2011/12
Edition 1

BLOCK
CATALOGUE 3

Line reactors / Filter reactors / Harmonics filters / Interference filters / Sinusoidal filters / All-pole filters / Motor reactors / Stabilisers / Testing lab

EMC-FILTERS/ REACTORS

perfecting power

BLOCK
block-trafo.de

Catalogues

Catalogue 1
TRANSFORMERS

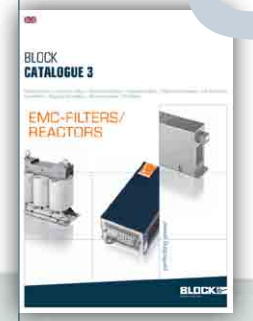
- ☐ Control transformers
- ☐ Isolating transformers
- ☐ Safety transformers
- ☐ PCB transformers
- ☐ Dry-type power transformers
- ☐ Autotransformers / Adapter transformers
- ☐ Toroidal transformers
- ☐ 100 V transformers
- ☐ Electronic transformers
- ☐ Starting current limiters
- ☐ Energy-saving systems
- ☐ Testing and measuring equipment
- ☐ Winding wires
- ☐ Housings
- ☐ Inductive components for switched mode power supplies

Catalogue 2
DC POWER SUPPLIES

- ☐ Switched mode power supplies, PEL series
- ☐ Switched mode power supplies, PowerVision series
- ☐ Switched mode power supplies, PSR series
- ☐ Electronic circuit breakers
- ☐ Redandancy modules
- ☐ Capacitive buffer modules
- ☐ Uninterruptible power supplies
- ☐ DC-DC converters
- ☐ Linearly regulated DC power supplies
- ☐ Unregulated DC power supplies
- ☐ Adapter transformers for power supplies

Catalogue 3
EMC FILTERS/REACTORS

- ☐ Line reactors
- ☐ Filter reactors
- ☐ Harmonics filters
- ☐ Interference filters
- ☐ Sinusoidal filters
- ☐ All-pole filters
- ☐ Motor reactors
- ☐ Stabilisers
- ☐ Testing lab



BLOCK – perfecting power

perfecting power

BLOCK's products and solutions guarantee maximum voltage and power supply quality in every single area of business and industry. Encompassing over 2000 standard products as well as a myriad of customised solutions, our extensive product portfolio is a reliable choice for customers throughout the world who want exactly the right amount of power and power quality.

Our transformers, power supplies, reactors and interference filters, not to mention our other innovative products and solutions, improve the efficiency of devices, plants, control facilities and systems by minimising the wear and tear these experience, extending their service life and enabling them to use energy in a way that is more efficient and cost-effective.

All BLOCK products are developed and produced in-house, from the research and development phase to production and quality assurance, right through to certification. At our in-house testing lab, we perform tests relating to electromagnetic compatibility (EMC) and device safety, as well as simulating environmental influences.

Through our unswerving commitment to providing customers with everything they need from a single source, we can respond to even the most unconventional demands using an approach that is highly flexible, prompt and creative.

BLOCK – perfecting power

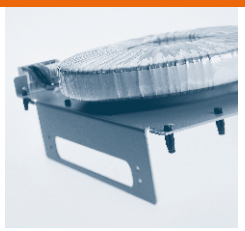
Contacts around the globe.

Commercial relationships reaching all four corners of the globe have long been a reality here at BLOCK. When it comes to connecting to the grid, our products are the first choice in many countries. With six BLOCK companies as well as numerous national and international agencies situated right across the globe, we successfully supply international markets with transformers, reactors, EMC filters, switched mode power supplies, and much more.

Well over half of our deliveries are exported to destinations throughout the world. This being the case, it goes without saying that precise knowledge of the technical requirements and standards of individual countries is a must. That's why all the key national and international marks of conformity are applied to BLOCK products.

Comprehensive warehousing facilities ensure items are available quickly, keeping downtimes to a minimum, whilst our logistics system gets them to our customers without delay.

BLOCK – perfecting power



A space-saving toroidal transformer developed specifically for lifts

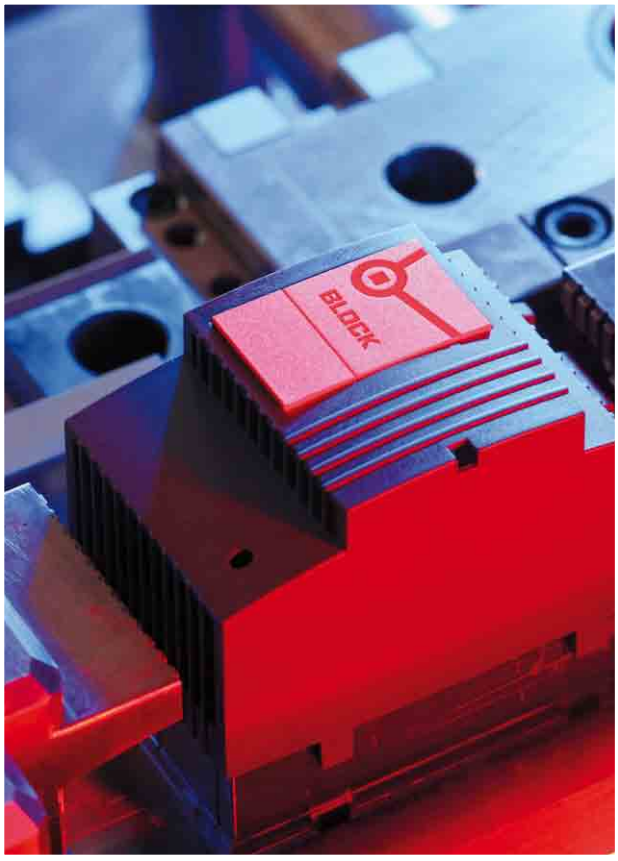
Individual

Our practical collaborative work with industry means that we here at BLOCK are continually able to develop sophisticated solutions. Thanks to our unique vertical range of manufacture as well as our unparalleled technological expertise, we can address individual customer requirements and problems directly. The result is applications tailored specifically to our customers, which are ultimately transformed into products at our prototyping facilities. Our cutting-edge machinery means we have the tools to produce both individual and series-manufactured items cost-effectively and with a short lead time. So we can make specific customer requirements a reality.

CUSTOM MADE

2500 m² punching and nibbling machines for metalworking

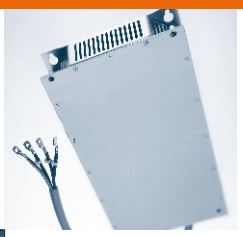
Plastic injection moulding with in-house toolmaking facilities



Automated cable assembly

Fully automatic coil production for small transformers

BLOCK CUSTOM MADE



EMC filters, suitable for a frequency converter

Cable drums (filters) for tractors, to supply power out in fields

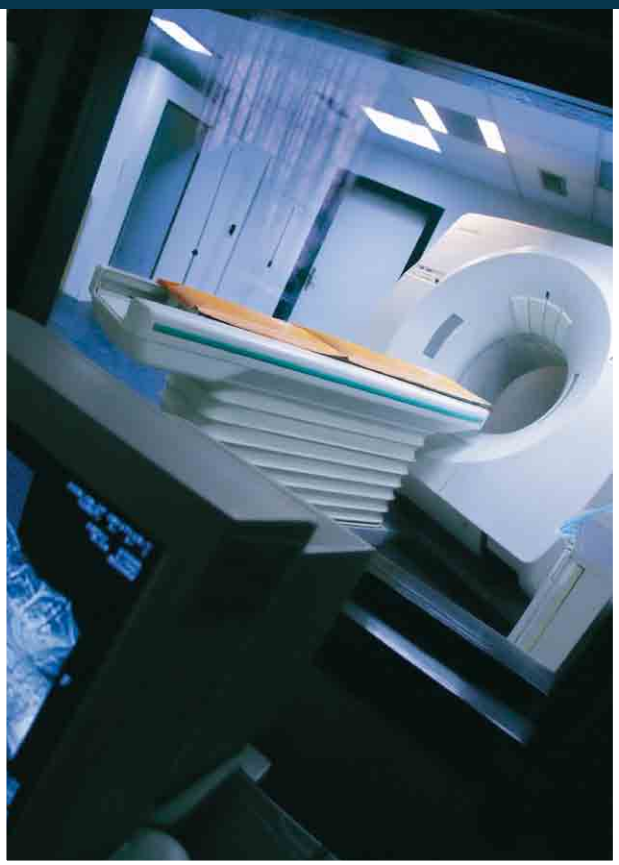
Ferrite components for rail engineering

Welding transformer

Europe's largest low-voltage winding machine combining foil and wire winding

State-of-the-art production lines: SMD printed circuit board manufacturing

BLOCK – perfecting power



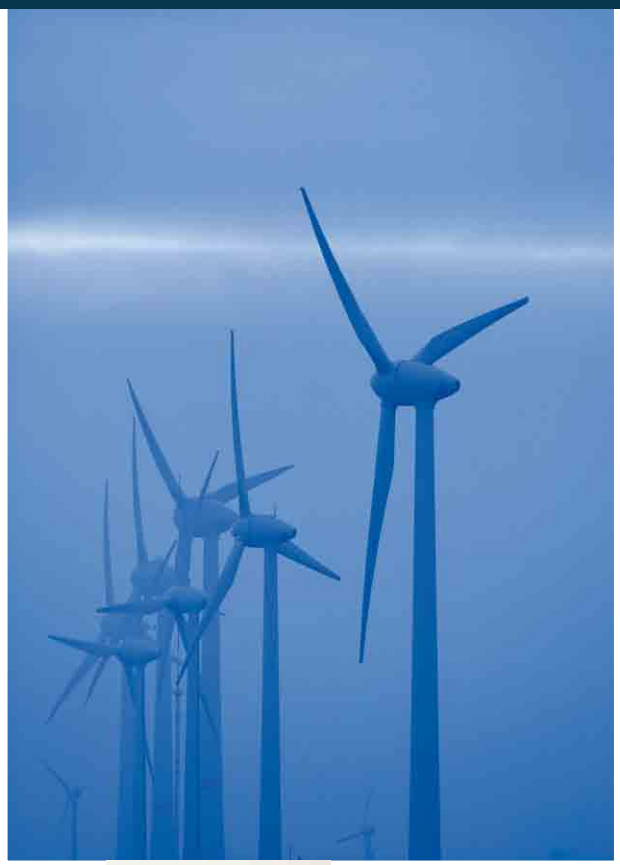
CUSTOM MADE

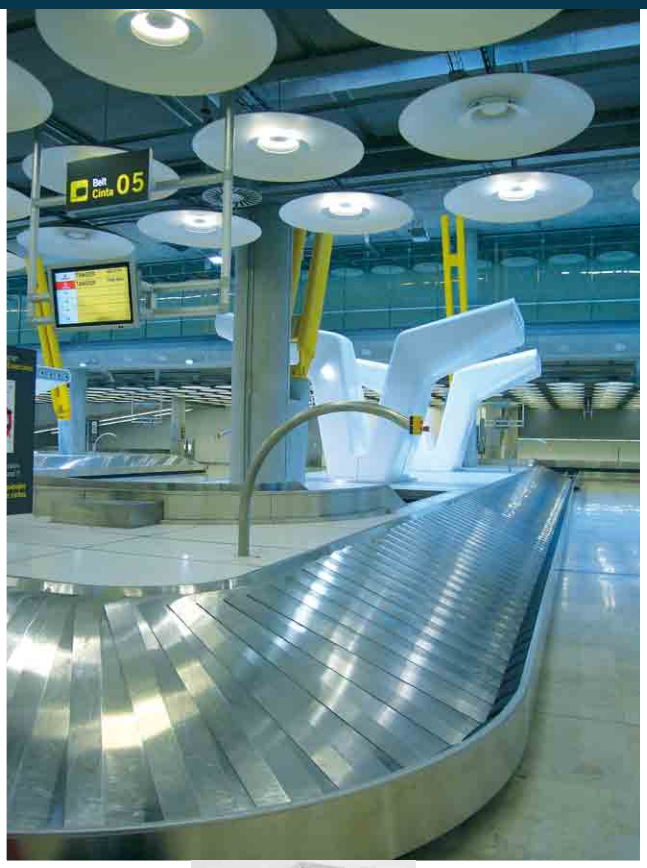
Built-in door power supplies for building technology

Power supplies for LED street lighting technology

Individual

You can find our products and solutions at work no matter which business and industrial sectors you look in - from mechanical and system engineering to drive, materials handling and medical technology, regenerative energies and energy efficiency, building infrastructure, shipbuilding and rail engineering. We focus our efforts on what we can realistically achieve through technology and on maximum product quality. That's why we're able to pass major benefits on to customers across the world, and particularly in our target markets of Europe, Asia and the USA.





Reactors for generating energy in wind turbines

Harmonics filters for drive technology

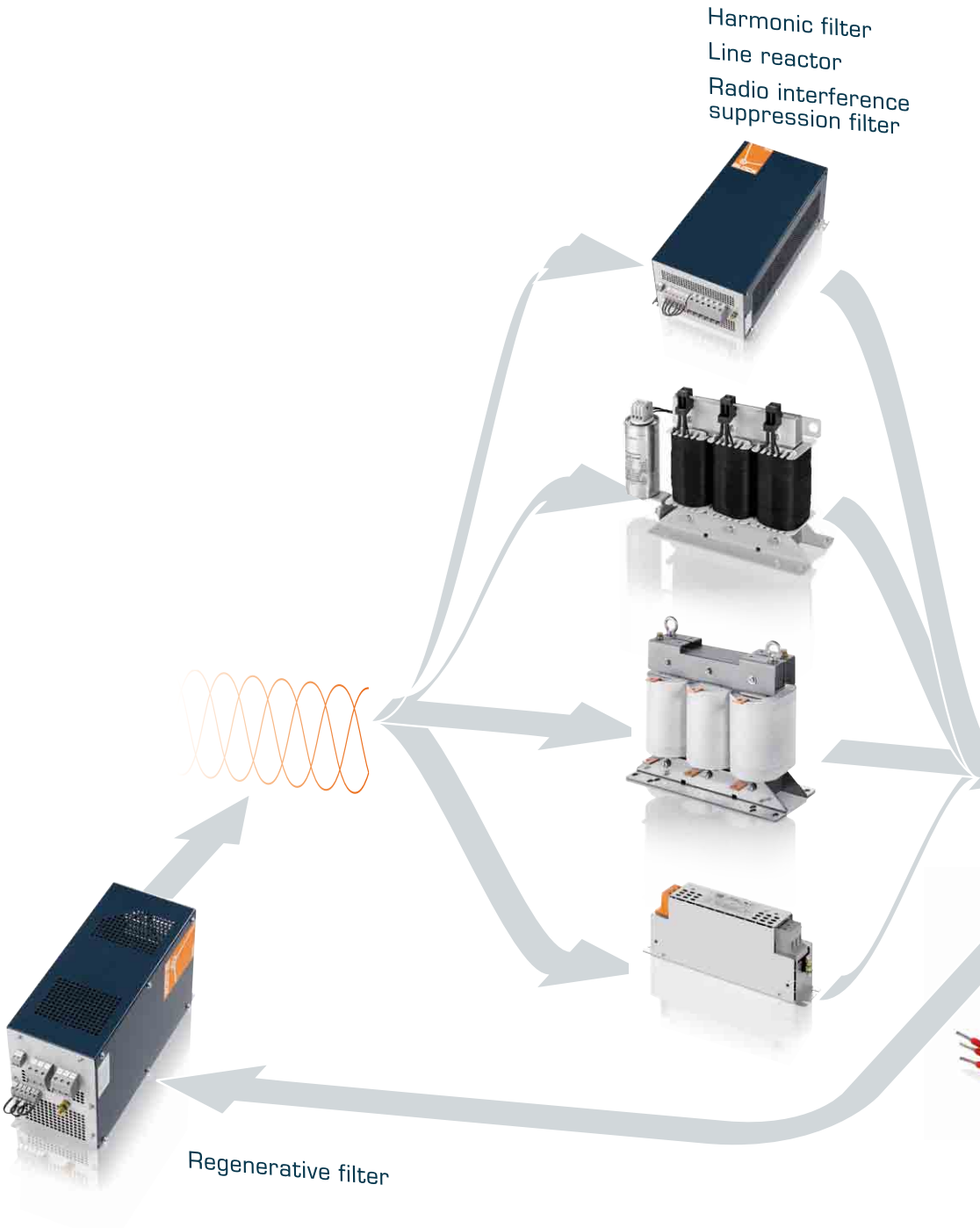
Switched mode power supply for high-intensity floodlights, for lighting up buildings and large events

BLOCK CUSTOM MADE

Reactors for rail engineering

Transformers for the groand power supply at airports

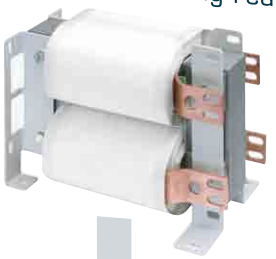
Trouble-free operation



Test laboratory

Voltage stabilizers

DC-intermediate circuit and smoothing reactor



dv/dt reactor
Sinusoidal filter
All-pole sinusoidal filter

OEM installation components

FI

Motor

3.1
3.2
3.3
3.4
3.5

Overview of sections

The products

3.1 Line-side suppression

3.2 Motor-side suppression

3.3 Test laboratory

Catalogue 3

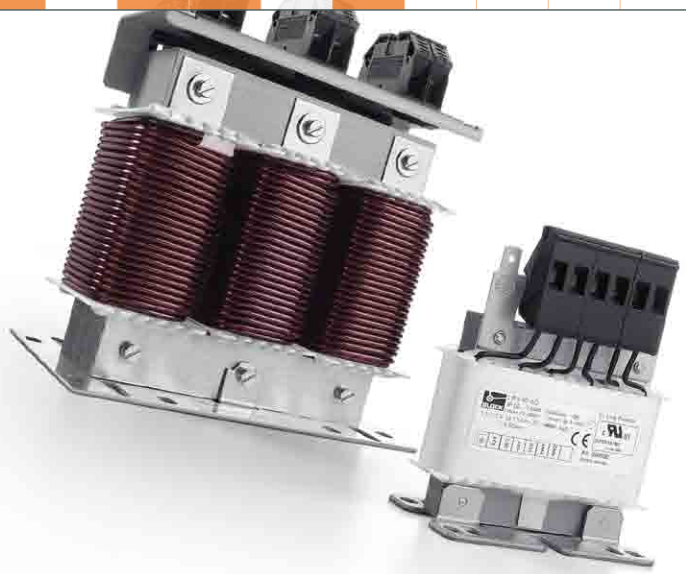
EMC FILTERS/ REACTORS

Overview
Line reactors

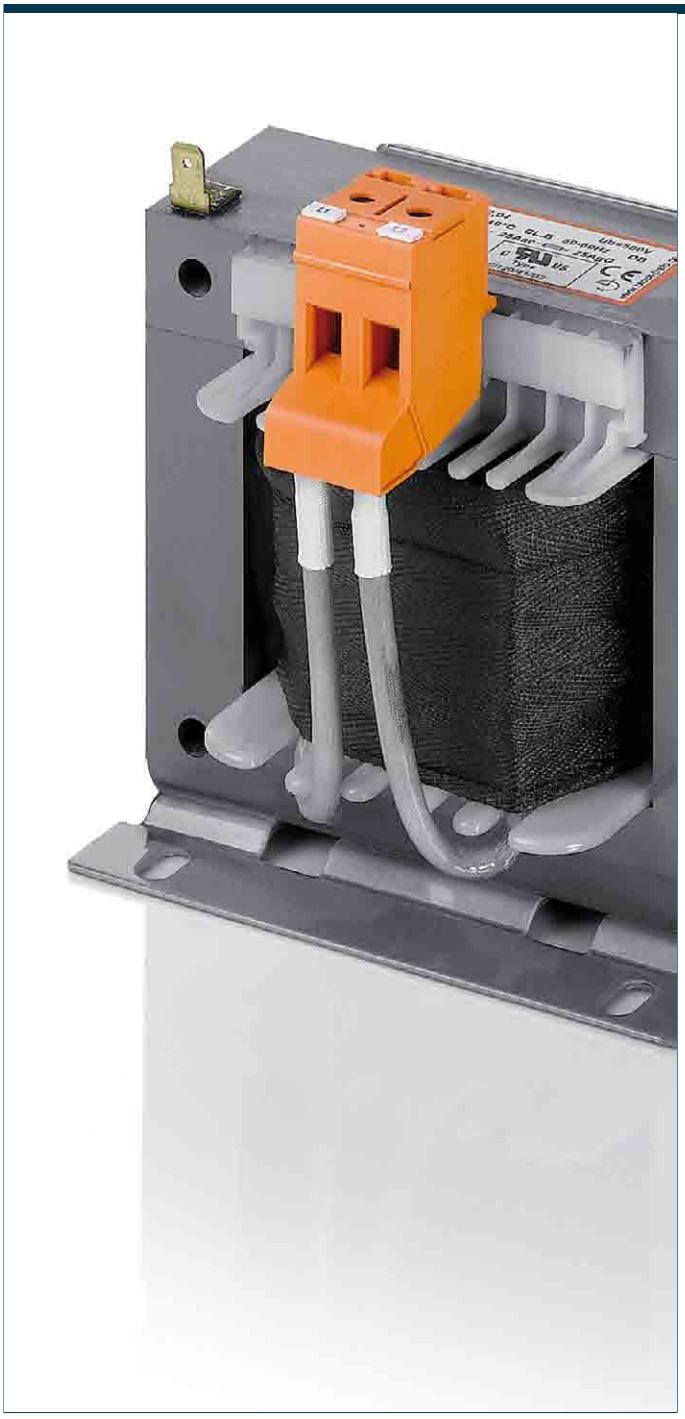
Power at a glance

	Type	Rated input voltage	Voltage drop	Rated current																				
AC 1-phase	NKE	230 or 400 Vac	4 % uK	2 A	4 A	6 A		10 A	16 A	20 A	25 A		35 A	40 A		50 A	63 A		80 A		
	ALR3	3 x 400 – 500 Vac	2 % uK	2 A	4 A	6 A	8 A	10 A	16 A	20 A	25 A	30 A	35 A	40 A	45 A	50 A	63 A				
AC 3-phase	LR3	3 x 400 – 500 Vac	4 % uK	2 A	4 A	6 A	8 A	10 A	16 A	20 A	25 A	30 A	35 A	40 A	45 A	50 A	63 A	70 A	80 A	90 A	
	NKD	3 x 400 – 500 Vac	4 % uK	2 A	4 A	6 A		10 A	16 A	20 A	25 A		35 A	40 A		50 A	63 A		80 A		

																		Page
	100 A																	18
																		31
	100 A	115 A	125 A	160 A	180 A	200 A	250 A	300 A	400 A	500 A	630 A	710 A	800 A	1000 A	1200 A	1400 A	1600 A	22
	100 A		125 A	160 A		200 A												36



Line reactor, single phase
NKE



General Data

Rated voltage 230 or 400 Vac
Rated current 4 - 25 A
Inductance 1.170 - 12.750 mH
Insulation class B
Ambient temperature -10° C to +40° C
Degree of protection IP 00

Advantages

Use as line reactor, commutating reactor or PFC reactor
Power harmonic damping
Starting current limitation
Increases the service life of consumers
Low ripple
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Bridging voltage dips
Peak current limitation

Applications

Line reactor to minimize mains pollution, to reduce the reactive-power components and charging currents in the DC link capacitor and to improve the cos(phi).

Standards

Line- and commutation reactor to
DIN EN 61558-2-20, IEC 61558-2-20, UL 506, CSA 22.2

Certifications

UL 506, CSA 22.2

Line reactor, single phase
NKE

Electrical data

Type	NKE 4/7,33	NKE 4/12,75	NKE 6/4,88	NKE 6/8,50	NKE 10/2,93	NKE 10/5,10
Operating data						
Rated voltage	230 Vac	400 Vac	230 Vac	400 Vac	230 Vac	400 Vac
Voltage drop	9.2 Vac at I rated	16 Vac at I rated	9.2 Vac at I rated	16 Vac at I rated	9.2 Vac at I rated	16 Vac at I rated
Rated current	4 A	4 A	6 A	6 A	10 A	10 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	7.330 mH	12.750 mH	4.880 mH	8.500 mH	2.930 mH	5.100 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	B	B	B	B	B	B
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac
Order numbers						
Order Number	**NKE 4/7,33**	**NKE 4/12,75**	**NKE 6/4,88**	**NKE 6/8,50**	**NKE 10/2,93**	**NKE 10/5,10**

Line reactor, single phase
NKE

Electrical data

Type	NKE 16/1,83	NKE 16/3,19	NKE 20/1,47	NKE 20/2,55	NKE 25/1,17	NKE 25/2,04
Operating data						
Rated voltage	230 Vac	400 Vac	230 Vac	400 Vac	230 Vac	400 Vac
Voltage drop	9.2 Vac at I rated	16 Vac at I rated	9.2 Vac at I rated	16 Vac at I rated	9.2 Vac at I rated	16 Vac at I rated
Rated current	16 A	16 A	20 A	20 A	25 A	25 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	1.830 mH	3.190 mH	1.470 mH	2.550 mH	1.170 mH	2.040 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	B	B	B	B	B	B
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac
Order numbers						
Order Number	**NKE 16/1,83**	**NKE 16/3,19**	**NKE 20/1,47**	**NKE 20/2,55**	**NKE 25/1,17**	**NKE 25/2,04**

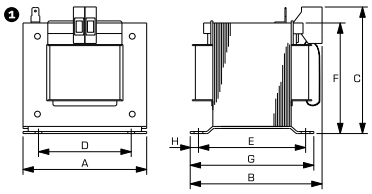
Line reactor, single phase
NKE

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G	H
NKE 4/7,33	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M3	0.60 kg	1	60	66	68	44	39	56	50	5.5
NKE 4/12,75	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M3	0.60 kg	1	60	66	68	44	39	56	50	5.5
NKE 6/4,88	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M3	0.60 kg	1	60	66	68	44	39	56	50	5.5
NKE 6/8,50	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M4	1.40 kg	1	84	78	96	64	52	76	64	6
NKE 10/2,93	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M4	1.40 kg	1	84	78	96	64	52	76	64	6
NKE 10/5,10	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M4	1.40 kg	1	84	78	96	64	52	76	64	6
NKE 16/1,83	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M4	1.40 kg	1	84	78	96	64	52	76	64	6
NKE 16/3,19	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M5	2.20 kg	1	96	88	110	84	65	86	81	7.5
NKE 20/1,47	Screw clamp, 10 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M4	1.40 kg	1	84	87	96	64	52	76	64	6
NKE 20/2,55	Screw clamp, 10 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M5	4.20 kg	1	120	110	130	90	75	116	93	8
NKE 25/1,17	Screw clamp, 10 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M4	1.40 kg	1	84	87	96	64	52	76	64	6
NKE 25/2,04	Screw clamp, 10 mm²	Tab connector, 6.3 x 0.8 mm	Base plate	M5	4.20 kg	1	120	110	130	90	75	116	93	8

Dimension pictures

1



Line Reactor, three phase, 4 % (uK)
LR3

General Data

Rated voltage 3 x 400 Vac
Short circuit voltage (uK) 4 %
Rated current 3 x 2 - 3 x 1600A
Inductance 0.019 - 14.700 mH
Insulation class B or F
Ambient temperature -10° C to +40° C
Degree of protection IP 00

Advantages

Use as line reactor, commutating reactor or PFC reactor
Ensuring the short-circuit voltage of 4 % to the mains
Power harmonic damping
Starting current limitation
Increases the service life of consumers
Low ripple
Bridging voltage dips
Peak current limitation
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Integrated lifting rings
Multifunctional fixing rail

Applications

Line reactor to minimize mains pollution, to reduce the reactive-power components and charging currents in the DC link capacitor and to improve the cos(phi).

Standards

Line- and commutation reactor to
DIN EN 61558-2-20, IEC 61558-2-20, UL 506, CSA 22.2

Certifications

UL 506, CSA 22.2

Line Reactor, three phase, 4 % (uK)
LR3

Electrical data

Type	LR3 40-4/2	LR3 40-4/4	LR3 40-4/6	LR3 40-4/8	LR3 40-4/10	LR3 40-4/16
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac
Rated current	2 A	4 A	6 A	8 A	10 A	16 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	14.700 mH	7.350 mH	4.900 mH	3.680 mH	2.940 mH	1.840 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=B, UL=class 130	IEC=B, UL=class 130	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers						
Order Number	**LR3 40-4/2**	**LR3 40-4/4**	**LR3 40-4/6**	**LR3 40-4/8**	**LR3 40-4/10**	**LR3 40-4/16**

Line Reactor, three phase, 4 % (uK)
LR3

Electrical data

Type	LR3 40-4/20	LR3 40-4/25	LR3 40-4/30	LR3 40-4/35	LR3 40-4/40	LR3 40-4/45
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac
Rated current	20 A	25 A	30 A	35 A	40 A	45 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	1.470 mH	1.180 mH	0.980 mH	0.840 mH	0.740 mH	0.650 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers						
Order Number	**LR3 40-4/20**	**LR3 40-4/25**	**LR3 40-4/30**	**LR3 40-4/35**	**LR3 40-4/40**	**LR3 40-4/45**

Line Reactor, three phase, 4 % (uK)
LR3

Electrical data

Type	LR3 40-4/50	LR3 40-4/63	LR3 40-4/70	LR3 40-4/80	LR3 40-4/90	LR3 40-4/100
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac
Rated current	50 A	63 A	70 A	80 A	90 A	100 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	0.590 mH	0.470 mH	0.420 mH	0.370 mH	0.330 mH	0.290 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers						
Order Number	**LR3 40-4/50**	**LR3 40-4/63**	**LR3 40-4/70**	**LR3 40-4/80**	**LR3 40-4/90**	**LR3 40-4/100**

Line Reactor, three phase, 4 % (uK)
LR3

Electrical data

Type	LR3 40-4/115	LR3 40-4/125	LR3 40-4/160	LR3 40-4/180	LR3 40-4/200	LR3 40-4/250
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac
Rated current	115 A	125 A	160 A	180 A	200 A	250 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	0.250 mH	0.230 mH	0.180 mH	0.160 mH	0.150 mH	0.120 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=H, UL=class 180	IEC=H, UL=class 180	IEC=H, UL=class 180	IEC=B, UL=class 130	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers						
Order Number	**LR3 40-4/115**	**LR3 40-4/125**	**LR3 40-4/160**	**LR3 40-4/180**	**LR3 40-4/200**	**LR3 40-4/250**

Line Reactor, three phase, 4 % (uK)
LR3

Electrical data

Type	LR3 40-4/300	LR3 40-4/400	LR3 40-4/500	LR3 40-4/630	LR3 40-4/710	LR3 40-4/800
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac
Rated current	300 A	400 A	500 A	630 A	710 A	800 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	0.098 mH	0.074 mH	0.059 mH	0.047 mH	0.042 mH	0.037 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=H, UL=class 180	IEC=H, UL=class 180	IEC=H, UL=class 180	IEC=H, UL=class 180
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers						
Order Number	**LR3 40-4/300**	**LR3 40-4/400**	**LR3 40-4/500**	**LR3 40-4/630**	**LR3 40-4/710**	**LR3 40-4/800**

Line Reactor, three phase, 4 % (uK)
LR3

Electrical data

Type	LR3 40-4/1000	LR3 40-4/1200	LR3 40-4/1400	LR3 40-4/1600
Operating data				
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 1100 Vac	3 x 1100 Vac	3 x 1100 Vac	3 x 1100 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac	9.2 Vac	9.2 Vac	9.2 Vac
Rated current	1000 A	1200 A	1400 A	1600 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	0.030 mH	0.025 mH	0.021 mH	0.019 mH
Inductivity deviation	±10%	±10%	±10%	±10%
Approvals				
Approvals	cURus	cURus	cURus	cURus
Environment				
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN
Safety and protection				
Type	open type	open type	open type	open type
Class of Insulation System	IEC=H, UL=class 180	IEC=H, UL=class 180	IEC=H, UL=class 180	IEC=H, UL=class 180
Protection index	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers				
Order Number	**LR3 40-4/1000**	**LR3 40-4/1200**	**LR3 40-4/1400**	**LR3 40-4/1600**

Line Reactor, three phase, 4 % (uK)
LR3

Mechanical data 30

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	d1	d2	E	e1	e2
LR3 40-4/2	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Mounting brackets	M4	0.53 kg	❶	78	56	100	50	65	-	35	27	36
LR3 40-4/4	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Mounting brackets	M4	1.31 kg	❶	96	60	117	56	71	-	44	30	41
LR3 40-4/6	Screw clamp, 4 mm²	Tab connector, 6.3 x 0.8 mm	Mounting brackets	M4	1.45 kg	❶	96	69	117	56	71	-	53	39	50
LR3 40-4/8	Screw clamp, 4 mm²	for M5	Mounting brackets	M4	1.90 kg	❷	120	85	140	90	105	-	35	68	-
LR3 40-4/10	Screw clamp, 4 mm²	for M5	Mounting brackets	M4	2.00 kg	❷	120	85	140	90	105	-	35	68	-
LR3 40-4/16	Screw clamp, 4 mm²	for M5	Mounting brackets	M4	2.70 kg	❷	120	95	140	90	105	-	45	78	-
LR3 40-4/20	Screw clamp, 4 mm²	for M5	Mounting brackets	M5	3.80 kg	❸	155	95	162	113	135	-	45	78	-
LR3 40-4/25	Screw clamp, 10 mm²	for M5	Mounting brackets	M5	5.80 kg	❸	155	110	177	113	135	-	60	93	-
LR3 40-4/30	Screw clamp, 10 mm²	for M5	Mounting brackets	M5	5.85 kg	❸	155	110	177	113	135	-	60	93	-
LR3 40-4/35	Screw clamp, 10 mm²	for M5	Mounting brackets	M5	5.95 kg	❸	155	110	177	113	135	-	60	93	-
LR3 40-4/40	Screw clamp, 10 mm²	for M5	Mounting brackets	M5	6.80 kg	❸	185	102	210	90	136	170	74	50	51
LR3 40-4/45	Screw clamp, 10 mm²	for M5	Mounting brackets	M5	8.25 kg	❸	185	112	210	90	136	170	74	50	51
LR3 40-4/50	Screw clamp, 16 mm²	for M5	Mounting brackets	M5	8.35 kg	❹	185	112	210	90	136	170	62	91	62
LR3 40-4/63	Screw clamp, 16 mm²	for M5	Mounting brackets	M5	9.65 kg	❹	185	122	210	90	135	170	94	70	71
LR3 40-4/70	Screw clamp, 35 mm²	for M6	Mounting brackets	M6	10.80 kg	❹	210	117	240	98	156	175	77	88	105
LR3 40-4/80	Screw clamp, 35 mm²	for M6	Mounting brackets	M6	12.50 kg	❹	210	125	240	106	156	175	85	93	105
LR3 40-4/90	Flat copper	for M8	Mounting brackets	M8	16.00 kg	❺	267	149	200	176	249	-	79	79	-
LR3 40-4/100	Flat copper	for M8	Mounting brackets	M8	19.00 kg	❺	267	173	200	176	249	-	103	103	-
LR3 40-4/115	Flat copper	for M8	Mounting brackets	M8	21.00 kg	❺	291	179	210	185	273	-	107	107	-
LR3 40-4/125	Flat copper	for M8	Mounting brackets	M8	22.00 kg	❺	291	179	210	185	273	-	107	107	-
LR3 40-4/160	Flat copper	for M8	Mounting brackets	M8	25.50 kg	❺	291	189	210	185	273	-	117	117	-
LR3 40-4/180	Flat copper	for M8	Mounting brackets	M8	28.00 kg	❺	291	194	210	185	273	-	121	121	-

Dimension pictures

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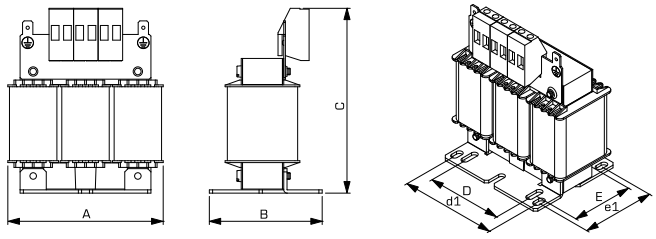

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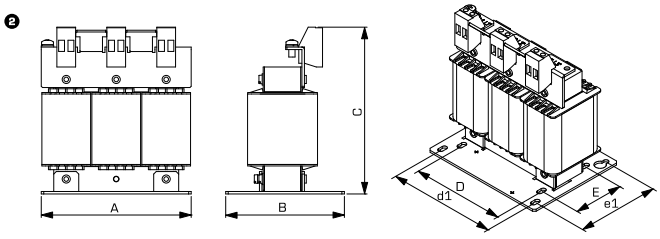

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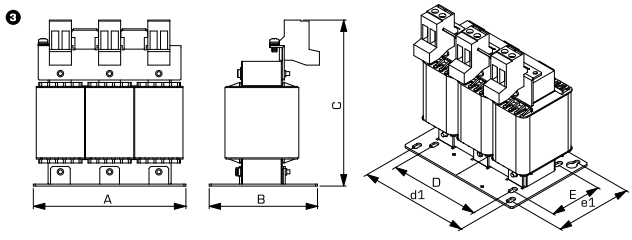

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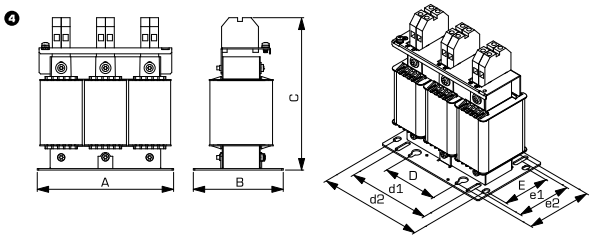

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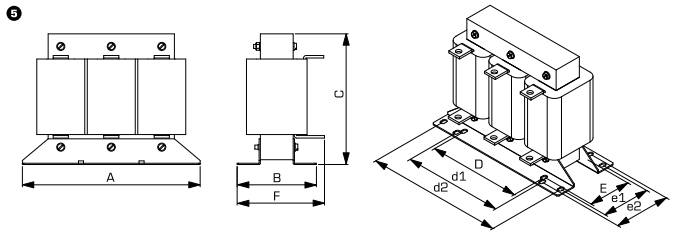

Line Reactor, three phase, 4 % (uK)
LR3

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	d1	d2	E	e1	e2
LR3 40-4/200	Flat copper	for M8	Mounting brackets	M4	32.00 kg	5	352	194	260	224	240	328	102	92	119
LR3 40-4/250	Flat copper	for M8	Mounting brackets	M8	41.00 kg	5	352	207	260	224	240	328	115	105	132
LR3 40-4/300	Flat copper	for M8	Mounting brackets	M8	48.00 kg	5	352	219	260	224	240	328	127	117	144
LR3 40-4/400	Flat copper	for M8	Mounting brackets	M8	56.00 kg	5	352	234	260	224	240	328	142	132	159
LR3 40-4/500	Flat copper	for M8	Mounting brackets	M8	62.00 kg	5	352	245	260	224	240	328	153	143	170
LR3 40-4/630	Flat copper	for M8	Mounting brackets	M8	75.50 kg	5	480	225	380	316	370	450	125	143	135
LR3 40-4/710	Flat copper	for M8	Mounting brackets	M8	102.00 kg	5	480	235	380	316	370	450	135	153	145
LR3 40-4/800	Flat copper	for M10	Mounting brackets	M10	115.00 kg	5	480	250	380	316	370	450	150	153	145
LR3 40-4/1000	Flat copper	for M10	Mounting brackets	M10	145.00 kg	5	480	295	380	316	370	450	195	198	190
LR3 40-4/1200	Flat copper	for M10	Mounting brackets	M10	0.00 kg	5	555	330	445	356	430	515	180	210	180
LR3 40-4/1400	Flat copper	for M10	Mounting brackets	M10	0.00 kg	5	555	360	445	356	430	515	210	240	210
LR3 40-4/1600	Flat copper	for M10	Mounting brackets	M10	0.00 kg	5	555	380	445	356	430	515	230	260	230

Dimension pictures

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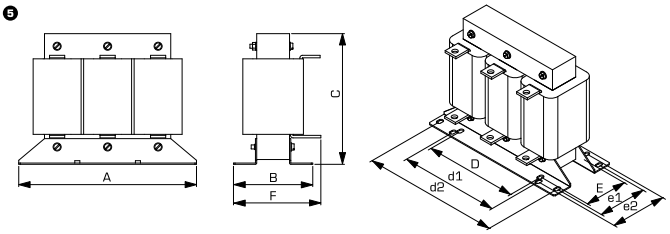
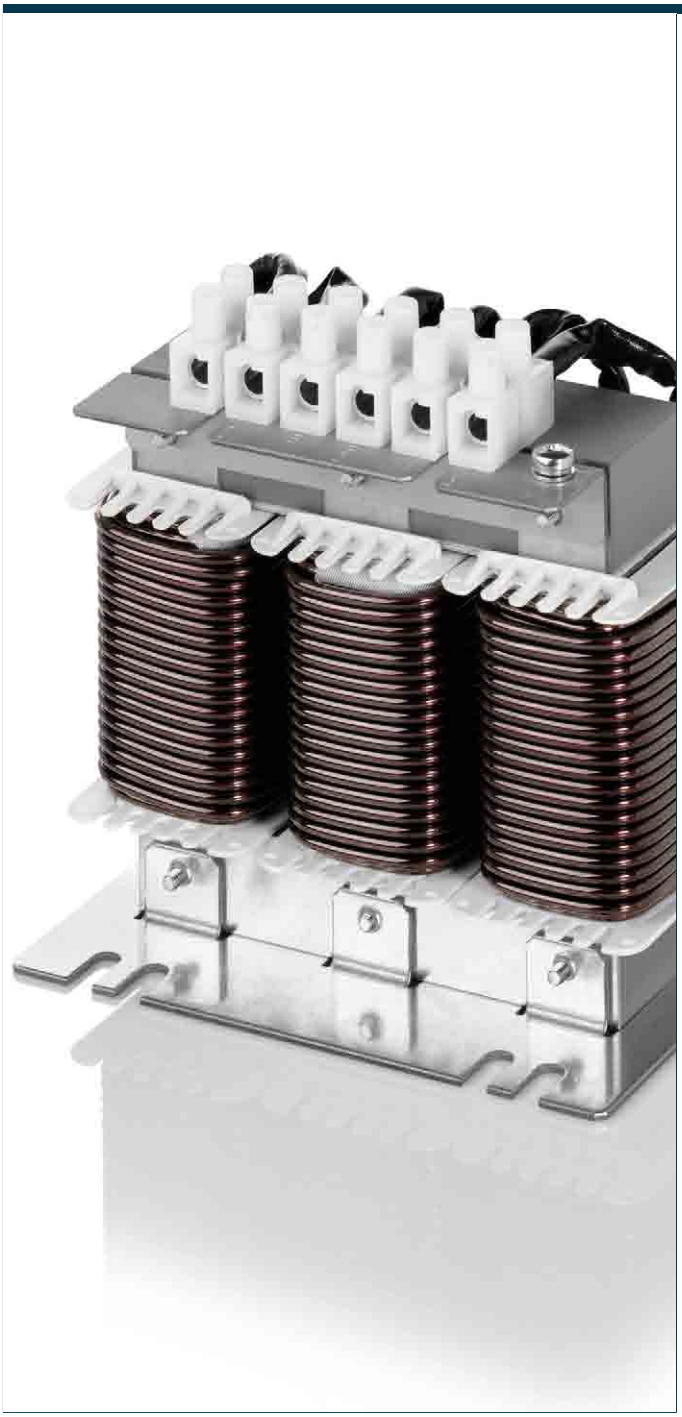


Line Reactor, three phase, 2 % (uK)
ALR3



General Data

Rated voltage 3 x 400 Vac
Short circuit voltage (uK) 2 %
Rated current 3 x 2 - 3 x 63 A
Inductivity 0.650 - 6.100 mH
Insulation class (IEC) F
Ambient temperature -10° C to +40° C
Protection index IP 00
Multifunctional mounting brackets

Advantages

Application as Line reactor, Commutation Reactor or PFC-reactor
Guarantee of short circuit voltage of 2% to the grid
Attenuation of harmonics
Limitation of starting current
Extending the lifetime of connected units
Minimum ripple factor
Briding voltage dips
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Limitation of peak current
Multifunctional fixing rail

Applications

Line reactor to minimize mains pollution, to reduce the reactive-power components and charging currents in the DC link capacitor and to improve the cos(phi).

