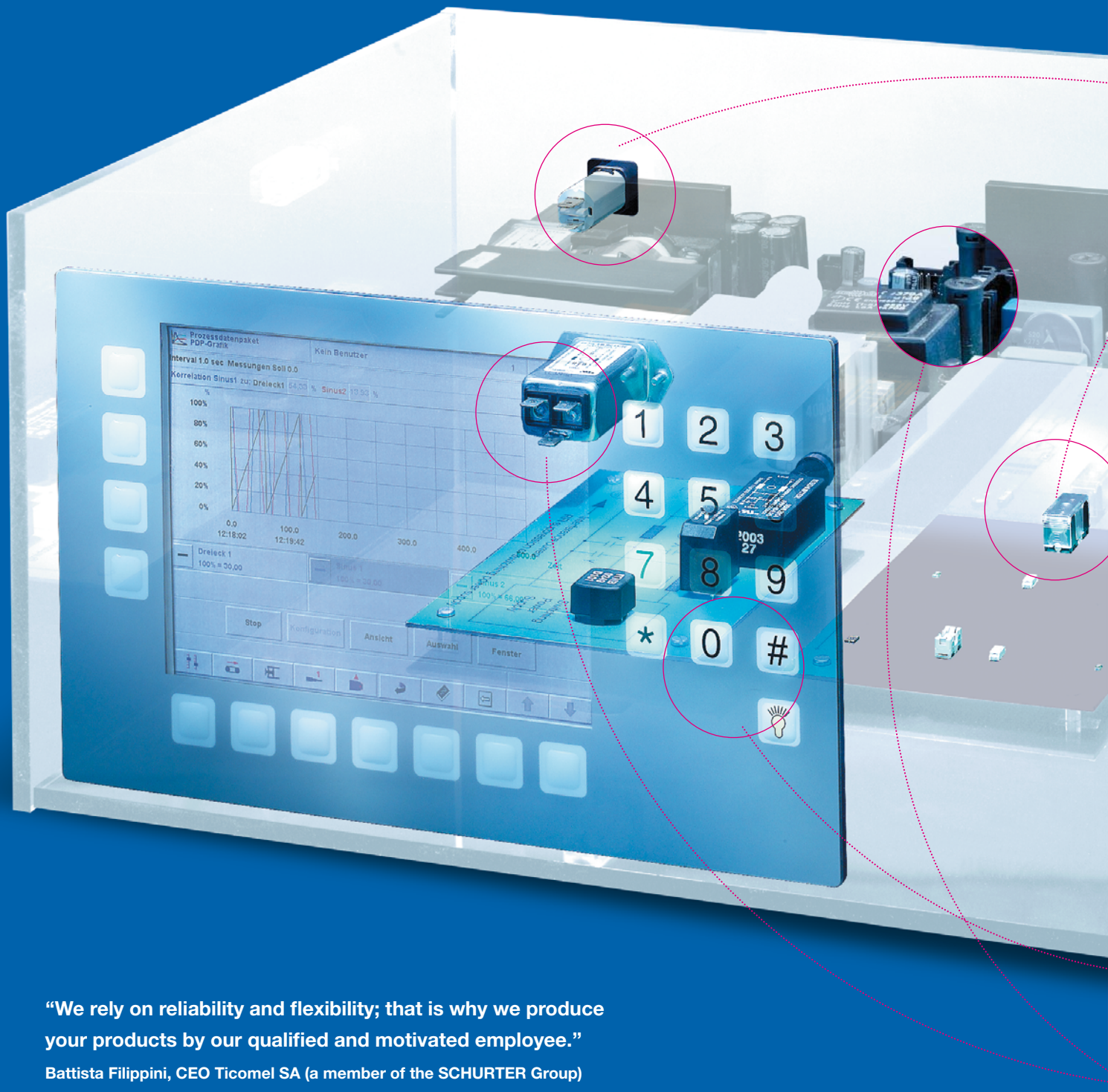
Product Group Catalog
EMC Prpducts

www.schurter.com/emc

SCHURTER
ELECTRONIC COMPONENTS

3-Phase Line Filter

summary

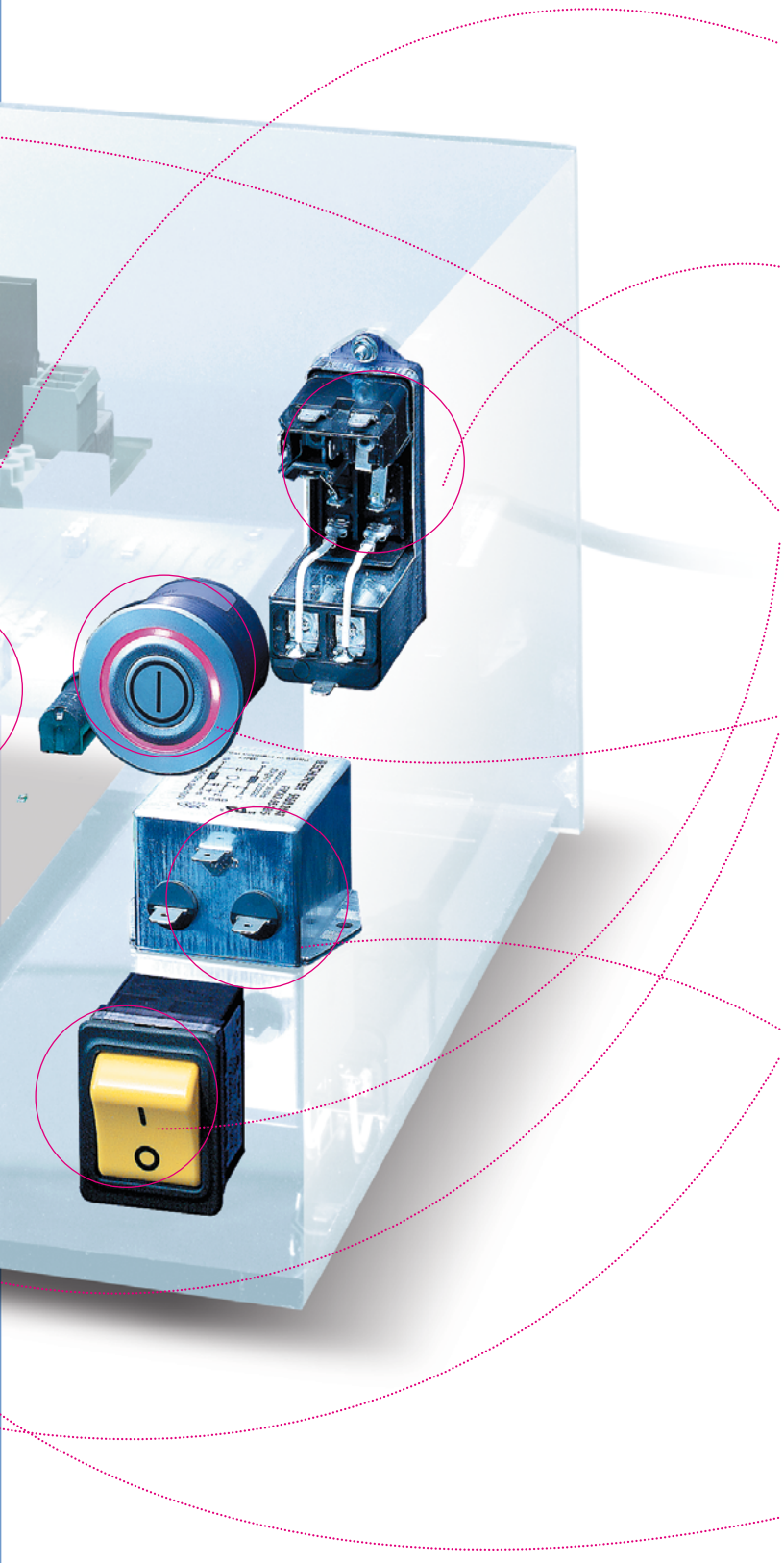


“We rely on reliability and flexibility; that is why we produce your products by our qualified and motivated employee.”

Battista Filippini, CEO Ticomel SA (a member of the SCHURTER Group)

> the Schurter Range at the Glance

SCHURTER is a progressive innovator and manufacturer of fuses, connectors, circuit breakers, input systems, EMC products and manufacturing services for the electronics industry. We focus on components that ensure safe supply of power and make the interface between human and machine easier.



fuses
non resettable fuses
telecom fuses
resettable fuses
fuseholders
fuseholders blocks & clips

connectors
power entry modules without line filter
power entry modules with line filter
appliance couplers
cord connectors (rewireable)
distribution units
cord sets

circuit breakers
thermal (t- and ta-line)
thermal-magnetic (tm- and as-line)
undervoltage protection
power entry modules with CBE

input systems
printmount switches
frontpanel switches
public transport switch
metal line switches
sensor switches
membrane keypads
sensor keypad
metal line keypads
touch panel / touch screen
housing systems and front panels

EMC products
power entry modules with line filter
1-phase line filters
3-phase line filters
chokes
pulse transformers
power stage driver modules

other products
voltage selector
test jacks & probes
indicators
data & signal, audio, dc/ din connectors

EMS
Electronic Manufacturing Services

	Description Approvals	Rated Current	Attenuation Filter Stage	Application	Web Reference or Type
 new	Ultra compact and efficient 1-stage filter in ECO design for 3-phase systems	16 - 150A / -	- Standard	-	**FMAC ECO 10**
	1- stage filter for 3-phase systems	6 - 1100A / -	- High	General purpose	**FMAC 16**
 new	Ultra compact and efficient 2-stage filter in ECO design for 3-phase systems	10 - 115A / -	- Standard	-	**FMBC ECO 22**
	Compact 2-stage bookform filter	10 - 115A / -	- Very High	For high requirements	**FMBC BOOK STYLE 26**
	2-stage filter for 3-phase systems	8 - 64A / -	- Very High	For high requirements	**FMBC 31**

	Description Approvals	Rated Current	Attenuation Filter Stage	Application	Web Reference or Type
	1-stage filter for 3-phase systems with neutral conductor	6 - 250A / -	- High	High attenuation at high loads	**FMAD** **35**
	Compact 1-stage filter for 3-phase systems with neutral conductor	3 - 20A / -	- Standard	General purpose	**FMW4-65** **39**
	Compact 2-stage filter for 3-phase systems with neutral conductor	4 - 6A / -	- Standard	-	**FMW4-81(95)** **41**

This overview only shows a selection of the current product range of SCHURTER.
You will find additional information about the respective products on our website: www.schurter.com/pg80
For customer specific solutions, please contact us. www.schurter.com/contact
General Product Information see Industrial Mains Filters page 50

Description Approvals	Rated Current	Attenuation Filter Stage	Application	Web Reference or Type
Output filter for 3-phase frequency inverter	8 - 32 A / -	Standard	-	**FMAC-Out 44**

This overview only shows a selection of the current product range of SCHURTER.
You will find additional information about the respective products on our website: www.schurter.com/pg80
For customer specific solutions, please contact us. www.schurter.com/contact
General Product Information see Industrial Mains Filters page 50

For a noise free and reliable DC power distribution

The filter series FMEB and FMEC have been specially developed for DC applications offering optimal EMC noise suppression for that range of power distribution.

The new DC-filter series FMEB and FMEC are designed for current rage up to 30 A. The single pole version FMEB is suitable for a maximum operating voltage of +80 VDC, the dual pole version FMEC +/- 80 VDC. There are numerous applications that need a noise free DC supply, which, however environmental conditions not always permit. Areas of application include IT- and telecom sector, electical and control cabinets as well as automation.

General Product Information about EMC Products

- Product Standards
- National Approvals
- Electric Protection
- Fuseholders and IEC Inlets
- Technical Data for Line Switches
- Industrial Line Filters
- Pulse Transformers
- Driver Modules

Please find details: www.schurter.com/info_emc

Ultra compact and efficient 1-stage filter in ECO design for 3-phase systems

new

Description
- High attenuation value
- Cost optimized filter design with excellent price / perfomance ratio
- Very light due to partial potting

Standards
- UL 1283
- EN 133 200

Approvals
- VDE License Number: pending
- UL License Number: pending

Applications
- Voltage rating 480 VAC for world wide acceptance
- Especially designed for industrial applications such as: Frequency Converters, Stepper Motor Drives, UPS-Systems, Inverters
- Qualified for use in equipment according IEC/EN 60950

References
General Product Information

Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

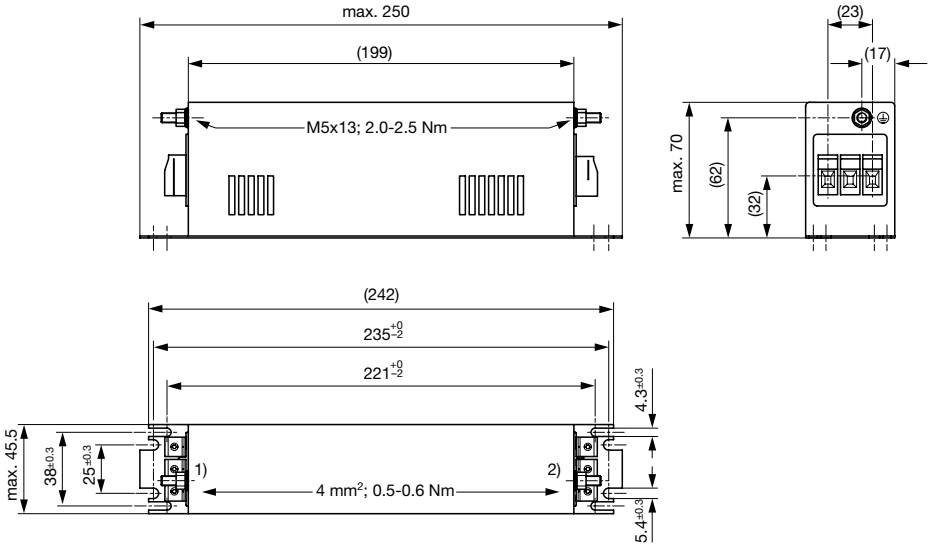
Technical Data

Rated Current	16 - 150 A @ Ta 40 °C
Rated Voltage	480 VAC, 50/60 Hz
Approval for	16 - 150 A @ Ta 40 °C / 480 VAC; 50/60 Hz
Leakage Current	< 33 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	> 2.25 kVDC between L-L > 3 kVDC between L-PE Test voltage 2 sec
Number of Filter Stages	1
Weight	1 - 7 kg
Sealing Compound	UL 94V-0

Mounting	Screw-on mounting on chassis, upright or lengthwise
Terminal	Screw terminals
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

