guide to the complete on-line catalog

SCHURTER
ELECTRONIC COMPONENTS

Circuit Protection
Equipment Connections
Input Systems
EMC Products
EMS

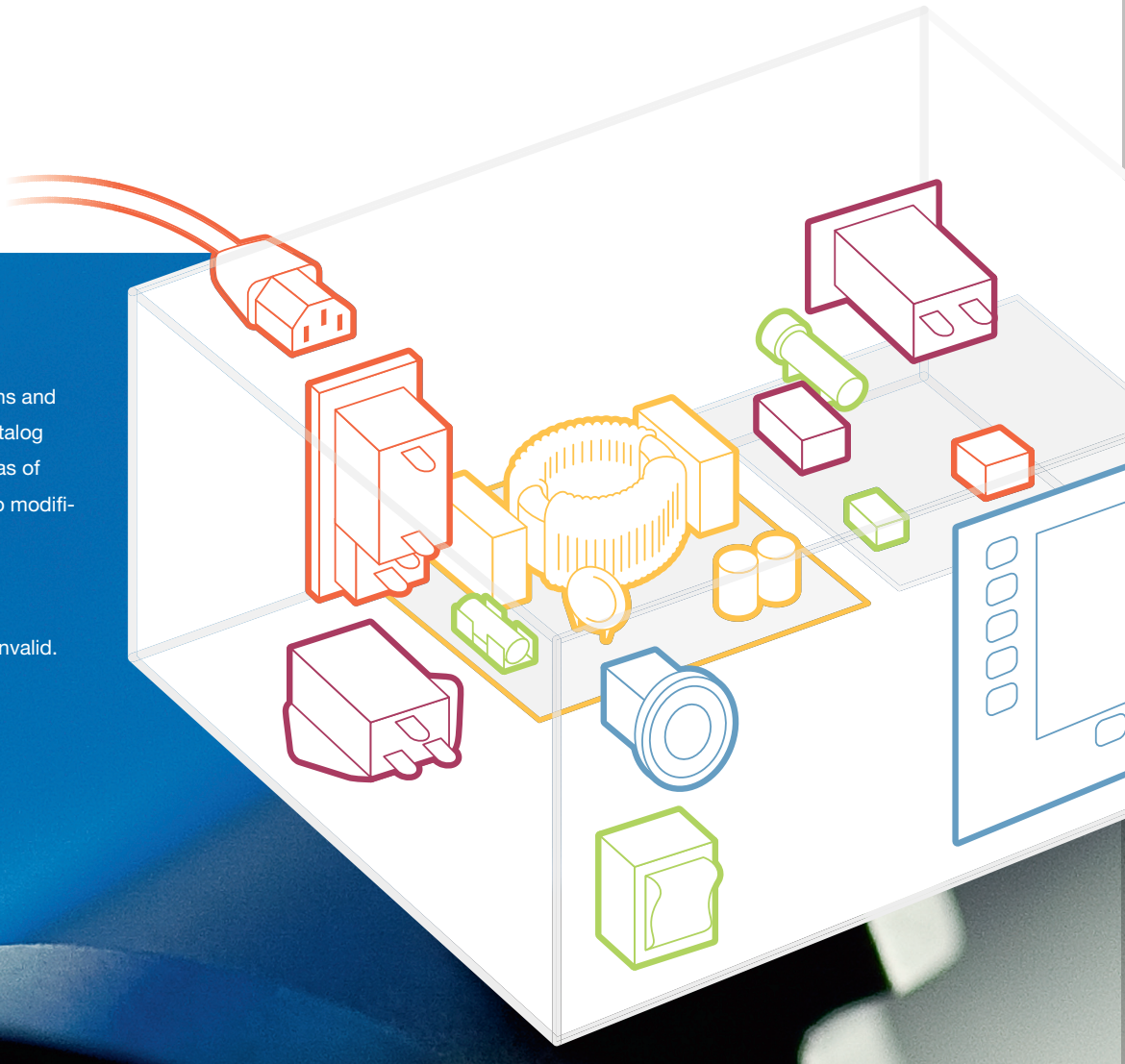
the SCHURTER range at a glance

foreword

From component provider to system supplier

In today's world, providing outstanding, top quality products no longer entirely satisfies the high requirements of our customers.
We therefore support our partners in the development of individual solutions and continuously expand our products and services.

Hans-Rudolf Schurter, SCHURTER Holding AG



The specifications, descriptions and illustration indicated in this catalog are based on the information as of 02/11. All content is subject to modifications and amendments.

With the present catalogue, all previous editions become invalid.

Printed in Switzerland

content

Webnavigation

How to use the SCHURTER Range at a Glance catalog

This SCHURTER catalog contains an overview of the company's entire product range in a handy quick-reference guide. It is intended to be used in combination with the SCHURTER website, where continuous updates are made to ensure the latest available product information.

Navigating the SCHURTER Range at a Glance catalog to the web

Navigating the SCHURTER catalog and the website is made easy because their look alike format. Use the SCHURTER Range at a Glance catalog to identify your products of interest and visit the mentioned URL to locate detailed technical information including PDF files, approvals, CAD drawings and other related tools to aid your selection of SCHURTER products.

Quick tour

Take a look at the example, which is taken from a section of this SCHURTER catalog. Proceed with following steps:

1 | Select product area of interest and specific type in the catalog.
2 | Go to the mentioned URL and select your preferred language.
3 | Select specific type, e.g. FMBB NEO to access detailed product information.

Product search

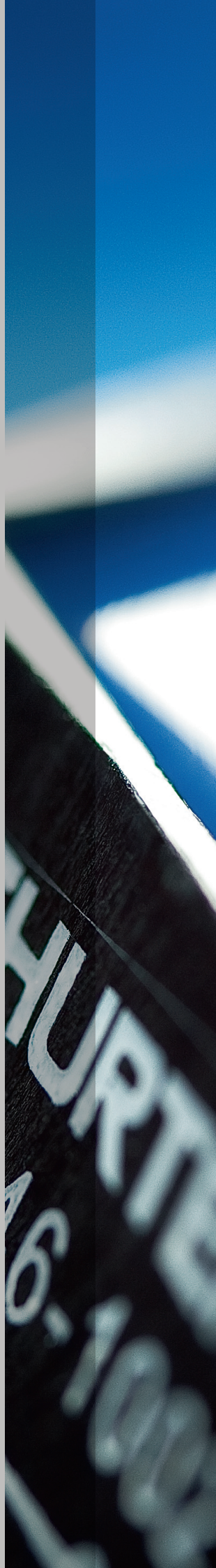
If you want to run a quick search, proceed with following steps:

1 | Select product of interest.
2 | From the drop down search box, select search by part no. or type.
3 | Enter specific type, e.g. FMBB NEO to access detailed product information.

Product selection by attributes

If you want to compare different products on attribute base:

1 | Select product area of interest and specific attributes.
2 | Go to the mentioned URL and select your preferred language.
3 | From the search area, select the relevant attribute instance.
4 | Select specific type based on comparison.




1
CATALOG
search
reference
telecom fuses
www.schurter.com/pg01_3
SCHURTER's Telecom Fuses
SURFACE MOUNT FUSE
TF 600
2
WEBSITE
search
by article or
free text
Products
Quick Links
News
3
WEBSITE
details on
search results
Search for "FMBB NEO" returned 14 matches
4
WEBSITE
webselector:
select preferred
product or
refine search
Single Phase Block Filters

The components of our success

A leader in many markets, a role model in every respect: For SCHURTER, success is based on more than just technological achievements. After all, it is the people here that make it possible to offer people elsewhere a maximum of advantages and security. The task we have assigned to ourselves therefore is clear: Let us establish an environment that facilitates and fosters human achievements – for the benefit of all.

Corporate Ethics
SCHURTER knows that an impeccable brand image can only be built on a foundation of rock-solid values. That is why we continuously optimize the quality of our products and services. We collaborate intensively with our customers and partners. And we take – perhaps our most demanding job – full responsibility for our actions towards our staff, society and the environment.

Quality
SCHURTER considers the quality of its products and services key factors for the continuing success of our company. We manage, monitor and further improve excellent processes with the aid of our management systems which we have established and certified in accordance with ISO 9001, ISO 14001, OHSAS 18001 and SA 8000 (more information: www.schurter.com). They confirm unequivocally that we take very personally and seriously issues such as quality assurance, process, environmental and human resources management and on-the-job safety as well as socially responsible and ethical behavior in management.

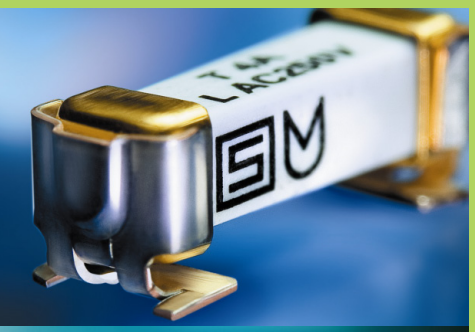
Research and Development
SCHURTER, being an innovator, manufacturer and leading supplier of electronic and electrical components, refuses to slow down. To be successful is our permanent incentive. We are used to meeting new challenges in the most diverse of markets each day, to boldly realizing new ideas, to supporting and driving forward our R&D teams, and to learning from our own successes and our customers' expectations.

Sales and Distribution
SCHURTER is an influential, globally active industrial partner. We are not only, thanks to our products, on the cutting edge of technology; we are, thanks to our distribution network, very close to the markets – with headquarters in Europe, the Americas and Asia as well as regional representatives in over 50 countries and about 200 distributors worldwide, all perfectly familiar with their local regulations, needs and peculiarities – making it a great deal easier for us to always have the best solutions ready for our customers.

Sustainability
SCHURTER didn't subscribe to this vision just yesterday. Also, we commit ourselves to it from points of view by far surpassing healthy long-term economic development and respect for the environment. Sustainability also determines our social commitment and our principles of leadership. It is so important to us, in fact, that we have dedicated an entire information brochure to it (we will gladly send you a copy). Let us join forces and work on a secure future, in every respect!