Standards

Line- and commutation reactor to
DIN EN 61558-2-20, IEC 61558-2-20, UL 506, CSA 22.2

Certifications

UL 506, CSA 22.2

Line Reactor, three phase, 2 % (uK)
ALR3

Electrical data

Type	ALR3 40-2/2	ALR3 40-2/4	ALR3 40-2/6	ALR3 40-2/8	ALR3 40-2/10	ALR3 40-2/16
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	2.0 %	2.0 %	2.0 %	2.0 %	2.0 %	2.0 %
Voltage drop	4.6 Vac	4.6 Vac	4.6 Vac	4.6 Vac	4.6 Vac	4.6 Vac
Rated current	2 A	4 A	6 A	8 A	10 A	16 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	6.100 mH	3.050 mH	2.030 mH	1.530 mH	1.220 mH	0.760 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=B, UL=class 130	IEC=B, UL=class 130	IEC=B, UL=class 130	IEC=B, UL=class 130	IEC=B, UL=class 130	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers						
Order Number	**ALR3 40-2/2**	**ALR3 40-2/4**	**ALR3 40-2/6**	**ALR3 40-2/8**	**ALR3 40-2/10**	**ALR3 40-2/16**

Line Reactor, three phase, 2 % (uK)
ALR3

Electrical data

Type	ALR3 40-2/20	ALR3 40-2/25	ALR3 40-2/30	ALR3 40-2/35	ALR3 40-2/40	ALR3 40-2/45
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	2.0 %	2.0 %	2.0 %	2.0 %	2.0 %	2.0 %
Voltage drop	4.6 Vac	4.6 Vac	4.6 Vac	4.6 Vac	4.6 Vac	4.6 Vac
Rated current	20 A	25 A	30 A	35 A	40 A	45 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	0.610 mH	0.490 mH	0.410 mH	0.350 mH	0.310 mH	0.270 mH
Inductivity deviation	±10%	±10%	±10%	±10%	±10%	±10%
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=H, UL=class 180
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac	4000 Vac
Order numbers						
Order Number	**ALR3 40-2/20**	**ALR3 40-2/25**	**ALR3 40-2/30**	**ALR3 40-2/35**	**ALR3 40-2/40**	**ALR3 40-2/45**

Line Reactor, three phase, 2 % (uK)
ALR3

Electrical data

Type	ALR3 40-2/50	ALR3 40-2/63
Operating data		
Rated voltage	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	2.0 %	2.0 %
Voltage drop	4.6 Vac	4.6 Vac
Rated current	50 A	63 A
Rated frequency	50 - 60 Hz	50 - 60 Hz
Inductivity	0.240 mH	0.190 mH
Inductivity deviation	±10%	±10%
Approvals		
Approvals	cURus	cURus
Environment		
Ambient temperature	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN
Safety and protection		
Type	open type	open type
Class of Insulation System	IEC=H, UL=class 180	IEC=H, UL=class 180
Protection index	IP 00	IP 00
Safety class (prepared)	I	I
Test voltage	4000 Vac	4000 Vac
Order numbers		
Order Number	**ALR3 40-2/50**	**ALR3 40-2/63**

Line Reactor, three phase, 2 % (uK)
ALR3

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D1	D2	E	F
ALR3 40-2/2	Europe terminal, 2.5 mm²	for M5	Mounting brackets	M6	0.53 kg	❶	78	54	87	63.5	38	38	6.5
ALR3 40-2/4	Europe terminal, 2.5 mm²	for M5	Mounting brackets	M6	0.53 kg	❶	78	54	87	63.5	38	38	6.5
ALR3 40-2/6	Europe terminal, 2.5 mm²	for M5	Mounting brackets	M6	1.10 kg	❶	78	64	87	63.5	38	50.8	6.5
ALR3 40-2/8	Europe terminal, 6 mm²	for M5	Mounting brackets	M6	1.30 kg	❶	96	63.5	107	63.5	38	38	6.5
ALR3 40-2/10	Europe terminal, 6 mm²	for M5	Mounting brackets	M6	1.50 kg	❶	96	76	107	63.5	38	50.8	6.5
ALR3 40-2/16	Europe terminal, 6 mm²	for M5	Mounting brackets	M6	2.00 kg	❶	127	76	125	102	76.2	38	6.5
ALR3 40-2/20	Europe terminal, 6 mm²	for M5	Mounting brackets	M6	2.00 kg	❶	127	76	125	102	76.2	38	6.5
ALR3 40-2/25	Europe terminal, 6 mm²	for M5	Mounting brackets	M6	2.90 kg	❶	127	89	125	102	76.2	50.8	6.5
ALR3 40-2/30	Europe terminal, 10 mm²	for M5	Mounting brackets	M6	2.90 kg	❶	127	89	132	102	76.2	50.8	6.5
ALR3 40-2/35	Europe terminal, 10 mm²	for M5	Mounting brackets	M6	2.90 kg	❶	127	89	132	102	76.2	50.8	6.5
ALR3 40-2/40	Europe terminal, 10 mm²	for M5	Mounting brackets	M6	3.80 kg	❶	152.5	101.5	163	114	88.9	76.2	6.5
ALR3 40-2/45	Europe terminal, 10 mm²	for M5	Mounting brackets	M6	3.80 kg	❶	152.5	101.5	163	114	88.9	76.2	6.5
ALR3 40-2/50	Europe terminal, 16 mm²	for M5	Mounting brackets	M6	5.80 kg	❶	152.5	101.5	163	114	88.9	88.9	6.5
ALR3 40-2/63	Europe terminal, 16 mm²	for M5	Mounting brackets	M6	6.80 kg	❶	178	101.5	188	127	102	88.9	6.5

Dimension pictures

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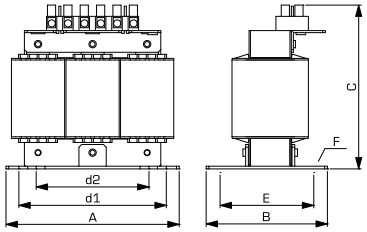
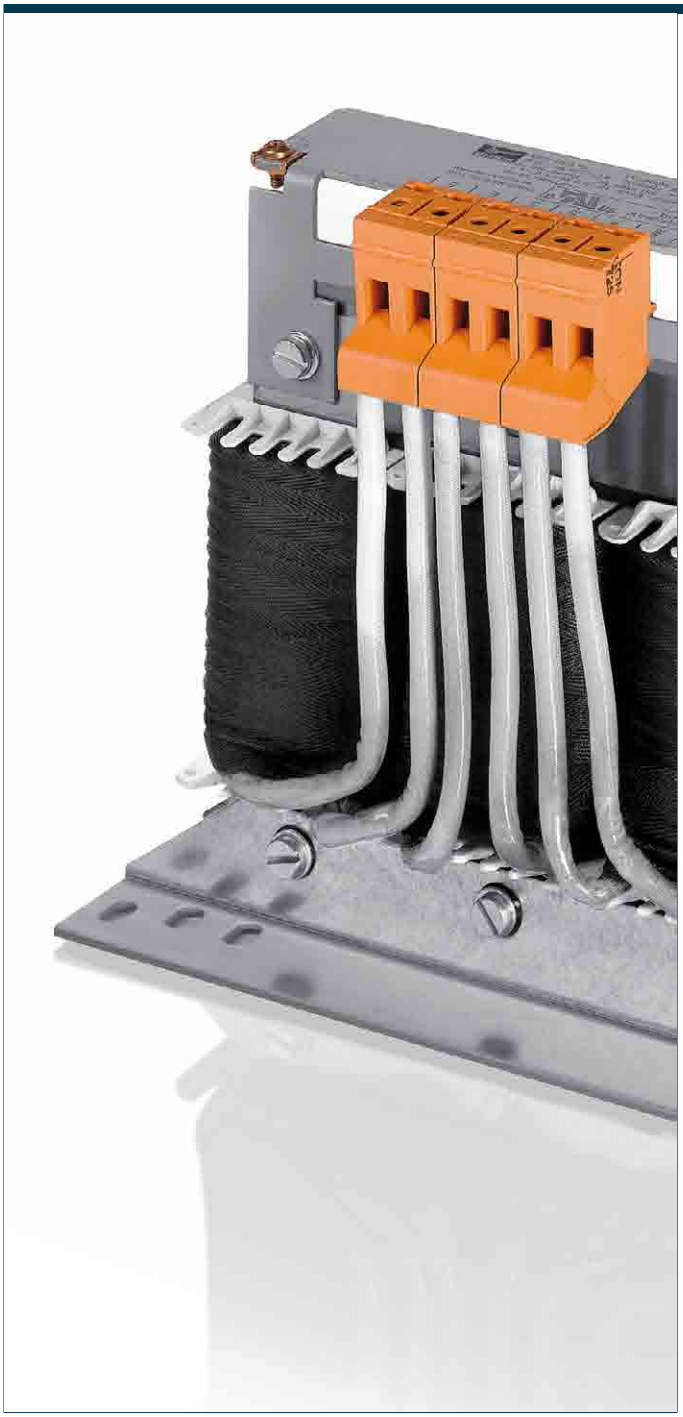


Line reactor, three phase, 4 % (uK)
NKD



General Data

Rated voltage 3 x 400 Vac
Short-circuit voltage (uK) 4 %
Rated current 3 x 2 - 3 x 200 A
Inductance 0.015 - 14.650 mH
Insulation class F
Ambient temperature -10° C to +40° C
Degree of protection IP 00

Advantages

Use as line reactor, commutating reactor or PFC reactor
Ensuring the short-circuit voltage of 4 % to the mains
Power harmonic damping
Starting current limitation
Increases the service life of consumers
Low ripple
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Bridging voltage dips
Peak current limitation

Applications

Line reactor to minimize mains pollution, to reduce the reactive-power components and charging currents in the DC link capacitor and to improve the cos(phi).

Standards

Line- and commutation reactor to
DIN EN 61558-2-20, IEC 61558-2-20, UL 506, CSA 22.2

Certifications

UL 506, CSA 22.2

Line reactor, three phase, 4 % (uK)
NKD

Electrical data

Type	NKD 2/14,65	NKD 4/7,33	NKD 6/4,88	NKD 10/2,93	NKD 16/1,83	NKD 20/1,47
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated
Rated current	3 x 2 A	3 x 4 A	3 x 6 A	3 x 10 A	3 x 16 A	3 x 20 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	14.650 mH	7.330 mH	4.880 mH	2.930 mH	1.830 mH	1.470 mH
Inductivity deviation	±10 %	±10 %	±10 %	±10 %	±10 %	±10 %
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac
Order numbers						
Order Number	**NKD 2/14,65**	**NKD 4/7,33**	**NKD 6/4,88**	**NKD 10/2,93**	**NKD 16/1,83**	**NKD 20/1,47**

Line reactor, three phase, 4 % (uK)
NKD

Electrical data

Type	NKD 25/1,17	NKD 35/0,84	NKD 40/0,73	NKD 50/0,59	NKD 63/0,49	NKD 80/0,37
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated
Rated current	3 x 25 A	3 x 35 A	3 x 40 A	3 x 50 A	3 x 63 A	3 x 80 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	1.170 mH	0.840 mH	0.730 mH	0.590 mH	0.470 mH	0.370 mH
Inductivity deviation	±10 %	±10 %	±10 %	±10 %	±10 %	±10 %
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN	AN	AN
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac	2500 Vac
Order numbers						
Order Number	**NKD 25/1,17**	**NKD 35/0,84**	**NKD 40/0,73**	**NKD 50/0,59**	**NKD 63/0,49**	**NKD 80/0,37**

Line reactor, three phase, 4 % (uK)
NKD

Electrical data

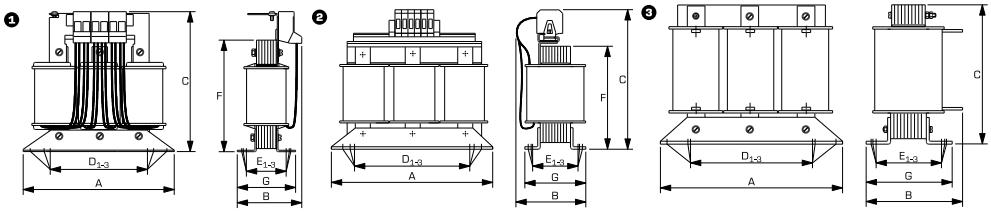
Type	NKD 100/0,29	NKD 125/0,23	NKD 160/0,18	NKD 200/0,15
Operating data				
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated voltage (IEC)	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac	3 x 690 Vac
Rated voltage (UL)	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac	3 x 600 Vac
Short circuit voltage uK	4 %	4 %	4 %	4 %
Voltage drop	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated	9.2 Vac at I rated
Rated current	3 x 100 A	3 x 125 A	3 x 160 A	3 x 200 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Inductivity	0.290 mH	0.230 mH	0.180 mH	0.150 mH
Inductivity deviation	±10 %	±10 %	±10 %	±10 %
Approvals				
Approvals	cURus	cURus	cURus	cURus
Environment				
Ambient temperature	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C	-10° C to +40° C
Cooling method	AN	AN	AN	AN
Safety and protection				
Type	open type	open type	open type	open type
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I
Test voltage	2500 Vac	2500 Vac	2500 Vac	2500 Vac
Order numbers				
Order Number	**NKD 100/0,29**	**NKD 125/0,23**	**NKD 160/0,18**	**NKD 200/0,15**

Line reactor, three phase, 4 % (uK)
NKD

Mechanical data 30

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D1	D2	D3	E1	E2	E3	F	G
NKD 2/14,65	Screw clamp, 4 mm²	for M4	Mounting brackets	M4	2.10 kg	❶	148	76	151	90	100	136	39	45	49	110	69
NKD 4/7,33	Screw clamp, 4 mm²	for M4	Mounting brackets	M4	2.10 kg	❶	148	76	151	90	100	136	39	45	49	110	69
NKD 6/4,88	Screw clamp, 4 mm²	for M4	Mounting brackets	M4	2.10 kg	❶	148	76	151	90	100	136	39	45	49	110	69
NKD 10/2,93	Screw clamp, 4 mm²	for M4	Mounting brackets	M4	2.10 kg	❶	148	76	151	90	100	136	39	45	49	110	69
NKD 16/1,83	Screw clamp, 10 mm²	for M4	Mounting brackets	M4	3.80 kg	❶	178	91	175	113	130	166	50	57	55	133	75
NKD 20/1,47	Screw clamp, 10 mm²	for M4	Mounting brackets	M4	3.80 kg	❶	178	91	175	113	130	166	50	57	55	133	75
NKD 25/1,17	Screw clamp, 10 mm²	for M4	Mounting brackets	M4	5.80 kg	❶	178	106	175	113	130	166	65	72	70	133	90
NKD 35/0,84	Screw clamp, 10 mm²	for M4	Mounting brackets	M6	6.50 kg	❶	219	105	201	136	170	201	57	58	71	162	101
NKD 40/0,73	Screw clamp, 10 mm²	for M4	Mounting brackets	M6	6.50 kg	❶	219	105	201	136	170	201	57	58	71	162	101
NKD 50/0,59	Screw clamp, 16 mm²	for 16 mm²	Mounting brackets	M6	13.50 kg	❷	267	115	265	176	180	249	71	98	79	200	115
NKD 63/0,49	Screw clamp, 16 mm²	for 16 mm²	Mounting brackets	M6	13.50 kg	❷	267	115	265	176	180	249	71	98	79	200	115
NKD 80/0,37	Flat copper	for M8	Mounting brackets	M6	17.70 kg	❸	267	162	200	176	180	249	95	122	103	-	139
NKD 100/0,29	Flat copper	for M8	Mounting brackets	M6	17.70 kg	❸	267	162	200	176	180	249	95	122	103	-	139
NKD 125/0,23	Flat copper	for M8	Mounting brackets	M8	19.50 kg	❸	316	148	227	200	215	292	76	100	98	-	138
NKD 160/0,18	Flat copper	for M8	Mounting brackets	M8	23.00 kg	❸	352	162	265	224	240	328	78	104	88	-	128
NKD 200/0,15	Flat copper	for M8	Mounting brackets	M8	26.00 kg	❸	352	162	265	224	240	328	94	120	104	-	144

Dimension pictures



Harmonic circuit filter reactor
FKD

General Data

Rated input voltage 3 x 400 Vac
For reactive power 25 - 50 kVAr
Detuning factor 7 - 14 %
Insulation class F
Maximum ambient temperature 40 °C
Degree of protection IP 00

Advantages

No overloading of the capacitors
Improvement of the impedance behaviour
Low inductance tolerance
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Linear inductance development to far above the rated current
Thermal design for continuous duty in the event of mains operation and harmonics

Applications

Filter circuit reactor for choking idle current compensation installations.

Standards

Filter circuit reactor in accordance with EN 61558 Part 1, 61558 Part 20, UL 506, CSA 22.2

Certifications

UL 506, CSA 22.2

Harmonic circuit filter reactor
FKD

Electrical data

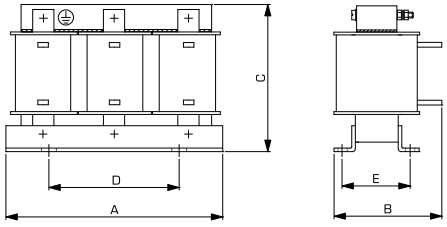
Type	FKD 25/7	FKD 25/7/T	FKD 25/14	FKD 25/14/T	FKD 50/7	FKD 50/7/T
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
for reactive power	25 kVAr	25 kVAr	25 kVAr	25 kVAr	50 kVAr	50 kVAr
Current pere phase at 50 Hz (I)	38.2 A	38.2 A	38.2 A	38.2 A	79.4 A	79.4 A
Inductivity linear to (at ≥95 % L; Im)	55 A	55 A	55 A	55 A	95 A	95 A
Inductivity per phase (L)	1.530 mH	1.530 mH	3.320 mH	3.320 mH	0.767 mH	0.787 mH
Tolerance	±5 %	±5 %	±5 %	±5 %	±5 %	±5 %
Filtering factor	p = 0.07 (7 %)	p = 0.07 (7 %)	p = 0.14 (14 %)	p = 0.14 (14 %)	p = 0.07 (7 %)	p = 0.07 (7 %)
Power loss	108.0 W	108.0 W	150.0 W	150.0 W	168.0 W	168.0 W
Temperature control	no	yes	no	yes	no	yes
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	F	F	F	F	F	F
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers						
Order Number	**FKD 25/7**	**FKD 25/7/T**	**FKD 25/14**	**FKD 25/14/T**	**FKD 50/7**	**FKD 50/7/T**

Mechanical data

Terminal and mounting						
Fixing method	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets
Fixing screws	M8	M8	M8	M8	M8	M8
Connections phase/N	Flat copper	Flat copper	Flat copper	Flat copper	Flat copper	Flat copper
Connections PE	Bolt, M8	Bolt, M8	Bolt, M8	Bolt, M8	Bolt, M8	Bolt, M8
Measures and weights						
Weight	20.00 kg	20.00 kg	25.00 kg	25.00 kg	34.00 kg	34.00 kg
Dimension picture (in mm)	❷	❷	❷	❷	❷	❷
A	220	220	264	264	300	300
B	155	155	155	155	200	200
C	210	210	230	230	270	270
D	176	176	215	215	255	255
E	94	94	114	114	145	145

Dimension pictures

❷



Harmonic circuit filter reactor
FKD

Electrical data

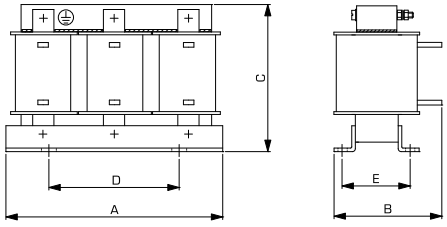
Type	FKD 50/14	FKD 50/14/T
Operating data		
Rated voltage	3 x 400 Vac	3 x 400 Vac
Rated frequency	50 Hz	50 Hz
for reactive power	50 kVAr	50 kVAr
Current pere phase at 50 Hz (I)	76.5 A	76.5 A
Inductivity linear to (at ≥95 % L; Im)	95 A	95 A
Inductivity per phase (L)	1.660 mH	0.767 mH
Tolerance	±5 %	±5 %
Filtering factor	p = 0.14 (14 %)	p = 0.14 (14 %)
Power loss	201.0 W	201.0 W
Temperature control	no	yes
Approvals		
Approvals	cURus	cURus
Environment		
Ambient temperature max.	40 °C	40 °C
Safety and protection		
Type	open type	open type
Class of Insulation System	F	F
Protection index	IP 00	IP 00
Safety class (prepared)	I	I
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers		
Order Number	**FKD 50/14**	**FKD 50/14/T**

Mechanical data

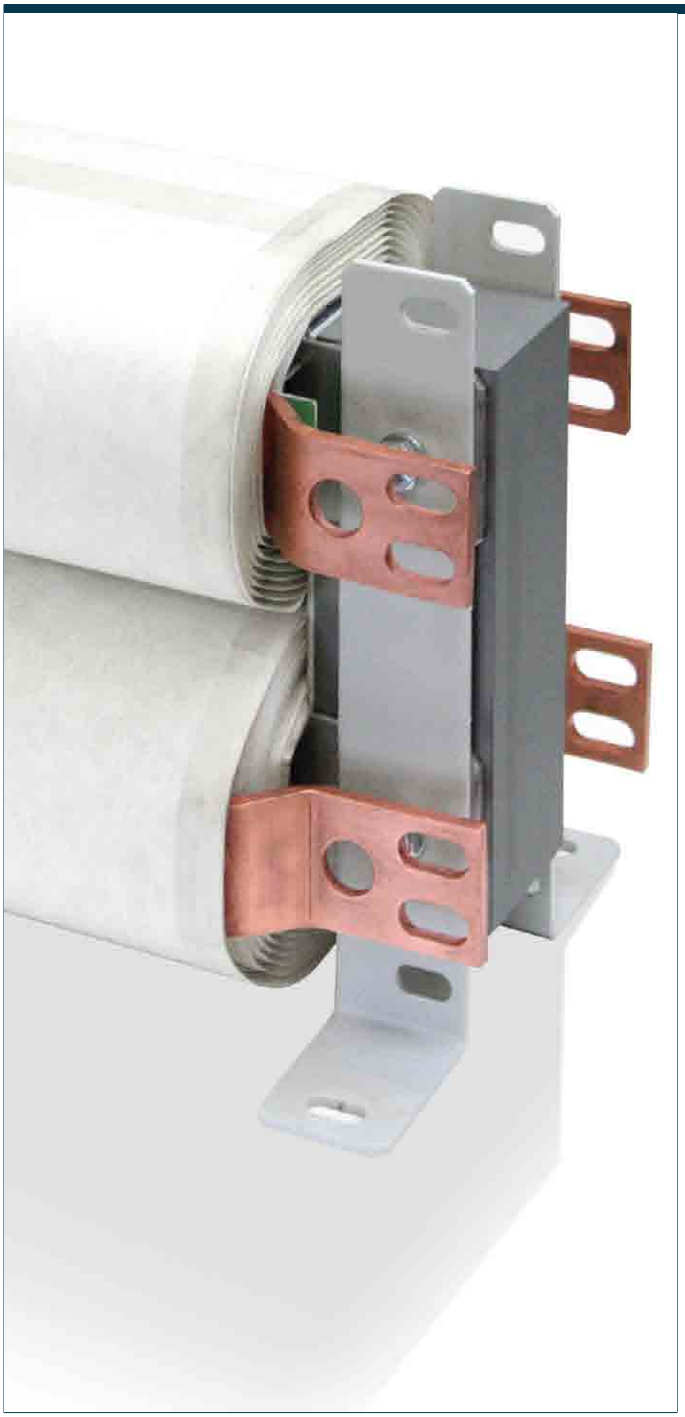
Terminal and mounting		
Fixing method	Mounting brackets	Mounting brackets
Fixing screws	M8	M8
Connections phase/N	Flat copper	Flat copper
Connections PE	Bolt, M8	Bolt, M8
Measures and weights		
Weight	45.00 kg	45.00 kg
Dimension picture (in mm)	❷	❷
A	300	300
B	215	215
C	270	270
D	255	255
E	160	160

Dimension pictures

❷



DC intermediate circuit and smoothing reactor
DCD



General Data

Rated voltage 0 - 1500 Vac
Rated current 0 - 1500 A
Superimposed ripple at 100 - 5000 Hz

Advantages

Smooting of rectified signals
Suppression of the residual ripple
Reduction of the harminics

Applications

For use in the converter link circuit. In converter stages of wind power or solar installations.

Further information on request.

Overview Harmonic filter

Power at a glance

	Type	Rated voltage	THD-I	5,5 kW	11 kW	15 kW	20 kW	26 kW	45 kW	55 kW	90 kW	110 kW	132 kW	160 kW	230 kW	260 kW	250 kW	Page
AC 3-phase	HF1K	3 x 400 Vac	<8 %	10 A	19 A	26 A	35 A	43 A	72 A	101 A	144 A							48
	HFM-FB	3 x 400 Vac	5 %	10 A	19 A	26 A	35 A	43 A	72 A	101 A	144 A	180 A	217 A	289 A	325 A	370 A	433 A	52
		3 x 480 Vac		10 A	19 A	26 A	35 A	43 A	72 A	101 A	144 A	180 A	217 A	289 A	325 A	370 A		


Power Quality
4RB2 020-5AB47
SH
2.00 kvar
1.69 kvar
1.49 kvar
ssure disconnector
ge before handling

Harmonic Filter
HF1K

General Data

Rated voltage 3 x 400 Vac
Rated current 3 x 10.00 - 3 x 144.00 A
THD-I 8 % in rated operation
Load rated capacity 5.5 - 90 kW
Insulation class H
Ambient temperature -10° C to +40° C
Degree of protection IP 00

Advantages

Sinusoidal current consumption from the mains in devices with uncontrolled B6U diode rectifiers
Compliance with EN 61000-3-2, EN 61000-3-12
Support in the compliance with IEEE 519, D-A-CH-CZ
cos(phi)>0,95 at rated current
Hardly any intermediate circuit voltage dip by comparison with a 4 % uK line reactor
Harmonic filter with minimum capacitive idle reactive power
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation
Operation at 50 - 60 Hz possible
Use of the HF1K as a central hum filter for multiple converters possible

Applications

Harmonic filter module to ensure sinusoidal mains currents, reduction of mains harmonic currents, increase in system service life and system reliability and compliance with power quality standards such as IEEE 519, TEC 61000-3-2, IEC 61000-3-12.

Standards

Harmonic filter in accordance with
EN 61558 Part 1, EN 61558 Part 20, UL 508 17th Ed., CSA 22.2 No. 14-10

Certifications

UL 506, CSA 22.2

Harmonic Filter
HF1K

Electrical data

Type	HF1K 7-400	HF1K 13-400	HF1K 18-400	HF1K 24-400	HF1K 30-400	HF1K 50-400
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	360-440 Vac	360-440 Vac	360-440 Vac	360-440 Vac	360-440 Vac	360-440 Vac
Rated current	3 x 10 A	3 x 19 A	3 x 26 A	3 x 35 A	3 x 43 A	3 x 72 A
Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
THD-I	8 % (nominal load)	8 % (nominal load)	8 % (nominal load)	8 % (nominal load)	8 % (nominal load)	8 % (nominal load)
Rated load power*	5.5 kW	11 kW	11 kW	20 kW	26 kW	45 kW
Description of the load	Symmetrical loading by converters with B6U input rectifiers	Symmetrical loading by converters with B6U input rectifiers	Symmetrical loading by converters with B6U input rectifiers	Symmetrical loading by converters with B6U input rectifiers	Symmetrical loading by converters with B6U input rectifiers	Symmetrical loading by converters with B6U input rectifiers
Overrating Capacity	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.
Power loss	90.0 W	160.0 W	180.0 W	230.0 W	290.0 W	412.0 W
Efficiency	99 %	99 %	99 %	99 %	99 %	99 %
	1.7 kVAr	1.8 kVAr	2.9 kVAr	3.8 kVAr	4.9 kVAr	10.0 kVAr
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10° C to +40° C, without condensation	-10° C to +40° C, without condensation	-10° C to +40° C, without condensation	-10° C to +40° C, without condensation	-10° C to +40° C, without condensation	-10° C to +40° C, without condensation
Cooling method	AN	AN	AN	AN	AN	AN
MTBF @ 50°C/500 V (Mil-HB-217F)	>500.000 h @ 40°C/400Vac	>500.000 h @ 40°C/400Vac	>500.000 h @ 40°C/400Vac	>500.000 h @ 40°C/400Vac	>500.000 h @ 40°C/400Vac	>500.000 h @ 40°C/400Vac
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	H	H	H	H	H	H
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class	I	I	I	I	I	I
Notes						
*	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed
Order numbers						
Order Number	**HF1K 7-400**	**HF1K 13-400**	**HF1K 18-400**	**HF1K 24-400**	**HF1K 30-400**	**HF1K 50-400**

Harmonic Filter
HF1K

Electrical data

Type	HF1K 70-400	HF1K 100-400
Operating data		
Rated voltage	3 x 400 Vac	3 x 400 Vac
Voltage range	360-440 Vac	360-440 Vac
Rated current	3 x 101 A	3 x 144 A
Rated frequency	50 Hz	50 Hz
THD-I	8 % (nominal load)	8 % (nominal load)
Rated load power*	63 kW	90 kW
Description of the load	Symmetrical loading by converters with B6U input rectifiers	Symmetrical loading by converters with B6U input rectifiers
Overrating Capacity	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.
Power loss	550.0 W	750.0 W
Efficiency	99 %	99 %
	13.5 kVAr	19.0 kVAr
Approvals		
Approvals	cURus	cURus
Environment		
Ambient temperature	-10° C to +40° C, without condensation	-10° C to +40° C, without condensation
Cooling method	AN	AN
MTBF @ 50°C/500 V (Mil-HB-217F)	>500.000 h @ 40°C/400Vac	>500.000 h @ 40°C/400Vac
Safety and protection		
Type	open type	open type
Class of Insulation System	H	H
Protection index	IP 00	IP 00
Safety class	I	I
Notes		
*	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed
Order numbers		
Order Number	**HF1K 70-400**	**HF1K 100-400**

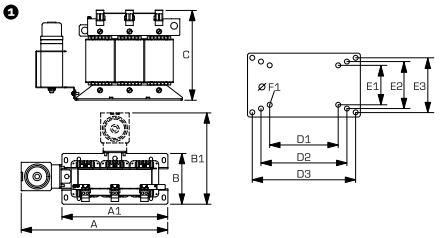
Harmonic Filter
HF1K

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	A1	B	B1	C	D1	D2	D3	E1	E2	E3	F1
HF1K 7-400	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	14.00 kg	❶	375	260	115	230	235	175	225	-	85	84	-	6.5
HF1K 13-400	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	28.00 kg	❶	440	325	160	275	270	200	215	292	90	114	112	9
HF1K 18-400	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	31.00 kg	❶	425	325	175	272	270	200	215	292	102	126	124	9
HF1K 24-400	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	36.20 kg	❶	460	360	265	215	315	224	240	328	107	133	117	9
HF1K 30-400	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	59.10 kg	❶	545	420	165	290	350	264	310	388	125	125	115	9
HF1K 50-400	Copper tab, M8 bolt	Bolt, M8	Mounting lugs	75.50 kg	❷	545	420	192	320	315	264	310	388	155	155	145	9
HF1K 70-400	Copper tab, M8 bolt	Bolt, M8	Mounting lugs	125.00 kg	❷	685	560	223	348	460	356	430	516	156	182	154	13.5
HF1K 100-400	Copper tab, M8 bolt	Bolt, M8	Mounting lugs	163.00 kg	❷	685	560	250	375	460	356	430	516	182	219	181	13.5

Dimension pictures

❶



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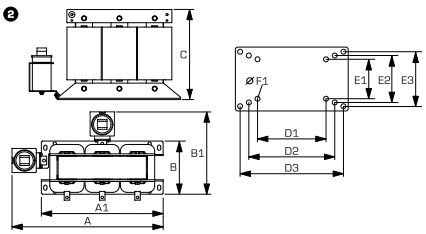


The placement of the capacitor between the two positions shown is arbitrary and can subsequently be adapted to the conditions of the installation.

Harmonic Filter
HFM-FB

General Data

Rated voltage 3 x 400 - 3 x 480 Vac
Rated current 3 x 10.00 - 3 x 433.00 A
THD-I 5 % in rated operation
Load rated capacity 5 - 250 kW
Insulation class F
Ambient temperature -10 °C to +40 °C
Degree of protection IP 00
SCCR 100 kA (without preliminary fuse)

Advantages

Sinusoidal current consumption from the mains in devices with uncontrolled B6U diode rectifiers or controlled B6C thyristor bridges
Compliance with EN 61000-3-2, EN 61000-3-12
Support in the compliance with IEEE 519, D-A-CH-CZ
Cos(phi)>0.95 at rated current
Hardly any intermediate circuit voltage dip by comparison with a 4 % uK line reactor
Use of the HFM as a central hum filter for multiple converters possible

Applications

Harmonic filter module to ensure sinusoidal mains currents, reduction of mains harmonic currents, increase in system service life and system reliability and compliance with power quality standards such as IEEE 519, TEC 61000-3-2, IEC 61000-3-12.

Standards

Harmonic filter in accordance with
EN 61558 Part 1, EN 61558 Part 20, UL 508 17th Ed., CSA 22.2 No. 14-10

Certifications

UL 506, CSA 22.2

Harmonic Filter
HFM-FB

Electrical data

Type	HFM-FB 7-400	HFM-FB 8-460	HFM-FB 13-400	HFM-FB 15-460	HFM-FB 18-400	HFM-FB 21-460
Operating data						
Rated voltage	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac	3 x 460 Vac
Rated current	3 x 10.00 A	3 x 10.00 A	3 x 19.00 A	3 x 19.00 A	3 x 26.00 A	3 x 26.00 A
Voltage range	380 - 440 Vac	460 - 500 Vac	380 - 440 Vac	460 - 500 Vac	380 - 440 Vac	460 - 500 Vac
Rated frequency	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
THD-I	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)
Rated load power*	5.0 kW	5.5 kW	7.5 kW	11.0 kW	11.0 kW	15.0 kW
Description of the load	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter
Overrating Capacity	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.
Efficiency	99 %	99 %	99 %	99 %	99 %	99 %
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation
MTBF @ 50°C/500 V (Mil-HB-217F)	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class	I	I	I	I	I	I
SCCR**	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Notes						
*	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed
**	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HFM-FB 7-400**	**HFM-FB 8-460**	**HFM-FB 13-400**	**HFM-FB 15-460**	**HFM-FB 18-400**	**HFM-FB 21-460**

Harmonic Filter
HFM-FB

Electrical data

Type	HFM-FB 24-400	HFM-FB 28-460	HFM-FB 30-400	HFM-FB 34-460	HFM-FB 50-400	HFM-FB 57-460
Operating data						
Rated voltage	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac	3 x 460 Vac
Rated current	3 x 35.00 A	3 x 35.00 A	3 x 43.00 A	3 x 43.00 A	3 x 72.00 A	3 x 72.00 A
Voltage range	380 - 440 Vac	460 - 500 Vac	380 - 440 Vac	460 - 500 Vac	380 - 440 Vac	460 - 500 Vac
Rated frequency	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
THD-I	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)
Rated load power*	15.0 and 18.5 kW	22.0 kW	22.0 kW	30.0 kW	30.0 and 37.0 kW	345.0 kW
Description of the load	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter
Overrating Capacity	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.
Efficiency	99 %	99 %	99 %	99 %	99 %	99 %
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation
MTBF @ 50°C/500 V (Mil-HB-217F)	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class	I	I	I	I	I	I
SCCR**	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Notes						
*	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed
**	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HFM-FB 24-400**	**HFM-FB 28-460**	**HFM-FB 30-400**	**HFM-FB 34-460**	**HFM-FB 50-400**	**HFM-FB 57-460**

Harmonic Filter
HFM-FB

Electrical data

Type	HFM-FB 70-400	HFM-FB 80-460	HFM-FB 100-400	HFM-FB 115-460	HFM-FB 125-400	HFM-FB 145-460
Operating data						
Rated voltage	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac	3 x 460 Vac
Rated current	3 x 101.00 A	3 x 101.00 A	3 x 144.00 A	3 x 144.00 A	3 x 180.00 A	3 x 180.00 A
Voltage range	380 - 440 Vac	460 - 500 Vac	380 - 440 Vac	460 - 500 Vac	380 - 440 Vac	460 - 500 Vac
Rated frequency	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
THD-I	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)
Rated load power*	55.0 kW	55.0 kW	75.0 kW	90.0 kW	90.0 kW	110.0 kW
Description of the load	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter
Overrating Capacity	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.
Efficiency	99 %	99 %	99 %	99 %	99 %	99 %
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation
MTBF @ 50°C/500 V (Mil-HB-217F)	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class	I	I	I	I	I	I
SCCR**	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Notes						
*	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed
**	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HFM-FB 70-400**	**HFM-FB 80-460**	**HFM-FB 100-400**	**HFM-FB 115-460**	**HFM-FB 125-400**	**HFM-FB 145-460**

Harmonic Filter
HFM-FB

Electrical data

Type	HFM-FB 150-400	HFM-FB 175-460	HFM-FB 200-400	HFM-FB 225-400	HFM-FB 230-460	HFM-FB 255-400
Operating data						
Rated voltage	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac	3 x 400 Vac	3 x 460 Vac	3 x 400 Vac
Rated current	3 x 217.00 A	3 x 217.00 A	3 x 289.00 A	3 x 325.00 A	3 x 289,00 A	3 x 370,00 A
Voltage range	380 - 440 Vac	460 - 500 Vac	380 - 440 Vac	380 - 440 Vac	380 - 440 Vac	380 - 420 Vac
Rated frequency	50 Hz	60 Hz	50 Hz	50 Hz	60 Hz	50 Hz
THD-I	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)
Rated load power*	110.0 kW	132.0 kW	160.0 kW	180.0 kW	160.0 kW	200.0 kW
Description of the load	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter
Overrating Capacity	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.
Efficiency	99 %	99 %	99 %	99 %	99 %	99 %
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation
MTBF @ 50°C/500 V (Mil-HB-217F)	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h	>200.000 h
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class	I	I	I	I	I	I
SCCR**	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Notes						
*	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed
**	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HFM-FB 150-400**	**HFM-FB 175-460**	**HFM-FB 200-400**	**HFM-FB 225-400**	**HFM-FB 230-460**	**HFM-FB 255-400**

Harmonic Filter
HFM-FB

Electrical data

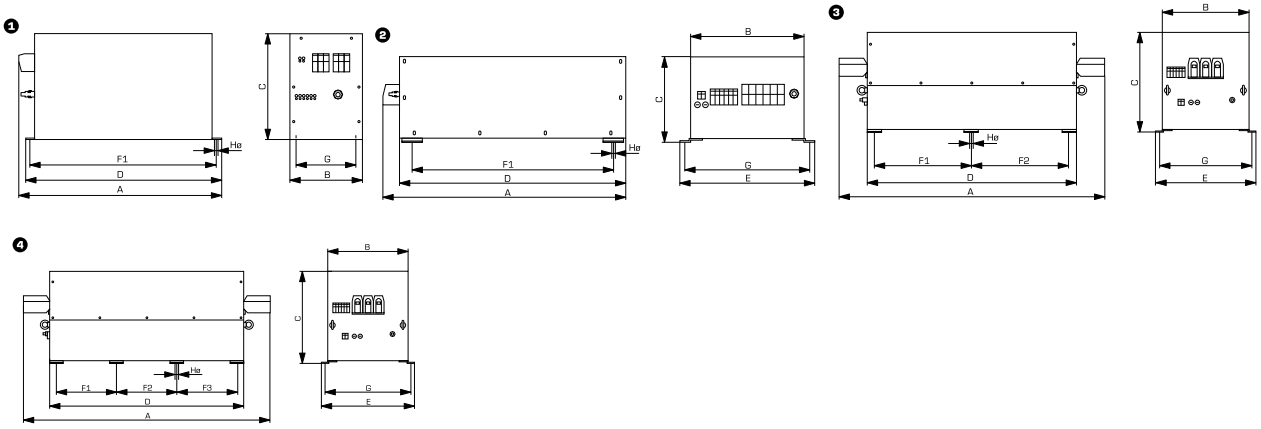
Type	HFM-FB 260-460	HFM-FB 295-460	HFM-FB 300-400
Operating data			
Rated voltage	3 x 460 Vac	3 x 460 Vac	3 x 400 Vac
Rated current	3 x 325,00 A	3 x 370,00 A	3 x 433,00 A
Voltage range	460 - 500 Vac	460 - 500 Vac	380 - 420 Vac
Rated frequency	60 Hz	60 Hz	50 Hz
THD-I	5 % (nominal load)	5 % (nominal load)	5 % (nominal load)
Rated load power*	230.0 kW	260.0 kW	250.0 kW
Description of the load	Balanced load by inverter	Balanced load by inverter	Balanced load by inverter
Overrating Capacity	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.	150 % for 60 sec. every 10 min.
Efficiency	99 %	99 %	99 %
Approvals			
Approvals	cURus	cURus	cURus
Environment			
Ambient temperature	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation	-10 °C to +40 °C, without condensation
MTBF @ 50°C/500 V (Mil-HB-217F)	>200.000 h	>200.000 h	>200.000 h
Safety and protection			
Type	Metal enclosure	Metal enclosure	Metal enclosure
Class of Insulation System	IEC=F, UL=class 155	IEC=F, UL=class 155	IEC=F, UL=class 155
Protection index	IP 00	IP 00	IP 00
Safety class	I	I	I
SCCR**	100 kA	100 kA	100 kA
Notes			
*	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed	IE2 efficiencies of the motors and an efficiency >96 % assumed
**	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers			
Order Number	**HFM-FB 260-460**	**HFM-FB 295-460**	**HFM-FB 300-400**

Harmonic Filter
HFM-FB

30 Mechanical data

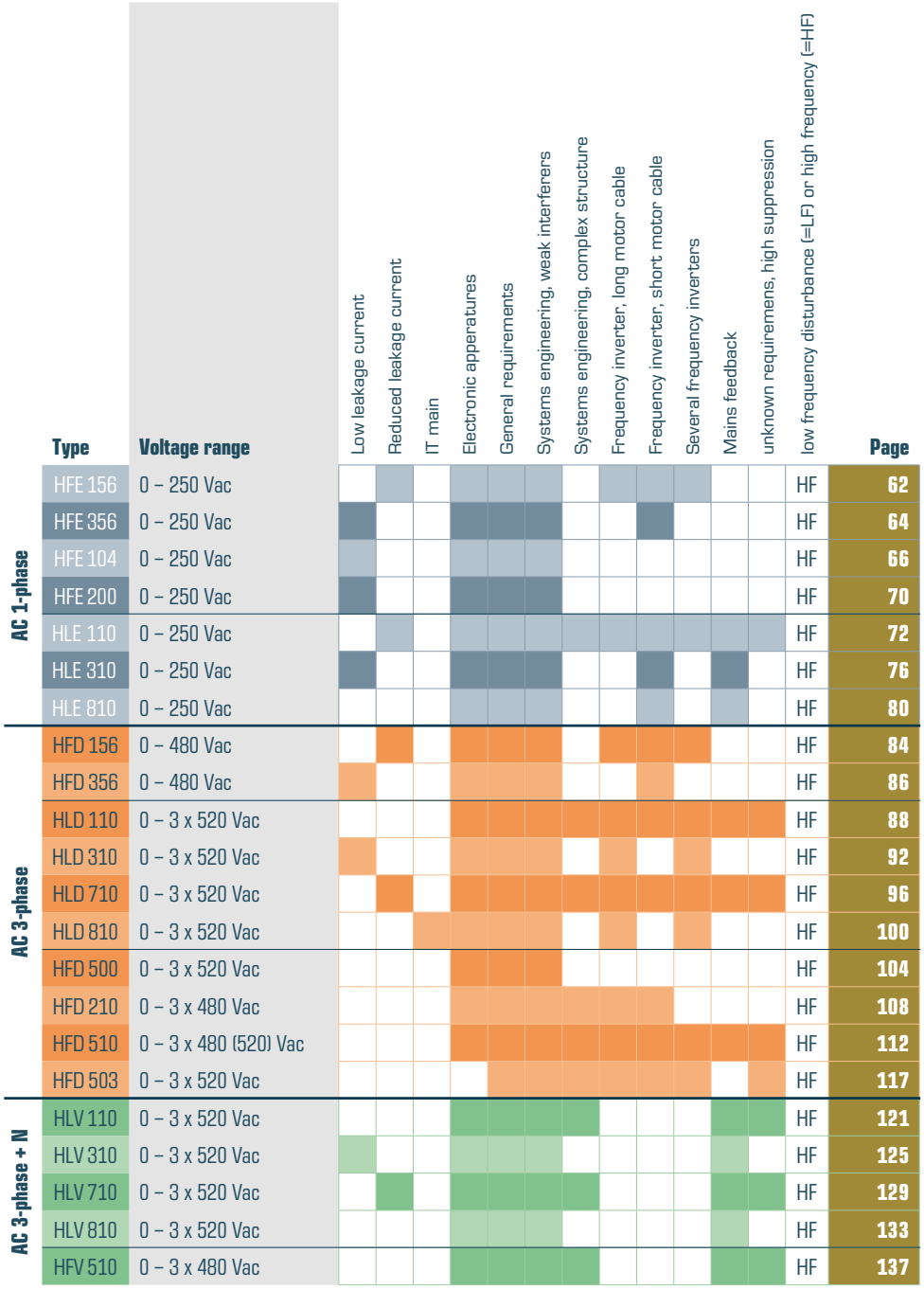
Typ	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F1	F2	F3	G	H
HFM-FB 7-400	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	27.00 kg	1	455	165	242	440	-	416	-	-	135	6.5
HFM-FB 8-460	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	27.00 kg	1	455	165	242	440	-	416	-	-	135	6.5
HFM-FB 13-400	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	28.00 kg	1	455	165	242	440	-	416	-	-	135	6.5
HFM-FB 15-460	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	28.00 kg	1	455	165	242	440	-	416	-	-	135	6.5
HFM-FB 18-400	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	40.00 kg	2	645	302	225	600	365.5	532.5	-	-	333.5	11
HFM-FB 21-460	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	41.00 kg	2	645	302	225	600	365.5	532.5	-	-	333.5	11
HFM-FB 24-400	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	49.00 kg	2	645	302	225	600	356.5	532.5	-	-	333.5	11
HFM-FB 28-460	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	49.00 kg	2	645	302	225	600	356.5	532.5	-	-	333.5	11
HFM-FB 30-400	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	52.00 kg	2	885	302	225	840	356.5	772.5	-	-	333.5	11
HFM-FB 34-460	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	56.00 kg	2	885	302	225	840	356.5	772.5	-	-	333.5	11
HFM-FB 50-400	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	88.00 kg	2	885	302	225	840	356.5	772.5	-	-	333.5	11
HFM-FB 57-460	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	80.00 kg	2	885	302	225	840	356.5	772.5	-	-	333.5	11
HFM-FB 70-400	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	150.00 kg	3	1060	345	400	830	393	377	395	-	370	11
HFM-FB 80-460	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	98.00 kg	3	1060	345	400	830	393	377	395	-	370	11
HFM-FB 100-400	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	167.00 kg	3	1060	345	400	830	393	377	395	-	370	11
HFM-FB 115-460	Screw clamp, 50 mm²	Bolt, M8	Mounting lugs	130.00 kg	3	1060	345	400	830	393	377	395	-	370	11
HFM-FB 125-400	Screw clamp, 150 mm²	Bolt, M8	Mounting lugs	178.00 kg	3	1160	406	420	900	454	430	412	-	430	11
HFM-FB 145-460	Screw clamp, 150 mm²	Bolt, M8	Mounting lugs	151.00 kg	3	1160	406	420	900	454	430	412	-	430	11
HFM-FB 150-400	Screw clamp, 150 mm²	Bolt, M8	Mounting lugs	224.00 kg	3	1160	406	420	900	454	430	412	-	430	11
HFM-FB 175-460	Screw clamp, 150 mm²	Bolt, M8	Mounting lugs	171.00 kg	3	1160	406	420	900	454	430	412	-	430	11
HFM-FB 200-400	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	271.00 kg	3	1330	406	420	1070	454	515	497	-	430	11
HFM-FB 225-400	Screw clamp, 240 mm²	Bolt, M8	Mounting lugs	284.00 kg	3	1330	406	420	1070	454	515	497	-	430	11
HFM-FB 230-460	Screw clamp, 240 mm²	Bolt, M8	Mounting lugs	215.00 kg	3	1330	406	420	1070	454	515	497	-	430	11
HFM-FB 255-400	Screw clamp, 240 mm²	Bolt, M8	Mounting lugs	310.00 kg	4	1350	470	420	1100	530	355	355	355	505	11
HFM-FB 260-460	Screw clamp, 240 mm²	Bolt, M8	Mounting lugs	240.00 kg	4	1350	470	420	1100	530	355	355	355	505	11
HFM-FB 295-460	Screw clamp, 240 mm²	Bolt, M8	Mounting lugs	285.00 kg	4	1350	470	420	1100	530	355	355	355	505	11
HFM-FB 300-400	Screw clamp, 300 mm²	Bolt, M8	Mounting lugs	387.00 kg	4	1350	470	420	1100	530	355	355	355	505	11