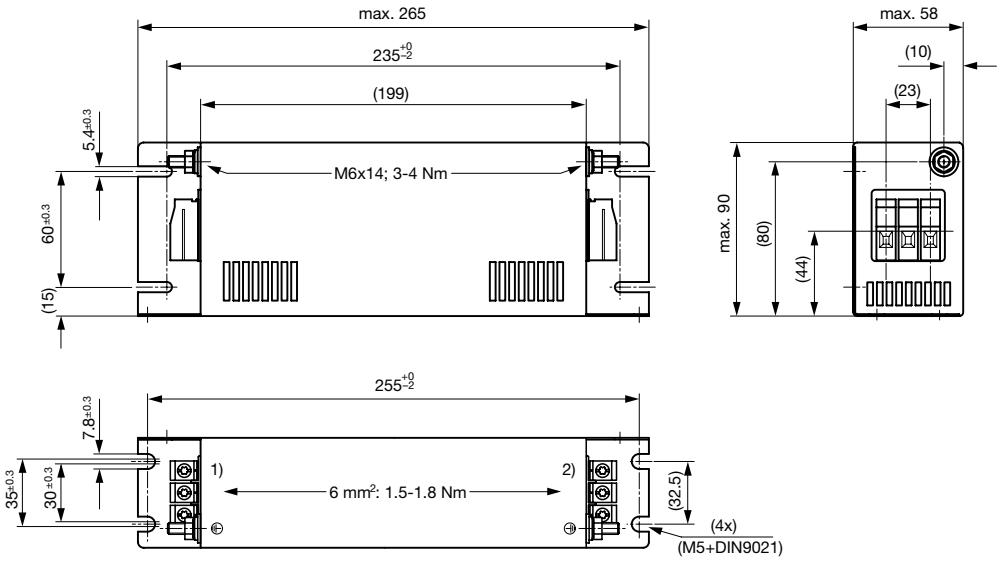
Dimensions

Case 1C



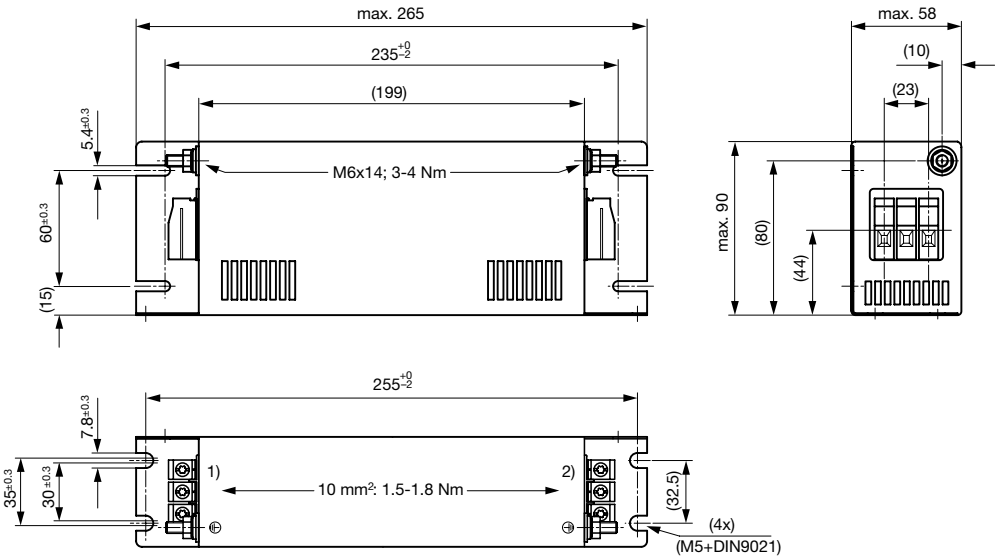
1) Line
2) Load

Case 1D-6



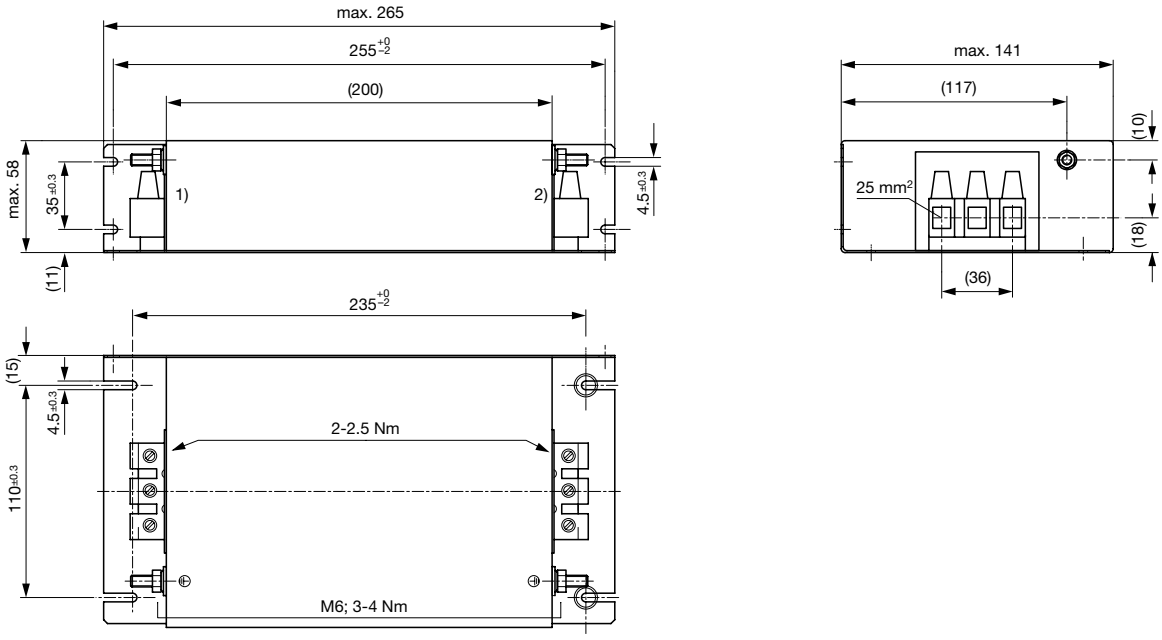
1) Line
2) Load

Case 1D-10



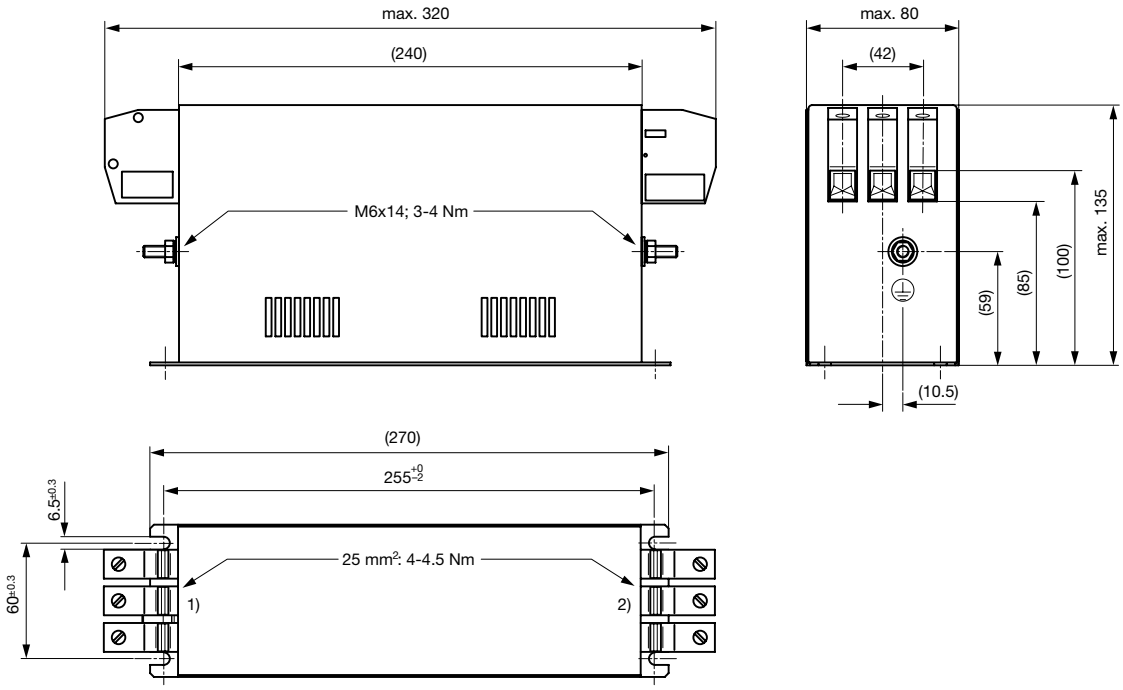
1) Line
2) Load

Case 1E



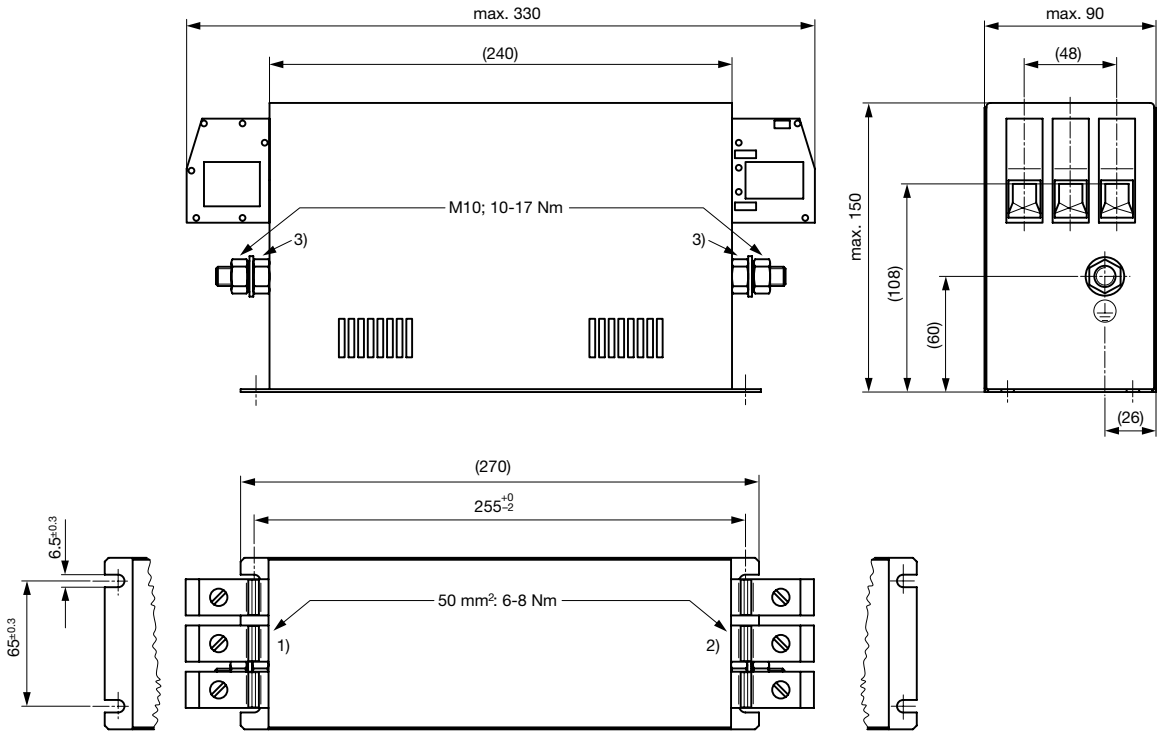
1) Line
2) Load

Case 1T



1) Line
2) Load

Case 1G

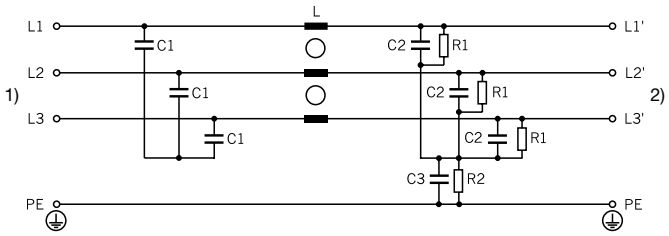


1) Line
2) Load
3) Do not unscrew lock-nut, keep lock-nut fastened while tightening

Technical data to the filter components

Rated Current [A]	L [mH]	C1 [µF]	C2 [µF]	C3 [µF]	R1 [MΩ]	R2 [MΩ]	Filter-Type
110	0.55	6.6	6.6	3.3	1	1	Industrial Version
150	0.48	6.6	6.6	3.3	1	1	Industrial Version
16	0.55	2.2	2.2	3.3	1	1	Industrial Version
25	0.45	2.2	2.2	3.3	1	1	Industrial Version
36	0.57	2.2	2.2	3.3	1	1	Industrial Version
50	0.65	4.7	3.3	3.3	1	1	Industrial Version
55	0.75	4.7	3.3	3.3	1	1	Industrial Version
64	0.55	4.7	4.7	3.3	1	1	Industrial Version
80	0.55	4.7	4.7	3.3	1	1	Industrial Version

Diagrams



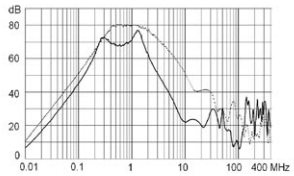
1) Line
2) Load

Attenuation Loss

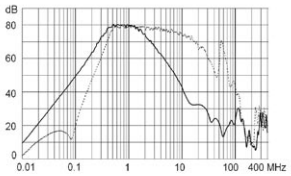
- - - - differential mode _____ common mode

Industrial Version

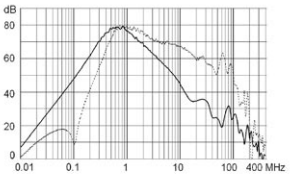
16A (FMAC-091C-1610)



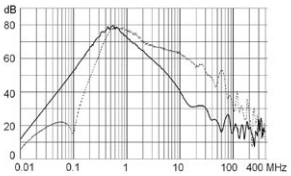
25A (FMAC-091C-2510)



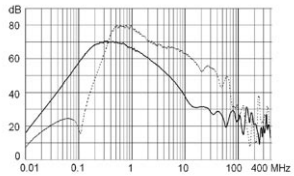
36A (FMAC-091D-3610)



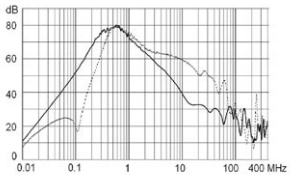
50A (FMAC-091D-5010)



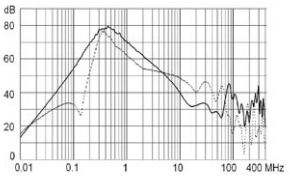
55A (FMAC-091D-5510)



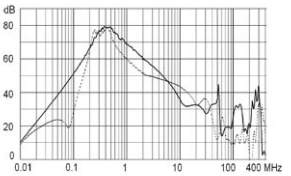
64A (FMAC-091E-6410)



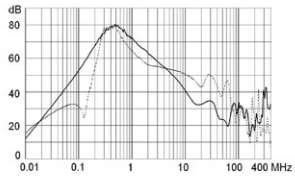
80A (FMAC-091T-8010)



110A (FMAC-091G-H110)



150A (FMAC-091G-H210)



Variants

Distributor-Stock-Check | SCHURTER-Stock-Check | e-Store

Rated Current [A]	Characteristic	Rated Voltage [VAC]	P_{loss} [W]	Leakage Current [mA] 1)	Contact Resistance [mΩ]	Weight [kg]	Screw clamps [mm²] 2)	Case	Order Number
110	High attenuation	480	28	110	0.8	5.8	50	1G	FMAC-091G-H110
150	High attenuation	480	40	110	0.6	7	50	1G	FMAC-091G-H210
16	High attenuation	480	6	96	7.6	1	4	1C	FMAC-091C-1610
25	High attenuation	480	8	96	4.1	1	4	1C	FMAC-091C-2510
36	High attenuation	480	10	96	2.5	1.3	6	1D-6	FMAC-091D-3610
50	High attenuation	480	13	103	1.7	1.7	10	1D-10	FMAC-091D-5010
55	High attenuation	480	14	103	1.5	1.7	10	1D-10	FMAC-091D-5510
64	High attenuation	480	17	103	1.4	2	25	1E	FMAC-091E-6410
80	High attenuation	480	22	110	1.1	5.1	25	1T	FMAC-091T-8010

2) Maximum conductor cross section (wire gauge) to be used; a comparative table for AWG and mm² values can be found in the general product information www.schurter.com/emc_info

1) Worst case leakage current acc. to IEC60950 - Annex G4 (situation with two interrupted lines). Nominal leakage current acc. to IEC60950 - 5.2.5. can be found in section technical data.

Packaging unit 1 Pcs

1- stage filter for 3-phase systems

Description
- Available as line-filter with normal or high attenuation
- Available as high voltage filter (up to 520 VAC)
- Very high symmetrical and asymmetrical attenuation loss
- In the frequency range from 10kHz up to 300MHz

Standards
- IEC 60939
- UL 1283
- EN 133 200

Approvals
- VDE License Number: 40004666 + 40004673

Applications
- Voltage rating 480 - 520 VAC for world wide acceptance
- Protection against interference voltage from the mains
- For standard and industrial applications
- Qualified for use in equipment according IEC/EN 60950

References
General Product Information

Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

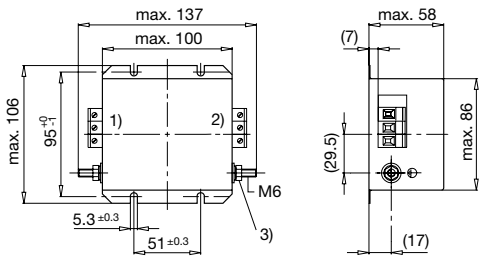
Technical Data

Rated Current	6 - 1100 A @ Ta 40 °C
Rated Voltage	480 - 520 VAC, 50/60 Hz
Approval for	6 - 1100 A @ Ta 40 °C / 520 VAC; 50 Hz
Leakage Current	industrial < 5 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	2.25 kVDC between L-L 3 kVDC between L-PE
Dielectric Strength for 520 VAC	2.25 between L-L 4 between L-PE Test voltage (2 sec)
Number of Filter Stages	1
Weight	0.9 - 47 kg
Material: Housing	Metal
Sealing Compound	UL 94V-0

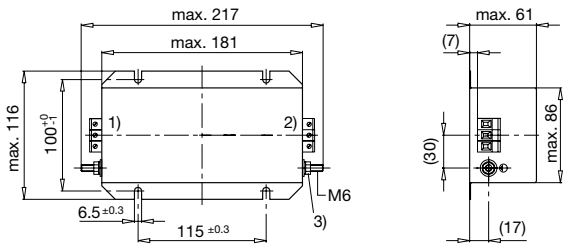
Mounting	Screw-on mounting on chassis from top
Terminal	Screw Clamp
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

Dimensions

Case 24-3

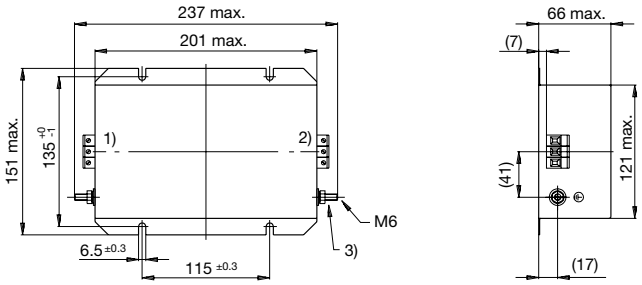


Case 31-3

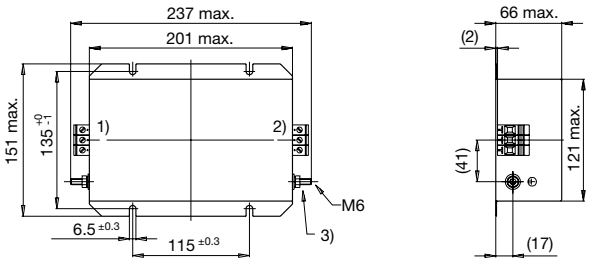


1) Line
2) Load
3) Tightening torque 3...4 Nm

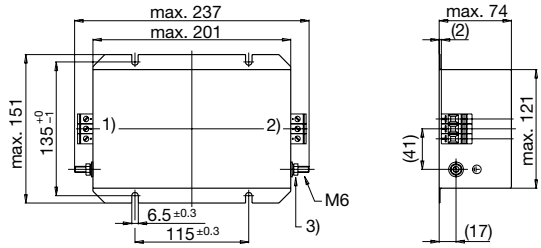
Case 32-3



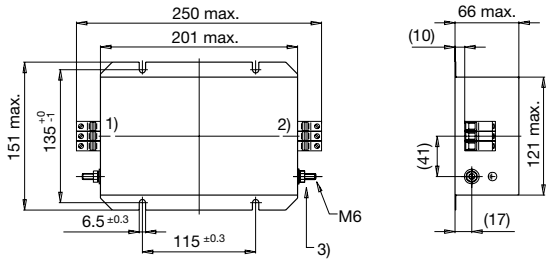
Case 32-7



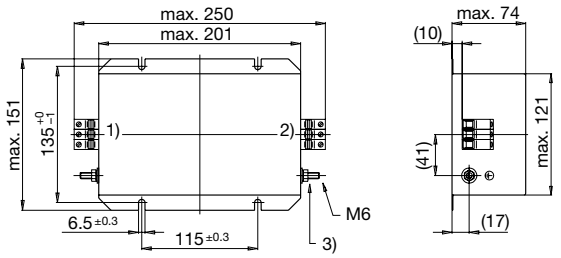
Case 32-C



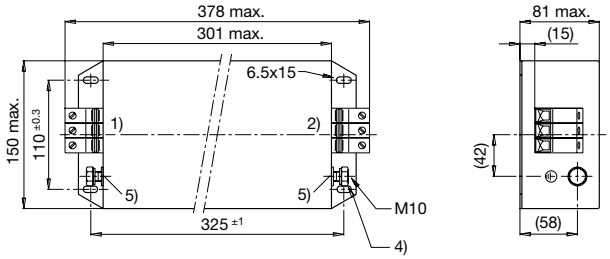
Case 34-3



Case 34-C

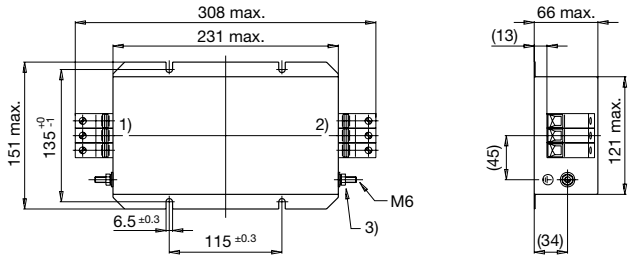


Case 37-3

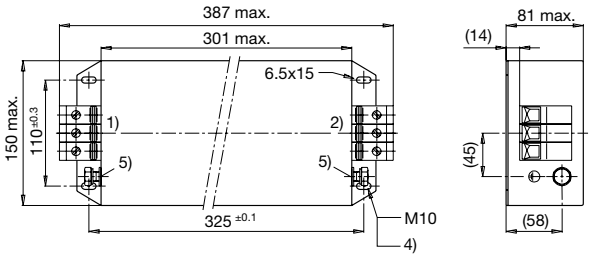


1) Line
2) Load
3) Tightening torque 3...4 Nm
4) Tightening torque 10...17 Nm
5) Do not unscrew lock-nut

Case 53-3

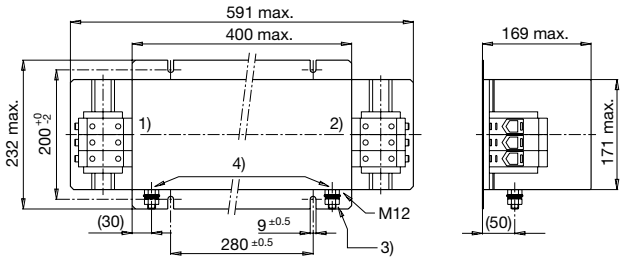


Case 54-3

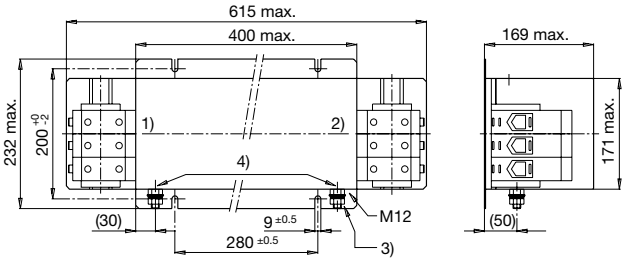


1) Line
2) Load
3) Tightening torque 3...4 Nm
4) Tightening torque 10...17 Nm
5) Do not unscrew lock-nut

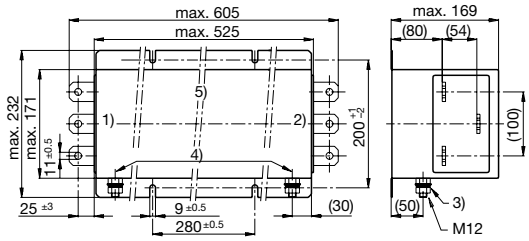
Case 55-3



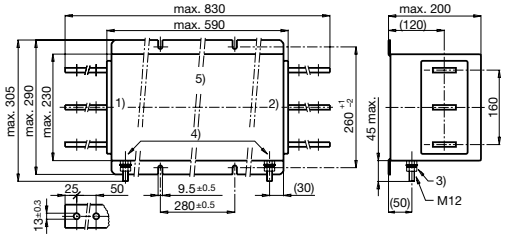
Case 56-3



Case 57



Case 74



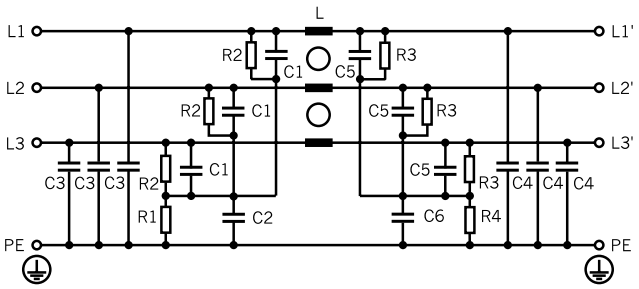
1) Line
2) Load
3) Tightening torque 14...30 Nm
4) Do not unscrew lock-nut
5) Current plates 720 mm2 (60x12)

