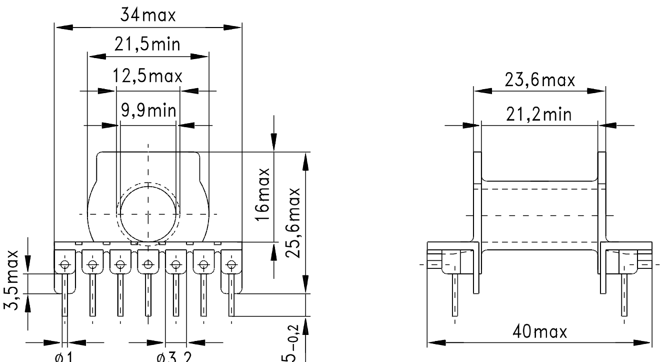
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

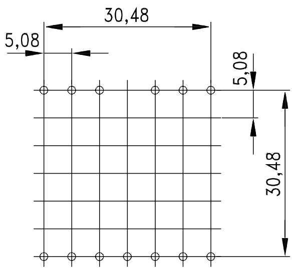
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding: see page 156

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	97	53	18,8	13	B66272-J1013-T1	200

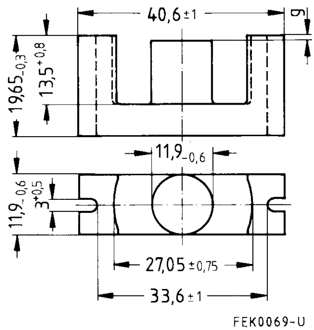


FEK0209-Y



Hole arrangement
View in mounting direction
Mounting holes ∅ $1{,}6^{+0,15}$

- In accordance with IEC 647
- Compact E core with large winding window
- Round center leg particularly suitable for use of thick winding wires
- EC cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 0,74 mm^{-1}
l_e = 89,3 mm
A_e = 121 mm^2
A_{min} = 106 mm^2
V_e = 10800 mm^3

Approx. weight 52 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2700+30/-20%	1580	2130	1,80 (200 mT, 25 kHz, 100°C)	B66339-G-X127	200

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,10 ± 0,02	927	543	B66339-G100-X127	200
	0,25 ± 0,02	470	275	B66339-G250-X127	
	0,50 ± 0,05	281	165	B66339-G500-X127	
	1,00 ± 0,05	168	98	B66339-G1000-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	168	-0,742	300	-0,847	279	-0,865

Validity range: $K1$, $K2$: 0,10 mm < s < 2,50 mm
$K3$, $K4$: 90 nH < A_L < 850 nH

Coil former (magnetic axis horizontal or vertical)

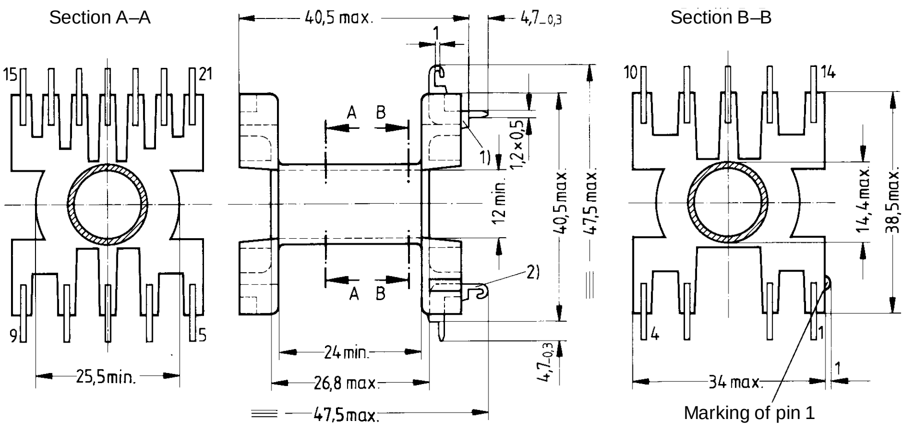
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Solder tags hot-tin dipped
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 156
Also available without solder terminals

Mounting assemblies

For vertical version: consisting of bracket and yoke
For horizontal version: consisting of yoke and metal strip
Max. torque for screwing the mounting assembly onto the PC board: 0,6 Nm per thread.

Coil former						Ordering code	PU
Version	Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
Horizontal	1	134	62	15,9	9 12	B66274-B1001-T1 B66274-B1002-T1	200
Vertical	1	134	62	15,9	9 12	B66274-B1011-T1 B66274-B1012-T1	
Mounting assembly (horizont.) complete with screws and nuts						B66274-B2001	200
Mounting assembly (vertical) complete with screws and nuts						B66274-B2002	

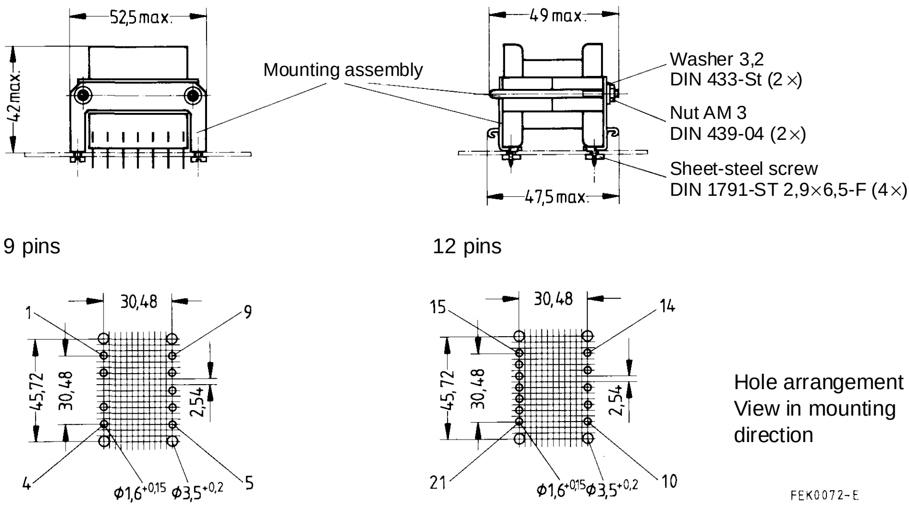
Coil former



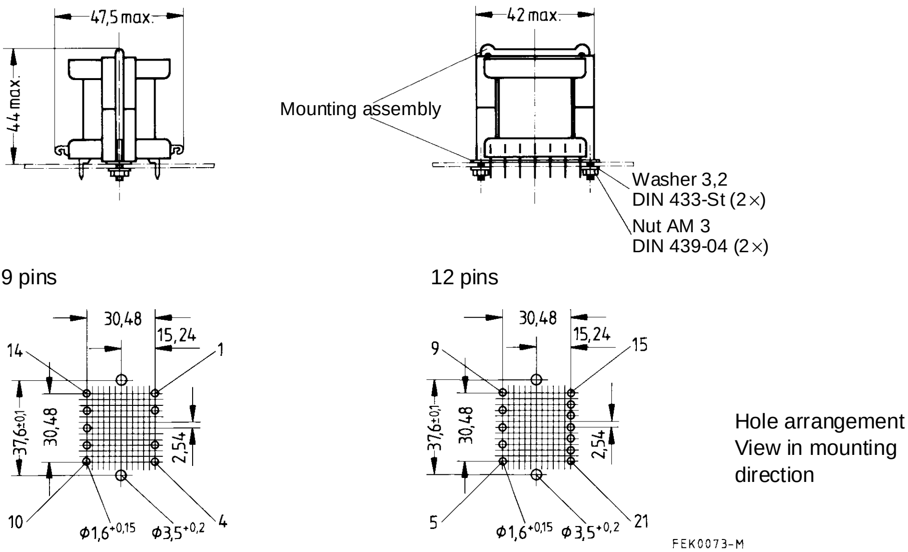
1) Position of solder tag in vertical version
2) Position of solder tag in horizontal version

FEK0071-6

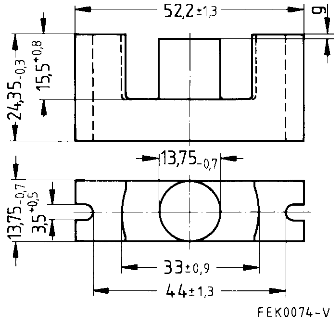
Horizontal version: core assembled with accessories



Vertical version: core assembled with accessories



- In accordance with IEC 647
- Compact E core with large winding window
- Round center leg particularly suitable for use of thick winding wires
- EC cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 0,58 mm^{-1}
l_e = 105 mm
A_e = 180 mm^2
A_{min} = 141 mm^2
V_e = 18900 mm^3

Approx. weight 110 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3400+30/-20%	1570	2700	2,40 (200 mT, 25 kHz, 100°C)	B66341-G-X127	100

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,25 ± 0,02	621	288	B66341-G250-X127	100
	0,50 ± 0,05	372	172	B66341-G500-X127	
	1,00 ± 0,05	223	103	B66341-G1000-X127	
	1,50 ± 0,05	165	77	B66341-G1500-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	223	-0,739	435	-0,847	406	-0,865

Validity range: $K1$, $K2$: 0,10 mm < s < 3,00 mm
$K3$, $K4$: 110 nH < A_L < 1050 nH

Coil former (magnetic axis horizontal or vertical)

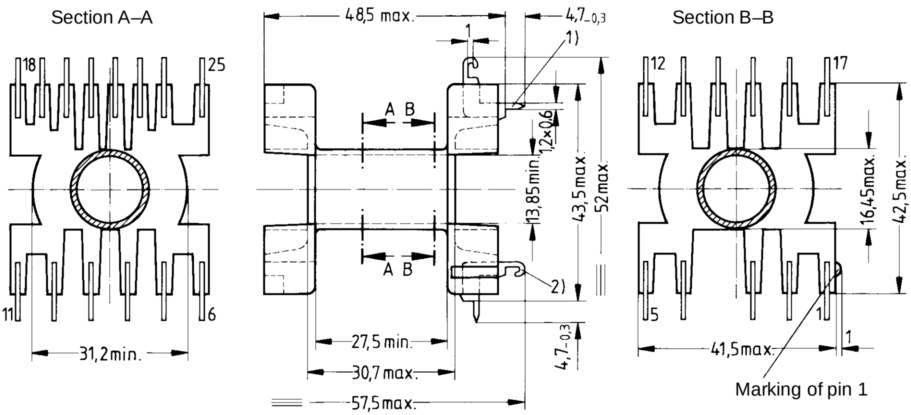
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Solder tags hot-tin dipped
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 156
Also available without solder terminals

Mounting assemblies

For vertical version: consisting of bracket and yoke
For horizontal version: consisting of yoke and metal strip
Max. torque for screwing the mounting assembly onto the PC board: 0,8 Nm per thread.

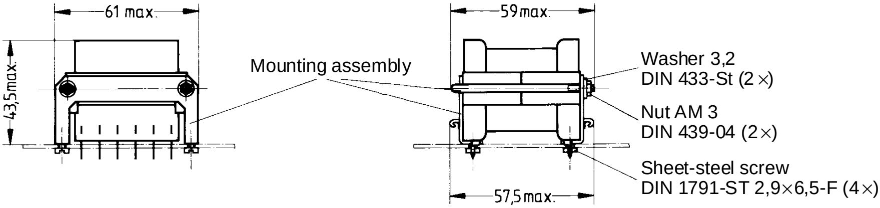
Coil former						Ordering code	PU
Version	Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
Horizontal	1	212	74	12	11 14	B66276-B1001-T1 B66276-B1002-T1	100
Vertical	1	212	74	12	11 14	B66276-B1011-T1 B66276-B1012-T1	
Mounting assembly (horizont.) complete with screws and nuts						B66276-B2001	100
Mounting assembly (vertical) complete with screws and nuts						B66276-B2002	

Coil former

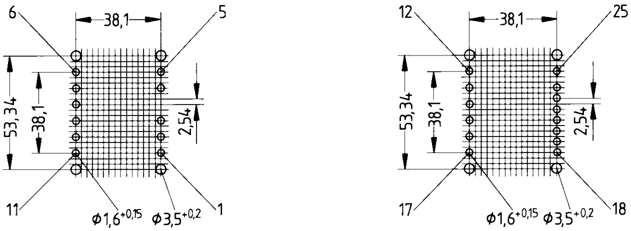


1) Position of solder tag in vertical version
2) Position of solder tag in horizontal version

Horizontal version: core assembled with accessories



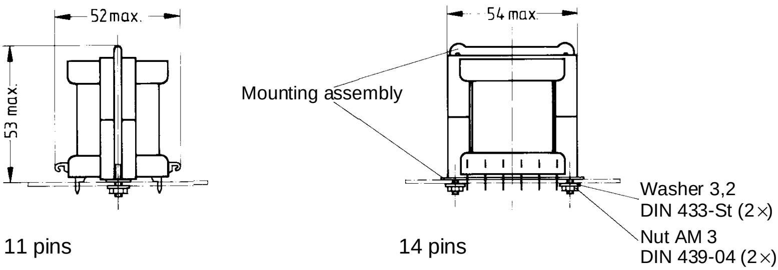
11 pins | 14 pins



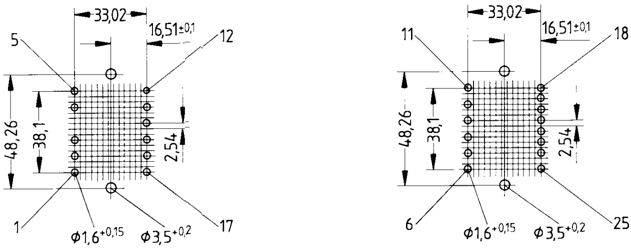
Hole arrangement
View in mounting direction

FEK0077-K

Vertical version: core assembled with accessories



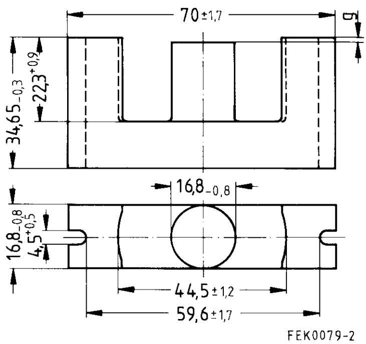
11 pins | 14 pins



Hole arrangement
View in mounting direction

FEK0078-T

- In accordance with IEC 647
- Compact E core with large winding window
- Round center leg particularly suitable for use of thick winding wires
- EC cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$=	0,52	mm^{-1}
l_e =	144	mm
A_e =	279	mm^2
A_{min} =	211	mm^2
V_e =	40200	mm^3

Approx. weight 252 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3900+30/-20%	1600	3050	4,80 (200 mT, 25 kHz, 100°C)	B66343-G-X127	60

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,25 ± 0,02	874	358	B66343-G250-X127	60
	0,50 ± 0,05	529	217	B66343-G500-X127	
	1,00 ± 0,05	320	131	B66343-G1000-X127	
	1,50 ± 0,05	238	98	B66343-G1500-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$)

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	320	-0,725	644	-0,847	603	-0,865

Validity range: $K1$, $K2$: 0,10 mm < s < 3,50 mm
$K3$, $K4$: 120 nH < A_L < 1200 nH

Coil former (magnetic axis horizontal or vertical)

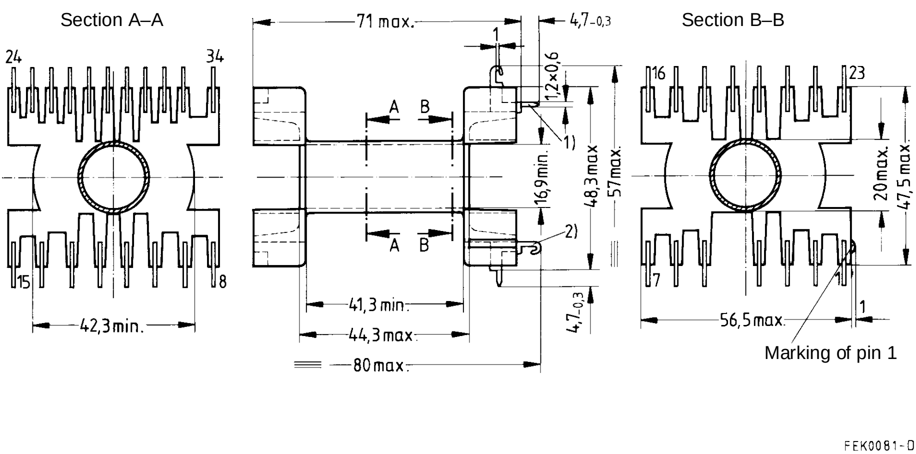
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Solder tags hot-tin dipped
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding: see page 156
Also available without solder terminals

Mounting assemblies

For vertical version: consisting of bracket and yoke
For horizontal version: consisting of yoke and metal strip
Max. torque for screwing the mounting assembly onto the PC board: 1,2 Nm per thread.

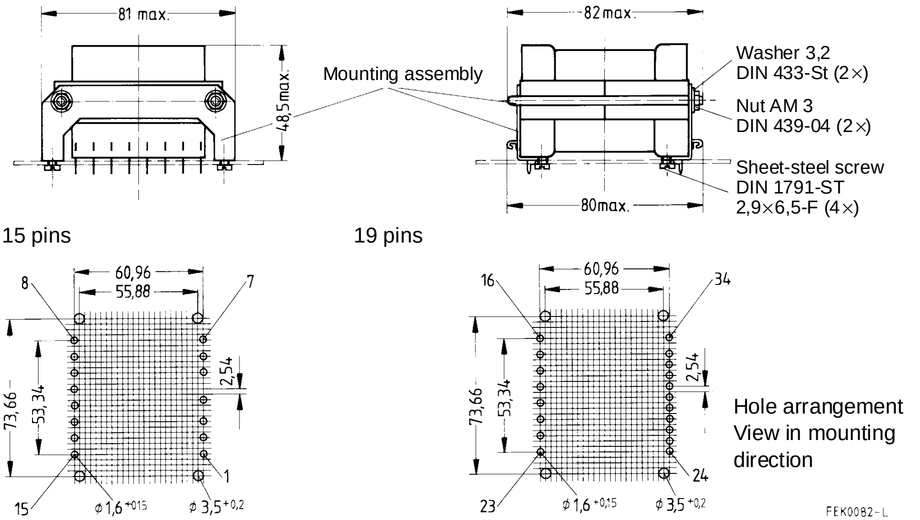
Coil former						Ordering code	PU
Version	Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
Horizontal	1	469	97	7,1	15 19	B66278-B1001-T1 B66278-B1002-T1	60
Vertical	1	469	97	7,1	15 19	B66278-B1011-T1 B66278-B1012-T1	
Mounting assembly (horizont.) complete with screws and nuts						B66278-B2001	60
Mounting assembly (vertical) complete with screws and nuts						B66278-B2002	

Coil former

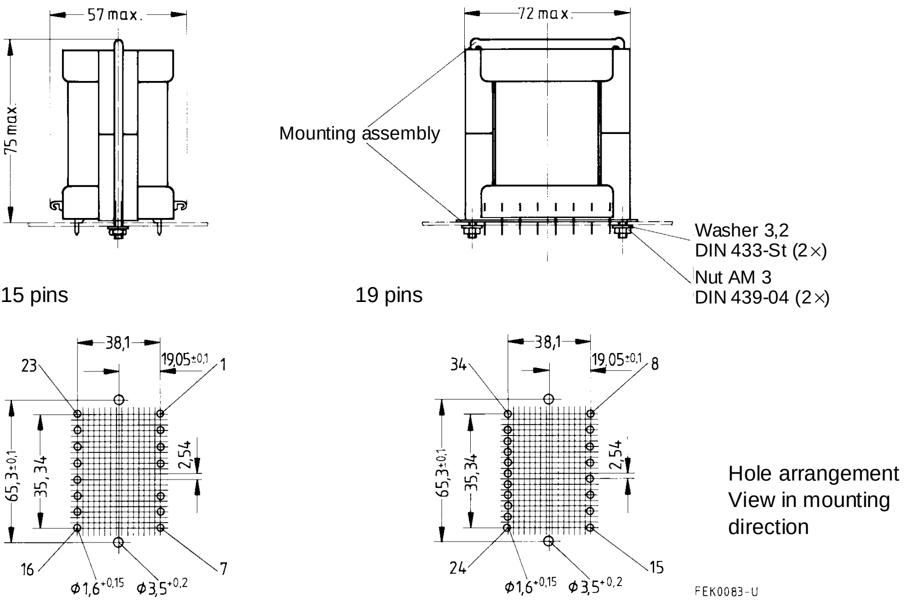


1) Position of solder tags in vertical version
2) Position of solder tag in horizontal version

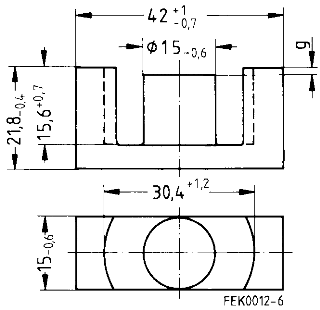
Horizontal version: core assembled with accessories



Vertical version: core assembled with accessories



- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,58	mm^{-1}
l_e =	99,0	mm
A_e =	170	mm^2
A_{min} =	170	mm^2
V_e =	16800	mm^3

Approx. weight 84 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3200+30/-20%	1480	2700	3,1 (200 mT, 25 kHz, 100°C)	B66347-G-X127	200
N67	3500+30/-20%	1620	2700	1,7 (100 mT, 100 kHz, 100°C) 10,5 (200 mT, 100 kHz, 100°C)	B66347-G-X167	

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	1,00 ± 0,05 1,50 ± 0,05	257 190	119 88	B66347-G1000-X127 B66347-G1500-X127	200

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

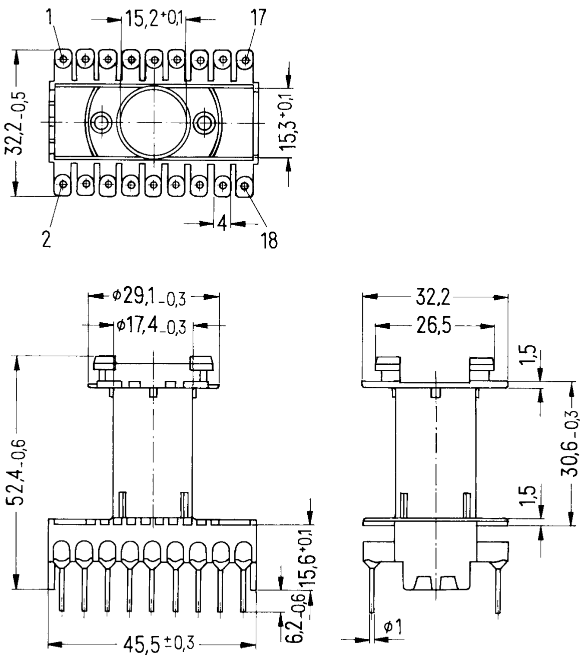
Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	257	-0,741	415	-0,847	387	-0,865
N67	257	-0,741	396	-0,82	390	-0,881