Dimension pictures



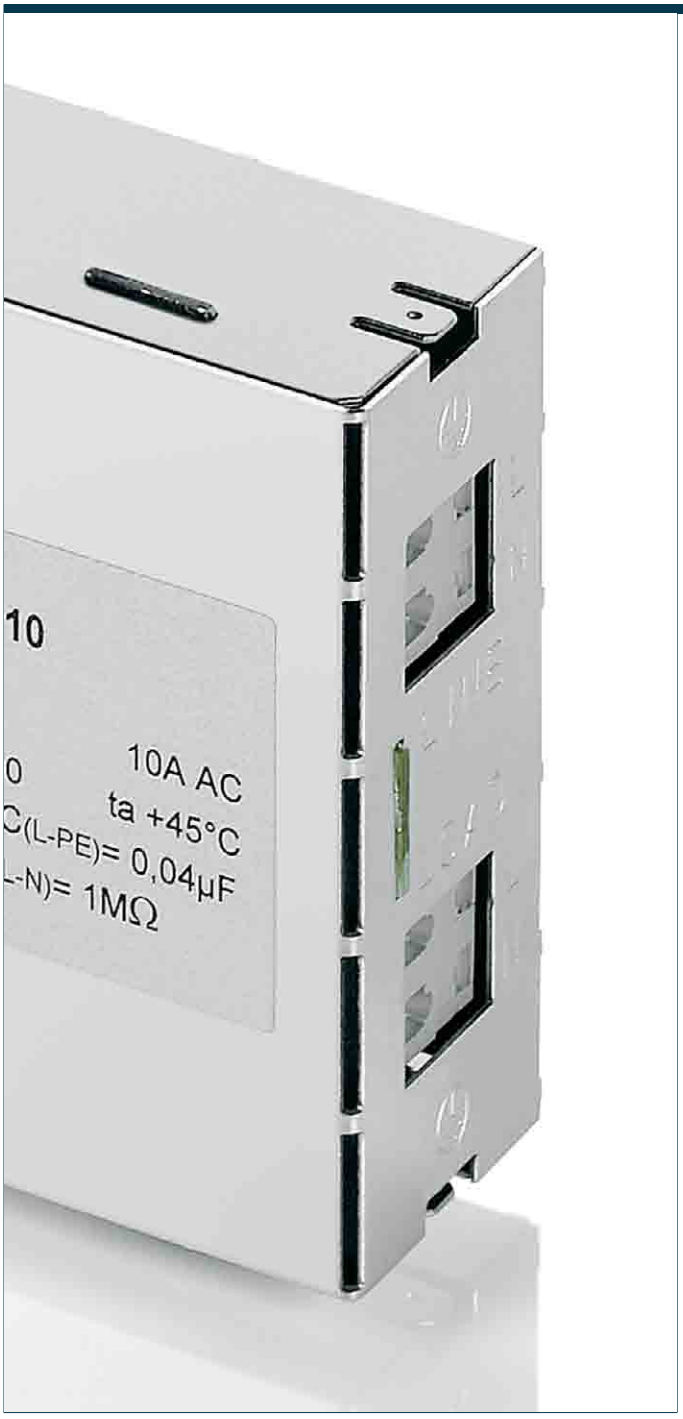
Overview Radio interference suppression filters

Power at a glance



	Type	Voltage range	Low leakage current	Reduced leakage current	IT main	Electronic apperatures	General requirements	Systems engineering, weak interferers	Systems engineering, complex structure	Frequency inverter, long motor cable	Frequency inverter, short motor cable	Several frequency inverters	Mains feedback	unknown requiremens, high suppression	low frequency disturbance (=LF) or high frequency (=HF)	Page
AC 1-phase	HFE 156	0 – 250 Vac													HF	62
	HFE 356	0 – 250 Vac													HF	64
	HFE 104	0 – 250 Vac													HF	66
	HFE 200	0 – 250 Vac													HF	70
	HLE 110	0 – 250 Vac													HF	72
	HLE 310	0 – 250 Vac													HF	76
	HLE 810	0 – 250 Vac													HF	80
AC 3-phase	HFD 156	0 – 480 Vac													HF	84
	HFD 356	0 – 480 Vac													HF	86
	HLD 110	0 – 3 x 520 Vac													HF	88
	HLD 310	0 – 3 x 520 Vac													HF	92
	HLD 710	0 – 3 x 520 Vac													HF	96
	HLD 810	0 – 3 x 520 Vac													HF	100
	HFD 500	0 – 3 x 520 Vac													HF	104
	HFD 210	0 – 3 x 480 Vac													HF	108
	HFD 510	0 – 3 x 480 (520) Vac													HF	112
	HFD 503	0 – 3 x 520 Vac													HF	117
AC 3-phase + N	HLV 110	0 – 3 x 520 Vac													HF	121
	HLV 310	0 – 3 x 520 Vac													HF	125
	HLV 710	0 – 3 x 520 Vac													HF	129
	HLV 810	0 – 3 x 520 Vac													HF	133
	HFV 510	0 – 3 x 480 Vac													HF	137

Radio interference suppression filter, single phase
HFE 156



General Data

Rated voltage 250 Vac
Voltage range 0 - 250 Vac
Rated current 1.00 - 16.00 A
Leakage current 8.00 mA
Ambient temperature max. 45 °C
Degree of protection IP 20

Advantages

For general requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer
Rail mounting

Applications

Radio interference suppression filter for mains-side interference suppression of power supplies and electronic devices.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, single phase
HFE 156

Electrical data

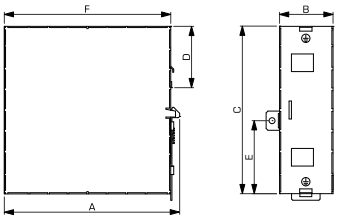
Type	HFE 156-230/1	HFE 156-230/3	HFE 156-230/6	HFE 156-230/10	HFE 156-230/12	HFE 156-230/16
Operating data						
Rated voltage	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	1 A	3 A	6 A	10 A	12 A	16 A
Leakage current (50 Hz)	8 mA	8 mA	8 mA	8 mA	8 mA	8 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	0.9 W	1.8 W	2.6 W	4.0 W	6.2 W	8.9 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE
Order numbers						
Order Number	**HFE 156-230/1**	**HFE 156-230/3**	**HFE 156-230/6**	**HFE 156-230/10**	**HFE 156-230/12**	**HFE 156-230/16**

Mechanical data

Terminal and mounting						
Connections phase/N	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal
Connections PE	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm
Fixing method	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails
Measures and weights						
Weight	0.31 kg	0.32 kg	0.33 kg	0.56 kg	0.56 kg	0.57 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❶
A	107	107	107	107	127	127
B	40	40	40	40	45	45
C	85	85	85	85	110	110
D	22	22	22	22	52	52
E	33	33	33	33	33	33
F	100	100	100	100	120	120

Dimension pictures

❶



Radio interference suppression filter, single phase, low leakage current
HFE 356

General Data

Rated voltage 250 Vac
Voltage range 0 - 250 Vac
Rated current 1.00 - 16.00 A
Leakage current 2 mA
Degree of protection IP 20
Rail mounting

Advantages

For general requirements
Low leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for mains-side interference suppression of power supplies and electronic devices.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, single phase, low leakage current
HFE 356

Electrical data

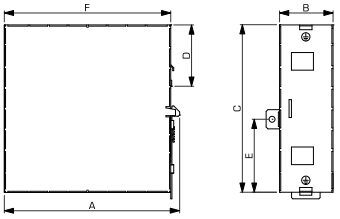
Type	HFE 356-230/1	HFE 356-230/3	HFE 356-230/6	HFE 356-230/10	HFE 356-230/12	HFE 356-230/16
Operating data						
Rated voltage	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	1 A	3 A	6 A	10 A	12 A	16 A
Leakage current (50 Hz)	2 mA	2 mA	2 mA	2 mA	2 mA	2 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	0.9 W	1.8 W	2.6 W	4.0 W	6.2 W	8.9 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE
Order numbers						
Order Number	**HFE 356-230/1**	**HFE 356-230/3**	**HFE 356-230/6**	**HFE 356-230/10**	**HFE 356-230/12**	**HFE 356-230/16**

Mechanical data

Terminal and mounting						
Connections phase/N	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal
Connections PE	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm
Fixing method	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails	Panel installation on mounting rails
Measures and weights						
Weight	0.31 kg	0.32 kg	0.33 kg	0.34 kg	0.56 kg	0.57 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❶
A	107	107	107	107	127	127
B	40	40	40	40	45	45
C	85	85	85	85	110	110
D	22	22	22	22	52	52
E	33	33	33	33	33	33
F	100	100	100	100	120	120

Dimension pictures

❶



Radio interference filter, single phase, low leakage current
HFE 104

General Data

Rated voltage 250 Vac
Voltage range 0 - 250 Vac
Rated current 1.00 - 65.00 A
Leakage current 0.37 mA
Degree of protection IP 00
Flat-pin terminals 6.3 x 0.8 mm

Advantages

For general requirements
Low leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for mains-side interference suppression of power supplies and electronic devices.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference filter, single phase, low leakage current
HFE 104

Electrical data

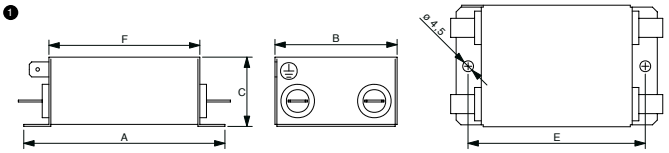
Type	HFE 104-230/1	HFE 104-230/2	HFE 104-230/3	HFE 104-230/6	HFE 104-230/10	HFE 104-230/16
Operating data						
Rated voltage	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	1 A	2 A	3 A	6 A	10 A	16 A
Leakage current (50 Hz)	0.37 mA	0.37 mA	0.37 mA	0.37 mA	0.37 mA	0.37 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE
Order numbers						
Order Number	**HFE 104-230/1**	**HFE 104-230/2**	**HFE 104-230/3**	**HFE 104-230/6**	**HFE 104-230/10**	**HFE 104-230/16**

Mechanical data

Terminal and mounting						
Connections phase/N	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm
Connections PE	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm
Fixing method	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs
Measures and weights						
Weight	0.20 kg	0.20 kg	0.25 kg	0.25 kg	0.30 kg	0.35 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❶
A	70	70	84	84	84	84
B	45	45	51	51	51	51
C	29	29	29	29	39	39
D	-	-	-	-	-	-
E	60	60	74	74	74	74
F	50	50	63	63	63	63

Dimension pictures

❶



Radio interference filter, single phase, low leakage current
HFE 104

Electrical data

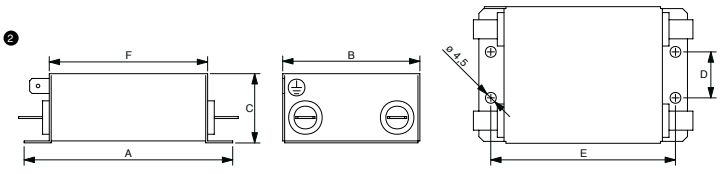
Type	HFE 104-230/20
Operating data	
Rated voltage	250 Vac
Voltage range	0 - 250 Vac
Rated current	20 A
Leakage current (50 Hz)	0.37 mA
Rated frequency	50 - 60 Hz
Overrating Capacity	150 %, shortly
Standards	
Classification	EMI filter
Environment	
Climatic category	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C
Safety and protection	
Type	Metal enclosure
Protection index	IP 00
Safety class (prepared)	I
Test voltage	1700 Vdc Phase/N, 2700 Vdc Phase/PE
Order numbers	
Order Number	**HFE 104-230/20**

Mechanical data

Terminal and mounting	
Connections phase/N	Tab connector, 6.3 x 0.8 mm
Connections PE	Tab connector, 6.3 x 0.8 mm
Fixing method	Mounting lugs
Measures and weights	
Weight	0.70 kg
Dimension picture (in mm)	❷
A	118
B	84
C	38
D	51
E	108
F	99

Dimension pictures

❷



LINE-SIDE SUPPRESSION/
RADIO INTERFERENCE SUPPRESSION FILTER

Radio interference suppression filter, single phase, low leakage current
HFE 200

General Data

Rated voltage 250 Vac
Voltage range 0 - 250 Vac
Rated current 1.00 - 16.00 A
Leakage current 0.40 mA
Degree of protection IP 20

Advantages

For enhanced requirements
Low leakage current
Two stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for mains-side interference suppression of power supplies and electronic devices.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, single phase, low leakage current
HFE 200

Electrical data

Type	HFE 200-230/1	HFE 200-230/3	HFE 200-230/6	HFE 200-230/10	HFE 200-230/12	HFE 200-230/16
Operating data						
Rated voltage	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	1 A	3 A	6 A	10 A	12 A	16 A
Leakage current (50 Hz)	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE	1700 Vdc Phase/N, 2700 Vdc Phase/PE
Order numbers						
Order Number	**HFE 200-230/1**	**HFE 200-230/3**	**HFE 200-230/6**	**HFE 200-230/10**	**HFE 200-230/12**	**HFE 200-230/16**

Mechanical data

Terminal and mounting						
Connections phase/N	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²
Connections PE	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm
Fixing method	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs
Measures and weights						
Weight	0.14 kg	0.19 kg	0.37 kg	0.53 kg	0.53 kg	0.58 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❶
A	85	85	114	156	156	119
B	54	54	57	58	58	86
C	35	47	55	67	67	69
D	75	75	103	143	143	109
E	34	46	54	66	66	68
F	5.5	5.5	5.5	5.5	5.5	5.5

Dimension pictures

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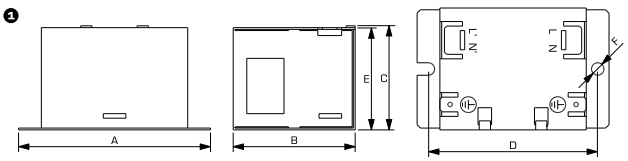

Radio interference suppression filter, single phase
HLE 110

General Data

Rated voltage 250 Vac
Voltage range 0 - 250 Vac
Rated current 4 - 55 A
Leakage current 8.50 mA
Degree of protection IP 20

Advantages

For enhanced requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, single phase
HLE 110

Electrical data

Type	HLE 110-230/4	HLE 110-230/8	HLE 110-230/12	HLE 110-230/16	HLE 110-230/20	HLE 110-230/25
Operating data						
Rated voltage	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	4 A	8 A	12 A	16 A	20 A	25 A
Leakage current (50 Hz)*	8.50 mA	8.50 mA	8.50 mA	8.50 mA	8.50 mA	8.50 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, short-time	150 %, short-time	150 %, short-time	150 %, short-time	150 %, short-time	150 %, short-time
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
Order numbers						
Order Number	**HLE 110-230/4**	**HLE 110-230/8**	**HLE 110-230/12**	**HLE 110-230/16**	**HLE 110-230/20**	**HLE 110-230/25**

Radio interference suppression filter, single phase
HLE 110

Electrical data

Type	HLE 110-230/30	HLE 110-230/42	HLE 110-230/55
Operating data			
Rated voltage	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	30 A	42 A	55 A
Leakage current (50 Hz)*	8.50 mA	8.50 mA	8.50 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, short-time	150 %, short-time	150 %, short-time
Standards			
Classification	EMI filter	EMI filter	EMI filter
Environment			
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C
Safety and protection			
Type	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I
Test voltage	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes			
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
Order numbers			
Order Number	**HLE 110-230/30**	**HLE 110-230/42**	**HLE 110-230/55**

Radio interference suppression filter, single phase
HLE 110

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLE 110-230/4	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.52 kg	❶	160	38	75	16	150	134
HLE 110-230/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.58 kg	❶	160	38	75	16	150	134
HLE 110-230/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.78 kg	❶	190	38	75	16	180	165
HLE 110-230/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.78 kg	❶	190	38	75	16	180	165
HLE 110-230/20	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.80 kg	❶	190	38	75	16	180	165
HLE 110-230/25	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	1.30 kg	❶	230	50	95	25	215	197
HLE 110-230/30	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	1.35 kg	❶	230	50	95	25	215	197
HLE 110-230/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	1.45 kg	❶	230	50	95	25	197	215
HLE 110-230/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M6	2.00 kg	❷	225	85	95	60	210	230

Dimension pictures

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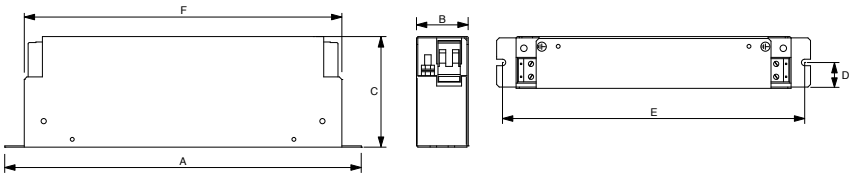

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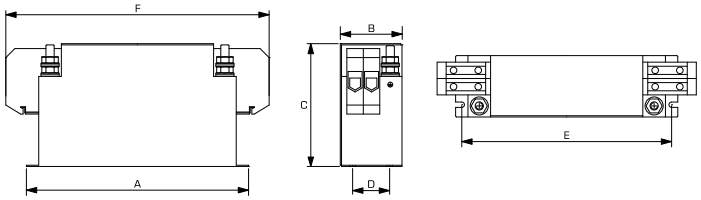

Radio interference filter, single phase, low leakage current
HLE 310

General Data

Rated voltage 250 Vac
Voltage range 0 - 250 Vac
Rated current 4 - 55 A
Leakage current <3.00 mA
Degree of protection IP 20

Advantages

For enhanced requirements
Low leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference filter, single phase, low leakage current
HLE 310

Electrical data

Type	HLE 310-230/4	HLE 310-230/8	HLE 310-230/12	HLE 310-230/16	HLE 310-230/20	HLE 310-230/25
Operating data						
Rated voltage	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	4 A	8 A	12 A	16 A	20 A	25 A
Leakage current (50 Hz)*	<3.00 mA	<3.00 mA	<3.00 mA	<3.00 mA	<3.00 mA	<3.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
Order numbers						
Order Number	**HLE 310-230/4**	**HLE 310-230/8**	**HLE 310-230/12**	**HLE 310-230/16**	**HLE 310-230/20**	**HLE 310-230/25**

Radio interference filter, single phase, low leakage current
HLE 310

Electrical data

Type	HLE 310-230/30	HLE 310-230/42	HLE 310-230/55
Operating data			
Rated voltage	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	30 A	42 A	55 A
Leakage current (50 Hz)*	<3.00 mA	<3.00 mA	<3.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly
Standards			
Classification	EMI filter	EMI filter	EMI filter
Environment			
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C
Safety and protection			
Type	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I
Test voltage	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes			
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
Order numbers			
Order Number	**HLE 310-230/30**	**HLE 310-230/42**	**HLE 310-230/55**

Radio interference filter, single phase, low leakage current
HLE 310

Mechanical data

Typ	Fixing screws	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLE 310-230/4	M5	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	0.52 kg	❶	160	38	75	16	150	134
HLE 310-230/8	M5	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	0.58 kg	❶	160	38	75	16	150	134
HLE 310-230/12	M5	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	0.78 kg	❶	190	38	75	16	180	165
HLE 310-230/16	M5	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	0.78 kg	❶	190	38	75	16	180	165
HLE 310-230/20	M5	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	0.80 kg	❶	190	38	75	16	180	165
HLE 310-230/25	M6	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	1.30 kg	❶	230	50	95	25	215	197
HLE 310-230/30	M6	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	1.35 kg	❶	230	50	95	25	215	197
HLE 310-230/42	M6	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	1.45 kg	❶	230	50	95	25	215	197
HLE 310-230/55	M6	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	2.00 kg	❷	225	85	95	60	210	230

Dimension pictures

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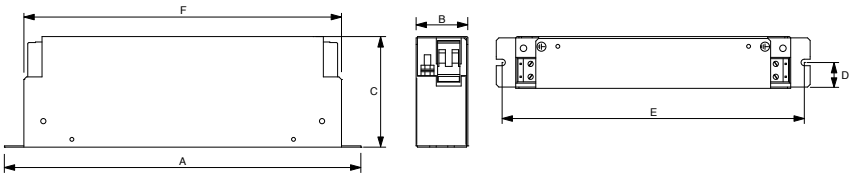

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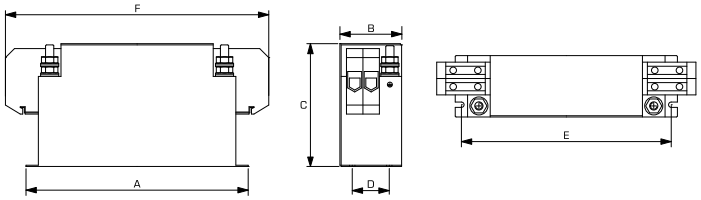

Radio interference filter, single phase, no leakage current
HLE 810

General Data

Rated voltage 250 Vac
Voltage range 0 - 250 Vac
Rated current 4 - 55 A
Degree of protection IP 20

Advantages

For enhanced requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices or frequency converters.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference filter, single phase, no leakage current
HLE 810

Electrical data

Type	HLE 810-230/4	HLE 810-230/8	HLE 810-230/12	HLE 810-230/16	HLE 810-230/20	HLE 810-230/25
Operating data						
Rated voltage	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	4 A	8 A	12 A	16 A	20 A	25 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 [in accordance with EN 60068-1]	25/085/21 [in accordance with EN 60068-1]	25/085/21 [in accordance with EN 60068-1]	25/085/21 [in accordance with EN 60068-1]	25/085/21 [in accordance with EN 60068-1]	25/085/21 [in accordance with EN 60068-1]
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE
Order numbers						
Order Number	**HLE 810-230/4**	**HLE 810-230/8**	**HLE 810-230/12**	**HLE 810-230/16**	**HLE 810-230/20**	**HLE 810-230/25**

Radio interference filter, single phase, no leakage current
HLE 810

Electrical data

Type	HLE 810-230/30	HLE 810-230/42	HLE 810-230/55
Operating data			
Rated voltage	250 Vac	250 Vac	250 Vac
Voltage range	0 - 250 Vac	0 - 250 Vac	0 - 250 Vac
Rated current	30 A	42 A	55 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly
Standards			
Classification	EMI filter	EMI filter	EMI filter
Environment			
Climatic category	25/085/21 [in accordance with EN 60068-1]	25/085/21 [in accordance with EN 60068-1]	25/085/21 [in accordance with EN 60068-1]
Ambient temperature max.	50 °C	50 °C	50 °C
Safety and protection			
Type	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I
Test voltage	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE	1700 Vdc Phase/Phase, 2700 Vdc Phase/PE
Order numbers			
Order Number	**HLE 810-230/30**	**HLE 810-230/42**	**HLE 810-230/55**

Radio interference filter, single phase, no leakage current
HLE 810

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLE 810-230/4	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.52 kg	❶	160	38	75	16	150	134
HLE 810-230/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.58 kg	❶	160	38	75	16	150	134
HLE 810-230/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.78 kg	❶	190	38	75	16	180	165
HLE 810-230/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.78 kg	❶	190	38	75	16	180	165
HLE 810-230/20	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.80 kg	❶	190	38	75	16	180	165
HLE 810-230/25	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	1.30 kg	❷	230	50	95	25	215	197
HLE 810-230/30	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	1.35 kg	❶	230	50	95	25	218	197
HLE 810-230/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	1.45 kg	❶	230	50	95	25	197	215
HLE 810-230/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M6	2.00 kg	❷	225	85	95	60	210	230

Dimension pictures

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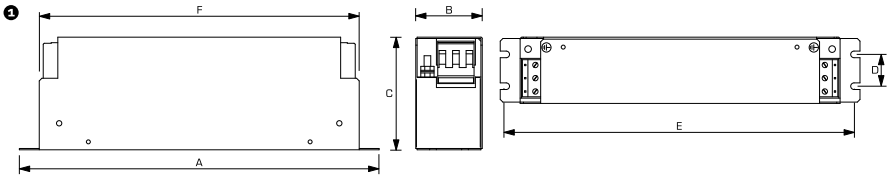

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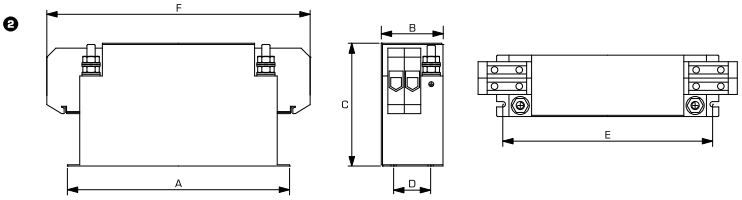

Radio interference suppression filter, three phase
HFD 156

General Data

Rated voltage 3 x 480 Vac
Voltage range 0 - 480 Vac
Rated current 3 x 3 - 3 x 16 A
Leakage current 1.00 mA
Ambient temperature max. 45 °C
Degree of protection IP 20

Advantages

For general requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer
Rail mounting

Applications

Radio interference suppression filter for mains-side interference suppression of power supplies and electronic devices.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase
HFD 156

Electrical data

Type	HFD 156-400/3	HFD 156-400/6	HFD 156-400/10	HFD 156-400/12	HFD 156-400/16
Operating data					
Rated voltage	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac
Voltage range	0 - 480 Vac	0 - 480 Vac	0 - 480 Vac	0 - 480 Vac	0 - 480 Vac
Rated current	3 x 3 A	3 x 6 A	3 x 10 A	3 x 12 A	3 x 16 A
Leakage current (50 Hz)**	9.00 mA	9.00 mA	9.00 mA	9.00 mA	9.00 mA
Leakage current (50 Hz)*	1.00 mA	1.00 mA	1.00 mA	1.00 mA	1.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	2.2 W	2.7 W	4.7 W	6.1 W	7.9 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	45 °C	45 °C	45 °C	45 °C	45 °C
Safety and protection					
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers					
Order Number	**HFD 156-400/3**	**HFD 156-400/6**	**HFD 156-400/10**	**HFD 156-400/12**	**HFD 156-400/16**

Mechanical data

Terminal and mounting					
Connections phase/N	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal
Connections PE	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm
Fixing method	Rail mounting	Rail mounting	Rail mounting	Rail mounting	Rail mounting
Measures and weights					
Weight	0.48 kg	0.49 kg	0.49 kg	0.72 kg	0.73 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶
A	127	127	127	147	147
B	45	45	45	45	45
C	110	110	110	140	140
D	52	52	52	52	52
E	33	33	33	66	66
F	120	120	120	140	140

Dimension pictures

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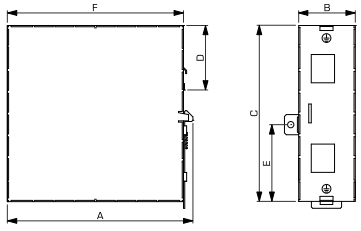

Radio interference suppression filter, three phase, low leakage current
HFD 356

General Data

Rated voltage 3 x 480 Vac
Voltage range 0 - 480 Vac
Rated current 3 x 3 - 3 x 16 A
Leakage current 0.50 mA
Degree of protection IP 20
Rail mounting

Advantages

For general requirements
Low leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for mains-side interference suppression of power supplies and electronic devices.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase, low leakage current
HFD 356

Electrical data

Type	HFD 356-400/3	HFD 356-400/6	HFD 356-400/10	HFD 356-400/12	HFD 356-400/16
Operating data					
Rated voltage	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac
Voltage range	0 - 480 Vac	0 - 480 Vac	0 - 480 Vac	0 - 480 Vac	0 - 480 Vac
Rated current	3 x 3 A	3 x 6 A	3 x 10 A	3 x 12 A	3 x 16 A
Leakage current (50 Hz)**	4.00 mA	4.00 mA	5.00 mA	5.00 mA	5.00 mA
Leakage current (50 Hz)*	0.50 mA	0.50 mA	0.50 mA	0.50 mA	0.50 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	2.2 W	2.7 W	4.7 W	6.1 W	7.9 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	45 °C	45 °C	45 °C	45 °C	45 °C
Safety and protection					
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE	2100 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers					
Order Number	**HFD 356-400/3**	**HFD 356-400/6**	**HFD 356-400/10**	**HFD 356-400/12**	**HFD 356-400/16**

Mechanical data

Terminal and mounting					
Connections phase/N	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal	2.5 mm² spring terminal
Connections PE	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm	Tab connector, 6.3 x 0.8 mm
Fixing method	Rail mounting	Rail mounting	Rail mounting	Rail mounting	Rail mounting
Measures and weights					
Weight	0.50 kg	0.49 kg	0.49 kg	0.72 kg	0.73 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶
A	127	127	127	147	147
B	45	45	45	45	45
C	110	110	110	140	140
D	52	52	52	52	52
E	33	33	33	66	66
F	120	120	120	140	140

Dimension pictures

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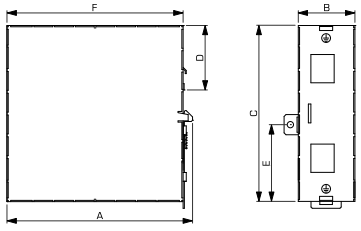

Radio interference suppression filter, three phase
HLD 110

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A
Leakage current 20.00 - 37.00 mA
Ambient temperature max. 50 °C
Degree of protection IP 20

Advantages

For enhanced requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter complying with DIN EN 60939-2, UL 1283, CSA C22.2 No.8

Certifications

UL 1283 5th edition, CSA 22.2 No 8

Radio interference suppression filter, three phase
HLD 110

Electrical data

Type	HLD 110-500/8	HLD 110-500/12	HLD 110-500/16	HLD 110-500/30	HLD 110-500/42	HLD 110-500/55
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A	3 x 12 A	3 x 16 A	3 x 30 A	3 x 42 A	3 x 55 A
Leakage current (50 Hz)*	20.00 mA	20.00 mA	21.00 mA	29.00 mA	20.00 mA	30.00 mA
Leakage current (50 Hz)**	190.00 mA	190.00 mA	205.00 mA	280.00 mA	290.00 mA	290.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	6.0 W	9.0 W	12.0 W	15.0 W	22.0 W	30.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals						
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
SCCR***	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
***	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HLD 110-500/8**	**HLD 110-500/12**	**HLD 110-500/16**	**HLD 110-500/30**	**HLD 110-500/42**	**HLD 110-500/55**

Radio interference suppression filter, three phase
HLD 110

Electrical data

Type	HLD 110-500/75	HLD 110-500/100	HLD 110-500/130	HLD 110-500/180	HLD 110-500/250
Operating data					
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 75 A	3 x 100 A	3 x 130 A	3 x 180 A	3 x 250 A
Leakage current (50 Hz)*	22.00 mA	30.00 mA	22.00 mA	31.00 mA	37.00 mA
Leakage current (50 Hz)**	210.00 mA	290.00 mA	210.00 mA	300.00 mA	355.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	35.0 W	60.0 W	90.0 W	150.0 W	180.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals					
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
SCCR***	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
***	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers					
Order Number	**HLD 110-500/75**	**HLD 110-500/100**	**HLD 110-500/130**	**HLD 110-500/180**	**HLD 110-500/250**

Radio interference suppression filter, three phase
HLD 110

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLD 110-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.80 kg	❶	190	45	75	20	180	166
HLD 110-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.90 kg	❶	220	45	75	20	210	190
HLD 110-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.10 kg	❶	250	45	75	20	240	220
HLD 110-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.70 kg	❶	270	55	95	30	255	240
HLD 110-500/42	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	2.10 kg	❶	310	55	95	30	295	280
HLD 110-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M5	2.50 kg	❷	250	85	95	60	235	255
HLD 110-500/75	Screw clamp, 35 mm²	Bolt, M8	Mounting lugs	M6	3.50 kg	❷	270	85	135	60	255	310
HLD 110-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	4.80 kg	❷	270	95	150	65	255	325
HLD 110-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	5.60 kg	❷	270	95	150	65	255	325
HLD 110-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	8.90 kg	❷	380	130	181	102	365	440
HLD 110-500/250	Screw clamp, 150 mm²	Bolt, M12	Mounting lugs	M6	12.20 kg	❷	450	155	220	125	435	525

Dimension pictures

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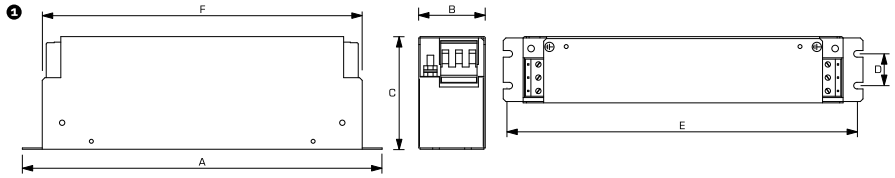

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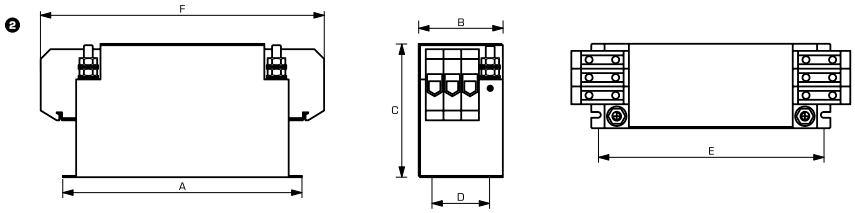

Radio interference suppression filter, three phase, low leakage current
HLD 310

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A
leakage current <0.4 mA
Degree of protection IP 20

Advantages

For enhanced requirements
Low leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter complying with
DIN EN 60939-2, UL 1283, CSA C22.2 No.8

Certifications

UL 1283 5th edition, CSA 22.2 No 8

Radio interference suppression filter, three phase, low leakage current
HLD 310

Type	HLD 310-500/8	HLD 310-500/12	HLD 310-500/16	HLD 310-500/30	HLD 310-500/42	HLD 310-500/55
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A	3 x 12 A	3 x 16 A	3 x 30 A	3 x 42 A	3 x 55 A
Leakage current (50 Hz)*	<0.40 mA	<0.40 mA	<0.40 mA	<0.40 mA	<0.40 mA	<0.40 mA
Leakage current (50 Hz)**	<3.50 mA	<3.50 mA	<3.50 mA	<3.50 mA	<3.50 mA	<3.50 mA
Power loss	6.0 W	9.0 W	12.0 W	15.0 W	22.0 W	30.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Input						
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals						
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
SCCR***	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
***	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HLD 310-500/8**	**HLD 310-500/12**	**HLD 310-500/16**	**HLD 310-500/30**	**HLD 310-500/42**	**HLD 310-500/55**

Radio interference suppression filter, three phase, low leakage current
HLD 310

Electrical data

Type	HLD 310-500/75	HLD 310-500/100	HLD 310-500/130	HLD 310-500/180	HLD 310-500/250
Operating data					
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 75 A	3 x 100 A	3 x 130 A	3 x 180 A	3 x 250 A
Leakage current (50 Hz)*	<0.40 mA	<0.40 mA	<0.40 mA	<0.40 mA	<0.40 mA
Leakage current (50 Hz)**	<3.50 mA	<3.50 mA	<3.50 mA	<3.50 mA	<3.50 mA
Power loss	35.0 W	60.0 W	90.0 W	150.0 W	180.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Input					
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals					
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
SCCR***	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
***	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers					
Order Number	**HLD 310-500/75**	**HLD 310-500/100**	**HLD 310-500/130**	**HLD 310-500/180**	**HLD 310-500/250**

Radio interference suppression filter, three phase, low leakage current
HLD 310

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Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLD 310-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.80 kg	❶	190	45	75	20	180	166
HLD 310-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.90 kg	❶	220	45	75	20	210	190
HLD 310-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.10 kg	❶	250	45	75	20	240	220
HLD 310-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.70 kg	❶	270	55	95	30	255	240
HLD 310-500/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M5	2.10 kg	❶	310	55	95	30	295	280
HLD 310-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M5	2.50 kg	❷	250	85	95	60	235	255
HLD 310-500/75	Screw clamp, 35 mm²	Bolt, M8	Mounting lugs	M6	3.50 kg	❷	270	85	135	60	255	310
HLD 310-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	4.80 kg	❷	270	95	150	65	255	325
HLD 310-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	5.60 kg	❶	270	95	150	65	255	325
HLD 310-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	8.90 kg	❷	380	130	181	102	365	440
HLD 310-500/250	Screw clamp, 150 mm²	Bolt, M10	Mounting lugs	M6	12.20 kg	❷	450	155	220	125	435	525

Dimension pictures

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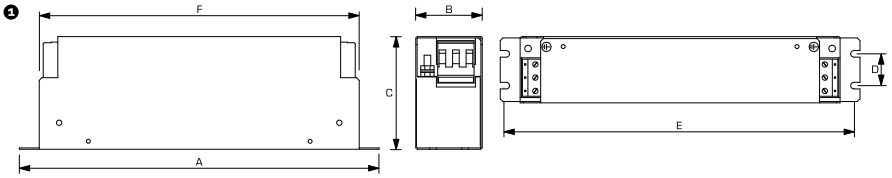

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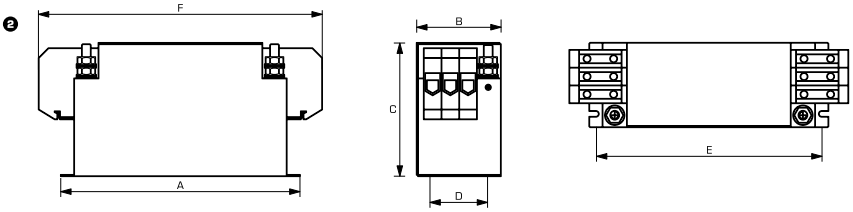


Radio interference suppression filter, three phase, low leakage current
HLD 710

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A
Leakage current 6.00 - 7.00 mA
Ambient temperature max. 50 °C
Degree of protection IP 20

Advantages

For enhanced requirements
Reduced leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter complying with DIN EN 60939-2, UL 1283, CSA C22.2 No.8

Certifications

UL 1283 5th edition, CSA 22.2 No 8

Radio interference suppression filter, three phase, low leakage current
HLD 710

Electrical data

Type	HLD 710-500/8	HLD 710-500/12	HLD 710-500/16	HLD 710-500/30	HLD 710-500/42	HLD 710-500/55
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A	3 x 12 A	3 x 16 A	3 x 30 A	3 x 42 A	3 x 55 A
Leakage current (50 Hz)*	6.00 mA	6.00 mA	6.00 mA	6.50 mA	6.50 mA	6.50 mA
Leakage current (50 Hz)**	60.00 mA	60.00 mA	60.00 mA	63.00 mA	63.00 mA	63.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	6.0 W	9.0 W	12.0 W	15.0 W	22.0 W	30.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals						
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
SCCR***	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
***	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HLD 710-500/8**	**HLD 710-500/12**	**HLD 710-500/16**	**HLD 710-500/30**	**HLD 710-500/42**	**HLD 710-500/55**

Radio interference suppression filter, three phase, low leakage current
HLD 710

Electrical data

Type	HLD 710-500/75	HLD 710-500/100	HLD 710-500/130	HLD 710-500/180	HLD 710-500/250
Operating data					
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 75 A	3 x 100 A	3 x 130 A	3 x 180 A	3 x 250 A
Leakage current (50 Hz)*	6.50 mA	6.50 mA	6.50 mA	7.00 mA	7.00 mA
Leakage current (50 Hz)**	63.00 mA	63.00 mA	63.00 mA	65.00 mA	65.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	35.0 W	60.0 W	90.0 W	150.0 W	180.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals					
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
SCCR***	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
***	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers					
Order Number	**HLD 710-500/75**	**HLD 710-500/100**	**HLD 710-500/130**	**HLD 710-500/180**	**HLD 710-500/250**

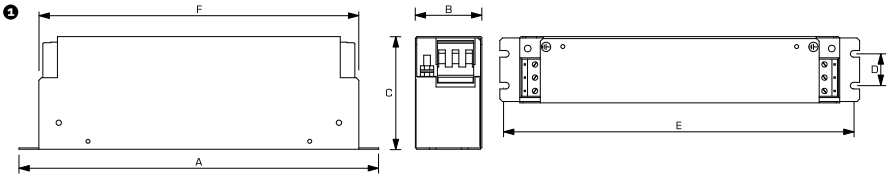
Radio interference suppression filter, three phase, low leakage current
HLD 710

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLD 710-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.80 kg	1	190	45	75	20	180	166
HLD 710-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.78 kg	1	220	45	75	20	210	190
HLD 710-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.20 kg	1	250	45	75	20	240	220
HLD 710-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.80 kg	1	270	55	95	30	255	240
HLD 710-500/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M5	2.10 kg	1	310	55	95	30	295	280
HLD 710-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M5	2.50 kg	2	250	85	95	60	235	255
HLD 710-500/75	Screw clamp, 35 mm²	Bolt, M8	Mounting lugs	M6	4.50 kg	2	270	85	135	60	255	310
HLD 710-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	5.20 kg	2	270	95	150	65	255	325
HLD 710-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	5.60 kg	2	270	95	150	65	255	325
HLD 710-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	9.20 kg	2	380	130	181	102	365	440
HLD 710-500/250	Screw clamp, 150 mm²	Bolt, M12	Mounting lugs	M6	12.20 kg	2	450	155	220	125	435	525

Dimension pictures

1



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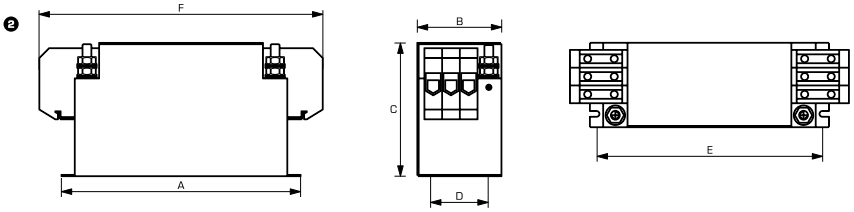

Radio interference suppression filter, three phase, for IT Network
HLD 810

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A
Ambient temperature max. 50 °C
Degree of protection IP 20

Advantages

For enhanced requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression in isolated networks (IT network).