Technical data to the filter components

Rated Current [A]	Characteristic	Rated Voltage [VAC]	L [mH]	C1 [µF]	C2 [µF]	C3 [nF]	C4 [nF]	C5 [µF]	C6 [µF]	R1 [MΩ]	R2 [MΩ]	R3 [MΩ]	R4 [MΩ]
110	High voltage filter	520	0.7	4.5	1.1	50	50	4.5	1.1	2	1	1	2
110	Excellent attenuation	480	0.7	6.6	1	47	100	6.6	1	2.2	1	1	2.2
1100	High voltage filter	520	0.12	11	1.1	50	-	22	1.1	2	0.5	0.25	2
16	Excellent attenuation	480	6	1.0	-	100	10	2.2	-	-	-	1	1
16	High voltage filter	520	6	1.5	-	50	11	1.5	-	2	1	1	2
180	High voltage filter	520	0.4	4.5	1.1	50	50	4.5	1.1	2	1	1	2
180	Excellent attenuation	480	0.4	6.6	1	47	100	6.6	1	2.2	1	1	2.2
25	High voltage filter	520	3	3	1.1	50	11	3	1.1	2	1	1	2
25	High attenuation	480	2.4	4.4	1	10	47	4.4	1	2.2	-	1	2
25	Excellent attenuation	480	3	4.4	1	10	47	4.4	1	2.2	1	1	2.2
250	High voltage filter	520	0.3	7.5	1.1	50	50	7.5	1.1	2	1	1	2
250	Excellent attenuation	480	0.3	11	1	100	100	11	1	2.2	0.5	0.5	2.2
340	High voltage filter	520	0.2	7.5	1.1	50	50	15	1.1	2	1	1	2
340	Excellent attenuation	480	0.2	11	1	100	100	22	1	2.2	0.33	0.33	2.2
36	High voltage filter	520	2	3	1.1	50	11	3	1.1	2	1	1	2
36	High attenuation	480	1.5	4.4	1	10	47	4.4	1	2.2	-	1	2
36	Excellent attenuation	480	2	4.4	1	10	47	4.4	1	2.2	1	1	2.2
450	Excellent attenuation	480	0.2	11	1	100	100	22	1	2.2	0.33	0.33	2.2
50	High voltage filter	520	1	3	1.1	50	11	3	1.1	2	1	1	2
50	High attenuation	480	1	4.4	1	10	100	4.4	1	2.2	-	1	2
550	Excellent attenuation	480	0.2	11	1	100	100	22	1	2.2	0.33	0.33	2.2
6	Excellent attenuation	480	10	1.0	-	100	10	2.2	-	-	-	1	1
64	High voltage filter	520	0.6	3	1.1	50	11	3	1.1	2	1	1	2
64	High attenuation	480	0.6	4.4	1	10	100	4.4	1	2.2	-	1	2
8	Excellent attenuation	480	10	1.0	-	100	10	2.2	-	-	-	1	1
80	High voltage filter	520	1	4.5	1.1	50	50	4.5	1.1	2	1	1	2
80	Excellent attenuation	480	1	6.6	1	47	100	6.6	1	2.2	1	1	2.2

Diagrams

1)



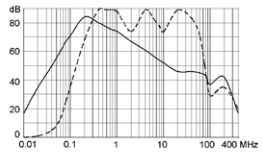
1) Power Line

Attenuation Loss

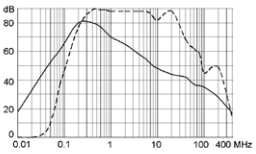
- - - - differential mode _____ common mode

Industrial Version

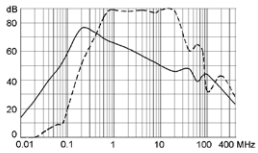
6A (FMAC-0924-0610)



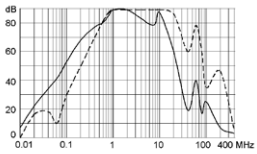
8A (FMAC-0931-0810)



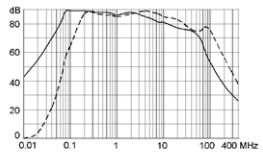
16A (FMAC-0931-1610)
16A (FMAC-0932-1610)



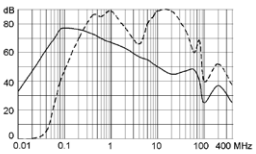
16A (FMAC-0931-1612I)



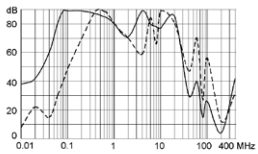
25A (FMAC-0932-2510)



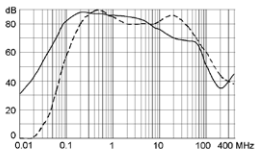
25A (FMAC-0932-2510L)



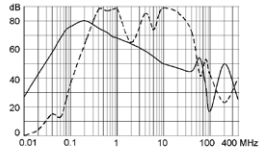
25A (FMAC-0932-2512I)



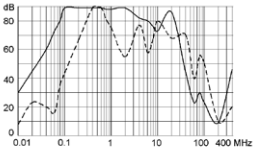
36A (FMAC-0934-3610)



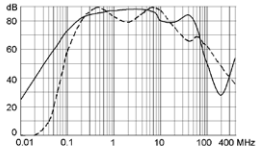
36A (FMAC-0932-3610L)



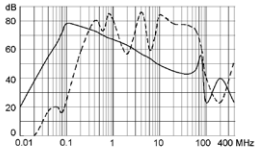
36A (FMAC-0932-3612I)



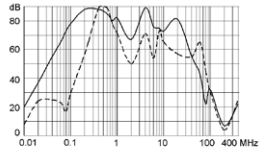
50A (FMAC-0934-5010)



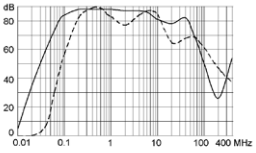
50A (FMAC-0934-5010L)



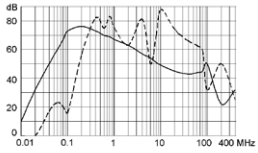
50A (FMAC-0934-5012I)



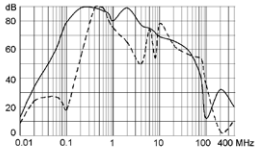
64A (FMAC-0953-6410)



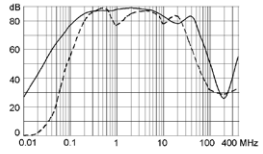
64A (FMAC-0934-6410L)



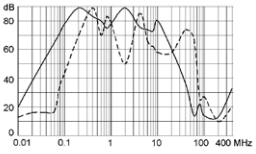
64A (FMAC-0953-6412I)



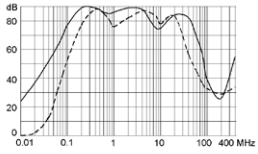
80A (FMAC-0937-8010)



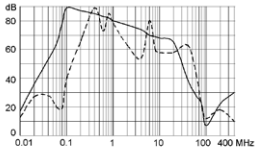
80A (FMAC-0937-8012I)



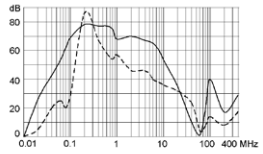
110A (FMAC-0954-H110)



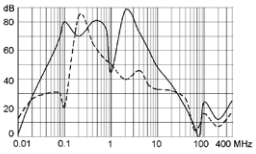
110A (FMAC-0954-H112I)



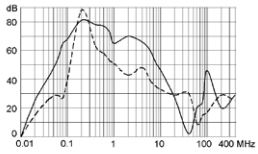
180A (FMAC-0955-H210)



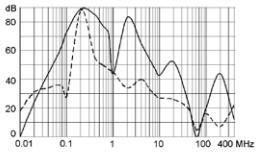
180A (FMAC-0955-H212I)



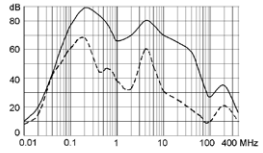
250A (FMAC-0956-H310)



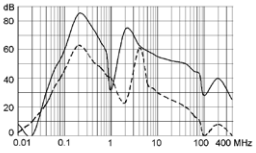
250A (FMAC-0956-H312I)



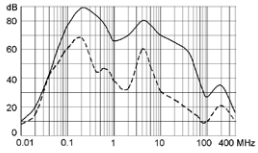
340A (FMAC-0956-H410)



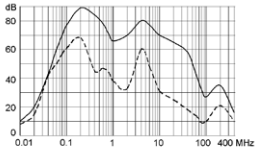
340A (FMAC-0956-H412I)



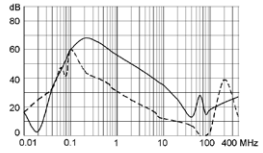
450A (FMAC-0957-H550)



550A (FMAC-0957-H650)



1100A (FMAC-0974-K152I)



Variants

Distributor-Stock-Check | SCHURTER-Stock-Check | e-Store

Rated Current [A]	Characteristic	Rated Voltage [VAC]	P_{loss} [W]	Leakage Current [mA] 1)	Contact Resistance [mΩ]	Weight [kg]	Screw clamps [mm²] 2)	Case	Order Number
110	Excellent attenuation	480	27.23	167	0.75	7.5	50	54-3	FMAC-0954-H110
110	High voltage filter	520	27.23	179	0.75	7.45	50	54-3	FMAC-0954-H112I
1100	High voltage filter	520	80	182	0.022	47	(A)	74	FMAC-0974-K152I
16	Excellent attenuation	480	8.83	40	11.5	1.8	4	31-3	FMAC-0931-1610
16	Excellent attenuation	480	8.83	40	11.5	2.8	4	32-3	FMAC-0932-1610
16	High voltage filter	520	8.83	26	11.5	1.8	4	31-3	FMAC-0931-1612I
180	Excellent attenuation	480	36	167	0.37	22	95	55-3	FMAC-0955-H210
180	High voltage filter	520	36	179	0.37	23	95	55-3	FMAC-0955-H212I
25	Excellent attenuation	480	8.25	156	4.4	3.4	6	32-7	FMAC-0932-2510
25	High attenuation	480	9.86	156	5.26	3.5	4	32-7	FMAC-0932-2510L
25	High voltage filter	520	8.25	172	4.4	3.35	6	32-7	FMAC-0932-2512I
250	Excellent attenuation	480	36	175	0.2	23.7	240	56-3	FMAC-0956-H310
250	High voltage filter	520	36	185	0.2	25	240	56-3	FMAC-0956-H312I
340	Excellent attenuation	480	45	176	0.13	27	240	56-3	FMAC-0956-H410
340	High voltage filter	520	45	188	0.13	30	240	56-3	FMAC-0956-H412I
36	Excellent attenuation	480	12.91	156	3.32	3.5	6	34-3	FMAC-0934-3610
36	High attenuation	480	10.55	156	2.71	3.75	6	32-C	FMAC-0932-3610L
36	High voltage filter	520	12.91	172	3.32	3.3	6	34-3	FMAC-0934-3612I
450	Excellent attenuation	480	40	176	0.06	33	(B)	57	FMAC-0957-H550
50	Excellent attenuation	480	9.75	160	1.3	3.4	6	34-3	FMAC-0934-5010
50	High attenuation	480	12.63	160	1.68	3.6	6	34-C	FMAC-0934-5010L
50	High voltage filter	520	9.75	172	1.3	3.35	6	34-3	FMAC-0934-5012I
550	Excellent attenuation	480	45	176	0.046	32	(B)	57	FMAC-0957-H650
6	Excellent attenuation	480	2.48	40	23	0.9	4	24-3	FMAC-0924-0610
64	Excellent attenuation	480	13.52	160	1.1	3.9	25	53-3	FMAC-0953-6410
64	High attenuation	480	18.23	160	1.48	4.2	6	34-C	FMAC-0934-6410L
64	High voltage filter	520	13.52	172	1.1	3.8	25	53-3	FMAC-0953-6412I
8	Excellent attenuation	480	5.38	40	28	1.8	4	31-3	FMAC-0931-0810
80	Excellent attenuation	480	22.6	167	1.17	7	25	37-3	FMAC-0937-8010
80	High voltage filter	520	22.6	179	1.17	7.28	25	37-3	FMAC-0937-8012I

2) Maximum conductor cross section (wire gauge) to be used; a comparative table for AWG and mm² values can be found in the general product information www.schurter.com/emc_info

1) Worst case leakage current acc. to IEC60950 - Annex G4 (situation with two interrupted lines). Nominal leakage current acc. to IEC60950 - 5.2.5. can be found in section technical data.

6A version: packing unit 2 pcs.

(A): Connecting straps for M12

(B): Connecting straps for M10

Packaging unit 1 Pcs

Ultra compact and efficient 2-stage filter in ECO design for 3-phase systems

new

Description
- High attenuation value
- Cost optimized filter design with excellent price / perfomance ratio
- Very light due to partial potting

Standards
- UL 1283
- EN 133 200

Approvals
- VDE License Number: 40023521
- UL License Number: pending

Applications
- Voltage rating 480 VAC for world wide acceptance
- Especially designed for industrial applications such as: Frequency Converters, Stepper Motor Drives, UPS-Systems, Inverters
- Qualified for use in equipment according IEC/EN 60950

References
General Product Information

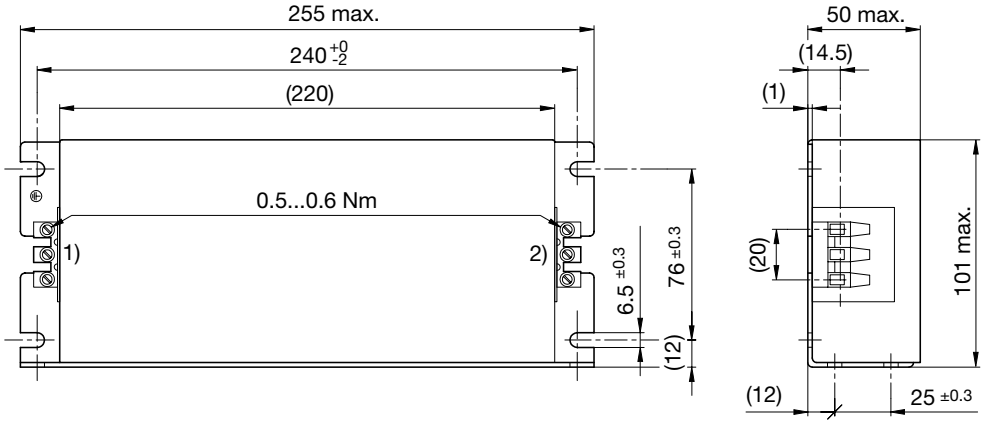
Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

Technical Data

Rated Current	10 - 115 A @ Ta 40 °C
Rated Voltage	480 VAC, 50/60 Hz
Approval for	10 - 115 A @ Ta 40 °C / 480 VAC; 50/60 Hz
Leakage Current	industrial < 5 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	> 2.25 kVDC between L-L > 3 kVDC between L-PE
Number of Filter Stages	2
Weight	1.1 - 5 kg
Material: Housing	Aluminum
Sealing Compound	UL 94V-0

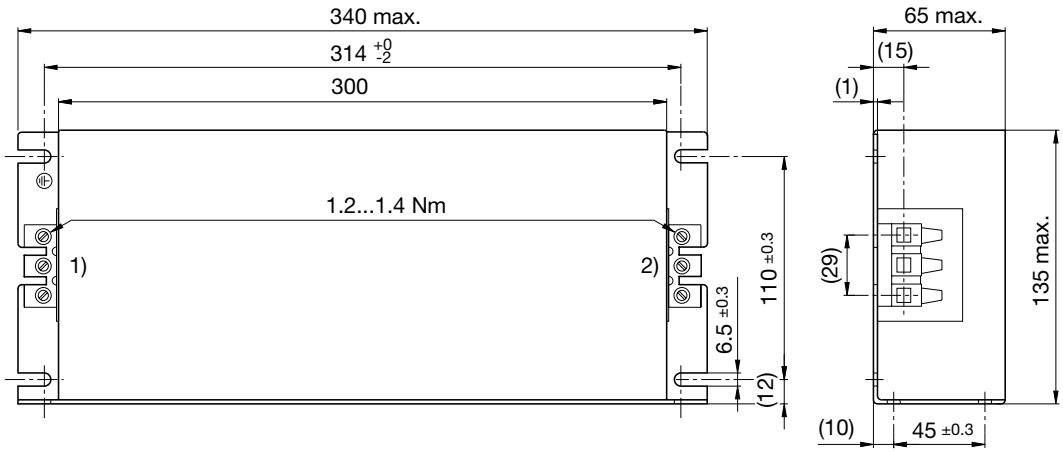
Mounting	Screw-on mounting on chassis, upright or lengthwise
Terminal	Screw terminals
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

Dimensions
Case 94



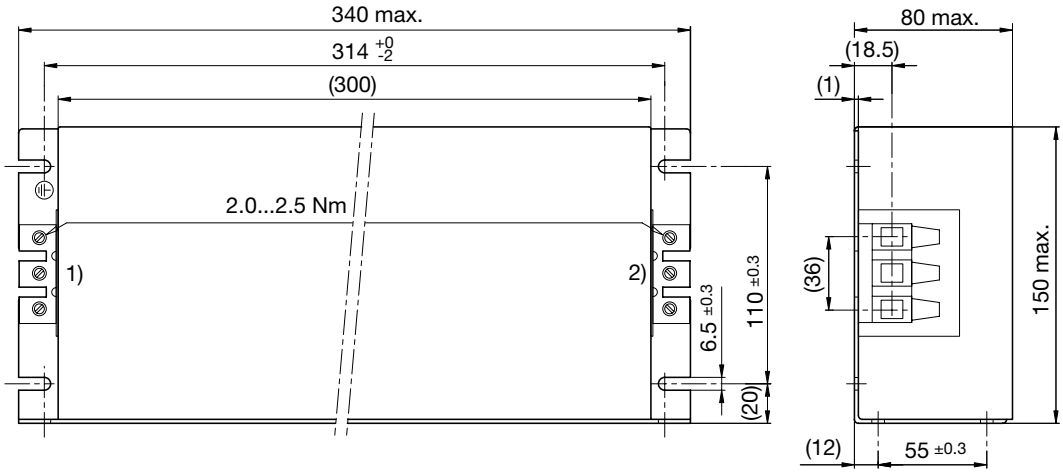
1) Line
2) Load

Case 95



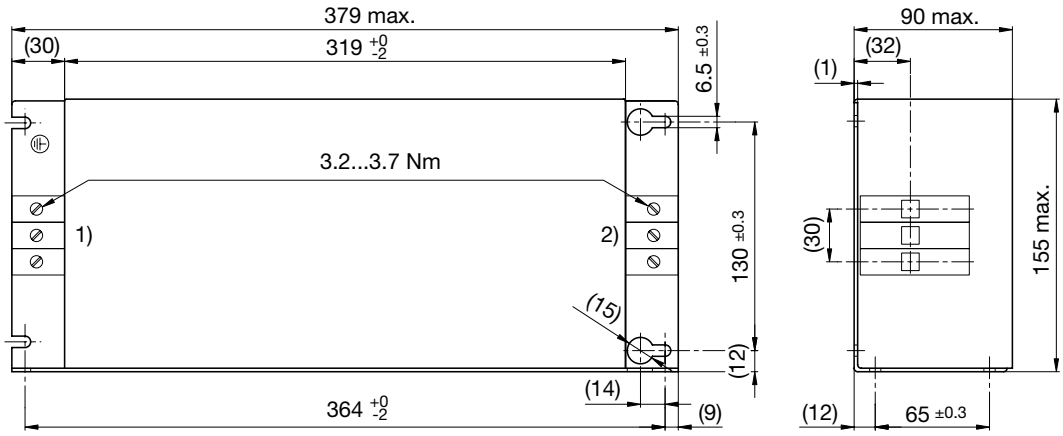
1) Line
2) Load

Case 96



1) Line
2) Load

Case 97

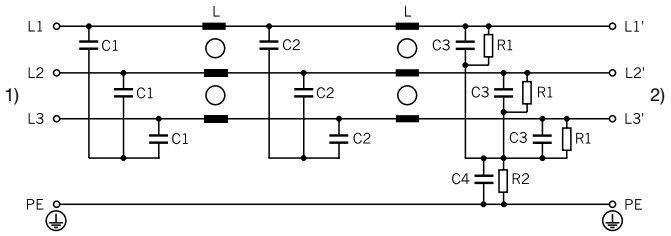


1) Line
2) Load

Technical data to the filter components

Rated Current [A]	L [mH]	C1 [µF]	C2 [µF]	C3 [µF]	C4 [nF]	R1 [MΩ]	R2 [MΩ]
10	2.3	1	1	1	10	1	1
115	0.24	1	2.2	2.2	100	1	2.2
20	1.5	1	1	1	10	1	1
36	0.9	1	1	2.2	47	1	2.2
50	0.45	1	1	2.2	47	1	2.2
66	0.45	1	1	2.2	47	1	2.2
80	0.32	1	1	2.2	47	1	2.2