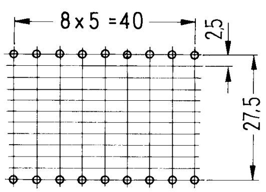
Validity range: *K1*, *K2*: 0,10 mm < s < 3,00 mm
K3, *K4*: 110 nH < A_L < 1100 nH

Coil former (standard version)

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 156

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value μΩ	Pins		Pcs
1	127	68,5	18,6	18	B66348-A1018-T1	200
Case see page 504					B66348-A2001-T1	200





Mounting holes ∅ 1,6$^{+0,15}$

FEK0156-4

Pile-up coil former

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

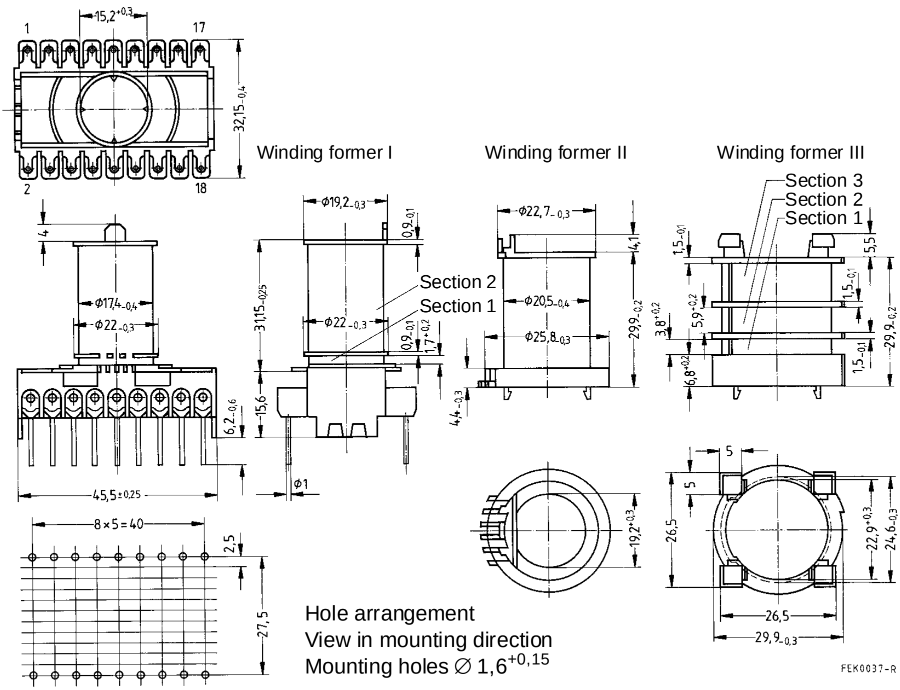
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding:see page 156

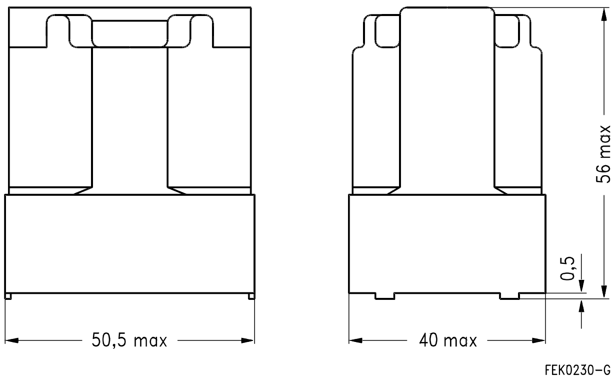
Pile-up coil former, complete set: ordering code: B66348-A1018-T103, PU = 200 pieces

Winding former	Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
I	1 2	4,0 24,5	61,5 57,5	529 81	18	Available only as a complete set	—
II	1	24,1	67,5	96	18		
III	1 2 3	8,4 12,6 42,2	85,5 85,5 85,5	350 233 70	18		
Case see page 504						B66348-A2001-T	200

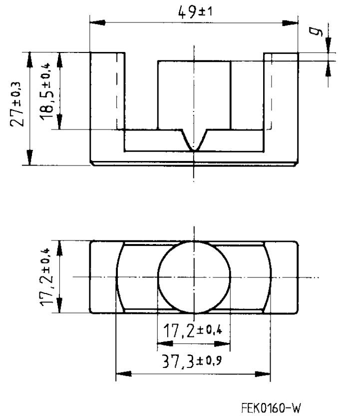


● Used to protect the transformer against external influences, and for stamping
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code blue

	Ordering code	PU Pcs
Case	B66348-A2001-T	200



- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,49 mm^{-1}
l_e = 118 mm
A_e = 243 mm^2
A_{min} = 225 mm^2
V_e = 28700 mm^3

Approx. weight 146 g/set

Ungapped

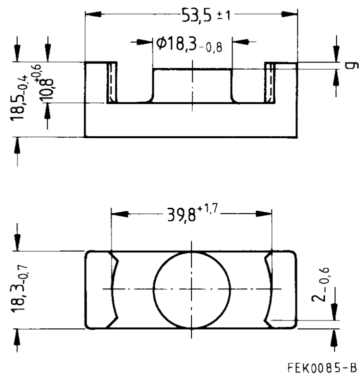
Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3500+30/-20%	1350	3240	5,38 (200 mT, 25 kHz, 100°C)	B66391-G-X127	120

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	342	-0,75	578	-0,847	540	-0,865

Validity range: $K1$, $K2$: 0,10 mm < s < 3,50 mm
$K3$, $K4$: 130 nH < A_L < 1300 nH

ER 54
Core **B66357**



- Round center leg particularly suitable for use of thick winding wires or tapes
- For compact winding design with low leakage inductance
- ER cores are supplied as pieces.

Magnetic characteristics (per set)

$\Sigma l/A$ =	0,35	mm^{-1}
l_e =	90	mm
A_e =	256	mm^2
A_{min} =	252	mm^2
V_e =	23000	mm^3

Approx. weight 119 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	5600+30/-20%	1560	4480	4,4 (200 mT, 25 kHz, 100°C)	B66357-G-X127	100
N67	5750+30/-20%	1600	4480	2,50 (100 mT, 100 kHz, 100°C) 14,9 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66357-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,50 ± 0,05	620	173	B66357-G500-X127	100
	1,00 ± 0,05	360	100	B66357-G1000-X127	

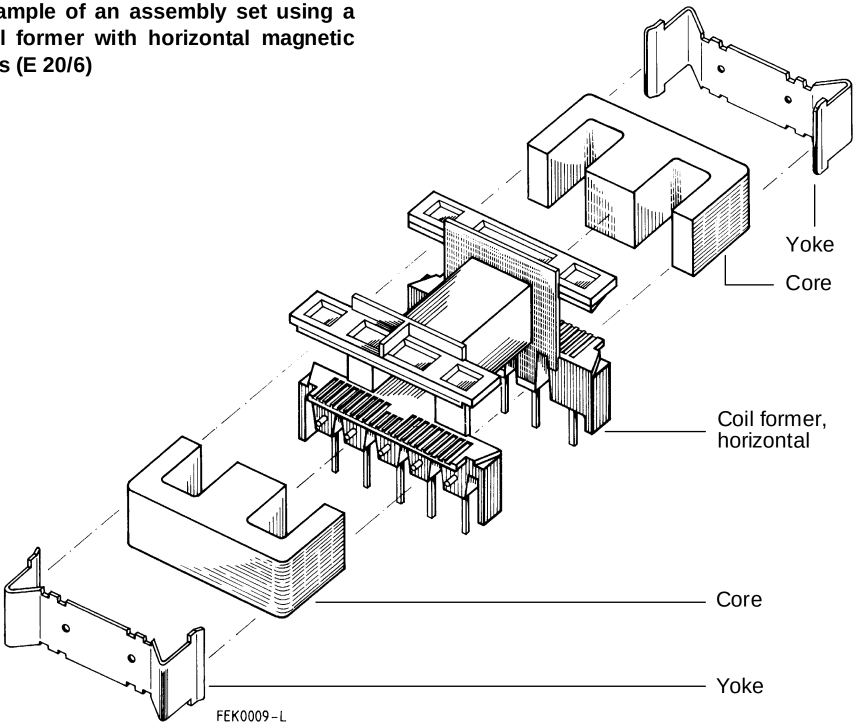
The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

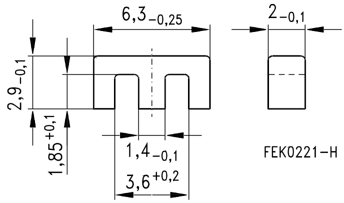
Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	360	-0,786	635	-0,847	590	-0,865
N67	360	-0,786	608	-0,82	594	-0,881

Validity range: $K1$, $K2$: 0,15 mm < s < 3,50 mm
$K3$, $K4$: 180 nH < A_L < 1800 nH

Example of an assembly set using a coil former with horizontal magnetic axis (E 20/6)



- For miniature transformers, e.g. DC/DC converters for surface mounting (SMD version)
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ = 3,70 mm^{-1}
l_e = 12,2 mm
A_e = 3,30 mm^2
A_{min} = 2,60 mm^2
V_e = 40,3 mm^3

Approx. weight 0,12 g/set

Material	A_L value nH	μ_e	$A_{L1\,min}$ mH	Ordering code	PU Pcs
T38	1700+40/-30%	4990		B66300-G-X138	10000
N67	380+30/-20%	1120	300	B66300-G-X167	

The A_L value in the table applies to a core set comprising two ungapped cores.

SMD coil former with gullwing terminals

Material: GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

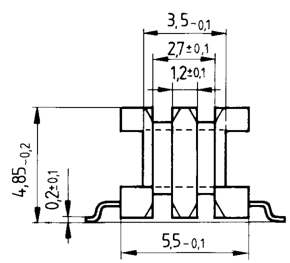
Plastic cover

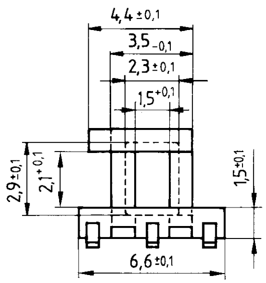
Used to protect the transformer against external influences, for stamping and for improved processing on assembly machines

Material: see coil former

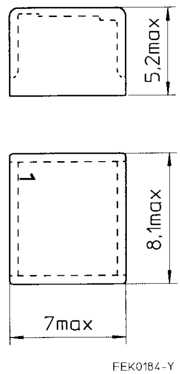
Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Terminals		Pcs
1	1,62	12,8	272	4 6	B66301-B1004-T1 B66301-B1006-T1	5000
2	0,9	12,8	490	4 6	B66301-B1004-T2 B66301-B1006-T2	
Plastic cover					B66301-B2000	5000

Coil former

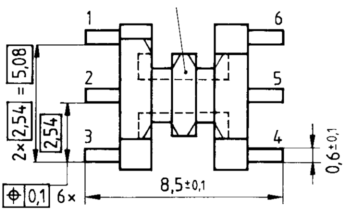




Cover

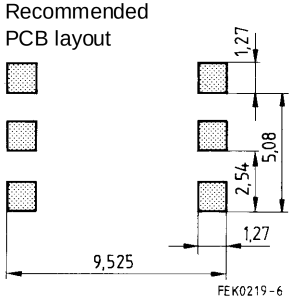


Omitted in
1-section version

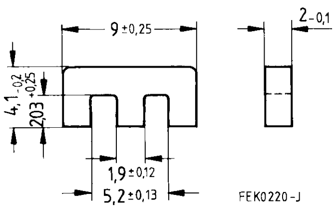


Terminals 2 and 5 are
omitted in 4-terminal version

Recommended
PCB layout



- In accordance with IEC 1246
- For miniature transformers, e.g. DC/DC converters for surface mounting (SMD version)
- Available with SMD coil former
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 3,10 mm^{-1}
$l_e =$ 15,5 mm
$A_e =$ 5,00 mm^2
$A_{min} =$ 3,60 mm^2
$V_e =$ 78 mm^3

Approx. weight 0,50 g/set

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	1000+30/-20	2460			B66302-G-X130	5000
T38	2100+40/-30%	5170			B66302-G-X138	
N67	550+30/-20%	1350	400	0,04 (200 mT, 100 kHz, 100°C)	B66302-G-X167	

The A_L value in the table applies to a core set comprising two ungapped cores.

E 8,8
Coil FormerB66302

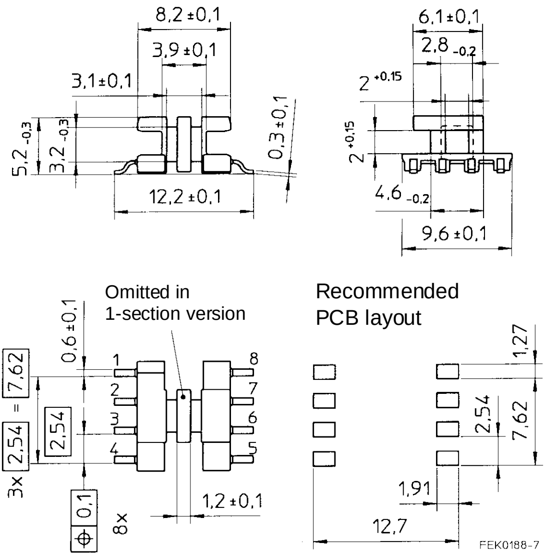
SMD coil former with gullwing terminals

Material:GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

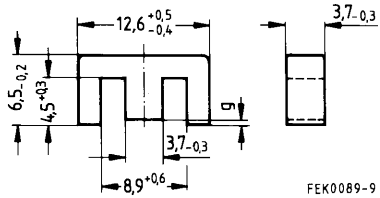
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Sections	A_N mm^2	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	2,7	14,9	190	8	B66302-D1008-T1	2500
2	1,7	14,9	302	8	B66302-D1008-T2	



E 13/7/4 (EF 12,6)
CoreB66305

- In accordance with IEC 1246
- For miniature transformers
- Also available with SMD coil former
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	2,39	mm^{-1}
l_e =	29,6	mm
A_e =	12,4	mm^2
A_{min} =	12,2	mm^2
V_e =	367	mm^3

Approx. weight 2 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	1000+30/-20%	1900			B66305-G-X130	3450
N27	800+30/-20%	1510	530	0,07 (200 mT, 25 kHz, 100°C)	B66305-G-X127	
N67	830+30/-20%	1570	530	0,04 (100 mT, 100 kHz, 100°C) 0,25 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66305-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,04 ± 0,01	250	454	B66305-G40-X127	3450

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	28,4	-0,676	36,5	-0,847	33,2	-0,865
N67	28,4	-0,676	36	-0,82	32,9	-0,881

Validity range: $K1$, $K2$: 0,03 mm < s < 1,00 mm
$K3$, $K4$: 30 nH < A_L < 260 nH

Coil former (magnetic axis horizontal or vertical) with squared pins

Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Squared pins

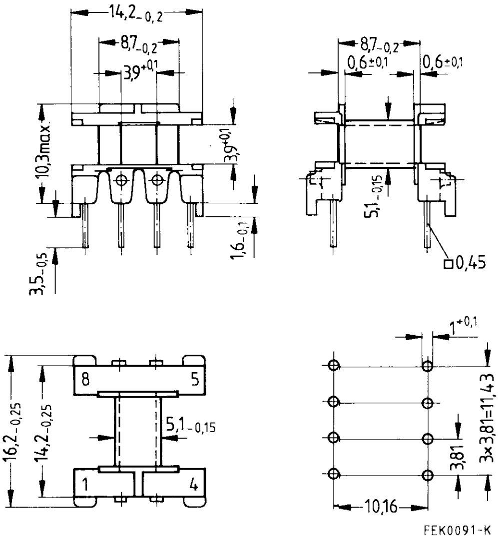
Winding: see page 157

Yoke

Material: Stainless spring steel (0,2 mm)

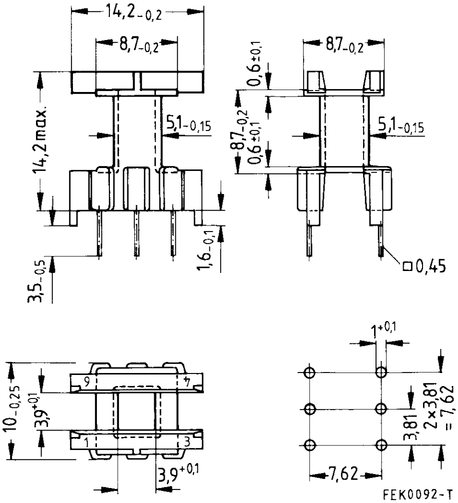
Coil former						Ordering code	PU
Figure	Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	1	11,6	27,2	80,6	8	B66202-A1108-T1	3450
2	1	11,6	27,2	80,6	6	B66202-J1106-T1	
Yoke (ordering code per piece, 2 are required)						B66202-A2010	3450

Fig. 1, horizontal version



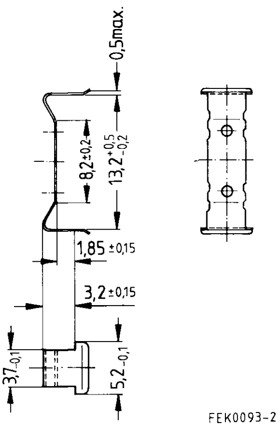
Hole arrangement
View in mounting direction

Fig. 2, vertical version



Hole arrangement
View in mounting direction

Yoke



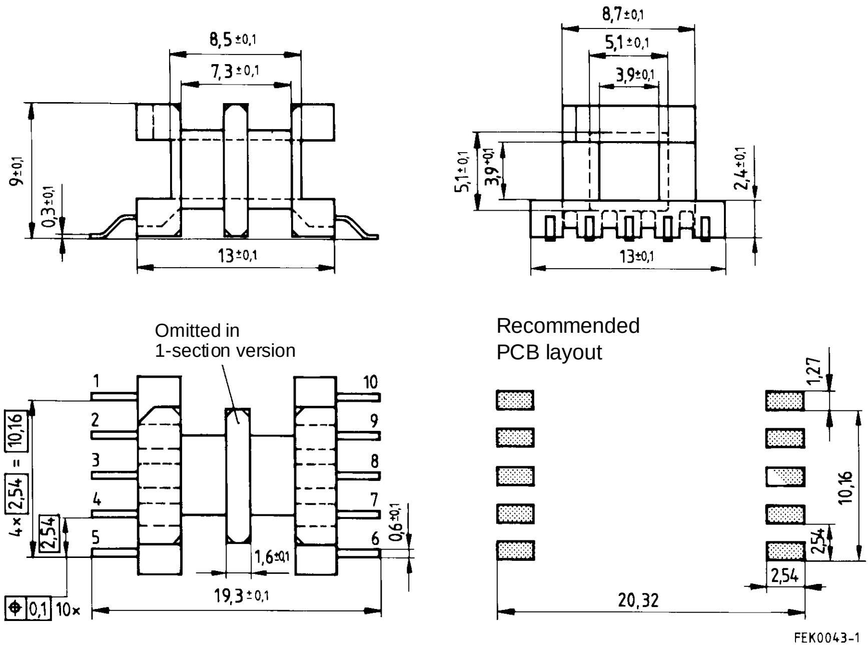
SMD coil former with gullwing terminals

Material:GFR liquid crystal polymer (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

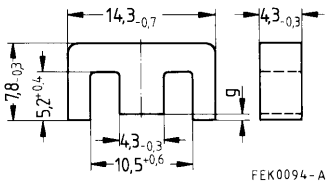
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
permissible soldering temperature for wire-wrap connection on coil former: 400°C, 1 s

Sections	A_N mm^2	l_N mm	A_R value µΩ	Terminals	Ordering code	PU Pcs
1	13	27	71	10	B66306-B1010-T1	3450
2	10,2	27	91	10	B66306-B1010-T2	



- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	2,19	mm^{-1}
l_e =	33,9	mm
A_e =	15,5	mm^2
A_{min} =	13,1	mm^2
V_e =	525	mm^3

Approx. weight 2,8 g/set

Ungapped

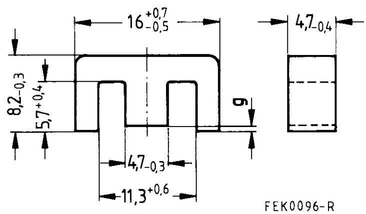
Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	1250+30/-20%	2170			B66219-G-X130	3000
N27	860+30/-20%	1490	570	0,11 (200 mT, 25 kHz, 100°C)	B66219-G-X127	
N41	1050+30/-20%	1820	630	0,11 (200 mT, 25 kHz, 100°C)	B66219-G-X141	

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	36,8	-0,712	44,6	-0,847	40,8	-0,865

Validity range: *K1*, *K2*: 0,05 mm < *s* < 1,50 mm
K3, *K4*: 30 nH < A_L < 280 nH

E 16/8/5 (EF 16)
CoreB66307



- In accordance with IEC 1246
- E cores are supplied as pieces.