Standards

Radio interference suppression filter complying with DIN EN 60939-2, UL 1283, CSA C22.2 No.8

Certifications

UL 1283 5th edition, CSA 22.2 No 8

Radio interference suppression filter, three phase, for IT Network
HLD 810

Electrical data

Type	HLD 810-500/8	HLD 810-500/12	HLD 810-500/16	HLD 810-500/30	HLD 810-500/42	HLD 810-500/55
Operating data						
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Rated current	3 x 8 A	3 x 12 A	3 x 16 A	3 x 30 A	3 x 42 A	3 x 55 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	6.0 W	9.0 W	12.0 W	15.0 W	22.0 W	30.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals						
Approvals	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
SCCR*	100 kA	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers						
Order Number	**HLD 810-500/8**	**HLD 810-500/12**	**HLD 810-500/16**	**HLD 810-500/30**	**HLD 810-500/42**	**HLD 810-500/55**

Radio interference suppression filter, three phase, for IT Network
HLD 810

Electrical data

Type	HLD 810-500/75	HLD 810-500/100	HLD 810-500/130	HLD 810-500/180	HLD 810-500/250
Operating data					
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Rated current	3 x 75 A	3 x 100 A	3 x 130 A	3 x 180 A	3 x 250 A
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Power loss	35.0 W	60.0 W	90.0 W	150.0 W	180.0 W
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals					
Approvals	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8	cURus, UL 1283 5th edition, CSA C22.2 No.8
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
SCCR*	100 kA	100 kA	100 kA	100 kA	100 kA
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse	with corresponding preliminary fuse
Order numbers					
Order Number	**HLD 810-500/75**	**HLD 810-500/100**	**HLD 810-500/130**	**HLD 810-500/180**	**HLD 810-500/250**

Radio interference suppression filter, three phase, for IT Network
HLD 810

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLD 810-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.78 kg	1	190	45	75	20	180	166
HLD 810-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.00 kg	1	220	45	75	20	210	190
HLD 810-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.20 kg	1	250	45	75	20	240	220
HLD 810-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.80 kg	1	270	55	95	30	255	240
HLD 810-500/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M5	2.10 kg	1	310	55	95	30	295	280
HLD 810-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M5	2.50 kg	2	250	85	95	60	235	255
HLD 810-500/75	Screw clamp, 35 mm²	Bolt, M8	Mounting lugs	M6	4.50 kg	2	270	85	135	60	255	310
HLD 810-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	5.20 kg	2	270	95	150	65	255	325
HLD 810-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	5.60 kg	2	270	95	150	65	255	325
HLD 810-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	9.20 kg	2	380	130	181	102	365	440
HLD 810-500/250	Screw clamp, 150 mm²	Bolt, M12	Mounting lugs	M6	12.20 kg	2	450	155	220	125	435	525

Dimension pictures

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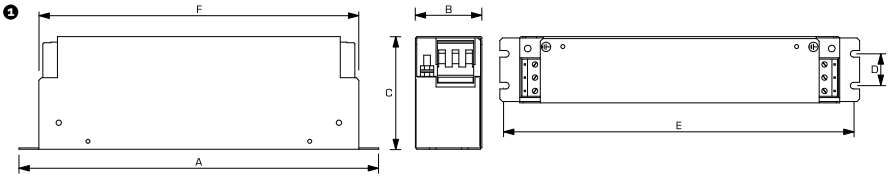

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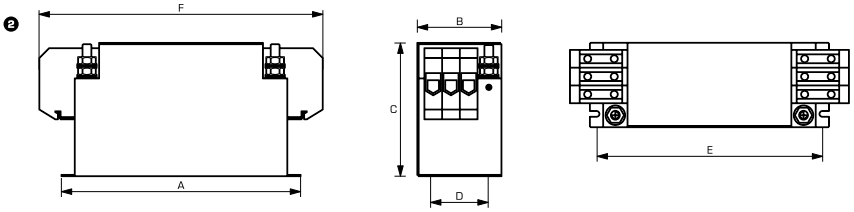

Radio interference suppression filter, three phase
HFD 500

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 110 A
Leakage current 18.00 - 66.00 mA
Degree of protection IP 20
Rail mounting

Advantages

For general requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for mains-side interference suppression of power supplies and electronic devices.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase
HFD 500

Electrical data

Type	HFD 500/8	HFD 500/16	HFD 500/25	HFD 500/36	HFD 500/50	HFD 500/80
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A	3 x 16 A	3 x 25 A	3 x 36 A	3 x 50 A	3 x 80 A
Leakage current (50 Hz)*	18.00 mA	18.00 mA	34.00 mA	34.00 mA	34.00 mA	66.00 mA
Leakage current (50 Hz)**	6.00 mA	6.00 mA	175.00 mA	175.00 mA	175.00 mA	220.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HFD 500/8**	**HFD 500/16**	**HFD 500/25**	**HFD 500/36**	**HFD 500/50**	**HFD 500/80**

Radio interference suppression filter, three phase
HFD 500

Electrical data

Type	HFD 500/110
Operating data	
Rated voltage	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac
Rated current	3 x 110 A
Leakage current (50 Hz)*	66.00 mA
Leakage current (50 Hz)**	220.00 mA
Rated frequency	50 - 60 Hz
Overrating Capacity	150 %, shortly
Standards	
Classification	EMI filter
Environment	
Ambient temperature max.	40 °C
Climatic category	25/085/21 (in accordance with EN 60068-1)
Safety and protection	
Type	Metal enclosure
Protection index	IP 20
Safety class (prepared)	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes	
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases
Order numbers	
Order Number	**HFD 500/110**

Radio interference suppression filter, three phase
HFD 500

Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G	H
HFD 500/8	Screw clamp, 4 mm²	Bolt, M6	Mounting lugs	1.85 kg	1	219	85	60	180	115	100	115	6.5
HFD 500/16	Screw clamp, 4 mm²	Bolt, M6	Mounting lugs	3.10 kg	1	239	120	65	200	150	135	115	6.5
HFD 500/25	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	3.15 kg	1	250	120	65	200	150	135	115	6.5
HFD 500/36	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	3.22 kg	1	250	120	65	200	150	135	115	6.5
HFD 500/50	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	3.30 kg	1	250	120	65	200	150	135	115	6.5
HFD 500/80	Screw clamp, 25 mm²	Bolt, M6	Mounting lugs	9.50 kg	2	427	170	90	350	-	384	3.5	15
HFD 500/110	Screw clamp, 50 mm²	Bolt, M6	Mounting lugs	10.20 kg	2	436	170	100	350	-	130	384	15

Dimension pictures

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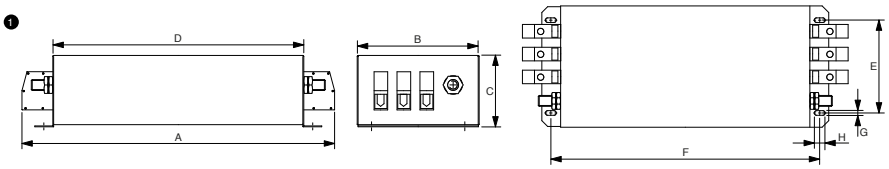

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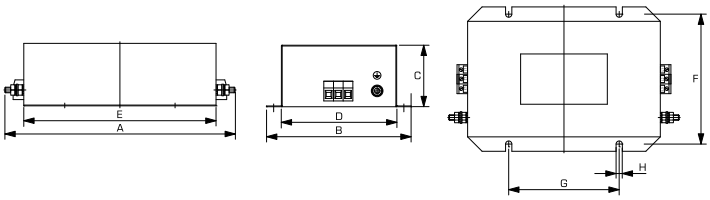


Radio interference filter, three phase
HFD 210

General Data

Rated voltage 3 x 480 - 3 x 520 Vac
Voltage range 0 - 3 x 480 - 520 Vac
Rated current 3 x 7 - 3 x 180 A
Leakage current 12.00 - 18.00 mA
Protection index IP 20

Advantages

For enhanced requirements
Two-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter complying with
DIN EN 60939-2, UL 1283, CSA C22.2 No.8

Certifications

UL 1283 5th edition, CSA 22.2 No 8

Radio interference filter, three phase
HFD 210

Electrical data

Type	HFD 210-500/7	HFD 210-500/16	HFD 210-500/30	HFD 210-500/42	HFD 210-500/55	HFD 210-500/75
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 7 A	3 x 16 A	3 x 30 A	3 x 42 A	3 x 55 A	3 x 75 A
Leakage current (50 Hz)*	13.00 mA	14.00 mA	16.00 mA	16.00 mA	16.00 mA	16.00 mA
Leakage current (50 Hz)**	130.00 mA	133.00 mA	154.00 mA	154.00 mA	154.00 mA	154.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals						
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HFD 210-500/7**	**HFD 210-500/16**	**HFD 210-500/30**	**HFD 210-500/42**	**HFD 210-500/55**	**HFD 210-500/75**

Radio interference filter, three phase
HFD 210

Electrical data

Type	HFD 210-500/100	HFD 210-500/130	HFD 210-500/180
Operating data			
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 100 A	3 x 130 A	3 x 180 A
Leakage current (50 Hz)*	16.00 mA	18.00 mA	18.00 mA
Leakage current (50 Hz)**	154.00 mA	173.00 mA	173.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly
Standards			
Classification	EMI filter	EMI filter	EMI filter
Approvals			
Approvals	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8	cURus, UL 1283 5th edition, CSA 22.2 No.8
Environment			
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C
Safety and protection			
Type	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes			
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers			
Order Number	**HFD 210-500/100**	**HFD 210-500/130**	**HFD 210-500/180**

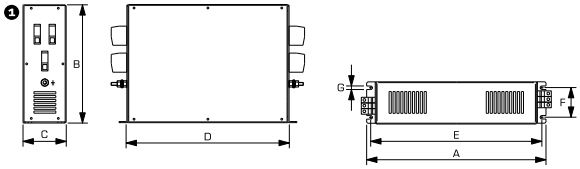
Radio interference filter, three phase
HFD 210

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G
HFD 210-500/7	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	1.10 kg	❶	255	126	50	225	240	25	6.5
HFD 210-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	1.70 kg	❶	305	142	55	275	289	30	6.5
HFD 210-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	1.80 kg	❶	335	150	60	305	320	35	6.5
HFD 210-500/42	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	2.80 kg	❶	329	185	70	300	314	45	6.5
HFD 210-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	3.10 kg	❶	329	185	80	300	314	55	6.5
HFD 210-500/75	Screw clamp, 25 mm²	Bolt, M6	Mounting lugs	4.00 kg	❶	329	220	80	300	314	55	6.5
HFD 210-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	5.50 kg	❶	379	220	90	350	364	65	6.5
HFD 210-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	7.50 kg	❶	429	240	110	400	414	80	6.5
HFD 210-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	11.00 kg	❶	438	240	110	400	414	80	6.5

Dimension pictures

❶



Radio interference filter, three phase
HFD 510

General Data

- Rated voltage 3 x 480 - 3 x 520 Vac
- Voltage range 0 - 3 x 480 - 520 Vac
- Rated current 3 x 8 - 3 x 180 A
- Leakage current 4.00 - 43.00 mA
- Degree of protection IP 20

Advantages

- For the highest requirements
- Two-stage filter concept
- Efficient filter effect against line-bound interference emissions
- Increase in the interference immunity of the connected consumer

Applications

Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference filter, three phase
HFD 510

Electrical data

Type	HFD 510-400/8	HFD 510-400/16	HFD 510-400/25	HFD 510-400/35	HFD 510-400/50	HFD 510-400/80
Operating data						
Rated voltage	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac
Voltage range	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac
Rated current	3 x 8 A	3 x 16 A	3 x 25 A	3 x 35 A	3 x 50 A	3 x 80 A
Leakage current (50 Hz)*	4.00 mA	19.00 mA	17.00 mA	22.00 mA	18.00 mA	31.00 mA
Leakage current (50 Hz)**	37.00 mA	178.00 mA	161.00 mA	216.00 mA	174.00 mA	295.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HFD 510-400/8**	**HFD 510-400/16**	**HFD 510-400/25**	**HFD 510-400/35**	**HFD 510-400/50**	**HFD 510-400/80**

Radio interference filter, three phase
HFD 510

Electrical data

Type	HFD 510-400/130	HFD 510-400/180	HFD 510-500/8	HFD 510-500/16	HFD 510-500/25	HFD 510-500/35
Operating data						
Rated voltage	3 x 480 Vac	3 x 480 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 130 A	3 x 180 A	3 x 8 A	3 x 16 A	3 x 25 A	3 x 35 A
Leakage current (50 Hz)*	39.00 mA	40.00 mA	4.00 mA	20.00 mA	18.00 mA	24.00 mA
Leakage current (50 Hz)**	371.00 mA	385.00 mA	40.00 mA	193.00 mA	175.00 mA	233.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HFD 510-400/130**	**HFD 510-400/180**	**HFD 510-500/8**	**HFD 510-500/16**	**HFD 510-500/25**	**HFD 510-500/35**

Radio interference filter, three phase
HFD 510

Electrical data

Type	HFD 510-500/50	HFD 510-500/80	HFD 510-500/130	HFD 510-500/180
Operating data				
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 50 A	3 x 80 A	3 x 130 A	3 x 180 A
Leakage current (50 Hz)*	20.00 mA	33.00 mA	42.00 mA	43.00 mA
Leakage current (50 Hz)**	188.00 mA	320.00 mA	402.00 mA	417.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards				
Classification	EMI filter	EMI filter	EMI filter	EMI filter
Environment				
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C
Safety and protection				
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes				
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers				
Order Number	**HFD 510-500/50**	**HFD 510-500/80**	**HFD 510-500/130**	**HFD 510-500/180**

Radio interference filter, three phase
HFD 510

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G
HFD 510-400/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	1.10 kg	1	255	125	50	225	240	25	6.5
HFD 510-400/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	1.90 kg	1	305	142	55	275	290	27	6.5
HFD 510-400/25	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	1.90 kg	1	329	185	70	300	314	45	6.5
HFD 510-400/35	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	2.80 kg	1	329	185	70	300	314	45	6.5
HFD 510-400/50	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	3.10 kg	1	429	240	110	400	414	80	6.5
HFD 510-400/80	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	4.00 kg	1	429	240	110	400	414	80	6.5
HFD 510-400/130	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	6.80 kg	1	438	240	110	400	414	80	6.5
HFD 510-400/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	7.00 kg	1	536	300	116	500	512	90	8.5
HFD 510-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	1.10 kg	1	255	125	50	225	240	25	6.5
HFD 510-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	1.90 kg	1	305	142	55	275	290	27	6.5
HFD 510-500/25	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	1.90 kg	1	329	185	70	300	314	45	6.5
HFD 510-500/35	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	2.80 kg	1	329	185	70	300	314	45	6.5
HFD 510-500/50	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs	3.10 kg	1	429	240	110	400	414	80	6.5
HFD 510-500/80	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	4.00 kg	1	429	240	110	400	414	80	6.5
HFD 510-500/130	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	6.80 kg	1	438	240	110	400	414	80	6.5
HFD 510-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	7.00 kg	1	536	300	116	500	512	90	8.5

Dimension pictures

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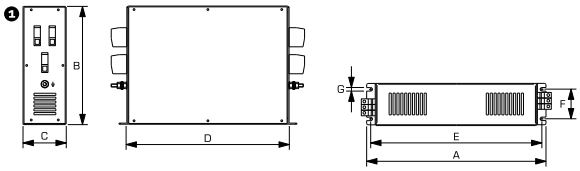
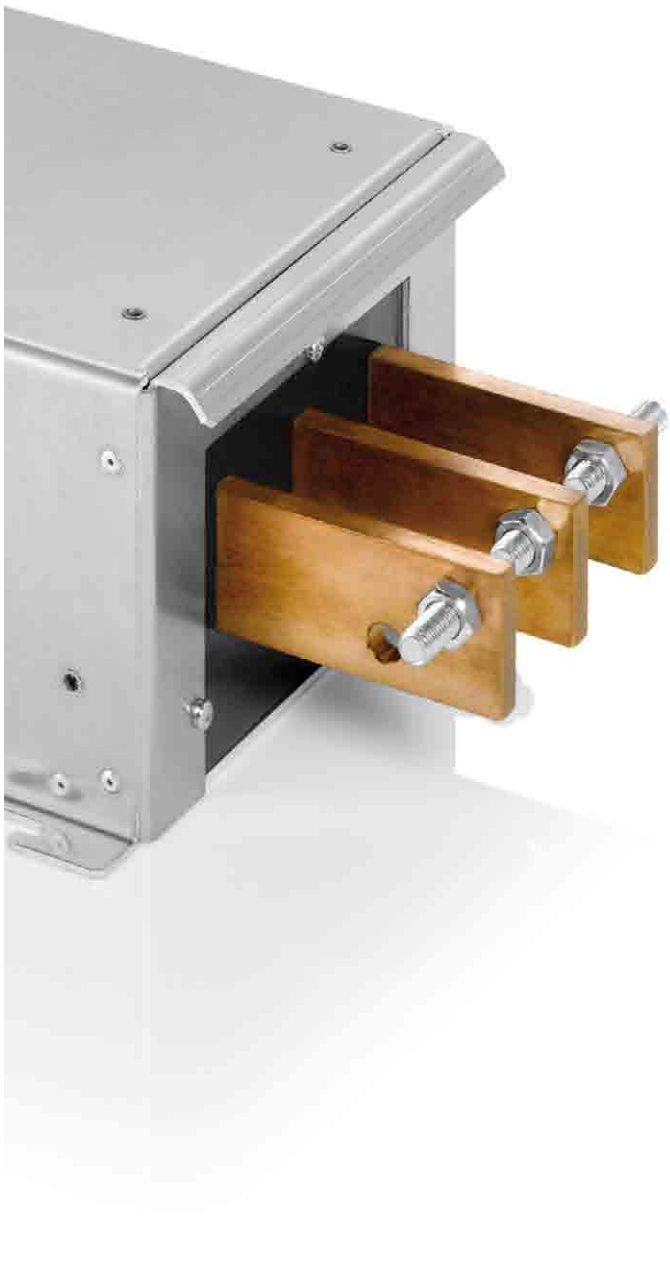


Radio interference suppression filter, three phase with energy recovery
HFD 503



General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 250 - 3 x 2200 A
Leakage current 23.00 - 370.00 mA
Ambient temperature max. 50 °C
Degree of protection IP 00

Advantages

- For high current applications in automation technology
- Multi stage filter concept
- Efficient filter effect against line-bound interference emissions
- Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase with energy recovery
HFD 503

Electrical data

Type	HFD 503-500/250	HFD 503-500/300	HFD 503-500/400	HFD 503-500/500	HFD 503-500/600	HFD 503-500/900
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 250 A	3 x 300 A	3 x 400 A	3 x 500 A	3 x 600 A	3 x 900 A
Leakage current (50 Hz)*	23.00 mA	20.00 mA	20.00 mA	20.00 mA	20.00 mA	170.00 mA
Leakage current (50 Hz)**	220.00 mA	200.00 mA	200.00 mA	200.00 mA	200.00 mA	1700.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HFD 503-500/250**	**HFD 503-500/300**	**HFD 503-500/400**	**HFD 503-500/500**	**HFD 503-500/600**	**HFD 503-500/900**

Radio interference suppression filter, three phase with energy recovery
HFD 503

Electrical data

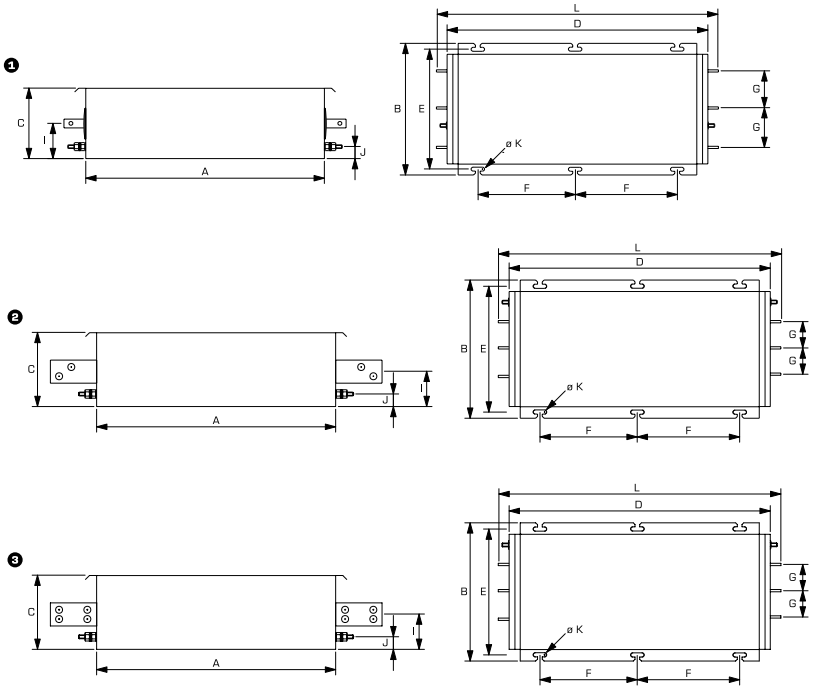
Type	HFD 503-500/1200	HFD 503-500/1600	HFD 503-500/2200
Operating data			
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 1200 A	3 x 1600 A	3 x 2200 A
Leakage current (50 Hz)*	20.20 mA	250.00 mA	370.00 mA
Leakage current (50 Hz)**	195.00 mA	2180.00 mA	3600.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly
Standards			
Classification	EMI filter	EMI filter	EMI filter
Environment			
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C
Safety and protection			
Type	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I
Test voltage	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE	2121 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes			
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers			
Order Number	**HFD 503-500/1200**	**HFD 503-500/1600**	**HFD 503-500/2200**

Radio interference suppression filter, three phase with energy recovery
HFD 503

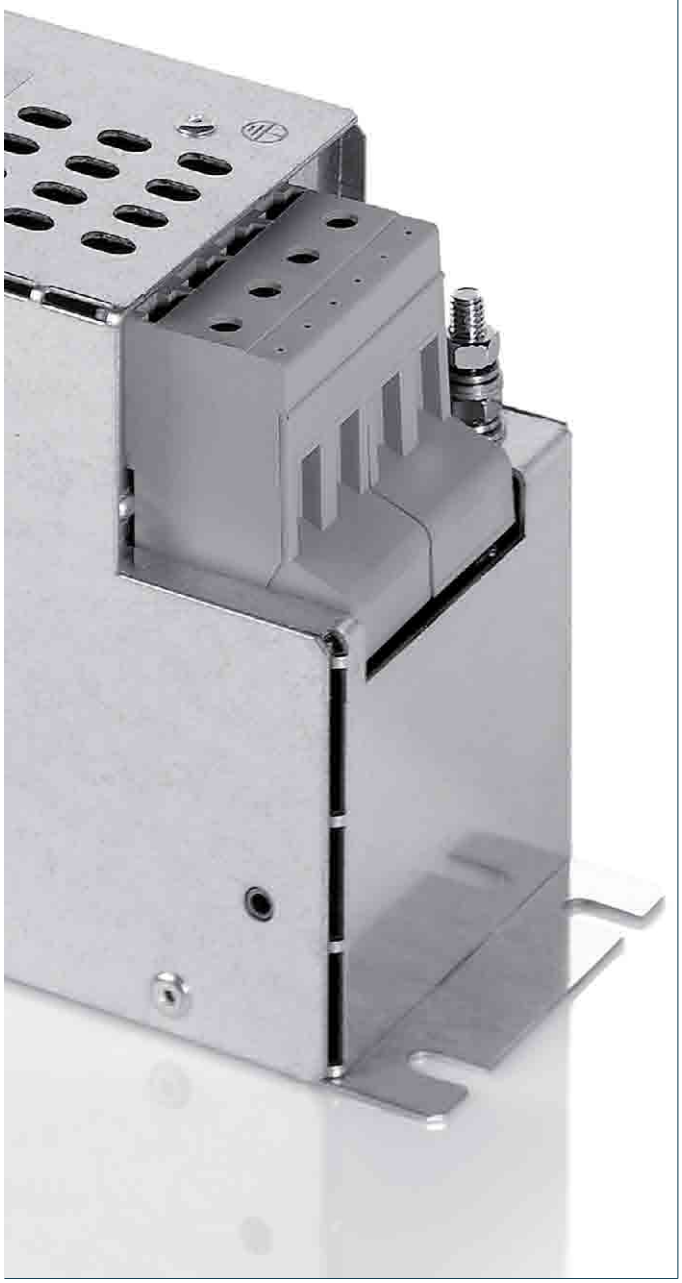
30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G	I	J	K	L
HFD 503-500/250	Flat copper, 47 x 25 x 8 mm	Bolt, M12	Mounting lugs	36.50 kg	1	510	300	160	564	275	210	78.5	80	27	9	610
HFD 503-500/300	Flat copper, 47 x 25 x 8 mm	Bolt, M12	Mounting lugs	38.00 kg	1	510	300	160	564	275	210	78.5	80	27	9	610
HFD 503-500/400	Flat copper, 47 x 25 x 8 mm	Bolt, M12	Mounting lugs	39.00 kg	1	510	300	160	564	275	210	78.5	80	27	9	610
HFD 503-500/500	Flat copper, 47 x 25 x 8 mm	Bolt, M12	Mounting lugs	39.00 kg	1	510	300	160	564	275	210	78.5	80	27	9	610
HFD 503-500/600	Flat copper, 100 x 30 x 8 mm	Bolt, M12	Mounting lugs	39.00 kg	1	510	300	160	564	275	210	78.5	80	27	9	630
HFD 503-500/900	Flat copper, 100 x 50 x 10 mm	Bolt, M12	Mounting lugs	49.00 kg	2	510	300	160	564	275	210	60	74.5	24	9	716
HFD 503-500/1200	Flat copper, 100 x 50 x 12 mm	Bolt, M12	Mounting lugs	49.00 kg	2	510	300	160	564	275	210	60	74.5	24	9	716
HFD 503-500/1600	Flat copper, 100 x 50 x 12 mm	Bolt, M12	Mounting lugs	38.00 kg	3	510	300	160	564	275	210	60	74.5	24	9	716
HFD 503-500/2200	Flat copper, 100 x 70 x 12 mm	Bolt, M12	Mounting lugs	60.00 kg	3	660	360	160	714	335	285	90	74.5	38	9	866

Dimension pictures



Radio interference suppression filter, three phase with neutral conductor **HLV 110**



General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A+N
Leakage current 19.00 - 37.00 mA
Ambient temperature max. 50 °C
Degree of protection IP 20

Advantages

For enhanced requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter complying with DIN EN 60939-2, UL 1283, CSA C22.2 No.8

Certifications

UL 1283 5th edition, CSA 22.2 No.8(only HLV 110-500/16)

Radio interference suppression filter, three phase with neutral conductor
HLV 110

Electrical data

Type	HLV 110-500/8	HLV 110-500/12	HLV 110-500/16	HLV 110-500/30	HLV 110-500/42	HLV 110-500/55
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A+N	3 x 12 A+N	3 x 16 A+N	3 x 30 A+N	3 x 42 A+N	3 x 55 A+N
Leakage current (50 Hz)*	19.00 mA	19.00 mA	21.00 mA	21.00 mA	30.00 mA	22.00 mA
Leakage current (50 Hz)**	187.00 mA	187.00 mA	200.00 mA	200.00 mA	285.00 mA	208.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals						
Approvals	-	-	cURus,UL 1283 5th edition, CSA 22.2 No.8	-	-	-
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HLV 110-500/8**	**HLV 110-500/12**	**HLV 110-500/16**	**HLV 110-500/30**	**HLV 110-500/42**	**HLV 110-500/55**

Radio interference suppression filter, three phase with neutral conductor
HLV 110

Electrical data

Type	HLV 110-500/75	HLV 110-500/100	HLV 110-500/130	HLV 110-500/180	HLV 110-500/250
Operating data					
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 75 A+N	3 x 100 A+N	3 x 130 A+N	3 x 180 A+N	3 x 250 A+N
Leakage current (50 Hz)*	30.00 mA	22.00 mA	22.00 mA	31.00 mA	37.00 mA
Leakage current (50 Hz)**	285.00 mA	207.00 mA	207.00 mA	296.00 mA	351.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Approvals					
Approvals	-	-	-	-	-
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers					
Order Number	**HLV 110-500/75**	**HLV 110-500/100**	**HLV 110-500/130**	**HLV 110-500/180**	**HLV 110-500/250**

Radio interference suppression filter, three phase with neutral conductor
HLV 110

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLV 110-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.83 kg	❶	190	55	75	30	178	165
HLV 110-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.97 kg	❶	220	55	75	30	208	190
HLV 110-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.20 kg	❶	250	55	75	30	240	220
HLV 110-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.80 kg	❶	270	70	95	45	255	240
HLV 110-500/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	2.20 kg	❶	310	70	95	40	295	280
HLV 110-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M6	2.90 kg	❷	250	100	95	70	233	255
HLV 110-500/75	Screw clamp, 35 mm²	Bolt, M10	Mounting lugs	M6	4.80 kg	❷	270	100	150	70	255	298
HLV 110-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	6.20 kg	❷	320	115	150	85	307	370
HLV 110-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	6.90 kg	❷	320	115	150	85	307	370
HLV 110-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	11.10 kg	❷	380	150	180	125	365	445
HLV 110-500/250	Screw clamp, 150 mm²	Bolt, M12	Mounting lugs	M6	15.10 kg	❷	450	186	220	155	435	420

Dimension pictures

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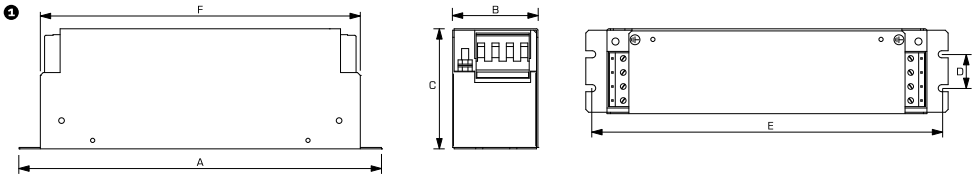

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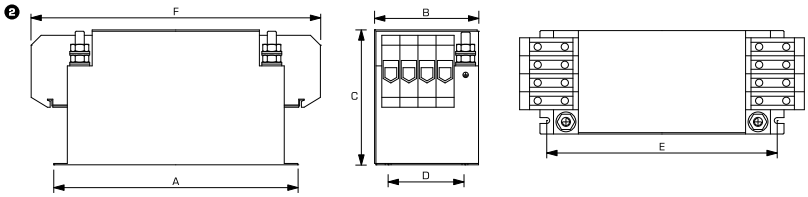

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 310

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A+N
Leakage current <1.0 mA
Degree of protection IP 20

Advantages

For enhanced requirements
Low leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 310

Electrical data

Type	HLV 310-500/8	HLV 310-500/12	HLV 310-500/16	HLV 310-500/30	HLV 310-500/42	HLV 310-500/55
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A+N	3 x 12 A+N	3 x 12 A + N	3 x 30 A+N	3 x 42 A +N	3 x 55 A+N
Leakage current (50 Hz)*	<1.0 mA	<1.0 mA	<1.0 mA	<1.0 mA	<1.0 mA	<1.0 mA
Leakage current (50 Hz)**	<3.5 mA	<3.5 mA	<3.5 mA	<3.5 mA	<3.5 mA	<3.5 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HLV 310-500/8**	**HLV 310-500/12**	**HLV 310-500/16**	**HLV 310-500/30**	**HLV 310-500/42**	**HLV 310-500/55**

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 310

Type	HLV 310-500/75	HLV 310-500/100	HLV 310-500/130	HLV 310-500/180	HLV 310-500/250
Operating data					
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 75 A+N	3 x 100 A+N	3 x 130 A+N	3 x 180 A+N	3 x 250 A+N
Leakage current (50 Hz)*	<1.0 mA	<1.0 mA	<1.0 mA	<1.0 mA	<1.0 mA
Leakage current (50 Hz)**	<3.5 mA	<3.5 mA	<3.5 mA	<3.5 mA	<3.5 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers					
Order Number	**HLV 310-500/75**	**HLV 310-500/100**	**HLV 310-500/130**	**HLV 310-500/180**	**HLV 310-500/250**

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 310

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLV 310-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.83 kg	❶	190	55	75	30	178	165
HLV 310-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.97 kg	❶	220	55	75	30	208	190
HLV 310-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.20 kg	❶	250	55	75	30	240	220
HLV 310-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.80 kg	❶	270	70	95	45	255	240
HLV 310-500/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	2.20 kg	❶	310	70	95	40	295	280
HLV 310-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M6	2.90 kg	❷	250	100	95	70	233	255
HLV 310-500/75	Screw clamp, 35 mm²	Bolt, M10	Mounting lugs	M6	4.80 kg	❷	270	100	150	70	255	298
HLV 310-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	6.20 kg	❷	320	115	150	85	307	370
HLV 310-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	6.90 kg	❷	320	115	150	85	307	370
HLV 310-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	11.10 kg	❷	380	150	180	125	365	445
HLV 310-500/250	Screw clamp, 150 mm²	Bolt, M12	Mounting lugs	M6	15.10 kg	❷	450	186	220	155	435	420

Dimension pictures

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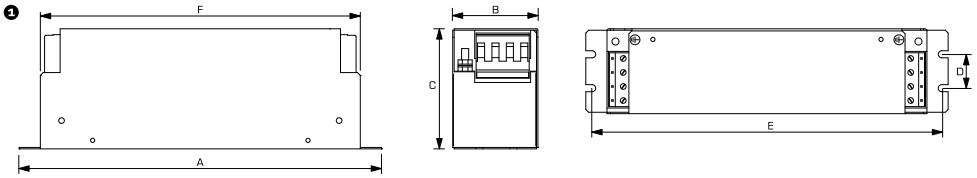

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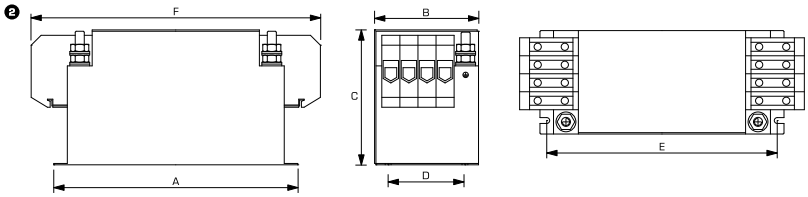

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 710

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A+N
Leakage current 6.00 - 7.00 mA
Degree of protection IP 20

Advantages

For enhanced requirements
Reduced leakage current
Single-stage filter concept
Efficient filter effect against line-bound interference emissions

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 710

Electrical data

Type	HLV 710-500/8	HLV 710-500/12	HLV 710-500/16	HLV 710-500/30	HLV 710-500/42	HLV 710-500/55
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A+N	3 x 12 A+N	3 x 16 A+N	3 x 30 A+N	3 x 42 A+N	3 x 55 A+N
Leakage current (50 Hz)*	6.00 mA	6.00 mA	6.00 mA	6.50 mA	6.50 mA	6.50 mA
Leakage current (50 Hz)**	60.00 mA	60.00 mA	60.00 mA	63.00 mA	63.00 mA	63.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HLV 710-500/8**	**HLV 710-500/12**	**HLV 710-500/16**	**HLV 710-500/30**	**HLV 710-500/42**	**HLV 710-500/55**

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 710

Electrical data

Type	HLV 710-500/75	HLV 710-500/100	HLV 710-500/130	HLV 710-500/180	HLV 710-500/250
Operating data					
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 75 A+N	3 x 100 A+N	3 x 130 A+N	3 x 180 A+N	3 x 250 A+N
Leakage current (50 Hz)*	6.50 mA	6.50 mA	6.50 mA	7.00 mA	7.00 mA
Leakage current (50 Hz)**	63.00 mA	63.00 mA	65.00 mA	65.00 mA	65.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes					
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers					
Order Number	**HLV 710-500/75**	**HLV 710-500/100**	**HLV 710-500/130**	**HLV 710-500/180**	**HLV 710-500/250**

Radio interference suppression filter, three phase with neutral conductor, low leakage current
HLV 710

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLV 710-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.83 kg	❶	190	55	75	30	178	165
HLV 710-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.97 kg	❶	220	55	75	30	208	190
HLV 710-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.20 kg	❶	250	55	75	30	240	220
HLV 710-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.80 kg	❶	270	70	95	45	255	240
HLV 710-500/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	2.20 kg	❶	310	70	95	40	295	255
HLV 710-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M6	2.90 kg	❷	250	100	95	70	233	255
HLV 710-500/75	Screw clamp, 35 mm²	Bolt, M10	Mounting lugs	M6	2.90 kg	❷	270	100	150	70	255	298
HLV 710-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	6.20 kg	❷	320	115	150	85	307	370
HLV 710-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	6.90 kg	❷	320	115	150	85	307	370
HLV 710-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	11.10 kg	❷	380	150	180	125	365	445
HLV 710-500/250	Screw clamp, 150 mm²	Bolt, M12	Mounting lugs	M6	15.10 kg	❷	450	186	220	155	435	420

Dimension pictures

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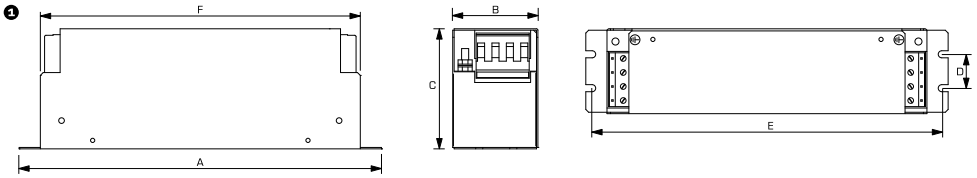

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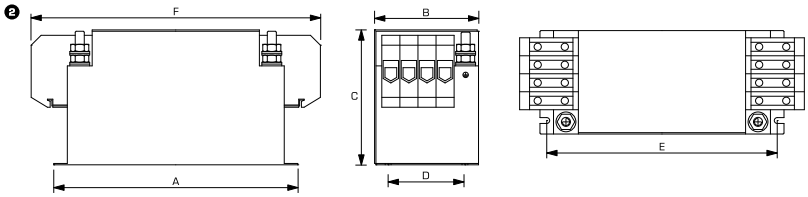

Radio interference suppression filter, three phase with neutral conductor, no leakage current
HLV 810

General Data

Rated voltage 3 x 520 Vac
Voltage range 0 - 3 x 520 Vac
Rated current 3 x 8 - 3 x 250 A+N
Degree of protection IP 20

Advantages

For enhanced requirements
Single-stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices or frequency converters.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase with neutral conductor, no leakage current
HLV 810

Electrical data

Type	HLV 810-500/8	HLV 810-500/12	HLV 810-500/16	HLV 810-500/30	HLV 810-500/42	HLV 810-500/55
Operating data						
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 8 A+N	3 x 12 A+N	3 x 16 A+N	3 x 30 A+N	3 x 42 A+N	3 x 55 A+N
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Order numbers						
Order Number	**HLV 810-500/8**	**HLV 810-500/12**	**HLV 810-500/16**	**HLV 810-500/30**	**HLV 810-500/42**	**HLV 810-500/55**

Radio interference suppression filter, three phase with neutral conductor, no leakage current
HLV 810

Electrical data

Type	HLV 810-500/75	HLV 810-500/100	HLV 810-500/130	HLV 810-500/180	HLV 810-500/250
Operating data					
Rated voltage	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac	3 x 520 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 75 A+N	3 x 100 A+N	3 x 130 A+N	3 x 180 A+N	3 x 250 A+N
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards					
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment					
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	50 °C	50 °C	50 °C	50 °C	50 °C
Safety and protection					
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Order numbers					
Order Number	**HLV 810-500/75**	**HLV 810-500/100**	**HLV 810-500/130**	**HLV 810-500/180**	**HLV 810-500/250**

Radio interference suppression filter, three phase with neutral conductor, no leakage current
HLV 810

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Fixing screws	Weight	Dimension picture (in mm)	A	B	C	D	E	F
HLV 810-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.83 kg	1	190	55	75	30	178	165
HLV 810-500/12	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	0.97 kg	1	220	55	75	30	208	190
HLV 810-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs	M5	1.20 kg	1	250	55	75	30	240	220
HLV 810-500/30	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs	M5	1.80 kg	1	270	70	95	45	255	240
HLV 810-500/42	Screw clamp, 10 mm²	Bolt, M6	Mounting lugs	M6	2.20 kg	1	310	70	95	40	295	255
HLV 810-500/55	Screw clamp, 16 mm²	Bolt, M6	Mounting lugs	M6	2.90 kg	2	250	100	95	70	233	255
HLV 810-500/75	Screw clamp, 35 mm²	Bolt, M10	Mounting lugs	M6	4.80 kg	2	270	100	150	70	255	298
HLV 810-500/100	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M5	6.20 kg	2	320	115	150	85	307	370
HLV 810-500/130	Screw clamp, 50 mm²	Bolt, M10	Mounting lugs	M6	6.90 kg	2	320	115	150	85	307	370
HLV 810-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs	M6	11.10 kg	2	380	150	180	125	365	445
HLV 810-500/250	Screw clamp, 150 mm²	Bolt, M12	Mounting lugs	M6	15.10 kg	2	450	186	220	155	435	420

Dimension pictures

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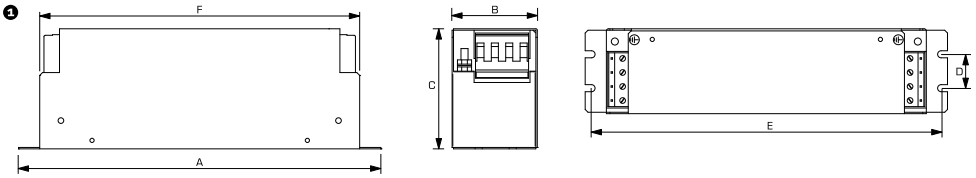

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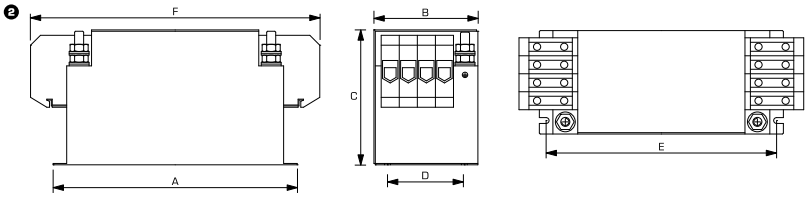

Radio interference suppression filter, three phase with neutral conductor **HFV 510**

General Data

Rated voltage 3 x 480 Vac
Voltage range 0 - 3 x 480 Vac
Rated current 3 x 16 - 3 x 80 A+N
Leakage current 15.00 - 22.00 mA
Degree of protection IP 20

Advantages

For the highest requirements
Two stage filter concept
Efficient filter effect against line-bound interference emissions
Increase in the interference immunity of the connected consumer

Applications

Radio interference suppression filter for line-side interference suppression of single devices, frequency converters or as group interference suppression.

Standards

Radio interference suppression filter to DIN EN 60939-2

Radio interference suppression filter, three phase with neutral conductor
HFV 510

Electrical data

Type	HFV 510-400/8	HFV 510-400/16	HFV 510-400/25	HFV 510-400/35	HFV 510-400/50	HFV 510-400/80
Operating data						
Rated voltage	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac
Voltage range	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 480 Vac
Rated current	3 x 8 A+N	3 x 16 A+N	3 x 25 A+N	3 x 35 A+N	3 x 50 A+N	3 x 80 A+N
Leakage current (50 Hz)*	6.50 mA	15.00 mA	17.00 mA	22.00 mA	17.00 mA	19.00 mA
Leakage current (50 Hz)**	63.00 mA	145.00 mA	161.00 mA	215.00 mA	161.00 mA	178.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HFV 510-400/8**	**HFV 510-400/16**	**HFV 510-400/25**	**HFV 510-400/35**	**HFV 510-400/50**	**HFV 510-400/80**

Radio interference suppression filter, three phase with neutral conductor
HFV 510

Electrical data

Type	HFV 510-400/130	HFV 510-400/180	HFV 510-500/8	HFV 510-500/16	HFV 510-500/25	HFV 510-500/35
Operating data						
Rated voltage	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac
Voltage range	0 - 3 x 480 Vac	0 - 3 x 480 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 130 A+N	3 x 180 A+N	3 x 8 A+N	3 x 16 A+N	3 x 25 A+N	3 x 35 A+N
Leakage current (50 Hz)*	39.00 mA	40.00 mA	7.00 mA	16.00 mA	18.00 mA	24.00 mA
Leakage current (50 Hz)**	372.00 mA	386.00 mA	68.00 mA	157.00 mA	175.00 mA	233.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards						
Classification	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter	EMI filter
Environment						
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes						
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers						
Order Number	**HFV 510-400/130**	**HFV 510-400/180**	**HFV 510-500/8**	**HFV 510-500/16**	**HFV 510-500/25**	**HFV 510-500/35**

Radio interference suppression filter, three phase with neutral conductor
HFV 510

Electrical data

Type	HFV 510-500/50	HFV 510-500/80	HFV 510-500/130	HFV 510-500/180
Operating data				
Rated voltage	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac	3 x 480 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Rated current	3 x 50 A+N	3 x 80 A+N	3 x 130 A+N	3 x 180 A+N
Leakage current (50 Hz)*	18.00 mA	20.00 mA	42.00 mA	44.00 mA
Leakage current (50 Hz)**	175.00 mA	193.00 mA	403.00 mA	418.00 mA
Rated frequency	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz	50 - 60 Hz
Overrating Capacity	150 %, shortly	150 %, shortly	150 %, shortly	150 %, shortly
Standards				
Classification	EMI filter	EMI filter	EMI filter	EMI filter
Environment				
Climatic category	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)	25/085/21 (in accordance with EN 60068-1)
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C
Safety and protection				
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Protection index	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I
Test voltage	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE	2150 Vdc Phase/Phase, 2700 Vdc Phase/PE
Notes				
*	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %	Leakage current measured against the maximum permissible input voltage fluctuation in accordance with IEC 38 ±10 %
**	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases	Leakage current by loss of two phases
Order numbers				
Order Number	**HFV 510-500/50**	**HFV 510-500/80**	**HFV 510-500/130**	**HFV 510-500/180**

Radio interference suppression filter, three phase with neutral conductor
HFV 510

30 Mechanical data

Typ	Connections phase/N	Connections PE	Fixing method	Weight	Dimension picture (in mm)	A	B	C	D	E	F	G
HFV 510-400/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs with fixing holes	1.60 kg	❶	255	50	125	240	25	265	6.5
HFV 510-400/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs with fixing holes	1.70 kg	❶	305	55	142	290	30	295	6.5
HFV 510-400/25	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs with fixing holes	1.80 kg	❶	329	70	185	314	45	300	6.5
HFV 510-400/35	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs with fixing holes	2.80 kg	❶	329	70	185	314	45	300	6.5
HFV 510-400/50	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs with fixing holes	3.10 kg	❶	429	110	240	414	80	400	6.5
HFV 510-400/80	Screw clamp, 25 mm²	Bolt, M10	Mounting lugs with fixing holes	4.00 kg	❶	633	110	240	618	80	600	6.5
HFV 510-400/130	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs with fixing holes	16.00 kg	❶	429	129	240	414	98	500	6.5
HFV 510-400/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs with fixing holes	20.00 kg	❶	438	136	240	414	105	500	6.5
HFV 510-500/8	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs with fixing holes	1.60 kg	❶	255	50	125	240	25	265	6.5
HFV 510-500/16	Screw clamp, 4 mm²	Bolt, M5	Mounting lugs with fixing holes	1.70 kg	❶	305	55	142	290	30	295	6.5
HFV 510-500/25	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs with fixing holes	1.80 kg	❶	329	70	185	314	45	300	6.5
HFV 510-500/35	Screw clamp, 10 mm²	Bolt, M5	Mounting lugs with fixing holes	2.80 kg	❶	329	70	185	314	45	300	6.5
HFV 510-500/50	Screw clamp, 16 mm²	Bolt, M8	Mounting lugs with fixing holes	3.10 kg	❶	429	110	240	414	80	400	6.5
HFV 510-500/80	Screw clamp, 25 mm²	Bolt, M10	Mounting lugs with fixing holes	4.00 kg	❶	633	110	240	618	80	600	6.5
HFV 510-500/130	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs with fixing holes	16.00 kg	❶	429	129	240	414	98	500	6.5
HFV 510-500/180	Screw clamp, 95 mm²	Bolt, M10	Mounting lugs with fixing holes	20.00 kg	❶	438	136	240	414	105	500	6.5

Dimension pictures

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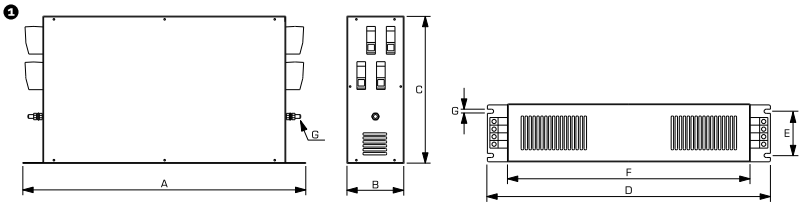

Magnetic voltage stabilizer
KH 250

General Data

Rated input voltage 230 Vac
Rated output voltage 230 Vac
Rated power 250 VA
Ambient temperature +40 °C
Degree of protection IP 40

Advantages

Compensation for mains voltage fluctuations
Attenuation of asymmetric parasitic voltage peaks
Bridging momentary voltage dips
Galvanic isolation from the mains
Short-circuit proof
No-load proof
RF interference free
Maintenance-free

Applications

Magnetic voltage stabilizer securing the supply voltage in the event of mains overvoltage, mains undervoltage, voltage dips and voltage surges and in the case of brief voltage interruptions.