Diagrams



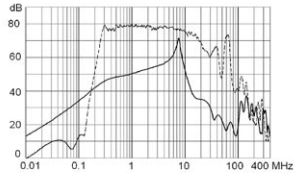
1) Line
2) Load

Attenuation Loss

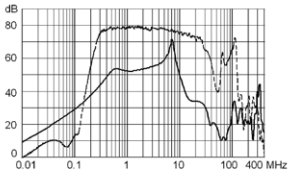
- - - - differential mode _____ common mode

Industrial Version

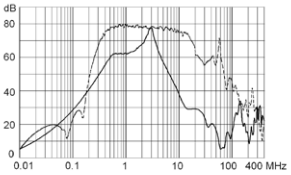
10A (FMBC-0994-1000)



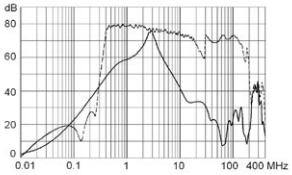
20A (FMBC-0994-2000)



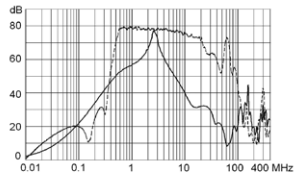
36A (FMBC-0995-3600)



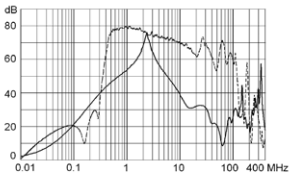
50A (FMBC-0996-5000)



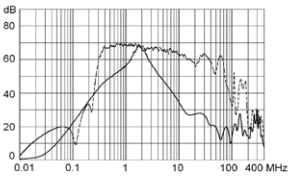
66A (FMBC-0996-6600)



80A (FMBC-0996-8000)



115A (FMBC-0997-H115)



Variants

Distributor-Stock-Check | SCHURTER-Stock-Check | e-Store

Rated Current [A]	Characteristic	P_{loss} [W]	Contact Resistance [mΩ]	Leakage Current	Weight [kg]	Screw clamps [mm²] 2)	Case	Order Number
10	High attenuation	4	37	5	1.1	10	94	FMBC-0994-1000
115	High attenuation	36	2.5	15.0	5	35	97	FMBC-0997-H115
20	High attenuation	9	20	5	1.6	10	94	FMBC-0994-2000
36	High attenuation	5	3.5	7.5	2.2	16	95	FMBC-0995-3600
50	High attenuation	20	7.5	7.5	2.7	16	95	FMBC-0995-5000
66	High attenuation	22	4.5	7.5	3.4	25	96	FMBC-0996-6600
80	High attenuation	24	3.5	7.5	3.4	25	96	FMBC-0996-8000

2) Maximum conductor cross section (wire gauge) to be used; a comparative table for AWG and mm² values can be found in the general product information www.schurter.com/emc_info

1) Worst case leakage current acc. to IEC60950 - Annex G4 (situation with two interrupted lines). Nominal leakage current acc. to IEC60950 - 5.2.5. can be found in section technical data.

Packaging unit	1 Pcs

Compact 2-stage bookform filter

Description
- Very compact and slim filter design
- Very high symmetrical and asymmetrical attenuation loss
- In the frequency range from 10kHz up to 300MHz

Standards
- IEC 60939
- EN 133 200

Approvals
- VDE License Number: 40004666

Applications
- Voltage rating 480 VAC for world wide acceptance
- Especially designed for industrial applications such as: Frequency Converters, Stepper Motor Drives, UPS-Systems, Inverters
- Qualified for use in equipment according IEC/EN 60950

References
General Product Information

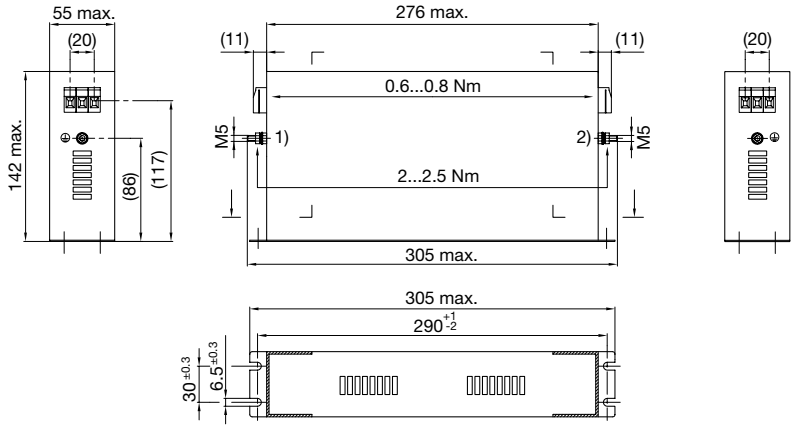
Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

Technical Data

Rated Current	10 - 115 A @ Ta 40 °C
Rated Voltage	480 VAC 50/60 Hz
Approval for	10 - 115 A @ Ta 40 °C / 480 VAC; 50 Hz
Leakage Current	industrial < 5 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	2.25 kVDC between L-L 3 kVDC between L-PE Test voltage (2 sec)
Number of Filter Stages	2
Weight	1.9 - 7.25 kg
Material: Housing	Metal
Sealing Compound	UL 94V-0

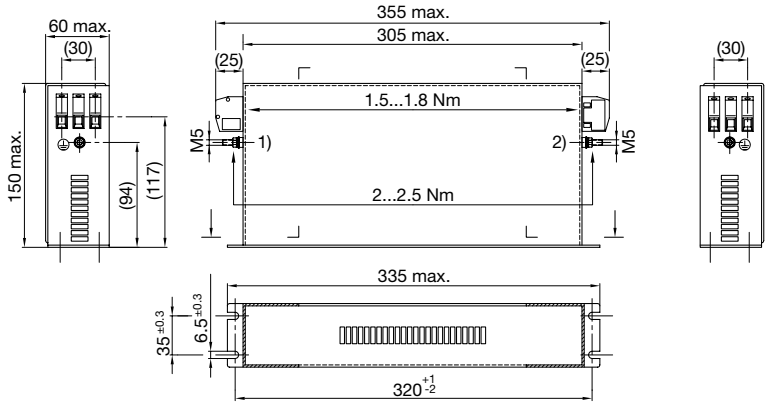
Mounting	Screw-on mounting on chassis, from top
Terminal	Screw clamps / flexible wires
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

Dimensions
Case 58

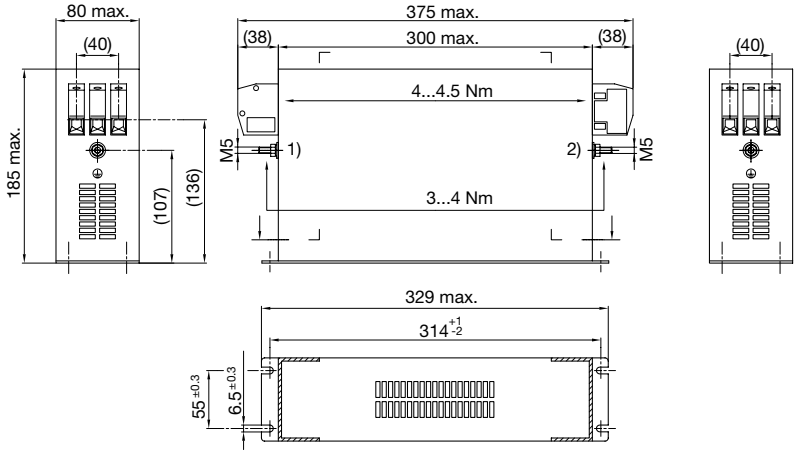


1) Line
2) Load

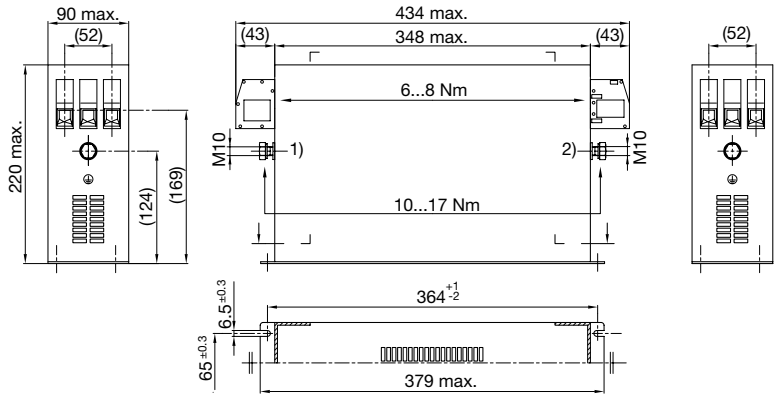
Case 60



Case 62

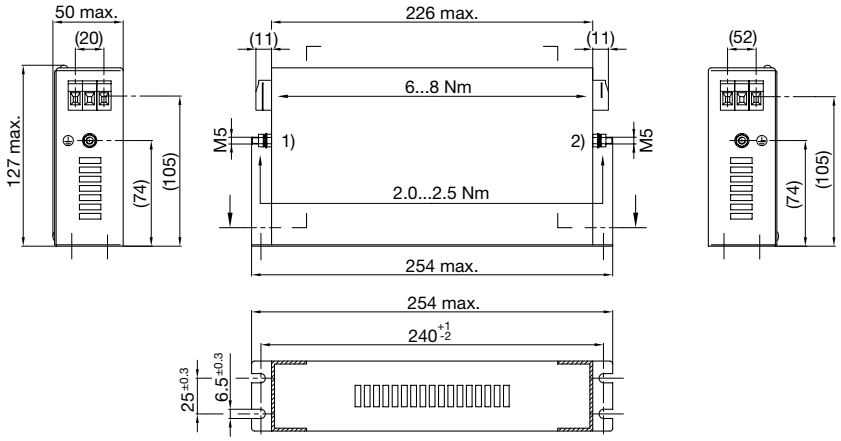


Case 64

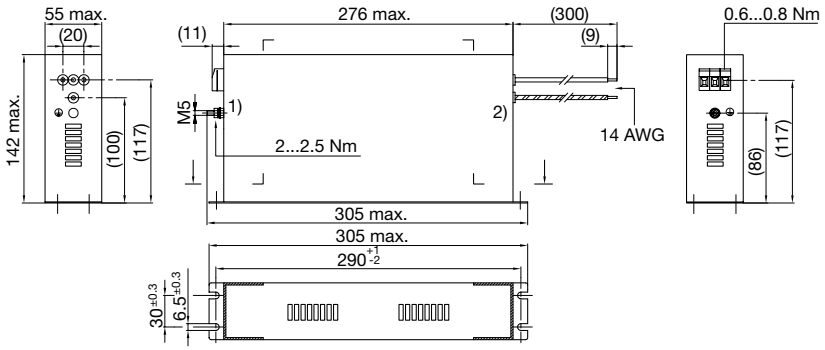


1) Line
2) Load

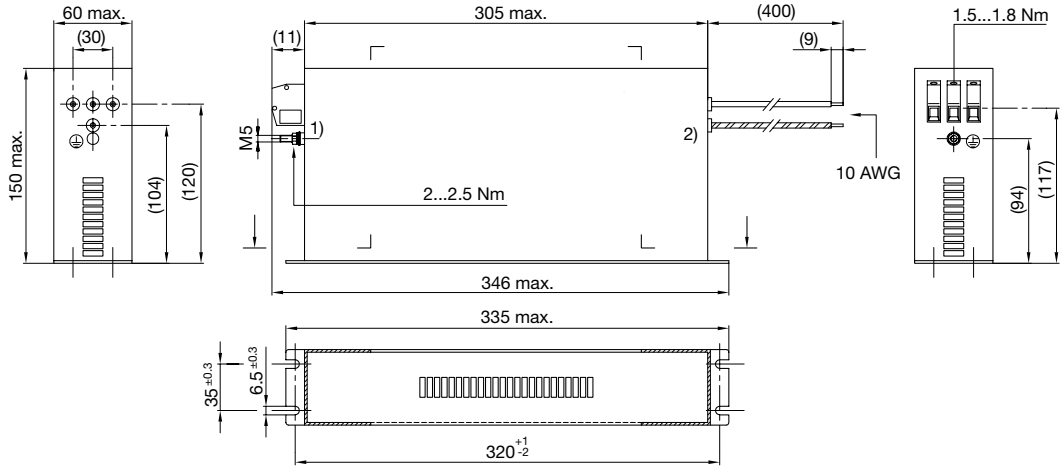
Case 67



Case 58C

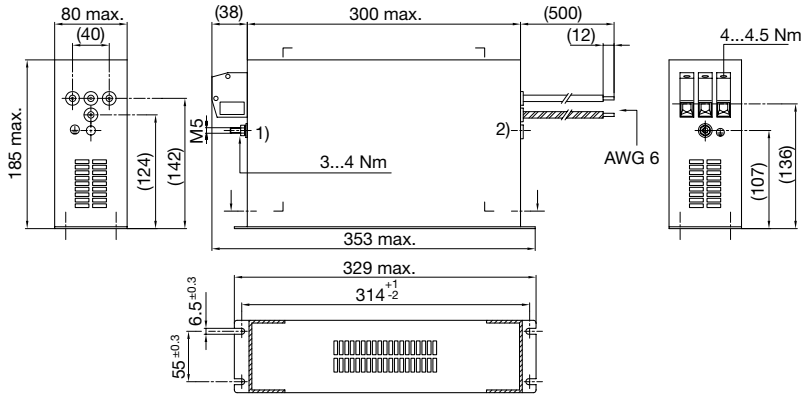


Case 60C

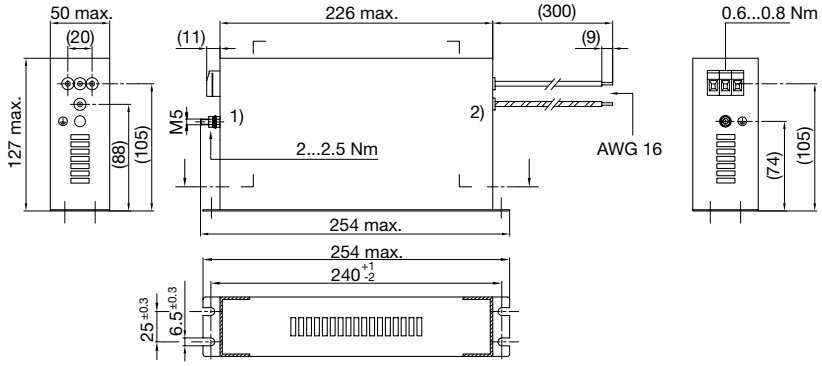


1) Line
2) Load

Case 62C



Case 67C

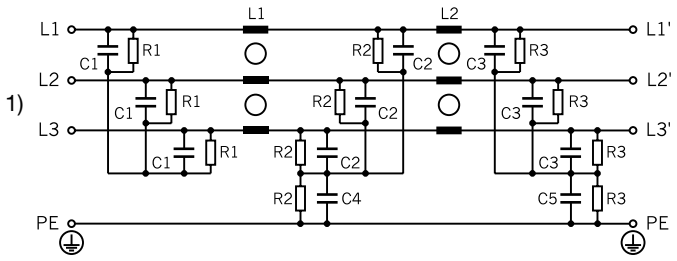


1) Line
2) Load

Technical data to the filter components

Rated Current [A]	Terminal	L1 [mH]	L2 [mH]	C1 [µF]	C2 [µF]	C3 [nF]	C4 [nF]	C5 [µF]	R1 [MΩ]	R2 [MΩ]	R3 [MΩ]
10	Screw-on terminals on line- and loadside	3	1.5	1.5	1.0	1.5	-	1.5	-	-	1
115	Screw-on terminals on line- and loadside	0.7	0.2	2.2	2.2	2.2	100	2.2	-	1	1
20	Screw-on terminals on line- and loadside	1.8	2	2.2	1.5	2.2	-	1.5	-	-	1
36	Screw-on terminals on line- and loadside	1.5	0.5	2.2	2.2	2.2	-	2.2	-	-	1
66	Screw-on terminals on line- and loadside	0.65	0.45	2.2	2.2	2.2	100	2.2	-	1	1

Diagrams



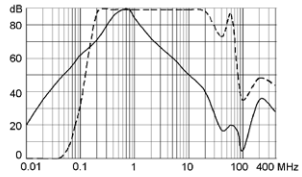
1) Power Line

Attenuation Loss

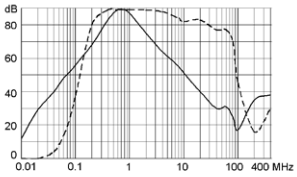
- - - - differential mode _____ common mode

Industrial Version

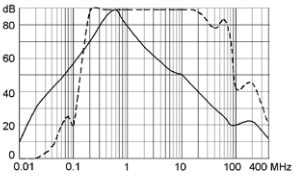
10 A



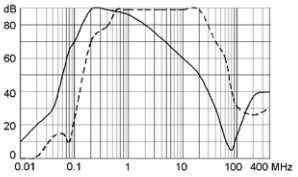
20 A



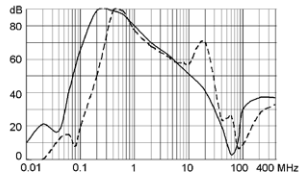
36 A



66 A



115 A



Variants

Distributor-Stock-Check | SCHURTER-Stock-Check | e-Store

Rated Current [A]	Terminal	P_{loss} [W]	Contact Resistance [mΩ]	Weight [kg]	Clamps [mm²]	Case	Order Number
10	Screw-on terminals on line- and loadside	9.45	31.5	1.9	4	67	FMBC-0967-1010
10	Screw-on terminals on lineside, wires on loadside	9.45	31.5	1.65	4	67C	FMBC-0967-1060
115	Screw-on terminals on line- and loadside	48	1.33	7.25	50	64	FMBC-0964-H110
20	Screw-on terminals on line- and loadside	17.5	14.6	2.15	4	58	FMBC-0958-2010
20	Screw-on terminals on lineside, wires on loadside	17.5	14.6	2.3	4	58C	FMBC-0958-2060
36	Screw-on terminals on line- and loadside	25.7	6.6	2.9	10	60	FMBC-0960-3610
36	Screw-on terminals on lineside, wires on loadside	25.7	6.6	3.1	10	60C	FMBC-0960-3660
66	Screw-on terminals on line- and loadside	43	3.3	4.4	25	62	FMBC-0962-6610
66	Screw-on terminals on lineside, wires on loadside	43	3.3	4.41	25	62C	FMBC-0962-6660

Packaging unit 1 Pcs

SCHURTER ELECTRONIC COMPONENTS

2-stage filter for 3-phase systems

Description
- Available as line-filter with normal or high attenuation
- Very high symmetrical and asymmetrical attenuation loss
- In the frequency range from 10kHz up to 300MHz

Standards
- IEC 60939
- UL 1283
- EN 133 200

Approvals
- VDE License Number: 40004666

Applications
- Voltage rating 480 VAC for world wide acceptance
- Protection against interference voltage from the mains
- For standard and industrial applications
- Qualified for use in equipment according IEC/EN 60950

References
General Product Information

Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

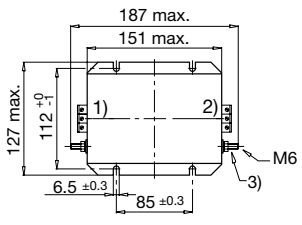
Technical Data

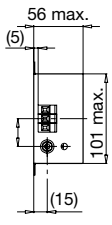
Rated Current	8 - 64 A @ Ta 40 °C
Rated Voltage	480 VAC, 50/60 Hz
Approval for	8 - 64 A @ Ta 40 °C / 480 VAC; 50 Hz
Leakage Current	industrial < 5 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	2.25 kVDC between L-L 3 kVDC between L-PE Test voltage (2 sec)
Number of Filter Stages	2
Weight	1.7 - 7.45 kg
Material: Housing	Metal
Sealing Compound	UL 94V-0