Magnetic characteristics (per set)

$\Sigma l/A =$	1,87	mm^{-1}
l_e =	37,6	mm
A_e =	20,1	mm^2
A_{min} =	19,4	mm^2
V_e =	756	mm^3

Approx. weight 3,6 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	1400+30/-20%	2080			B66307-G-X130	2000
N27	950+30/-20%	1410	670	0,14 (200 mT, 25 kHz, 100°C)	B66307-G-X127	
N67	990+30/-20%	1470	670	0,07 (100 mT, 100 kHz, 100°C) 0,45 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66307-G-X167	

Gapped

Material	*g* mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,06 ± 0,01 0,10 ± 0,02 0,50 ± 0,05	303 212 69	450 315 102	B66307-G60-X127 B66307-G100-X127 B66307-G500-X127	2000

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	42,2	-0,701	57	-0,847	52,1	-0,865
N67	42,2	-0,701	55,9	-0,82	51,8	-0,881

Validity range: *K1*, *K2*: 0,05 mm < *s* < 1,50 mm
K3, *K4*: 30 nH < A_L < 330 nH

E 16/8/5 (EF 16)
AccessoriesB66308

Coil former (magnetic axis horizontal or vertical)

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Squared pins

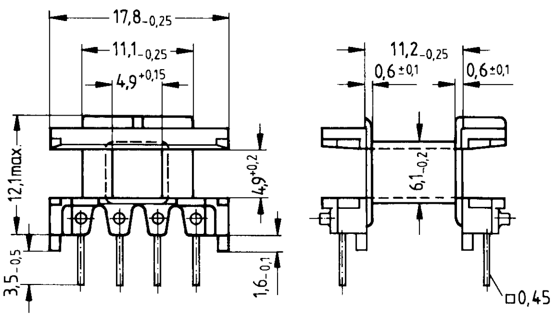
Winding:see page 157

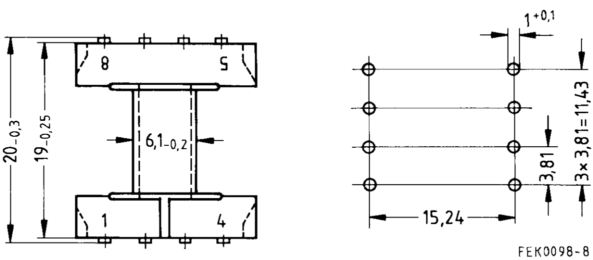
Yoke

Material:Stainless spring steel (0,2 mm)

Coil former						Ordering code	PU
Figure	Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	1	22,3	34	52,4	8	B66308-A1108-T1	2000
2	1	22,3	34	52,4	8	B66308-J1108-T1	
Yoke (ordering code per piece, 2 are required)						B66308-A2010	2000

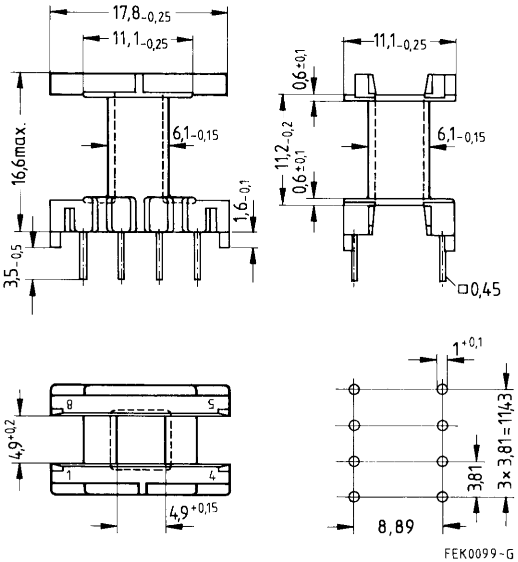
Fig. 1, horizontal version





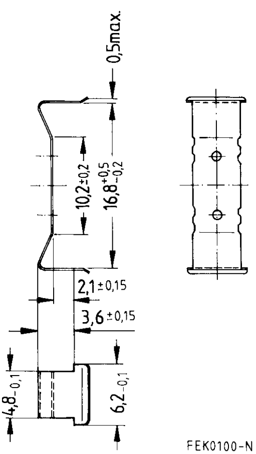
Hole arrangement
View in mounting direction

Fig. 2, vertical version



Hole arrangement
View in mounting direction

Yoke



E 16/8/5 (EF 16)
Coil FormerB66308

Coil former for luminaires

- To be used without clamps

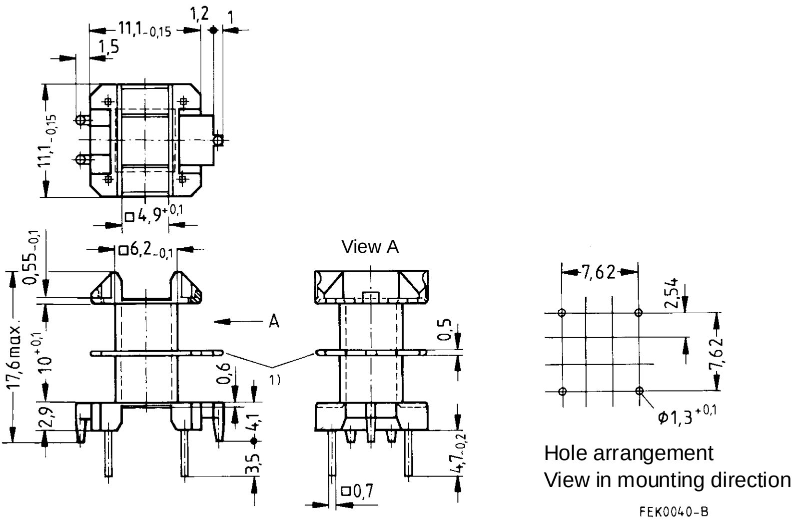
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code natural

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Winding:see page 157

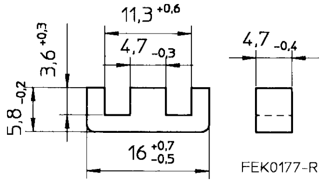
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	22,3	34	52,4	4	B66308-J1004-T1	2000
2	21,0	34	55,0	4	B66308-J1004-T2	



1) Center flange omitted for one-section version

E 16/6/5
CoreB66393

- Shortened leg compared with E 16/8/5
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ = 1,49 mm^{-1}
l_e = 28,6 mm
A_e = 19,2 mm^2
A_{min} = 17,6 mm^2
V_e = 549 mm^3

Approx. weight 3 g/set

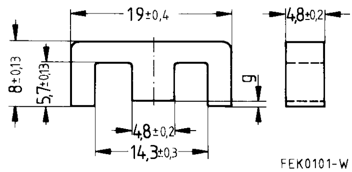
Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	1100+30/-20%	1300	850	0,10 (200 mT, 25 kHz, 100°C)	B66393-G-X127	2000

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	42,0	-0,764	56,7	-0,847	51,7	-0,865

Validity range: $K1$, $K2$: 0,05 mm < s < 1,50 mm
$K3$, $K4$: 40 nH < A_L < 430 nH



- Size based on US lam. size E cores
  US designation E 187
- E cores are supplied as pieces.

Magnetic characteristics (per set)

$\Sigma l/A =$ 1,76 mm^{-1}
l_e = 39,6 mm
A_e = 22,5 mm^2
A_{min} = 22,1 mm^2
V_e = 891 mm^3

Approx. weight 4,4 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	1700+30/-20%	2380			B66379-G-X130	1785
N27	1050+30/-20%	1470	720	0,18 (200 mT, 25 kHz, 100°C)	B66379-G-X127	
N67	1100+30/-20%	1540	720	0,09 (100 mT, 100 kHz, 100°C) 0,55 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66379-G-X167	

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,25 ± 0,02	122	170	B66379-G250-X127	1785

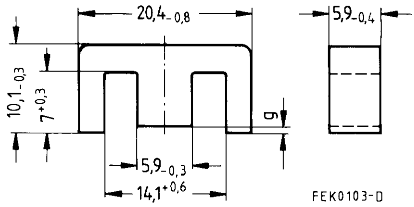
The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	46,4	-0,697	63,3	-0,847	57,9	-0,865
N67	46,4	-0,697	61,9	-0,82	57,6	-0,881

Validity range $K1$, $K2$: 0,10 mm < s < 2,00 mm
$K3$, $K4$: 40 nH < A_L < 350 nH

- In accordance with IEC 1246
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	1,44	mm^{-1}
l_e =	46,3	mm
A_e =	32,1	mm^2
A_{min} =	31,9	mm^2
V_e =	1490	mm^3

Approx. weight 7,3 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	2150+30/-20%	2460			B66311-G-X130	1470
N27	1300+30/-20%	1490	1090	0,27 (200 mT, 25 kHz, 100°C)	B66311-G-X127	
N67	1350+30/-20%	1540	1090	0,15 (100 mT, 100 kHz, 100°C) 0,92 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66311-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code ** = 27 (N27) ** = 67 (N67)	PU Pcs
N27, N67	0,09 ± 0,01	329	377	B66311-G90-X1**	1470
	0,17 ± 0,02	212	243	B66311-G170-X1**	
	0,25 ± 0,02	162	186	B66311-G250-X1**	
	0,50 ± 0,05	100	115	B66311-G500-X1**	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	62,2	-0,692	88,1	-0,847	80,9	-0,865
N67	62,2	-0,692	85,9	-0,82	80,6	-0,881

Validity range: *K1*, *K2*: 0,05 mm < s < 1,50 mm
K3, *K4*: 50 nH < A_L < 430 nH

E 20/10/6 (EF 20)
Coil FormerB66206

Coil former (magnetic axis horizontal or vertical)

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

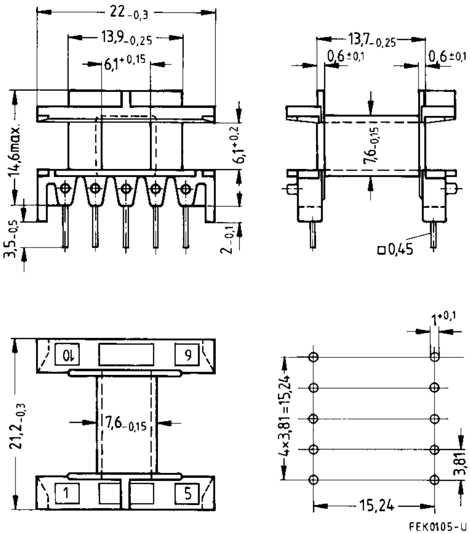
Squared pins

Winding:see page 157

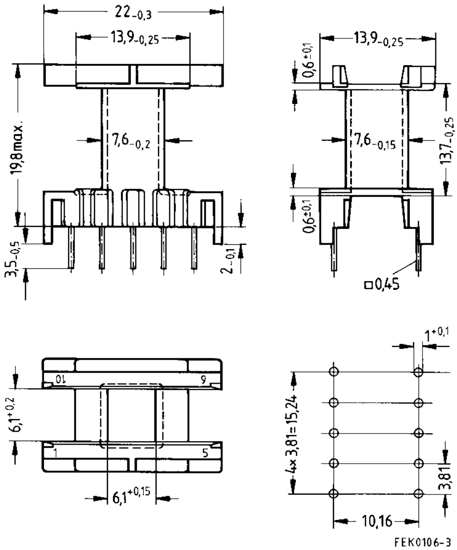
For matching yoke see next page.

Figure	Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	1	34	41,2	42	10	B66206-A1110-T1	1470
2	1	34	41,2	42	10	B66206-J1110-T1	

Fig. 1, horizontal versionFig. 2, vertical version



Hole arrangement
View in mounting direction



Hole arrangement
View in mounting direction

Coil former (with right-angle pins)

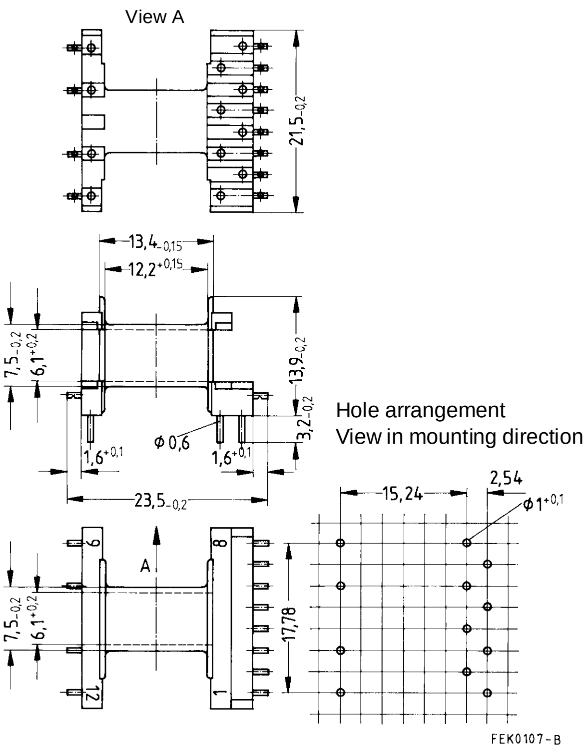
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 157

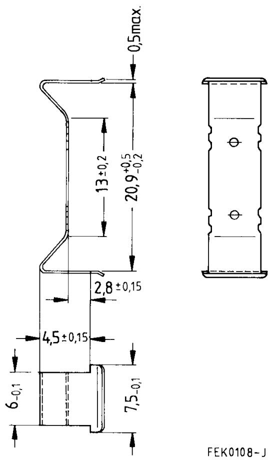
Yoke

Material:Stainless spring steel (0,2 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	34	41,2	42	12	B66206-B1012-T1	1470
Yoke (ordering code per piece, 2 are required)					B66206-A2010	1470

Coil formerYoke



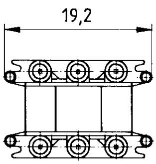


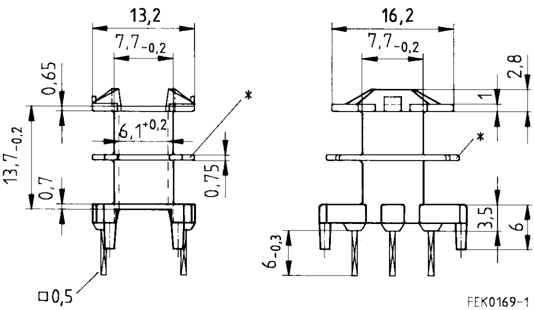
Coil former for luminaires

- To be used without clamps

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 157

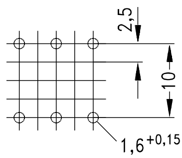
Sections	A_N mm^2	l_N mm	A_R value μΩ	Pins	Ordering code	PU Pcs
1	32,7	42,3	44,5	6	B66206-J1106-T1	1470
2	30,7	42,3	34,4	6	B66206-J1106-T2	





FEK0169-1

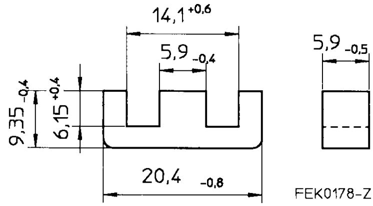
Hole arrangement
View in mounting direction



FEK0234-E

* Omitted for one-section version. Where nothing is specified the tolerances are ± 0,1 mm.

- Reduced leg length compared to E20/10/6, giving low overall coil height
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	1,34	mm^{-1}
l_e =	42,9	mm
A_e =	32,1	mm^2
A_{min} =	31,9	mm^2
V_e =	1377	mm^3

Approx. weight 6,8 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	1300+30/-20%	1400	1180	0,25 (200 mT, 25 kHz, 100°C)	B66312-G-X127	1470

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N27	61,6	-0,727	89,1	-0,847	81,7	-0,865

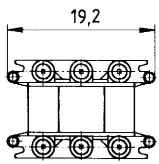
Validity range: *K1*, *K2*: 0,05 mm < *s* < 1,50 mm
K3, *K4*: 50 nH < A_L < 470 nH

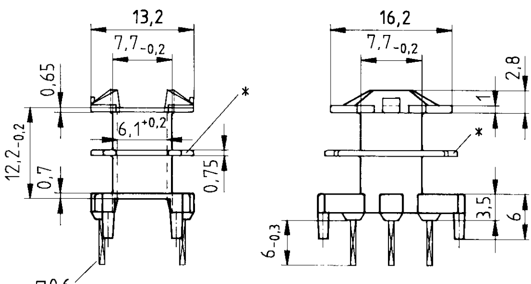
Coil former for luminaires

- To be used without clamps

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 157

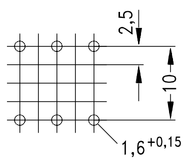
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	28,75	42,3	50,6	6	B66206-J1006-T1	1470
2	26,8	42,3	54,3	6	B66206-J1006-T2	





FEK0170-4

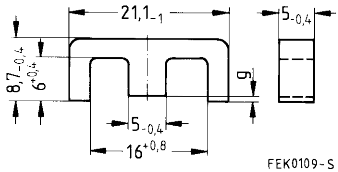
Hole arrangement
View in mounting direction



FEK0234-E

* Omitted for one-section version. Where nothing is specified the tolerances are ± 0,1 mm

E 21/9/5
CoreB66314



- E cores are supplied as pieces.

Magnetic characteristics (per set)

$\Sigma l/A$=	2,01	mm^{-1}
l_e =	43,4	mm
A_e =	21,6	mm^2
A_{min} =	20,2	mm^2
V_e =	937	mm^3

Approx. weight 4,8 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	1650+30/-20%	2630			B66314-G-X130	1785
N27	900+30/-20%	1440	630	0,18 (200 mT, 25 kHz, 100°C)	B66314-G-X127	

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,20 ± 0,02	142	226	B66314-G200-X127	1785
	0,50 ± 0,05	76	121	B66314-G500-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	47,4	-0,682	59,9	-0,847	54,9	-0,865

Validity range: *K1*, *K2*: 0,05 mm < s < 1,50 mm
K3, *K4*: 30 nH < A_L < 310 nH

Coil former (magnetic axis horizontal)

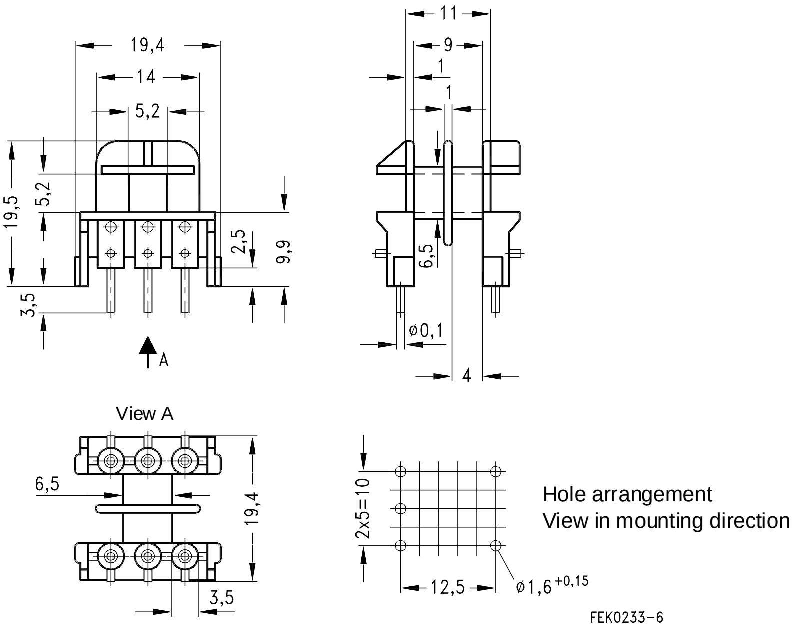
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

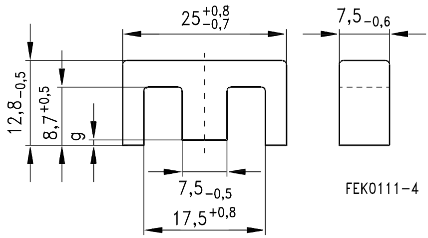
Winding:see page 157

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
2	30	41	47	5	B66314-Z1005-T2	1785



E 25/13/7 (EF 25)
CoreB66317

- In accordance with IEC 1246
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 1,10 mm^{-1}
l_e = 57,5 mm
A_e = 52,5 mm^2
A_{min} = 51,5 mm^2
V_e = 3020 mm^3

Approx. weight 16 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	2900+30/-20%	2530			B66317-G-X130	850
N27	1750+30/-20%	1520	1440	0,59 (200 mT, 25 kHz, 100°C)	B66317-G-X127	
N67	1800+30/-20%	1570	1440	0,32 (100 mT, 100 kHz, 100°C) 2 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66317-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,10 ± 0,02	489	425	B66317-G100-X127	850
	0,16 ± 0,02	347	302	B66317-G160-X127	
	0,25 ± 0,02	250	218	B66317-G250-X127	
	0,50 ± 0,05	151	131	B66317-G500-X127	
	1,00 ± 0,05	91	79	B66317-G1000-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	90	-0,731	139	-0,847	129	-0,865
N67	90	-0,731	135	-0,82	129	-0,881

Validity range: $K1$, $K2$: 0,10 mm < s < 2,00 mm
$K3$, $K4$: 60 nH < A_L < 570 nH

Coil former (magnetic axis horizontal or vertical)

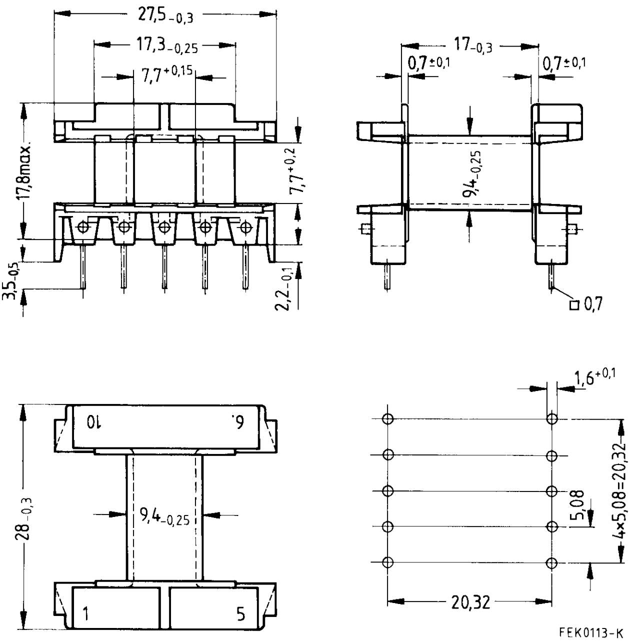
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 157

Yoke

Material:Stainless spring steel (0,25 mm)

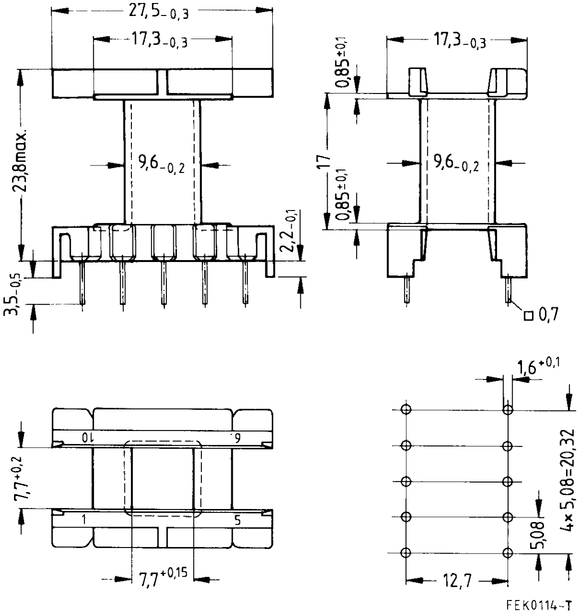
Coil former						Ordering code	PU
Figure	Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	1	61	50	28	10	B66208-A1110-T1	850
2	1	61	50	28	10	B66208-J1110-T1	
Yoke (ordering code per piece, 2 are required)						B66208-A2010	850

Fig. 1, horizontal version



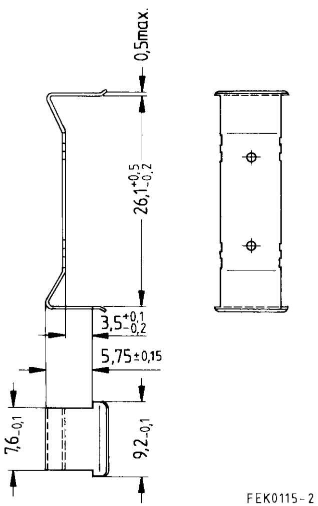
Hole arrangement
View in mounting
direction

Fig. 2, vertical version



Hole arrangement
View in mounting
direction

Yoke



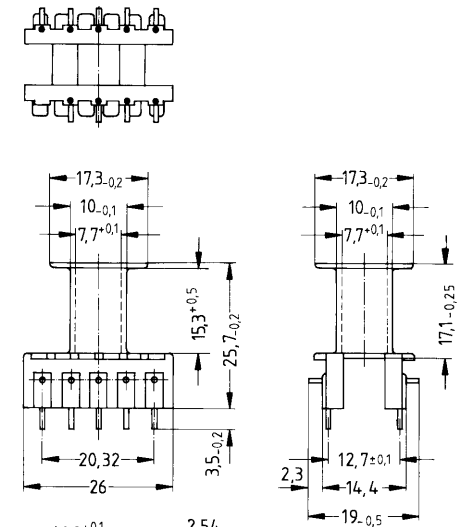
Coil former for SMPS transformers with line isolation

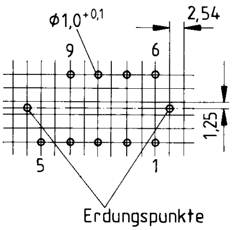
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235°C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 157

Yoke:Stainless spring steel (0,3 mm), with ground terminal

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	56	52	32	9	B66208-J1009-T1	850
Yoke (ordering code per piece, 1 piece required)					B66208-A2003	850

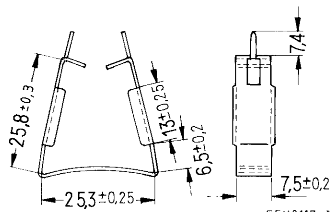
Coil formerYoke





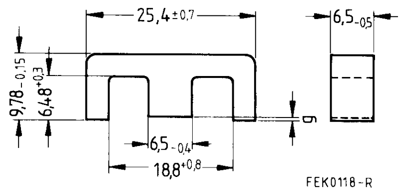
Hole arrangement
View in mounting direction

FEK0116-A



FEK0117-I

- Size based on US lam. size E cores
  US designation E2425
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 1,27 mm^{-1}
$l_e =$ 49,2 mm
$A_e =$ 38,8 mm^2
$A_{min} =$ 38,4 mm^2
$V_e =$ 1910 mm^3

Approx. weight 9,6 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	2700+30/-20%	2720			B66315-G-X130	950
N27	1500+30/-20%	1510	1240	0,36 (200 mT, 25 kHz, 100°C)	B66315-G-X127	
N67	1600+30/-20%	1610	1240	0,19 (100 mT, 100 kHz, 100°C) 1,20 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66315-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,25 ± 0,02	199	200	B66315-G250-X127	950
	0,50 ± 0,05	122	123	B66315-G500-X127	

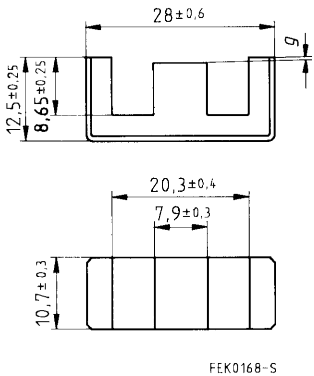
The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	75	-0,707	106	-0,847	97	-0,865
N67	75	-0,707	103	-0,82	97	-0,881

Validity range: $K1$, $K2$: 0,10 mm < s < 2,00 mm
$K3$, $K4$: 50 nH < A_L < 500 nH

E 28/13/11
CoreB66403



- For compact SMPS transformers, e.g. in video recorders
- E cores are supplied as pieces.