Standards

Magnetic voltage stabilizer acting as mains transformer in accordance with VDE 0570 part 2-12, EN 61558-2-12; IEC 61558-2-12

Magnetic voltage stabilizer
KH 250

Type	KH 250
Electrical data	
Operating data	
Rated input voltage	230 Vac
Permissible tolerance (Input voltage)	+10 % to -20 %
Rated output voltage	230 Vac
Rated current	1.1 A
Rated Power	250 VA
Rated frequency	50 Hz
Permissible tolerance (Frequency)	±1 Hz
Harmonic content	typ. 5 % in relation to 230 Vac rated input range
Response time	typ. 3 line periods (60 ms)
Environment	
Ambient temperature max.	40 °C
Safety and protection	
Type	Resin encapsulated transformer
Class of Insulation System	A
Protection index	IP 40
Safety class (prepared)	II
Short circuit strength	short-circuit proof
Test voltage	3750 Vac, 50 Hz
Order numbers	
Order Number	**KH 250**
Mechanical data	
Terminal and mounting	
Terminals PRI	Mains lead, 2 m long with moulded plug
Terminals SEC	Socket
Measures and weights	
Weight	11.70 kg
Dimension picture (in mm)	❶
A	245
B	145
C	200

Dimension pictures

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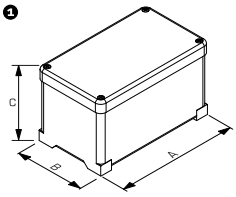

Magnetic voltage stabilizer
BSD

General Data

Rated input voltage 230 Vac
Rated output voltage 230 Vac
Rated power 60 - 3000 VA
Degree of protection IP 00
Ambient temperature +40 °C

Advantages

Compensation for mains voltage fluctuations
Attenuation of asymmetric parasitic voltage peaks
Bridging momentary voltage dips
May be switched between high control precision and elevated parasitic voltage attenuation
Galvanic isolation from the mains
Short-circuit proof
No-load proof
RF interference free

Applications

Magnetic voltage stabilizer securing the supply voltage in the event of mains overvoltage, mains undervoltage, voltage dips and voltage surges and in the case of brief voltage interruptions.

Standards

Magnetic voltage stabilizer acting as mains transformer in accordance with VDE 0570 part 2;2-12, EN 61558-1; 2-12, IEC 61558-1;2-12

Magnetic voltage stabilizer
BSD

Electrical data

Type	BSD 60	BSD 120	BSD 250	BSD 500	BSD 800	BSD 1000
Operating data						
Rated input voltage	230 Vac	230 Vac	230 Vac	230 Vac	230 Vac	230 Vac
Permissible tolerance (Input voltage)	+10 % to -30 %	+10 % to -30 %	+10 % to -30 %	+10 % to -30 %	+10 % to -30 %	+10 % to -30 %
Rated output voltage	230 Vac	230 Vac	230 Vac	230 Vac	230 Vac	230 Vac
Rated current	0.26 A	0.52 A	1.01 A	2.17 A	3.48 A	4.34 A
Rated Power	60 VA	120 VA	250 VA	500 VA	800 VA	1000 VA
Rated frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Harmonic content	<5 % at ohmic load	<5 % at ohmic load	<5 % at ohmic load	<5 % at ohmic load	<5 % at ohmic load	<5 % at ohmic load
Stored energy time at rated load	10 ms	10 ms	10 ms	10 ms	10 ms	10 ms
Correction time	20 - 60 ms	20 - 60 ms	20 - 60 ms	20 - 60 ms	20 - 60 ms	20 - 60 ms
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	enclosed	enclosed	enclosed	enclosed	enclosed	enclosed
Class of Insulation System	E	E	E	E	E	E
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Short circuit strength	short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof	short-circuit proof
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers						
Order Number	**BSD 60**	**BSD 120**	**BSD 250**	**BSD 500**	**BSD 800**	**BSD 1000**

Mechanical data

Terminal and mounting						
Fixing method	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets
Terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
Measures and weights						
Weight	3.60 kg	6.40 kg	11.00 kg	15.50 kg	22.00 kg	31.00 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❶
A	212	232	266	288	318	287
B	75	100	147	147	147	210
C	138	181	216	216	216	302
D	92	120	165	165	165	235
E	58	59	66	88	118	82
F	190	210	242	264	294	261
G	66	66	140	140	140	162
H	-	-	-	-	-	340

Dimension pictures

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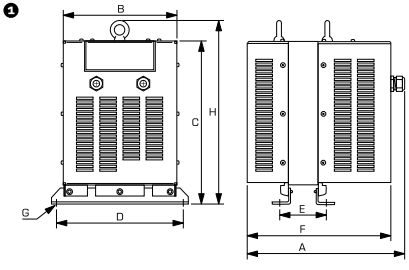


Magnetic voltage stabilizer
BSD

Electrical data

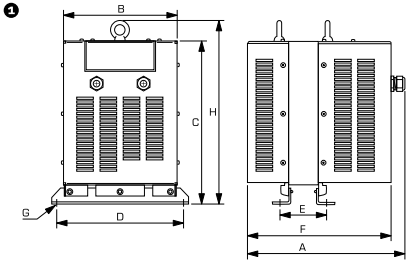
Type	BSD 1500	BSD 2000	BSD 3000
Operating data			
Rated input voltage	230 Vac	230 Vac	230 Vac
Permissible tolerance (Input voltage)	+10 % to -30 %	+10 % to -30 %	+10 % to -30 %
Rated output voltage	230 Vac	230 Vac	230 Vac
Rated current	6.52 A	8.7 A	13 A
Rated Power	1500 VA	2000 VA	3000 VA
Rated frequency	50 Hz	50 Hz	50 Hz
Harmonic content	<5 % at ohmic load	<5 % at ohmic load	<5 % at ohmic load
Stored energy time at rated load	10 ms	10 ms	10 ms
Correction time	20 - 60 ms	20 - 60 ms	20 - 60 ms
Environment			
Ambient temperature max.	40 °C	40 °C	40 °C
Safety and protection			
Type	enclosed	enclosed	enclosed
Class of Insulation System	E	E	E
Protection index	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I
Short circuit strength	short-circuit proof	short-circuit proof	short-circuit proof
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers			
Order Number	**BSD 1500**	**BSD 2000**	**BSD 3000**

Mechanical data

Terminal and mounting			
Fixing method	Mounting brackets	Mounting brackets	Mounting brackets
Terminals	Screw-type terminals	Screw-type terminals	Screw-type terminals
Measures and weights			
Weight	43.00 kg	56.00 kg	82.00 kg
Dimension picture (in mm)	❶	❶	❶
A	325	418	485
B	210	210	210
C	302	302	302
D	235	235	235
E	120	153	220
F	299	392	459
G	162	162	162
H	340	340	340

Dimension pictures

❶



Overview Sinusoidal filters/Motor reactor

Power at a glance

	Type	Art	Voltage range	0.55 kW	1.1 kW	1.5 kW	2.2 kW	4 kW	4 kW	5.5 kW	7.5 kW	7.5 kW	11 kW	15 kW	18.5 kW	22 kW
Sinusoidal filters	SFB	Sinusoidal filters	0 – 3 x 520 Vac			4 A			10 A		16.5 A		23.5 A	32 A	37 A	
	SFA 400	All-pole sinusoidal filters	0 – 480 Vac	1.3 A	2.5 A	4 A	6 A		10 A		16.5 A		24 A	32 A	40 A	
Motor reactor	MDB	Motor reactor	0 – 3 x 500 Vac				6.3 A		9.4 A	13 A	16 A		24 A	30 A	39 A	
	MR3	Motor reactor	0 – 3 x 690 Vac		2.5 A	4 A	6 A	8 A	10 A			18 A	24 A	30 A	37 A	42 A

22 kW	30 kW	37 kW	45 kW	55 kW	75 kW	90 kW	132 kW	250 kW	Page
48 A	61 A	72 A	90 A	115 A	150 A	180 A	250 A	440 A	150
50 A	60 A								154
46 A	61 A	72 A	91 A	110 A	150 A	176 A			158
48 A	61 A								162

Sinusoidal filter
SFB

General Data

Rated voltage 3 x 400 Vac
Rated current 4 - 440 A
For motor rated output 1.5 - 250 kW
For clock frequencies of 4 to 8 kHz
Rated frequency from 0 to 150 Hz
Insulation class H
Maximum ambient temperature 40 °C
Degree of protection IP 00

Advantages

- Prevention of overvoltages on the motor
- Long cable lengths possible
- Reduction in motor noise
- Reduction in line-borne and field-borne emitted interference:
- Reduction in motor losses
- Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation

Applications

Sinus filter for the suppression of differential mode interference.

Standards

Output filter with capacitor for frequency converters complying with DIN EN 61558-2-20, IEC 61558-2-20, UL 508, CSA 22.2 No. 14-9195

Certifications

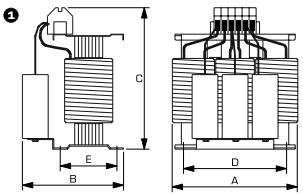
UL 508, CSA 22.2 No 14-9195

Sinusoidal filter
SFB

Type	SFB 400/4	SFB 400/10	SFB 400/16,5	SFB 400/23,5	SFB 400/32	SFB 400/37
Electrical data						
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Voltage drop	7.5 %	7 %	7.5 %	8 %	8.7 %	8.6 %
Rated current	4 A	10 A	16.5 A	23.5 A	32 A	37 A
for motor rated output approx.	1.50 kW	4.00 kW	7.50 kW	11.00 kW	15.00 kW	18.50 kW
Rated frequency	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz
Switching frequency	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	H	H	H	H	H	H
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz
Order numbers						
Order Number	**SFB 400/4**	**SFB 400/10**	**SFB 400/16,5**	**SFB 400/23,5**	**SFB 400/32**	**SFB 400/37**
Mechanical data						
Terminal and mounting						
Fixing method	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail
Fixing screws	M5	M5	M5	M6	M6	M6
Connections phase/N	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 10 mm²	Screw clamp, 16 mm²	Screw clamp, 16 mm²	Screw clamp, 16 mm²
Connections PE	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M6	Bolt, M6	Bolt, M6
Measures and weights						
Weight	4.00 kg	5.50 kg	8.50 kg	14.50 kg	19.00 kg	21.00 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❶
A	155	155	190	240	240	240
B	105	120	160	190	200	210
C	160	160	185	280	280	280
D	130	130	170	190	190	190
E	56	71	67	105	105	115

Dimension pictures

❶



Sinusoidal filter
SFB

Electrical data

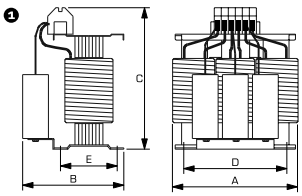
Type	SFB 400/48	SFB-N 400/61	SFB-N 400/72	SFB-N 400/90	SFB 400/115	SFB 400/150
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Voltage drop	7.8 %	8.3 %	7.5 %	10 %	11 %	10.2 %
Rated current	48 A	61 A	72 A	90 A	115 A	150 A
for motor rated output approx.	22.00 kW	30.00 kW	37.00 kW	45.00 kW	55.00 kW	75.00 kW
Rated frequency	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz	0 - 150 Hz
Switching frequency	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	H	H	H	H	H	H
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz
Order numbers						
Order Number	**SFB 400/48**	**SFB-N 400/61**	**SFB-N 400/72**	**SFB-N 400/90**	**SFB 400/115**	**SFB 400/150**

Mechanical data

Terminal and mounting						
Fixing method	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail
Fixing screws	M6	M8	M8	M8	M8	M10
Connections phase/N	Screw clamp, 16 mm²	Screw clamp, 35 mm²	Screw clamp, 35 mm²	Screw clamp, 50 mm²	Screw clamp, 95 mm²	Screw clamp, 95 mm²
Connections PE	Bolt, M6	Bolt, M8	Bolt, M8	Bolt, M8	Bolt, M8	Bolt, M8
Measures and weights						
Weight	25.50 kg	33.50 kg	37.00 kg	53.00 kg	66.00 kg	69.00 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❶
A	240	300	300	300	360	360
B	220	228	240	270	210	225
C	280	315	315	320	415	415
D	190	240	240	240	264	264
E	125	133	145	172	125	140

Dimension pictures

❶



Sinusoidal filter
SFB

Electrical data

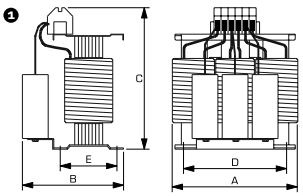
Type	SFB 400/180	SFB 400/250	SFB 400/440	SFB 400/480
Operating data				
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac	0 - 3 x 520 Vac
Voltage drop	7.5 %	7.5 %	7.5 %	7 %
Rated current	180 A	250 A	440 A	480 A
for motor rated output approx.	90.00 kW	132.00 kW	250.00 kW	0.00 kW
Rated frequency	0 - 60 Hz	0 - 60 Hz	0 - 60 Hz	0 - 60 Hz
Switching frequency	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz	4 - 8 kHz
Approvals				
Approvals	cURus	cURus	cURus	cURus
Environment				
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C
Safety and protection				
Type	open type	open type	open type	open type
Class of Insulation System	H	H	H	H
Protection index	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I
Test voltage	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz	3000 Vac, 50 Hz
Order numbers				
Order Number	**SFB 400/180**	**SFB 400/250**	**SFB 400/440**	**SFB 400/480**

Mechanical data

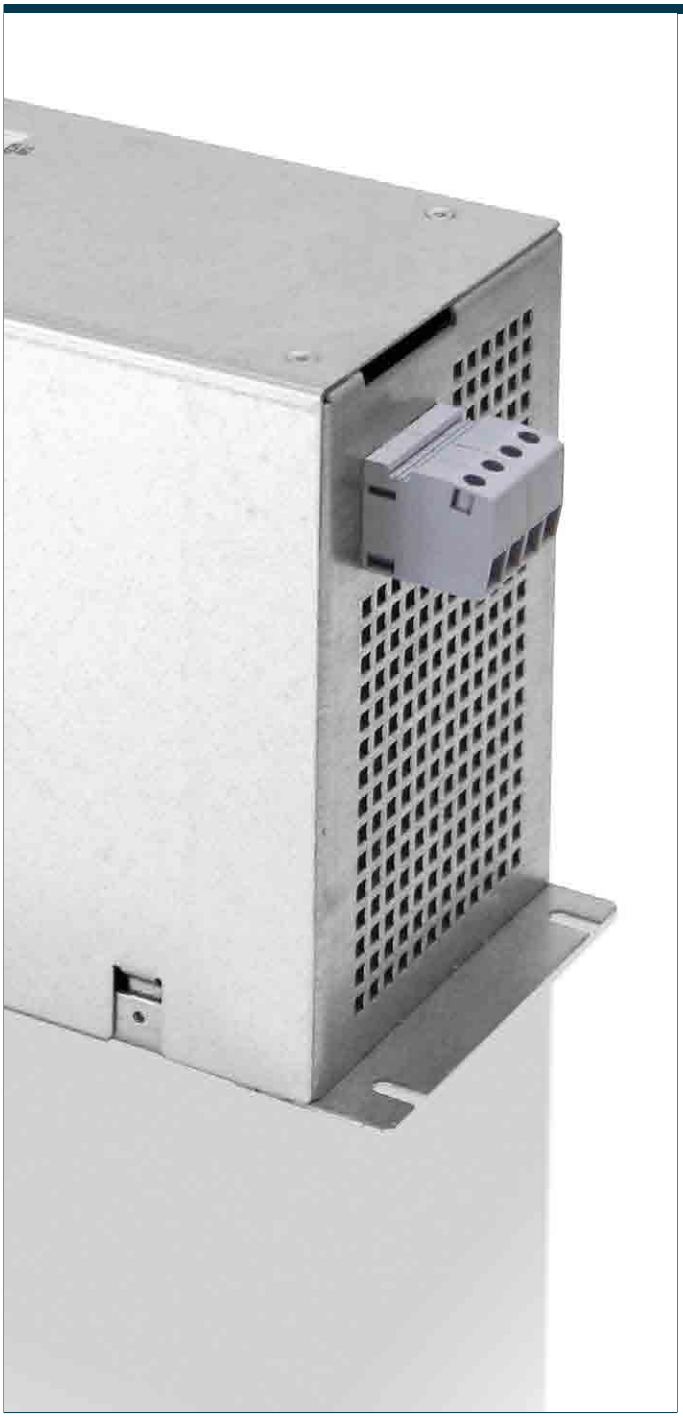
Terminal and mounting				
Fixing method	Fixing rail	Fixing rail	Fixing rail	Fixing rail
Fixing screws	M10	M10	M10	
Connections phase/N	Screw clamp, 150 mm²	Screw clamp, 150 mm²	Screw clamp, 150 mm²	
Connections PE	Bolt, M8	Bolt, M12	Bolt, M12	
Measures and weights				
Weight	75.00 kg	120.00 kg	200.00 kg	220.00 kg
Dimension picture (in mm)	❶	❶	❶	❶
A	360	400	610	-
B	240	500	540	-
C	415	450	450	-
D	264	320	550	-
E	154	450	480	-

Dimension pictures

❶



All-pole sinusoidal filter
SFA 400



General Data

Rated voltage 3 x 400 Vac
Rated current 1.3 - 60 A
for motor rated output 1.5 - 30 kW
for clock frequencies 8 kHz
Rated frequency from 0 to 60 Hz
Insulation class H
Maximum ambient temperature 40 °C
Degree of protection IP 00

Advantages

Prevention of overvoltages on the motor
Long cable lengths possible
Reduction in motor noise
Prevention of bearing currents
Reduction in leakage currents (is beneficial in the event of incorrect RCD tripping)
Reduction in line-borne and field-borne emitted interference: can be omitted from shielded cables, where necessary
Reduction in motor losses

Applications

Sinus filter for the suppression of differential mode interference and common mode interference.

Standards

Output filter with capacitor for frequency converters complying with IEC 61558-2-20, UL 508, CSA 22.2 No. 14-10

All-pole sinusoidal filter
SFA 400

Electrical data

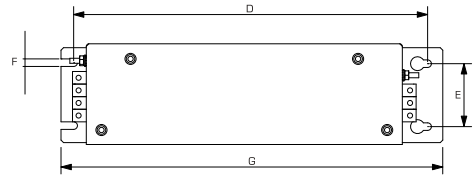
Type	SFA 400/1,3	SFA 400/2,5	SFA 400/4	SFA 400/6	SFA 400/10	SFA 400/16,5
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac
Voltage drop	<5%	<5%	<5%	<5%	<5%	<5%
Rated current	1.3 A	2.5 A	4 A	6 A	10 A	16.5 A
for motor rated output approx.	0.55 kW	1.10 kW	1.50 kW	2.20 kW	4.00 kW	7.50 kW
Rated frequency	≤60 Hz	≤60 Hz	≤60 Hz	≤60 Hz	≤60 Hz	≤60 Hz
Switching frequency	≥8 kHz	≥8 kHz	≥8 kHz	≥8 kHz	≥8 kHz	≥8 kHz
Approvals						
Approvals	cURus	cURus	cURus	cURus	cURus	cURus
Environment						
Ambient temperature max.	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
Safety and protection						
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Class of Insulation System	F	F	F	F	F	F
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers						
Order Number	**SFA 400/1,3**	**SFA 400/2,5**	**SFA 400/4**	**SFA 400/6**	**SFA 400/10**	**SFA 400/16,5**

Mechanical data

Terminal and mounting						
Fixing method	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs
Fixing screws	M6	M6	M6	M6	M6	M6
Connections phase/N	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 10 mm²	Screw clamp, 10 mm²	Screw clamp, 10 mm²
Connections PE	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M5	Bolt, M5
Measures and weights						
Weight	3.20 kg	4.70 kg	7.40 kg	8.10 kg	11.00 kg	17.00 kg
Dimension picture (in mm)	❶	❶	❷	❷	❶	❶
A	250	250	290	290	320	320
B	80	80	80	80	135	135
C	150	150	170	170	200	200
D	280	280	320	320	340	355
E	50	50	50	50	100	100
F	6	6	6	6	6.5	6.5
G	302	302	342	342	372	372

Dimension pictures

❶



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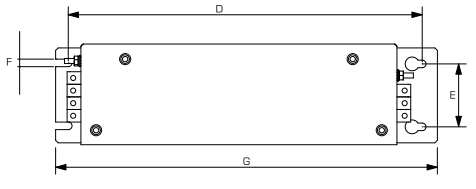


All-pole sinusoidal filter
SFA 400

Electrical data

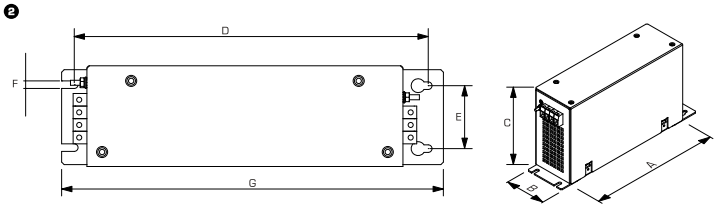
Type	SFA 400/24	SFA 400/32	SFA 400/40	SFA 400/50	SFA 400/60
Operating data					
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac	3 x 380 - 3 x 480 Vac
Voltage drop	<5%	<5%	<5%	<5%	<5%
Rated current	24 A	32 A	40 A	50 A	60 A
for motor rated output approx.	11.00 kW	1500.00 kW	18.50 kW	22.00 kW	30.00 kW
Rated frequency	≤60 Hz	≤60 Hz	≤60 Hz	≤60 Hz	≤60 Hz
Switching frequency	≥8 kHz	≥8 kHz	≥8 kHz	≥8 kHz	≥8 kHz
Approvals					
Approvals	cURus	cURus	cURus	cURus	cURus
Environment					
Ambient temperature max.	45 °C	45 °C	45 °C	45 °C	45 °C
Safety and protection					
Type	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure	Metal enclosure
Class of Insulation System	F	F	F	F	F
Protection index	IP 20	IP 20	IP 20	IP 20	IP 20
Safety class (prepared)	I	I	I	I	I
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers					
Order Number	**SFA 400/24**	**SFA 400/32**	**SFA 400/40**	**SFA 400/50**	**SFA 400/60**

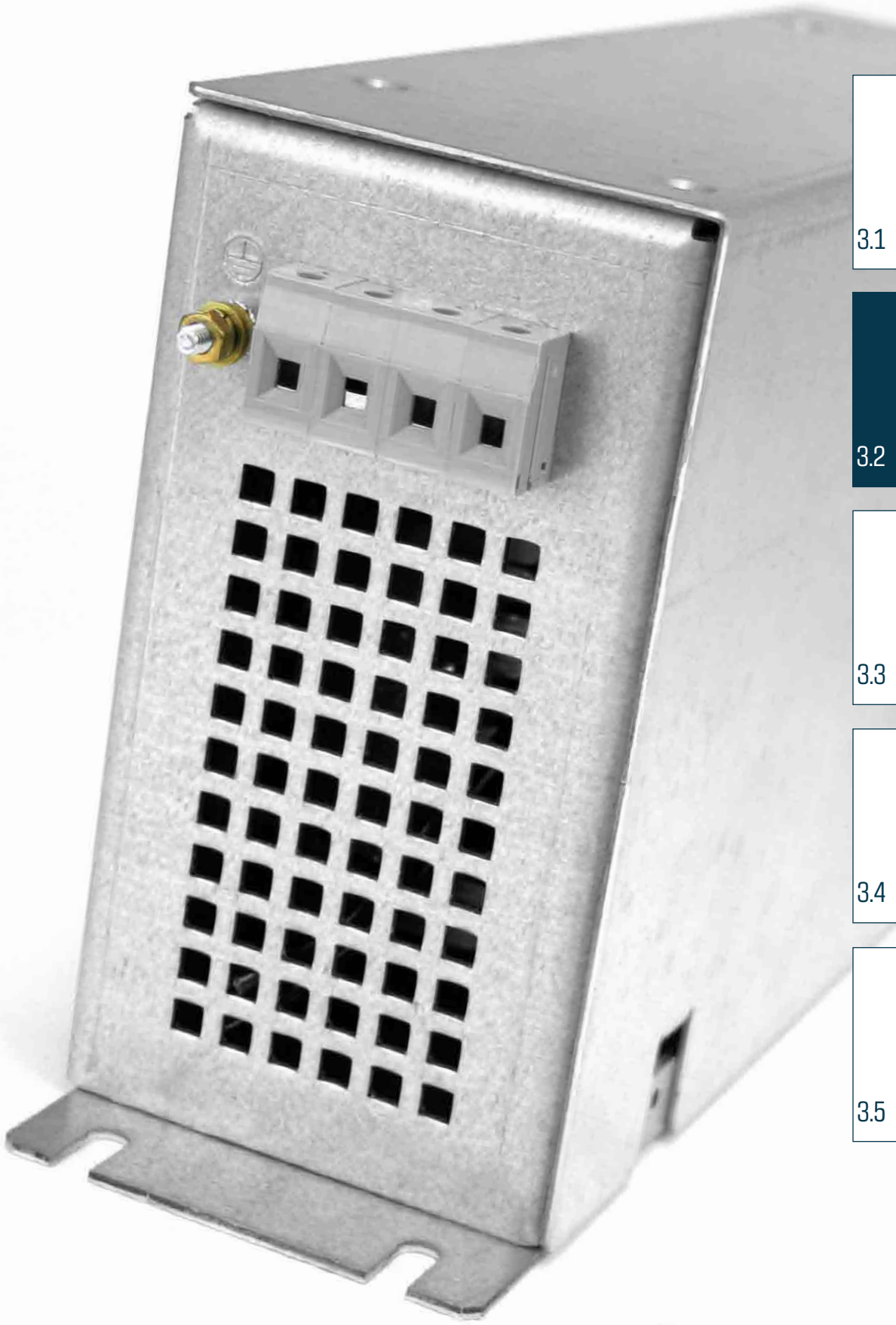
Mechanical data

Terminal and mounting					
Fixing method	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs	Mounting lugs
Fixing screws	M6	M6	M6	M6	M6
Connections phase/N	Screw clamp, 16 mm²	Screw clamp, 16 mm²	Screw clamp, 16 mm²	Screw clamp, 16 mm²	Screw clamp, 35 mm²
Connections PE	Bolt, M6	Bolt, M6	Bolt, M6	Bolt, M6	Bolt, M8
Measures and weights					
Weight	25.00 kg	27.00 kg	34.00 kg	45.00 kg	56.00 kg
Dimension picture (in mm)	❷	❷	❷	❷	❷
A	370	400	450	500	550
B	260	280	310	310	310
C	200	200	250	250	250
D	400	430	480	530	580
E	230	230	250	250	250
F	6.5	6.5	6.5	6.5	6.5
G	430	460	510	560	610

Dimension pictures

❷





Motor reactor
MDB

General Data

Rated voltage 3 x 400 Vac
Rated current 6.3 - 176 A
For motor rated output 2.2 - 90 kW
For clock frequencies of 2 to 6 kHz
Rated frequency from 0 to 120 Hz
Insulation class F
Maximum ambient temperature 40 °C
Degree of protection IP 00

Advantages

High damping of edge steepness
High damping of inverter switchinh/clock frequency
Reduction of leakage current
Long shielded cable lengths possible
High efficiency
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation

Standards

Output reactor for frequency converter
DIN EN 61558-2-20, IEC 61558-2-20

Motor reactor
MDB

Electrical data

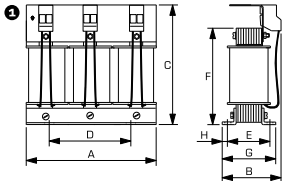
Type	MDB 400/6,3	MDB 400/9,4	MDB 400/13	MDB 400/16	MDB 400/24	MDB 400/30
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac
Rated current	6.30 A	9.40 A	13.00 A	16.00 A	24.00 A	30.00 A
for motor rated output approx.	2.20 kW	4.00 kW	5.50 kW	7.50 kW	11.00 kW	15.00 kW
Inductivity	2.000 mH	0.900 mH	0.900 mH	0.900 mH	0.450 mH	0.450 mH
Rated frequency	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz
Switching frequency	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	F	F	F	F	F	F
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers						
Order Number	**MDB 400/6,3**	**MDB 400/9,4**	**MDB 400/13**	**MDB 400/16**	**MDB 400/24**	**MDB 400/30**

Mechanical data

Terminal and mounting						
Fixing method	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets
Fixing screws	M5	M5	M5	M6	M6	M6
Connections phase/N	Screw clamp, 2.5 mm²	Screw clamp, 2.5 mm²	Screw clamp, 4 mm²	Screw clamp, 10 mm²	Screw clamp, 10 mm²	Flat copper
Connections PE	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M6
Measures and weights						
Weight	4.50 kg	4.50 kg	5.50 kg	10.00 kg	10.00 kg	11.20 kg
Dimension picture (in mm)	❶	❶	❶	❶	❶	❷
A	155	155	155	190	190	210
B	70	70	85	115	115	130
C	160	160	160	193	193	-
D	130	130	130	170	170	175
E	55	55	70	75	75	95
F	128	128	128	155	155	182
G	75	75	90	100	100	115
H	10	10	10	12.5	12.5	10

Dimension pictures

❶



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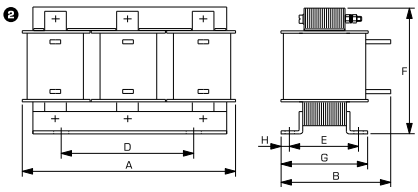


Motor reactor
MDB

Electrical data

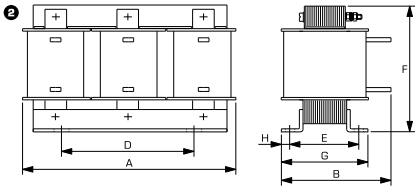
Type	MDB 400/39	MDB 400/46	MDB 400/61	MDB 400/72	MDB 400/91	MDB 400/110
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac	0 - 3 x 500 Vac
Rated current	39.00 A	46.00 A	61.00 A	72.00 A	91.00 A	110.00 A
for motor rated output approx.	18.50 kW	22.00 kW	30.00 kW	37.00 kW	45.00 kW	55.00 kW
Inductivity	0.300 mH	0.150 mH	0.100 mH	0.050 mH	0.050 mH	0.050 mH
Rated frequency	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz	0 - 120 Hz
Switching frequency	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz	2 - 6 kHz
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Class of Insulation System	F	F	F	F	F	F
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers						
Order Number	**MDB 400/39**	**MDB 400/46**	**MDB 400/61**	**MDB 400/72**	**MDB 400/91**	**MDB 400/110**

Mechanical data

Terminal and mounting						
Fixing method	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets	Mounting brackets
Fixing screws	M6	M6	M6	M6	M6	M8
Connections phase/N	Flat copper	Flat copper	Flat copper	Flat copper	Flat copper	Flat copper
Connections PE	Bolt, M6	Bolt, M6	Bolt, M6	Bolt, M6	Bolt, M6	Bolt, M8
Measures and weights						
Weight	11.30 kg	10.30 kg	10.30 kg	10.30 kg	10.30 kg	20.00 kg
Dimension picture (in mm)	❷	❷	❷	❷	❷	❷
A	210	210	210	210	210	240
B	130	120	120	120	120	131
C	-	-	-	-	-	-
D	175	175	175	175	175	190
E	95	85	85	85	85	95
F	182	182	182	182	182	205
G	115	105	105	105	105	121
H	10	10	10	10	10	13

Dimension pictures

❷



Motor reactor
MDB

Electrical data

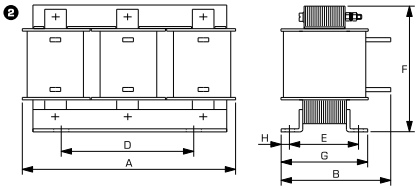
Type	MDB 400/150	MDB 400/176
Operating data		
Rated voltage	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 500 Vac	0 - 3 x 500 Vac
Rated current	150.00 A	176.00 A
for motor rated output approx.	75.00 kW	90.00 kW
Inductivity	0.050 mH	0.050 mH
Rated frequency	0 - 120 Hz	0 - 120 Hz
Switching frequency	2 - 6 kHz	2 - 6 kHz
Environment		
Ambient temperature max.	40 °C	40 °C
Safety and protection		
Type	open type	open type
Class of Insulation System	F	F
Protection index	IP 00	IP 00
Safety class (prepared)	I	I
Test voltage	2500 Vac, 50 Hz	2500 Vac, 50 Hz
Order numbers		
Order Number	**MDB 400/150**	**MDB 400/176**

Mechanical data

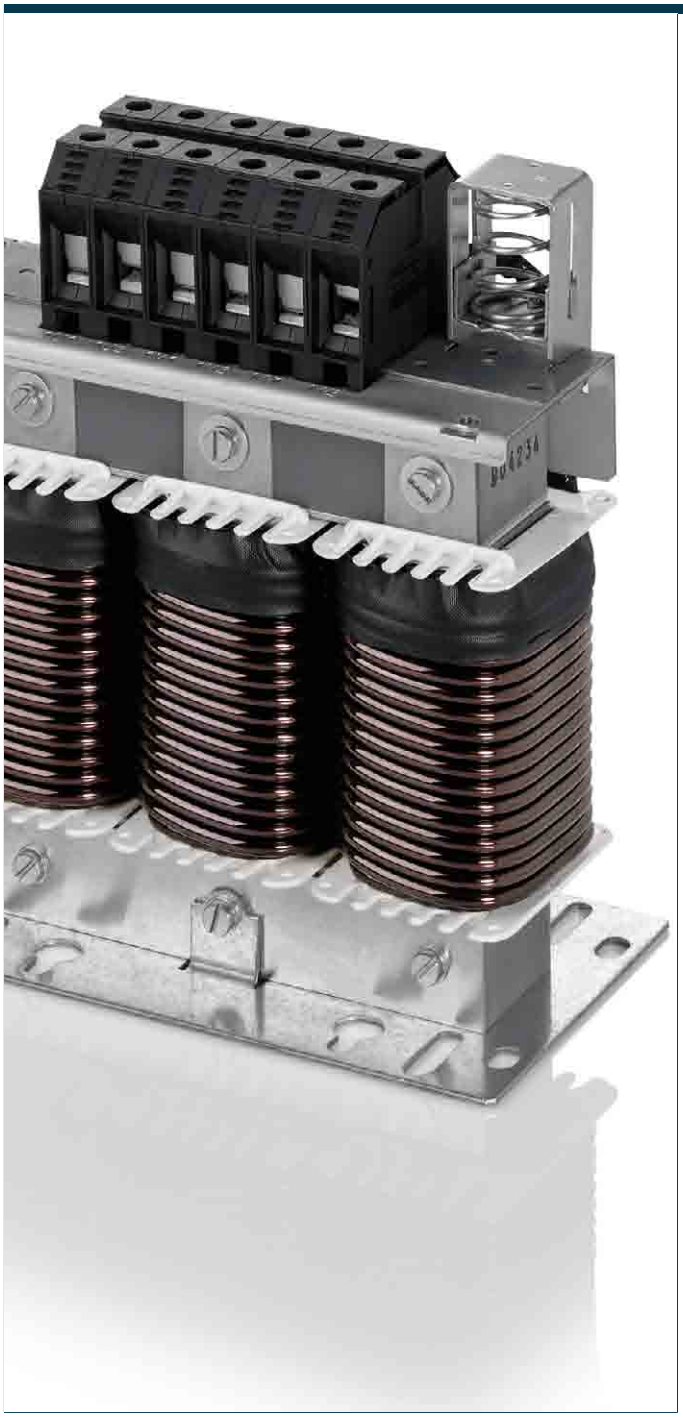
Terminal and mounting		
Fixing method	Mounting brackets	Mounting brackets
Fixing screws	M8	M8
Connections phase/N	Flat copper	Flat copper
Connections PE	Bolt, M8	Bolt, M8
Measures and weights		
Weight	24.30 kg	27.50 kg
Dimension picture (in mm)	❷	❷
A	240	240
B	141	165
C	-	-
D	190	190
E	105	129
F	205	205
G	131	155
H	13	13

Dimension pictures

❷



Motor reactor
MR3



General Data

Rated voltage 3 x 400 Vac
Rated current 2.5 - 61.0 A
For motor rated output 0.75 - 30 kW
For clock frequencies of 3 to 8 kHz
Rated frequency from 0 to 50 Hz
Inductance 2.55 - 0.10 mH
Insulation class B
Maximum ambient temperature 40 °C

Advantages

High damping of edge steepness
High damping of inverter switchinh/clock frequency
Reduction of leakage current
Long shielded cable lengths possible
High efficiency
Very good corrosion protection and low noise thanks to BLOCKIMPEX vacuum impregnation

Applications

Motor reactor for the limitation of the voltage peaks damaging to the motor insulation (du/dt).

Standards

Output reactor for frequency converter
DIN EN 61558-2-20, IEC 61558-2-20

Motor reactor
MR3

Electrical data

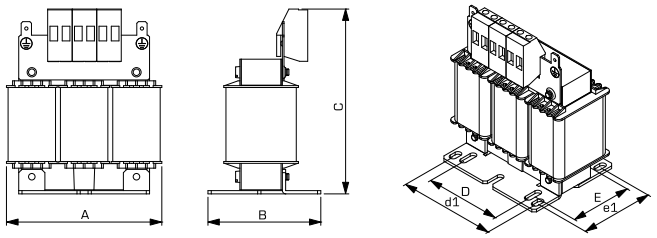
Type	MR3 400/2,5	MR3 400/4	MR3 400/6	MR3 400/8	MR3 400/10	MR3 400/13
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac
Rated current	2.5 A	4 A	6 A	8 A	10 A	13 A
for motor rated output approx.	0.75 kW	1.10 kW	2.20 kW	4.00 kW	4.00 kW	5.50 kW
Inductivity	2.550 mH	1.590 mH	1.060 mH	0.800 mH	0.640 mH	0.490 mH
Rated frequency	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz
Switching frequency	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz
Class of Insulation System	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130
Order numbers						
Order Number	**MR3 400/2,5**	**MR3 400/4**	**MR3 400/6**	**MR3 400/8**	**MR3 400/10**	**MR3 400/13**

Mechanical data

Terminal and mounting						
Fixing method	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail
Fixing screws	M4	M4	M4	M4	M4	M4
Connections phase/N	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²
Connections PE	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M4	Bolt, M5
Measures and weights						
Weight	0.70 kg	0.75 kg	0.90 kg	0.95 kg	1.70 kg	1.80 kg
Dimension picture (in mm)	❶	❶	❶	❶	❷	❷
A	78	78	96	96	120	120
B	63	63	69	69	85	85
C	100	100	117	117	140	140
D	50	50	56	56	90	90
d1	65	65	71	71	105	105
d2	-	-	-	-	-	-
E	42	42	42	42	35	35
e1	47	47	47	47	68	68
e2	-	-	-	-	-	-

Dimension pictures

❶



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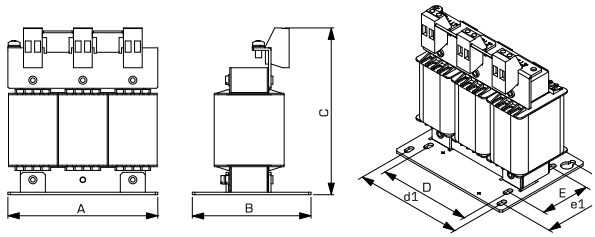


Motor reactor
MR3

Electrical data

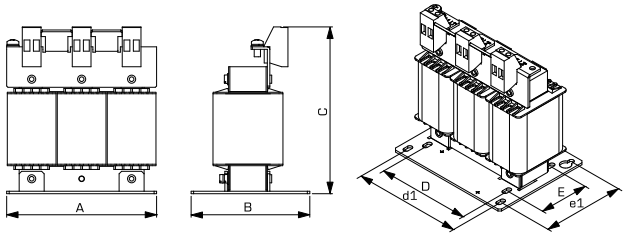
Type	MR3 400/18	MR3 400/24	MR3 400/30	MR3 400/37	MR3 400/42	MR3 400/48
Operating data						
Rated voltage	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac	3 x 400 Vac
Voltage range	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac	0 - 3 x 690 Vac
Rated current	18 A	24 A	30 A	37 A	42 A	48 A
for motor rated output approx.	7.50 kW	11.00 kW	15.00 kW	18.50 kW	22.00 kW	22.00 kW
Inductivity	0.350 mH	0.270 mH	0.210 mH	0.170 mH	0.150 mH	0.130 mH
Rated frequency	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz	0 - 50 Hz
Switching frequency	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz	3 - 8 kHz
Environment						
Ambient temperature max.	40 °C	40 °C	40 °C	40 °C	40 °C	40 °C
Safety and protection						
Type	open type	open type	open type	open type	open type	open type
Protection index	IP 00	IP 00	IP 00	IP 00	IP 00	IP 00
Safety class (prepared)	I	I	I	I	I	I
Test voltage	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz	4000 Vac, 50 Hz
Class of Insulation System	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130	VDE=B, UL=class 130
Order numbers						
Order Number	**MR3 400/18**	**MR3 400/24**	**MR3 400/30**	**MR3 400/37**	**MR3 400/42**	**MR3 400/48**

Mechanical data

Terminal and mounting						
Fixing method	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail	Fixing rail
Fixing screws	M4	M4	M5	M5	M5	M5
Connections phase/N	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 4 mm²	Screw clamp, 10 mm²	Screw clamp, 16 mm²
Connections PE	Bolt, M5	Bolt, M5	Bolt, M5	Bolt, M5	Bolt, M5	Bolt, M5
Measures and weights						
Weight	2.50 kg	2.60 kg	3.50 kg	3.60 kg	5.20 kg	5.80 kg
Dimension picture (in mm)	❷	❷	❸	❸	❸	❹
A	120	120	155	155	155	185
B	95	95	95	95	110	102
C	140	140	162	162	177	210
D	90	90	113	113	113	90
d1	105	105	135	135	135	136
d2	-	-	-	-	-	-
E	45	45	45	45	60	74
e1	78	78	78	78	93	50
e2	-	-	-	-	-	-

Dimension pictures

❷



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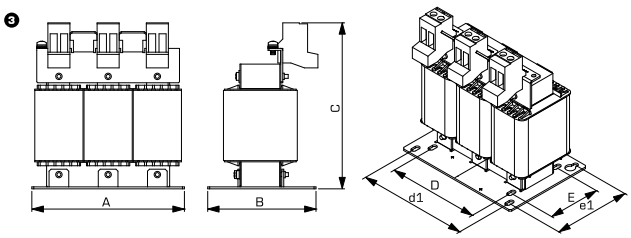
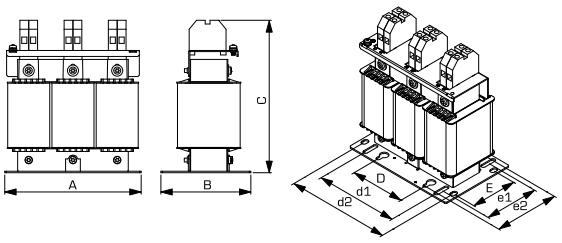


Motor reactor
MR3

Type	MR3 400/61
Operating data	
Rated voltage	3 x 400 Vac
Voltage range	0 - 3 x 690 Vac
Rated current	60 A
for motor rated output approx.	30.00 kW
Inductivity	0.100 mH
Rated frequency	0 - 50 Hz
Switching frequency	3 - 8 kHz
Environment	
Ambient temperature max.	40 °C
Safety and protection	
Type	open type
Protection index	IP 00
Safety class (prepared)	I
Test voltage	4000 Vac, 50 Hz
Class of Insulation System	VDE=B, UL=class 130
Order numbers	
Order Number	**MR3 400/61**
Terminal and mounting	
Fixing method	Fixing rail
Fixing screws	M6
Connections phase/N	Screw clamp, 16 mm²
Connections PE	Bolt, M6
Measures and weights	
Weight	7.40 kg
Dimension picture (in mm)	❹
A	185
B	112
C	210
D	90
d1	136
d2	-
E	62
e1	91
e2	-

Dimension pictures

❹



BLOCKLAB

EMC service

We get electricity into shape – worldwide. All our products, such as transformers, reactors, mains units and radio interference suppression filters are developed and produced with the customer and market in mind. You will find them wherever a reliable mains interface is needed. Our accredited EMC test laboratory functions as an independent business division. The laboratory concentrates on EMC services in the field of industry standards for products in the capital goods industry.