„Both now and in the future, our customers are guaranteed the best products worldwide; products which perfectly correspond to their individual needs.
SCHURTER is permanently committed to the excellent quality of its products and business practices whichare ecologically sound.“

Hans-Rudolf Schurter, Schurter Holding AG



UMZ 250

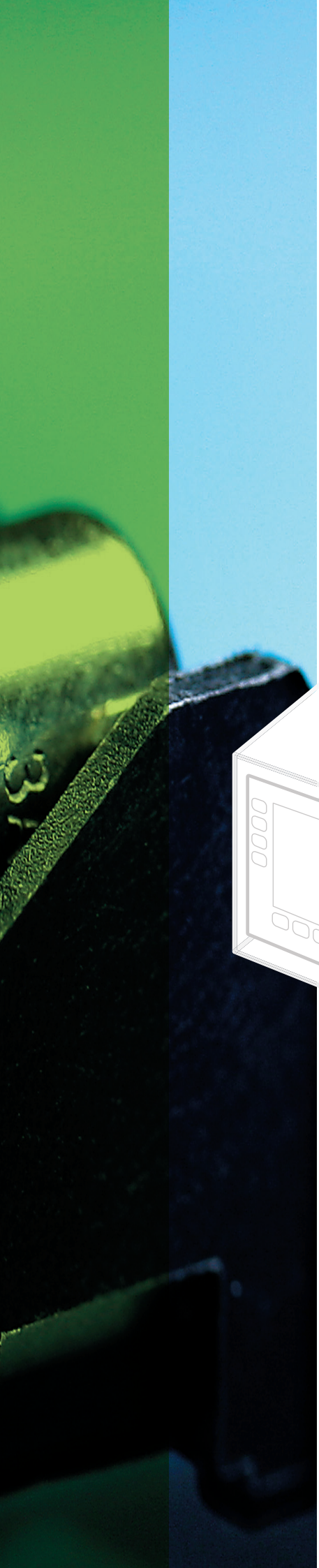
SMD fuse with clip

FUA

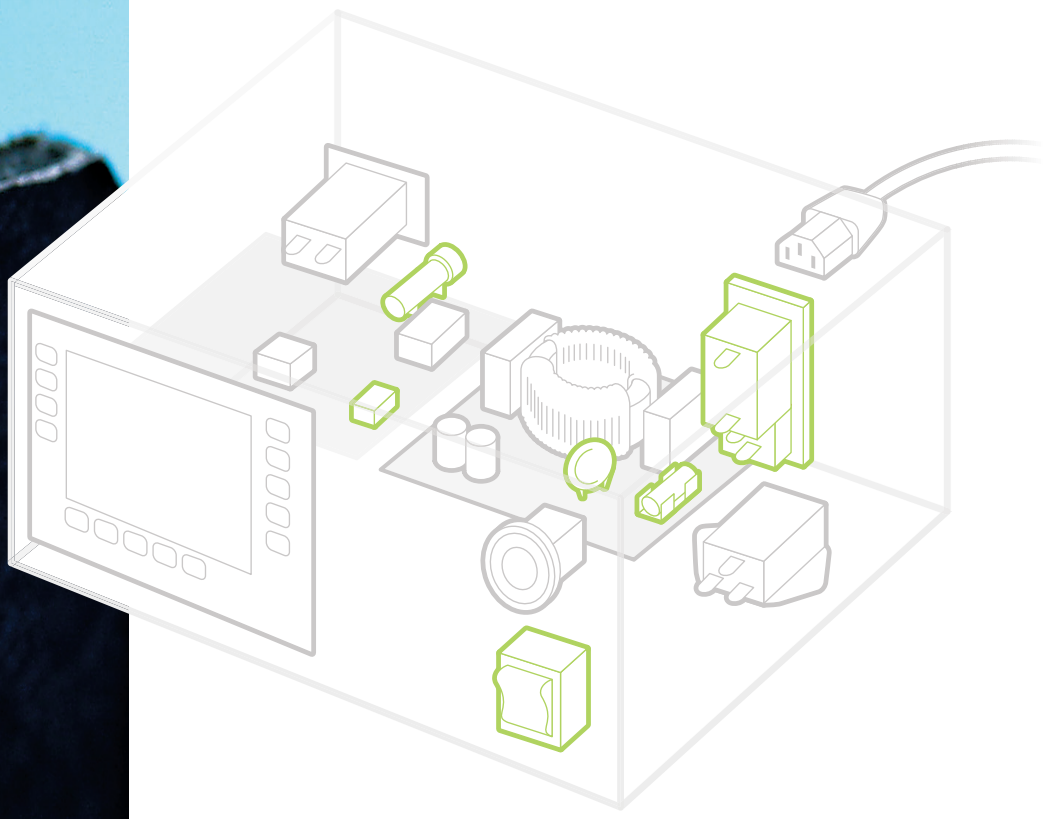
shock-safe fuseholder, 5 x 20 / 6.3 x 32 mm

TA35

circuit breaker for equipment thermal, rocker actuation, 1 - 3 pole



Circuit protection



SCHURTER's non-resettable fuses
provide low voltage primary and secondary protection. Devices meet applicable international safety standards. The MGA-S type fuse complies with ESA/ESCC generic specification No. 4008 for use in space.

SURFACE MOUNT FUSE				
 **USF 0402** Surface Mount Fuse, 1.05 x 0.55 mm, Super-Quick-Acting FF, 32 VDC cULus CCC	Rated Current **0.375 - 5A**	Characteristic **Super-Quick-Acting FF**	Dimensions **1.05x0.55mm**	Rated Voltage **32VDC** Breaking Capacity **35A**
 **USF 0603** Surface Mount Fuse, 1.6 x 0.8 mm, Super-Quick-Acting FF, 32 VAC, 63 VDC cULus CCC	Rated Current **0.5 - 5A**	Characteristic **Super-Quick-Acting FF**	Dimensions **1.6x0.8mm**	Rated Voltage **32VAC / 63VDC** Breaking Capacity **50A**
 **USF 1206** Surface Mount Fuse, 3.2 x 1.6 mm, Super-Quick-Acting FF, 32 VAC, 63 VDC cULus CCC	Rated Current **0.375 - 4A**	Characteristic **Super-Quick-Acting FF**	Dimensions **3.2x1.6mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50A**
 new **USFF 1206** Surface Mount Fuse, 3.2 x 1.6 mm, Super-Quick-Acting FF, 24 VDC, low impedance cULus	Rated Current **0.16 - 0.25A**	Characteristic **Super-Quick-Acting FF**	Dimensions **3.2x1.6mm**	Rated Voltage **125VAC / 63VDC** Breaking Capacity **100A**
 **USI 1206** Surface Mount Fuse, 3.2 x 1.6 mm, Quick-Acting F, 32 VAC, 63 VDC cULus VDE CCC	Rated Current **0.5 - 6.3A**	Characteristic **Quick-Acting F**	Dimensions **3.2x1.6mm**	Rated Voltage **32VAC / 63VDC** Breaking Capacity **63A**
 new **UST 1206** SMD Fuse, 3.2 x 1.6 mm, Slow-Blow, 32 VAC, 63 VDC cULus	Rated Current **7 - 25A**	Characteristic **Slow-Blow**	Dimensions **3.2x1.6mm**	Rated Voltage **32VAC / 63VDC** Breaking Capacity **100 - 400A**
 **MGA** Surface Mount Fuse, 3.2 x 1.55 mm, Super-Quick-Acting FF, 125 VAC, 125 VDC, 150 °C cULus CCC	Rated Current **0.2 - 5A**	Characteristic **Super-Quick-Acting FF**	Dimensions **3.2x1.6mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50A**

 new	**MGA-S** Surface Mount Fuse for Space Application, ESCC QPL Listed	Rated Current **0.14 - 3.5A**	Characteristic **Super-Quick-Acting FF**	Dimensions **3.2x1.6mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50 - 300A**
	**UMT 250** Surface Mount Fuse, 10.1 x 3 mm, Time-Lag T, 250 VAC, 125 VDC	Rated Current **0.08 - 10A**	Characteristic **Time-Lag T**	Dimensions **10.1x3mm**	Rated Voltage **250VAC / 125VDC** Breaking Capacity **35 - 200A**
 new	**UMF 250** Surface Mount Fuse, 10.1 x 3 mm, Quick-Acting F, 250 VAC, 125 VDC	Rated Current **0.5 - 12.5A**	Characteristic **Quick-Acting F**	Dimensions **10.1x3mm**	Rated Voltage **250VAC / 125VDC** Breaking Capacity **100 - 200A**
 new	**UMZ 250** Surface Mount Fuse with Clip, 11.1 x 3.8 mm, Time-Lag T, UMZ 250 = UMT 250 (Au) + UMC 250	Rated Current **0.08 - 4A**	Characteristic **Time-Lag T**	Dimensions **11.1x3.8mm**	Rated Voltage **250VAC / 125VDC** Breaking Capacity **200A**
	**172876** Surface Mount Fuse, 7 x 2 mm, Quick-Acting F, 125 VAC, 125 VDC	Rated Current **0.063 - 15A**	Characteristic **Quick-Acting F**	Dimensions **7x2mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **300A**
	**MKF** Surface Mount Fuse, 7 x 2.54 mm, Quick-Acting F, 125 VAC, 125 VDC	Rated Current **0.063 - 15A**	Characteristic **Quick-Acting F**	Dimensions **7x2.54mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **300A**
	**MSB** Surface Mount Fuse, 7 x 2 mm, Time-Lag T, 125 VAC, 125 VDC	Rated Current **0.75 - 15A**	Characteristic **Time-Lag T**	Dimensions **7x2mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50 - 150A**
	**MKT** Surface Mount Fuse, 7 x 2.54 mm, Time-Lag T, 125 VAC, 125 VDC	Rated Current **2 - 15A**	Characteristic **Time-Lag T**	Dimensions **7x2.54mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50 - 150A**

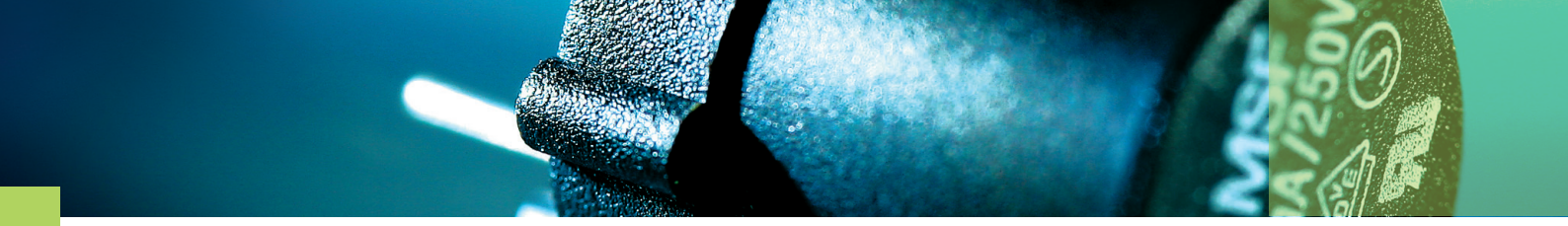
	**OMF 63** **Surface Mount Fuse, 7.4 x 3.1 mm, Quick-Acting F, 63 VAC, 63 VDC**	Rated Current **0.063 - 10A**	Characteristic **Quick-Acting F**	Dimensions **7.4x3.1mm**	Rated Voltage **63VAC / 63VDC** Breaking Capacity **50A**
	**MSB** **Surface Mount Fuse, 7 x 2 mm, Time-Lag T, 125 VAC, 125 VDC**	Rated Current **0.75 - 15A**	Characteristic **Time-Lag T**	Dimensions **7x2mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50 - 150A**
	**OMK 63** **Surface Mount Fuse with Holder, 12 x 5.2 mm, Quick-Acting F, 63 VAC, 63 VDC**	Rated Current **0.063 - 5A**	Characteristic **Quick-Acting F**	Dimensions **12x5.2mm**	Rated Voltage **63VAC / 63VDC** Breaking Capacity **50A**
	**OMF 125** **Surface Mount Fuse, 7.4 x 3.1 mm, Quick-Acting F, 125 VAC, 125 VDC**	Rated Current **0.063 - 10A**	Characteristic **Quick-Acting F**	Dimensions **7.4x3.1mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **100A**
	**OMK 125** **Surface Mount Fuse with Holder, 12 x 5.2 mm, Quick-Acting F, 125 VAC, 125 VDC**	Rated Current **0.063 - 5A**	Characteristic **Quick-Acting F**	Dimensions **12x5.2mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **100A**
	**OMT 125** **Surface Mount Fuse, 7.4 x 3.1 mm, Time-Lag T, 125 VAC, 125 VDC**	Rated Current **0.25 - 6.3A**	Characteristic **Time-Lag T**	Dimensions **7.4x3.1mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **100A**
	**OMZ 125** **Surface Mount Fuse with Holder, 12 x 5.2 mm, Time-Lag T, 125 VAC, 125 VDC**	Rated Current **0.25 - 5A**	Characteristic **Time-Lag T**	Dimensions **12x5.2mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **100A**
	**OMF 250** **Surface Mount Fuse, 11 x 4.6 mm, Quick-Acting F, 250 VAC, 250 DC**	Rated Current **0.25 - 4A**	Characteristic **Quick-Acting F**	Dimensions **11x4.6mm**	Rated Voltage **250VAC / 250VDC** Breaking Capacity **100A**