Magnetic characteristics (per set)

Σl/A=	0,71	mm^{-1}
l_e =	59,1	mm
A_e =	83,0	mm^2
A_{min} =	82,4	mm^2
V_e =	4910	mm^3

Approx. weight 25 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N67	3100+30/-20%	1750	2210	0,50 (100 mT, 100 kHz, 100°C) 3,2 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66403-G-X167	660

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N67	0,50 ± 0,05 0,70 ± 0,05	237 185	134 105	B66403-G500-X167 B66403-G700-X167	660

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

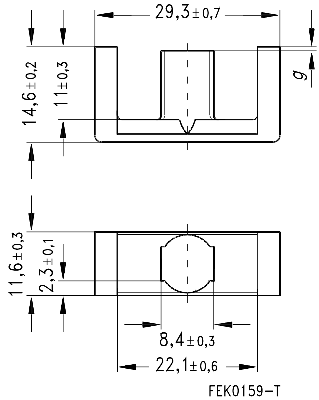
Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N67	143	-0,731	220	-0,82	203	-0,881

Validity range: *K1*, *K2*: 0,10 mm < s < 2,00 mm
K3, *K4*: 90 nH < A_L < 890 nH

ED 29/14/11
CoreB66407

- E core with flat, rounded center leg
- Compact winding design with low leakage inductance
- ED cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,84	mm^{-1}
l_e =	69,5	mm
A_e =	83,0	mm^2
A_{min} =	82,1	mm^2
V_e =	5770	mm^3

Approx. weight 29 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2200+30/-20%	1460	1880	1,10 (200 mT, 25 kHz, 100°C)	B66407-G-X127	585

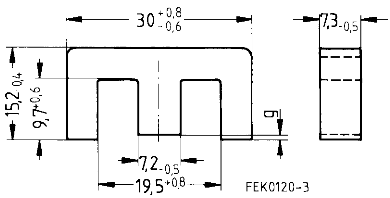
Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	138	-0,731	214	-0,847	198	-0,865

Validity range: *K1*, *K2*: 0,10 mm < s < 2,00 mm
K3, *K4*: 80 nH < A_L < 750 nH

E 30/15/7
CoreB66319

- In accordance with DIN 41 295
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	1,12	mm^{-1}
l_e =	67	mm
A_e =	60	mm^2
A_{min} =	49	mm^2
V_e =	4000	mm^3

Approx. weight 22 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	3100+30/-20%	2760			B66319-G-X130	850
N27	1700+30/-20%	1510	1410	0,81 (200 mT, 25 kHz, 100°C)	B66319-G-X127	
N67	1850+30/-20%	1640	1410	0,44 (100 mT, 100 kHz, 100°C) 2,75 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66319-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,10 ± 0,02	460	410	B66319-G100-X127	850
	0,18 ± 0,02	300	265	B66319-G180-X127	
	0,34 ± 0,02	195	175	B66319-G340-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	90	-0,708	156	-0,847	144	-0,865
N67	90	-0,708	150	-0,82	144	-0,881

Validity range: $K1$, $K2$: 0,10 mm < s < 2,00 mm
$K3$, $K4$: 560 nH < A_L < 60 nH

Coil former (magnetic axis horizontal or vertical)

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s

Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s

Squared pins

Winding:see page 157

Yoke

Material:Stainless spring steel (0,4 mm)

Coil former						Ordering code	PU
Figure	Sections	A_N mm²	l_N mm	A_R value µΩ	Pins		Pcs
1	1	90	56	21	14	B66232-A1114-T1	850
2	1	90	56	21	12	B66232-J1112-T1	
Yoke (ordering code per piece, 2 are required)						B66232-A2010	850

Fig. 1, horizontal version

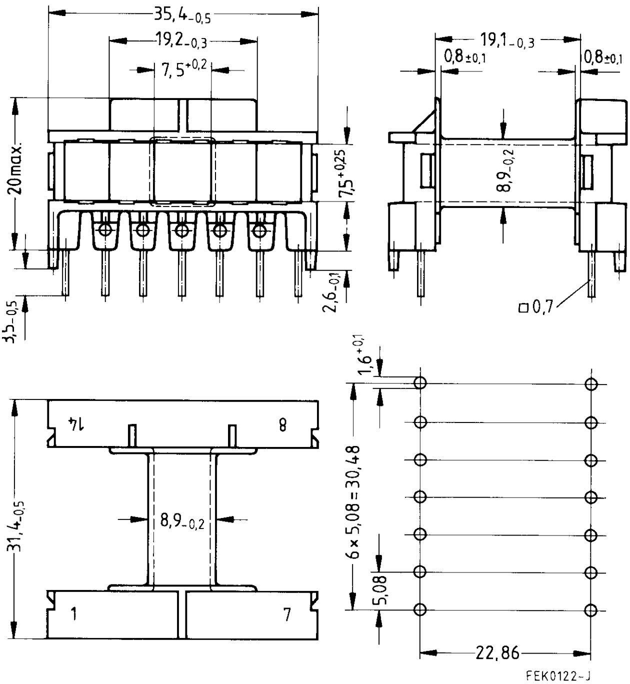
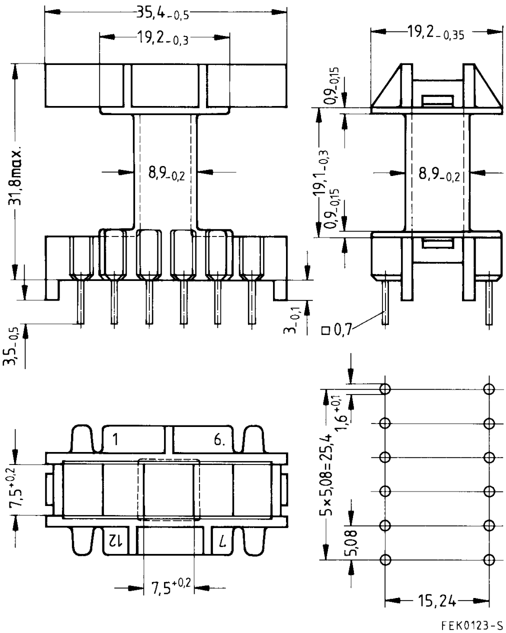
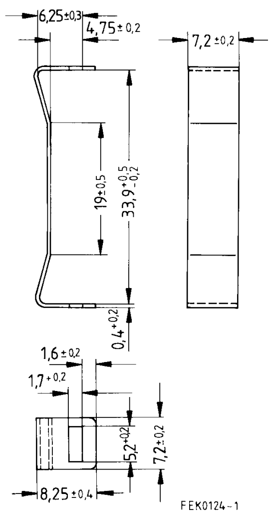


Fig. 2, vertical version



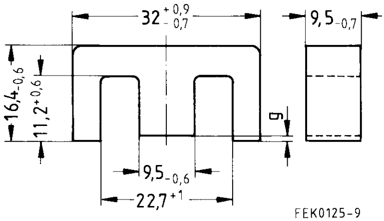
Hole arrangement
View in mounting direction

Yoke



E 32/16/9 (EF 32)
CoreB66229

- In accordance with IEC 1246
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 0,89 mm^{-1}
l_e = 74 mm
A_e = 83 mm^2
A_{min} = 81,4 mm^2
V_e = 6140 mm^3

Approx. weight 30 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N30	3800+30/-20%	2690			B66229-G-X130	480
N27	2100+30/-20%	1480	1770	1,10 (200 mT, 25 kHz, 100°C)	B66229-G-X127	
N67	2250+30/-20%	1590	1770	0,60 (100 mT, 100 kHz, 100°C) 3,75 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66229-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,50 ± 0,05 1,00 ± 0,05	244 145	172 103	B66229-G500-X127 B66229-G1000-X127	480

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	145	-0,748	212	-0,847	196	-0,865
N67	145	-0,748	204	-0,82	197	-0,881

Validity range: $K1$, $K2$: 0,10 mm < s < 2,50 mm
$K3$, $K4$: 70 nH < A_L < 710 nH

Coil former

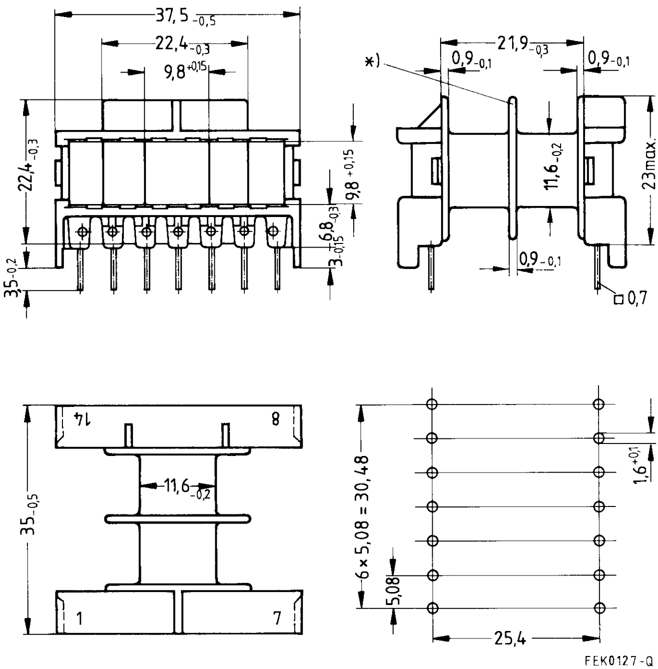
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 157

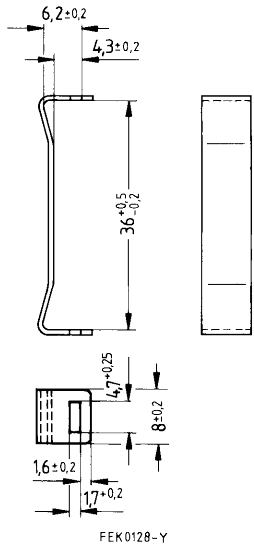
Yoke

Material:Stainless spring steel (0,4 mm)

Coil former					Ordering code	PU
Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins		Pcs
1	108,50	64,4	20,42	14	B66230-A1114-T1	480
2	103,64	64,4	21,38	14	B66230-A1114-T2	
Yoke (ordering code per piece, 2 are required)					B66230-A2010	480

Coil formerYoke

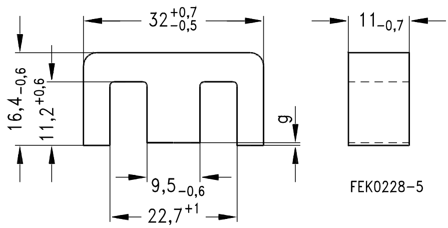




Hole arrangement
View in mounting direction

*) Center flange omitted in one-section version

- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$=	0,76	mm^{-1}
l_e =	74	mm
A_e =	97	mm^2
A_{min}=	95	mm^2
V_e =	7180	mm^3

Approx. weight 37 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N67	2800+30/-20%	1690	2050	0,74 (100 mT, 100 kHz, 100°C) 4,65 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66233-G-X167	420

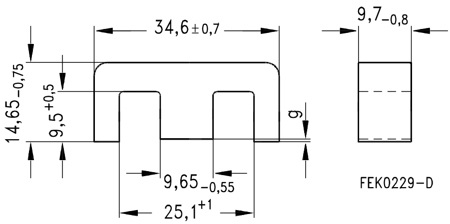
Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N67	165	-0,711	239	-0,82	231	-0,881

Validity range: *K1*, *K2*: 0,10 mm < *s* < 2,5 mm
K3, *K4*: 90 nH < A_L < 800 nH

E 34/14/9
CoreB66370

- Size based on US lam. size E cores US designation E375
- E cores are supplied as pieces.



Magnetic characteristics (per set)

Σl/A=	0,82	mm^{-1}
l_e =	69,6	mm
A_e =	84,8	mm^2
A_{min}=	83,2	mm^2
V_e =	5900	mm^3

Approx. weight 30 g/set

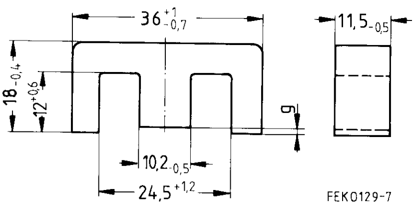
Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2300+30/-20%	1498	1929	1,10 (200 mT, 25 kHz, 100°C)	B66370-G-X127	480

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K*3(100°C)	*K*4(100°C)
N67	146	-0,719	219	-0,847	202	-0,865

Validity range: *K1*, *K2*: 0,10 mm < *s* < 2,5 mm
K3, *K4*: 80 nH < A_L < 770 nH



- E cores are supplied as pieces.

Magnetic characteristics (per set)

Σl/A=	0,68	mm^{-1}
l_e =	81	mm
A_e =	120	mm^2
A_{min}=	112	mm^2
V_e =	9670	mm^3

Approx. weight 50 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2900+30/-20%	1550	2330	1,85 (200 mT, 25 kHz, 100°C)	B66389-G-X127	420
N67	3000+30/-20%	1600	2330	1,00 (100 mT, 100 kHz, 100°C) 6,25 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66389-G-X167	

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,50 ± 0,05 1,00 ± 0,05	312 183	166 96	B66389-G500-X127 B66389-G1000-X127	420

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

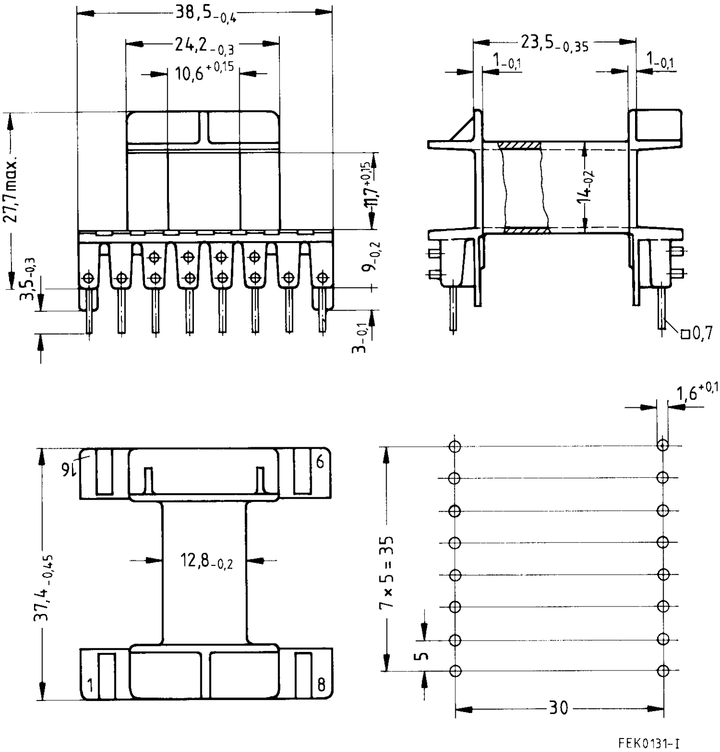
Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	182	-0,749	302	-0,847	280	-0,865
N67	182	-0,749	290	-0,82	282	-0,881

Validity range: *K1*, *K2*: 0,10 mm < s < 2,50 mm
K3, *K4*: 100 nH < A_L < 930 nH

E 36/18/11
Coil FormerB66390

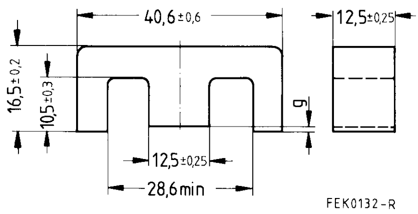
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Squared pins
Winding:see page 157

Sections	A_N mm^2	l_N mm	A_R value μΩ	Pins	Ordering code	PU Pcs
1	122,55	76,4	21,45	16	B66390-A1016-T1	420



Hole arrangement
View in mounting direction

- Size based on US lam. size E cores
  US designation E 21
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 0,52 mm^{-1}
l_e = 77 mm
A_e = 149 mm^2
A_{min} = 143 mm^2
V_e = 11500 mm^3

Approx. weight 58 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3800+30/-20%	1560	3050	2,15 (200 mT, 25 kHz, 100°C)	B66381-G-X127	200
N67	4000+30/-20%	1640	3050	1,16 (100 mT, 100 kHz, 100°C) 7,25 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66381-G-X167	

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,50 ± 0,05	411	169	B66381-G500-X127	200

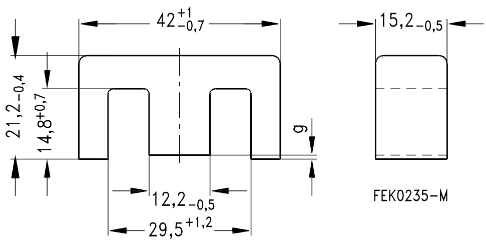
The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	239	-0,782	378	-0,847	351	-0,865
N67	239	-0,782	364	-0,82	352	-0,881

Validity range: $K1$, $K2$: 0,10 mm < s < 2,50 mm
$K3$, $K4$: 130 nH < A_L < 1200 nH

- In accordance with IEC 1246
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,54	mm^{-1}
l_e =	97	mm
A_e =	178	mm^2
A_{min} =	175	mm^2
V_e =	17600	mm^3

Approx. weight 88 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	3500+30/-20%	1510	2900	3,30 (200 mT, 25 kHz, 100°C)	B66325-G-X127	200
N67	3800+30/-20%	1640	2900	1,76 (100 mT, 100 kHz, 100°C) 11 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66325-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,10 ± 0,02	1497	647	B66325-G100-X127	200
	0,25 ± 0,02	759	328	B66325-G250-X127	
	0,50 ± 0,05	454	196	B66325-G500-X127	
	0,64 ± 0,05	378	164	B66325-G640-X127	
	1,00 ± 0,05	272	118	B66325-G1000-X127	
	1,50 ± 0,05	201	87	B66325-G1500-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

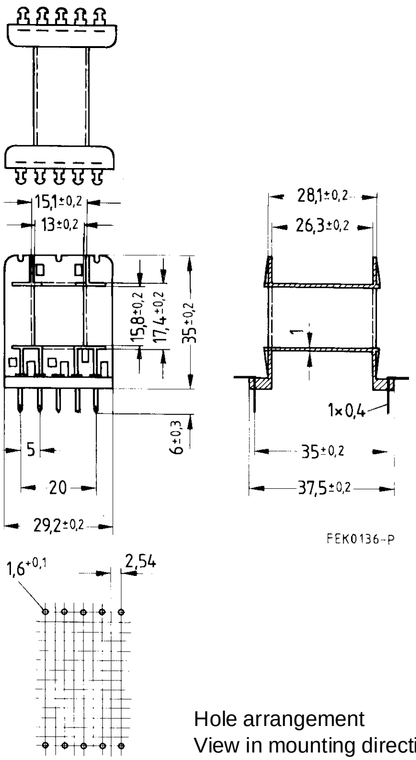
Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	272	-0,741	436	-0,847	406	-0,865
N67	272	-0,741	417	-0,82	410	-0,881

Validity range: $K1$, $K2$: 0,10 mm < s < 2,50 mm
$K3$, $K4$: 1210 nH < A_L < 130 nH

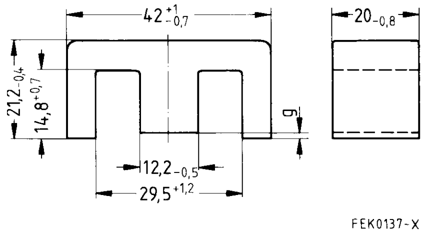
Material:GFR 6-polyamide (UL 94 HB, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code natural
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 157

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	177	87	17	10	B66242-J1000-R1	200