- Consultancy
- There right from the start of development
- EMC interference suppression components
- DIN EN ISO 9001:2000 certified
- Mobile EMC-equipment

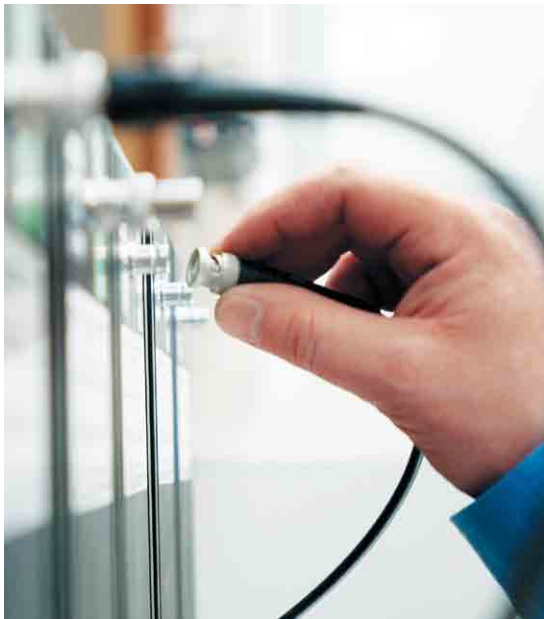
BLOCKLAB

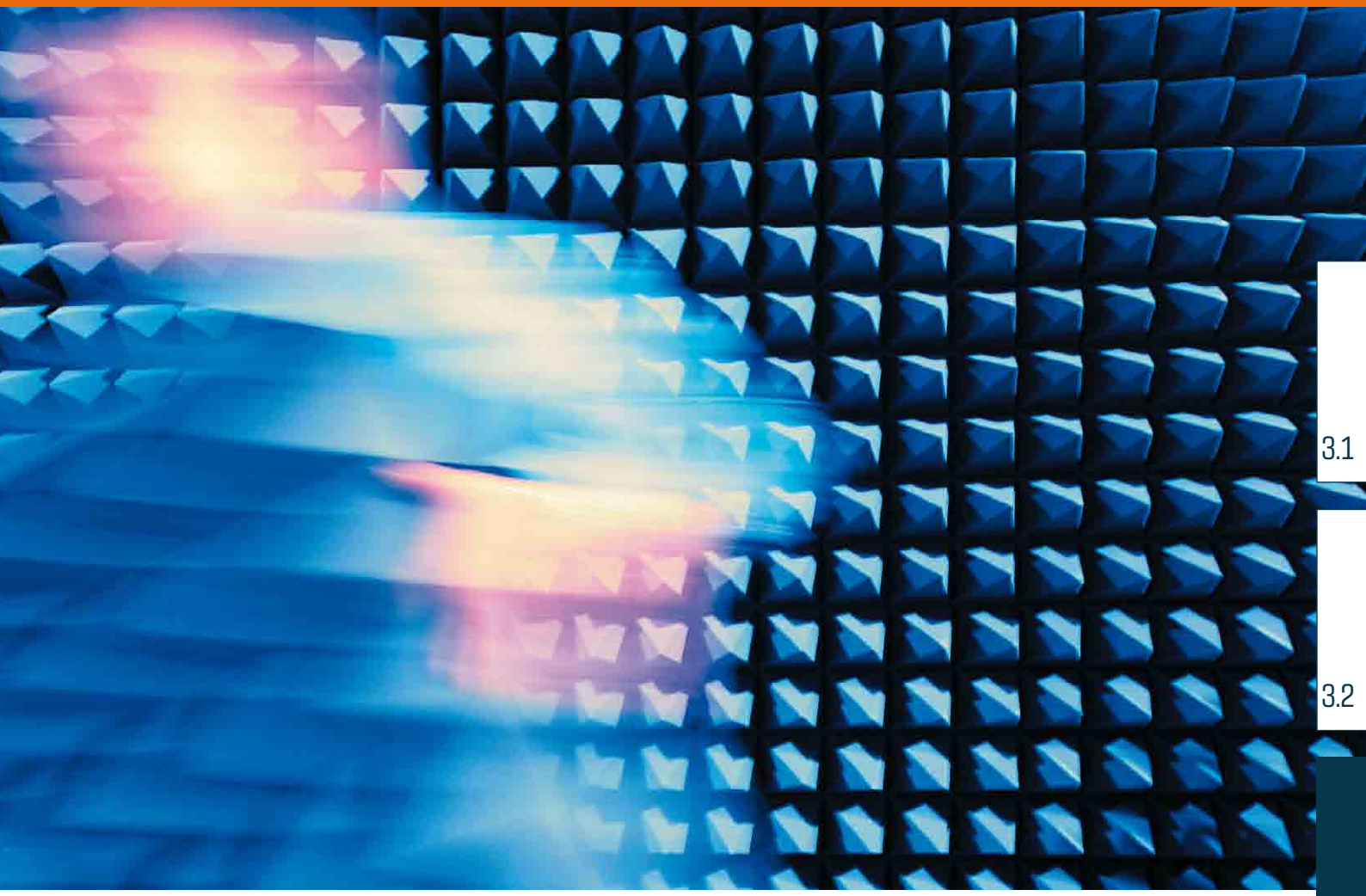
EMC services catalogue

Standard	Test
Interference immunity	
DIN EN 61000-4-2	ESD, discharge of static electricity up to 15 kV
DIN EN 61000-4-3	High-frequency electromagnetic fields 80 MHz–1 GHz, up to 10 V/m (3 m test track), in the absorber booth
DIN EN 61000-4-4	BURST, rapid transient electrical interference parameters, 5/50 ns, 5 kHz repeat frequency, to 4 kV.
DIN EN 61000-4-5	SURGE, surge voltage, 1.2/50 (8/20) µs, up to 4 kV
DIN EN 61000-4-6	Line-guided high frequency, 0.15–80 MHz, up to 10 V/140 dB (µV)
DIN EN 61000-4-11	Voltage dips, short-term interruptions, voltage fluctuations
DIN EN 61000-4-13	Harmonics and interharmonics
Interference emissions	
DIN EN 61000-3-2	Line-guided mains feedback, harmonics up to 2 kHz/16 A
DIN EN 61000-3-3	Line-guided mains feedback, flicker up to 16 A
DIN EN 61000-3-11	Line-guided mains feedback, flicker > 16 A up to max 75 A
DIN EN 61000-3-12	Line-guided mains feedback, up to 2 kHz/16 A < I ≤ 75 A
DIN EN 55011,	Line-guided mains feedback,
DIN EN 55022	150 kHz – 30 MHz
DIN EN 55011,	Radiated interference,
DIN EN 55022	30 MHz – 1 GHz

More services

- Material tests
- Shock and vibrationtests
- Climatic testing





Material tests

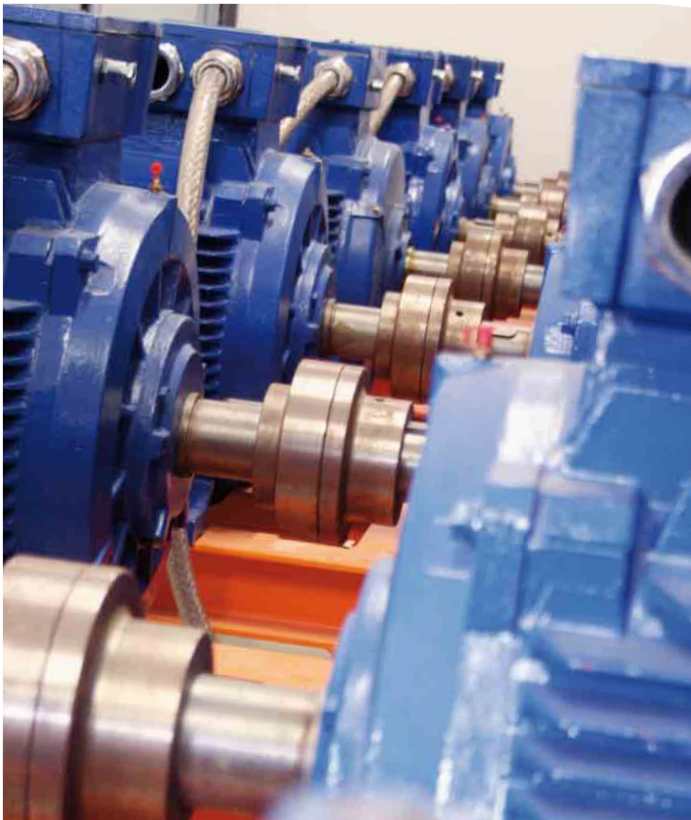
- Partial discharge test
- Pall thrust test
- Temperature rise test max. 80 Channels
- Power quality test up to 24 h monitoring incl. estimation of values
- Power quality test weekly monitoring incl. estimation of values

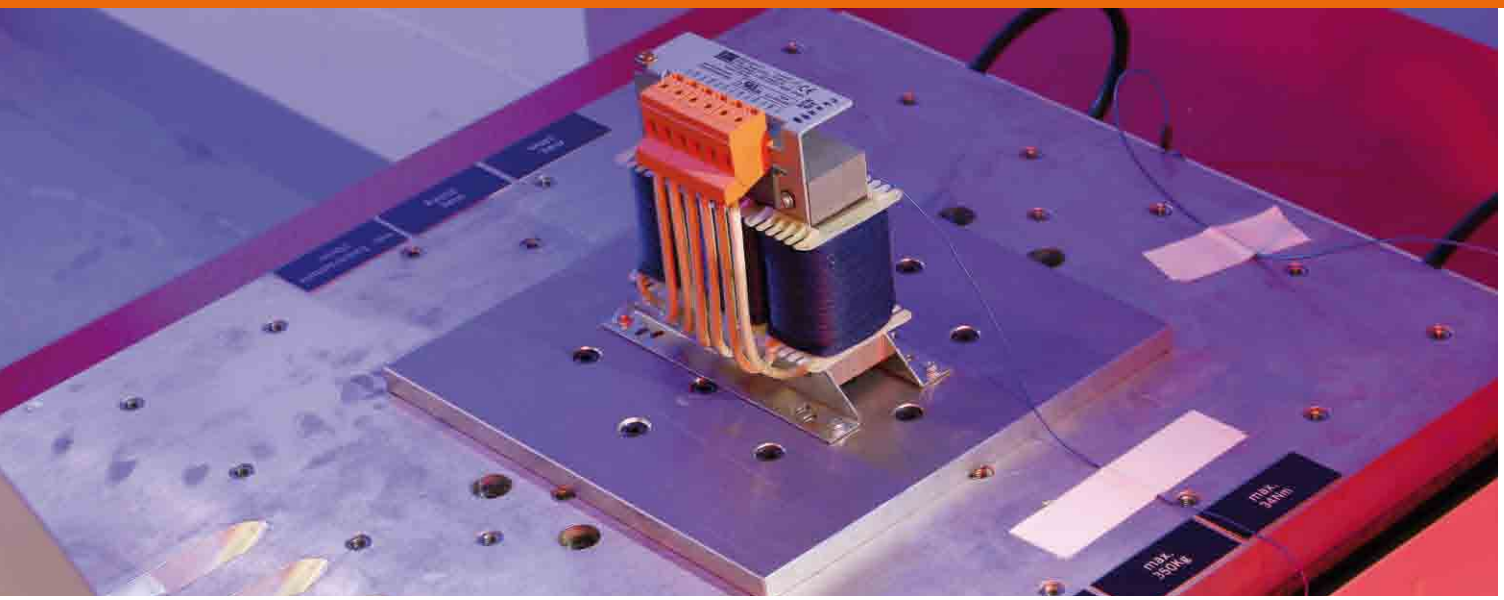
45 kilo volt-ampere

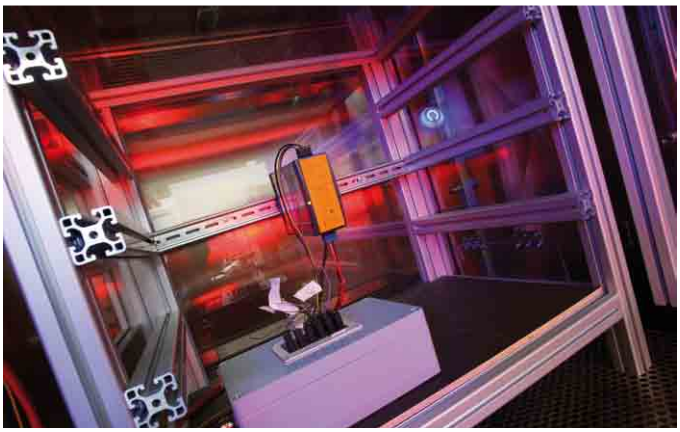
AC voltage source with a power of up to 45 kVA. For structuring computer-controlled test systems for the application of standards in the field of EMC and power supply quality.

1 megawatt

Loading bay for testing and optimising our products under actual conditions







About our products and services

BLOCK has many years of design engineering experience and works in partnership with its customers, providing a variety of sources of support for proving the reliability of products when subject to environmental and operational loads. We will be at your side at every stage of the product creation process, helping you to select suitable trials and even carrying out in-process reliability tests.

Schock and vibrationstests

max. weight of DUT up to 350 kg
Swept Sine, Shock and Random

- Max. Peak-Force
  22.2 kN
- Max. Acceleration
  Sine 40 g (60 g vertical)
- Shock (half-sine)
  150 g
- Random (RMS)
  30 g
- Max. Velocity
  2 m/s

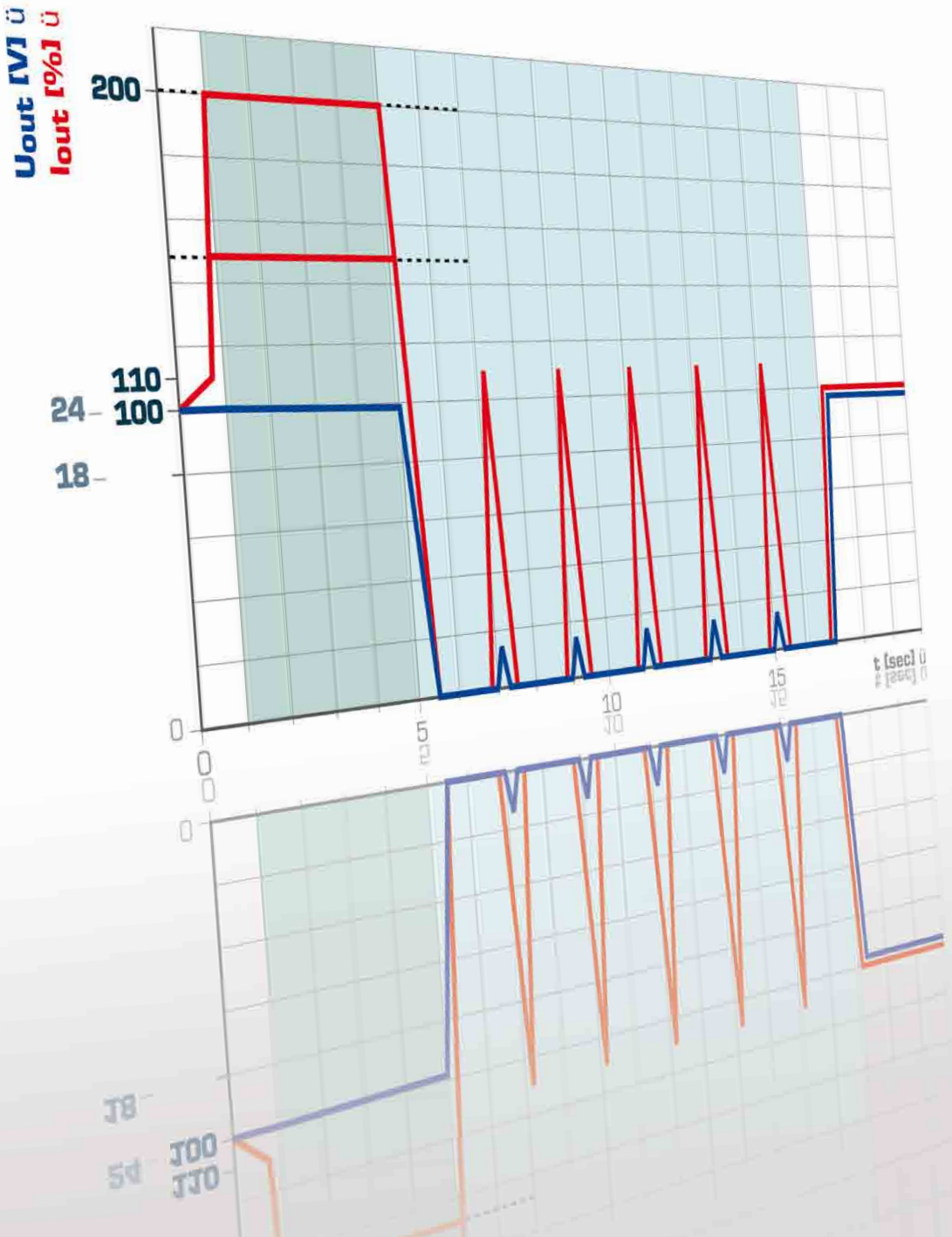
Thermal simulation

- Temperature range
  -45 – +180 °C
- Humidity
  0 – 100 %

- **EMC service**
- **Climatic testing**
- **Shock and vibration testing**
- **Partial discharge measuring**
- **RoHS screening**

Technical information

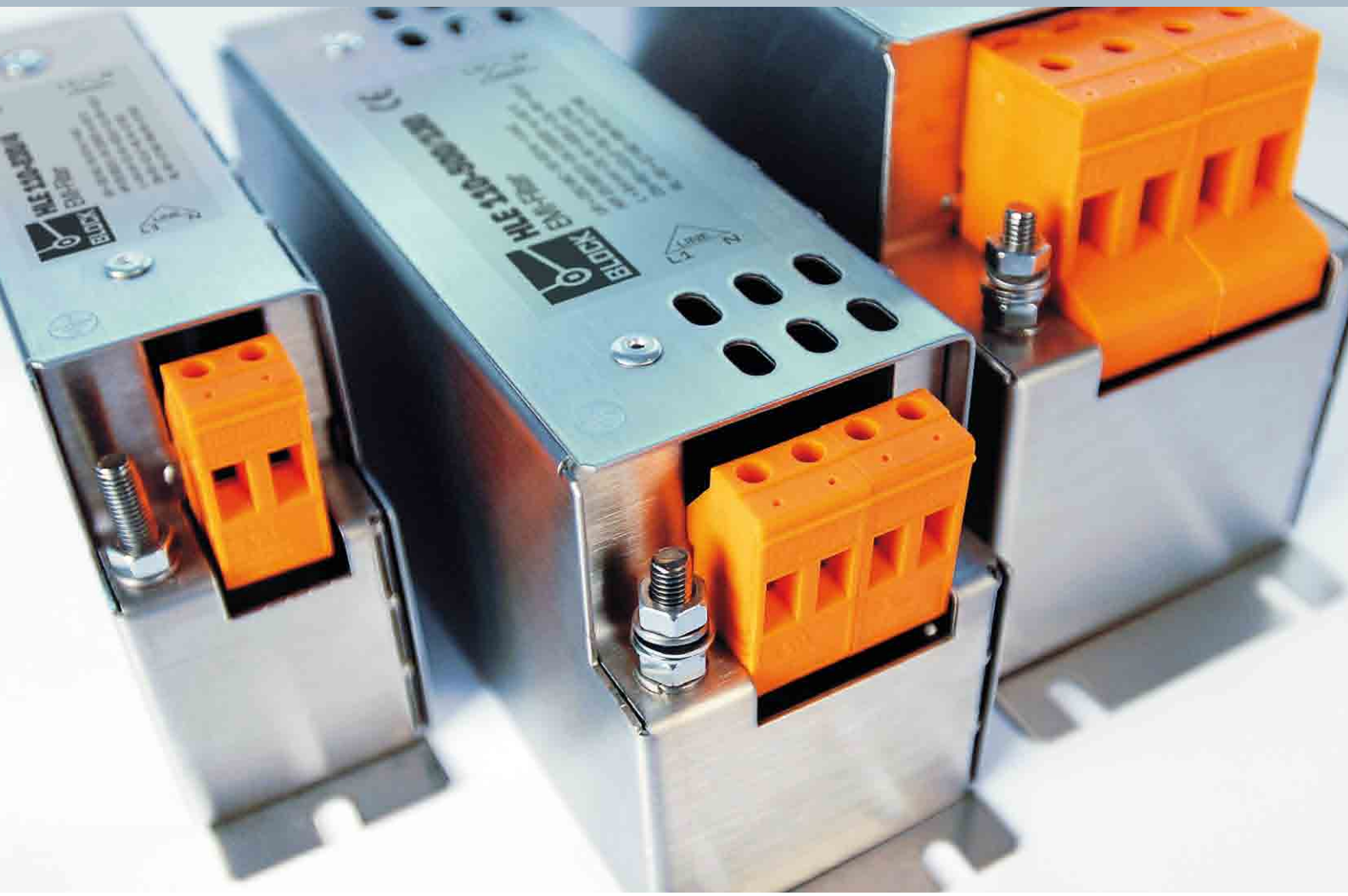
Content



Technical informations EMC/Radio interference suppression

Technical informations reactors

General informations



Passive filters and interference suppression components

General technical informations

It is essentially the following components which are utilised for the suppression mains borne electromagnetic interference:

- **Passive filter**
  An assembly of individual parts and inductive, capacitive and resistor elements which are utilised for the reduction of electromagnetic interference caused by electrical or electronic devices or other sources.
- **Reactor**
  An element which exhibits a slight impedance at low frequencies and a high inductively-marked reactance at high frequencies.
- **Capacitor**
  An element which exhibits a high impedance at low frequencies and a low capacitively-marked reactance at high frequencies.

Requirements

The constructive differences between passive electrical filters and interference suppression components, referred to below under the general title “filters”, are generally determined by their intended utilisation. Corresponding requirements are established in the installation, device and EMC-standards
(e.g. VDE 0100, VDE 0113/
EN 60204/IEC 60204, VDE 0700/
EN 60335/IEC 60335, VDE 0805/
EN 60950/IEC 60950, EN 61000-6-1 to EN 61000-6-4, EN 61800-3,
EN 62041).

An important selection criterion is the achievable attenuation effect against mains borne interference, depending on the interfering frequency:

Filters against low-band interference

- Power reactors*
- Filtering circuit reactors*

Filters against low and high-frequency interference

- Interference suppression filters
- Motor reactors
- Motor filters
- Sinusoidal filters

Filters against high-frequency interference

- Reactors for the suppression of electromagnetic interference (EMI reactors), current-compensated
- Passive filters for the suppression of electromagnetic interference (EMI filters)

Note:
Proof of whether the limit values of the EMC standards (see “Electromagnetic Interference” and “Electromagnetic Interference Immunity”) can be maintained can be obtained only by means of measurement technology as a systems test which takes into account all participating individual components.

*see chapter “reactors”

Standards

Unless otherwise agreed upon with ordering party, we manufacture in accordance with the latest “State of Technology” and with the following standards:

VDE 0565 Teil 3: Passive filter for the suppression of electromagnetic interference

EN 60939/IEC 60939: Passive filter units for electromagnetic interference suppression

EN 60939-1/IEC 60939-1: Passive filter units for electromagnetic interference suppression

VDE 0565 Teil 2: Reactors for electromagnetic interference suppression

EN 60938/IEC 60938: Fixed Reactors for electromagnetic interference suppression

VDE 0570: Safety of power transformers, power supply units and similar, Part 1: General requirements and tests, Part 2-20: Particular requirements for small reactors

EN 61558, IEC 61558: Safety of power transformers, power supply units and similar, Part 1: General requirements and tests, Parts 2–20: Particular requirements for small reactors

Rated voltage

The rated voltage (UR) is either the highest effective operating voltage(1) at rated frequency or the highest operating direct current voltage which can be continuously present at the filter location in conjunction with temperatures between the lower category temperature(2) and the rated ambient temperature (Ref.: VDE 0565 Part 3/EN 60939/IEC 60939).

(1)Supplement: in cases of alternating current systems, the voltage of the external conductor to one another

(2)Supplement: of the lowest permitted ambient temperature, see Test class

Note (Ref.: VDE 0565 Part 3/EN 60939/ IEC 60939): Passive filters for the suppression of electromagnetic interference (EMI filters) must be selected in such a way that their rated voltage is equal to or larger than the rated voltage of the voltage network to which they are connected. It must be taken into account thereby that the network voltage can increase up to 10 % over its rated value(3).

(3)Supplement: see “Conversation of the low-voltage mains”.

Note: The specification of the rated voltage with filters often leads to misunderstandings since it deviates from the usual electrical equipment designations which are also in conformance with standard norms.

An example of this: An industry PC, a frequency converter and a passive filter for the suppression of electromagnetic interference is to be operated on a low-voltage mains with the standard norm voltage 230 V (tolerance -10 % to +6 %, which corresponds to 207 V to 244 V) in accordance with VDE 0175/HD 472 S1/
IEC 60038.

A rated voltage of 230 V is to be displayed on the type plates of the industry PC and of the frequency converter. It is established in the standard norms for the device
(Ref.: VDE 0805/EN 60950/IEC 60950 and VDE 0160/EN 61800/IEC 61800) that the industry PC and the frequency converter may be operated continuously up to 110 % of their rated voltage. This means that safe functioning is ensured for these two pieces of electrical equipment, even after the year 2008 (in accordance with VDE 0175/
HD 472 S1/IEC 60038: Tolerance range -10 % to +10 %, which corresponds to 207 V to 253 V), on the 230 V low-voltage mains.

The type plate of the passive filter displays a rated voltage of 250 V. This specification, however, already refers to the upper voltage limit at which the passive filter is permitted to be placed in continuous operation
(Ref.: VDE 0565 Part 3–1/EN 133200). Starting with the year 2008, the passive filter can carry a load of 253 V, which puts it in the limit range of safe functioning.

Passive filters from our company will, in the interests of the greatest possible application security, generally be labelled with rated voltage (as electrical equipment) and with rated voltage (UR) in accorddance with
VDE 0565 Teil 3/EN 60939/IEC 60939.

Voltage range

The voltage range has been assigned to the filter and it is expressed in terms of the upper and lower limits within which the filter is permitted to be placed in continuous operation. Whereas it is true that the lower limit is generally non-critical, the upper limit is determined by the insulation system and the dielectric strength, e.g. of the capacitors.

In a departure from the otherwise usual standard norm-oriented allocation of voltages for electrical equipment, here the upper limit will be marked by the rated voltage of the filter, unless labelled otherwise.

Rated frequency

The rated frequency is the frequency allocated to the filter for the established operating conditions.

Unless other arrangements have been made, radio interference filters will be designed for 50 to 60 Hz.

Rated current

The rated electrical current (Ref.: VDE 0565 Part 3/EN 60939/IEC 60939) is the greatest effective operating current at rated frequency or the greatest operating direct current with which a filter may be operated continuously at its rated temperature (1). It is specified by the manufacturer for one or both of the following conditions:

a) open-air (I_{RO})

b) with a specified heat sink (I_{RH})

(1)Ergänzung: rated ambient temperature

Unless other arrangements have been made, filters will be designed accordingly, mounted on a wooden foundation in position for use, in accordance with Condition b).

Ambient temperature and rated electrical current

The rated electrical current assigned to a filter refers to the surrounding rated ambient temperature of the immediate surroundings. Higher ambient temperatures require an electrical current derating in accordance with the following function:

$$I_{max} = I_B \times \sqrt{\frac{T_K - T}{T_K - T_B}}$$

I_{max} = maximum electrical current at ambient temperature T [A]
I_B = rated electrical current at rated ambient temperature T_B [A]
T_K = upper temperature value of the climate category [°C], z. B. 85 °C
T = ambient temperature [°C]
T_B = rated ambient temperature [°C]

Example: A filter of the test class 25/085/21 is assigned a rated electrical current of 16 A for a rated ambient temperature of 40 °C. With which maximum electrical current may the filter be loaded for an ambient temperature of 55 °C?

$$I_{max} = 16\ A \times \sqrt{\frac{85\ °C - 55\ °C}{85\ °C - 40\ °C}} = 13\ A$$

In cases of lower ambient temperatures than the rated ambient temperature, one is advised against the possibility of using an increase of electrical current over the rated electrical current, since this can then easily lead to saturation phenomena on the parts of the inductances

Leakage current

Leakage current is an undesired flowing alternating current between electrical poles which possesses different levels of voltage potential. An internal wiring of filters with capacitors to earth (PE) is often indispensable for an efficient damping of high-frequency asymmetrical interference. This/these capacity/capacities bring about a leakage current to earth (PE) in terms of the rated frequency of the network.

The maximum limit values for the leakage current are established in several installation and device regulations. The usual values range from 0.1 mA (medical devices) to 5 mA (household appliances).

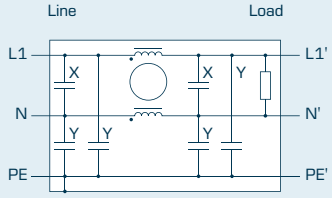
Higher leakage currents with filters are mainly to be encountered in the industrial sector. These filters are equipped with a respective warning and earthing notice. In cases of multiphase systems, the highest leakage current (worst-case scenario) occurs with the connection of only one external conductor to earth (PE). The utilisation of FI safety switches should be dispensed with when filters with a great leakage current are being used, since it can lead to unwanted triggering at the moment of being turning on.

Passive filters for the suppression of electromagnetic interference (EMI filter)

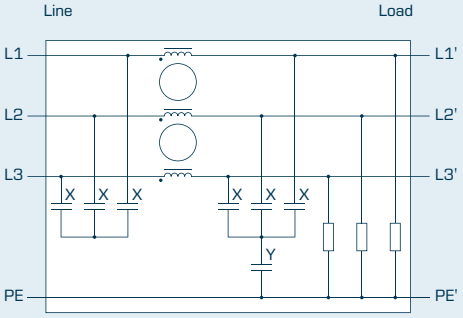
The utilisation of passive filters for the suppression of electromagnetic interference (EMI filters) is the mains borne suppression of interference on the network in the frequency range located between 150 kHz (9 kHz)(1) and 30 MHz. Here are several low-pass principal circuits:

(1) not yet included as part of the EMC standardisation.

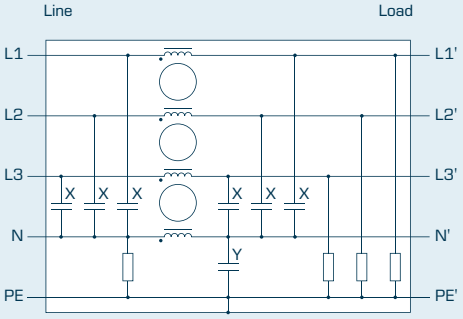
single phase, universally utilisable



three-phase, utilisable for equivalent (symmetrical) current distribution in L1, L2, L3 (e.g. for the individual interference suppression of frequency converters, motors)



three-phase+N, utilisable for equivalent (asymmetrical) current distribution in L1, L2, L3, because the differential current can flow via N (e.g. cumulative interference suppression of entire machines)



Interference suppression components utilised:

- Capacitors Class Y (L-PE, N-PE)
- Capacitors Class X (L-L, L-N)
- Resistance for discharge of the capacitors
- Current-compensated magnetic core reactor

An even more efficient suppression of interference, and with it a greater insertion attenuation, is achieved when additional elements (interference suppression components) are added, thus creating multi stage constructions.

Y-capacitors

In passive filters for the suppression of electromagnetic interference (Ref.: VDE 0565 Part 3/EN 60939/ IEC 60939), designed essentially for the operation of mains alternating voltage, the capacitors need to fulfil the requirements of Class X or Y (depending on the position of the circuit).

Class Y capacitors are suitable for applications where the failure of the capacitor could lead to a dangerous electrical shock. A failure of the Y-capacitor resulting from a short circuit or a disruptive breakdown is thus prevented from occurring during the course of orderly use.

The switching of Class Y capacitors takes place to earth (PE) in relation to the application.

Sub-class	Type of Bridged-over insulation	Rated voltage ranges	Peak value of the surge value
Y1	Double or reinforced insulation	≤500 V	8.0 kV
Y2	Basic or supplementary insulation	≥150 V ≤300 V	5.0 kV
Y3	Basic or supplementary insulation	≥150 V ≤250 V	-
Y4	Basic or supplementary insulation	<150 V	2.5 kV

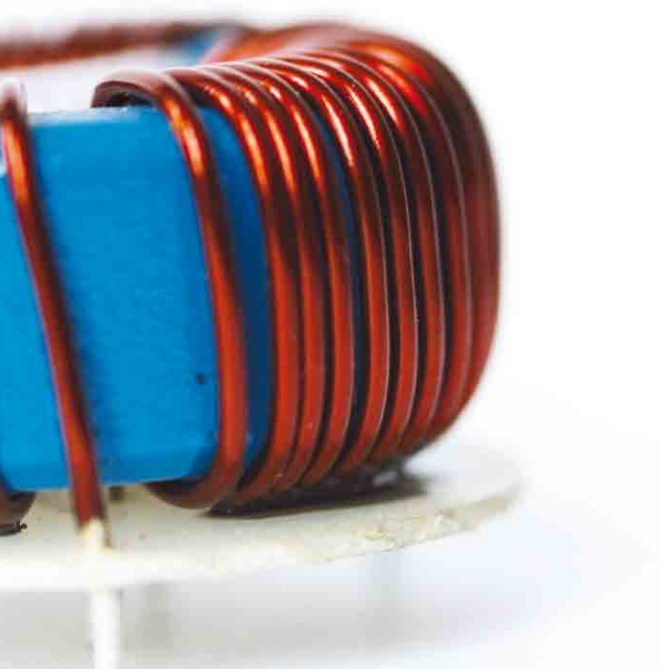
X-capacitors

In passive filters for the suppression of electromagnetic interference (Ref.: VDE 0565 Part 3/EN 60939/IEC 60939), designed essentially for the operation of mains alternating voltage, the capacitors need to fulfil the requirements of Class X or Y (depending on the position of the circuit).

Class X capacitors are catagorised according to the peak voltages of impulses superimposed on the mains alternating voltage to which they are exposed.

The switching of Class X capacitors takes place, depending on application, L-L and L-N.

Sub-class	Impulse peak voltage in operation	Installation category in accordance with IEC 60664
X1	>2.5 kV ≤4.0 kV	III
X2	≤2.5 kV	II
X3	≤1.2 kV	-

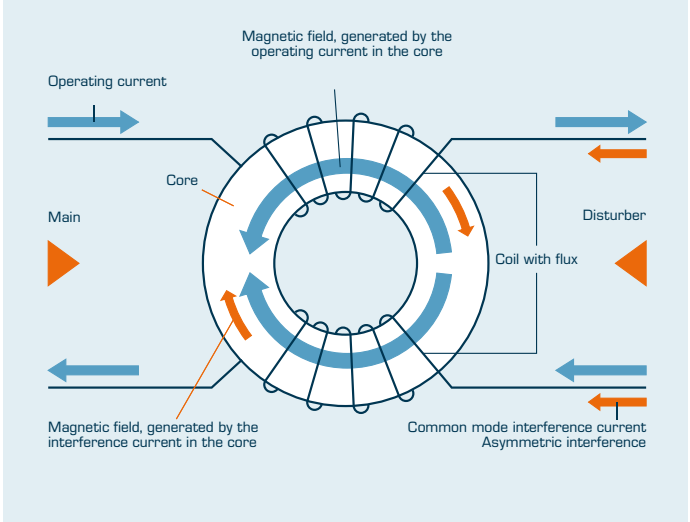


Discharging resistor

The discharge voltage resistors integrated in a filter aid the voltage degradation of charged capacitors. Capacitors should be discharged down to a voltage of less than 60 V within 5 seconds of the switching-off of the supply voltage in order to avoid the danger of an electric shock.

Current-compensated magnetic core reactor

Current-compensated reactors for the suppression of electromagnetic interference are reactors whose coils are configured upon a normally closed core in such a way that the magnetisation occurring as a result of the (symmetrical) is neutralised. A greater inductive resistor is, however, effective against asymmetrical parasitic currents.



Example of a current-compensated magnetic core reactor

Insertion attenuation

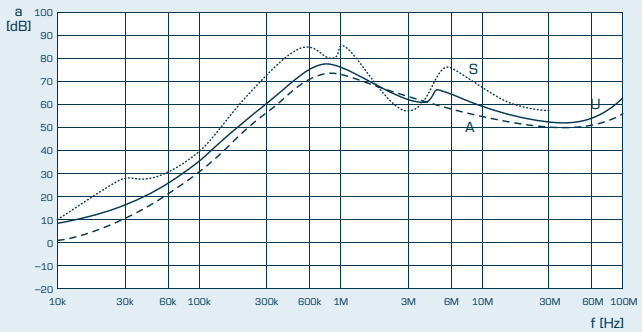
Insertion attenuation represents a non-system-dependent benchmark criterion for passive filters. The measuring procedure has been standardised (Ref.: CISPR 17) and adapted from communications engineering. It describes the logarithmic ratio U1: U2 of the (interference) voltage before and after the insertion of a filter into a circuit in terms of the frequency, measured at the output.

$a = 20 \times l_g (U_1 : U_2)$ [dB]

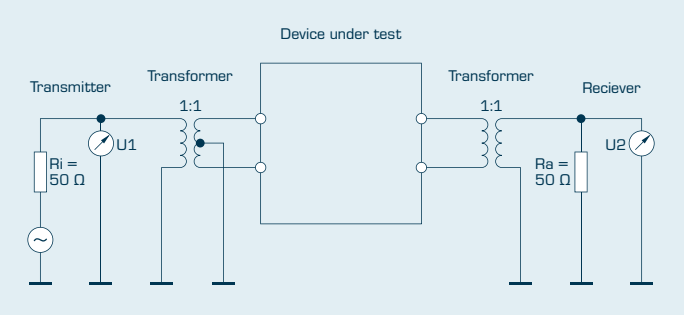
Values often applied for U1: U2 include:

0 db = 1 : 1
3 db = 1 : 1,41
6 db = 1 : 2
10 db = 1 : 3,16
20 db = 1 : 10
40 db = 1 : 100
60 db = 1 : 1.000
80 db = 1 : 10.000
100 db = 1 : 100.000
120 db = 1 : 1.000.000
140 db = 1 : 10.000.000

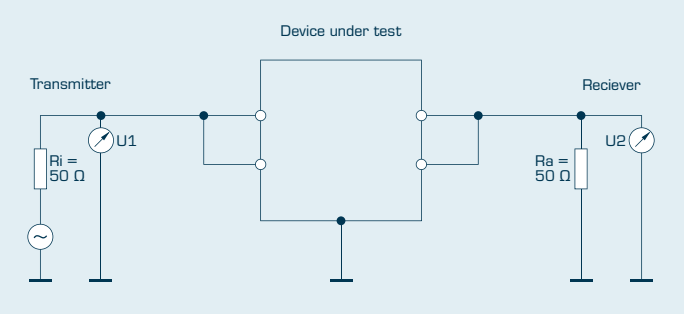
If the filter is terminated on both sides with a real resistor of e.g. 50 Ω during measurement of the insertion attenuation, then one speaks of a 50 Ω insertion attenuation.



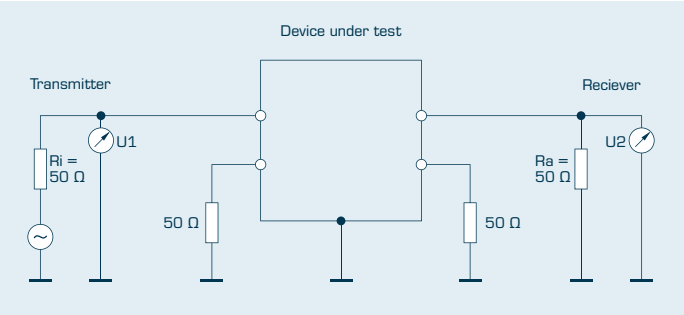
A = asymmetric (common mode)
S = symmetric (differential mode)
U = non-symmetric (with termination of the adjacent branch)



Basic measurement setup for measurement of the symmetrical 50 Ω insertion attenuation (differential mode) of a filter



Basic measurement setup for measurement of the non-symmetrical 50 Ω insertion attenuation (common mode) of a filter



Basic measurement setup for measurement of the asymmetrical 50 Ω insertion attenuation of a filter with termination of the neighbouring branch.

Measurement with unequal real terminating resistors (e.g. 0.1 Ω/100 Ω or 100 Ω/0.1 Ω) can also be carried out. These combinations make it possible to evaluate a filter in case of a mismatch. Even a negative insertion attenuation, meaning an (interference) voltage increase, is thereby possible.

While these measuring procedures do permit a comparison of different filters and make possible a preselection of the desired attenuation characteristics, they do not provide much information concerning the effectiveness of the filter in individual applications. The reason for this is to be found in the fact that neither the source of the interference (interference sink) nor the connected power line system exhibits a real resistor of 50 Ω. In addition to this there is the fact that the measurement of the 50 Ω insertion attenuation takes place in the small signal range (circa 1 V) and that the operating current (non-linear magnetisation characteristic curve, pre-magnetisation) is not achieved for the inductances of the filter. The interference voltage level itself, however, lies once again in the small signal range.

Proof of whether the limit values of the EMC standards (see “Electromagnetic Interference” and “Electromagnetic Interference Immunity”) can be maintained can be obtaines only by means of measurement technology as a systems test which takes into account all participating individual components.

Current-compensated magnetic core reactor

The usual utilisation of network interference filters takes place between the network and the input of the consumer (e.g. frequency converters). 1-phase and 3-phase models are available. A network interference filter efficiently brings together the characteristic of a power reactor (see "reactors") and that of a "passive filter for the suppression of electromagnetic interference (EMI-filters)" to make just a single filter which is very effective across a wide band. Optimal tuning of the components makes it possible to have a mains borne suppression of interference from the network frequency up to 30 MHz.

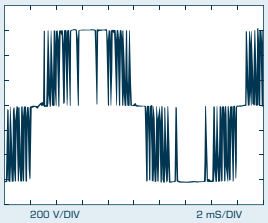
Motor reactor

The problems connected with the operation of alternating current motors at the frequency converter are increased with the utilisation of rapidly-switching power semiconductors. The steep buildup and falloff of the voltage (edge steepness dv/dt up to 12 kV/µs) causes, among other things, the following:

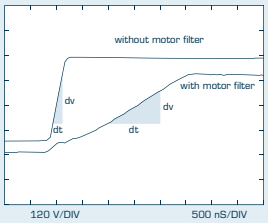
- Problems with the insulation strength and service life of the coil wires in the motor
- Generates harmonic oscillations of greater intensity up into the high frequency range

As a result of the utilisation of motor reactors,

- the edge steepness is reduced to circa 500 V/µs, which protects the motor
- the high-frequency harmonic oscillation share is reduced, which means that electromagnetic compatibility with other systems components is improved



Output voltage of a phase of the frequency converter



Resolution of an edge of the output voltage with and without a motor reactor

Motor reactors represent a minimum degree of protection. A higher level of usefulness can be obtained with motor filters or sinusoidal filters.

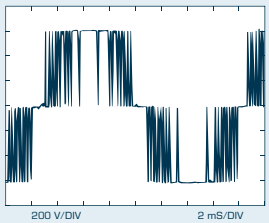
Sinusoidal filters

The utilisation of the sinusoidal filter extends itself to include the mains borne suppression of interference, from the frequency converter output to the shielded motor feed line with the alternating current motor attached to it, for clock frequencies from circa 500 Hz and higher.

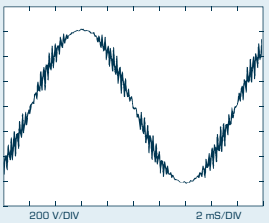
The sinusoidal filter achieves a very high filtering effect as a result of its precise low-pass tuning to the clock frequency of the frequency converter. The wanted signal (the motor operation frequency) up to circa 120 Hz passes the sinusoidal filter with only a slight effective voltage drop, while the clock frequency (typically 8 kHz to 10 kHz) is already being reduced by circa 90%. Harmonic oscillations of the clock frequency are filtered out almost completely.

The special andvantages in summary:

- very high filtering effect throughprecise low-pass tuning
- practically the only edge steepness of the output voltage still remaining is that which is usual for mains
- clock frequency and harmonic oscillation of the frequency converter output voltage become severely attenuated
- long shielded motor feed line possible
- low-noise motor operation through high attenuation of the clock frequency
- reduction of leakage currents



Output voltage of a phase of the frequency converter

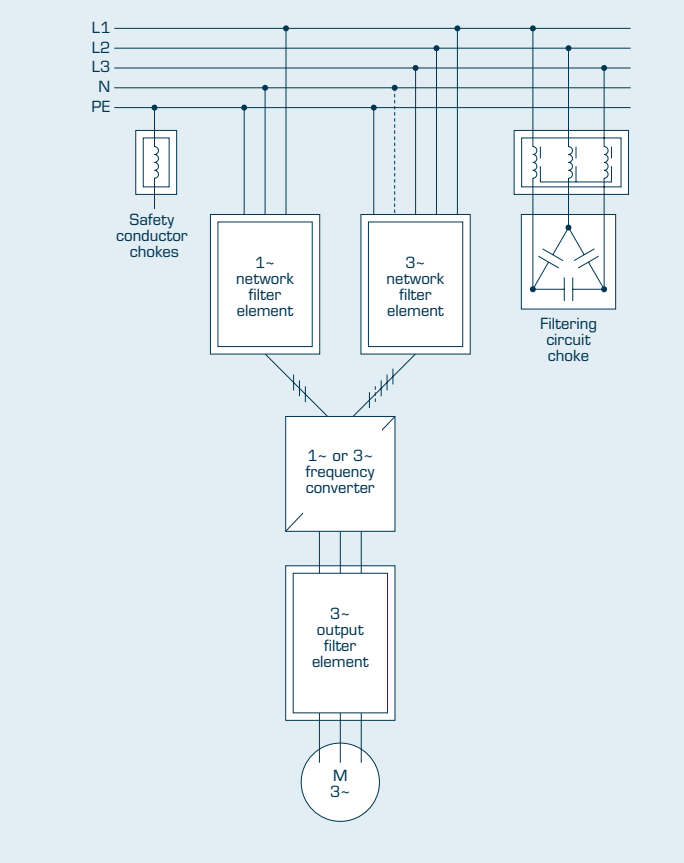


Output voltage of a phase of the sinusoidal filter

It can be seen in the oscillogram that the clock frequency of the frequency converter is present only in conjunction with a low-level amplitude superimposed on the wanted signal (motor operation frequency).

Overview for the utilisation of reactors and passive filters connected with the frequency converter

Frequency converters represent the optimal form of general motive power engineering for the control and regulation of motors, both from a technical and from an economic point of view. A typical configuration for this of the pieces of electrical equipment utilised is presented in the illustration:



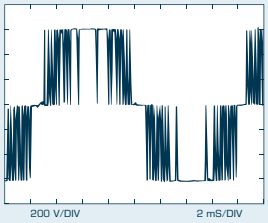
Electrical energy is obtained from the 400 V/50 Hz alternating current network via an alternately 1-phase (230 V) or 3-phase (3 x 400 V) network filter element and fed to the alternately 1-phase or 3-phase frequency converter input. Depending on individual requirements, the network filter element can be designed as a power reactor, a network interference suppression filter or an EMI filter (see in this connection "Passive Filters and Interference Suppression components, Requirements").

The rectification of the 50 Hz mains voltage and the storage of the electrical energy takes place in a direct current "intermediate circuit" in the frequency converter. The feeding of the intermediate circuit can take place in 1-phase (usual: B 4 rectifier bridge) or even 3-phase form (usual: B 6 rectifier bridge). The intermediate circuit energy is clock-pulse controlled by means of a targeted switching on and off using six semiconductor switches. This clock-pulse control takes place fundamentally as alternating current voltage with 120° phase displacement and is made available at the output of the frequency converter. The level of the clock-pulse controlled 3-phase-output voltage is oriented to the input voltage of the frequency converter, i.e. 1-phase 230 V devices supply 3 x 230 V, 3-phase 3 x 400 V devices supply 3 x 400 V at the output. Control and regulation functions such as soft start, constant torque, current limitation or modification of the motor operation frequency are realisable through the targeted clock-pulse controlling of the output. The operation of a commercially-available alternating current asynchronous motor then takes place via the (always) 3-phase output filter element via amore or less long cable. Depending on individual requirements, the output filter element can be designed as a motor reactor, a motor interference suppression filter or a sinusoidal filter (see in this connection "Passive Filters and Interference Suppression components, Requirements").