	**OMT** **Surface Mount Fuse, 11 x 4.6 mm, Time-Lag T, 250 VAC**	Rated Current **0.75 - 5A**	Characteristic **Time-Lag T**	Dimensions **11x4.6mm**	Rated Voltage **250VAC** Breaking Capacity **50 - 100A**
	**SMD-FST** **Surface Mount Fuse, 5 x 20 mm, Time-Lag T, L, 250 VAC, Au plating**	Rated Current **0.05 - 20A**	Characteristic **Time-Lag T**	Dimensions **5x20mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 125A**
	**SMD-SPT** **Surface Mount Fuse, 5 x 20 mm, Time-Lag T, H, 250 VAC, Au plating**	Rated Current **1 - 16A**	Characteristic **Time-Lag T**	Dimensions **5x20mm**	Rated Voltage **250VAC / 300VDC** Breaking Capacity **500 - 1500A**
	**SMD-FTT** **Surface Mount Fuse, 5 x 20 mm, Super-Time-Lag TT, L, 250 VAC, Au plating**	Rated Current **0.16 - 4A**	Characteristic **Super-Time-Lag TT**	Dimensions **5x20mm**	Rated Voltage **250VAC** Breaking Capacity **35A**

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see fuses page 159

UMZ 250: The successful SMD fuse UMT 250 with clip option

The clip model ensures that the equipment manufacturer must specify the required fuse to be used in case of fuse failure.



SCHURTER's non-resettable fuses
provide low voltage primary and secondary protection. Devices meet applicable international safety standards. The MGA-S type fuse complies with ESA/ESCC generic specification No. 4008 for use in space.

SUBMINIATURE FUSE				
 **MSF 125** **Subminiature Fuse, 6.4 mm, Quick-Acting F, 125 VAC, 125 VDC**	Rated Current **0.1 - 5A**	Characteristic **Quick-Acting F**	Dimensions **6.4x6.4mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **100A**
 **MSF 250** **Subminiature Fuse, 8.5 mm, Quick-Acting F, 250 VAC, 250 VDC**	Rated Current **0.04 - 5A**	Characteristic **Quick-Acting F**	Dimensions **8.5x8.5mm**	Rated Voltage **250VAC** Breaking Capacity **35A**
 **MST 250** **Subminiature Fuse, 8.5 mm, Time-Lag T, 250 VAC**	Rated Current **0.05 - 6.3A**	Characteristic **Time-Lag T**	Dimensions **8.5x8.5mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 63A**
 **MSTU 250** **Subminiature Fuse, 8.5 mm, Time-Lag T, 250 VAC, cULus**	Rated Current **0.063 - 10A**	Characteristic **Time-Lag T**	Dimensions **8.5x8.5mm**	Rated Voltage **250VAC** Breaking Capacity **50A**
 **MXT 250** **Subminiature Fuse, 8.5 mm, Time-Lag T, 250 VAC, 100 A**	Rated Current **0.8 - 10A**	Characteristic **Time-Lag T**	Dimensions **8.5x8.5mm**	Rated Voltage **250VAC** Breaking Capacity **100A**
 **172321** **Subminiature Fuse, 2.3 x 8 mm, Quick-Acting F, 125 VAC, 125 VDC**	Rated Current **0.063 - 15A**	Characteristic **Quick-Acting F**	Dimensions **8x2.36mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **300A**
 **172322** **Subminiature Fuse, 2.3 x 8 mm, Quick-Acting F, IEC, 125 VAC, 125 VDC**	Rated Current **0.063 - 15A**	Characteristic **Quick-Acting F**	Dimensions **8x2.36mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50 - 300A**

	**172593** **Subminiature Fuse, 3.8 x 10 mm, Quick-Acting F, 250 VAC, 125 VDC**	Rated Current **0.05 - 5A**	Characteristic **Quick-Acting F**	Dimensions **10x3.8mm**	Rated Voltage **250VAC / 125VDC** Breaking Capacity **50 - 300A**
	**172844** **Subminiature Fuse, 3.8 x 10 mm, Time-Lag T, 125 VAC, 125 VDC**	Rated Current **0.125 - 10A**	Characteristic **Time-Lag T**	Dimensions **10x3.8mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **40 - 100A**
	**SPT 3.6x10** **Subminiature Fuse, 3.6 x 10 mm, Time-lag T, 250 VAC**	Rated Current **0.1 - 5A**	Characteristic **Time-Lag T**	Dimensions **11x3.9mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 40A**
new 	**FRT 250F** **Subminiature Fuse, 11.5 x 5 mm, Flink F**	Rated Current **0.16 - 10A**	Characteristic **Quick-Acting F**	Dimensions **11.5x5mm**	Rated Voltage **250VAC** Breaking Capacity **100A**
	**FRT 250T** **Subminiature Fuse, 11.5 x 5 mm, Träge T**	Rated Current **0.2 - 10A**	Characteristic **Time-Lag T**	Dimensions **11.5x5mm**	Rated Voltage **250VAC** Breaking Capacity **50 - 100A**
	**PSC 125V** **Subminiature Fuse, 10 x 10 mm, 125 VAC, 125 VDC**	Rated Current **1 - 5A**	Characteristic **Quick-Acting F**	Dimensions **10x10mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **50A**

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General product information see fuses page 159

SCHURTER's non-resettable fuses

provide low voltage primary and secondary protection. Devices meet applicable international safety standards. The MGA-S type fuse complies with ESA/ESCC generic specification No. 4008 for use in space.

MIDGET FUSE

new

ASO 10.3x38

Midget Fuse, 10.3 x 38 mm, Quick-acting, 1000 VDC, Photovoltaic

Rated Current **1 - 30A**

Characteristic **Quick-Acting F**

Dimensions **10.3x38mm**

Rated Voltage **1000VDC**

Breaking Capacity **20kA**

MINIATURE FUSE

FSF 5x20

Miniature Fuse, 5 x 20 mm, Quick-Acting F, L, 250 VAC

Rated Current **0.032 - 10A**

Characteristic **Quick-Acting F**

Dimensions **5x20mm**

Rated Voltage **250VAC**

Breaking Capacity **35 - 100A**

FSF 5x20 Pigtail

Miniature Fuse with Pigtail, 5.4 x 22.5 mm, Quick-Acting F, L, 250 VAC

Rated Current **0.5 - 10A**

Characteristic **Quick-Acting F**

Dimensions **22.5x5.4mm**

Rated Voltage **250VAC**

Breaking Capacity **35 - 100A**

FST 5x20

Miniature Fuse, 5 x 20 mm, Time-Lag T, L, 250 VAC

Rated Current **0.02 - 20A**

Characteristic **Time-Lag T**

Dimensions **5x20mm**

Rated Voltage **250VAC**

Breaking Capacity **35 - 200A**

FST 5x20 Pigtail

Miniature Fuse with Pigtail, 5.4 x 22.5 mm, Time-Lag T, L, 250 VAC

Rated Current **0.05 - 20A**

Characteristic **Time-Lag T**

Dimensions **22.5x5.4mm**

Rated Voltage **250VAC**

Breaking Capacity **35 - 200A**

SP 5x20

Miniature Fuse, 5 x 20 mm, Quick-Acting F, H, 250 VAC

Rated Current **0.5 - 16A**

Characteristic **Quick-Acting F**

Dimensions **5x20mm**

Rated Voltage **250VAC**

Breaking Capacity **500 - 1500A**

SP 5x20 Pigtail

Miniature Fuse with Pigtail, 5.4 x 22.5 mm, Quick-Acting F, H, 250 VAC

Rated Current **0.5 - 16A**

Characteristic **Quick-Acting F**

Dimensions **22.5x5.4mm**

Rated Voltage **250VAC**

Breaking Capacity **500 - 1500A**

	**SPT 5x20** Miniature Fuse, 5 x 20 mm, Time-Lag T, H, 250 VAC, UL: 115 V - 300 VDC	Rated Current **0.5 - 16A**	Characteristic **Time-Lag T**	Dimensions **5x20mm**	Rated Voltage **250VAC / 300VDC** Breaking Capacity **500 - 1500A**
	**SPT 5x20 Pigtail** Miniature Fuse with Pigtail, 5.4 x 22.5 mm, Time-Lag T, H, 250 VAC, UL: 115 - 300 VDC	Rated Current **0.5 - 16A**	Characteristic **Time-Lag T**	Dimensions **22.5x5.4mm**	Rated Voltage **250VAC / 300VDC** Breaking Capacity **500 - 1500A**
	**FSK 5x20** Miniature Fuse, 5 x 20 mm, Quick-Acting F, cULus, 250 VAC	Rated Current **0.05 - 6.3A**	Characteristic **Quick-Acting F**	Dimensions **5x20mm**	Rated Voltage **250VAC** Breaking Capacity **32 - 10kA**
	**FSK 5x20 Pigtail** Miniature Fuse with Pigtail, 5.4 x 22.5 mm, Quick-Acting F, cULus, 250 VAC	Rated Current **0.05 - 6.3A**	Characteristic **Quick-Acting F**	Dimensions **22.5x5.4mm**	Rated Voltage **250VAC** Breaking Capacity **32 - 10kA**
	**FSL 5x20** Miniature Fuse, 5 x 20 mm, Time-Lag T, cULus, 250 VAC	Rated Current **0.08 - 3A**	Characteristic **Time-Lag T**	Dimensions **5x20mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 10kA**
	**FSL 5x20 Pigtail** Miniature Fuse with Pigtail, 5.4 x 22.5 mm, Time-Lag T, cULus, 250 VAC	Rated Current **0.08 - 3A**	Characteristic **Time-Lag T**	Dimensions **22.5x5.4mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 10kA**
	**SA 5x20** Miniature Fuse, 5 x 20 mm, Super-Quick-Acting FF, 250 VAC	Rated Current **1.6 - 10A**	Characteristic **Super-Quick-Acting FF**	Dimensions **5x20mm**	Rated Voltage **250VAC** Breaking Capacity **1500A**
	**FSM 5x20** Miniature Fuse, 5 x 20 mm, Medium-Time-Lag M, 250 VAC	Rated Current **0.315 - 10A**	Characteristic **Medium-Time-Lag M**	Dimensions **5x20mm**	Rated Voltage **250VAC** Breaking Capacity **43/80 - 1000A**