Mounting	Screw-on mounting on chassis, from top
Terminal	Screw Clamp
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

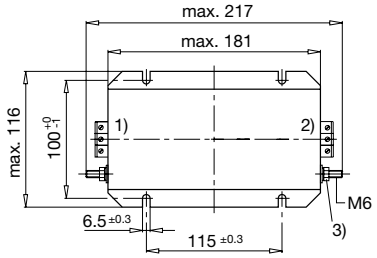
Dimensions

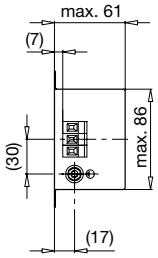
Case 27-3





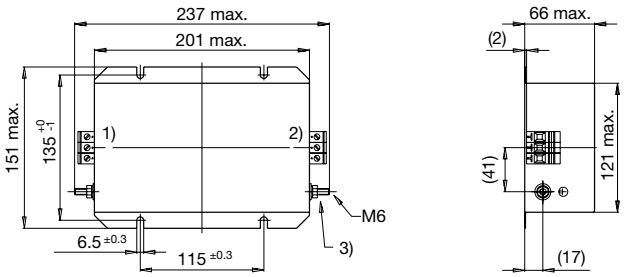
Case 31-3



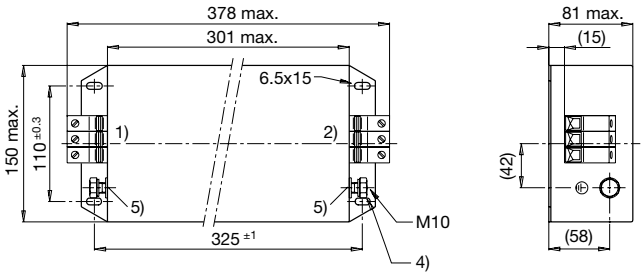


1) Line
2) Load
3) Nut torque 3...4 Nm

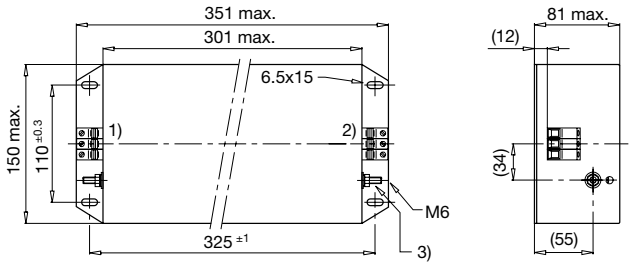
Case 32-7



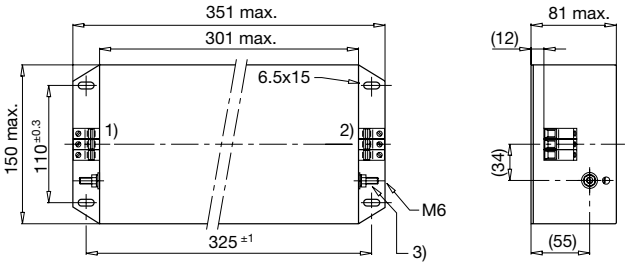
Case 37-3



Case 38-3



Case 40-3

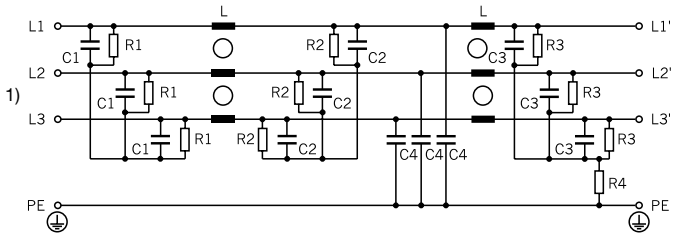


1) Line
2) Load
3) Nut torque 3...4 Nm
4) Nut torque 10...17 Nm
5) Do not unscrew lock-nut

Technical data to the filter components

Rated Current [A]	Characteristic	L [mH]	C1 [µF]	C2 [µF]	C3 [nF]	C4 [nF]	R1 [MΩ]	R2 [MΩ]	R3 [MΩ]	R4 [MΩ]
12	Excellent attenuation	5.5	1.0	1.0	2.2	47	-	-	1	1
16	Excellent attenuation	4.5	1.0	1.0	2.2	47	-	-	1	1
25	Excellent attenuation	4.5	1.0	2.2	2.2	47	-	-	1	1
25	High attenuation	2.4	1.0	2.2	2.2	47	-	-	1	1
36	Excellent attenuation	3	1.0	2.2	4.4	47	1	1	1	1
36	High attenuation	1.5	1.0	2.2	4.4	47	-	1	1	1
50	Excellent attenuation	1.5	2.2	2.2	4.4	100	1	1	1	1
50	High attenuation	1	2.2	2.2	4.4	100	-	1	1	1
64	Excellent attenuation	0.85	2.2	2.2	4.4	100	-	1	1	1
8	Excellent attenuation	8	1.0	1.0	2.2	47	-	-	1	1

Diagrams



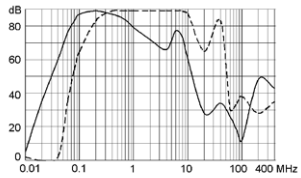
1) Power Line

Attenuation Loss

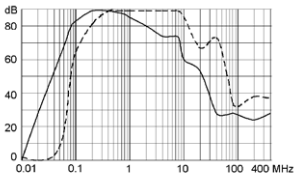
- - - - differential mode _____ common mode

Industrial Version

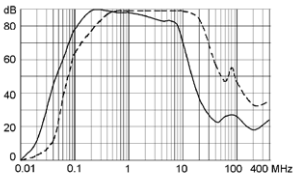
8A (FMBC-0927-0810)



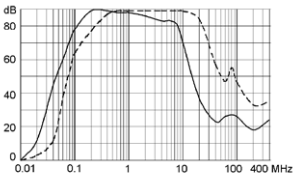
12A (FMBC-0927-1210)



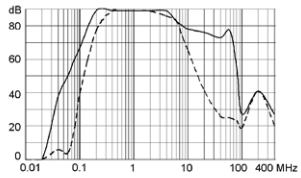
16A (FMBC-0931-1610)



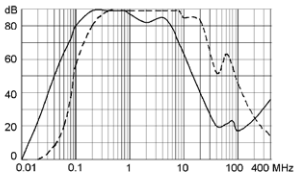
25A (FMBC-0932-2510)



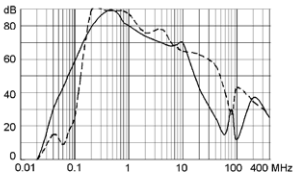
25A (FMBC-0932-2510L)



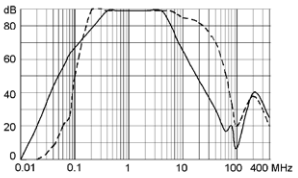
36A (FMBC-0938-3610)



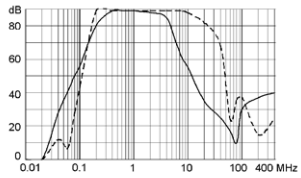
36A (FMBC-0940-3610L)



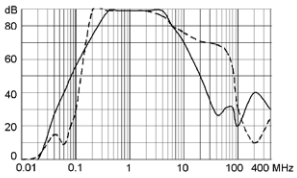
50A (FMBC-0938-5010)



50A (FMBC-0938-5010L)



64A (FMBC-0937-6410)



Variants

Distributor-Stock-Check | SCHURTER-Stock-Check | e-Store

Rated Current [A]	Characteristic	P_{loss} [W]	Contact Resistance [mΩ]	Leakage Current	Weight [kg]	Screw clamps [mm²] 2)	Case	Order Number
12	Excellent attenuation	10	23	19	1.9	4	27-3	FMBC-0927-1210
16	Excellent attenuation	14.6	19	19	2.28	4	31-3	FMBC-0931-1610
25	Excellent attenuation	18.8	10	19	3.4	6	32-7	FMBC-0932-2510
25	High attenuation	20.7	11	19	3.5	6	32-7	FMBC-0932-2510L
36	Excellent attenuation	29.2	7.5	19	7.4	6	38-3	FMBC-0938-3610
36	High attenuation	18.3	4.7	19	6.5	6	40-3	FMBC-0940-3610L
50	Excellent attenuation	30.3	4.0	39	7	10	38-3	FMBC-0938-5010
50	High attenuation	25.9	3.45	39	7	10	38-3	FMBC-0938-5010L
64	Excellent attenuation	47.9	3.9	39	7.45	25	37-3	FMBC-0937-6410
8	Excellent attenuation	10.6	55	19	1.7	4	27-3	FMBC-0927-0810

2) Maximum conductor cross section (wire gauge) to be used; a comparative table for AWG and mm² values can be found in the general product information www.schurter.com/emc_info

1) Worst case leakage current acc. to IEC60950 - Annex G4 (situation with two interrupted lines). Nominal leakage current acc. to IEC60950 - 5.2.5. can be found in section technical data.

Packaging unit	1 Pcs

1-stage filter for 3-phase systems with neutral conductor

Description
- Terminals for three phases, neutral conductor and ground
- Very high symmetrical and asymmetrical attenuation loss
- In the frequency range from 10kHz up to 300MHz

Standards
- IEC 60939
- UL 1283
- EN 133 200

Applications
- Voltage rating 480 VAC for world wide acceptance
- Protection against interference voltage from the mains
- For standard and industrial applications
- Qualified for use in equipment according IEC/EN 60950

References
General Product Information

Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

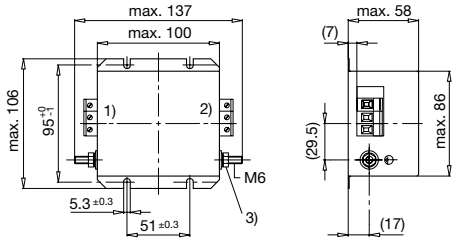
Technical Data

Rated Current	6 - 250 A @ Ta 40 °C
Rated Voltage	275 - 480 VAC, 50/60 Hz
Approval for	6 - 250 A / 275/480 VAC
Leakage Current	industrial < 5 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	2.25 kVDC between L-L 1.7 kVDC between L-N 3 kVDC between L-PE 2.7 kVDC between N-PE Test voltage (2 sec)
Number of Filter Stages	1
Weight	0.95 - 24.5 kg
Material: Housing	Metal
Sealing Compound	UL 94V-0

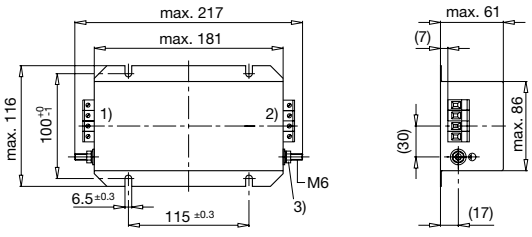
Mounting	Screw-on mounting on chassis, from top
Terminal	Screw Clamp
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

Dimensions

Case 24-4

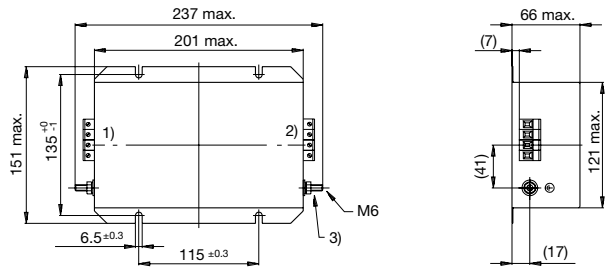


Case 31-4

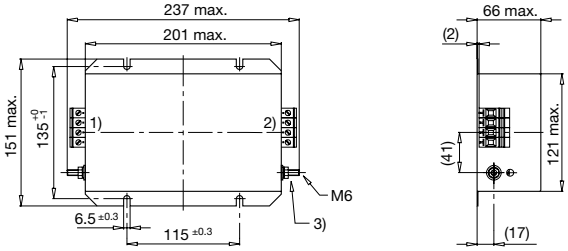


1) Line
2) Load
3) Nut torque 3...4 Nm

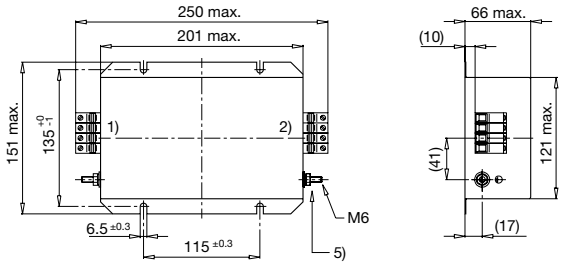
Case 32-4



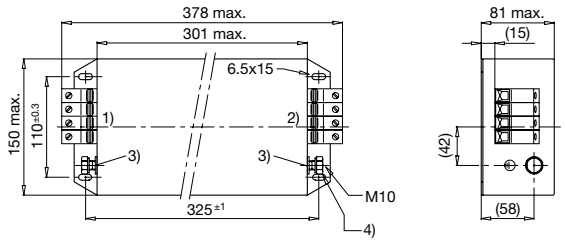
Case 32-8



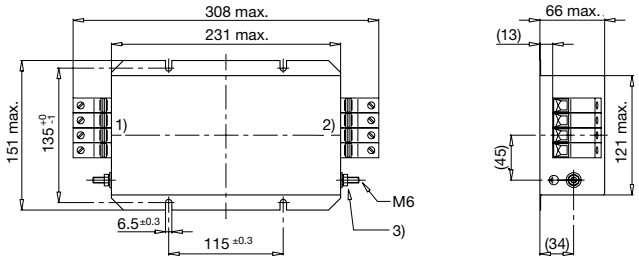
Case 34-4



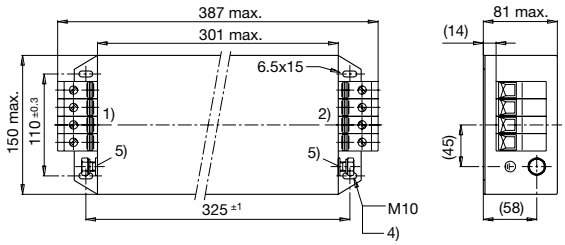
Case 37-4



Case 53-4

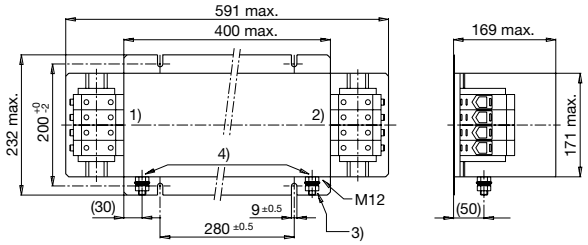


Case 54-4

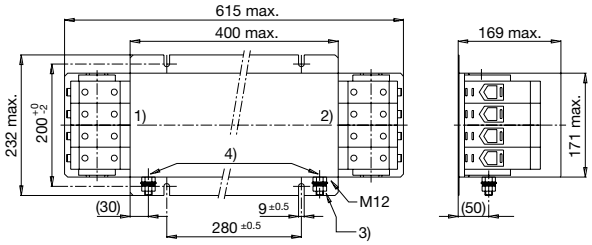


1) Line
2) Load
3) Nut torque 3...4 Nm
4) Nut torque 10...17 Nm
5) Do not unscrew lock-nut

Case 55-4



Case 56-4



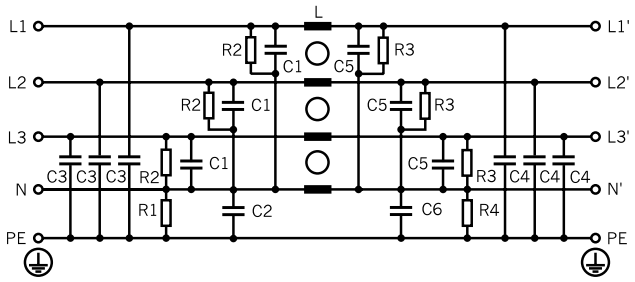
1) Line
2) Load
3) Nut torque 14...30 Nm
4) Do not unscrew lock-nut

Technical data to the filter components

Rated Current [A]	L [mH]	C1 [µF]	C2 [µF]	C3 [nF]	C4 [nF]	C5 [µF]	C6 [µF]	R1 [MΩ]	R2 [MΩ]	R3 [MΩ]	R4 [MΩ]
110	0.5	6.6	1	47	100	6.6	1	2.2	1	1	-
16	5	1.0	-	100	10	2.2	-	-	-	1	2.2
180	0.25	6.6	1	47	100	6.6	1	2.2	1	1	2.2
25	2.6	4.4	1	10	47	4.4	1	-	1	1	2.2
250	0.2	11	1	100	100	11	1	2.2	0.5	0.5	2.2
36	1.8	4.4	1	10	47	4.4	1	2.2	1	1	-
50	0.8	4.4	1	10	100	4.4	1	2.2	1	1	-
6	9	1.0	-	100	10	2.2	-	-	-	1	2.2
64	0.6	4.4	1	10	100	4.4	1	2.2	1	1	-
8	8	1.0	-	100	10	2.2	-	-	-	1	2.2
80	0.9	6.6	1	47	100	6.6	1	2.2	1	1	-

Diagrams

1)



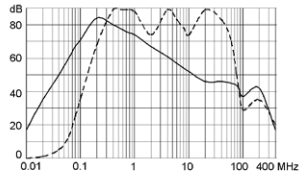
1) Power Line

Attenuation Loss

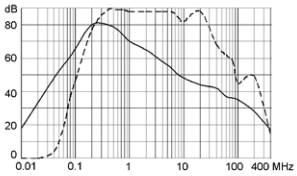
- - - - differential mode _____ common mode

Industrial Version

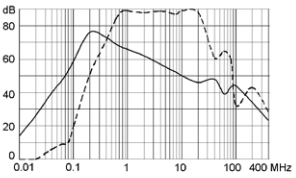
6A (FMAD-0924-0610)



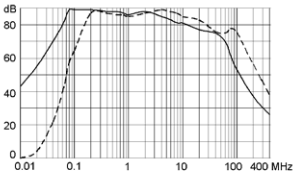
8A (FMAD-0931-0810)



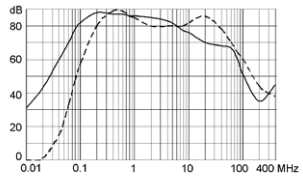
16A (FMAD-0931-1610)
16A (FMAD-0932-1610)



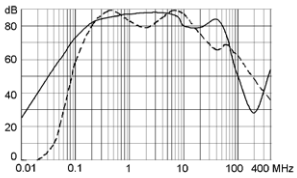
25A (FMAD-0932-2510)



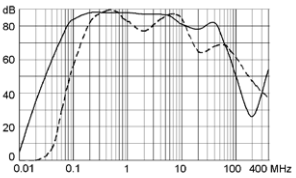
36A (FMAD-0934-3610)



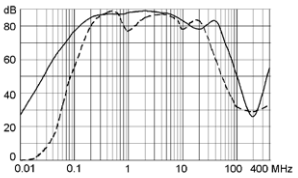
50A (FMAD-0934-5010)



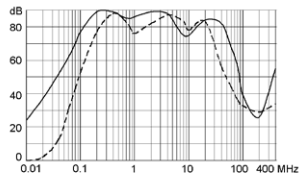
64A (FMAD-0953-6410)



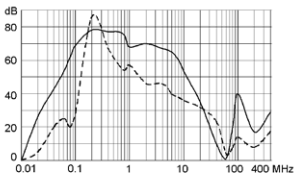
80A (FMAD-0937-8010)



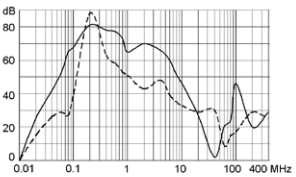
110A (FMAD-0954-H110)



180A (FMAD-0955-H210)



250A FMAD-0956-H310



Variants

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Rated Current [A]	Rated Voltage [VAC]	P_{loss} [W]	Contact Resistance [mΩ]	Weight [kg]	Clamps [mm²]	Case	Order Number
110	275/480	58	1.2	7.25	50	54-4	FMAD-0954-H110
16	275/480	15.4	15	2.1	4	31-4	FMAD-0931-1610
16	275/480	15.4	15	3.1	4	32-4	FMAD-0932-1610
180	275/480	51	0.39	22	95	55-4	FMAD-0955-H210
25	275/480	11.5	4.6	3.35	6	32-8	FMAD-0932-2510
250	275/480	62.5	0.25	24.5	240	56-4	FMAD-0956-H310
36	275/480	21	4	3.4	10	34-4	FMAD-0934-3610
50	275/480	20	2	3.4	10	34-4	FMAD-0934-5010
6	275/480	3.9	27	0.95	4	24-4	FMAD-0924-0610
64	275/480	27	1.6	4.3	25	53-4	FMAD-0953-6410
8	275/480	9	35	1.9	4	31-4	FMAD-0931-0810
80	275/480	39	1.5	7.35	25	37-4	FMAD-0937-8010

6A version: packing unit 2 pcs.