The problems of modern frequency converters

A distinction is made between I frequency converters and U frequency converters. Both variants have technical advantages and disadvantages in terms of their respective applications. Due to advantages which are conceptional and thus also economic, the U frequency converter is utilised by far the most often – the statements made apply mainly to it.

Large numbers of manufacturing pieces and sophisticated circuit technology make possible the development of ever smaller and ever more efficient devices, qualities which keep them inexpensive. These advantages are achieved through ever-greater clock frequencies and through more rapidly-switching semiconductor switches (IGBT) which are linked to a lower level of power dissipation. The illustration shows the oscillogram of the (pulse width-controlled) clock-pulse controlled frequency converter output voltage of one of the three phases:



The oscillogram is resolved to a period of the "wanted signal" of the alternating current frequency for the operation of the motor (typically up to circa 150 Hz). This alternating current voltage is formed by precisely time-controlled switch-on and switch-off processes of the intermediate circuit direct current voltage with clock frequency of the frequency converter (typically starting from 4 kHz). The steep buildup and falloff of the voltage (edge steepness dv/dt to 12 kV/µs) causes considerable problems, however, with the insulation strenghth of the coil wires in the motor. The stress permitted should not exceed 500 V/µs, since otherwise either a malfunction caused by short circuit in coil will occur or there will be a reduction in the expected service life of the motors. An important additional aspect to be considered is electromagnetic compatibility (EMC) with other system components. The high degree of edge steepness of the clock-pulse controlled voltage generates harmonic oscillations of great intensity extending up into the high frequency range. The elimination of the problems mentioned and the lessened motor noise make it possible to have network filter and output filter elements specially tailored to the operating needs of the frequency converter technology. The power line length of all system components should be structured to be as short as possible in order to avoid a scattering of high frequencies (antenna effect) through the power lines.

Passive filters in the input range of frequency converters

From the point of view of measuring technology, verification of whether the EMC Requirements of an electrical drive system are being fulfilled in connection with a frequency converter can only be achieved in the form of a system inspection which includes all of the components involved.

EMI filter

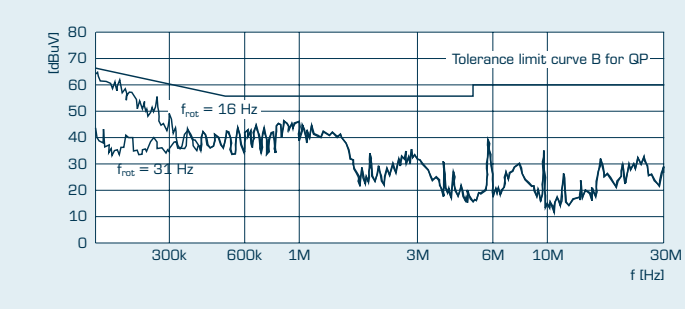
The European standard norm EN 55011: Industrial, scientific and medicinial high frequency devices (ISM devices) is considered the fundamental principle to be applied in connection with mains borne emitted interference in the frequency range extending between 150 kHz and 30 MHz, which is essentially responsible for the dimensioning of the input-side EMI (electromagnetic interference) filter between network and frequency converters. The frequency converter generates HF energy, which is required for internal functioning, and thus becomes classified as an ISM device belonging to Group 1. If it can be assumed that the electrical drive system is not connected exclusively to its own low-voltage supply network (industrial network), but ratherthat a power feed from the public network can also take place, then the frequency converter must be considered to be a Class B device. Class B devices must adhere to the Class B limit values for radio disturbance. If the utilisation of the electrical drive system takes place by means of a low-voltage supply network (industrial network), then the frequency converter is regarded as a Class A device. In such cases, it is then only the less-strict Class A limit values for radio disturbance which must be adhered to.

A passive filter for the suppression of electromagnetic interference in connection with frequency converters must be adjusted to accommodate the different operating states of the electrical drive system. Numbered among the most important operating parameters, the variations of which can lead to aberrant emitted interference, are the following:

- Rotating field frequency (speed of the motors)
- Switching frequency
- Length of the shielded motor line

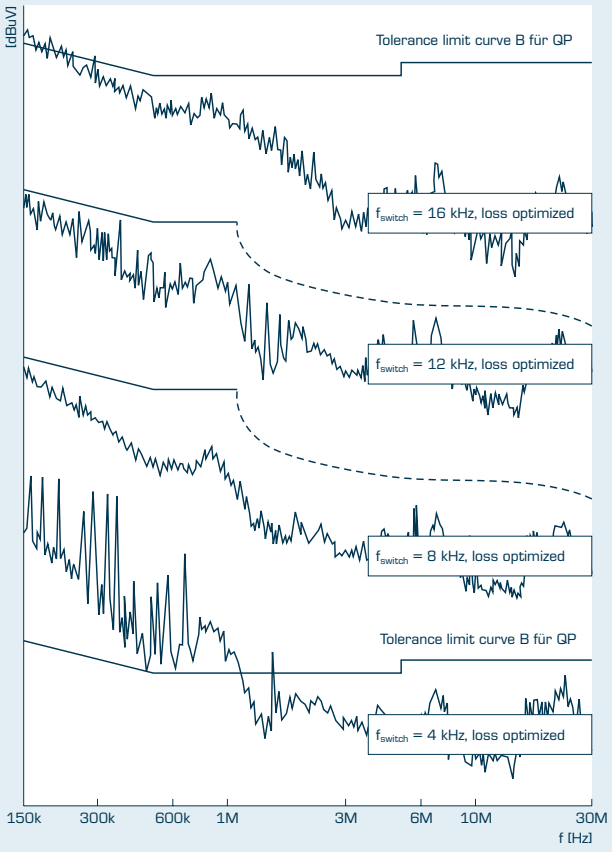
Variation of the rotating field frequency

The ability to carry out simple changes of speed of completely normal, commercially available alternating current asychronous motors is one of the most important reasons for the utilisation of a frequency converter. Even the modification of this operating parameter has an effect on the interference voltage released. Increased emissions were detected in many frequency converters, particularly for the lower rpm range. As a result, the “worst case situation” must be determined for each filter by means of continuous modification of the (output) rotating field frequency as early as in its development stage, the required filtering effect can be dimensioned by extrapolating from this. The following diagram of the interference voltage measurement in accordance with EN 55011 presents typical behaviour:



Variation of the switching frequency

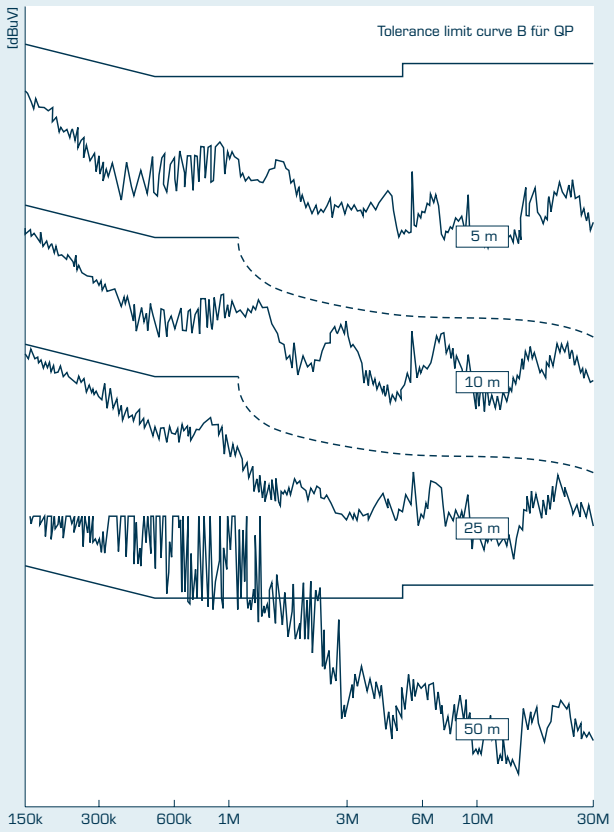
Modern frequency converters with their rapidly-switching IGBT terminal stages permit step-by-step adjustment of the switching frequency within the typical range between 4 kHz and 16 kHz. There are, however, devices on the market which feature automatically changing switching frequency (chopper frequency) for the purpose of avoiding device overheating. When faced with extreme situations, these models automatically reduce the specified high switching frequency to a lower frequency. This variation possibility also exercises a significant influence on the insertion attenuation of the filter which is to be provided. In the following diagram, various switching frequencies were set on the frequency converter in conjunction with the same filter. Whereas the interference voltage measured with the switching frequencies 16 kHz, 12 kHz and 8 kHz was close to and/or just above the limit value curve B, the same filter is completely overwhelmed when faced with a switching frequency of 4 kHz



Variation of the shielded motor line

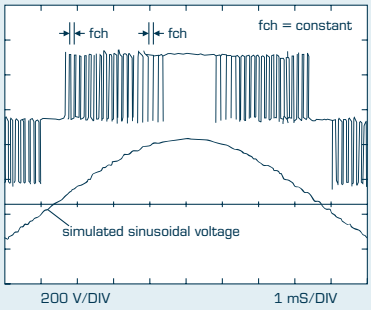
The length of the motor line connected to the output of the frequency converter, and thereby also the shield area, has an effect on the design of an EMI filter. The dependency of the interference voltage at the input of the frequency converter upon the cable length connected to the output is illustrated in the following diagram.

The increase on the mains borne emitted interference in connection with increasing cable length is clearly recognisable. The limit for Class B in the lower frequency range is already exceeded at 25 m, while a 50 m cable length overwhelms the filter.



Passive filters in the output range of frequency converters

Frequency converters have the task of propelling alternate current motors forward. This task should be accomplished for the operating behaviour of the almost exclusively-used alternating current asynchronous motor in a way reflecting a high degree of efficiency and user-friendly setting options. For this, it is necessary to supply the three-phase output voltages of the frequency converter with clock pulses. The following illustration shows the oscillographic output voltage of one of the phases of a typical U frequency converter, each of which has been shifted by 120°:

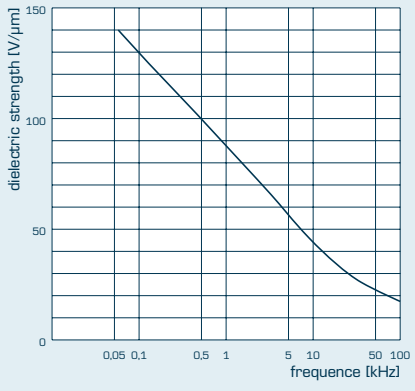


The superimposed sinusoidal semioscillation is intended as an aid to understanding the processes connected with simulation network of the operating voltage. A direct current voltage generated in the frequency converter is split up with unchanging switching frequency (in pre-selectable intervals between 4 kHz and 16 kHz) into individual packets with an unchanging curve summit value. Starting at the first zero crossing of the sine curve, initially very narrow impulse packets with low energy content are to be found, the later progression then witnesses a steady prolongation of the impulse duration up to the amplitude maximum of the shape of the curve to be network balanced. After that, the impulse duration shortens again back to the renewed zero crossing. In the second half-wave, the process repeats itself with reversed polarity.

The control of the connected motor takes place by means of variation of pulse and interlude times in terms of rotating field frequency, torque and startup and braking behaviour. These advantages unfortunately also involve a few disadvantages:

- reduction of the motor service life as the result of steep switch edges
- overvoltages at the motor
- EMC problems
- increasing problems with long power lines
- additional noise development in the motor

Designed for a low-band sinusoidal operating voltage, there have been no problems in the past in terms of insulation strength of the commercially available enameled copper wires used in virtually all electric motors. Whereas in the early days of frequency converter technology frequencies were relatively low and switching procedures were relatively slow, nowadays determined further development of semiconductor components have established ever-shorter switching times and steadily increasing switching frequencies. No development progress of equal import can be recorded for the insulation strength of the enameled copper wires in standard electric motors. In addition to their previous dynamic loads, nowadays the coil wires are also subjected to a frequency-dependent insulation stress which has the effect of reducing expected service life. The dependency of insulation strength on enameled copper wire as a function of frequency is presented in the following diagram:



Varnish insulation, based on modified polyester, layer thichness approx. 75 µm, test voltage increased until voltage breakdown, within 10–20 s.

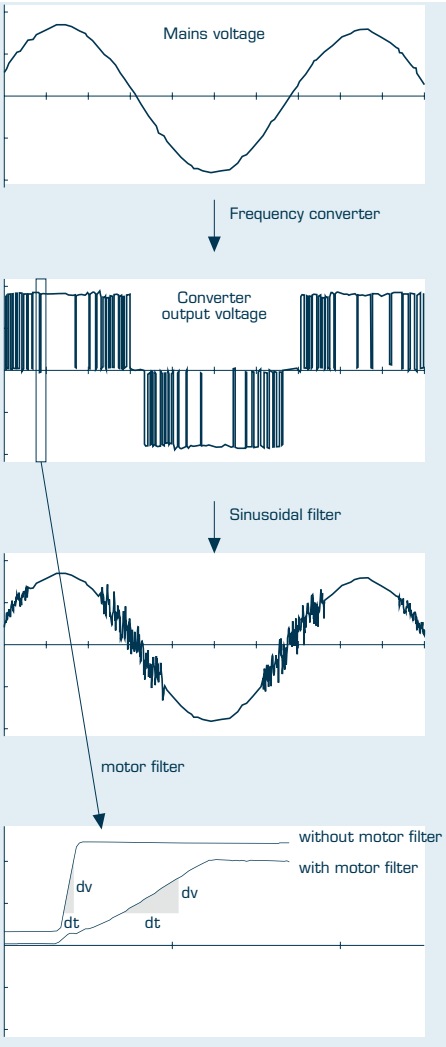
Even in the presence of a sinusoidal voltage with as little as 10 kHz, insulation strength will be reduced by more than a factor of 3. If one considers the quite energetic harmonic oscillation spectrum present in the steep impulse edges of the switching frequency, then the dielectric strength falls to dramatically low values.

The uncontrolled emergence of overvoltages are the result of stationary or wandering harmonic oscillations upon the motor line. The frequency spectrum is not at all constant, it changes with the impulse packets to the control system of the motor. Because the transfer system consisting of frequency converter–motor line–motor needs to be optimised to the power transfer in the rotating field frequency range of the motor, a constant mismatching takes place for the harmonic oscillation spectrum, which promotes the uncontrolled appearance of resonances.

The noise development of the motor, though not important in terms of electrical reliability, is still felt to be extremely disturbing in some areas of use (particularly in the residential sector). It is precisely in the audible range under 16 kHz that the magnetostriction of the sheet steel of the motor occurring with the switching frequency and the mechanical oscillations of the coils in the motor are felt to be particularly disturbing.

In critical cases, a frequency converter with enhanced output power can become necessary. The source of the trouble is an increased frequency converter load caused by parasitic cables and earth currents.

Corrective help for the weak points named can be had from motor reactors, a motor filter and a sinusoidal filter on the output side of the frequency converter.



Whereas motor reactors offer minimum protection against a high degree of edge steepness on the part of the frequency converter output voltage, motor filter are even more efficient. This efficiency can be recognised in the lefthand oscillogram:

Compared to a commercially-available frequency converter with 8 kHz switching frequency, the motor filter reduces the dv/dt value from approx. 12 kV/µs down to a non-critical 500 V/µs. The original expected service life of the motor is thus restored once again. In addition, a low-loss measure for the attenuation of stationary waves on the lines is also integrated into the filter. This installation provides for stable operating behaviour at different power line lengths.

Sinusoidal filters form a sinusoidal voltage with low levels of distortion from the clock-pulse controlled frequency converter output voltage. The ratios in front of and behind a sinusoidal filter are illustrated in the oscillogram. Only a few remaining harmonic oscillations on the sinusoidal fundamental oscillation of the of the rotating field frequency of the motor are indicative of the original progression of the frequency converter output voltage. This is the way the builder of electrical installations avoids the following points of weakness in the area of frequency converter motive power engineering:

- dv/dt loading of the coil wires
- overvoltages at the motor coils
- noise development in the motor caused by the switching frequency
- problems with long motor power lines

The problems outlined are now all to be attributed to the filter utilised, which assumes a key position in the transmission system of frequency converter–filter–motor power line. Only many years of experience and careful selection of materials, coupled with extensive testing techniques makes possible the development and manufacture of reliable filter products for frequency converter motive power engineering.

Installation directions for the frequency converter motive power engineering

The installation of a good filter does not also automatically ensure the successful interference suppression of a switch cabinet.

Basic information concerning service cabinet construction

It is only when the correct concept for service cabinet construction in view of high-frequency interference emissions and immissions has been selected that all EMC efforts will exercise their effective influence. The first step to professional handling of the complex techniques is the recognition of critical components. Included among these in the context of an installation are for example frequency converters, switched mode mains power supplies and SPS devices. Mutual influencing and negative effects upon other consumers are to be assumed when they are connected to a shared network and when they are physically close to one another. Possible points of weakness as well as suitable solution approaches are shown in the following illustration 1:

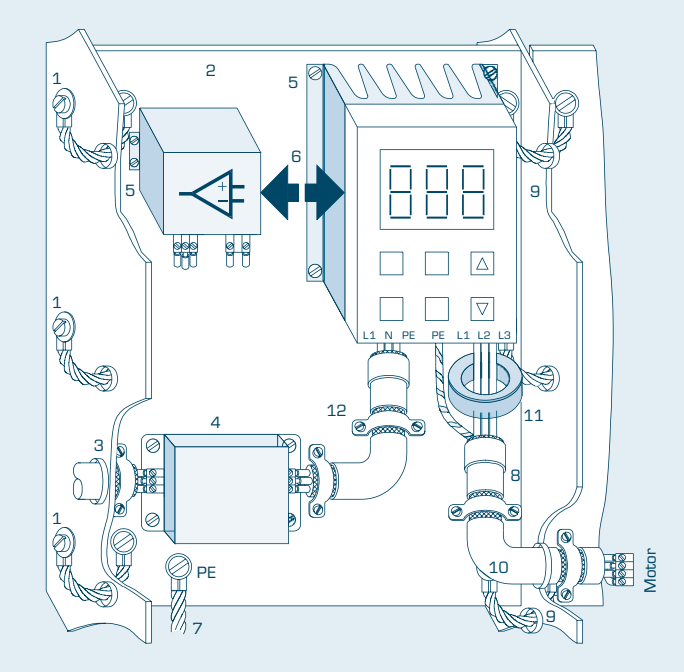


Illustration 1

- Single filters are to be provided for as needed before each source of interference for the purpose of decoupling conducted interference dissemination, thus contributing to the minimisation of its influence. The use of this procedural method leads to the reduction of the conducted interference potential down to permitted values and to the simultaneous improvement of the interference immunity of the shielded component against line-commutated voltage influences.
- In cases of single interferences, the filter is to be placed as close as possible to the emission site. If this is not possible due to space considerations, then a shielded cable is to be selected for the connection (Ill.: 1/12).
- Relays, contactors, solenoid valves, etc., which are located in the same electrical circuit with electronics components are to be provided with corresponding spark extinction combinations and/or overvoltage protection circuits.
- The total sum of suppression filters take over the limiting of conducted interference for the entire installation. Their position is to be as close as possible to the network input (Ill.: 1/3). As a positive side effect, this measure leads to an increase of the conducted immission resistance of the attached product in relation to the spike, burst and surge pulses carried on the network side.
- Suppression filters must channel off corresponding currents against PE for emission suppression. The Y capacities necessary for this allow leakage currents to flow through the protective conductors. For the majority of three-phase filters, only very low levels of leakage current occur during normal operation. This changes however in the presence of non-symmetrical network conditions: then a few 100 mA of leakage current can be expected. For that reason it is absolutely imperative to take care to ensure the presence of a dimensioned PE connection.
- Many manufacturers use the maximum permissible highest value as the basis for the voltage specification for suppression filters. Warning! In such cases, the maximum permitted operating voltage – without any upward tolerances – is to be equated with the printed value.
- An essential part of secure EMC construction is an HF-suitable bonding of all devices and/or installation components. This means that they are bonded in a way which is large-area, of low impedance and protected against corrosion with the PE reference potential (Ill.: 1/5).
- The enhancement of the interference immunity against radiated immission leads to an improved level of operational safety. Adherence to a sufficient spatial separation between sources of radio noise and loaded components is in this connection an effective an inexpensive procedural method (Ill.: 1/6). In cases where spatial opportunities are absent, metallic separating walls are of help (Ill.: 2/7).
- Connect all metallic parts of the switch cabinet, such as rear and side walls, ceiling and floor sheet metal together in a way which is HF-suitable. If this is not done, then the elements will function as junction transistors (Ill.: 1/1). Cross-section-sized fine-wired strands or earthing straps are suitable as connection lines. Solid wire should be dispensed with altogether (Ill.: 1/1). This also applies to the PE connection
(Ill.: 1/7).
- All metallic parts in the switch cabinet (devices, mounting plates, etc.) are to be bonded together in an HF-suitable manner (Ill.: 1/9).
- Unfortunately, coloured lacquered mounting plates are still to be used in switch cabinets. These could hardly be less appropriate for an EMC-suitable construction, since it would take an unacceptable amount of effort to establish an adequate HF bonding. Anodised surfaces are equally unsuitable for good bonding because of the high level of contact resistance in the high frequency range.
- For custom-made structures, one must remember that the only metal surfaces which meet the requirements of HF technology are those which have been permanently protected against corrosion damage.

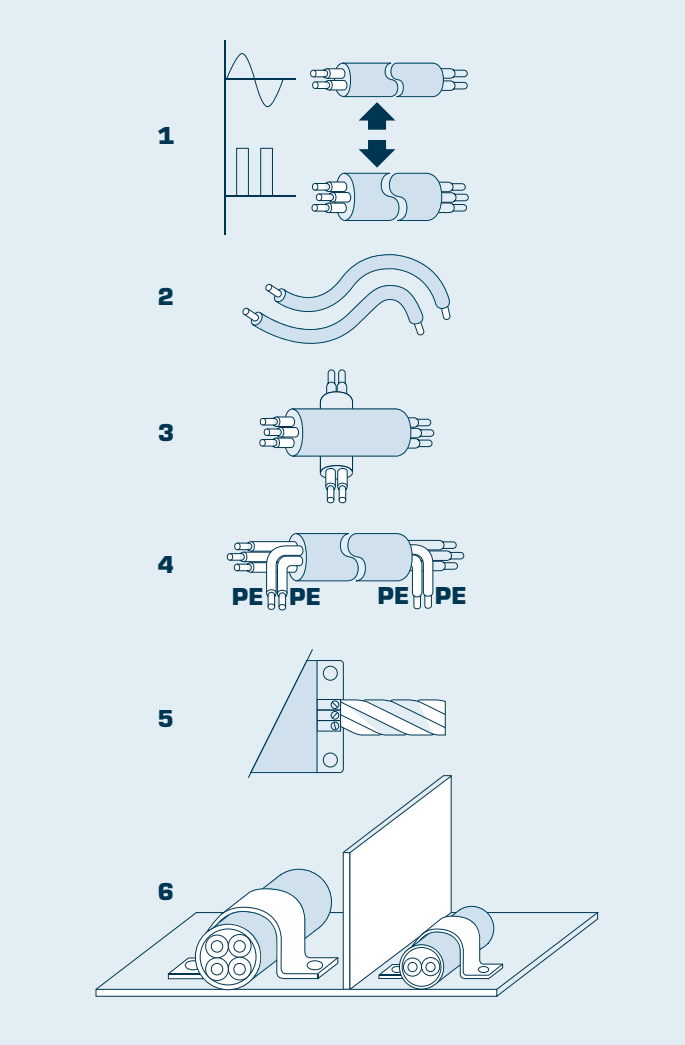


Illustration 2

Selection of cables and their placement

The correct selection and placement of the connecting cable is numbered among the basic prerequisites of a successful EMC setup. Greater problems with installation components accompanied the appearance on the market a few years ago of modern versions of frequency converters, the IGBT final phases of which generate voltage units of up to 12 kV/µs, which means they release a considerable interference potential. Illustration 2 shows typical methods for the placement of connection lines:

- There must be a spatial separation between "hot" and "cold" cables. What is meant here is the placement of interference-prone lines parallel or in the immediate proximity of already shielded or non-interfering lines (Ill.: 2/1). Where necessary, a shielding or metallic separation wall is to be placed between the cable strands (Ill.: 2/7).
- Interference-prone lines should be placed as close as possible to reference potentials such as rear wall, side wall, etc. This will cause a part of the radiated emission to be absorbed by the reference surface (Ill.: 2/6).
- An "orderly" parallel and spatially-narrow arrangement of the wiring between interference-prone and "clean" connections is to be avoided. Each cable has an E-field component which leads to capacitive coupling and thus also to the contamination of the previously interference-free cable (Ill.: 2/2).
- If interference-prone power cables and control cables cross over one another, then this is to be carried out at a 90° angle as much as possible (Ill.: 2/3).
- Cut off "safety lengths" and thus overlong lines, do not roll them up and store them in the switch cabinet. These "coils" act like antennas and "suck up" interference and/or radiate it off.
- The simple measure of drilling unshielded analog lines protects against symmetrical interference couplings
  (Ill.: 2/5).
- Connect non-occupied wires with PE voltage. Otherwise they will act like antennas (Ill.: 2/4).
- Only use cables which have copper-mesh shielding, YCY. As for steel mesh or braids, their electric conductance is insufficiently high for HF applications. There is only a very low shield effect. The latest cable shields consist of a synthetic foil with woven-in ferrite material. Cost/benefit considerations are to be pondered in this connection.
- In cases where shield unraveling is required, this should be woven back together again over as large a surface as possible. The free wire ends for the connection clamps should be kept as short as possible.
- Do not place any further lines such as for example control or data cables within a shielded motor line.
- Set up the connection between the suppression filter and the emission source to be as shielded as possible. In cases of extremely short lengths (≤20 cm) this can in some cases be dispensed with.

Proper placement of the cable shield

An opinion widely shared concerning the bonding of a cable shield rests on the state of technology relating to power lines with analogue signals. Here only a single-sided placement of the shield is to be recommended for avoiding humming and earth circuits. This is often also practiced for connections with digital signals (e.g. of the frequency converter output voltage). Unfortunately, this is an unfavourable procedural method. Illustration 3:

- In cases of shielded cables with digital voltage forms, both shield ends must be put on (Ill.: 3/4).
- Always put the shield on over a large surface, e.g. with a cable clip (Ill.: 3/4).
- Completely insufficient is any bonding of the shield by means of simple drilling and subsequent bonding of the thin end with a PE terminal (Pigtail) (Ill.: 3/1).
- Similarly, the shield may not be connected by means of a soldered strand end to a PE clamp (Pigtail) (Ill.: 3/2).
- Connecting the shield weave with a pressure ring and a soldered-on strand end will also yield only unsatisfactory results (Ill.: 3/3).
- The distance between the shield strap and the clamping point is to be kept short (Ill.: 1/8,12). If this requirement cannot be met, then the shield should be carried further up to a position close to the clamping point. The shield end should also be mechanically secured with a heat- shrinkable sleeve as necessary (Ill.: 3/5).
- Use special PG threaded connections for cable bushings use HF-suitable shield layers.
- The motor feed line carries the greatest emission potential. For this reason, do not fail to use shielded cable, particularly in connection with longer connections (Ill.: 1/10).
- A great deal of energy is lost in the shield on long shielded lines. The cause of this is the high speed of voltage increase (dv/dt) of the generated motor voltage. A high dv/dt can, in the case of small frequency converters, lead to a situation where all of the power is extinguished in the cable itself. Motor reactors offer some aid here, as do motor filters and/or sinusoidal filters by means of a flattening of the speed of voltage increase. Besides the EMC problems, there also exists a high dv/dt, in addition to the danger of a rapid shortening of the service life of the motor coil insulation. A useful side effect of the suggested EMC measure is the improvement of the expected service life of the connected motor.
- Sinusoidal filters re-form a sinusoidal operating voltage out of the clock-pulse controlled frequency converter signal. This makes it possible to maintain extremely long shielded motor feed lines. An additional plus point is the noise minimisation at the motor.
- Guide the motor cables of frequency converters as directly as possible out of the switch cabinet. This handling method reduces the internal susceptibility to interference (Ill.: 1/10).
- A ferrite ring over the motor line can under certain circumstances reduce radiated interference as well as the leakage currents to the motor cable shield (Ill.: 1/11).

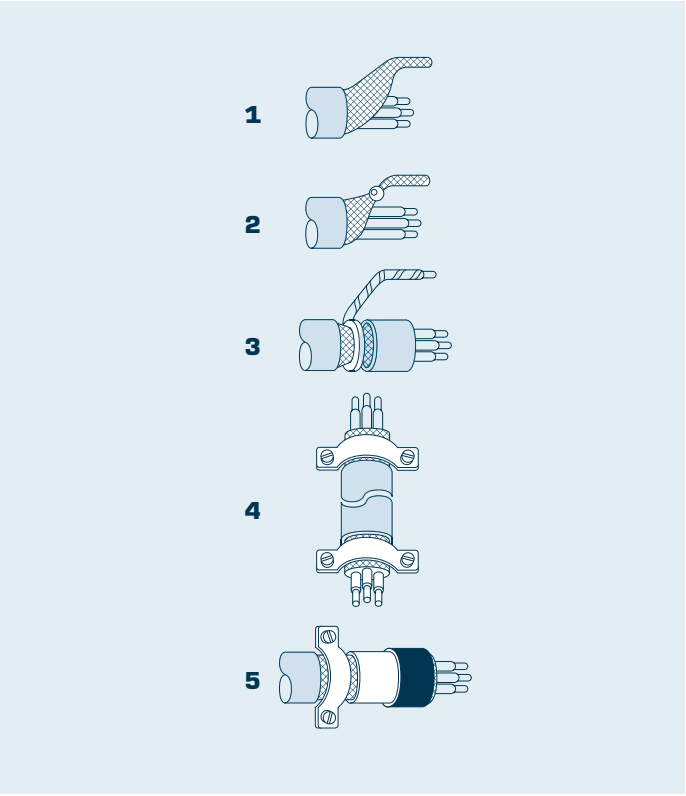


Illustration 3

Reactors

General technical informations

A reactor is a device which is made up of one or several coils with a frequency-dependent impedance and which works in accordance with the principle of self-induction, whereby a magnetising electrical current generates a magnetic field which is directed through a magnetically-charged core or through air (Ref.: Ref.: VDE 0570 Teil 2–20/IEN 61558-2-20/IEC 61558-2-20).

Requirements

The general statements already made concerning such things as protection class, type of protection, insulation material class, rated ambient temperature and (to the extent applicable) transformers also apply to reactors.

Usually, and unless otherwise agreed upon with the ordering party, reactors will be manufactured with basic insulation between voltage-bearing parts and the core.
As a result of the laws of physics, the presence of at least one air gap in reactors causes an operating frequency magnetic leakage field which cannot be ignored and an acoustic noise development which corresponds to twice the operating frequency.
There is a need for providing sufficient clearance to neighbouring electrical equipment and ferromagnetic materials
(e.g. steel switch cabinet).
An important criterion for dimensioning is utilisation of reactors provided for in the low-band range, e.g. as:

- Power reactor
- Smoothing/commutating reactor
- Filtering circuit reactor
- Motor reactor
- Motor filter
- Sinusoidal filter

Standards

Unless otherwise agreed upon with the ordering party, we manufacture in accordance with the latest "State of Technology" and with the following standards:

VDE 0570: Safety of transformers, power supply units and similar devices, Part 1: General requirements and tests, Part 2-20: Particular requirements for small reactors

EN 61558, IEC 61558: Safety of power transformers, power supply units and similar, Part 1: General requirements and tests, Parts 2–20: Particular requirements for small reactors.

Frequency behaviour

Non-dependence on frequency for the inductance can only be expected from ideal inductances and air-core coils. Actual inductances and reactors with a ferromagnetic core exhibit a more-or-less marked frequency dependency, even in the low-band range, which is essentially determined by the core material utilised.

The usual utilisation of reactors in the area of application of VDE 0570 Teil 2–20/ IEN 61558-2-20/IEC 61558-2-20
(see chart).

Harmonic oscillations generate exponentially increasing attenuation in a reactor as frequency increases. These increases will be determined by BLOCK theoretically and optimized for the best possible use in the application. The usual thermal dimensioning (e.g. of a power reactor) on the rated electrical current with rated frequency takes into account only an increase of load through the sum of all harmonic oscillation currents of up to a maximum of 5%. An increase of the core power is required for greater increase of load.

Furthermore, in addition to the rated electrical current at the rated frequency (fundamental oscillation), the effective value of the current of each emerging harmonic oscillation must be known for the thermal dimensioning of the reactor. In critical cases, when a harmonic oscillation current exceeds circa 10% of the fundamental oscillation current, then the phase position of the oscillations to one another is also to be taken into account.

Usual use of reactors within the purview of the standards:

laminated (lamellar) cores	iron powder cores ironres	ferrite fecoresrores
<3 kHz*	**<250 kHz***	**<1 MHz**
Smoothing/ Commutating reactor	Smoothing/ Commutating reactor	Smoothing/ Commutating reactor
Line reactor	Motor reactor	Motor reactor
Filtering circuit reactor	Motorfilter	Motorfilter
Motor reactor	Sinusoidal filter	Sinusoidal filter
		Motor filter
		Sinusoidal filter

*still working on sinusoidal frequence

Tolerance

The voltage drop (Ref.: VDE 0570 Teil 2–20/
IEN 61558-2-20/IEC 61558-2-20) may not deviate by more than 25% from the rated value in the equilibrium state with rated frequency and rated electrical current. For biased reactors and reactors with such additional components as capacitors, rectifiers, etc., the voltage drop may not deviate by more than 30% from the rated value.

Special models of reactors, such as filtering circuit reactors, must be precisely calibrated, which means that they are subject to considerably lower tolerances.

Proportional to rated voltage drop, inductance is calculated to:

$$L = \frac{U_{rated}}{I_{rated} \times 2 \times \pi \times f_{rated}}$$

Linearity

The linearity of the inductance of a reactor can be influenced within certain limits by constructive design. The illustration A shows a common layout, e.g. as a power reactor (with a linear air gap).

Inductance proceeds in an almost linear manner up to the rated electrical current (thermal dimensioning) and falls off in the presence of over-current in a relatively undefined manner as the result of the magnetic saturation of the core. As a rule, the only way to avoid loss of linearnetic saturation of the core. As a rule, the only way to avoid loss of linearity in the over-current range is to increase core power.

If a greater initial inductivity of up to a current of circa 10–20% of the rated current is required, this can be realised by means of a nonlinear air gap. The disadvantageous effect of this, however, is a relatively undefined curve progression and the associated greater inductance tolerance.

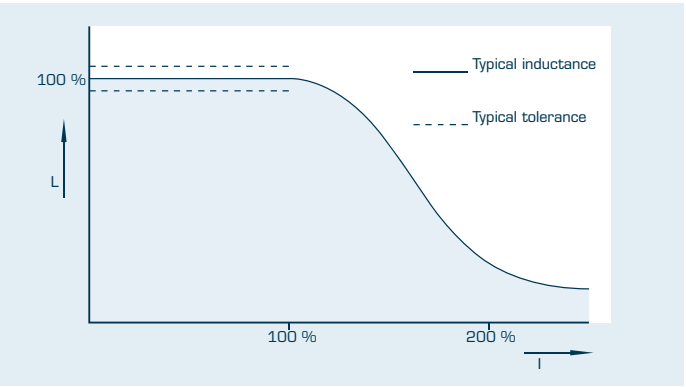


Illustration A

Bemessungsleistung

The rated power (Ref.: VDE 0570 Teil 2–20/IEN 61558-2-20/IEC 61558-2-20) of a reactor is the sum of the products of rated voltage drop and of rated electrical current with rated frequency. The specification of the reactive power is given in kVAR or VAR (Volt Ampere Reactive).

$$W = U \times I \times t = \frac{L \times I^2}{2}$$

with W = energy in Watt seconds (Ws)

U = voltage drop in Volts (V)

I = current in Amperes (A)

t = time in seconds (s)

L = inductance in Henry (H)

Note concerning magnetic energy of the rated power

Smoothing/Commutating reactors

These reactors are often utilised as storage reactors for electrical energy in direct current circuits. The core is thereby often biased with a direct current, which is either superimposed upon an alternating current characterised by the most eccentric curve progressions and frequencies or used for current direction changes (commutation). Dimensioning is highly dependent on circuits and applications.

Line reactors

These reactors are usually used in the mains in series connections to the user. Single phase and 3-phase models are available. They provide the following important safety functions:

- Attenuation of harmonic oscillation currents resulting from frequency-dependent inductive resistance
- Starting current limitation for the user and thus reduced module stress, e.g. for rectifier circuits
- Guarantee of the short circuit voltage UK of 4% to the network frequently demanded by the EVUs (electric supply companies)

Example: With rated electrical current (e.g. 4 A) and rated frequency (e.g. 50 Hz) of a reactor with UK = 4 %, 96 % of the mains voltage (3 * 384 V) is still available to the consumer (ohmic resistance) on a 3-phase network of 3 * 400 V/50 Hz. The rated voltage drop of each phase at the reactor amounts to 16 V * 1/w3 = 9.2 V and the rated inductance is calculated to

$$L_{rated} = \frac{U_{rated}}{I_{rated} \times 2 \times \pi \times f_{rated}}$$

$$= \frac{9{,}2\ V}{4\ A \times 2 \times 3{,}14 \times 50\ Hz}$$

$$= 7{,}3\ mH \text{ per phase}$$

For the rated frequency (fundamental oscillation), the inductive resistance is calculated to

$$XL = 2 \times \pi \times f_{rated} \times L_{rated}$$

$$= 2 \times 3{,}14 \times 50\ Hz \times 7{,}3\ mH$$

$$= 2{,}3\ \Omega \text{ per phase}$$

an idealised point of view, harmonic oscillation currents are reduced in relation to fundamental oscillation (1st harmonic = 50 Hz) by the factor of the ordinal number (e.g. 3rd harmonic = 150 Hz = factor 3). However, the statements made concerning the “frequency behaviour” of reactors should be taken into account for this.

Filtering circuit reactors

Power converters and frequency converters are used nowadays with increasing frequency on the network. This leads to harmonic oscillations on the network, which causes additional attenuation, especially in the capacitors of reactive current compensation installations. Among the advantages offered by filtering circuit reactors are:

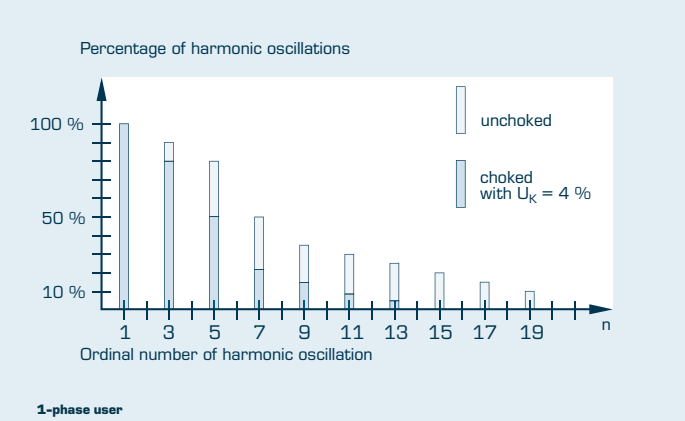
- less attenuation and no overloading of the capacitors of a reactive current compensation installation,
- the impedance behaviour of the network becomes improved.

Filtering circuit reactors require special dimensioning for safe and long-lasting operation:

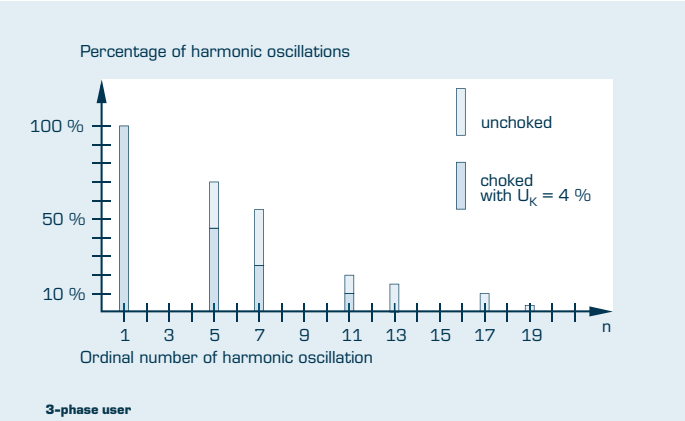
- low inductance tolerance,
- linear inductance progression extending far beyond the rated electrical current and with harmonic oscillations,
- thermal design construction for continuous operation for network frequency and harmonic oscillations.

The series connection to the capacitors is carried out almost exclusively in 3-phase design, which means that it has an effect upon the entire alternating current network.

Typical effect for consumers with direct current intermediate circuit (rectification and filterung of the mains voltage):



1-phase user



3-phase user

Filtering circuit reactors for reactive current compensation installations

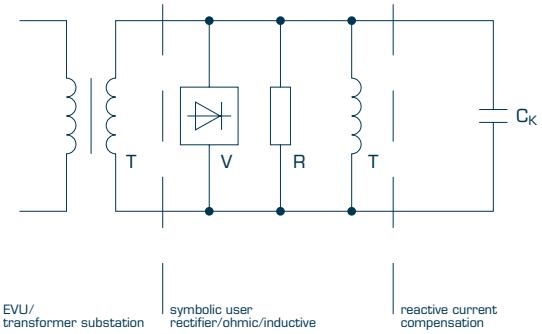
An economic operation of inductive consumers such as motors, transformers and fluorescent lamps is possible only through appropriate measures involving reactive current compensation. A capacitive reactive current has a compensating effect to counter the inductive reactive current of consumers. This means that it becomes possible to approach the desired power factor cos 0.9 ind. up to 1. Reactive power costs will continue to be minimised and the load on the networks of the electric supply companies (EVUs) will be lightened.

Networks with harmonic oscillations

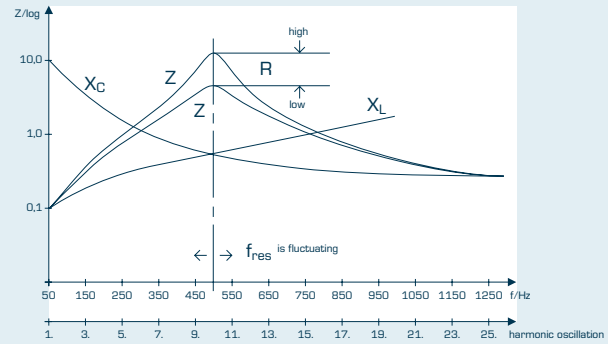
Harmonic oscillations on the mains occur, for example, as the result of the operation of power converters and frequency converters. The frequency spectrum of the harmonic oscillations that arises is dependent on the generator of the harmonic oscillations and extends well up into the Kilohertz range. Generally speaking, however, an assessment which extends up to the 25th harmonic oscillation (in terms of the network frequency) is sufficient. Installations and components are usually designed for compatibility levels in accordance with the VDEW guidelines “Fundamentals for the evaluation of network reactions”.

The normal reactive current compensation

The illustration shows the basic construction of a reactive current compensation at a network which is loaded with harmonic oscillations:



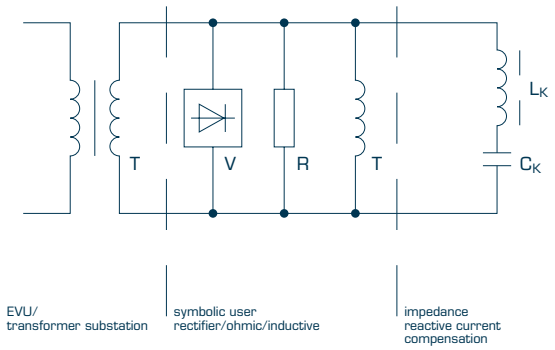
The harmonic oscillations are caused by the user V. Even just a relatively low share of harmonic oscillations leads to additional losses in power lines, transformers, switching elements and in the capacitor of the reactive current compensation, which is to be regarded as particularly critical. To this is added an undefined impedance behaviour on the part of the mains. The following illustration shows a typical impedance behaviour:



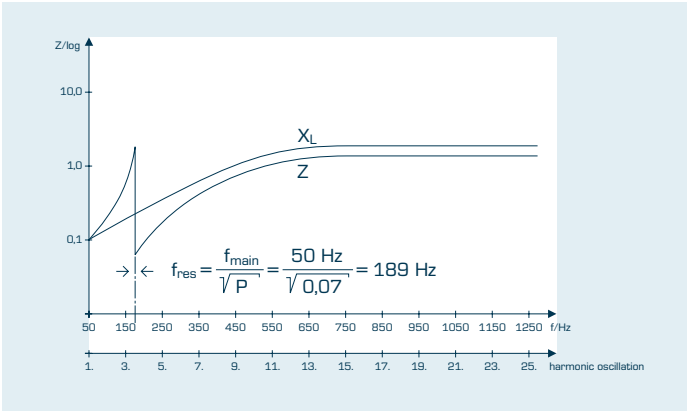
Depending on the load and the effect of the existing parallel oscillation circuit, which consists of the sum of all inductances and the capacitor of the reactive current compensation, resonance increases occur. The resonance frequency which arises can fluctuate and, in conjunction with the generated harmonic oscillations, can lead to the destruction of individual components of the network being observed.

The impedance reactive current compensation

The following illustration shows the basic structure of an impedance reactive current compensation:



Defined network conditions are created through the addition of a filtering circuit reactor LK in series connection to the capacity CK of the reactive current compensation. Generally speaking, an impedance becomes absolutely mandatory when the apparent power of the consumer generating harmonic oscillations amounts to more than 1/5 of the rated power of the feeding transformer. By adjusting the series oscillation circuit (LK, CK) to match a non-critical frequency, undefined resonance increases are avoided and the capacitor of the reactive current compensation, which is to be regarded as critical (particularly in conjunction with high frequency harmonic oscillations), is protected. The following illustration shows in this connection a typical example of network impedance behaviour in conjunction with the most frequently selected impedance of 7% (p = 0.07):



The impedance factor p is expressed as the ratio of the reactive impedances:

$$p = \frac{X_{LK}}{X_{CK}}$$

The ensuing resonance frequency of the series oscillation circuit is

$$f_{res} = \frac{f_{mains}}{\sqrt{p}}\ (Hz)$$

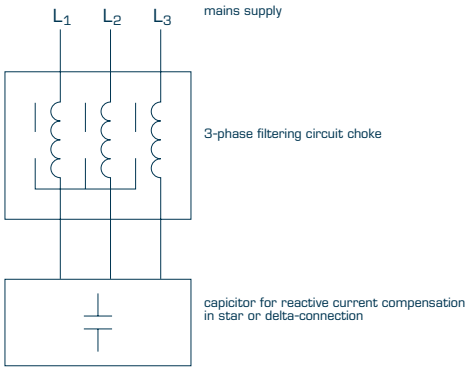
This means the resonance frequency in a 50 Hz network calculates out to 189 Hz. This resonance frequency, which is considered to be non-critical, lies clearly above the network frequency of 50 Hz on the one hand, but below the base frequency of the harmonic oscillation-generating consumer and below the audio frequency multi-station control system of the electric supply company (EVUs) on the other.