	**FTT 5x20** **Miniature Fuse, 5 x 20 mm, Super-Time-Lag TT, 250 VAC**	Rated Current **0.063 - 4A**	Characteristic **Super-Time-Lag TT**	Dimensions **5x20mm**	Rated Voltage **250VAC** Breaking Capacity **35A**
	**D1** **Miniature Fuse, 5 x 20 mm, Quick-Acting F, NF, 220 VAC**	Rated Current **0.02 - 20A**	Characteristic **Quick-Acting F**	Dimensions **5x20mm**	Rated Voltage **220VAC** Breaking Capacity **60 - 300A**
	**D1TD** **Miniature Fuse, 5 x 20 mm, Super-Time-Lag TT, NF, 220 VAC**	Rated Current **0.031 - 15A**	Characteristic **Super-Time-Lag TT**	Dimensions **5x20mm**	Rated Voltage **220VAC** Breaking Capacity **40 - 100A**
	**FSF 6.3x32** **Miniature Fuse, 6.3 x 32 mm, Quick-Acting F, 250 VAC**	Rated Current **0.1 - 10A**	Characteristic **Quick-Acting F**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 100A**
	**FST 6.3x32** **Miniature Fuse, 6.3 x 32 mm, Time-Lag T, 250 VAC**	Rated Current **0.02 - 20A**	Characteristic **Time-Lag T**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 200A**
 new	**SUT 6.3x32** **Cartridge Fuse, 6.3x32 mm, low resistance, up to 30 A**	Rated Current **12 - 30A**	Characteristic **Slow-Blow**	Dimensions **32x6.3mm**	Rated Voltage **250VAC** Breaking Capacity **500A**
 new	**SUT 6.3x32 Pigtail** **Axial Lead Fuse, 6.3x32 mm, low resistance, up to 30 A**	Rated Current **12 - 30A**	Characteristic **Slow-Blow**	Dimensions **32x6.3mm**	Rated Voltage **250V** Breaking Capacity **500A**
	**SP 6.3x32** **Miniature Fuse, 6.3 x 32 mm, Quick-Acting F, Sand, 250 VAC**	Rated Current **0.5 - 20A**	Characteristic **Quick-Acting F**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **1000 - 1500A**

	**SPT 6.3x32** Miniature Fuse, 6.3 x 32 mm, Time-Lag T, Sand, 250 VAC	Rated Current **0.5 - 32A**	Characteristic **Time-Lag T**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **1000 - 1500A**
	**FSF 6.3x32 (UL)** Miniature Fuse, 6.3 x 32 mm, Quick-Acting F, UL, 250 VAC	Rated Current **0.1 - 15A**	Characteristic **Quick-Acting F**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **200 - 10kA**
	**FST 6.3x32 (UL)** Miniature Fuse, 6.3 x 32 mm, Time-Lag T, UL, 250 VAC	Rated Current **0.63 - 15A**	Characteristic **Time-Lag T**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 10kA**
	**SA 6.3x32** Miniature Fuse, 6.3 x 32 mm, Super-Quick-Acting FF, 250 VAC	Rated Current **1.6 - 16A**	Characteristic **Super-Quick-Acting FF**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **1500A**
	**D8** Miniature Fuse, 6.3 x 32 mm, Quick-Acting F, NNO, 220 VAC	Rated Current **0.04 - 20A**	Characteristic **Quick-Acting F**	Dimensions **6.3x32mm**	Rated Voltage **220VAC** Breaking Capacity **100 - 500A**
	**D8M 125V** Miniature Fuse, 6.3 x 32 mm, Quick-Acting F, 125 VAC, 125 VDC	Rated Current **0.16 - 6.3A**	Characteristic **Quick-Acting F**	Dimensions **6.3x32mm**	Rated Voltage **125VAC / 125VDC** Breaking Capacity **5kA**
	**D8TD** Miniature Fuse, 6.3 x 32 mm, Super-Time-Lag TT, NNO, 220 VAC	Rated Current **1.6 - 30A**	Characteristic **Super-Time-Lag TT**	Dimensions **6.3x32mm**	Rated Voltage **220VAC** Breaking Capacity **100A**
	**A12FA 250V** Miniature Fuse, 6.3 x 32 mm, Super-Quick-Acting FF, 250 VAC	Rated Current **0.1 - 16A**	Characteristic **Super-Quick-Acting FF**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **200kA**

	**A12FA 380V** **Miniature Fuse, 6.3 x 32 mm, Super-Quick-Acting FF, 380 VAC**	Rated Current **0.1 - 12.5A**	Characteristic **Super-Quick-Acting FF**	Dimensions **6.3x32mm**	Rated Voltage **380VAC** Breaking Capacity **150kA**
	**A12FA 500V** **Miniature Fuse, 6.3 x 32 mm, Super-Quick-Acting FF, 500 VAC**	Rated Current **0.1 - 12.5A**	Characteristic **Super-Quick-Acting FF**	Dimensions **6.3x32mm**	Rated Voltage **500VAC** Breaking Capacity **10 - 150kA**
	**A12FA 660V** **Miniature Fuse, 6.3 x 32 mm, Super-Quick-Acting FF, 660 VAC**	Rated Current **0.1 - 2A**	Characteristic **Super-Quick-Acting FF**	Dimensions **6.3x32mm**	Rated Voltage **660VAC** Breaking Capacity **30kA**
	**A12BK** **Miniature Fuse, 6.3 x 32 mm, Quick-Acting F, UL, NNO, 250 VAC**	Rated Current **0.125 - 25A**	Characteristic **Quick-Acting F**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 10kA**
	**A12TD** **Miniature Fuse, 6.3 x 32 mm, Time-Lag T, GAM T1, 30 A, 220 VAC, 125 VDC**	Rated Current **1.6 - 30A**	Characteristic **Time-Lag T**	Dimensions **6.3x32mm**	Rated Voltage **220VAC / 125VDC** Breaking Capacity **100A**
	**172600** **Miniature Fuse, 6.3 x 32 mm, Time-Lag T, UL, NNO, 250 VAC**	Rated Current **2 - 20A**	Characteristic **Time-Lag T**	Dimensions **6.3x32mm**	Rated Voltage **250VAC** Breaking Capacity **35 - 10kA**
	**172582** **Miniature Fuse, 6.3 x 32 mm, Quick-Acting F, GAM T1, 250 VAC, 125 VDC**	Rated Current **0.16 - 20A**	Characteristic **Quick-Acting F**	Dimensions **6.3x32mm**	Rated Voltage **250VAC / 125VDC** Breaking Capacity **1 - 10kA**
	**D0** **Miniature Fuse, 4.7 x 16 mm, 125 VAC**	Rated Current **0.063 - 10A**	Characteristic **Quick-Acting F**	Dimensions **4.7x16mm**	Rated Voltage **125VAC** Breaking Capacity **35A**

	**A3BK** Miniature Fuse, 10.3 x 38 mm, Quick-Acting F, 300 VAC	Rated Current **0.125 - 50A**	Characteristic **Quick-Acting F**	Dimensions **10.3x38mm**	Rated Voltage **300VAC** Breaking Capacity **10000A**
	**D20K** Miniature Fuse, 10.3 x 38 mm, Quick-Acting F, 250 VAC	Rated Current **0.4 - 30A**	Characteristic **Quick-Acting F**	Dimensions **10.3x38mm**	Rated Voltage **250VAC** Breaking Capacity **100 - 4000A**
	**D20TD** Miniature Fuse, 10.3 x 38 mm, Super-Time-Lag TT, 250 VAC	Rated Current **1.6 - 50A**	Characteristic **Super-Time-Lag TT**	Dimensions **10.3x38mm**	Rated Voltage **250VAC** Breaking Capacity **300 - 500A**
	**A10 gG** Miniature Fuse, 10.3 x 38 mm, gG, 500 VAC	Rated Current **0.5 - 32A**		Dimensions **10.3x38mm**	Rated Voltage **500VAC** Breaking Capacity **120kA**
	**A10 aM** Miniature Fuse, 10.3 x 38 mm, aM, 500 VAC	Rated Current **0.16 - 32A**		Dimensions **10.3x38mm**	Rated Voltage **500VAC** Breaking Capacity **120kA**
	SPECIAL FUSE				
	**MA** Special Fuse, 14 x 50 mm Quick-Acting F, 500 VAC, 250 VDC	Rated Current **0.5 - 40A**	Characteristic **Quick-Acting F**	Dimensions **14x50mm**	Rated Voltage **500VAC / 250VDC** Breaking Capacity **10 - 100kA**
	**MADM** Special Fuse, 14.3 x 51 mm, 500 VAC, 250 VDC	Rated Current **1 - 25A**		Dimensions **14.3x51mm**	Rated Voltage **500VAC / 250VDC** Breaking Capacity **100kA**
	**MC** Special Fuse, 14 x 50 mm, Quick-Acting F, 380 VDC	Rated Current **0.5 - 50A**	Characteristic **Quick-Acting F**	Dimensions **14x50mm**	Rated Voltage **380VDC** Breaking Capacity **85kA**

MAT

Special Fuse, 14 x 50 mm, Time-Lag T, 500 VAC, 250 VDC

Rated Current	Characteristic	Dimensions	Rated Voltage
1 - 20A	**Time-Lag T**	**14x50mm**	**500VAC / 250VDC** Breaking Capacity **100kA**

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see fuses page 159

Low impedance fuse for high-sensitive electronic circuits

Super-quick-acting USFF 1206 fuse for low current applications. Current range from 160 to 250 mA with rated voltage of 63 VDC or 125 VAC. Extremely low impedance values, providing exceptional performance in dense circuits.

Designed for protecting DC over-current conditions where heat dissipation is critical, including computer peripherals and communication equipment. cURus approved, RoHS compliant and halogen free.

Use experience for development

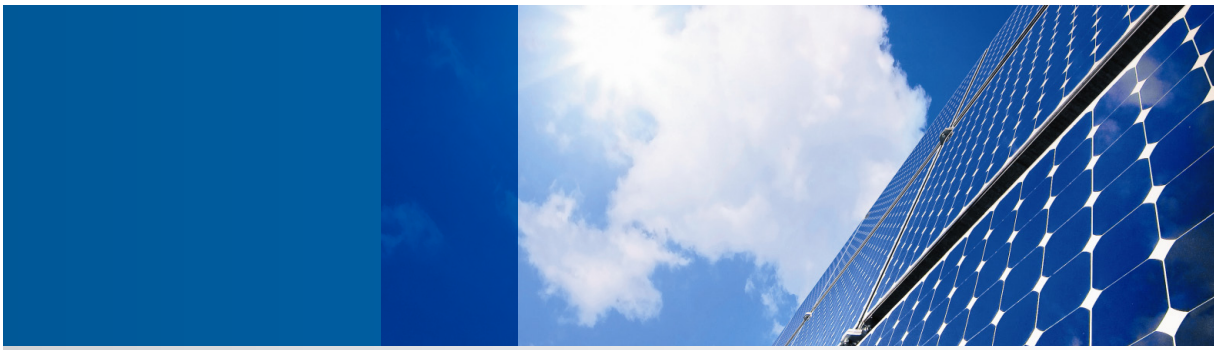
Achievements we gain through SIX SIGMA, are measurable. We secure new knowledge, new awareness and experience, by involving others.