Hole arrangement
View in mounting direction

- In accordance with IEC 1246
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,41	mm^{-1}
l_e =	97,0	mm
A_e =	234	mm^2
A_{min} =	229	mm^2
V_e =	22700	mm^3

Approx. weight 116 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	4750+30/-20%	1560	3800	4,40 (200 mT, 25 kHz, 100°C)	B66329-G-X127	120
N67	5100+30/-20%	1680	3800	2,32 (100 mT, 100 kHz, 100°C) 14,5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66329-G-X167	

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,25 ± 0,02	1029	338	B66329-G250-X127	120
	0,50 ± 0,05	603	198	B66329-G500-X127	
	1,00 ± 0,05	354	116	B66329-G1000-X127	
	1,50 ± 0,05	259	85	B66329-G1500-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

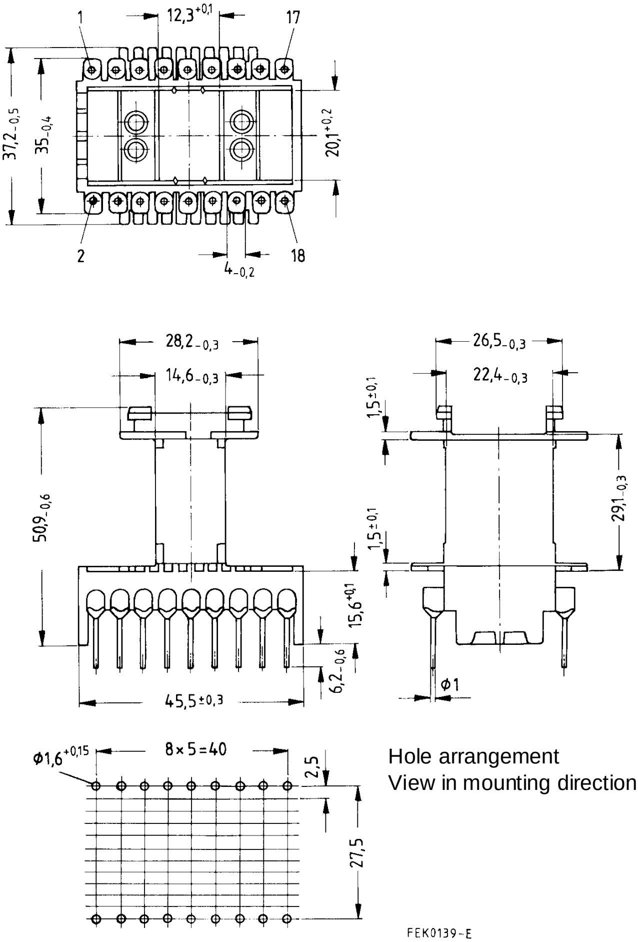
Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	354	-0,77	574	-0,847	534	-0,865
N67	354	-0,77	548	-0,82	538	-0,881

Validity range: *K1*, *K2*: 0,10 mm < s < 3,00 mm
K3, *K4*: 160 nH < A_L < 1500 nH

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s
Winding:see page 157

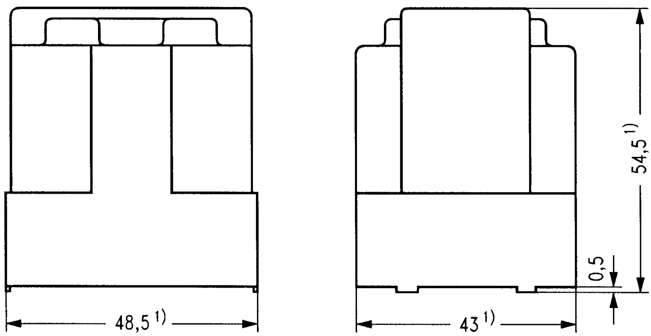
Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	172	100	20	18	B66243-A1018-T1	120



Hole arrangement
View in mounting direction

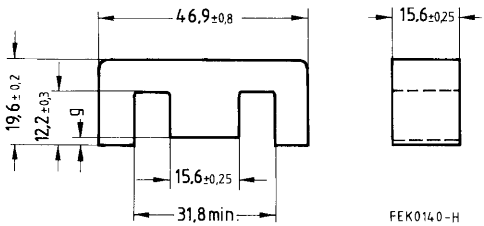
● Used to protect the transformer against external influences, and for stamping
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code blue

	Ordering code	PU Pcs
Case	B66243-A2001-T	120



1) Maximum dimension

- Size based on US lam. size E cores
  US designation E 625
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,38 mm^{-1}
l_e = 89,0 mm
A_e = 233 mm^2
A_{min} = 226 mm^2
V_e = 20700 mm^3

Approx. weight 106 g/set

Ungapped

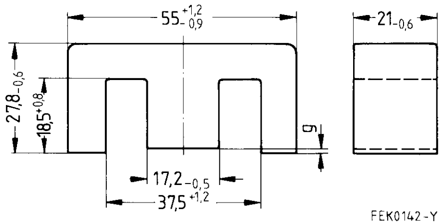
Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	5100+30/-20%	1550	4120	3,95 (200 mT, 25 kHz, 100°C)	B66383-G-X127	200
N67	5400+30/-20%	1640	4120	2,12 (100 mT, 100 kHz, 100°C) 13,3 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66383-G-X167	

Calculation factors (see page 447for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	364	-0,773	579	-0,847	538	-0,865
N67	364	-0,773	554	-0,82	542	-0,881

Validity range: $K1$, $K2$: 0,10 mm < s < 3,00 mm
$K3$, $K4$: 170 nH < A_L < 1640 nH

- In accordance with IEC 1246
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ = 0,35 mm^{-1}
l_e = 124 mm
A_e = 354 mm^2
A_{min} = 351 mm^2
V_e = 43900 mm^3

Approx. weight 215 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	5800+30/-20%	1610	4500	8,0 (200 mT, 25 kHz, 100°C)	B66335-G-X127	100

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	$0{,}50 \pm 0{,}05$	843	234	B66335-G500-X127	100
	$1{,}00 \pm 0{,}05$	496	138	B66335-G1000-X127	
	$1{,}50 \pm 0{,}05$	364	101	B66335-G1500-X127	
	$2{,}00 \pm 0{,}05$	292	81	B66335-G2000-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

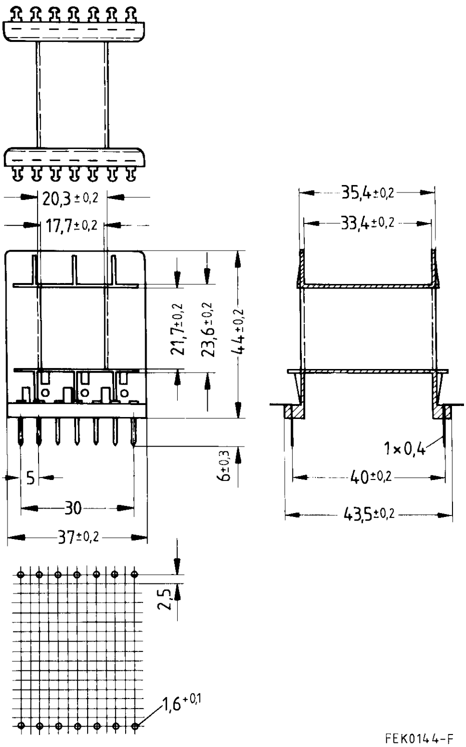
Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	496	-0,764	836	-0,847	781	-0,865

Validity range: $K1$, $K2$: 0,15 mm < s < 3,50 mm
$K3$, $K4$: 180 nH < A_L < 1799 nH

E 55/28/21
Coil FormerB66252

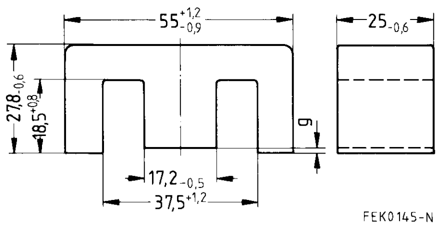
Material:GFR 6-polyamide (UL 94 HB, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code natural
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s
Winding:see page 157

Sections	A_N mm²	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	280	113	14	14	B66252-B-M1	100



Hole arrangement
View in mounting direction

- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,30	mm^{-1}
l_e =	124	mm
A_e =	420	mm^2
A_{min} =	420	mm^2
V_e =	52100	mm^3

Approx. weight 256 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	6800+30/-20%	1600	5340	9,5 (200 mT, 25 kHz, 100°C)	B66344-G-X127	100

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	2,50 ± 0,05	295	70	B66344-G2500-X127	100

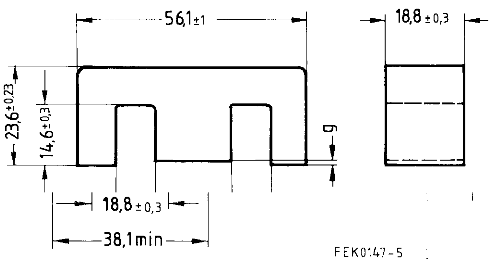
The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	596	-0,769	992	-0,847	927	-0,865

Validity range: $K1$, $K2$: 0,15 mm < s < 3,50 mm
$K3$, $K4$: 220 nH < A_L < 2130 nH

- Size based on US lam. size E cores
  US designation E 75
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 0,31 mm^{-1}
l_e = 107 mm
A_e = 340 mm^2
A_{min} = 327 mm^2
V_e = 36400 mm^3

Approx. weight 184 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	6300+30/-20%	1570	5000	6,8 (200 mT, 25 kHz, 100°C)	B66385-G-X127	100
N67	6700+30/-20%	1670	5000	3,7 (100 mT, 100 kHz, 100°C) 23 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B66385-G-X167	

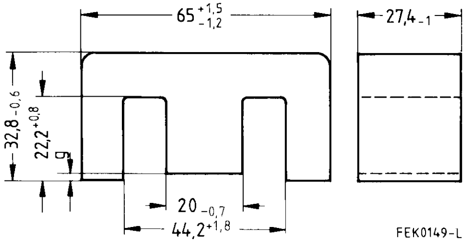
Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	K1(23°C)	*K2*(23°C)	*K3*(23°C)	*K4*(23°C)	*K3*(100°C)	*K4*(100°C)
N27	500	-0,784	821	-0,847	765	-0,865
N67	500	-0,784	783	-0,82	773	-0,881

Validity range: *K1*, *K2*: 0,10 mm < *s* < 3,00 mm
K3, *K4*: 200 nH < A_L < 2000 nH

E 65/32/27
CoreB66387

- In accordance with IEC 1246
- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A =$ 0,27 mm^{-1}
$l_e =$ 147 mm
$A_e =$ 535 mm^2
$A_{min} =$ 529 mm^2
$V_e =$ 78600 mm^3

Approx. weight 394 g/set

Ungapped

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	7200+30/-20%	1570	5730	14,6 (200 mT, 25 kHz, 100°C)	B66387-G-X127	30

Gapped

Material	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,50 ± 0,05	1214	265	B66387-G500-X127	30
	1,00 ± 0,05	716	156	B66387-G1000-X127	
	1,50 ± 0,05	526	115	B66387-G1500-X127	

The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

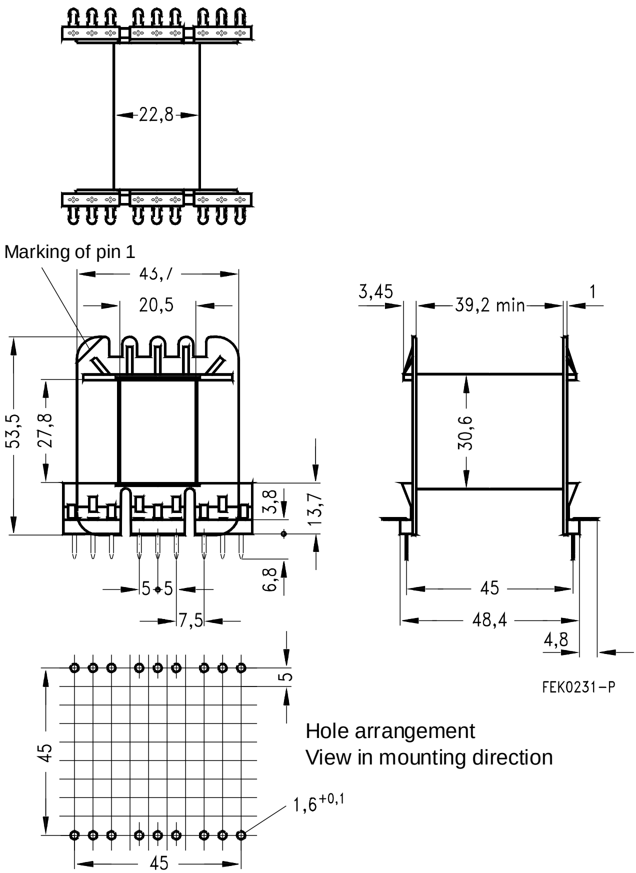
Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	716	-0,762	1231	-0,847	1154	-0,865

Validity range: $K1$, $K2$: 0,20 mm < s < 5,00 mm
$K3$, $K4$: 230 nH < A_L < 2290 nH

E 65/32/27
Coil FormerB66388

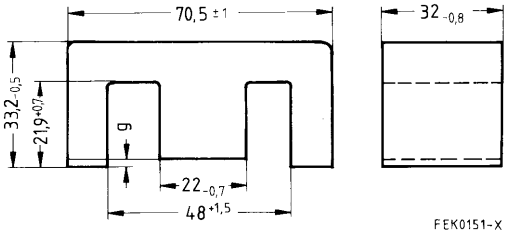
Material:GFR 6-polyamide (UL 94 HB, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code natural
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s
Winding:see page 157

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	415	151	12,5	18	B66388-A1018-T1	30



E 70/33/32
CoreB66371

- E cores are supplied as pieces.



Magnetic characteristics (per set)

$\Sigma l/A$ =	0,22	mm^{-1}
l_e =	149	mm
A_e =	683	mm^2
A_{min} =	676	mm^2
V_e =	102000	mm^3

Approx. weight 514 g/set

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	8850+30/-20%	1530	7200	19,0 (200 mT, 25 kHz, 100°C)	B66371-G-X127	30

Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	1,50 ± 0,05	655	113	B66371-G1500-X127	30

The A_L value in the table applies to a core set comprising one ungapped core (dimension g = 0) and one gapped core (dimension g > 0).

Calculation factors (see page 447 for formulas)

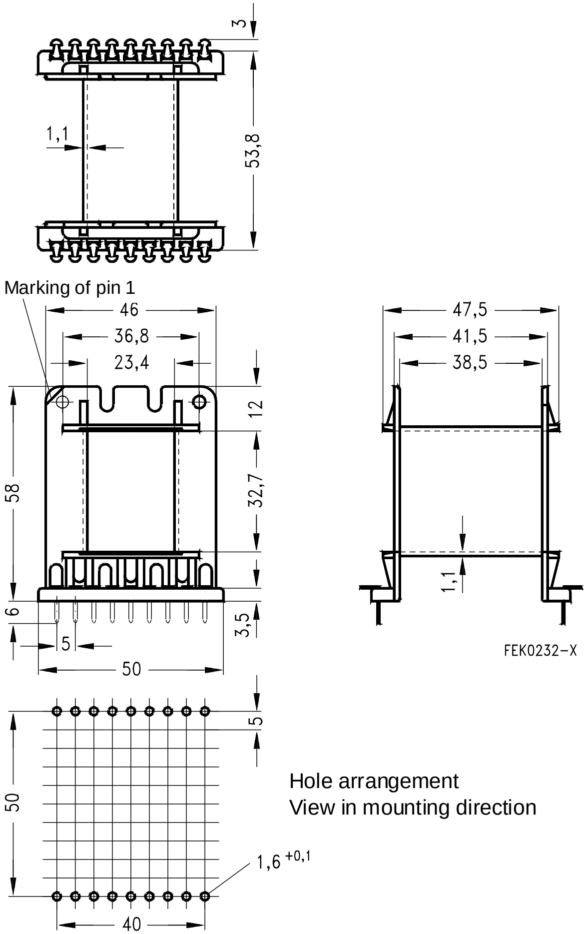
Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	903	-0,789	1568	-0,847	1470	-0,865

Validity range: $K1$, $K2$: 0,20 mm < s < 5,00 mm
$K3$, $K4$: 290 nH < A_L < 2880 nH

E 70/33/32
Coil FormerB66372

Material:GFR 6-polyamide (UL 94 HB, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code natural
Solderability:to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5s
Winding:see page 157

Sections	A_N mm^2	l_N mm	A_R value µΩ	Pins	Ordering code	PU Pcs
1	445	164	123	18	B66372-A1018-T1	30



Hole arrangement
View in mounting direction

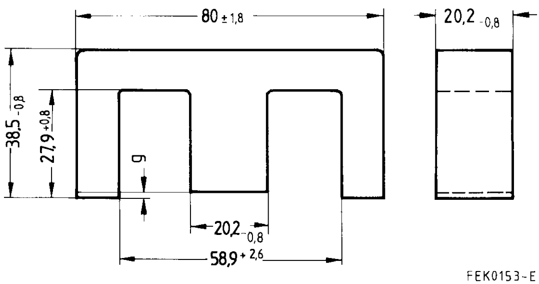
E 80/38/20
CoreB66375

- E cores are supplied as pieces.

Magnetic characteristics (per set)

$\Sigma l/A =$ 0,47 mm^{-1}
$l_e =$ 184 mm
$A_e =$ 390 mm^2
$A_{min} =$ 388 mm^2
$V_e =$ 71800 mm^3

Approx. weight 358 g/set



Gapped

Mate-rial	g mm	A_L value approx. nH	μ_e	Ordering code	PU Pcs
N27	0,50 ± 0,05	882	329	B66375-G500-X127	40

Ungapped

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	4150+30/-20%	1550	3340	13,3 (200 mT, 25 kHz, 100°C)	B66375-G-X127	40

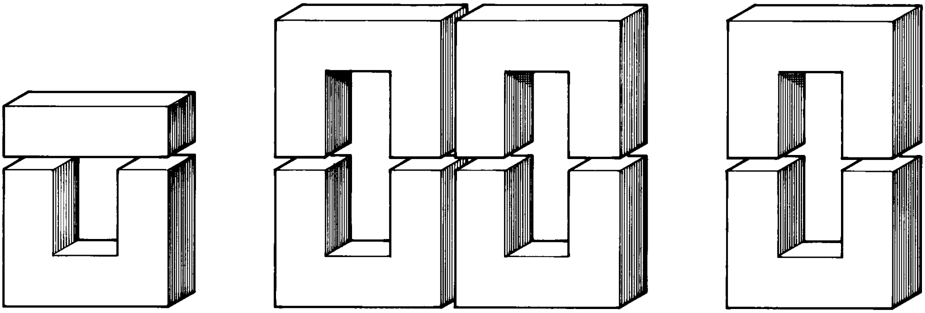
The A_L value in the table applies to a core set comprising one ungapped core (dimension $g = 0$) and one gapped core (dimension $g > 0$).

Calculation factors (see page 447 for formulas)

Material	Relationship between air gap - A_L value		Calculation of saturation current			
	$K1$(23°C)	$K2$(23°C)	$K3$(23°C)	$K4$(23°C)	$K3$(100°C)	$K4$(100°C)
N27	539	-0,71	867	-0,847	816	-0,865

Validity range: $K1$, $K2$: 0,20 mm < s < 5,00 mm
$K3$, $K4$: 140 nH < A_L < 1330 nH

U and UI Cores
General Information



FUS0001-3

1 Core shapes and materials

U and I cores are made of SIFERRIT materials N27, N62 and N67. Owing to their high saturation flux density, high Curie temperature and low dissipation losses, they are suitable for power, pulse and high-voltage transformers (in particular line deflection transformers and diode splitting transformers in TV sets, energy storage chokes, ignition transformers etc.). Typical core shapes are U cores with rectangular centerposts and UR cores with one round and one rectangular centerpost. UU and UI cores of rectangular cross section are preferred for power ratings > 1 kW, since they can be combined in various ways (see illustration above) to produce transformers in the kilowatt range.

2 Ordering, marking and delivery

U and I cores are supplied as pieces, not as sets. Please note the size of the packing units.
The cores carry only the designation of the material, e.g. „N27“.
U cores with one shortened leg (≙ air gap) are available only on request.

3 Test results for A_L and A_{L1} values and core losses P_V

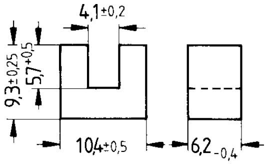
The corresponding test results are tabulated separately for each core shape.

a) A_L value (see also p. 109)
The A_L value is measured with a fully wound 100-turn coil at a flux density of $\hat{B}$ = 0,25 mT and a frequency of f = 10 kHz. The temperature of the core is equal to room temperature.

b) A_{L1} value
The A_{L1} value is measured with a flux density of $\hat{B}$ = 320 mT at 100 °C. The measuring frequency here is less than 25 kHz. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min} of the core.

c) Power loss P_V
The dissipation loss is specified in W/set. The data are maximum values under the specified measuring conditions. For material N67, the provisional limiting values at 200 mT/100 kHz/100 °C are also specified. The flux density has been calculated on the basis of a sinusoidal voltage and is referred to the minimum cross-sectional area A_{min} of the core.