Packaging unit 1 Pcs

Compact 1-stage filter for 3-phase systems with neutral conductor

Description
- Quick-connect terminals 6.3 x 0.8 for three phases, neutral conductor and ground
- Very high symmetrical and asymmetrical attenuation loss
- In the frequency range from 10kHz up to 300MHz

Standards
- IEC 60939
- UL 1283
- EN 133 200

Approvals
- VDE License Number: 40004673

Applications
- Especially designed for industrial applications such as: Frequency Converters, Stepper Motor Drives, UPS-Systems, Inverters
- Qualified for use in equipment according IEC/EN 60950

References
General Product Information

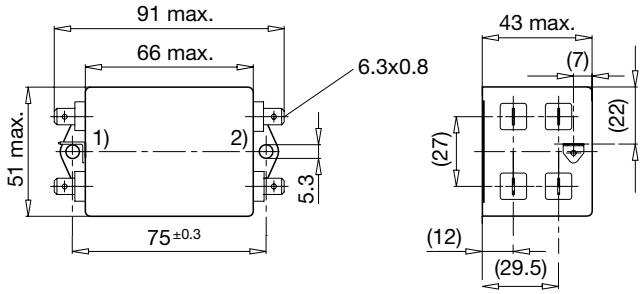
Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

Technical Data

Rated Current	3 - 20 A @ Ta 40 °C
Rated Voltage	250 - 440 VAC, 50/60 Hz
Approval for	3 - 20 A / 440 VAC; 50 Hz
Leakage Current	industrial < 3 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	2.25 kVDC between L-L 1.7 kVDC between L-N 3 kVDC between L-PE 2.7 kVDC between N-PE Test voltage (2 sec)
Number of Filter Stages	1
Weight	0.2 - 2.5 kg
Material: Housing	Metal
Sealing Compound	UL 94V-0

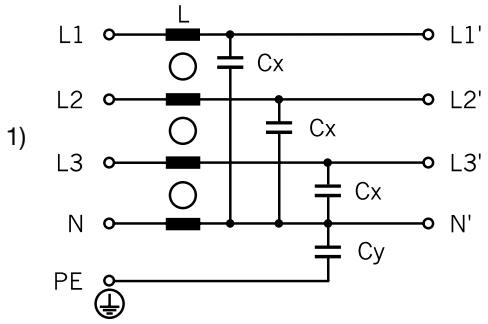
Mounting	Screw-on mounting on chassis, from top
Terminal	Quick connect terminals 6.3 x 0.8 mm
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

Dimensions
Case 47



1) Line
2) Load

Diagrams



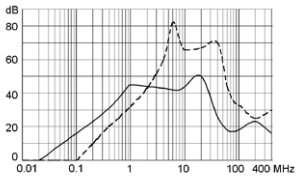
1) Power Line

Attenuation Loss

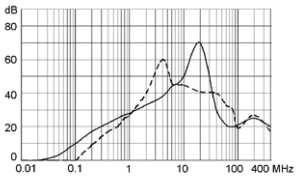
- - - - differential mode _____ common mode

Standard version

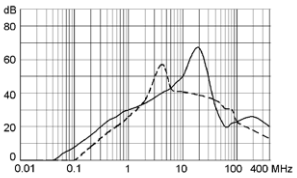
3A (FMW-65-0001)



6A (FMW-65-0002)

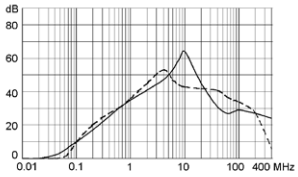


10A (FMW-65-0003)

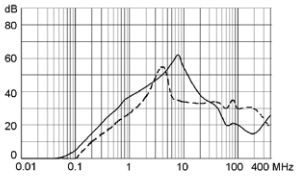


Industrial Version

10A (FMW-65-0004)



20A (FMW-65-0005)



Variants

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Rated Current [A]	Rated Voltage [VAC]	Leakage Current [mA]	L [mH]	Cx [µF]	Cy [nF]	Weight [kg]	Case	Order Number
10	250/440	3	0.4	0.1	22	2.35	47	FMW-65-0004
10	250/440	0.5	0.4	0.1	4.7	0.23	47	FMW-65-0003
20	250/440	3	0.15	0.1	22	2.5	47	FMW-65-0005
3	250/440	0.5	1	0.1	4.7	0.2	47	FMW-65-0001
6	250/440	0.5	0.5	0.1	4.7	0.2	47	FMW-65-0002

Packaging unit 10 Pcs

FMW4-81(95)

Compact 2-stage filter for 3-phase systems with neutral conductor

Description

- Quick-connect terminals 6.3 x 0.8 for three phases, neutral conductor and ground
- Very high symmetrical and asymmetrical attenuation loss
- In the frequency range from 10kHz up to 300MHz

Standards

- IEC 60939
- UL 1283
- EN 133 200

Approvals

- VDE License Number: 40004673

Applications

- Especially designed for industrial applications such as: Frequency Converters, Stepper Motor Drives, UPS-Systems, Inverters
- Qualified for use in equipment according IEC/EN 60950

References

General Product Information

Weblinks

Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

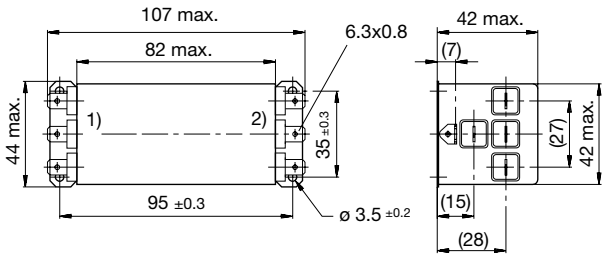
Technical Data

Rated Current	4 - 6 A @ Ta 40 °C
Rated Voltage	250 - 440 VAC, 50/60 Hz
Approval for	4 - 6 A / 440 VAC; 50 Hz
Leakage Current	standard < 0.5 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	2.25 kVDC between L-L 1.7 kVDC between L-N 3 kVDC between L-PE 2.7 kVDC between N-PE Test voltage (2 sec)
Number of Filter Stages	2
Weight	0.26 - 0.5 kg
Material: Housing	Metal
Sealing Compound	UL 94V-0

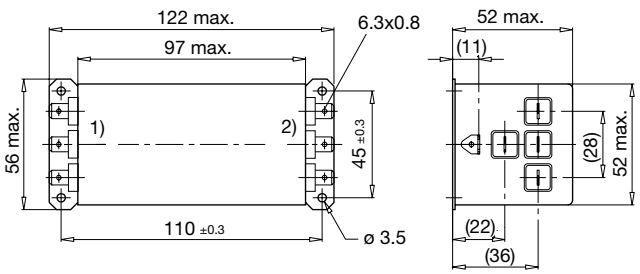
Mounting	Screw-on mounting on chassis, from top
Terminal	Quick connect terminals 6.3 x 0.8 mm
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

Dimensions

Case 18

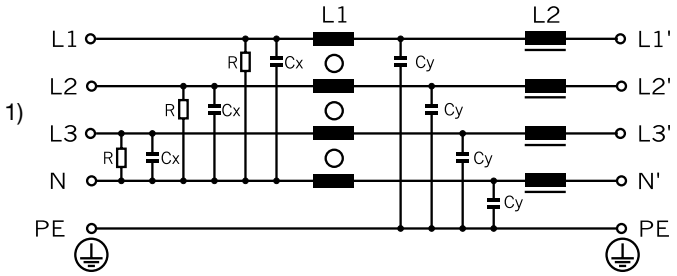


Case 20



1) Line
2) Load

Diagrams



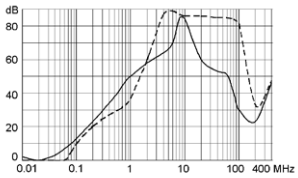
1) Power Line

Attenuation Loss

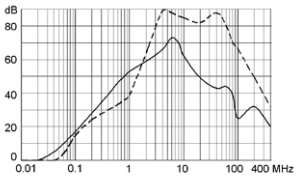
- - - - differential mode _____ common mode

Standard version

4A (FMW-81-0001)



6A (FMW-95-0001)



Variants

Distributor-Stock-Check | SCHURTER-Stock-Check | e-Store

Rated Current [A]	Rated Voltage [VAC]	L1 [mH]	L2 [µH]	Cx [µF]	Cy [nF]	R [MΩ]	Weight [kg]	Case	Order Number
4	250/440	0.4	4	0.33	15	1	0.26	18	FMW-81-0001
6	250/440	0.5	4	0.47	15	1	0.5	20	FMW-95-0001

Packaging unit

5 Pcs

SCHURTER ELECTRONIC COMPONENTS

Do you require any other documentation or samples?

You will find a request form for further documentation material, samples or price quotes on the SCHURTER website.

www.schurter.ch/contact/catalogue.asp

A market leader's statement

With the development, production and sales of active and passive components for electronic and electromechanical applications SCHURTER is a leading global industry partner. The SCHURTER Group leads the way in its four strategic business areas, using its innovative strength and cutting-edge technology to provide customers with intelligent practical solutions.

Efficient Use or Ressources

We create and safeguard secure and clean workplaces. This serves the protection of the wealth of our employees. And we preserve the environment by using ressources efficiently and reducing emissions.

Antje Stein

Output filter for 3-phase frequency inverter

Description
- Compact design
- Standard versions include insulated safety screw terminals
- Enhancement of the system efficiency

Standards
- IEC 60939
- EN 133 200

Approvals
- VDE License Number: 40004669

Applications
- Voltage rating 550 VAC for world wide acceptance
- Motors can be fed through long cables
- Reduces the voltage rise rate of inverter output voltage

References
General Product Information

Weblinks
Approvals, RoHS, CHINA-RoHS, e-Store, SCHURTER-Stock-Check, Distributor-Stock-Check

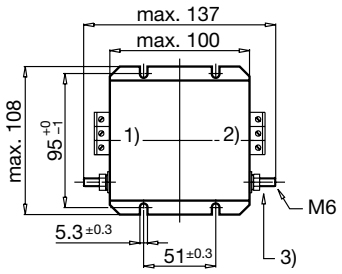
Technical Data

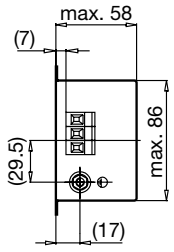
Rated Current	8 - 32 A @ Ta 40 °C
Rated Voltage	550 VAC; 50/60 Hz
Approval for	8 - 32 A @ Ta 40 °C / 550 VAC; 50 Hz
Leakage Current	standard < 0.5 mA (440 V / 50 Hz)
Dielectric Strength for 480 VAC	2.25 kVDC between L-L 3 kVDC between L-PE Test voltage (2 sec)
Voltage Rise Rate dU/dt	< 500 V/µs
Weight	1.36 - 7 kg
Material: Housing	Metal
Sealing Compound	UL 94V-0

Mounting	Screw-on mounting on chassis, from top
Terminal	Screw Clamp
Operating Temperature [°C]	-25 °C to 100 °C
Climatic Category	25/100/21 acc. to IEC 60068-1
Degree of Protection	IP 20 acc. to IEC 60529
Protection Class	Suitable for appliances with protection class I acc. to IEC 61140
MTBF	> 200'000 h acc. to MIL-HB-217 F

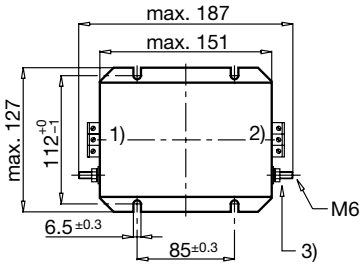
Dimensions

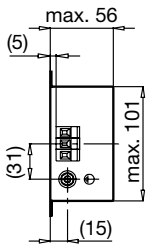
Case 24
I/O connections torque 0.6...0.8 Nm





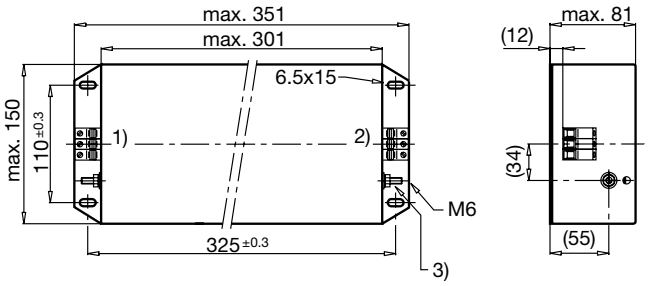
Case 27
I/O connections torque 0.6...0.8 Nm



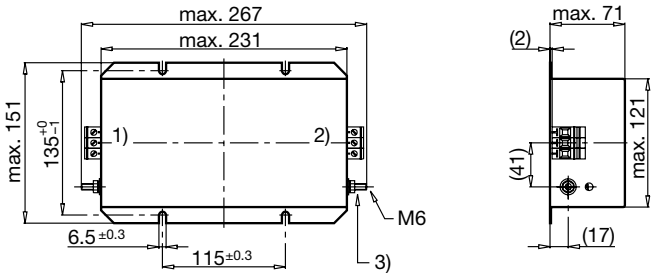


1) Inverter
2) Motor
3) Nut torque 3...4 Nm

Case 38
I/O connections torque 1.5...1.8 Nm

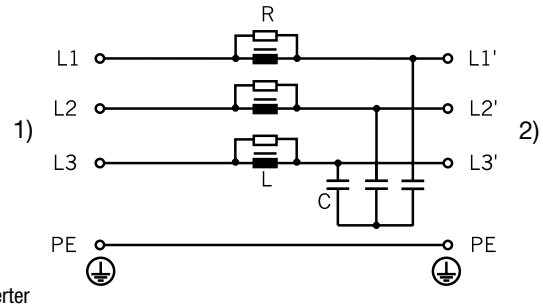


Case 40
I/O connections torque 1.5...1.8 Nm

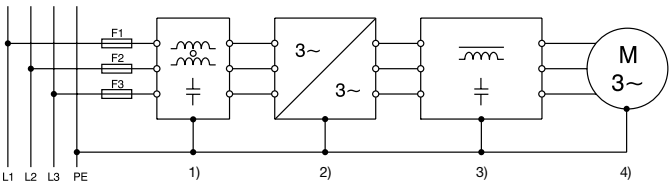


1) Inverter
2) Motor
3) Nut torque 3...4 Nm

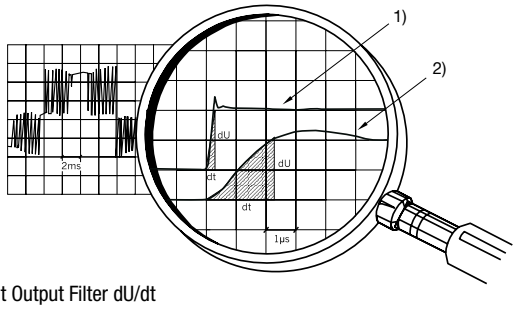
Diagrams



1) Inverter
2) Motor



1) EMC Filter
2) Frequency Inverter
3) Output Filter dU/dt
4) Induction Motor



1) without Output Filter dU/dt
2) with Output Filter dU/dt

Variants

Distributor-Stock-Check | SCHURTER-Stock-Check | e-Store

Rated Current [A]	Rated Voltage [VAC]	Contact Resistance [mΩ]	L [mH]	C [nF]	Weight	Clamps [mm²]	Case	Order Number
16	550	11.6	0.2	4.7	2.2	4	27	FMAC-0A27-1613
25	550	9.2	0.2	4.7	4.7	6	40	FMAC-0A40-2513
32	550	9.2	0.2	4.7	7	10	38	FMAC-0A38-3213
8	550	22	0.2	4.7	1.36	4	24	FMAC-0A24-0813

8A version: packing unit 2 pcs.

Packaging unit 1 Pcs

general product-information

general product-information

Product standard equipment standard

The product standard only contains minimum requirements. Attention is drawn to the fact that appliance specifications might contain requirements additional to or deviating from those specified in the relevant product standards.

Comments on definitions used

Please be aware that the specifications nominal value used in the German part of the Schurter catalogue and the data sheets, is synonymous with rated value.
The difference between these two values is a pure matter of definition. In order to avoid any unnecessary complications we will continue to use the specifications nominal value.

CE marking CE acc. to EU-directives

CE marking is the only marking which indicates that a product conforms to the relevant EU-directive.
This means that the CE-mark is no quality or standard conformity mark but only an administration mark.
SCHURTER products are covered by the low voltage directives 72/23/EEC and 93/68/EEC. Those are valid for equipment and appliances with rated voltage values between AC 50 V to AC 1000 V as well as DC 75 V to DC 1500 V.
The CE marking of SCHURTER parts will be found on the label of the smallest packing unit. On request we will submitt a CE conformity statement for each component. CE conformity statements and approvals can also be retrieved from the internet under www.schurter.com.

Conformity to component standards, national approvals

National testing institutions are testing according to national and international standards or other generally recognized rules of technology. Their certification/approval-marks confirm the observance of the safety requirements which electric appliances must fulfil.

National approvals

(Recognition)	UL	Underwriters Laboratories (USA)
(Listing)	UL	Underwriters Laboratories (USA, Canada)
(Recognition)	UL	Underwriters Laboratories (USA, Canada)
(Listing)	UL	Underwriters Laboratories (USA, Canada)
	CSA	Canadian Standard Association, Component Acceptance Service
	CSA	Canadian Standard Association
	SEV	Schweizerischer Elektrotechnischer Verein
(Mark)	VDE	Verband Deutscher Elektrotechniker
(Certificate of conformity with factory surveillance)		
	BSI	British Standard Institute
	SEMKO	Svenska Elektriska Materielkontrollanstalten
	NEMKO	Norges Elektriske Materiellkontroll
	DEMKO	Danmarks Elektriske Materielkontrol
	FIMKO	Finnish Electrical Inspectorate
	ÖVE	Österreichischer Verband für Elektrotechnik
	KEMA	Keuring van Elektrotechnische Materialien
	IMQ	Instituto italiano del marchio di qualità
(Mark)	European Norms Electrical Certification	
	CCC	China Compulsory Certification

In addition to the combined UL/CSA approvals, most of the SCHURTER components are also approved by one of the European Certification Bodies like VDE (Germany), Electrosuisse (Switzerland) or SEMKO (Sweden). The safety testing of all these European Certification Bodies are based on the commen European Safety Standards. With the harmonisation effort in Europe, the different National European Certification Bodies have lost their importance and SCHURTER has decided to maintain only one European approval (e.g. VDE, SEV or SEMKO) in future. The others will not be renewed once they have expired.

Because UL and CSA are not members of the CENELEC, the standards of UL and CSA are not harmonised yet with the European Standards. However, UL and CSA are trying to harmonize their standards with each other. Where possible, SCHURTER will apply for the combined cULus or cURus approval.

Further to development in Asia, SCHURTER has obtained national approvals from China, Japan and Korea.

IP degrees of protection provided by enclosures (IP code)

Standards IEC 60529; EN 60529

Scope
These standards apply to the classification of degrees of protection provided by enclosures for electrical equipment with a rated voltage not exceeding 72.5 kV.

Object
The object of these standards is to give:

a) Definitions for degrees of protection provided by enclosures of electrical equipment as regards:
1. Protection of persons against access to hazardous parts inside the enclosure
2. Protection of the equipment inside the enclosure against ingress of solid foreign objects
3. Protection of the equipment inside the enclosure against harmful effects due to the ingress of water.

b) Designations for these degrees of protection.
c) Requirements for each designation.
d) Tests to be performed to verify that the enclosure meets the requirements of these standards.

Designations

The degree of protection provided by an enclosure is indicated by the IP Code.

Elements of the IP Code and their meanings

A brief description of the IP Code elements is given in the following table.