Approvals

An important feature of products with international application is the 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.

Additional regulatory information can be found at: www.schurter.com/approvals

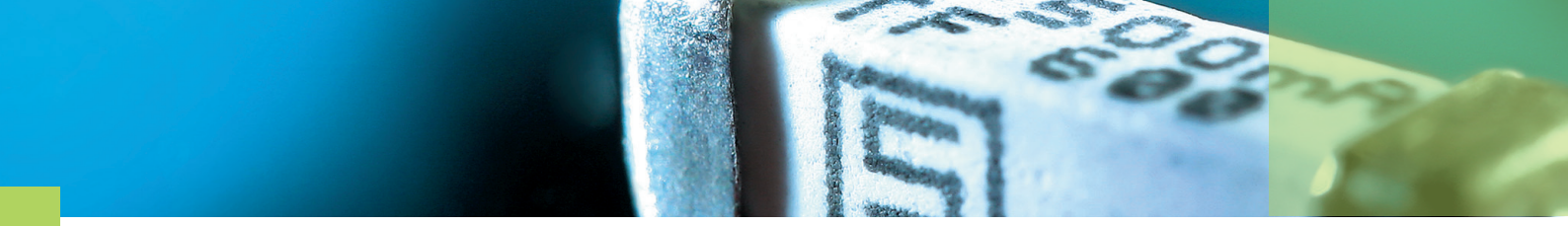


Solar technology

SCHURTER products are ideal for use in power engineering systems. They meet standard requirements: long service life, reliability, safety, high function integration, and last but not least, ease of use.

We focus our innovations consistently towards the technological trends of the emerging renewable energy technology industry.

A product overview can be found at: www.schurter.com/solartech



SCHURTER's telecom fuses

provide secondary protection in telecommunications equipment. Devices meet applicable international safety standards.

SURFACE MOUNT FUSE

TF 600

Surface Mount Fuse, 10.1 x 3.22 mm, Time-Lag T, Telecom

Rated Current **0.5 - 2A**
Characteristic **Time-Lag T**
Dimensions **10.1x3.22mm**
Rated Voltage **600VAC / 125VDC**
Breaking Capacity **60A**

OSU 125

Surface Mount Fuse, 7.4 x 3.1 mm, Quick-Acting F, Telecom

Rated Current **0.25 - 3.15A**
Characteristic **Quick-Acting F**
Dimensions **7.4x3.1mm**
Rated Voltage **125VAC / 125VDC**
Breaking Capacity **100A**

OSU 250

Surface Mount Fuse, 11 x 4.6 mm, Quick-Acting F, Telecom

Rated Current **0.25 - 3.15A**
Characteristic **Quick-Acting F**
Dimensions **11x4.6mm**
Rated Voltage **250VAC / 250VDC**
Breaking Capacity **100A**

SUBMINIATURE FUSE

MSU 125

Subminiature Fuse, 6.4 mm, Quick-Acting F, Telecom

Rated Current **0.25 - 3.15A**
Characteristic **Quick-Acting F**
Dimensions **6.4x6.4mm**
Rated Voltage **125VAC / 125VDC**
Breaking Capacity **300A**

MSU 250

Subminiature Fuse, 8.5 mm, Time-Lag T, Telecom

Rated Current **0.25 - 3.15A**
Characteristic **Time-Lag T**
Dimensions **8.5x8.5mm**
Rated Voltage **250VAC**
Breaking Capacity **35A**

MINIATURE FUSE

FSU 5x20

Miniature Fuse, 5 x 20 mm, Time-Lag T, Telecom, L, 250 VAC

Rated Current **0.25 - 3.15A**
Characteristic **Time-Lag T**
Dimensions **5x20mm**
Rated Voltage **250VAC**
Breaking Capacity **35A**

SSU 5x20

Miniature Fuse, 5 x 20 mm, Time-Lag T, Telecom, H, 250 VAC

Rated Current **0.25 - 3.15A**
Characteristic **Time-Lag T**
Dimensions **5x20mm**
Rated Voltage **250VAC**
Breaking Capacity **1500A**

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see fuses page 159

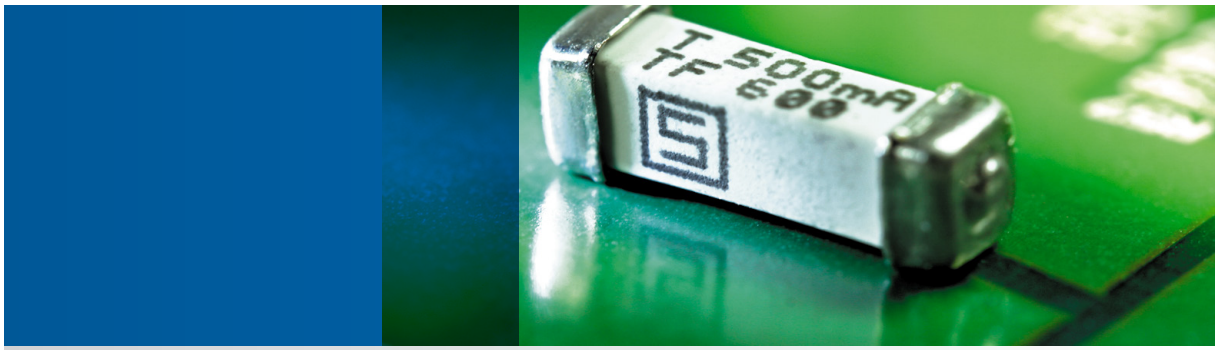
Telecom

SCHURTER's telecom fuses provide signal protection for telecommunications devices and equipment and meet international safety standards.

SCHURTER's fuses are tested in accordance with the following criteria and standards: ITU-T K.20, UL 60950/IEC 60950 and Telcordia GR-1089

Regardless of what interference affects the telecommunications device, it must be guaranteed that no, or limited, damage will occur.

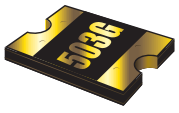
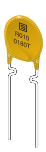
A product overview can be found at: www.schurter.com/telecom



TF 600: Fuse for telecommunication applications (tip & ring)

The fuse meets all important telecommunications stanards like Telcordia GR-1089, ITU-T K.20 and K.21, UL/IEC 60950 and TIA-968-A and fits very well for applications like analog linecards, modems and office equipments.

SCHURTER's resettable fuses
are designed for protection of low voltage DC circuits. Resettable fuses limit fault current to acceptable levels while a fault is present.

SURFACE MOUNT FUSE				
 **PFNF** Surface Mount Fuse, PTC, 1206 footprint, 3.2 x 1.6 mm, 30 VDC	Dimensions **3.2x1.6mm**	I hold **0.12 - 2A**	V max **6.0 - 30.0VDC**	Temperature **-40 to 85°C**
 new **PFUF** Surface Mount Fuse, PTC, 1210 footprint, 3.2 x 2.6 mm, 30 VDC	Dimensions **3.2x2.6mm**	I hold **0.05 - 1.5A**	V max **6.0 - 30.0VDC**	Temperature **-40 to 85°C**
 **PFMF** Surface Mount Fuse, PTC, 1812 footprint, 4.6 x 3.2 mm, 60 VDC	Dimensions **4.6x3.2mm**	I hold **0.1 - 2.6A**	V max **6.0 - 60.0VDC**	Temperature **-40 to 85°C**
 new **PFDF** Surface Mount Fuse, PTC, 2018 footprint, 5.1 x 4.6 mm, 60 VDC	Dimensions **5.1x4.6mm**	I hold **0.55A**	V max **60.0VDC**	Temperature **-40 to 85°C**
 **PFSM** Surface Mount Fuse, PTC, 2029 or 3425 footprint, 60 VDC		I hold **0.3 - 2.6A**	V max **6.0 - 60.0VDC**	Temperature **-40 to 85°C**
 new **PFHT** Surface Mount Fuse, PTC, 2029 or 3425 footprint, 16 VDC, up to 125 °C		I hold **1.36 - 1.6A**	V max **16.0VDC**	Temperature **-40 to 125°C**
RADIAL LEADED PTC-FUSE				
 **PFRA** Radial Leaded Fuse, PTC, 60 VDC		I hold **0.1 - 11A**	V max **16.0 - 60.0VDC**	Temperature **-40 to 85°C**

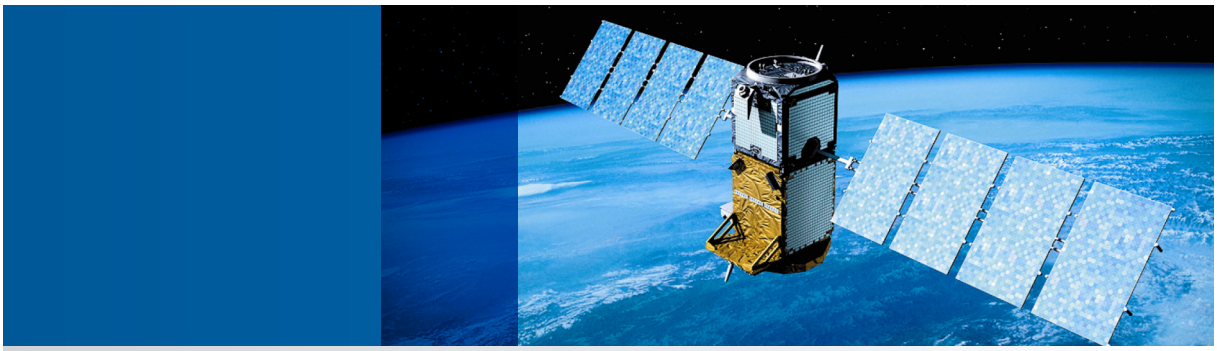
PFRY

Radial Leaded Fuse, PTC, 72 VDC

new

	I hold	V max	Temperature
	1.1 - 3.75A	**72.0VDC**	**-40 to 85°C**

General product information see PTC-circuit protection page 167



Fuse for aerospace industry

SCHURTER is the only European manufacturer of SMD fuses for space applications. This is based on the company's high level of competence and comprehensive expertise.

The application of fuses in space presents a particular challenge. The component qualification process at the European Space Agency (ESA) is complex and requires a quality of processes on a very high level. The SMD fuse for space applications – MGA-S – has a service life equal to that of a satellite: up to 30 years.

A product overview can be found at: www.schurter.com/space

SIX SIGMA uses process output

We base our decisions on data and facts. We identify the needs of our customers, measure process output, analyse results and take corrective action.

SCHURTER's fuseholders

include types for holding cartridge fuses and types for sub-miniature and miniature fuses.