The compatibility is, however, to be individually adjusted in conjunction with the local electric supply company (EVUs).

Filtering circuit reactors have special requirements to fulfil as a result of their utilisation, e.g.:

- low inductance tolerance
- linear inductance progression extending far beyond the rated current
- linear inductance progression with harmonic oscillations
- thermal design construction for continuous operation with network frequency and harmonic oscillations

Filtering circuit reactors are utilised almost exclusively in 3-phase models:



In cases of regulated reactive current compensation installations, each capacitor group is to be allocated to a filtering circuit reactor which is adjusted for this purpose.

the EU-Symbol (Communautés Européennes)

The CE marking

General Note

The technical explanations contained here represent points of departure for many areas of application, a number of rules apply in addition to special and exceptional cases. The intention here is to provide a brief introduction into the complex subject field.

EC Designation

EU guidelines have been issued by the Council of the European Union, based upon the Treaty for the Establishment of the European Economic Community (EEC), particularly under Article 100. These EU guidelines are for the purpose of establishing conformity among the legal and administrative regulations of the different member states of the European Union (EU) in cases where differences among national regulations lead to trade restrictions or otherwise hinder the functioning of the internal market of the EU. The guidelines are to be adopted by the national lawmakers within prescribed time periods for the respective national legal system.

The manufacturer is required to attach the EU designation to products which fall under the authority of certain EU regulations as a sign of conformity with them. The products affected are those which are covered by the guidelines made in accordance with the "New Concept" (issued 07.05.1985) which contain requirements governing the technical quality of different products.

EU guidelines are binding legal directives of the European Union. That means that the fulfillment of these requirements is a **precondition for the marketing of the products in Europe. This does not affect the rest of the world trade market.** The attachment of the EU designation confirms product conformity with the corresponding fundamental requirements of all (applicable) guidelines affecting the product. As the documentation of conformity with directives, the EU designation is solely intended for monitoring government agencies. It is, however, often misinterpreted as a "Quality Seal". Because of this, it is unfortunately often demanded in cases where there is no legal requirement for it.

For this reason, our company dispenses with any advertising display of the EU symbol in our catalogue and prospectus pages, since the placement of the EU designation on products is done solely to satisfy a legal requirement which all manufacturers and importers are obligated to adhere to.

Although the EU declaration of conformity on the part of the manufacturer is kept on file only for the purposes of the monitoring agencies (for at least 10 years following the last bringing of the product into circulation), respective copies of it can be made available to customers upon request.

The determination of which guideline(s) is (are) to be applied can be deduced from the EU Declaration of Conformity for the respective product. The directives and their changed directives most commonly applied to our company's range of products are:

1. The Low Voltage Directive (72/23/EEC) for electrical equipment to be used with a rated voltage of between 50 Vac and 1000 Vac and between 75 Vdc and 1500 Vdc.

Title: Directive of the Council for the Establishment of Conformity among Legal Directives of the Member States with respect to Electrical Equipment for Use between Certain Voltage Limits 73/23/EEC of 19. 02. 1973

Almost all of the products in our manufacturing program fall under the area of application of the Low Voltage Directive. The conformity of each piece of electrical equipment, every device, every system and every installation with the safety requirements of the directive is to be certified by

2. The EMC directive (89/336/EEC) for devices which could cause electromagnetic interference or whose operation could be impaired by this kind of interference.

Title: Directive of the Council for the Establishment of Conformity among Legal Directives of the Member States with respect to Electromagnetic Compatibility 89/336/EEC of 03. 05. 1989

Legal basis:
For the purpose of establishing conformity among the legal directives of the member states, the Council of the European Community issued a binding directive for its members on 03. 05. 1989, which was in turn put into effect on 09. 11. 1992 by the Federal Republic of Germany in the form of a federal law governing electromagnetic compatibility (EMVG). The Bureau of Directive for Telekommunikation und Post (RegTP) and its external offices were charged with responsibility for the implementation (monitoring) of the EMC law.

Definition, in accordance with the following extract from Article 1:
Electromagnetic compatibility is the ability of an apparatus, equipment or a system to operate satisfactorily in the electromagnetic environment without itself causing electromagnetic interference while doing so which would be unacceptable to any of the devices, installations or systems present in this environment.

Area of application, in accordance with the following extract from Article 2:
This directive applies to all devices which could cause electromagnetic interference or whose operation could be impaired by such interference.

Note: "Devices" (in accordance with Article 1) consist of all electrical and electronic apparatuses, installations and systems which contain electrical and/or electronic modules.

Fundamental procedural methods:
Starting 01. 01. 1992 (with transition grace period until 31. 12. 1995), only those electrical and electronic devices, systems and installations may be brought into circulation or put into operation in the European Union which are in conformance with the established EMC safety requirements contained in the directive. The conformity of every device, every system and every installation with the safety requirements of the directive is to be certified by the manufacturer by means of an EU Declaration of Conformity and to mark the product with the EU Sign of Conformity.

Modules which are not required to carry the designation of conformity:
For the purposes of the EMC directive, a module is defined as any element which is used for installation in a device but which possesses no function of its own and which is not intended for use by an ultimate consumer. In accordance with Article 1 of the EMC directive, modules are therefore not devices and from the onset do not fall under the jurisdiction of this directive.

Examples:

a) **Modules (for circuit boards, devices, control cabinets)**, which as built-in components are not required to bear the EU designation sign, such as resistors, capacitors, inductance, integrated switching circuits.

b)**Modules** which are required to bear the EU designation sign **(with housing and with protection against accidental contact)**, which are to be operated autonomously and/or are to ultimate consumers, such as plug-ready power supply units, battery charging sets, personal computers, testing and measuring apparatus, isolating transformers for construction sites or service, transformers for halogen lights.

Electromagnetic compatibility

Definition

According to the definition contained in the EMC Regulation 89/336/EEC, electromagnetic compatibility is the capability of a device to be able to work satisfactorily in the electromagnetic environment without itself causing electromagnetic interference while doing so which would be unacceptable to any of the devices, installations or systems present in this environment.

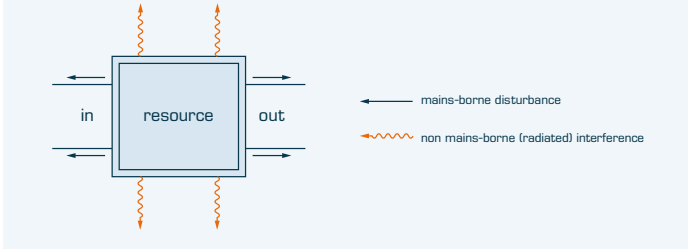
A distinction is made between
1. Electromagnetic interference (EMS)
2. Electromagnetic immunity (EMI)

Electromagnetic interference (EMS)

Electromagnetic interference (emitted interference) is every kind of electromagnetic event (e.g. noise, unwanted signal), which could impair the functioning of a device, an installation or a system.
The basic specification for emitted interference is

- EN 61000-6-3 (Residential, business, trade areas and small-scale enterprises)
- EN 61000-6-4 (Industrial area)

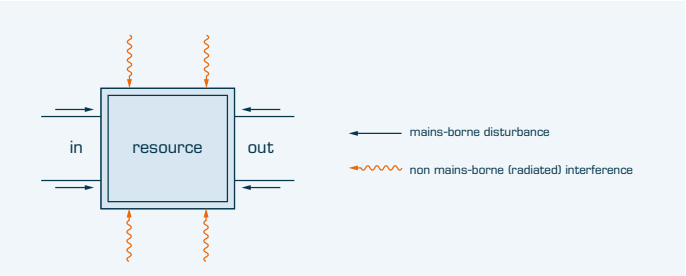
A large number of basic standards (IEC 61000, CISPR) and product standards are also to be taken into consideration as required.



Electromagnetic immunity (EMI)

Test standards are:

- EN 61000-4-2:1995 +A1:1998 +A2:2001
  Electrostatic discharge immunity test
- EN 61000-4-3:2006 +A1:2008
  Radiated, radio-frequency, electromagnetic field immunity test
- EN 61000-4-4:2004
  Electrical fast transient/burst immunity test
- EN 61000-4-5:2006
  Surge immunity test
- EN 61000-4-6:2007
  Immunity to conducted disturbances, induced by radio-frequency fields
- EN 61000-4-8:1993 + A1:2001
  Power frequency magnetic field immunity test
- EN 61000-4-11:2004
  Voltage dips, short interruptions and voltage variations immunity tests

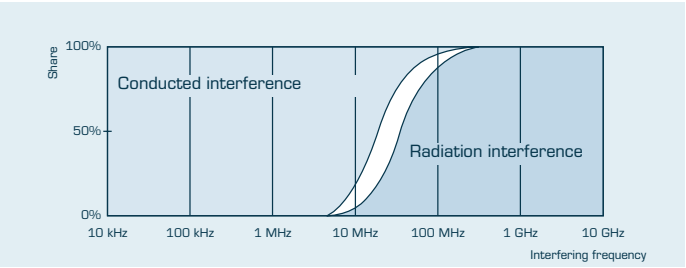


Shielding from interference

There are many opportunities for interference to be transmitted:

- by means of metallic contact as electrical current and voltage, carried by power mains
- as a magnetic field
- as an electrical field
- as an electromagnetic wave or radiation

Propagation of mains borne and radiated interference generally behaves as follows:

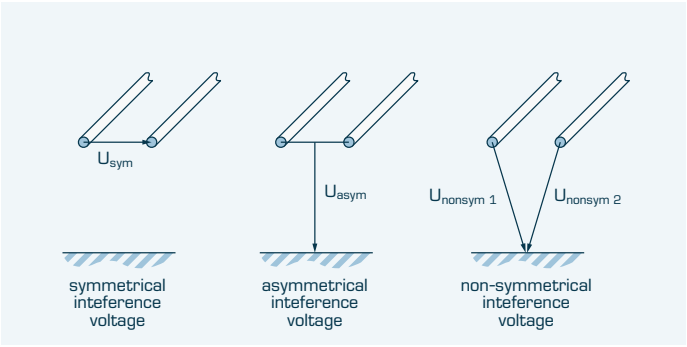


The attenuation of interference is achieved by construction which takes EMC into consideration, involving such things as low-impedance earthing, filters, shielded lines, metallic housing and spatial clearance. The EMC measures to be carried out, however, are highly dependent on the components utilised and on the operating parameters of the system, which means that it is almost impossible to make universally valid statements.

Mains borne interference

Interference voltage often occurs on electrical lines, between conductors and between conductors and the earth, in intensities which can range up to a frequency of circa 30 MHz. A distinction is made between symmetrical, asymmetrical and non-symmetrical interference voltage.

Reactors, capacitors and filters are particularly suitable for the attenuation of mains borne interference, as are – indirectly – shielded cables. As a rule, additional protection measures (radio links, varistors) are necessary against energy-rich interference, e.g. caused by lightning bolts.



EMC Standards

The fundamental principles for EMC standardisation are generally compiled by

- CISPR, founded in 1934 (International Special Committee on Radio Interference, Comité international Spécial des Perturbations Radioélectriques)

and

- IEC TC77, founded in 1974 (International Electrotechnical Commission Technical Committee 77, Comité d'études 77 de la Commission Electrotechnique Internationale)

in coordination with the IEC Regulation Guide 107 (EMC-Guide to the drafting of electromagnetic compatibility publications).

The purpose of Guide 107 is to ensure that identical procedures and points of view are applied during the course of EMC standardisation and to keep everything as conclusive as possible. Observations are carried out on line-borne and radiated phenomena occurring in the frequency range between 0 Hz and 400 GHz, in which electromagnetic compatibility is to be achievable.

Generally speaking, four categories of EMC standards are defined, whereby each EMC standard is, as a whole, assigned to only one of the four categories.

1. Basic publications (Basic Standards) e.g.

- IEC 61000-2, -3, -4, -5 etc.
- CISPR 11, 13, 14, 15, 16, 22

The Basic Standards can have the status of a standard or even that of a technical report. They contain the respective measuring procedures, classification of environmental conditions and testing techniques for EMC, but no measurement limiting values for individual products or product families. Constant reference is made to the Basic Standards in the basic specifications, product family standards and product standards. It should be clear from the title alone that it is a Basic Standard (Basic Norm) which is being dealt with.

2. Basic specifications (Generic Standards)

- Residential and small-scale business enterprises field:
  EN 61000-6-3 (Emitted Interference), EN 61000-6-1 (Interference Immunity)
- Industrial field:
  EN 61000-6-4 (Emitted Interference), EN 61000-6-2 (Interference Immunity)

The basic specifications are to be applied to products for which neither product family standards nor product standards exist. There is always a distinction made between the environmental conditions of industry (supplied by industrial networks) and those of residential, business and trade areas and small-scale enterprises (supplied by public electricity networks). While limited number of EMC tests specify minimum interference limit values and maximum interference emission limit values, they do not address certain product characteristics.

3. Product Family Standards, e.g.

- EN 55011 (Emitted Interference), Industrial, Scientific, Medicinal (ISM) Devices
- EN 55013 (Emitted Interference), EN 55020 (Interference Immunity), Audio, TV, Radio devices
- EN 55014 (Emitted Interference), EN 55104 (Interference Immunity), Household Appliances

The product family standards are tailored to specific product families and contain particular specifications (e.g. limit values, test design, operational criteria and criteria for complaints). Concerning measuring procedures, Basic Standards are referred to and limit values are coordinated with the basic specifications. Product family standards for EMC can exist as independent standards, but also as (autonomous) parts of standards which govern the other aspects (e.g. electrical safety) for the product family.

4. Product standards (Dedicated Product Standards), e.g.

- EN 61800-3, Frequency Converters
- EN 50199, Electric Arc Welding Devices

The product family standards are intended for special products, they enjoy the highest application priority and are therefore the only ones to be applied for ensuring the EMC of the product. In terms of the inclusion of Basic Standards and basic specifications, the rules which apply to the product family standards are the same as those for the product standards.

Classifications

Protection class

The protection class 0, I, II or III (Ref.: VDE 0140/EN 61140/IEC 61140) is a **construction feature** for the classification of electrical equipment for the purpose of security against dangerous fault or leakage currents (electrical shock), e.g.:

- Protection class 0:
  Device with basic insulation as a precaution for basic protection, but without provision for fault protection
- Protection class I:
  Device with protective conductor connection and (at least) basic insulation
- Protection class II:
  Device without protective conductor connection and double or enhanced insulation
- Protection class III:
  Device supplied with SELV (Safety Extra-Low Voltage) and in which no voltages higher than the SELV are generated.

Electrical equipment intended for installation in devices have no safety class and can only be "prepared for" one of these. Electrical equipment which has been prepared for utilisation in protection class II devices can also be utilised in protection class I devices.

Type of protection

Specification of the type of protection (Ref.: DIN VDE 0470, EN 60 529, IEC 60529) describes the protection of electrical equipment by means of housing, covers, enclosures and similar.

The type of protection is specified by letter symbols (IP Code), whereby the first code number (0 to 6) offers information concerning protection against contact and against the penetration of foreign objects. The second code number (0 to 8) provides information about protection against the water penetration.

Common types of protection in use:

- IP 00
  No special protection against accidental contact or against the penetration of foreign objects. No special protection against water. **Constructions of the "open design type" are manufactured for the IP 00 type of protection.**
- IP 20
  Protection against contact and against the penetration of solid foreign objects larger than ø 12 mm. No special protection against water.
- IP 23
  Protection against contact and against the penetration of solid foreign objects larger than ø 12 mm. Protection against water spray falling at any angle of up to 60° to the vertical, so that such jets will have no damaging effects.
- IP 40
  Protection against contact and against the penetration of solid foreign objects larger than ø 1 mm. No special protection against water.
- IP 44
  Protection against contact and against the penetration of solid foreign objects larger than ø 1 mm. Protection against water spray so that no spray hitting the equipment from any direction will have any damaging effect.
- IP 54
  Complete protection against contact. Protection against damaging dust deposits. While dust penetration is not completely prevented, the dust which does enter may not amount to quantities which will impair working procedures. Protection against water spray, so that no spray hitting the equipment from any direction will have any damaging effect.
- IP 65
  Complete protection against contact. Protection against dust penetration. Protection against water spray. Protection against water jets from spray nozzles directed at the equipment from all directions to the extent that no spray will have any damaging effect.
- IP 67
  Complete protection against contact. Protection against the dust penetration. Protection against the effects of temporary immersion in water. Water shall not be permitted to penetrate in a quantity which will would cause damaging effects when the housing is temporarily immersed in water under standardised pressure and time conditions.
- IP 68
  Complete protection against contact. Protection against the dust penetration. Protection against the effects of immersion in water for an indefinite time. Water shall not be permitted to penetrate in a quantity which will would cause damaging effects when the housing is immersed in water under standardised pressure conditions.

Note: The specification of the type of protection refers to the condition at the time of delivery and to the established or usual method of setting up the equipment. The type of protection can change as the result of a different setup or installation method.

Insulation material class

The regulations (Ref.: VDE 0301/ HD 566S1/IEC 60085) in addition to (Ref.: VDE 0304/HD 611.1S1/IEC 60216) describe among other things the thermal resistance of electrical insulation materials. The different insulation material classes are assigned temperatures in reference to their periods of thermal resistance.

Common Insulation material classes:
A (105 °C), E (120 °C), B (130 °C), F (155 °C), H (180 °C)

Unless other arrangements have been made, transformers and power reactors are designed in accordance with the specifications of the insulation material classes E or B.

Insulation system (EIS)

An electrical insulation system (EIS) is an insulating arrangement made up of one or more insulation materials (electrical insulation materials) which is installed together with the associated conduction parts in one piece of electrical equipment (Ref: VDE 0302 Teil 1/ EN 60505/ IEC 60505 sowie VDE 0302 Teil 11/ EN 61857-1/ IEC 61857-1). A judgement is made under thermal stresses of whether or not the combination of insulation materials is suitable for operation in the respective insulation material class.

Ambient air temperature for measurement

The ambient air temperature for measurement is the highest ambient air temperature at which a piece of electrical equipment or an electrical device or an installation component (e.g. transformer, reactor, filter) can be operated continuously under normal operating conditions. It is the air temperature of the immediate surroundings. Electrical values often refer to the ambient air temperature for measurement and they can change with different temperatures! Special attention is to be paid to the installation of components in housings with a higher type of protection. Possible deficient cooling can lead to non-authorised high temperatures in the housing. A reduction of the expected service life of the component is possible in this case (see “Insulation material class”).

The ambient air temperature for measurement is specified using a shortened notation form (Ref.: VDE* 0570, EN 61558, IEC 61558).

Example:
ta=25 °C or ta=40 °C

Unless other arrangements have been made, the rated ambient temperature used for the design of components intended for installation is set at 40 °C and at 25 °C for (table) devices which are to be operated independently.

*Association of german electrical engineersBemessungsumgebungstemperatur ausgelegt.

Test class

The test class indicates climate category (Ref.: DIN EN 60068/EN 60068/ IEC 60068) as the key to the designation of the climatic usability of component parts.

Example:

25/085/21
25 = –25 °C, Test A: coldness, 085 = + 85 °C, Test B: dry heat,
21 = 21 days, Test Ca: moist heat constant

The individual tests are defined in different parts of the standard.

Characters and symbols

VDE 0570 Part 2–6/EN 61558-2-6/IEC 61558-2-6
Safety transformer, short circuit-proof,
double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 50 V AC voltage (effective value) and/or 120 V smoothed DC voltage, frequency max. 500 Hz

VDE 0570 Part 2–6/EN 61558-2-6/IEC 61558-2-6
Safety transformer, not short circuit-proof,
double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 50 V AC voltage (effective value) and/or 120 V smoothed DC voltage, frequency max. 500 Hz

VDE 0570 Part 2–4/EN 61558-2-4/IEC 61558-2-4
Isolating transformer, short circuit-proof,
double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 500 V AC voltage or 708 V smoothed DC voltage, frequency max. 500 Hz.

VDE 0570 Part 2–4/EN 61558-2-4/IEC 61558-2-4
Isolating transformer, not short circuit-proof,
double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 500 V AC voltage or 708 V smoothed DC voltage, frequency max. 500 Hz.

VDE 0570 Part 2–15/EN 61558-2-15/IEC 61558-2-15
Isolating transformer for supplying medical areas, not short circuit-proof, double or increased insulation between PRI and SEC; windings installed one above the other; windings-core; windings-shield; shield-core; PRI max. 1000 V, SEC max. 250 V, frequency max. 500 Hz

VDE 0570 Part 2–12/EN 61558-2-12/IEC 61558-2-12
Magnetic voltage stabiliser acting as isolating transformer, short circuit-proof, double or increased insulation between PRI and SEC, PRI max. 1000 V, SEC max. 500 V, frequency max. 500 Hz (30 kHz internally)

VDE 0570 Part 2–2/EN 61558-2-2/IEC 61558-2-2
Control transformer, not short circuit-proof, basic insulation between PRI and SEC, PRI max. 1000 V, SEC max. 1000 V AC voltage or 1415 V smoothed DC voltage, frequency max. 500 Hz

VDE 0570 Part 2–1/EN 61558-2-1/IEC 61558-2-1
Mains transformer, not short circuit-proof, basic insulation between PRI and SEC, PRI max. 1000 V, SEC max. 1000 V AC voltage or 1415 V smoothed DC voltage, frequency max. 500 Hz

VDE 0570 Part 2–13/EN 61558-2-13/IEC 61558-2-13
Autotransformer, not short circuit-proof, no insulation between PRI and SEC, PRI max. 1100 V, SEC max. 1000 V AC voltage or 1415 V smoothed DC voltage, frequency max. 500 Hz

VDE 0570 Part 2–20/EN 61558-2-20/IEC 61558-2-20
Small reactor, not overload-free, max. 1000 V, frequency max. 1 MHz

Specification for the fuse assigned in the case of transformers that are not short circuit-proof; here, 6.3 A time-lag

Thermal overcurrent release; here, 20 A miniature circuit breaker

Temperature fuse

Temperature fuse

Self-resetting thermal relay
, e.g. thermal time delay switch

Non-self-resetting thermal relay Reset by switching off the mains connection, e.g. thermal time delay switch with locking function, PTC

Non-self-resetting thermal relay Manual reset (e.g. thermal overcurrent release, miniature circuit breaker)

PTC thermistor

NTC thermistor

ta 40 °C
ta 40

Rated ambient temperature; here, 40°C

CL.B
CL.130
class 130

Class of insulation; here, B

Safety class II, total insulation

Protective conductor, earth

Connection for mount or core

Suitable for use with fitments whose flammability properties are not known, e.g. wood, furniture, intermediate ceilings. Sign in acc. with VDE 0710 Part 14.

Sign for domestic use, only for dry rooms, general

Voltage warning, general

Heat source warning: hot surface, general

AC current, also spelled A. C. or ac (alternating current)

DC current, also spelled D. C. or dc (direct current)

cetification marks

CE mark, legal mark of conformity in Europe (stands for Conformité Européenne)

ENEC mark of conformity, Europe; in Germany: certification by VDE (10), European Norms Electrical Certification

VDE mark of conformity, Germany, VDE Testing and Certification Institute

UL mark of conformity (recognized component), USA and Canada; in Germany: certification by UL, Underwriters Laboratories Inc.

UL mark of conformity (recognized component), USA and Canada; in Germany: certification by UL, Underwriters Laboratories Inc., only relates to the integrated transformerr.

UL mark of conformity (recognized component), USA, Underwriters Laboratories Inc.

UL mark of conformity, (Listed) USA, Underwriters Laboratories Inc

CSA mark of conformity, Canada, Canadian Standards Association

GL mark of conformity, certification by Germanischer Lloyd

AS-Interface mark of conformity, certification by AS-International Association

Special signs by BLOCK

XtraDenseFill: XtraDenseFill from BLOCK, a casting technique that ensures cavity-free filling of the transformer's entire internal structure thanks to high vacuum and pressure phases. It significantly reduces creepage distances and clearances and enables the electrical equipment to enjoy long-term protection against the effects of its environment. A more compact design can also be used.

BLOCK ImpEx: Ensures the winding material is covered evenly, thus providing extensive protection against external influences. The resin developed specifically for BLOCKImpEx, together with our in-house-developed impregnation process, seals as many cavities as possible and creates a temperature reserve to ensure efficiency during long periods of operation.

The BLOCK logo: a sign of quality

The old BLOCK logo: our original logo

Appendix

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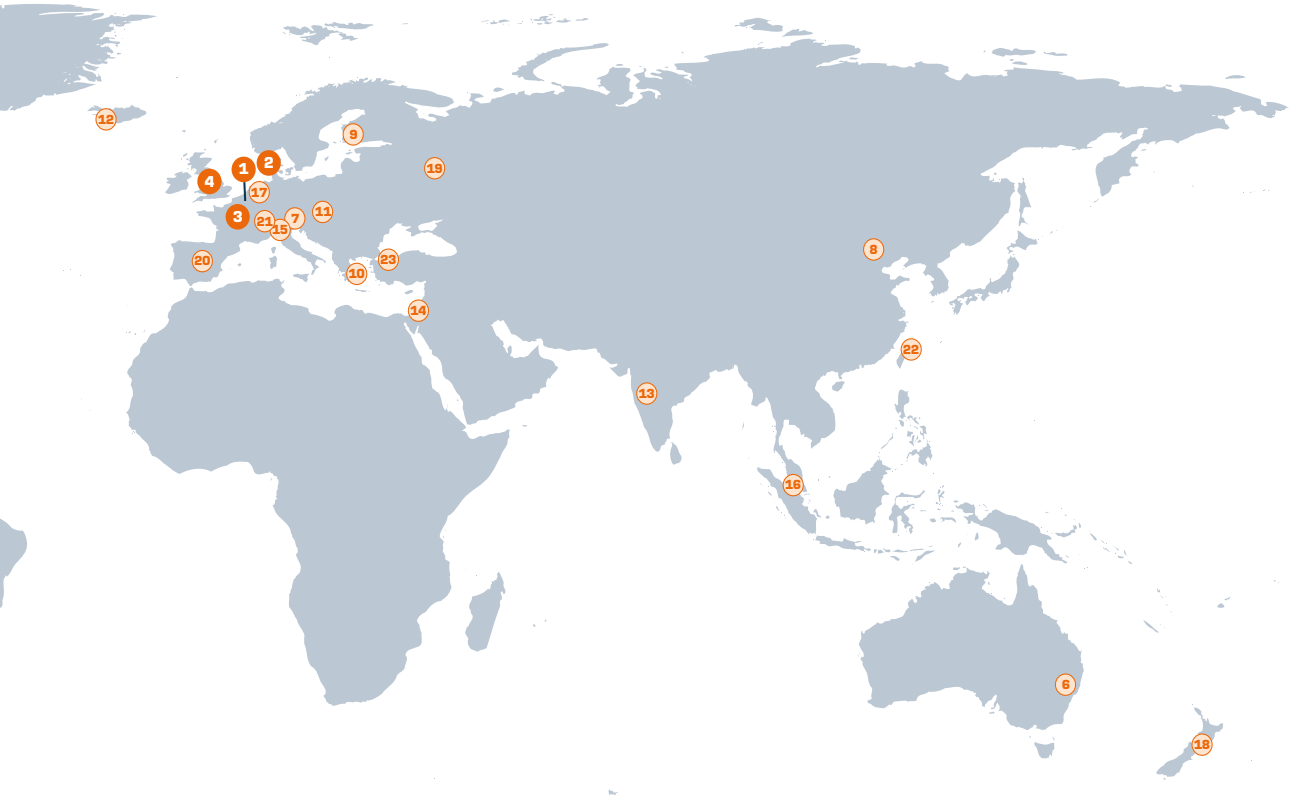

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Contract distributors

Farnell / element14
www.farnell.com

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www.muetron.de

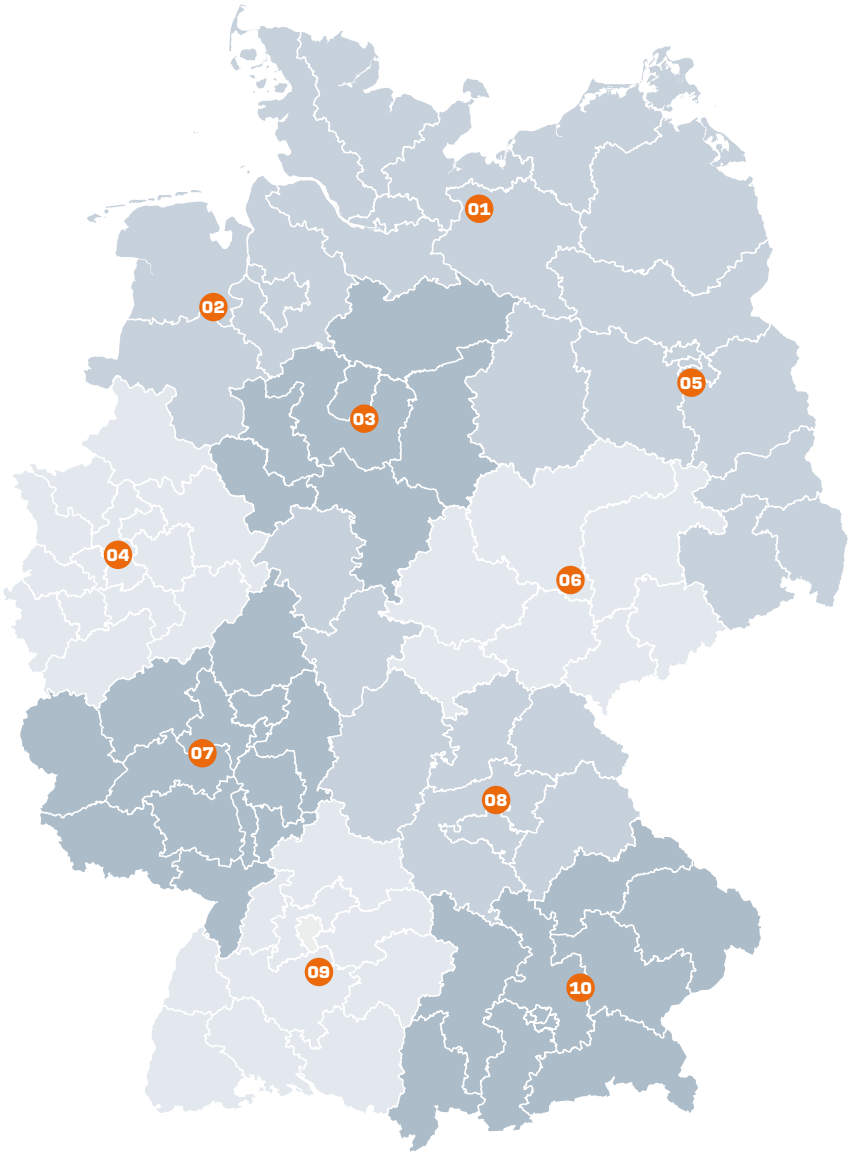
Conrad Electronic SE
www.conrad.de

Avnet Abacus
www.abacus.co.uk

Hagemeyer Deutschland GmbH & Co. KG
www.hagemeyerce.com

HANSETRONIK Elektronikbauteile Vertriebs GmbH
www.hansetronik.de

Reichelt Elektronik
www.reichelt.de



09
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RS Components Ltd.
www.rs-components.com

EVE GmbH
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ELFA AB
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E.T.N. Groupe
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Distrelec Schuricht GmbH
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DEG Deutsche Elektro-Gruppe GmbH
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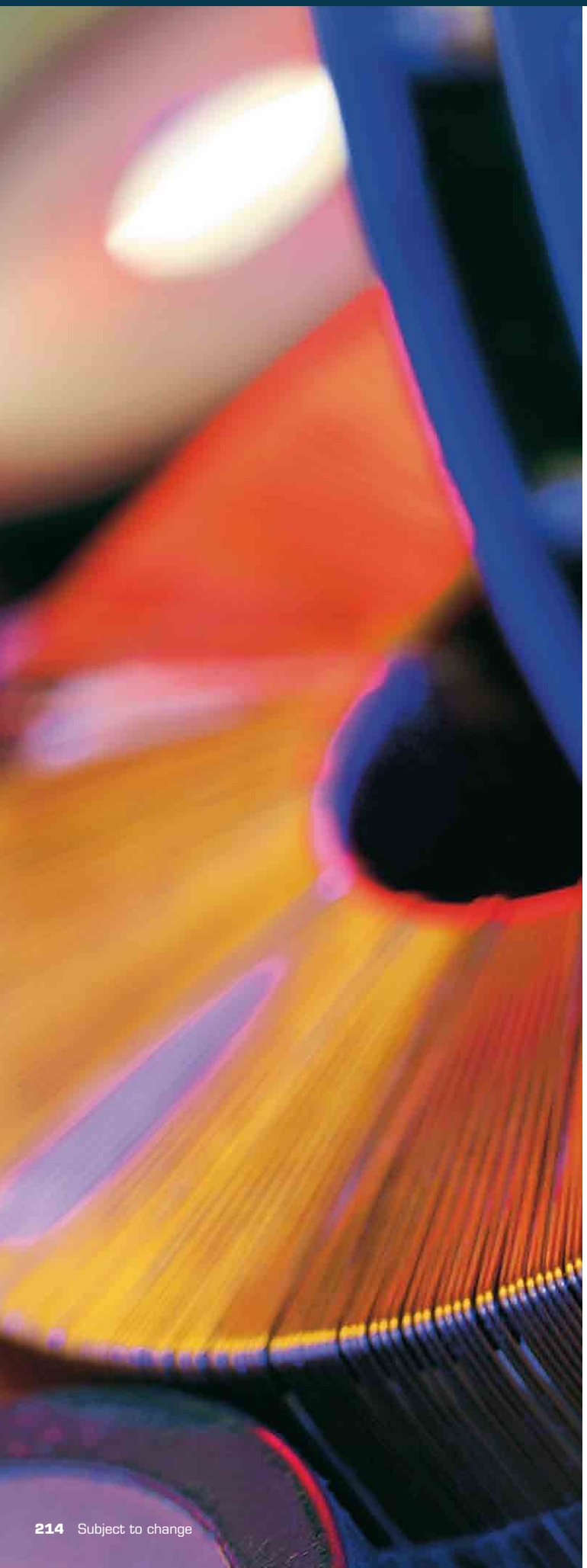

Alphabetical list of types

Catalogue 1
TRANSFORMERS

Catalogue 2
DC POWER SUPPLIES

Catalogue 3
EMC FILTERS/REACTORS

Terms of sale and delivery

§ 1 - General

1. Our terms of sale shall apply exclusively. We shall not recognise any terms of the customer which conflict with or diverge from these. For copper costing €150.00 per 100 kg and up, a copper surcharge shall be levied in accordance with the specified copper weight and the DEL (German electrolytic copper) quotation rate applicable on the date when the order is confirmed.
2. All the arrangements made between us and the customer are stipulated in writing in these terms of delivery.
3. Our terms of delivery shall only apply to companies within the meaning of Section 14 of the German Civil Code (BGB).

§ 2 - Conclusion of contract

1. We are entitled to accept the order within two weeks. This acceptance may be granted in writing or by delivering the goods to the customer. The order confirmation created by us shall exclusively determine the scope of delivery. Subsequent additions or alterations to the order must be expressly confirmed by us in writing in order to become effective.
2. If the goods are ordered electronically, then we shall immediately send the customer confirmation that the order has been received. This confirmation in itself does not constitute any binding acceptance of the order.
3. We reserve all existing copyright to documents, calculations, etc. sent by us. These documents and materials shall also remain our property unless otherwise agreed. These documents and materials may only be passed on to third parties with our written consent.
4. Our quotations are without obligation. We reserve the right to make minor alterations to the construction, design or performance of our equipment compared with what we have specified in our catalogues and brochures or on our website, as well as alterations due to technical progress.
5. Partial deliveries are permissible provided the customer may reasonably be expected to accept them. Each partial delivery shall in all cases be regarded as a separate transaction.

§ 3 - Delivery period

1. Our delivery period shall commence when the order confirmation is sent to the customer. However, commencement of the delivery period we specify assumes in all cases that any technical issues and design specifications have been resolved and clarified.
2. Delivery periods are always specified subject to cooperation by the customer with the terms of the contract. Compliance with our delivery obligations assumes that the customer has fulfilled their obligations in a timely and correct manner (e.g. provision of all required documents, permits, approvals, etc.).
3. The delivery period shall be deemed to have been adhered to if the goods have been dispatched in the period leading up to its deadline or if the customer has been notified in writing that they are ready for dispatch. Where any failure to adhere to the agreed delivery period is due to force majeure (e.g. war, natural disasters, etc.) or events such as strikes, etc., then the delivery period shall be extended accordingly.
4. If the customer defaults on accepting delivery, we shall be entitled to demand compensation for any damage we incur as a result. We reserve the right to assert claims beyond this. If compensation is demanded in lieu of performance pursuant to Section 281 of the German Civil Code, then we shall be entitled to demand 20% of the sale price by way of compensation, irrespective of the possibility of claiming higher compensation. The customer reserves the right to provide evidence that a substantially lower level of damage, or no damage at all, has been incurred.

§ 4 - Prices and terms of payment

1. Price lists and prices quoted in catalogues and on websites are without obligation. All fixed-price agreements must be made in writing.
2. The minimum order value is €40 or €150 for custom-made products.
3. Our prices are ex works or ex warehouse (EXW Verden/Aller – INCOTERMS 2000) and do not include packaging, freight, assembly, commissioning or any other additional costs (e.g. customs duties); these shall be charged separately.
4. Our prices do not include statutory value added tax; this is itemised separately in the invoice at the applicable statutory rate.
5. The purchase price must be paid within 30 days net of the invoicing date without a discount or within 10 days net of the invoicing date with a 2% discount, with no transaction charges in either case. Once the relevant deadline has passed, the customer shall be deemed to have defaulted on payment. The statutory regulations concerning the consequences of payment default shall apply. The same applies to part deliveries invoiced separately.

§ 5 - Right of return/withdrawal for consumer contracts

1. We shall grant the statutory right of return or withdrawal only in the case of legal transactions made with a natural person as defined in the legal system of the Federal Republic of Germany. Such customers shall no longer be bound by their order if they withdraw from the contract within 2 weeks by issuing a written declaration (e.g. letter, fax, e-mail), or by returning the goods (no reasons need be given). This period shall begin, at the earliest, when the customer receives this information. Dispatching the goods or sending the declaration of withdrawal within this time limit shall suffice in order for the deadline to be met. The declaration of withdrawal must be sent to or goods returned to BLOCK Transformatoren Elektronik GmbH, Max-Planck-Straße 36–46, 27283 Verden, Germany. If withdrawal from the contract is effected, the goods and services received by both parties must be returned and, where applicable, any profits gained (e.g. interest) must be surrendered. If the items received are not returned at all or are only returned in a deteriorated condition, then compensation for lost value must be paid. This does not apply if the deteriorated condition can be traced back exclusively to inspecting or trying out the items (such as would be possible in a shop). You can also avoid any obligation to pay compensation for lost value by not using the items as if they were your own property and refraining from any actions that may cause them to decrease in value. Items shall be returned at our expense unless the price of the items to be returned is 40 euros or less or if, in the case of higher-priced items, the consumer has not yet rendered counter-performance or made a part payment by the date of withdrawal from the contract. Items that cannot be sent in a parcel shall be picked up from your premises.

§ 6 - Transfer of risk

1. Unless otherwise specified in the order confirmation, it is agreed that delivery shall be made ex works (EXW Verden/Aller – INCOTERMS 2000). If we have agreed with the customer that the item to be delivered is to be dispatched, then we shall be entitled to choose the type of dispatch.
2. Risk of accidental loss of or damage to the items is transferred to the customer at the point when the items are handed over to or, in the case of a sale by delivery to a place other than the place of performance, when the items are surrendered to the carrier or other person responsible for delivery.

§ 7 - Liability for defects

1. The assertion of claims for defects assumes that the customer has fulfilled their obligations to inspect the goods and lodge complaints in accordance with Section 377 of the German Commercial Code (HGB). In particular, the function of devices must be checked before being put into operation and measuring instruments must be checked and, if necessary, adjusted to ensure they are displaying the correct readings. The specifications in the relevant operating instructions must be observed in this respect.
2. The customer may not derive any additional rights from material defects which do not affect or only negligibly affect the goods' value or suitability for the purpose recognised by us.
3. If the purchased goods are defective, we shall either make subsequent improvements or deliver additional goods, at our discretion. If we choose to make improvements, we shall be obligated to bear all costs required for this, in particular transport, labour and material costs. This shall not apply if the goods ordered have been taken to a location other than the place of performance and the costs increase as a result of this.
4. If we fail in our duty to render supplementary performance, the customer may demand withdrawal from the sales contract or a reduction in the price.
5. If the customer receives an incorrect or incomplete set of assembly instructions, we are only obligated to supply a set that is correct and complete. This applies even if the inaccuracies in or incompleteness of the assembly instructions render correct assembly impossible.
6. Unless otherwise stipulated above, liability is excluded.
7. The period during which claims for defects may be asserted is twelve months from the point of transfer of risk.
8. Assignment of warranty claims is only permissible with our prior written consent.

§ 8 - Damages

1. We shall only be liable for damages in accordance with statutory regulations in cases of personal injury, if the damage is covered by the scope of the German Product Liability Act (ProdHaftG), or if the damage is due to wilful intent or gross negligence.
2. In addition, if the damage is due to culpable breach of an essential contractual duty or a cardinal obligation, we shall only be liable for the damage that is typical for the type of contract concerned.
3. Any additional contractual claims or claims in tort on the part of the customer are excluded. Therefore, we shall in particular not be liable for any damage not occurring on the actual item delivered, or for loss of profits or other financial losses sustained by the customer.

§ 9 - Limitation

1. Accordingly, the right to withdrawal from the contract or a price reduction is excluded according to the legal regulations.

§ 10 - Retention of title

1. We shall reserve the title to the goods delivered until all our claims against the customer based on the business relationship have been paid, including any future claims which may arise from contracts concluded at the same time or a later date.
2. The customer is obligated to handle the goods delivered with care at all times and to insure them against fire, water and theft damage at their own expense.
3. If the customer acts in breach of contract, and in particular if they default on payment, we shall be entitled to withdraw from the contract and reclaim any goods. For the purpose of reclaiming the goods, the customer hereby irrevocably permits us to access their business and storage premises unimpeded and to remove the goods. Once we have taken back the purchased goods, we shall also be entitled to realise them. Any revenue obtained from this shall be offset against the accounts payable of the customer.
4. The customer is required to inform us immediately in writing of any seizure of the delivered goods. The customer is prohibited from entering into any agreements with their own customers that may negatively affect our rights.
5. The customer is entitled to re-sell or process the purchased goods in the normal course of business. Any processing shall be performed on our behalf. If the goods subject to retention of title are processed, combined or merged with other goods, we shall in all cases acquire a co-ownership share of the new item; in the case of processing, this shall be equivalent to the value (= gross invoice value including additional costs and taxes) of the goods subject to retention of title in proportion to the value of the new item; and in the case of combination or merging, it shall be equivalent to the value of the goods subject to retention of title in proportion to the value of the other goods.
6. The customer hereby assigns to us all claims to which they are entitled from the resale,up to the value of the invoice amount (incl. VAT). Even after assignment, the customer shall remain authorised to collect on these claims. Our powers to collect on these claims ourselves shall remain unaffected by this, but we shall not exercise this right as long as the customer fulfils their payment obligations and any other obligations, and as long as no petition to open insolvency proceedings against the customer's assets has been filed. If requested to do so, the customer must inform us of the assigned claims and debtors concerned, provide all the information required to collect on these claims, hand over the relevant documentation, and notify the debtors of the assignment.
7. The customer shall assign to us all claims against a third party that arise if the purchased goods are attached to a piece of real estate.
8. To the extent that and for as long as the retention of title exists, the customer may neither pledge goods or items manufactured from these goods nor assign them by way of security. The conclusion of financial contracts (e.g. leasing) which include the assignment of our rights to retention of title must be approved by us in writing beforehand, unless the contract obligates the financing institution to immediately pay out to us the share of the purchase price to which we are entitled.
9. At the request of the customer, we undertake to release at our own discretion securities to which we are entitled, provided that the realisable value of the securities exceeds the claims to be secured by more than 20% or their par value by more than 50%.

§ 11 - Delivering equipment for trial use

1. If equipment is delivered for trial use, the customer must, unless otherwise agreed, pay the freight costs as well as the costs for packaging, insurance and any depreciation which may have occurred. Additionally, the customer assumes liability for any loss of or damage to the goods delivered throughout the entire trial period. If returned, the goods must always be returned in a perfectly clean condition and with transport insurance at the customer's expense.

§ 12 - Miscellaneous

1. Liability for a breach of duties under the German Equipment and Product Safety Act is limited to products which were placed on the market after 01/05/2004.

§ 13 - Place of jurisdiction – Place of performance

1. The place of jurisdiction shall be our place of business. The same applies if the customer does not have a general place of jurisdiction in Germany or the location in which they are domiciled or normally resident is not known at the time when action is brought. However, we shall also be entitled to bring action against the customer at the court with jurisdiction at the location of their place of business or residence.
2. The laws of the Federal Republic of Germany shall apply; the United Nations Convention on Contracts for the International Sale of Goods is excluded. This shall apply even if the customer is from another country or is based in another country.
3. Unless otherwise stated in the order confirmation, the place of performance shall be our place of business.
4. If any provision of the contract with the customer, including these general terms of business, is or becomes invalid in whole or in part, then this shall not affect the validity of the remaining provisions. The provision which is entirely or partly invalid shall be substituted by one which most closely approximates the invalid provision in terms of its intended commercial outcome.

(Status: June 2010)

The most recent version of the general terms of delivery for products and services for the electrical industry also applies, as does the supplementary clause concerning extended retention of title as well as the software clause concerning the licensing of standard software as part of deliveries.n.

perfecting power

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