IP xy	Meaning for the protection of equipment	Meaning for the protection of persons
	Against ingress of solid foreign objectif	**Against access to hazardous parts with**
x = 0	(non-protected)	(non-protected)
x = 1	50 mm diameter	back of hand
x = 2	12.5 mm diameter	finger
x = 3	2.5 mm diameter	tool
x = 4	1.0 mm diameter	wire
x = 5	dust-protected	wire
x = 6	dust-tight	wire
	Against ingress of water with harmful effects	
y = 0	(non protected)	
y = 1	vertically dripping	
y = 2	dripping (15° tilted)	
y = 3	spraying	
y = 4	splashing	
y = 5	jetting	
y = 6	powerful jetting	
y = 7	temporary immersion	
y = 8	continuous immersion	

Protection against electric shock

1. Protection against direct and indirect contact General terms

The protection against electric shock on electric equipment as well as their components are divided into the following parts:

- Protection against direct contact with live parts concerns all measures for the protection of human beings and animals against hazards which result from direct contact with live parts of electric equipment and their components.

- Protection against indirect contact is the protection of human beings and animals against hazards which result from contact of live parts 1 of electric equipment as well as components thereof, which have become live due to an insulation failure.

[1)] Accessible, conductive part, which is not conductive normally but which may be conductive due to a failure.

2. Protection against direct contact with live parts e.g. of a fuseholder

The data sheets of the relevant components inform about the taken measures.

3. Protection against indirect contact

Measures for the protection against indirect contact on electrical equipment are defined according to IEC 61140 by the 4 protection classes 0, I, II, III. Each protection class includes two protection measures. Even if one of these measures should fail, no electric shocks will occur.

Protection class	Main protective measures
0	1. Basic insulation between live parts and accessible conductive parts. 2. Earth-free location, non-conducting environment.
I 	1. Basic insulation between live parts and accessible conductive parts. 2. Means are provided for the connection of accessible conductive parts of the equipment to the protective (earthing) conductor in the fixed wiring of the installation in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation.
II 	1. Basic insulation between live parts and accessible conductive parts. 2. Additional insulation. Basic and supplementary insulation are summarised under the term "double insulation". Under certain circumstances also a "reinforced insulation» (single insulation system) may guarantee an equivalent protection against electric shock as a "double-insulation" does. No terminal for a protective conductor is allowable. A possibly existing protective conductor must not be connected and has to be insulated like any live part.
III 	1. Functional insulation. 2. Supply at safety extra-low voltage SELV (the circuit is isolated from the mains supply by such means as a safety isolating transformer). The protection against electric shock is in this case completely based on the supplying by SELV-circuits (U ≤ 42 V). Higher voltages are not generated in the equipment. No terminal for a protective conductor is allowable.

Industrial mains filters

Frequency range 0.01 MHz ... 1000 MHz

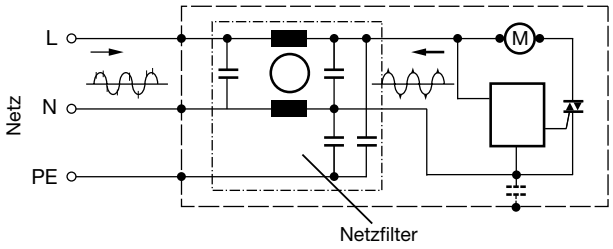
General Information

Electromagnetic Compatibility (EMC) is the capability of electrical equipment (installations, devices, assemblies) to operate effectively in its electromagnetic environment (Immunity), without in turn irresponsibly affecting this environment (Emission).

Mains filters of various types are used for the protection of electronic circuits, components and equipment against transients or similar interference, on the mains power supply. A suitable filter can be selected from the existing product range for each equipment type in accordance with electromagnetic conditions of its environment.

Mains interference can be classified into four categories:
A) Fluctuations in the industrial mains supply
(magnetic voltage stabilizer)
B) Harmonic wave interference in the frequency range 100 Hz ... 2 kHz
(filter type selective harmonic)
C) Transient interference signals in the frequency range up to
300 MHz (filter type low-pass)
D) Sinusoidal interference signals in the frequency range up to
1 GHz (filter type broad band, low-pass)

In practice, however, interference is mainly found in the last three categories B, C and D. Superimposed on the high-voltage mains supply, such interference can affect the performance of electronic circuits, or even cause them damage. An optimally-designed mains filter can perform a double function:



Function 1

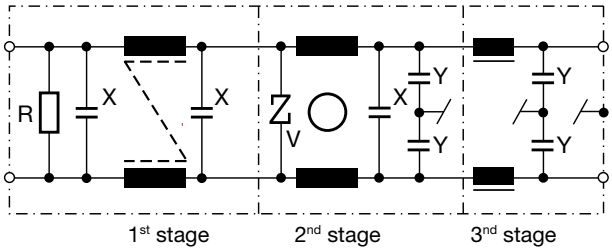
The filter protects an electronic control circuit from voltage spikes in the mains supply, which may be generated, for example, by electromechanical switches and relays.

Function 2

The same filter also acts simultaneously in the opposite direction. The HF interference generated in the unit by thyristor control is attenuated such that the boundary values Class B, (EN 55011/55022) are maintained.

Filters are usually made up of capacitors and inductance coils. Components such as leakage resistors, surge dissipators and VHF chokes can also be integrated into the filter. Broad band filters
which meet the highest requirements are often composed of 2 or 3 single stages put together to make one filter unit:

3-stage filter



1st stage

A differential mode acting filter with high energy absorption. Discharging resistors are normally used for Cx capacitors > 100 nF. The capacitors are tested and approved as so-called Class X noise suppression capacitors. The 1st stage serves as dI/dt limitation.

2nd stage

A common mode acting filter with a high, broad band attenuation ratio. A ZNR varistor surge serves as the overvoltage suppression component. The earthed capacitors are tested and approved as so-called Class Y noise suppression capacitors.

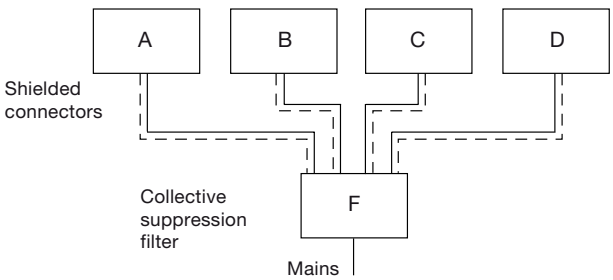
3rd stage

Common mode as well as differential mode acting filter in the HF range up to 300 MHz. Feedthrough capacitors make high attenuation values possible up to the gigahertz range. These capacitors are also Class Y type. SCHURTER uses only approved noise suppression capacitors according to EN 132400.

Filter Assemblies

Three types of mains noise suppression filter assemblies are used in practice:

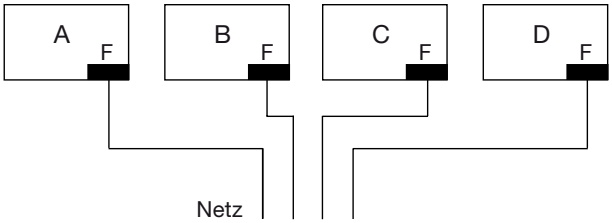
Collective Suppressor



The collective suppressor principle results in one filter per plant. This has to cope with the entire power input. In addition, all of the connecting cables have to be shielded. Furthermore interference generated by «A» device can reach other devices for instance «B» or «C» through the connecting cables. The following example promises to be a more economical solution. In many cases, the single suppressor principle is the most economical

solution.

Single Suppressors



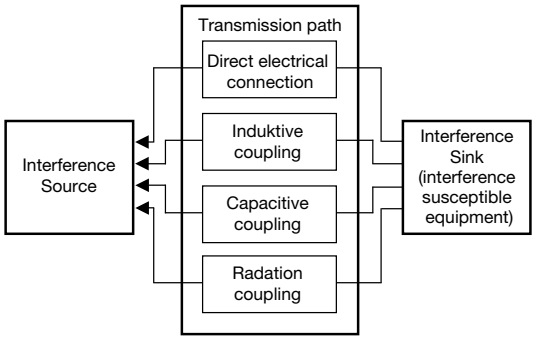
Combined Single and Collective Suppressor

From the technical point of view, only the combined application of both suppression techniques can result in a significant improvement.

Interference Propagation

In the field of interference and RF suppression, the most significant means of transmission is the direct electrical connection, i.e. the connecting wiring. The radiation coupling is also important from the electromagnetic compatibility (EMC) point of view; it cannot, however, be dealt with here.

Interference Propagation



Propagation and Coupling Paths

The capacitive and inductive coupling effects occur inside the case. These could be:
- Capacitive coupling through the coupling capacity of a mains transformer.
- Inductive coupling through control system wiring in parallel.

The introduction briefly mentioned the possibility of the mains filter operating with a double function. Depending on the main area of application, these filters are designated as either RF SUPPRESSION FILTERS or INTERFERENCE SUPPRESSION FILTERS.

The one filter may, therefore, appear under two references in the documentation. A filter is also classified by its mechanical design as well as its electrical data.

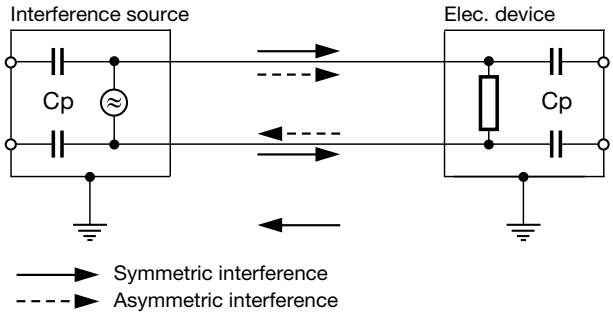
RF SUPPRESSION FILTERS impede the propagation of RF interference, generated by an electronic or electrical device into the mains. They also ensure an interference-free radio reception in the immediate vicinity.

INTERFERENCE SUPPRESSION FILTERS prevent mains interference from affecting electronic equipment. They enable an interference- free operation even in the case of a power supply badly affected by mains interference.

It is common to operate the mains filter in both directions in the one piece of equipment, allowing it to fulfil its double function as both interference and RF suppression filters as specified.

Common- and differential Mode Interference

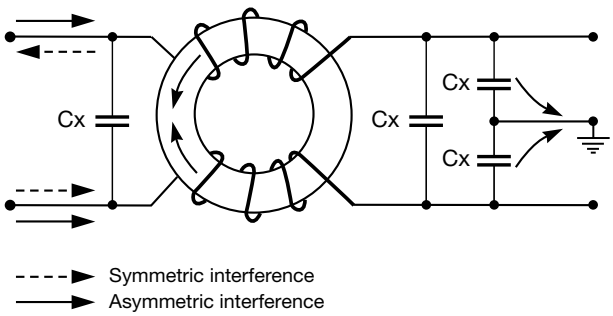
Filter engineering differentiates between common and differential mode interference originating from supply lines.



In the case of a non-earthed interference source, interference at first only propagates along the connecting lines. Like the mains AC current, the parasitic current flows to the user on one lead, and returns to the interference source on the other. Both these currents are in differential mode. This type of interference is therefore referred to as differential mode interference.

Due to the mechanical configuration and its parasitic capacitance, parasitic currents are also generated in the earthing circuit. This parasitic current flows on both connecting leads to the user and over an earthed lead back to the interference source. Both currents on the connecting lead are in common mode. This type of interference is therefore referred to as common mode interference.

Current Compensated Chokes in Interference Suppression Filters



The main type of choke used in suppression filter engineering is the current compensated choke. This mainly damps the common mode interference. The differential mode parasitic current, or rather the magnetic flux they produce in the core, is compensated by means of a special type of winding. The relatively small attenuation of the differential mode parasitic currents can be balanced through the large,

symmetrically connected capacitance C_x between the lines. Only the leakage inductance L_s of the choke is then of any importance.

$$L_{leakage} \approx \frac{L_{nominal}}{50} \text{ to } \frac{L_{nominal}}{100}$$

The high nominal inductance LN active for common mode parasitic currents allows the insertion of small, earthed capacitances CY in a filter circuit. These capacitances are regulated by international standards for leakage currents.

RF Suppression Capacitors:

General Information

All SCHURTER filters are fitted with Class X or Y RF suppression capacitors in accordance with international standards (IEC, EN). These are mainly self-healing metallized paper or polyester types, tested against the standards of major countries around the world and approved as noise suppression capacitors. Class X capacitors are capacitors with unlimited capacity for those applications in which a failure caused by a short circuit cannot result in a dangerous electrical shock. Class Y capacitors are capacitors intended for an operating voltage V_{eff} = 250 V with increased electrical and mechanical safety and limited capacitance.

General notes

a) Leakage current according to IEC 60335-1

The leakage current of a device is mainly determined by the capacity value of the Y-capacitor. According to international standards (IEC 60335-1) the following regulations with respect to leakage current can be assumed:

Type of appliance	Protection class	I_L max. (mA)	U(V)	f(Hz)
Portable appliances	I	0.75	250	50
Stationary motor appliances *	I	3.5	250	50
Stationary heating appliances	I	0.75/kW (max. 5.0)	250	50
Appliances	II	0.25	250	50
Appliances	I, OI, III	0.5	250	50

* Stationary appliances fixed or weighing in excess of 18 kg (without carrying handle).

For other applications:

Ref.	Laboratory	Medical	IT	Test equipment
UL	0.5 mA (UL 1262)	0.1 mA (UL 544)	3.5 mA (UL 1950)	5.0 mA (UL 1244)
IEC		0.1 mA (IEC 60601-1)	3.5 mA (IEC 60950)	3.5 mA (IEC 61010-1)

Filter classification

For easy reading of the catalogue data, SCHURTER uses the following simplified filter classification:

Differential Mode and Common Mode Attenuation

Attenuation value			
Standard	Medium	High	Excellent

Differential Mode and Common Mode Attenuation

20-50 dB	40-70 dB	60-80 dB	70-95 dB

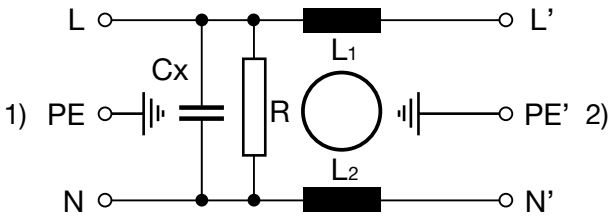
Leakage Current Classification

Operating leakage current			
Medical	Standard	Industrial	Other
<0.1 mA	<0.5 mA	<5 mA	>5 mA

Medical filter

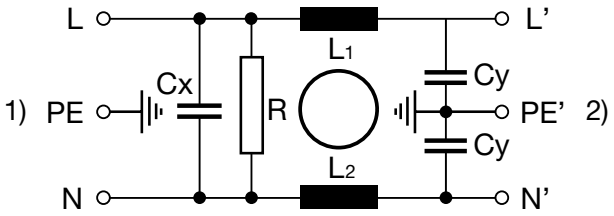
SCHURTER medical filters comply with UL544 and IEC 60601-1 standard specifications and are available in two versions, which differ in terms of their leakage current values.

Medical filter (M5)



1) Line
2) Load

Medical filter (M80)



1) Line
2) Load

Standard medical filters for direct person contact supplied by SCHURTER have a leakage current value of <5 µA (M5). This can only be achieved without C_Y. Here, a common mode fault current against earth is not attenuated and the filter acts only on differential mode fault currents. In addition, an inlet in protection class II can be used here, as no earth connection exists. However, if an earth connection is desired, Type (M80) can be used for indirect person contact; this has a leakage current of <80 µA which is below the required limit value of 0.1 mA. Type (M80) is manufactured to special order.

Bleed resistor

Medical filters and filters with a X-capacitor >100 nF have a bleed resistor so that no inadmissible rest voltage occurs at the touchable pins of the inlet.

EMC requirements in Europe

Household, Luminaries and Telecommunication Residential, commercial and light industrial	**Class Industrial** (ISM) Industrial, Scientific and Medical
Emission IEC 61000-6-3 (EN 50081-1)	**Emission** IEC 61000-6-4(EN 50081-2)
EN 55022 ITE Information technology equipment EN 55014 Household Applications and Tools Harmonic (IEC 61000-3-2) Voltage fluctuations (IEC 61000-3-3)	EN 55011 Harmonics (IEC 61000-3-2) Voltage fluctuation (IEC 61000-3-3)
Immunity IEC 61000-6-1 (EN 50082-1)	**Immunity** IEC 61000-6-2 (EN 50082-2)
IEC 61000-4-2 ESD IEC 61000-4-3 HF-Field IEC 61000-4-4 Burst IEC 61000-4-5 Surge	IEC 61000-4-2 ESD IEC 61000-4-3 Inducted HF-Field (enclosure) IEC 61000-4-6 Inducted HF-Field (lines) IEC 61000-4-4 Burst IEC 61000-4-5 Surge IEC 61000-4-8 NF Magnetic Field (only for magnetic devices)

Electrical Safety Regulations

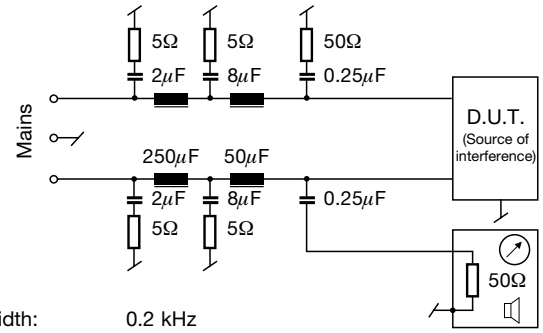
The most important safety standards for equipment/installations are listed in the following:

IEC 60950	Safety of Information Technology Equipment including Electrical Business Equipment
IEC 60335	Safety of Household and similar Electrical Appliances
IEC 61010-1	Safety requirements for Electronic Measuring Apparatus
IEC 60601	Safety requirements for Electro-medical Equipment
UL 1950	Safety requirements for Information Technology Equipment
UL 544	Electric Medical and Dental Equipment

Interference Emissions

There are basically 2 types of emitted disturbances: conducted and radiated. Line interferences are high frequency noise signals which are superimposed on the useful signals on input and output lines. Interference signals can be of common- or differential mode type. The significance of line interference is reduced dramatically above a frequency of 30 MHz. From here radiated interference increases greatly. On the following pages we will nevertheless deal with conducted interference only.

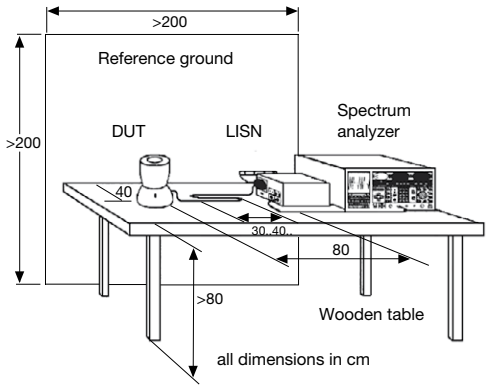
Measuring Technique CISPR 3



Bandwidth: 0.2 kHz
Impedance: 50 Ohm/1 MHz
Frequency range: 10 kHz–30 MHz

Test Receiver

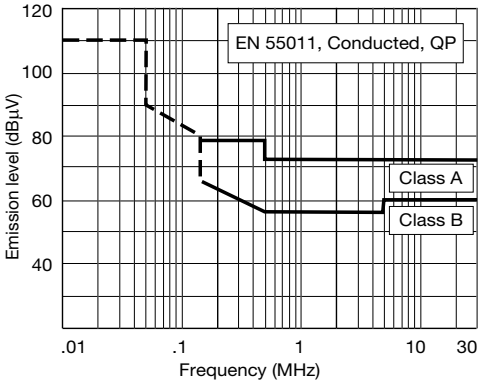
Radio Frequency Interference Boundary Values



RFI testing station

EN 55011: Boundary values and measuring systems for RF suppression for industrial, scientific and medical high frequency equipment (ISM), 1991 (see also CISPR 11 or VDE 0871)

Boundary values complying with EN 55011



Quasipeak (QP) and Average (AV) are two limits, neither of which must be exceeded and which are measured by two different test receivers.

The test arrangement remains the same. These boundary values replace the boundary values given by the old standards for broadband and narrowband noise generators.