FUSE-LINK 5 X 20 MM				
 **FPG1** **Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, IP 40 / IP 67, IEC 60335-1**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40 / IP 67**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 16A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
 **FPG2** **Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, Rear-Side, IP 40 / IP 67, IEC 60335-1**	Mounting **Panel Mount** **Rear-Side** IP-Protection **IP 40 / IP 67**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 16A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
 **FEF** **Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, IP 40 / IP 54**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40 / IP 54**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC**	Power Acceptance **4W / 10A**
 **FIO** **Shock-Safe Fuseholder, 5 x 20 mm, Slot, IP 40 / IP 65**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40 / IP 65**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
 **FIN** **Shock-Safe Fuseholder, 5 x 20 mm, Slot, IP 67**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 67**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
 **FBS1** **Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, PC3, medical**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
 **FIZ** **Shock-Safe Fuseholder, 5 x 20 mm, Slot, 4 W / 16 A, IP 40 / IP 67**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40 / IP 67**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **16A / 30A** Rated Voltage **250VAC / 600VAC/DC**	Power Acceptance **4W / 16A**

	**23316P** **Shock-Safe Fuseholder, 5 x 20 mm, Fingergrip, Rear-Side, NF, IP 40 / IP 67**	Mounting **Panel Mount** **Rear-Side** IP-Protection **IP 40 / IP 67**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **6.3A** Rated Voltage **250VAC**	Power Acceptance **1.5W / 6.3A**
	**231411** **Shock-Safe Fuseholder, 5 x 20 mm, Fingergrip, Solder**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **6.3A** Rated Voltage **250VAC**	Power Acceptance **1.3W**
	**231529P** **Shock-Safe Fuseholder, 5 x 20 mm, Fingergrip, NF**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 68**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **6.3A** Rated Voltage **250VAC**	Power Acceptance **3.4W / 6.3A**
	**FQE** **Shock-safe Fuseholder, Solder Terminals, 5x20 mm**	Mounting **Panel Mount**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **6.3A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 6.3A**
	**FPG3** **Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, Snap stepless, 1.0 - 3.0 mm, IEC 60335-1**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 16A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
	**FEF (Snap)** **Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, Snap Stepless, 0.75 - 3.0 mm**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC**	Power Acceptance **4W / 10A**
	**FPG6** **Shock-Safe Fuseholder, 5 x 20 mm, Slot, Press, IEC 60335-1**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 16A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
	**FPG4** **Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, vertical, IEC 60335-1**	Mounting **PCB** IP-Protection **IP 40**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 16A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**

FAF

Shock-Safe Fuseholder, 5 x 20 mm, Slot, vertical, IP 40 / IP 54

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**6.3A / 12A**	**2W / 6.3A**
IP-Protection		Rated Voltage	
IP 40 / IP 54		**250VAC**	

FAP

Shock-Safe Fuseholder, 5 x 20 mm, Fingergrip, vertical, PC1

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**6.3A**	**1.6W / 6.3A**
IP-Protection		Rated Voltage	
IP 40		**250VAC**	

231409

Shock-Safe Fuseholder, 5 x 20 mm, Fingergrip, horizontal oder vertical

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**10A**	**1.3W / 10A**
IP-Protection		Rated Voltage	
IP 00		**250VAC/DC**	

FPG5

Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, horizontal, IEC 60335-1

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**10A / 16A**	**2.5W / 10A**
IP-Protection		Rated Voltage	
IP 40		**250VAC**	

FBS2

Shock-Safe Fuseholder, 5 x 20 mm, Slot/Fingergrip, horizontal, PC3, medical

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**10A / 10A**	**2.5W / 10A**
IP-Protection		Rated Voltage	
IP 40		**250VAC**	

FAB

Shock-Safe Fuseholder, 5 x 20 mm, Slot, horizontal

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**10A / 12A**	**2.5W / 10A**
IP-Protection		Rated Voltage	
IP 40		**250VAC**	

FAS

Shock-Safe Fuseholder, 5 x 20 mm, Fingergrip, horizontal, PC1

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**6.3A**	**1.6W / 6.3A**
IP-Protection		Rated Voltage	
IP 40		**250VAC**	

FPG7

Shock-Safe Fuseholder, 5 x 20 mm, horizontal, Slot/Fingergrip, SMD, IEC 60335-1

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20mm**	**10A / 16A**	**2.5W / 10A**
IP-Protection		Rated Voltage	
IP 40		**250VAC**	

FUSE-LINK 6.3 X 32 MM

	**23312P** **Shock-Safe Fuseholder, 6.3 x 32 mm, Fingergrip, Rear-Side, NF**	Mounting **Panel Mount** **Rear-Side** IP-Protection **IP 40 / IP 67**	Fuse-Link **6.3x32mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
	**23463P** **Shock-Safe Fuseholder, 6.3 x 32 mm, Fingergrip, Rear-Side, grau**	Mounting **Panel Mount** **Rear-Side** IP-Protection **IP 67**	Fuse-Link **6.3x32mm**	Rated Current IEC/ UL **10A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
	**231549P** **Shock-Safe Fuseholder, 6.3 x 32 mm, NF, Fingergrip, IP 68**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 68**	Fuse-Link **6.3x32mm**	Rated Current IEC/ UL **16A** Rated Voltage **250VAC**	Power Acceptance **3.6W / 16A**

FUSE-LINK 5 X 20 OR 6.3 X 32 MM

	**FEU** **Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20 or 6.3x32mm**	Rated Current IEC/ UL **10A / 20A** Rated Voltage **250VAC**	Power Acceptance **4W / 10A**
	**FEU (Med)** **Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot, Medical**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20 or 6.3x32mm**	Rated Current IEC/ UL **10A / 20A** Rated Voltage **250VAC**	Power Acceptance **4W / 10A**
	**FEU (Grip)** **Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Fingergrip**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20 or 6.3x32mm**	Rated Current IEC/ UL **10A / 20A** Rated Voltage **250VAC**	Power Acceptance **4W / 10A**
	**FEC** **Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot Knob/Finger-grip, IEC: 500 VAC, UL/CSA: 600 VAC/DC**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40**	Fuse-Link **5x20 or 6.3x32mm**	Rated Current IEC/ UL **10A / 20A** Rated Voltage **500VAC / 600VAC/DC**	Power Acceptance **4W / 10A**
	**FUL** **Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot Knob**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40 / IP 67**	Fuse-Link **5x20 or 6.3x32mm**	Rated Current IEC/ UL **16A / 30A** Rated Voltage **500VAC / 600VAC/DC**	Power Acceptance **4W / 16A**

231702

Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Fingergrip, EMI/RFI

Mounting
Panel Mount
Front-Side
IP-Protection
IP 68

Fuse-Link
5x20 or 6.3x32mm

Rated Current IEC/ UL
16A / 6.3A
Rated Voltage
250VAC

Power Acceptance
3.5W / 16A

FAC

Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot, vertical

Mounting
PCB
IP-Protection
IP 40

Fuse-Link
5x20 or 6.3x32mm

Rated Current IEC/ UL
10A / 16A
Rated Voltage
250VAC

Power Acceptance
3.2W / 10A

FUA

Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot Knob, vertical

Mounting
PCB
IP-Protection
IP 40

Fuse-Link
5x20 or 6.3x32mm

Rated Current IEC/ UL
16A / 30A
Rated Voltage
500VAC / 600VAC/DC

Power Acceptance
4W / 16A

FAU

Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot, horizontal

Mounting
PCB
IP-Protection
IP 40

Fuse-Link
5x20 or 6.3x32mm

Rated Current IEC/ UL
10A / 16A
Rated Voltage
250VAC

Power Acceptance
3.2W / 10A

231618

Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Fingergrip, horizontal

Mounting
PCB
IP-Protection
IP 40

Fuse-Link
5x20 or 6.3x32mm

Rated Current IEC/ UL
16A
Rated Voltage
250VAC

FUP

Shock-Safe Fuseholder, 5 x 20 / 6.3 x 32 mm, Slot Knob, horizontal

Mounting
PCB
IP-Protection
IP 40

Fuse-Link
5x20 or 6.3x32mm

Rated Current IEC/ UL
16A / 30A
Rated Voltage
500VAC / 600VAC/DC

Power Acceptance
4W / 16A

FDI

Inline Fuseholder, 5x20 / 6.3x32 mm

Mounting
In-line
IP-Protection
IP 40

Fuse-Link
5x20 or 6.3x32mm

Rated Current IEC/ UL
6.3A
Rated Voltage
32VAC / 32VDC

Power Acceptance
2.5W / 6.3A

new

FUSE-LINK 4.7 X 16 MM

231600P

Shock-Safe Fuseholder, 4.7 x 16 mm, Fingergrip, Rear-Side

Mounting
Panel Mount
Rear-Side
IP-Protection
IP 67

Fuse-Link
4.7x16mm

Rated Current IEC/ UL
5A
Rated Voltage
250VAC

Power Acceptance
1W / 5A

FUSE-LINK 10.3 X 38 MM

	**23530P** **Shock-Safe Fuseholder, 10.3 x 38 mm, Fingergrip**	Mounting **Panel Mount** **Front-Side** IP-Protection **IP 40 / IP 67**	Fuse-Link **10.3x38mm**	Rated Current IEC/ UL **25A** Rated Voltage **600VAC**	Power Acceptance **4.5W / 25A**
 new	**FSO** **Touch-Safe Fuseholder, 35 mm DIN-Rail, 10.3 x 38 mm, 1000 VDC**	Mounting **DIN-Rail Mounting** IP-Protection **IP 20**	Fuse-Link **10.3x38mm**	Rated Current IEC/ UL **30A / 30A** Rated Voltage **1000VDC / 600VAC/DC**	

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see fuseholders page 168

ASO the high performance fuse for PV systems together with FSO, a touch safe fuseholder

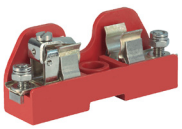
The ASO fuse protects PV modules, conductors and similar DC-applications from the potentially devastating effects of a low short circuit current in systems upwards of 1000 VDC.

The ASO fuse is especially designet for protecting DC low short circuit current and overvoltage conditions like solar panels (strings), inverters, battery charges and combiner boxes. The touch safe fuseholder FSO is designed for grid-tie or off-grid array combiners and standard DIN rail mount.

SCHURTER's fuseholders

include devices for holding cartridge fuses and types for sub-miniature and miniature fuses.