Core (with rectangular cross section)



Magnetic characteristics (per set)

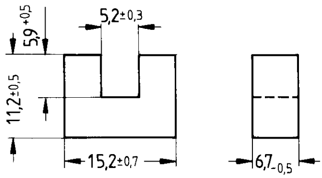
$\Sigma l/A$ = 2,11 mm^{-1}
l_e = 41,5 mm
A_e = 19,7 mm^2
A_{min} = 19,7 mm^2
V_e = 820 mm^3

Approx. weight 4,2 g/set

U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	800+30/-20%	1340	600	0,10 (200 mT, 16 kHz, 100°C)	B67366-A1-X27	1000

Core (with rectangular cross section)



Magnetic characteristics (per set)

$\Sigma l/A$ = 1,50 mm^{-1}
l_e = 48,0 mm
A_e = 32,0 mm^2
A_{min} = 32,0 mm^2
V_e = 1540 mm^3

Approx. weight 8,6 g/set

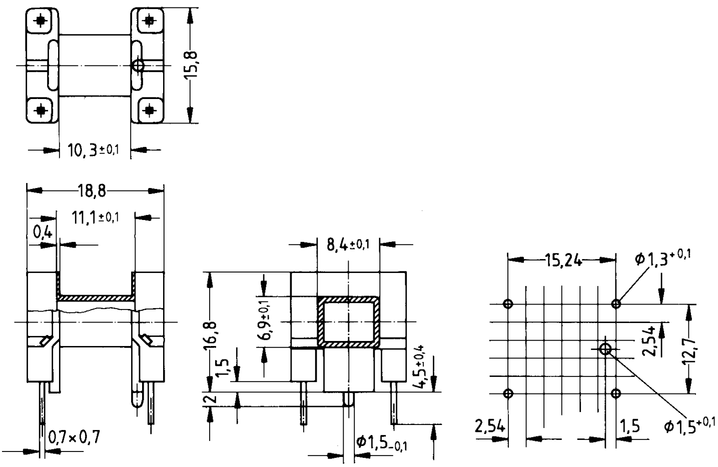
U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	1200+30/-20%	1430	840	0,19 (200 mT, 16 kHz, 100°C)	B67350-A1-X27	1360

Coil former with squared pins

Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85: E ≙ max. operating temperature 120 °C), color code natural
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

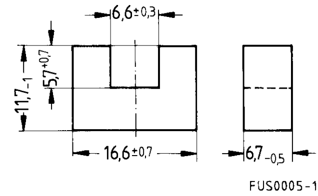
Sections	A_N mm^2	l_N mm	A_R $\mu\Omega$	Pins	Ordering code	PU Pcs
1	37	45	42	4	B67350-A1004-T1	1360



Hole arrangement
View in mounting direction

FUS0004-S

Core (with rectangular cross section)



Magnetic characteristics (per set)

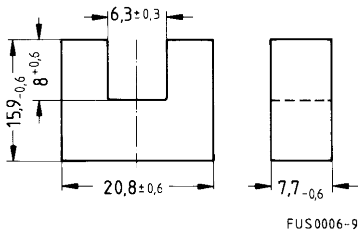
$\Sigma l/A$ = 1,66 mm^{-1}
l_e = 53,0 mm
A_e = 32,0 mm^2
A_{min} = 32,0 mm^2
V_e = 1700 mm^3

Approx. weight 9,6 g/set

U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	1300+30/-20%	1510	760	0,21 (200 mT, 16 kHz, 100°C)	B67364-G-X127	1360

Core (with rectangular cross section)
Dimensions in accordance with DIN 41296



Magnetic characteristics (per set)

$\Sigma l/A$ = 1,24 mm^{-1}
l_e = 68,0 mm
A_e = 55,0 mm^2
A_{min} = 55,0 mm^2
V_e = 3740 mm^3

Approx. weight 18 g/set

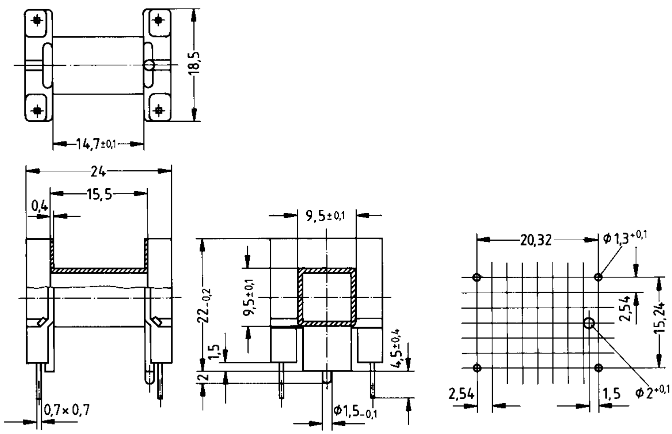
U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	1600+30/-20%	1570	1020	0,42 (200 mT, 16 kHz, 100°C)	B67348-A1-X27	500

Coil former with squared pins

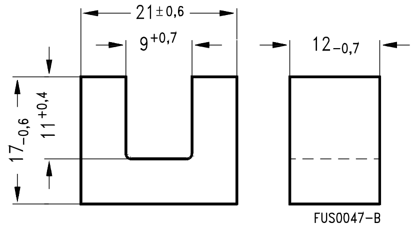
Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85: E ≙ max. operating temperature 120 °C), color code natural
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Sections	A_N mm^2	l_N mm	A_R $\mu\Omega$	Pins	Ordering code	PU Pcs
1	70	60	30	4	B67348-A1004-T1	500



Hole arrangement
View in
mounting direction

Core (with rectangular cross section)



Magnetic characteristics (per set)

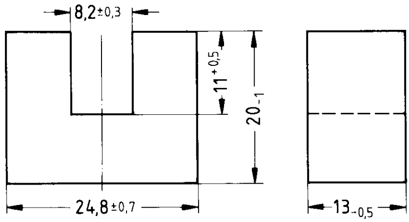
$\Sigma l/A$ = 1,22 mm^{-1}
l_e = 81,0 mm
A_e = 66,5 mm^2
A_{min} = 66,5 mm^2
V_e = 5390 mm^3

Approx. weight 27 g/set

U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N62	1600+30/-20%	1550	1290	0,54 (200 mT, 25 kHz, 100°C)	B67318-G-X162	528
N27	1650+30/-20%	1600	1030	0,59 (200 mT, 16 kHz, 100°C)	B67318-G-X127	

Core (with rectangular cross section)



FUS0008-Q

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,82 mm^{-1}
l_e = 86,0 mm
A_e = 105 mm^2
A_{min} = 105 mm^2
V_e = 9030 mm^3

Approx. weight 46 g/set

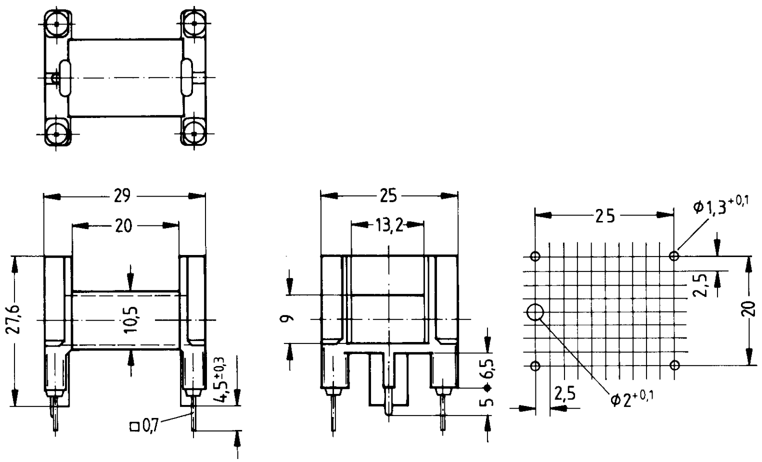
U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2500+30/-20%	1630	1540	1,0 (200 mT, 16 kHz, 100°C)	B67352-A1-X27	500

Coil former with squared pins

Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85: E ≙ max. operating temperature 120 °C), color code natural
Solderability: to IEC 68-2-20, test Ta, method 1 (aging 3): 235 °C, 2 s
Resistance to soldering heat: to IEC 68-2-20, test Tb, method 1B: 350 °C, 3,5 s

Sections	A_N mm^2	l_N mm	A_R $\mu\Omega$	Pins	Ordering code	PU Pcs
1	138	67	17	4	B67352-A1004-T1	500



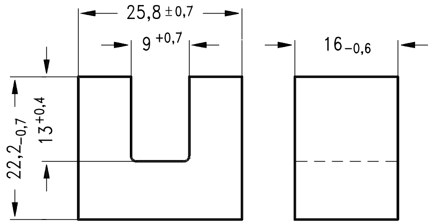
Hole arrangement
View in mounting direction

FUS0009-Y

Core (with rectangular cross section)

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,75 mm^{-1}
l_e = 98,0 mm
A_e = 131 mm^2
A_{min} = 129 mm^2
V_e = 12800 mm^3



Approx. weight 65 g/set

U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

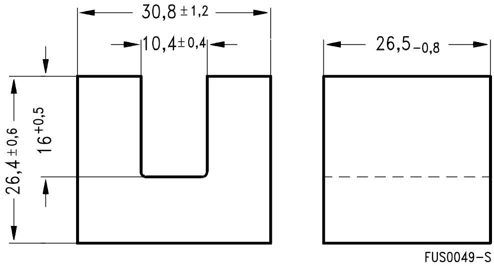
Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2500+30/-20%	1480	1680	1,4 (200 mT, 16 kHz, 100°C)	B67355-A1-X27	320

Core (with rectangular cross section)

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,45 mm^{-1}
l_e = 118 mm
A_e = 265 mm^2
A_{min} = 265 mm^2
V_e = 31300 mm^3

Approx. weight 146 g/set



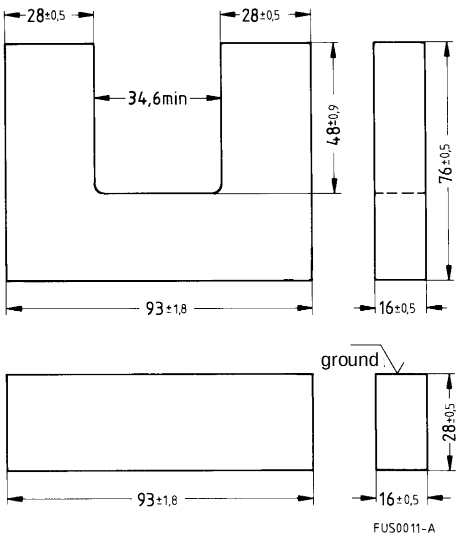
U cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	4400+30/-20%	1560	2830	3,0 (200 mT, 16 kHz, 100°C)	B67362-A1-X27	96

For power transformers
> 1 kW (20 kHz)

Magnetic characteristics (per set)

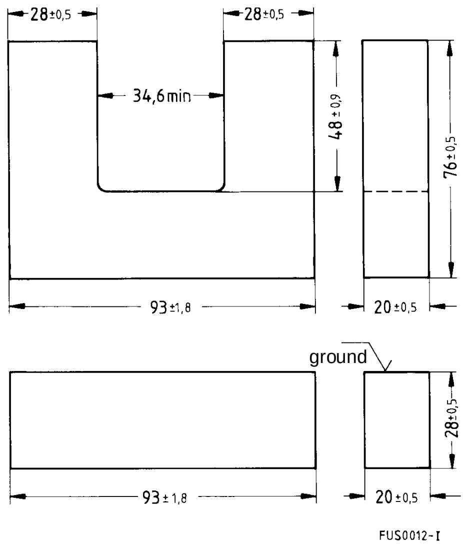
	UU 93/152/16	UI 93/104/16	
$\Sigma\, l/A$	0,79	0,58	mm^{-1}
l_e	354	258	mm
A_e	448	448	mm^2
A_{min}	448	448	mm^2
V_e	159000	116000	mm^3
m	800	600	g/set



U and I cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
Combination UU 93/152/16						
N27	2900+30/-20%	1820	1990	16,2 (200 mT, 16 kHz, 100°C)	B67345-B3-X27	20
Combination UI 93/104/16						
N27	3800+30/-20%	1740	2740	12,0 (200 mT, 16 kHz, 100°C)	B67345-B3-X27 (U) B67345-B4-X27 (I)	20 30

For power transformers
> 1 kW (20 kHz)



Magnetic characteristics (per set)

	UU 93/152/20	UI 93/104/20	
$\Sigma\, l/A$	0,63	0,46	mm^{-1}
l_e	354	258	mm
A_e	560	560	mm^2
A_{min}	560	560	mm^2
V_e	198000	144000	mm^3
m	1000	750	g/set

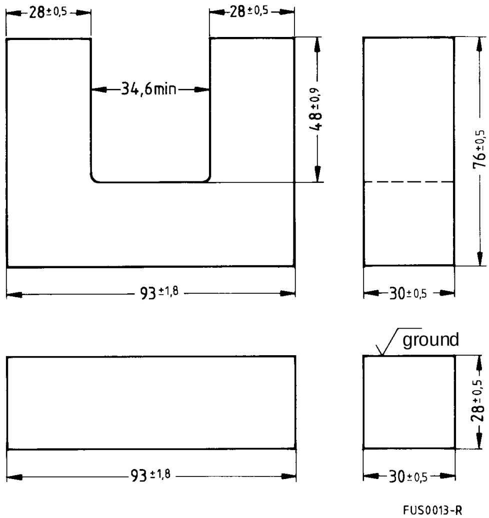
U and I cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
Combination UU 93/152/20						
N27	3600+30/-20%	1800	2490	20 (200 mT, 16 kHz, 100°C)	B67345-B10-X27	10
Combination UI 93/104/20						
N27	4900+30/-20%	1790	3420	15 (200 mT, 16 kHz, 100°C)	B67345-B10-X27 (U) B67345-B11-X27 (I)	10 20

For power transformers
> 1 kW (20 kHz)

Magnetic characteristics (per set)

	UU 93/152/30	UI 93/104/30	
$\Sigma\, l/A$	0,42	0,31	mm^{-1}
l_e	354	258	mm
A_e	840	840	mm^2
A_{min}	840	840	mm^2
V_e	297000	217000	mm^3
m	1500	1100	g/set



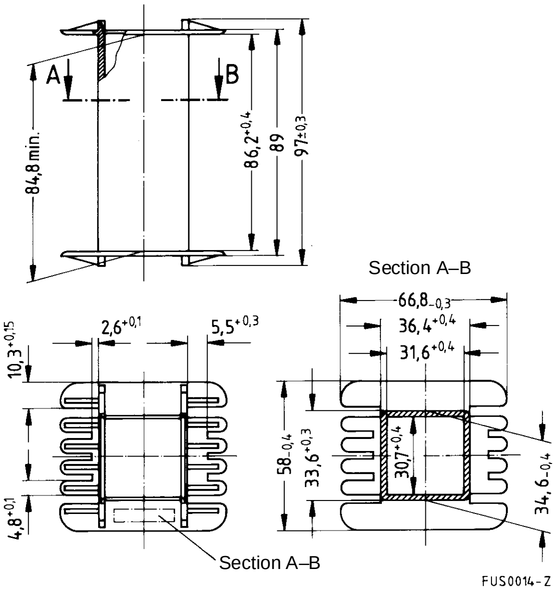
U and I cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
Combination UU 93/152/30						
N27	5400+30/-20%	1800	3740	30 (200 mT, 16 kHz, 100°C)	B67345-B1-X27	10
Combination UI 93/104/30						
N27	7400+30/-20%	1850	5130	22 (200 mT, 16 kHz, 100°C)	B67345-B1-X27 (U) B67345-B2-X27 (I)	10 10

UU 93/152/30
Coil Former **B67345**

Material: GFR 6-polyamide (UL 94 V-0, insulation class to IEC 85: E ≙ max. operating temperature 120 °C), color code natural

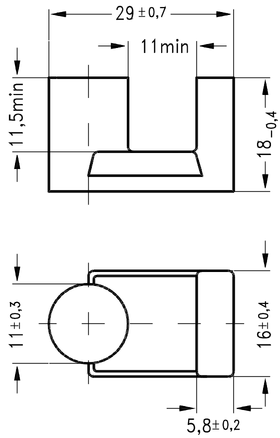
Sections	A_N mm^2	l_N mm	A_R µΩ	Ordering code	PU Pcs
1	1052	195	6,4	B67345-A1000-T1	10



Magnetic characteristics (per set)

$\Sigma l/A$ = 1,01 mm^{-1}
l_e = 95,0 mm
A_e = 94,0 mm^2
A_{min} = 94,0 mm^2
V_e = 8930 mm^3

Approx. weight 44 g/set



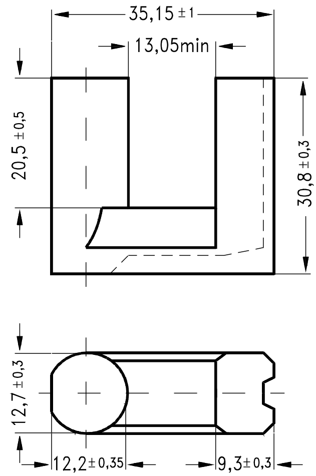
UR cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N27	2000+30/-20%	1600	1250	0,95 (200 mT, 16 kHz, 100°C)	B67354-A1-X27	250

Magnetic characteristics (per set)

$\Sigma l/A$ = 1,15 mm^{-1}
l_e = 142 mm
A_e = 120 mm^2
A_{min} = 112 mm^2
V_e = 17600 mm^3

Approx. weight 86 g/set



FUS0051-4

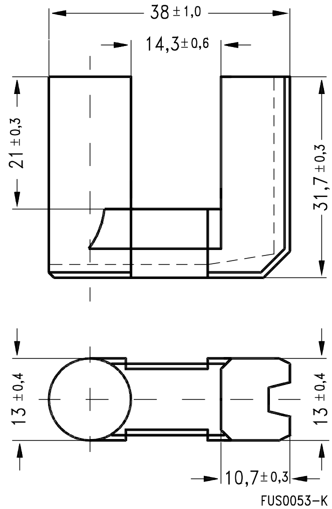
UR cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N62	1750+30/-20%	1670	1310	1,9 (200 mT, 25 kHz, 100°C)	B67359-G-X162	63
N27	1800+30/-20%	1720	1150	3,0 (200 mT, 25 kHz, 100°C)	B67359-G-X127	
N67	1950+30/-20%	1870	1150	1,7 (100 mT, 100 kHz, 100°C) 10,8 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B67359-G-X167	

Magnetic characteristics (per set)

$\Sigma l/A$ = 1,08 mm^{-1}
l_e = 148 mm
A_e = 137 mm^2
A_{min} = 133 mm^2
V_e = 20300 mm^3

Approx. weight 97,5 g/set



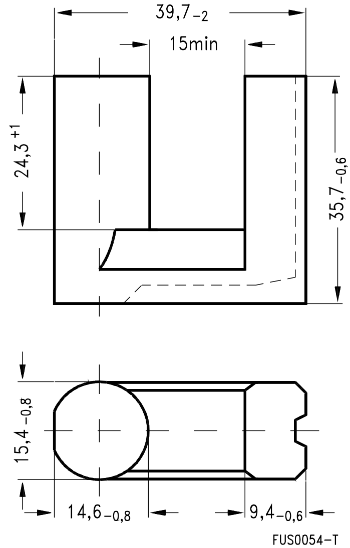
UR cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N62	1850+30/-20%	1590	1460	2,15 (200 mT, 25 kHz, 100°C)	B67313-G-X162	84
N27	1950+30/-20%	1670	1280	3,4 (200 mT, 25 kHz, 100°C)	B67313-G-X127	
N67	2000+30/-20%	1720	1280	1,97 (100 mT, 100 kHz, 100°C) 12,2 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B67313-G-X167	

Magnetic characteristics (per set)

$\Sigma l/A$ = 1,09 mm^{-1}
l_e = 163 mm
A_e = 150 mm^2
A_{min} = 133 mm^2
V_e = 24500 mm^3

Approx. weight 125 g/set



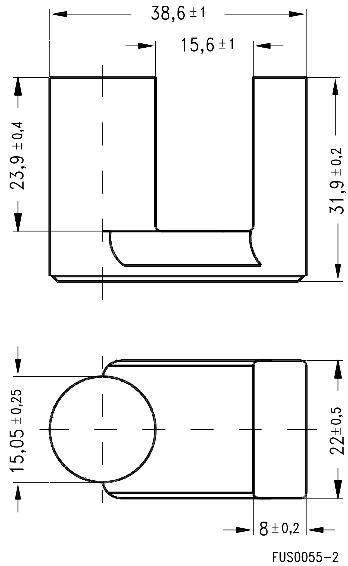
UR cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N62	1850+30/-20%	1680	1370	2,75 (200 mT, 25 kHz, 100°C)	B67317-G-X162	189
N27	1950+30/-20%	1780	1210	4,6 (200 mT, 25 kHz, 100°C)	B67317-G-X127	
N67	2050+30/-20%	1870	1210	2,5 (100 mT, 100 kHz, 100°C) 15,6 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B67317-G-X167	

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,89 mm^{-1}
l_e = 158 mm
A_e = 177 mm^2
A_{min} = 177 mm^2
V_e = 28000 mm^3

Approx. weight 137 g/set



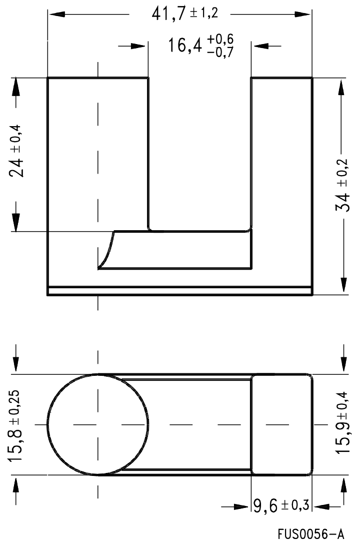
UR cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Mate-rial	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N62	2400+30/-20%	1700	1760	3,0 (200 mT, 25 kHz, 100°C)	B67312-G-X162	100
N27	2450+30/-20%	1740	1550	3,15 (200 mT, 16 kHz, 100°C)	B67312-G-X127	

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,98 mm^{-1}
l_e = 163 mm
A_e = 166 mm^2
A_{min} = 153 mm^2
V_e = 27100 mm^3

Approx. weight 140 g/set



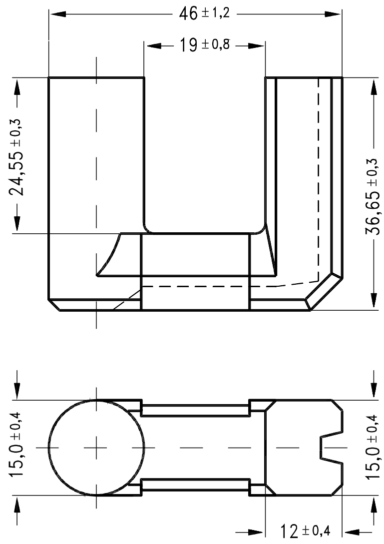
UR cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N62	2150+30/-20%	1680	1600	3,1 (200 mT, 25 kHz, 100°C)	B67368-G-X162	136
N27	2250+30/-20%	1750	1410	5,2 (200 mT, 25 kHz, 100°C)	B67368-G-X127	
N67	2350+30/-20%	1830	1410	2,8 (100 mT, 100 kHz, 100°C) 17,5 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B67368-G-X167	

Magnetic characteristics (per set)

$\Sigma l/A$ = 0,98 mm^{-1}
l_e = 176 mm
A_e = 180 mm^2
A_{min} = 177 mm^2
V_e = 31700 mm^3

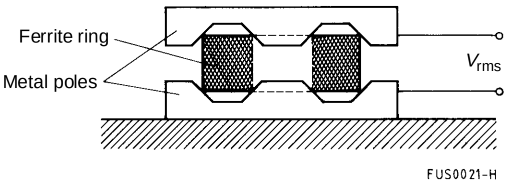
Approx. weight 145,5 g/set



UR cores are supplied as pieces.
The A_L value in the table applies to a core set comprising two ungapped cores.