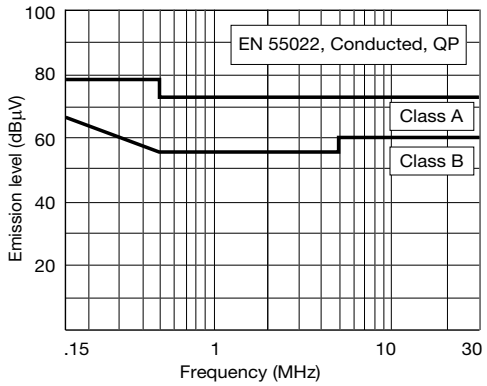
Boundary values are divided into Class A and B.

Into Class A fall those devices which should not be operated in residential buildings and should not be connected to power supplies which also supply these areas. Class A boundary values shall not be exceeded.

Into Class B fall devices for which above restrictions do not apply. Class B boundary values shall not be exceeded.

EN 55022: Boundary values and measuring systems for RF suppression for information technology installations (Telecommunications) 1987 (see also CISPR 22 or VDE 0878).

Boundary values complying with EN 55022



Into Class A fall all units which should be used in a commercial environment and should be used with a safety distance of 30 m to other units.
Into Class B fall all units which have no restrictions on their use.

EN 55013: Boundary value and measuring techniques for RF suppression characteristics of radio receivers and connected applications.

EN 55014: Boundary values and measuring systems for RF suppression for electrical household appliances, handheld electrical tools and similar electrical products, 1993 (see also CISPR 14).

EN 55015: Boundary values and measuring systems for RF suppression for fluorescent lamps and lighting, 1993 (see also CISPR 13).

Harmonics

(EN 61000-3-2, IEC 61000-3-2)
Current harmonics represent a distortion of the normal sine wave provided by the utility. When a product such as an SCR switched load or a switching power supply distorts the current, harmonics at multiples of the power line frequency are generated. Two significant consequences arise as a result of harmonic generation. First, because of finite impedances of power lines, voltage variations are generated that other equipment on the line must tolerate. Second, when generated in a three-phase system, harmonics may cause overheating of neutral lines.

Power line harmonics are generated when a load draws a non linear current from a sinusoidal voltage. The harmonic component is an element of a Fourier series which can be used to define any periodic waveshape. The harmonic order or number is the integral number defined by the ratio of the frequency of the harmonic to the fundamental frequency (e.g., 150 Hz is the third harmonic of 50 Hz; n = 150/50).

After multiple postponement finishes at 1.1. 2001 the transition-period for the EN 61000-3-2, frequently called "PFC-Norm". It applies to all electrical and electronic devices with input current up to max. 16 A per phase, which are designed to connect to the general lowvoltage mains. Limits are set only for 220/380 V, 230/400 V and 240/415 V at 50 Hz.

This standard distinguishes four classes of equipment.

Class	Equipment
A	Simmetric three phase equipment and all other equipment not in other classes
B	Portable tools
C	Lighting equipment
D	Equipment having special Waveshape (see EN 61000-3-2, paragraph 4 picture 1)

A harmonics test to conform to the standards must include an analysis of the incoming current up to the 40th harmonic (for f_N = 50 Hz, f_H = 2 kHz).
The IEC 61642 "Industrial a.c. networks affected by harmonics- Application of filters and shunt capacitors" give guidance for the use of passive a.c. harmonic filters and shunt capacitors for the limitation of harmonics and power factor correction intended to be used in industrial applications, at low and high voltages.

Voltage Fluctuations (Flicker)

(EN61000-3-3, IEC 61000-3-3, IEC 61000-3-5)
The appearance of flicker effects and voltage fluctuations on the mains supply is caused by varying loads connected to the mains. The most critical are the effects of voltage fluctuations on equipment such as lights and illumination. Here the light output and thereby the intensity is an exponential function of the supplied voltage. This fluctuation in light intensity is called flicker. Many people experience dizziness and headaches as a result.

There are various limit values depending on the type of voltage fluctuation (square, sinusoidal and mixed or erratic voltage fluctuation).

Flickers are measured by so-called flicker meters (arranged in compliance with EN 60808).

Immunity

ESD (Electrostatic Discharge)

(EN 61000-4-2, IEC 61000-4-2)
One of the main interference sources, along with switching through radio interference, is electrostatic discharge from people and equipment.

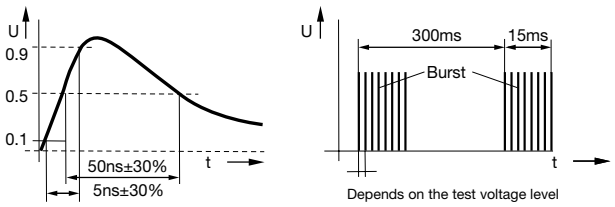
Burst

(EN 61000-4-4, IEC 61000-4-4)
One of the most common and most dangerous sources of interference are transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce, etc.). The burst test measures the resistance of the device to repetitive fast transients.

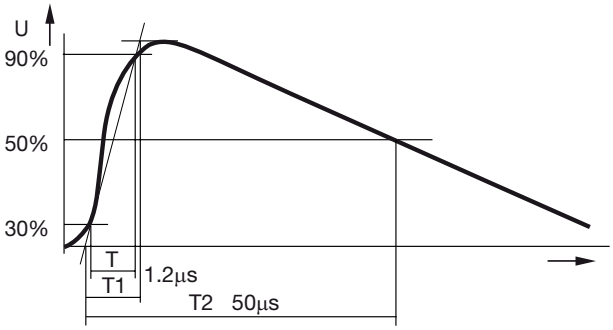
Surge

(EN 61000-4-5, IEC 61000-4-5)
This test procedure measures the behaviour of a device when subjected to high-energy pulses. Sources of such pulses are switching events due to lightning strikes, short-circuits, or switching cycles which vary in time and place. Surge test on SCHURTER filters are according to EN 133200.

Specification of the Burst test impulse



Surge voltage form in open circuit



Guideline for the selection of ESD test levels

Class	Relative ambient humidity as low as [%]	Antistatic material (floor)	Synthetic material (floor)	Level air discharge (kV)	Level contact discharge (kV)
Class 1	35	x		2.00	2.00
Class 2	10	x		4.00	4.00
Class 3	50		x	8.00	6.00
Class 4	10		x	15.00	8.00

Recommended test levels for Fast Transient/Burst (acc. IEC 61000-4-4)

Test levels	The installation is characterized by following attributes	Voltage peak: [kV]		Repetition rate [kHz]
		Power supply	Signal ports	
Level 1 Well-protected environment	Suppression of all EFT/B* in the switched power supply circuits Separation between power supply lines and control and measurement circuits Shielded power supply cables with the screens earthed at both ends	0.50	0.25	5.0
Level 2 Protected environment	Partial suppression of EFT/B* in the power supply and control circuits Separation of all the circuits from other circuits associated with environments of higher severity levels Physical separation of unshielded power supply and control cable from signal and communi-cation cables	1.00	0.50	5.0
Level 3 Typical industrial environment	No suppression of EFT/B* in the power supply and control circuits Poor separation of the industrial circuits from other circuits Dedicated cables for power supply, control, signal and communication lines Poor separation between power supply, control, signal and communication cables	2.00	1.00	5.0
Level 4 Severe industrial environment	No Suppression of EFT/B* in the power supply and control and power circuits No separation between power supply, control, signal and communication cables Use of multicore cables in common for control and signal lines	4.00	2.00	2.5

*EFT/B: Electrical Fast Transient/Burst

Installation classification for Surge Immunity test (acc. IEC 61000-4-5)

Class	Environment definition	Voltage peak [kV]	
		L → N [2kV]	L/N → PE [12kHz]
Class 0 well-protected environment	- All cables with overvoltage protection - Well-designed earthing system - Surge voltage may not exceed 25 V	-	-
Class 1 Partly protected environment	- All cables with overvoltage protection, well interconnected earth line network - Power supply completely separated from the other equipment - Surge voltage may not exceed 500 V	-	0.50
Class 2	- Separate earth line to earthing system - The power supply is separated from other circuits - Non-protected circuits are in the installation, but well separated and in restricted numbers - Surge voltage may not exceed 1000 V	0.50	1.00
Class 3	- The installation is earthed to the common earthing system - Protected electronic equipment and less sensitive electric equipment on the same power supply network - Unsuppressed inductive loads are in the installation	1.00	2.00

Installation classification for Surge Immunity test (acc. IEC 61000-4-5)

Class 4	- The installation is connected to the earthing system for the power installation - Current in the kA range due to earth faults - The power supply network can be the same for both the electronic and the electrical equipment - Surge voltages may not exceed 2000 V	2.00	4.00
Class 5	- Electrical environment for electronic equipment connected to telecommunication cables - The interference voltages can be extremely high - All cables and lines are provided with overvoltage protection	dep. on the local power supply network	dep. on the local power supply network dep. on the local power supply network

General Technical Data - Filter parameters

Rated voltage UR (U_{max})

The rated voltage UR is the maximum RMS alternating line to line voltage (U_{max}) which may be applied continuosly to the terminals of the filter. The rated voltage is the nominal voltage including 10% tolerances.

Example:

Filter with U_R = 440 VAC is made for a power system with nominal voltage 400 VAC +10%.
For standard three phase filters the voltage between phase and earth is intended $U_R/\sqrt{3}$ (example 440/250 VAC).

Filters made for IT power systems withstand a voltage between phase and earth equal to U_R.

SCHURTER filters for IT systems have code endingwith "I": ex. FMAC-0932-2512I.

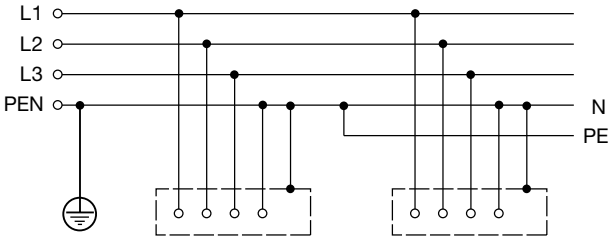
The line frequency f_N (50/60 Hz) may be exceeded under certain conditions. We recommend the users to consult in any case our technical department. DC power operation is possible in most cases.

Power distribution system

There are three main types of power distribution systems according to IEC 60950 (1.2.12): TN, TT, IT.

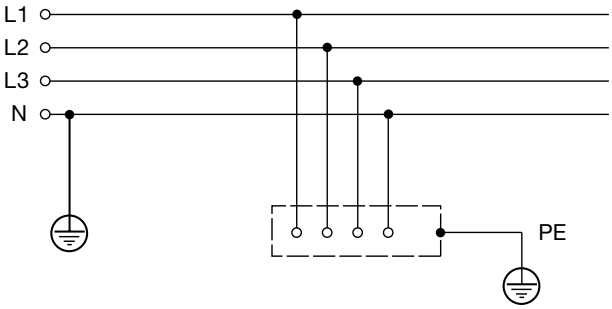
The TN POWER SYSTEM is a power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that point by protective earth conductors. Three types of TN POWER SISTEMS are recognized according to the arrangement of neutral and protective earth conductors: TN-S, TN-C-S, TN-C.

Example of a TN-C-S system



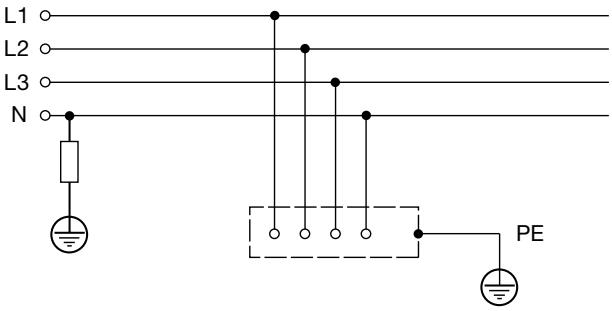
TN-C-S is in a system which neutral and protective functions are combined in a single conductors in a part of the system.

Example of a TT system



A TT POWER SYSTEM is a power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to earth electrodes electrically indipendent of the earth electrodes of the power system.

Example of a IT system



The IT POWER SYSTEM is a power distribution system having no direct connection to earth, the exposed conductive parts of the electrical installation being earthed. In this case the voltage between phase and earth can reach the line to line voltage.

Nominal Current I_N

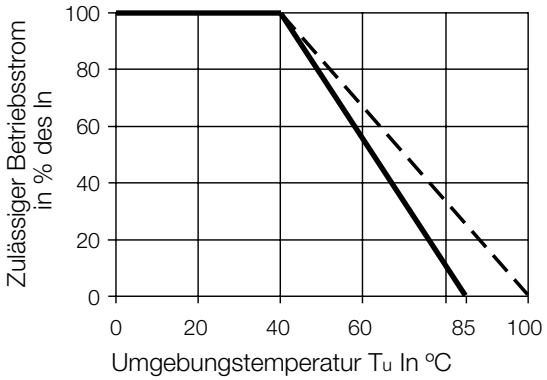
The technical data gives the max continuous supply current in function of the ambient temperature I_N/νa. The SCHURTER range generally differentiates between two types of filters:

- High-current filter: νa at I_N = 40°C
  νa$_{max}$ = 100°C
- All other filters: νa at I_N = 40°C
  νa$_{max}$ = 85°C

The permissible working current at higher ambient temperatures can be read from the following graph.

Permissible Working Current as a Function of Ambient Temperature Up to the approved nominal ambient temperature a the filter can be operated continuously at its nominal current. Above this temperature the square of the nominal current drops off linearly and reaches its zero point at Tmax (85 or 100 °C).

Derating curve (approx.)



Formula:

$$I = I_n \sqrt{\frac{T_{max} - T_a}{T_{max} - T_n}}$$

I = admissible operating current at elevated ambient air temperature
I_n = rated current
T_{max} = max. allowable ambient air temperature Ta (85 °C)
T_a = ambient air temperature
T_n = allowable ambient air temperature at rated current (40 °C)

RF Suppression Capacitor Complying with IEC 60384-14

All SCHURTER filters are equipped with components which have been tested and approved as R_F suppression capacitors.
The most important test data for R_F suppression capacitors are:
Capacitance C_x, C_y ± 20% for fM = 1 kHz

Insulation resistance Ris between the capacitor terminals:
for C > 0.33 µF: R_{is} x C > 2000 s (time constant)
for C 0.33 µF: R_{is} > 6000 MOhm

Major voltage test and standards for C_X and C_Y capacitors

Country	Standard	C	Rigidity	Pulse Test 1.2/50 µs
Europe	EN 132400	X1	4.3 UR VAC	4.0 kV
	IEC 60384-14.2	X2	4.3 UR VAC	2.5 kV
		Y1	4.0 kVAC	8.0 kV
		Y2	2.5 kVAC	5.0 kV
	IEC 60950	X1	2700 V_{DC}, 60s	4.0 kV
	(Equipment Standard)	X2	2121 V_{DC}, 60s	2.5 kV
USA	UL 1414		2121 V_{DC}, 60s	50 Pulse, 10 kV, 1000 W
	UL 1283		2121 VDC, 60s 2545 VDC, 1s	-

Major voltage test and standards for C_X and C_Y capacitors

Switzerland	SEV 1055	x	4.3 UR VAC	3.0 kV
		y	2(100 + 2 UR) min. 2250 VAC	5.0 kV

RF Suppression Chokes Conforming to IEC60938

All SCHURTER filters are fitted with chokes which satisfy the guidelines set down by international and national standards organizations.

The most important test data for RF suppression chokes are:

Maximum variation of inductance:	30% / +50% for compensated 15% / +15% for linear and storage
Test frequency	1MHz ± 20% at L 10 µH 100kHz ± 20% at 10 µH < L 1 mH 10kHz ± 20% at 1 mH < L 50 mH 50 to 120 Hz ± 20% at L > 50 mH
Test current:	0.1 mA
Test temperature:	25°C ± 3°C
Insulation resistance R_{is}:	6000 MOhm

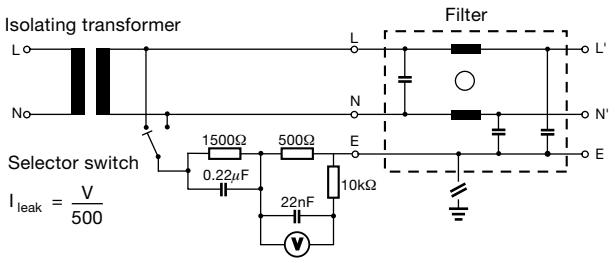
Test voltages

Chokes for	Between connections	Inner and outer insulation
AC	4.3 U_R VDC	2 U_R + 1500 VAC, but at least 2000 VAC
DC	3 U_R VDC	2 U_R + 1500 VDC

Leakage Current

(see also Chapter 1.6 RF Suppression Capacitors: General information)
1-Phase measuring Techniques
Measurement of the leakage current (simplified).
The leakage current is measured from every pole of the network:
- to all accessible metal parts
- to metal parts of protection class II equipment which is separated only by the base material from parts under voltage.

The test is made with AC at 250 V / 50 Hz.
Measurements are made in both switch positions (see diagram).



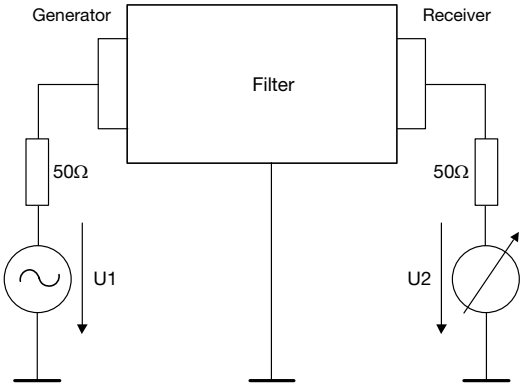
TT or TN Power System according to IEC 60950 - 5.2.3 - Annex D

Protection Class I:

Devices are fitted with a special grounding conductor to provide protection against electrical shocks (L,N,PE wire cable). SCHURTER filters correspond to Protection Class I.

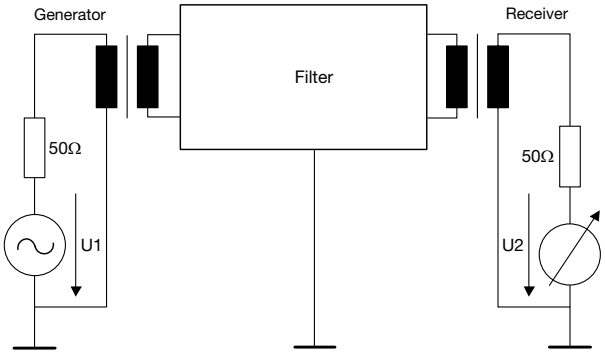
Insertion loss acc. CISPR 17 (common- and differential mode)

Asymmetrical measurement



In common mode measurements, the line and neutral conductors are measured with respect to earth.
Line (L) and neutral (N) are measured to earth (E).

Symmetrical measurement



In differential mode measurements, the insertion transmission loss is measured between line and neutral through a balancing transformer; the earth wire is not used.
4-pole network with integrated balancing transformer for the measurement of insertion transmission loss in the symmetric case.

Measurement Method

The insertion loss D is defined as that loss which results when a four-pole network is inserted into an existing layout, having a surge impedance Z, assuming that the LHS and the RHS terminal impedances of the four-pole network are equal in magnitude and real, the insertion transmission loss and the overall loss are the same.
The insertion transmission loss, in decibels, can be obtained as follows:

$$D_{dB} = \frac{20 \log (U_G)}{2\ U_2}$$

IEC 60939-2

Nominal voltage connections	Between	Inner and outer insulation	
		C*≤ 1 µF	C*> 1 µF
150 ≤ U_R ≤ 250 VAC	4.3 U_R VDC	1500 VAC or 2250 VDC	4.3 U_R VDC
250 ≤ U_R ≤ 500 VAC	4.3 U_R VDC	2 kVAC or 3 kVDC	4.3 U_R VDC
500 ≤ U_R ≤ 760 VAC	4.3 U_R VDC	3 kVAC or 4 kVDC	4.3 U_R VDC

*) C is the capacity measured between the connection block to which the high voltage is connected for test.

UL 1283
(Appliance filters)

Nominal voltage	Between connection	Between connection and case
UR ≤ 250 VAC	1250 VAC or 1768 VDC	1500 VAC or 2121 VDC

In compliance to the known standards of the IEC, EN, VDE and UL, the filters are tested as follows. In principle, these tests correspond to those of the RF suppression capacitors.

Test duration

- 2 sec for production test
- 60 sec for types test

The SCHURTER final production test has a duration of 2 sec. This test may not be repeated more than one time (i.e. incoming inspection at the customer). Any filter that has been under test for 60 sec can not be commercially used (reduced life cycle).

type index

index by order numbers

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