FUSE-LINK 5 X 20 MM					
	**OGN** **Fuseholder Open Design, 5 x 20 mm, THT, var. Covers, IEC 60335-1**	Mounting **PCB** IP-Protection **IP 00 / IP 20**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC / 500VAC/DC**	Power Acceptance **4W / 10A**
	**OGN-SMD** **Fuseholder Open Design, 5 x 20 mm, SMD, var. Covers, IEC 60335-1**	Mounting **PCB** IP-Protection **IP 00 / IP 20**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A / 10A** Rated Voltage **250VAC / 500VAC/DC**	Power Acceptance **4W / 10A**
	**OG (Holder) 5x20** **Fuseholder Open Design, 5 x 20 mm, THT, Cover**	Mounting **PCB** IP-Protection **IP 00**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A** Rated Voltage **600VAC/DC**	Power Acceptance **2.5W / 10A**
	**UH** **Fuseholder Open Design, 5 x 20 mm, Solder, Cover**	Mounting **Screw** IP-Protection **IP 00**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **10A** Rated Voltage **600VAC/DC**	Power Acceptance **3.2W / 10A**
	**UHB** **Fuseholder Open Design, 5 x 20 mm, Solder, transparent, Cover**	Mounting **Screw** IP-Protection **IP 00**	Fuse-Link **5x20mm**	Rated Current IEC/ UL **6.3A** Rated Voltage **250VAC**	Power Acceptance **3.2W / 4A**
FUSE-LINK 6.3 X 32 MM					
	**OG (Holder) 6.3x32** **Fuseholder Open Design, 6.3 x 32 mm, THT**	Mounting **PCB** IP-Protection **IP 00**	Fuse-Link **6.3x32mm**	Rated Current IEC/ UL **16A** Rated Voltage **250VAC**	Power Acceptance **2.5W / 10A**
	**RSH** **Fuseholder Open Design, 6.3 x 32 mm, Solder**	Mounting **Screw** IP-Protection **IP 00**	Fuse-Link **6.3x32mm**	Rated Current IEC/ UL **16A** Rated Voltage **250VAC**	Power Acceptance **3.2W / 10A**

	**23748B** **Fuseholder Open Design, 6.3 x 32 mm, Screw Clamp, grey**	Mounting **Screw** IP-Protection **IP 00**	Fuse-Link **6.3x32mm**	Rated Current IEC/ UL **16A** Rated Voltage **250VAC**	Power Acceptance **3.5W / 16A**
	**23211B** **Fuseholder Open Design, 6.3 x 32 mm, Screw Clamp**	Mounting **Screw** IP-Protection **IP 00**	Fuse-Link **6.3x32mm**	Rated Current IEC/ UL **16A** Rated Voltage **250VAC**	Power Acceptance **3.5W / 16A**
FUSE-LINK 5 X 20 OR 6.3 X 32 MM					
	**OGD** **Fuseholder Open Design, 5 x 20 / 6.3 x 32 mm, THT, IEC: 500 VAC, UL/CSA: 600 VAC/DC, Cover, IEC 60335-1**	Mounting **PCB** IP-Protection **IP 00 / IP 20**	Fuse-Link **5x20 or 6.3x32mm**	Rated Current IEC/ UL **10A / 16A** Rated Voltage **500VAC / 600VAC/DC**	Power Acceptance **4W / 10A**
	**OGD-SMD** **Fuseholder Open Design, 5 x 20 / 6.3 x 32 mm, SMD, IEC: 500 VAC, UL/CSA: 600 VAC/DC, Cover, IEC 60355-1**	Mounting **PCB** IP-Protection **IP 00 / IP 20**	Fuse-Link **5x20 or 6.3x32mm**	Rated Current IEC/ UL **10A / 16A** Rated Voltage **500VAC / 600VAC/DC**	Power Acceptance **4W / 10A**
FUSE-LINK 10.3 X 38 MM					
	**23351B** **Fuseholder Open Design, 10.3 x 38 mm, Screw Clamp**	Mounting **Screw** IP-Protection **IP 00 / IP 20**	Fuse-Link **10.3x38mm**	Rated Current IEC/ UL **30A** Rated Voltage **500VAC**	Power Acceptance **3.6W / 30A**
FUSE-LINK 14.3 X 51 MM					
	**23162** **Fuseholder Open Design, 14.3 x 51 mm, Screw Clamp**	Mounting **Screw** IP-Protection **IP 00**	Fuse-Link **14.3x51mm**	Rated Current IEC/ UL **40A** Rated Voltage **500VAC**	Power Acceptance **4W / 40A**
	**231756R** **Fuseholder Open Design, 14.3 x 51 mm, Screw Clamp, red**	Mounting **Screw** IP-Protection **IP 00**	Fuse-Link **14.3x51mm**	Rated Current IEC/ UL **50A** Rated Voltage **380VAC/DC**	Power Acceptance **5W / 50A**

FUSE-LINK 2 X 7 MM

231786

Fuseholder Open Design, Holder for MSB and 172876, THT

Mounting	Fuse-Link	Rated Voltage	Power Acceptance
PCB	**2x7mm**	**125VAC/DC**	**0.9W**
IP-Protection			
IP 00			

231787

Fuseholder Open Design, Holder for MSB and 172876, SMD

Mounting	Fuse-Link	Rated Voltage	Power Acceptance
PCB	**2x7mm**	**125VAC/DC**	**0.9W**
IP-Protection			
IP 00			

FUSE-LINK OMX 63/125 FUSE

OMH 125

Fuseholder Open Design, Holder for OMF 63, OMF 125 and OMT 125, SMD

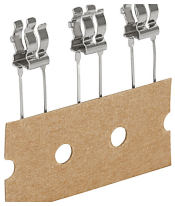
Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**OMx 63/125 Fuse**	**5A**	
IP-Protection		Rated Voltage	
IP 00		**125VAC**	

FUSE-LINK 5 X 20 MM

OG (Clip) 5x20

Clip, 5 x 20 mm, UR, Cover

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**5x20mm**	**6.3A**	
IP-Protection		Rated Voltage	
IP 00		**500VAC/DC**	



CQM

Clip, 5 x 20 mm, Version 1

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**5x20mm**	**6.3A**	
IP-Protection		Rated Voltage	
IP 00		**250VAC**	

231828

Clip, 5 x 20 mm, Version 2

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**5x20mm**	**6.3A**	
IP-Protection		Rated Voltage	
IP 00		**250VAC**	

231683

Clip, 5 x 20 mm, Version 3

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**5x20mm**	**6.3A**	
IP-Protection		Rated Voltage	
IP 00		**250VAC**	

FUSE-LINK 6.3 X 32 MM

231685

Clip, 6.3 x 32 mm

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**6.3x32mm**	**10A**	
IP-Protection		Rated Voltage	
IP 00		**250VAC**	

CQP

Clip, 6.3x32 mm, 30 A, BeCu

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**6.3x32mm**	**30A**	
		Rated Voltage	
		500VAC	

FUSE-LINK 5 X 20 OR 6.3 X 32 MM

OG (Clip) 5x20 / 6.3x32

Clip, 5 x 20 / 6.3 x 32 mm, UR

Mounting	Fuse-Link	Rated Current IEC/ UL	Power Acceptance
PCB	**5x20 or 6.3x32mm**	**16A**	**2.5W / 10A**
IP-Protection		Rated Voltage	
IP 00		**600VAC/DC**	

FUSE-LINK 10.3 X 38 MM

231660

Clip, 10.3 x 38 mm, UR

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**10.3x38mm**	**20A**	
IP-Protection			
IP 00			

FUSE-LINK FRT FUSE

231819

Fuseholder Open Design, Holder for FRT 250x, THT

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**FRT Fuse**	**6.3A**	
IP-Protection		Rated Voltage	
IP 30		**250VAC**	

FUSE-LINK PSC FUSE

231651

Fuseholder Open Design, Holder for PSC 125V, THT

Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**PSC Fuse**	**5A**	
IP-Protection		Rated Voltage	
IP 30		**125VAC**	

FUSE-LINK MICROFUSE 125 V

FMS (125V)

Fuseholder Open Design, Holder for MSF 125, vertical, THT

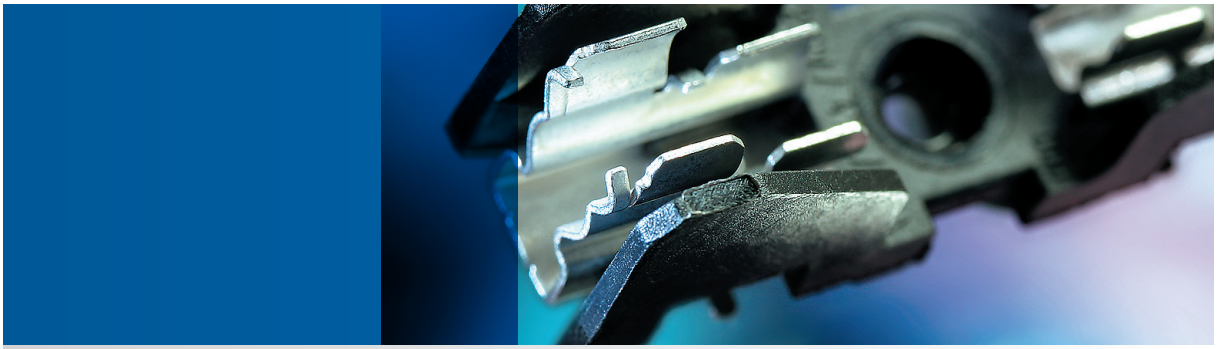
Mounting	Fuse-Link	Rated Current IEC/ UL	
PCB	**Microfuse 125 V**	**5A**	
IP-Protection		Rated Voltage	
IP 40		**125VAC/DC**	

FMR **Fuseholder Open Design, Holder for MSF 125, horizontal, THT**	Mounting **PCB** IP-Protection **IP 40**	Fuse-Link **Microfuse 125 V**	Rated Current IEC/ UL **5A** Rated Voltage **125VAC/DC**	
FUSE-LINK MICROFUSE 250 V				
FMS (250V) **Fuseholder Open Design, Holder for MSx 250, THT**	Mounting **PCB** IP-Protection **IP 30**	Fuse-Link **Microfuse 250 V**	Rated Current IEC/ UL **6.3A** Rated Voltage **250VAC/DC**	

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see fuseholders page 168

FUP: High current shock-safe fuseholder for three-phase applications

With the FUP/FUA fuseholder series SCHURTER offers a product with rated power acceptance of 4 W / 16 A and a rated voltage of 500 VAC according to IEC. There is no other product in the market with such an outstanding electrical performance.



OGD: Fuse blocks with dual clip

The fuse block holds dual fuse clips and accepts either 5 x 20 mm or 6.3 x 32 mm fuse-links. This allows customers to cover two fuse standard sizes with one single product.

Mission statement

SCHURTER fulfills the most stringent requirements, thanks to its comprehensive quality, environment and personnel management systems according to ISO 9001, ISO 14001, OHSAS 18001, SIX SIGMA and EFQM.

The suitable accessories to the SCHURTER products presented in the overview.

Cover for OGD, OGD-SMD

Cover for Holder OGD, OGD-SMD

Covers for OGN, OGN-SMD

Cover for Holder OGN, OGN-SMD

Cover OG, UHB, UH

Cover for Holder OG (Clip) 5x20, OG (Halter) 5x20, UH, UHB

Caps to FEC

Caps to Holder FEC

Caps to FEU (Grip)

Caps for Holder FEU (Grip)

Caps to FEU, FAU, FAC

Caps to Holder FEU, FEU (Med), FAU, FAC

Caps to FUL, FUP, FUA

Caps to Holder FUL, FUP, FUA

Caps to FUL (IP 67)

Caps to Holder FUL (IP 67)

Caps to 231618

Caps to Holder 231618

Fingergrip FEU, FAU, FAC

Caps Fingergrip for Holder FEU, FAU, FAC

Cover FIZ, FUL

Insulation Cover for FIZ, FUL

Cover FEU, FEU (Med)

Insulation Cover for FEU, FEU (Med)

Adapter to OGN, OGN-SMD

Fuse Carriage with Handle for OGN, OGN-SMD

General product information see fuses page 159

FPG2: Shocksafe fuseholder with IP 67 protection

The fuseholder with IP 67 protection prevents particles or liquids from entering into the appliance according IEC 60529. Ideally, it is used in electronic equipment exposed to leaks, drips and spills, as well as equipment subject to routine washing or disinfecting.