Material	A_L value nH	μ_e	A_{L1min} nH	P_V W/set	Ordering code	PU Pcs
N62	2050+30/-20%	1590	1610	3,3 (200 mT, 25 kHz, 100°C)	B67314-G-X162	120
N27	2100+30/-20%	1630	1420	5,4 (200 mT, 25 kHz, 100°C)	B67314-G-X127	
N67	2300+30/-20%	1790	1420	2,9 (100 mT, 100 kHz, 100°C) 18,2 (prov. limiting value) (200 mT, 100 kHz, 100°C)	B67314-G-X167	

- Our product line includes a wide range of ring cores with finely graded diameters ranging from 2,5 to 100 mm (see overview of available types). Other core heights can be supplied on request. All cores are available in the usual materials.
  Ring cores are available in different coating versions, thus offering the appropriate solution for every application. The coating not only offers protection for the edges but also provides an insulation function.
  The following test setup is used to test the dielectric strength of the insulating coating: A copper ring is pressed to the top edge of the ring. It touches the ferrite ring at the edges (see diagram). The test duration is 2 seconds; the test voltages specified in the table are minimum values:



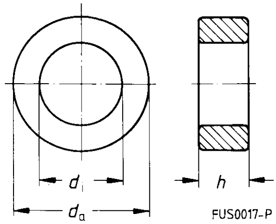
Core size	V_{rms}
R 4 thru R 10	1,0 kV
R 12,5 thru R 20	1,5 kV
> R 20	2,0 kV

For cores with high permeability, increased spread of the A_L values of several percent must be expected due to the polyamide coating (K version). This effect can be avoided by using an enamel coating (L version).
For small ring cores, we have introduced a parylene coating which features a low coating thickness and high dielectric strength.

- Ring cores are used primarily for pulse and broadband transformers, baluns and chokes. Owing to the magnetically closed circuit, high flux densities can be achieved at small volume. Magnetic leakage is negligible.
- Ring cores are also increasingly used for power applications. Here, the typical values for amplitude permeability and power loss, as summarized in the section on SIFERRIT materials (page 37), are applicable to the special power materials.
- In the list of preferred types, the A_{L1min} value (measurement conditions 320 mT, 100 °C, 10 kHz, for N47: 25 °C) is also specified for power applications, in addition to a limiting value for power loss under the relevant measurement conditions. This provides a guarantee of the minimum amplitude permeability.
- Characteristic data for cores not included among the preferred types are available on request.

Versions

Version	Ordering code
● Uncoated	B64290-**A**...
● Coated with polyamide; thickness of coating approx. 0,2 to 0,4 mm	B64290-**K**...
● Coated with parylene; thickness of coating approx. 10 to 15 µm, standard coating for small cores (≤ R4)	B64290-**P**...
● Coated with enamel; thickness of coating approx. 0,15 to 0,3 mm, coating for large cores, on request	B64290-**L**...



Overview of available types

Type	Dimensions			Magnetic characteristics				Approx.
	d_a[1] mm	d_i[1] mm	h[1] mm	$\Sigma l/A$ mm^{-1}	l_e mm	A_e mm^2	V_e mm^3	weight g
R 2,5	2,5 ± 0,12	1,5 ± 0,1	1,0 ± 0,1	12,30	6,02	0,49	3,0	0,02
R 3,0	3,05 ± 0,2	1,27 ± 0,2	1,27 ± 0,2	5,65	5,99	1,06	6,4	0,04
R 3,9	3,94 ±0,12	2,24 ±0,12	1,3 ± 0,12	8,56	9,21	1,08	9,9	0,05
R 3,9/2	3,94 ±0,12	2,24 ±0,12	2,0 ± 0,12	5,56	9,21	1,66	15,3	0,07
R 4,0	4,0 ± 0,12 (4,5 max)	2,4 ± 0,12 (1,9 min)	1,6 ± 0,1 (2,1 max)	7,69	9,63	1,25	12,0	0,06
R 5,8	5,84 ±0,12 (6,36 max)	3,05 ±0,12 (2,53 min)	1,52 ±0,12 (2,05 max)	6,36	13,03	2,05	26,7	0,1
R 5,8/3	5,84 ±0,12 (6,36 max)	3,05 ±0,12 (2,53 min)	3,0 ± 0,12 (3,55 max)	3,22	13,03	4,04	52,6	0,3
R 6,3	6,3 ± 0,15 (7,25 max)	3,8 ± 0,12 (2,85 min)	2,5 ± 0,12 (3,4 max)	4,97	15,21	3,06	46,5	0,2
R 9,5/2	9,53 ±0,19 (10,5 max)	4,75 ±0,12 (3,8 min)	2,0 ± 0,1 (2,9 max)	4,51	20,72	4,59	95,1	0,5
R 9,5	9,53 ±0,19 (10,5 max)	4,75 ±0,12 (3,8 min)	3,17 ±0,15 (4,1 max)	2,85	20,72	7,28	151	0,8
R 10	10,0 ± 0,2 (11,0 max)	6,0 ± 0,15 (5,05 min)	4,0 ± 0,15 (4,95 max)	3,07	24,07	7,83	188	0,9
R 12,5	12,5 ± 0,3 (13,6 max)	7,5 ± 0,2 (6,5 min)	5,0 ± 0,15 (5,95 max)	2,46	30,09	12,23	368	1,8
R 13,3	13,3 ± 0,3 (14,4 max)	8,3 ± 0,3 (7,2 min)	5,0 ± 0,15 (5,95 max)	2,67	32,70	12,27	401	1,8
R 14	14,0 ± 0,3 (15,1 max)	9,0 ± 0,25 (7,95 min)	5,0 ± 0,2 (6,0 max)	2,84	34,98	12,30	430	2,0
R 15	15,0 ± 0,5 (16,3 max)	10,4 ± 0,4 (9,2 min)	5,3 ± 0,3 (6,4 max)	3,24	39,02	12,05	470	2,4
R 16	16,0 ± 0,4 (17,2 max)	9,6 ± 0,3 (8,5 min)	6,3 ± 0,2 (7,3 max)	1,95	38,52	19,73	760	3,7

1) Values in parentheses apply to coated cores, ring cores made of NiZn ferrite (e.g. U17 and K12) may exceed the specified dimensions by up to 5%

Type	Dimensions			Magnetic characteristics				Approx.
	d_a[1)] mm	d_i[1)] mm	h[1)] mm	$\Sigma l/A$ mm^{-1}	l_e mm	A_e mm^2	V_e mm^3	weight g
R 17	17,0 ± 0,4 (18,2 max)	10,7 ± 0,3 (9,6 min)	6,8 ± 0,2 (7,8 max)	2,00	42,0	21,04	884	4,4
R 20/7	20,0 ± 0,4 (21,2 max)	10,0 ±0,25 (8,7 min)	7,0 ± 0,4 (8,2 max)	1,30	43,55	33,63	1465	7,6
R 22	22,1 ± 0,4 (23,3 max)	13,7 ± 0,3 (12,6 min)	6,35 ±0,3 (7,4 max)	2,07	54,15	26,17	1417	6,8
R23/8	22,6 ± 0,4 (23,8 max)	14,7 ± 0,2 (13,7 min)	7,6 ± 0,2 (8,6 max)	1,90	56,88	29,94	1703	8,1
R23/9	22,6 ± 0,4 (23,8 max)	14,7 ± 0,2 (13,7 min)	9,2 ± 0,2 (10,2 max)	1,58	56,88	36,01	2048	9,8
R 25/10	25,3 ± 0,7 (26,8 max)	14,8 ± 0,5 (13,5 min)	10,0 ± 0,2 (11,0 max)	1,17	60,07	51,26	3079	16
R 25/12	25,3 ± 0,7 (26,8 max)	14,8 ± 0,5 (13,5 min)	12,0 ± 0,3 (13,1 max)	0,98	60,07	61,51	3695	19
R 25/15	25,3 ± 0,7 (26,8 max)	14,8 ± 0,5 (13,5 min)	15,0 ± 0,4 16,2 max)	0,78	60,07	76,89	4619	24
R 25/20	25,3 ± 0,7 (26,8 max)	14,8 ± 0,5 (13,5 min)	20,0 ± 0,5 (21,3 max)	0,59	60,07	102,5	6157	33
R 29	29,5 ± 0,7 (31,0 max)	19,0 ± 0,5 17,7 min	14,9 ± 0,4 (16,1 max)	0,96	73,78	76,98	5680	27
R 30	30,5 ± 1,0 (32,3 max)	20,0 ± 0,6 (18,2 min)	12,5 ± 0,4 (13,7 max)	1,19	77,02	64,66	4980	25
R 34/10	34,0 ± 0,7 (35,5 max)	20,5 ± 0,5 (19,2 min)	10,0 ± 0,3 (11,1 max)	1,24	82,06	66,08	5423	27
R 34/12,5	34,0 ± 0,7 (35,5 max)	20,5 ± 0,5 (19,2 min)	12,5 ± 0,3 (13,6 max)	0,99	82,06	82,60	6778	33
R 36	36,0 ± 0,7 (37,5 max)	23,0 ± 0,5 (21,7 min)	15,0 ± 0,4 (16,2 max)	0,94	89,65	95,89	8597	43
R 40	40,0 ±1,0 (41,8 max)	24,0 ± 0,7 (22,5 min)	16,0 ± 0,4 (17,2 max)	0,77	96,29	125,3	12070	61
R 42	41,8 ± 1,0 (43,6 max)	26,2 ± 0,6 (24,8 min)	12,5 ± 0,3 (13,6 max)	1,08	103,0	95,75	9862	48
R 50	50,0 ± 1,0 (51,8 max)	30,0 ± 0,7 (28,5 min)	20,0 ± 0,5 (21,3 max)	0,62	120,4	195,7	23560	118
R 58	58,3 ± 1,0 (60,1 max)	40,8 ± 0,8 (39,2 min)	17,6 ± 0,4 (18,8 max)	1,00	152,4	152,4	23230	115
R 100	102,0±2,0 (104,8 max)	65,8 ± 1,3 (63,7 min)	15,0 ± 0,5 (16,3 max)	0,96	255,3	267,2	68220	330

1) Values in parentheses apply to coated cores, ring cores made of NiZn ferrite (e.g. U17 and K12) may exceed the specified dimensions by up to 5%!

Preferred types [1)]

Type	Mate-rial	A_L value nH (1mT, 10 kHz, 25°C)	A_{L1min} nH (320 mT, 10 kHz, 100°C, N47: 25°C)	Power loss per core (measurement conditions)	Ordering code B64290-	PU Pcs
R 2,5	N 30 T 38 T 38	440 ± 25% 1020 ± 30% 1020 +30/-40%			-P35-X830 -A35-X38 -P35-X38	4000 0
R 4	K 1 M 33 N 30 N 30 T 38 T 38	13 ± 25% 123 ± 25% 700 ± 25% 700 ± 25% 1630 ± 30% 1630 +30/-40%			-A36-X1 -A36-X33 -K36-X830 -P36-X830 -A36-X38 -P36-X38	1600 0
R 6,3	K 1 M 33 N 47 N 30 N 30 T38 T38	20 ± 25% 190 ± 25% 355 ± 25% 1090 ± 25% 1090 ± 25% 2530 ± 30% 2530 +30/-40%	180	< 10 mW (50 mT/500 kHz/25°C)	-A37-X1 -K37-X33 -K37-X47 -A37-X830 -K37-X830 -A37-X38 -K37-X38	4000
R 10	K1 M33 N47 N30 N30 T38 T38	33 ± 25% 308 ± 25% 570 ± 25% 1760 ± 25% 1760 ± 25% 4090 ± 30% 4090 +30/-40%	290	< 40 mW (50 mT/500 kHz/25°C)	-A38-X1 -K38-X33 -K38-X47 -A38-X830 -K38-X830 -A38-X38 -K38-X38	1000 3000 3000 1000 3000 1000 3000

1) The preferred core types are available at short notice. Other cores on request.

Type	Material	A_L value nH (1mT, 10 kHz, 25°C)	A_{L1min} nH (320 mT, 10 kHz, 100°C, N47: 25°C)	Power loss per core (measurement conditions)	Ordering code B64290-	PU Pcs
R 12,5	N 47	715 ± 25%	360	< 70 mW (50 mT/500 kHz/25°C)	-K44-X47	1500
	N27	1020 ± 25%	460	< 70 mW (200 mT/25 kHz/100°C)	-K44-X27	1500
	N 67	1070 ± 25%	460	< 280 mW (200 mT/100 kHz/100°C)	-K44-X67	1500
	N30	2200 ± 25%			-A44-X830	500
	N30	2200 ± 25%			-K44-X830	1500
	T 35	3060 ± 25%			-A44-X35	500
	T 35	3060 +25/-30%			-K44-X35	1500
R 12,5	T 38	5110 ± 30%			-A44-X38	500
	T 38	5110 +30/-40%			-K44-X38	1500
R 16	N 47	900 ± 25%	450	< 150 mW (50 mT/500 kHz/25°C)	-K45-X47	2000
	N27	1290 ± 25%	580	< 140 mW (200 mT/25 kHz/100°C)	-K45-X27	2000
	N67	1350 ± 25%	580	< 460 mW (200 mT/100 kHz/100°C)	-K45-X67	2000
	N30	2770 ± 25%			-K45-X830	2000
	T35	3870 ± 25%			-A45-X35	1000
	T35	3870 +25/-30%			-K45-X35	2000
	T38	6440 ± 25%			-A45-X38	1000
	T38	6440 +30/-40%			-K45-X38	2000
R 20/7	N 27	1930 ± 25%	870	< 280 mW (200 mT/25 kHz/100°C)	-K632-X27	1000
	N 67	2030 ± 25%	870	< 1,3 W (200 mT/100 kHz/100°C)	-K632-X67	1000
	N 30	4160 ± 25%			-A632-X830	500
	N 30	4160 ± 25%			-K632-X830	1000
	T 35	5000 ± 25%			-A632-X35	500
	T 35	5000 +25/-30%			-K632-X35	1000
	T 38	8500 ± 30%			-A632-X38	500
	T 38	8500 +30/-40%			-K632-X38	1000

Type	Material	A_L value nH (1mT, 10 kHz, 25°C)	A_{L1min} nH (320 mT, 10 kHz, 100°C, N47: 25°C)	Power loss per core (measurement conditions)	Ordering code B64290-	PU Pcs
R 22	N 27	1210 ± 25%	550	< 250 mW (200 mT/25 kHz/100°C)	-K638-X27	300
	N 67	1270 ± 25%	550	< 1,1 W (200 mT/100 kHz/100°C)	-K638-X67	300
	N30	2610 ± 25%			-A638-X830	500
	N30	2610 ± 25%			-K638-X830	300
	T 35	3200 ± 25%			-A638-X35	500
	T 35	3200 +25/-30%			-K638-X35	300
	T 38	5400 ± 30%			-A638-X38	500
	T 38	5400 +30/-40%			-K638-X38	300
R 25/10	N 27	2150 ± 25%	970	< 580 mW (200 mT/25 kHz/100°C)	-K618-X27	500
	N 67	2260 ± 25%	970	< 2,0 W (200 mT/100 kHz/100°C)	-K618-X67	500
	N 30	4620 ± 25%			-A618-X830	200
	N 30	4620 ± 25%			-K618-X830	500
	T 35	5400 ± 25%			-A618-X35	200
	T 35	5400 +25/-30%			-K618-X35	500
R 34/10	N 30	4360 ± 25%			-K58-X830	225
R 34/12,5	N 30	5460 ± 25%			-K48-X830	225
R 36	N 27	2670 ± 25%	1200	< 1,6 W (200 mT/25 kHz/100°C)	-K674-X27	200
	N 67	2810 ± 25%	1200	< 5,4 W (200 mT/100 kHz/100°C)	-K674-X67	
	N 30	5750 ± 25%			-A674-X830	
	N 30	5750 ± 25%			-K674-X830	
R 40	N 30	7000 ± 25%			-A659-X830	80
	N 30	7000 ± 25%			-K659-X830	
R 42	N 30	5000 ± 25%			-A22-X830	192
R 50	N 30	8700 ± 25%			-A82-X830	64
	N 30	8700 ± 25%			-L82-X830	
R 58	N 30	5400 ± 25%			-L40-X830	90
R 100	N 30	5500 ± 25%			-A84-X830	24

Other Cores

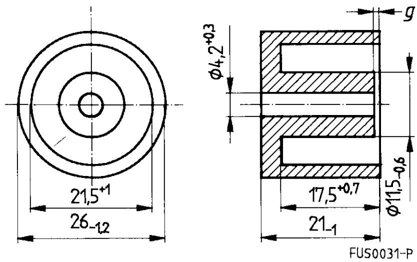
In addition to the core designs described in detail, we also manufacture the following core types:

- CC cores
- Double-aperture cores
- Shielding beads
- Cylindrical cores
- Tubular cores
- Rods for RF welding equipment
- Threaded cores

Furthermore, our product spectrum includes special designs such as yarn-role and mushroom cores, cores for RF chokes and ferrite blocks for machined parts. Please direct requests to your nearest Siemens office.

- Low leakage field
- For dividing networks in compact loudspeaker systems
- Air-gap cores with cover disk for use as energy storage chokes in switch-mode power supplies
- Fixing in core center hole with nonmagnetic M 4 screws

Core (unground)



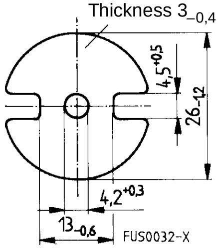
Magnetic characteristics
(core with cover disk)

$\Sigma l/A$ =	0,50	mm^{-1}
l_e =	52	mm
A_e =	103	mm^2
A_{min} =	84	mm^2
V_e =	5350	mm^3

Approx. weight
Core24 g/piece
Cover disk5 g/piece

Cover disk (unground)

Thickness $3_{-0,4}$



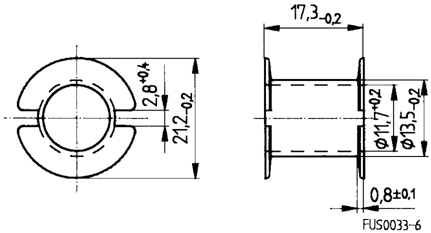
Material	Dimension *g* mm	A_L value[1)] approx. nH	Ordering code	PU Pcs
Gapped				
N27	1,0 ± 0,3 2,0 ± 0,3 3,0 ± 0,3	210 140 100	B66442-G1000-X27 B66442-G2000-X27 B66442-G3000-X27	360
Ungapped				
N27	ca. 0	108	B66442-A-X27	360
Cover disk			B66442-J-X27	720

1) Core with cover disk

CC 26
Coil FormerB66442

Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding:see page 158

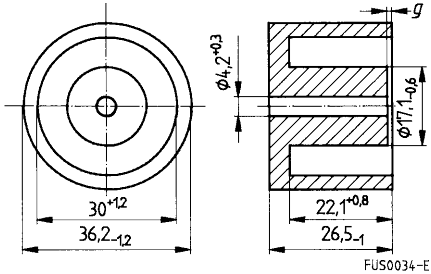
Sections	A_N mm^2	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	50	54	33	B66442-B1001-T1	360



CC 36
CoreB66443

- Low leakage field
- For dividing networks in compact loudspeaker systems
- Air-gap cores with cover disk for use as energy storage chokes in switch-mode power supplies
- Fixing in core center hole with nonmagnetic M 4 screws

Core (unground)

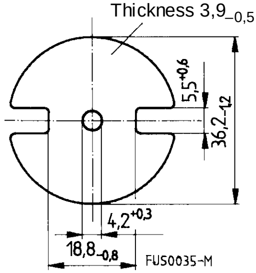


Magnetic characteristics
(core with cover disk)

Σl/A=	0,30	mm^{-1}
l_e =	69	mm
A_e =	230	mm^2
A_{min} =	204	mm^2
V_e =	15870	mm^3

Approx. weight
Core65 g/piece
Cover disk15 g/piece

Cover disk (unground)

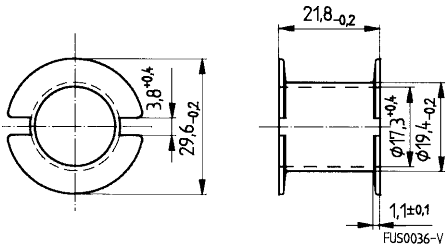


Material	Dimension g mm	A_L value[1)] approx. nH	Ordering code	PU Pcs
Gapped				
N27	1,0 ± 0,3 2,0 ± 0,3 3,0 ± 0,3	400 250 190	B66443-G1000-X27 B66443-G2000-X27 B66443-G3000-X27	144
Ungapped				
N27	ca. 0	157	B66443-A-X27	144
Cover disk			B66443-J-X27	720

1) Core with cover disk

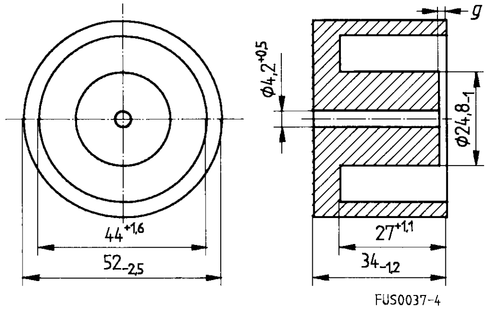
Material:GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black
Winding:see page 158

Sections	A_N mm²	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	95	77	28	B66443-B1001-T1	144



- Low leakage field
- For dividing networks in compact loudspeaker systems
- Air-gap cores with cover disk for use as energy storage chokes in switch-mode power supplies
- Fixing in core center hole with nonmagnetic M 4 screws

Core (unground)



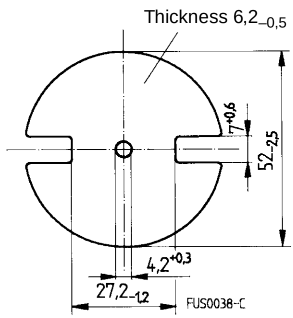
Magnetic characteristics
(core with cover disk)

Σl/A	=	0,19	mm^{-1}
l_e	=	91	mm
A_e	=	480	mm^2
A_{min}	=	448	mm^2
V_e	=	43680	mm^3

Approx. weight

Core	177 g/piece
Cover disk	52 g/piece

Cover disk (unground)



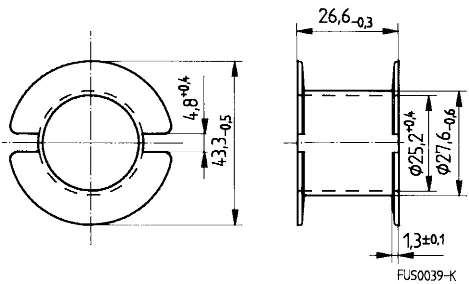
Material	Dimension *g* mm	A_L value[1)] approx. nH	Ordering code	PU Pcs
Gapped				
N27	1,0 ± 0,3 2,0 ± 0,3 3,0 ± 0,3 4,0 ± 0,3	730 440 320 250	B66446-G1000-X27 B66446-G2000-X27 B66446-G3000-X27 B66446-G4000-X27	32
Ungapped				
N27	ca. 0	202	B66446-A-X27	32
Cover disk			B66446-J-X27	192

1) Core with cover disk

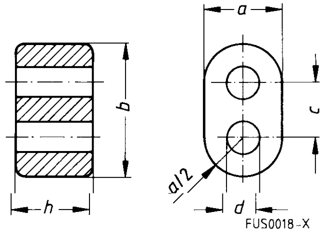
Material: GFR polyterephthalate (UL 94 V-0, insulation class to IEC 85: F ≙ max. operating temperature 155 °C), color code black

Winding: see page 158

Sections	A_N mm^2	l_N mm	A_R value µΩ	Ordering code	PU Pcs
1	178	111	21,5	B66446-B1001-T1	32



Primarily used for broadband transformers up to high frequencies
Application examples
SIFERRIT material N30 for low frequencies
and for pulse applications
SIFERRIT material K1
for matching transformers and baluns
up to about 250 MHz in antenna feeders or
in input circuits of VHF and TV receivers
SIFERRIT material U17
for the same applications up to 500 MHz



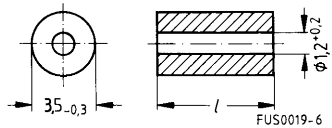
Dimensions 1)					Magnetic characteristics				Weight
h (mm)	b (mm)	a (mm)	c (mm)	d (mm)	$\Sigma l/A$ 3) mm^{-1}	l_e 3) mm	A_e 3) mm^2	V_e 3) mm^3	g
14,5 -1,0	14,5 -1,0	8,5 -0,5	5,85±0,25	3,4 + 0,8	0,31	15,7	50,2	761	4,0
8,3 - 0,6	14,5 - 1,0	8,5 - 0,5	5,85±0,25	3,4 + 0,6	0,54	15,7	28,9	435	2,5
6,2 -0,5	7,25-0,5	4,2 - 0,4	2,9±0,15	1,7 + 0,3	0,745	8,1	10,7	78	0,4
2,5 - 0,3	3,6 - 0,3	2,1 - 0,3	1,45±0,1	0,8 + 0,15	1,78	4,2	2,5	8,3	0,1

Overview of available types

Core height h (mm)	Material	A_L value 3) nH	Ordering code 4)	PU Pcs
14,5 – 1,0 2)	U17 K1	40 330	B62152-A1-X17 B62152-A1-X1	200
8,3 – 0,6 2)	U17 K1 N30	24 190 10000	B62152-A4-X17 B62152-A4-X1 B62152-A4-X30	400
6,2 – 0,5 2)	U17 K1 N30	17 140 7300	B62152-A7-X17 B62152-A7-X1 B62152-A7-X30	2000
2,5 – 0,3	U17 K1 N30	7 60 3000	B62152-A8-X17 B62152-A8-X1 B62152-A8-X30	20000

1)Cores made of NiZn ferrite (e.g. U17 and K12) may exceed the specified dimensions by up to 5%.
2)In accordance with DIN 41279, shape G
3)Magnetic characteristics and A_L value are based on winding of center leg. Tolerance of the A_L value = ±30%
4)Double-aperture cores are available with parylene coating on request. In this case the thickness of the coating is approx. 10 to 15 µm. Ordering code for coated version: B62152-P...

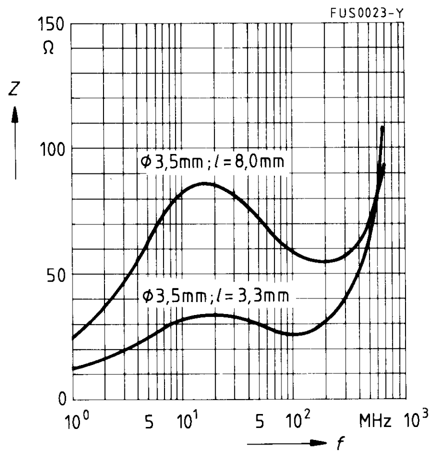
- In accordance with IEC 220
- For the short-wave to VHF range



Mode of operation

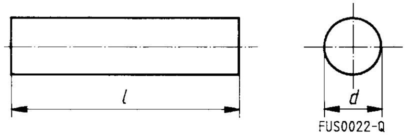
When slipped over a conductor,
the beads produce an attenuation,
which increases with the number of beads.
Magnetic biasing of the beads reduces
the attenuation.

Impedance *Z* versus frequency *f*
(typical values)
measured with shielding beads
B62110-A3011-X22 and
B62110-A3063-X22



Material	Length *L* mm	Ordering code	PU Pcs
N22	3,3 – 0,5 5,2 – 0,5 8,0 – 0,6 16,0 – 0,8	B62110-A3011-X22 B62110-A3007-X22 B62110-A3063-X22 B62110-A3064-X22	10000 8000 5000 2000

- In accordance with IEC 220 and DIN 41291
- Preferred types of unground cores available per table below
- Camber of unground cores based on DIN 41292
- Tolerance of apparent permeability μ_{app}: ± 5 % (typical value)
- Testing of magnetic properties in accordance with DIN 41276, sheet 1



Overview of available typesPreferred types 1)

d (mm)	*l* (mm)	*l/d* (mean value)	Material	Ordering code	PU Pcs
$1,6_{-0,2}$	$8,5_{-0,5}$	5,5			
	$12,5_{-0,7}$	8,1	K1	B61110-A1031-X1	10000
	$14,3_{-0,8}$	9,3			
	$15,0_{-0,8}$	9,7	K1	B61110-A1035-X1	10000
$1,8_{-0,2}$	$12,0_{-0,8}$	6,8			
	$14,0_{-0,8}$	8,0	N27	B61110-A1060-X27	10000
	$18,0_{-0,8}$	10,4	N27	B61110-A1061-X27	10000
$1,95_{-0,2}$	$12,7_{-0,7}$	6,7			
	$17,9_{-0,9}$	9,4			
$2,0_{-0,2}$	$4,5_{-0,4}$	2,3			
	$10,0_{-0,6}$	5,1			
	$15,0_{-0,8}$	7,5			
	$20,0_{-0,9}$	10,3			
$2,3_{-0,2}$	$10,0_{-0,4}$	4,5	K1	B61110-A2038-X1	10000
	$30,0_{-1,2}$	13,4			
	$35,0_{-1,2}$	15,6			
$2,5_{-0,25}$	$8,5_{-0,6}$	3,6			
	$10,0_{-0,6}$	4,3			
	$15,0_{-0,8}$	6,5			
	$20,0_{-0,9}$	8,7			
$3,0_{-0,25}$	$8,0_{-0,5}$	2,7			
	$10,0_{-0,6}$	3,4			
	$15,0_{-0,8}$	5,1			
	$20,0_{-0,9}$	6,8			
$3,2_{-0,25}$	$11,0_{-0,6}$	3,5			
	$30,8_{-1,2}$	9,8			

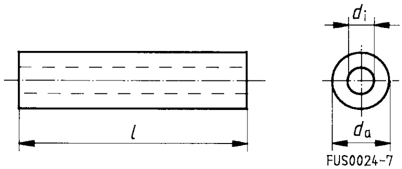
1) The preferred core types are available at short notice. Other cores on request.

Overview of available typesPreferred types [1)]

d (mm)	*l* (mm)	*l/d* (mean value)	Material	Ordering code	PU Pcs
$3{,}5_{-0{,}3}$	$17{,}0_{-0{,}8}$	5,0			
	$27{,}0_{-1{,}3}$	7,9			
$4{,}0_{-0{,}3}$	$10{,}0_{-0{,}6}$	2,5			
	$15{,}0_{-0{,}8}$	3,8	M33	B61110-A4007-X33	2000
	$20{,}0_{-0{,}9}$	5,1	K1	B61110-A4030-X1	1000
	$25{,}0_{-1{,}0}$	6,4	M33	B61110-A4035-X33	800
	$30{,}0_{-1{,}2}$	7,6			
	$45{,}0_{-1{,}8}$	11,5			
$4{,}5_{-0{,}3}$	$15{,}0_{-0{,}8}$	3,4			
	$20{,}0_{-0{,}9}$	4,5			
$5{,}0_{-0{,}3}$	$11{,}0_{-0{,}5}$	2,2			
	$15{,}0_{-0{,}8}$	3,0			
	$20{,}0_{-0{,}9}$	4,0			
	$25{,}0_{-1{,}0}$	5,1			
	$30{,}0_{-1{,}2}$	6,1			
	$45{,}0_{-1{,}8}$	9,1			
$5{,}2_{-0{,}3}$	$22{,}0_{-0{,}8}$	4,3			
$6{,}0_{-0{,}3}$	$15{,}0_{-0{,}8}$	2,5			
	$20{,}0_{-0{,}9}$	3,3			
	$30{,}0_{-1{,}2}$	5,0			
	$45{,}0_{-1{,}8}$	7,5	M33	B61110-A6010-X33	500
$7{,}2_{-0{,}4}$	$95{,}0_{-3{,}0}$	13			
$8{,}0_{-0{,}4}$	$10{,}0_{-0{,}5}$	1,3			
	$20{,}0_{-0{,}9}$	2,5			
	$25{,}0_{-1{,}0}$	3,1			
	$30{,}0_{-1{,}2}$	3,8			
	$40{,}0_{-1{,}6}$	5,0			
	$60{,}0_{-2{,}4}$	7,5			
$10{,}0_{-0{,}5}$	$15{,}0_{-0{,}8}$	1,5			
	$25{,}0_{-1{,}0}$	2,5			
	$30{,}0_{-1{,}2}$	3,0	M11	B61110-J1004-X11	500
	$36{,}0_{-1{,}5}$	3,6	U17	B61110-J1018-X17	500
	$40{,}0_{-1{,}6}$	4,0			
	$45{,}0_{-1{,}8}$	4,5			
	$50{,}0_{-2{,}0}$	5,0	U17	B61110-J1011-X17	500
	$60{,}0_{-2{,}4}$	6,0			
	$80{,}0_{-3{,}0}$	8,1			

1) The preferred core types are available at short notice. Other cores on request.

- In accordance with IEC 220
- Preferred types of unground cores available per table below
- Camber of unground cores based on DIN 41 292
- Tolerance of apparent permeability μ_{app}: ± 5 % (typical value)
- Testing of magnetic properties in accordance with DIN 41276, sheet 1

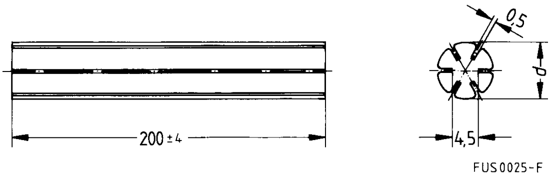


Material	d_a mm	d_i mm	l mm	Ordering code	PU Pcs
K 1	3,5 $_{-0,3}$	1,6 $_{+0,15}$	5 $_{-0,4}$ 10 $_{-0,6}$	B62110-A3048-X1 B62110-A3049-X1	8000 4000
	4 $_{-0,3}$	1,6 $_{+0,15}$	6 $_{-0,4}$ 10 $_{-0,6}$	B62110-A4045-X1 B62110-A4046-X1	5000 4000
M 33	5 $_{-0,3}$	2 $_{+0,2}$	6 $_{-0,4}$ 10 $_{-0,6}$ 18 $_{-0,9}$	B62110-A5028-X33 B62110-A5024-X33 B62110-A5025-X33	3000 2000 1000
	6 $_{-0,3}$	3 $_{+0,2}$	10 $_{-0,6}$ 18 $_{-0,9}$ 30 $_{-1,2}$	B62110-A6020-X33 B62110-A6021-X33 B62110-A6022-X33	1000 800 1000
	8 $_{-0,4}$	4 $_{+0,3}$	18 $_{-0,9}$ 30 $_{-1,2}$ 50 $_{-2}$	B62110-A8017-X33 B62110-A8018-X33 B62110-A8006-X33	1000 1000 500
	10 $_{-0,5}$	6 $_{+0,3}$	18 $_{-0,9}$ 30 $_{-1,2}$ 50 $_{-2}$	B62110-J1020-X33 B62110-J1021-X33 B62110-J1022-X33	200 500 500
N 4	3,5 $_{-0,3}$	1,2 $_{+0,2}$	3,3 $_{-0,5}$	B62110-A3065-X4	10000

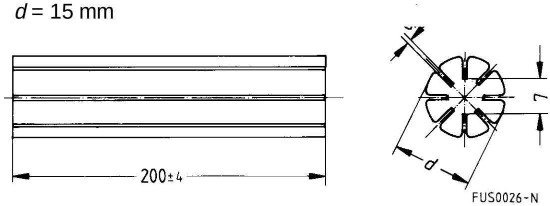
For RF tube welding equipment

- **Type A**
  With slots for reduced eddy-current losses (the slots also have a cooling effect)

Type A
d = 8 and 10 mm

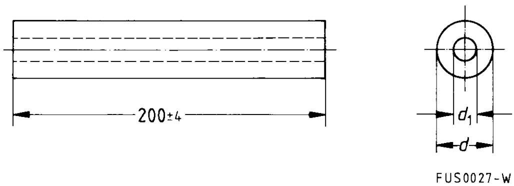


d = 15 mm



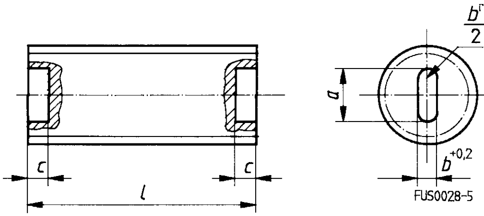
- **Type B**
  With internal hole for cooling water flow

Type B



Mate-rial	Type	Diameter d mm	d_1 mm	Tube gauge	Approx. weight g	Ordering code	PU Pcs
N 27	A	$8_{-0,4}$ $10_{-0,5}$ $15_{-0,6}$		$\varnothing\ 9^{E8} \times 200$ $\varnothing\ 11^{E8} \times 200$ $\varnothing\ 16^{E8} \times 200$	30 60 130	B61611-A8002-X27 B61611-J1002-X27 B61611-J5002-X27	50 50 20
N 27	B	$8_{-0,4}$ $10_{-0,5}$ $15_{-0,6}$	$4_{+0,2}$ $5_{+0,2}$ $7_{+0,3}$	$\varnothing\ 9^{E8} \times 200$ $\varnothing\ 11^{E8} \times 200$ $\varnothing\ 16^{E8} \times 200$	30 60 130	B61621-A8002-X27 B61621-J1002-X27 B61621-J5002-X27	50 50 20

- With ground thread
- Tolerance of apparent permeability μ_{app}: ± 5 % (typical value)
- Testing of magnetic properties in accordance with DIN 41276, sheet 1



Overview of available types / **Preferred types** [1)]

Suitable for female thread DIN 13, 518, 519	Core length *l* mm	Slot dimensions *a* mm	*b* mm	*c* mm	Mate-rial	Silicon brake	Ordering code	PU Pcs
3 × 0,5	$5{,}3_{-0{,}3}$ $6{,}2_{-0{,}4}$ $8{,}2_{-0{,}4}$ $9{,}2_{-0{,}4}$	$1{,}3^{+0{,}2}$	0,5	1	K12 K1 U17	yes yes yes	B63310-B2905-X12 B63310-B2905-X1 B63310-B2908-X17	10000 10000 5000
3,5 × 0,5	$6{,}3_{-0{,}6}$ $8{,}3_{-0{,}6}$ $10{,}3_{-0{,}6}$	$1{,}7^{+0{,}2}$	0,6	1,2				
4 × 0,5	$6{,}2_{-0{,}4}$ $8{,}3_{-0{,}4}$ $10{,}3_{-0{,}6}$ $12{,}3_{-0{,}6}$	$2{,}0^{+0{,}2}$	0,7	1,2	K1 K1	no no	B63310-B3030-X1 B63310-B3020-X1	5000 4000
5 × 0,75	$8{,}3_{-0{,}6}$ $10{,}3_{-0{,}6}$ $13{,}3_{-0{,}6}$	$2{,}5^{+0{,}3}$	1	1,2				
6 × 0,75	$10{,}3_{-0{,}6}$ $13{,}3_{-0{,}6}$	$3{,}0^{+0{,}3}$	1	1,2				

Threaded cores are available with or without a silicon rubber brake. The thread brake is used for fixing the core in the transformer.

The version with the silicon brake is identified in the ordering code by means of a „9“ (in the second digit position in the second block). The braking torque is tested in accordance with DIN 41286, sheet 3.

1) The preferred core types are available at short notice. Other cores on request.

I

Symbol	Meaning	Unit
A	Cross section of coil	mm^2
A_e	Effective magnetic cross section	mm^2
A_L	Inductance factor; $A_L = L/N^2$	nH
A_{L1}	Minimum inductance at defined high saturation ($\triangleq \mu_a$)	nH
A_{min}	Minimum core cross section	mm^2
A_N	Winding cross section	mm^2
A_R	Resistance factor; $A_R = R_{Cu}/N^2$	$\mu\Omega = 10^{-6}\ \Omega$
B	RMS value of magnetic flux density	Vs/m^2, mT
ΔB	Flux density deviation	Vs/m^2, mT
$\hat{B}$	Peak value of magnetic flux density	Vs/m^2, mT
$\Delta\hat{B}$	Peak value of flux density deviation	Vs/m^2, mT
$B_\_$	DC magnetic flux density	Vs/m^2, mT
B_R	Remanent flux density	Vs/m^2, mT
B_S	Saturation magnetization	Vs/m^2, mT
C_0	Winding capacitance	F = As/V
DF	Relative disaccommodation coefficient $DF = d/\mu_i$	
d	Disaccommodation coefficient	
E_a	Activation energy	J
f	Frequency	s^{-1}, Hz
f_{limit}	Limiting frequency	s^{-1}, Hz
f_r	Resonance frequency	s^{-1}, Hz
f_{Cu}	Copper space factor	
g	Air gap	mm
H	RMS value of magnetic field strength	A/m
$\hat{H}$	Peak value of magnetic field strength	A/m
$H_\_$	DC field strength	A/m
H_c	Coercive field strength	A/m
h	Hysteresis coefficient of material	10^{-6} cm/A
$h/\mu_i^{\ 2}$	Relative hysteresis coefficient	10^{-6} cm/A
I	RMS value of current	A
$I_\_$	Direct current	A
$\hat{i}$	Peak value of current	A
J	Polarization	Vs/m^2
k	Boltzmann constant	J/K
L	Inductance	H = Vs/A
$\Delta L/L$	Relative inductance change	
L_0	Inductance of coil without core	H
L_H	Principal inductance	H
L_p	Parallel inductance	H
L_{rev}	Reversible inductance	H
L_s	Series inductance	H

Symbols and Terms

Symbol	Meaning	Unit
l_e	Effective magnetic path length	mm
l_N	Average length of turn	mm
N	Number of turns	
P_{Cu}	Copper (winding) losses	W
P_{trans}	Transferrable power	W
P_V	Relative core losses	mW/g
Q	Quality factor ($Q = \omega L/R_s = 1/\tan\delta_L$)	
R	Resistance	Ω
R_{Cu}	Copper (winding) resistance ($f = 0$)	Ω
R_h	Hysteresis loss resistance of a core	Ω
ΔR_h	R_h change	Ω
R_i	Internal resistance	Ω
R_p	Parallel loss resistance of a core	Ω
R_s	Series loss resistance of a core	Ω
R_{th}	Thermal resistance	K/W
R_V	Effective loss resistance of a core	Ω
s	Total air gap	mm
T	Temperature	°C
ΔT	Temperature difference	K
T_C	Curie temperature	°C
t	Time	s
t_v	Pulse duty factor	
$\tan\delta$	Loss factor	
$\tan\delta_L$	Loss factor of coil	
$\tan\delta_r$	(Residual) loss factor at $H \to 0$	
$\tan\delta_e$	Relative loss factor	
$\tan\delta_h$	Hysteresis loss factor	
$\tan\delta/\mu_i$	Relative loss factor of material at $H \to 0$	
U	RMS value of voltage	V
$\hat{U}$	Peak value of voltage	V
V_e	Effective magnetic volume	mm^3
Z	Complex impedance	Ω
α	Temperature coefficient (TK)	1/K
α_F	Relative temperature coefficient of material	1/K
α_e	Temperature coefficient of effective permeability	1/K
ε_r	Relative dielectric constant	
Φ	Magnetic flux	Vs
η	Efficiency of a transformer	
η_B	Hysteresis material constant	mT^{-1}
η_i	Hysteresis core constant	$A^{-1}H^{-1/2}$
λ_s	Magnetostriction at saturation magnetization	

Symbols and Terms

Symbol	Meaning		Unit
μ	Relative complex permeability		
μ_0	Magnetic field constant		Vs/Am
μ_a	Relative amplitude permeability		
μ_{app}	Relative apparent permeability		
μ_e	Relative effective permeability		
μ_i	Relative initial permeability		
μ'_p	Relative real (inductive) component of μ	for parallel components	
μ''_p	Relative imaginary (loss) component of μ	for parallel components	
μ_r	Relative permeability		
μ_{rev}	Relative reversible permeability		
μ'_s	Relative real (inductive) component of μ	for series components	
μ''_s	Relative imaginary (loss) component of μ	for series components	
μ_{tot}	Relative total permeability derived from the static magnetization curve		
ρ	Resistivity		Ωm^{-1}
$\Sigma l/A$	Magnetic form factor		mm^{-1}
τ_{Cu}	DC time constant $\tau_{Cu} = L/R_{Cu} = A_L/A_R$		s
ω	Angular frequency; $\omega = 2\,\Pi f$		s^{-1}

The commas used in numerical values denote decimal points.

All dimensions are given in mm.

Ordering code structure

RM and P core sets
(Example here RM 4)

B65803	–	N	160	–	A	48

Part number

Code letter for revision status and version

A_L value in nH
Given only for gapped cores.
Not specified for ungapped cores
(e.g. B65803-J-R30)

Letter giving A_L value tolerance
A ≙ ± 3 %
G ≙ ± 2 %
J ≙ ± 5 %
K ≙ ± 10 %
L ≙ ± 15 %
R ≙ + 30/– 20 %
U ≙ + 80/– 0 %
Y ≙ + 40/– 30 %

Short designation for the SIFERRIT material
(48 ≙ N48,
1 ≙ K1,
33 ≙ M33 etc.)

E cores (ETD, EFD, EC, ER, E)
E cores are supplied as pieces; each packing unit contains only cores either with or without shortened center leg (gap dimension »*g*«). The typical value given in the tables for the A_L value applies to a core set consisting of one core with a shortened center leg and one core without a shortened center leg (dimension »*g*« approx. 0). E cores with a toleranced A_L value are available on request. We then prefer a symmetrical air gap distribution.

Ordering example (here ETD 29)

B66358	–	G	1000	–	X	1	27

Part number

Code letter „G“
for toleranced gap

Code number for gap
DImension »*g*« in thousandths of a millimeter
Not specified for ungapped cores
(e.g. B66358-G-X127)

Fill letter

Fill letter

Short designation for the SIFERRIT material
(27 ≙ N27, 67 ≙ N67 etc.)

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