SCHURTER's varistors

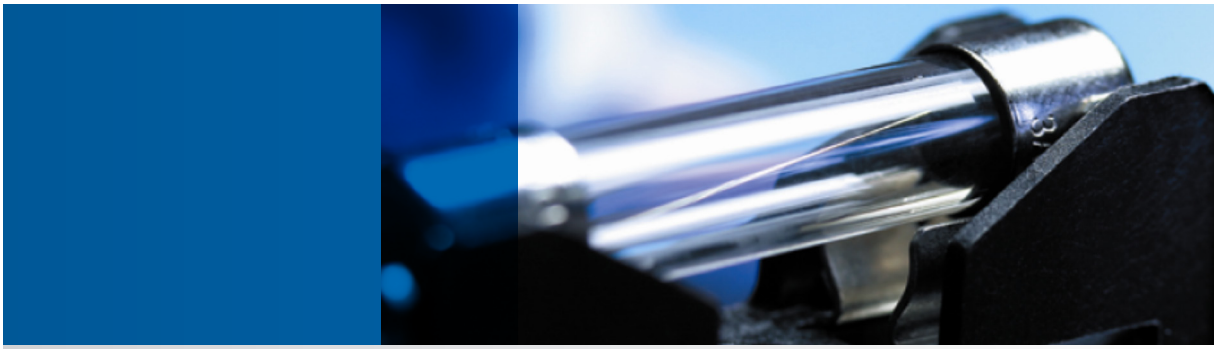
are designed for primary and secondary overvoltage protection of AC and DC applications. Varistors come into operation when a power surge occurs.

	**AVTS** **Radial Leaded Varistor (MOV), 11 - 95 VAC, 14 - 127 VDC** new	Rated Voltage AC **11 - 95 VAC**	Rated Voltage DC **14 - 127 VDC**	Disc Size **5 - 20 mm**	Peak Current 8/20 µs, 1 Pulse **250 - 10000 A**
	**AVTP** **Radial Leaded Varistor (MOV), 120 - 360 VAC, 160 - 470 VDC** new	Rated Voltage AC **120 - 360 VAC**	Rated Voltage DC **160 - 470 VDC**	Disc Size **5 - 25 mm**	Peak Current 8/20 µs, 1 Pulse **800 - 13000 A**
	**AVTT** **Radial Leaded Varistor (MOV), 390 - 1000 VAC, 500 - 1200 VDC** new	Rated Voltage AC **390 - 1000 VAC**	Rated Voltage DC **500 - 1200 VDC**	Disc Size **10 - 25 mm**	Peak Current 8/20 µs, 1 Pulse **3500 - 13000 A**

General product information see varistors page 171

Surge protection for primary and secondary power supplies

Radial leaded varistors (MOV) supports equipment manufacturers to pass the surge test condition according to IEC 61000-4-5.



Fuse selection, find the appropriate fuse!

SCHURTER offers a wide range of fuses and fuse holders.

An ill-considered choice of fuses can lead to device and equipment failure, resulting in high replacement costs and dissatisfied customers.

More information on this topic can be found at: www.schurter.com/white_paper

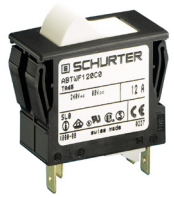
A market leader's statement

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.

SCHURTER's thermal circuit breakers
are designed for use in electrical and electronic equipment. They meet international safety standards. One-, two-, and three-pole types are available with different actuation and mounting styles.

TRIPPING TYPE THERMAL						
	**T9-211** **Circuit Breaker for Equipment thermal, Threaded-neck type, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **3 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Threaded neck type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Cover for IP65**
	**T9-311** **Circuit Breaker for Equipment thermal, Threaded-neck type, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **3 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Threaded neck type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Cover for IP65**
	**T9-611** **Circuit Breaker for Equipment thermal, Snap-in type, Fuseholder style, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **3 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	
	**T9-711** **Circuit Breaker for Equipment thermal, Snap-in rear side, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **3 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	
	**T11-211** **Circuit Breaker for Equipment thermal, Threaded neck type, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **0.05 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Threaded neck type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Cover for IP54**
	**T11-611** **Circuit Breaker for Equipment thermal, Snap-in type, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **0.05 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	
	**T11-811** **Circuit Breaker for Equipment thermal, Drop-in type, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **0.05 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Drop-in type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	

	**T11-818** **Circuit Breaker for Equipment thermal, PCB mounting, 1 pole**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **0.05 - 12A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Drop-in type** Anschlüsse **Solder, THT**	
	**T12-111** **Circuit Breaker for Equipment thermal, Flange type, 1 pole**	Rated Voltage **AC 240V** **DC 28V**	Rated Current **0.05 - 16A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Flange type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Auxiliary switch** **Cover for IP54**
	**T13-211** **Circuit Breaker for Equipment thermal, Threaded neck type, 1 pole**	Rated Voltage **AC 250V** **DC 28V**	Rated Current **0.05 - 30A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Threaded neck type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Manual ON-OFF** **Cover for IP54**
	**T13-611** **Circuit Breaker for Equipment thermal, Snap-in type, 1 pole**	Rated Voltage **AC 250V** **DC 28V**	Rated Current **0.05 - 30A** Tripping Type **Thermal**	Actuation type **Reset type**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Manual ON-OFF** **Cover for IP54**
	**TA35 Wippe 1Pol** **Circuit Breaker for Equipment thermal, Rocker actuation, 1 pole**	Rated Voltage **AC 240V** **DC 32V**	Rated Current **0.05 - 20A** Tripping Type **Thermal**	Actuation type **Rocker**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Cover for IP65**
	**TA35 Rocker 2Pol** **Circuit Breaker for Equipment thermal, Rocker actuation, 2 pole**	Rated Voltage **AC 240V** **DC 60V**	Rated Current **0.05 - 20A** Number of Poles **2** Tripping Type **Thermal**	Actuation type **Rocker**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Factory mount cover** **Cover for IP65**
	**TA35_Wippe 3Pol** **Circuit Breaker for Equipment thermal, Rocker actuation, 3 poles**	Rated Voltage **AC V**	Rated Current **0.05 - 12A** Number of Poles **3** Tripping Type **Thermal**	Actuation type **Rocker**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Cover for IP65**
 new	**TA35 Rotary Switch 1Pol** **Circuit Breaker for Equipment thermal, Rotary knob actuation, 1 pole**	Rated Voltage **AC 240V** **DC 32V**	Tripping Type **Thermal**		Mounting **Snap-in version**	

 new	**TA35 Rotary Switch 2Pol** **Circuit Breaker for Equipment thermal, Rotary knob actuation, 2 pole**	Rated Voltage **AC 240V** **DC 60V**	Tripping Type **Thermal**		Mounting **Snap-in version**	
 new	**TA35 Rotary Switch 3Pol** **Circuit Breaker for Equipment thermal, Rotary knob actuation, 3 poles**	Rated Voltage **AC V**	Tripping Type **Thermal**		Mounting **Snap-in version**	
	**TA45 2pol Rocker** **Circuit Breaker for Equipment thermal, Rocker actuation, 2 poles**	Rated Voltage **AC 240V** **DC 60V**	Rated Current **0.05 - 20A** Number of Poles **2** Tripping Type **Thermal**	Actuation type **Rocker**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Undervoltage and remote trip release** **Auxiliary switch** **Cover for IP54 or IP65**
	**TA45 2 Pol Pushbutton** **Circuit Breaker for Equipment thermal, Push button actuation, 2 poles**	Rated Voltage **AC 240V** **DC 60V**	Rated Current **0.05 - 20A** Number of Poles **2** Tripping Type **Thermal**	Actuation type **Pushbutton**	Mounting **Snap-in or flange mounted** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Undervoltage and remote trip release** **Auxiliary switch** **Cover for IP54 or IP65**
	**TA45 3Pole Rocker** **Circuit Breaker for Equipment thermal, Rocker actuation, 3 poles**	Rated Voltage **AC 400V**	Rated Current **0.05 - 12A** Number of Poles **3** Tripping Type **Thermal**	Actuation type **Rocker**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Undervoltage and remote trip release** **Auxiliary switch** **Cover for IP54 or IP65**
	**TA45 3Pol Pushbutton** **Circuit Breaker for Equipment thermal, Push button actuation, 3 poles**	Rated Voltage **AC 400V**	Rated Current **0.05 - 12A** Number of Poles **3** Tripping Type **Thermal**	Actuation type **Pushbutton**	Mounting **Snap-in or flange mounted** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Undervoltage and remote trip release** **Auxiliary switch** **Cover for IP54 or IP65**

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/pg17_18_19
For customer specific solutions, please contact us. www.schurter.com/contact

Thermal circuit breaker with rotary knob actuation

The manner of operation of the rotary knob is especially well suited for use with gloves.

Similar to the rocker switch this version is available with 1, 2 or 3 poles. The products are particularly well suited for switching tasks in construction devices.

Rigorous testing, high quality

"Rigorous testing, high quality and recently, thanks to major investments, the ability to conduct in-house tests meeting the requirements of UL and CSA, make SCHURTER unrivaled."

Martin Zäch

SCHURTER's thermal-magnetic circuit breakers
are designed for use in electrical and electronic equipment. They meet international safety standards. One-, two, three- and four-pole types are available with lever actuation for different mounting styles.

TRIPPING TYPE THERMAL-MAGNETIC					
 **TM12-211** **Circuit Breaker for Equipment thermal-magnetic, 1 pole**	Rated Voltage **AC 240V** **DC 28V**	Rated Current **0.05 - 16A** Tripping Type **Thermal-Magnetic**	Actuation type **Reset type**	Mounting **Threaded neck type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Auxiliary switch** **Cover for IP54**
 **TM12-111** **Circuit Breaker for Equipment thermal-magnetic, 1 pole**	Rated Voltage **AC 240V** **DC 28V**	Rated Current **0.05 - 16A** Tripping Type **Thermal-Magnetic**	Actuation type **Reset type**	Mounting **Flange type** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Auxiliary switch** **Cover for IP54**
 **AS168X** **Manual Motor Controller / Circuit Breaker for Equipment thermal-magnetic, 1 to 4 poles**	Rated Voltage **AC 240/420V** **DC 120V**	Rated Current **0.5 - 52A** Number of Poles **1-4** Tripping Type **Thermal-Magnetic**	Actuation type **Handle**	Mounting **DIN rail** Anschlüsse **Screw clamps**	Options **Remote trip release** **Auxiliary and/or signal contact**

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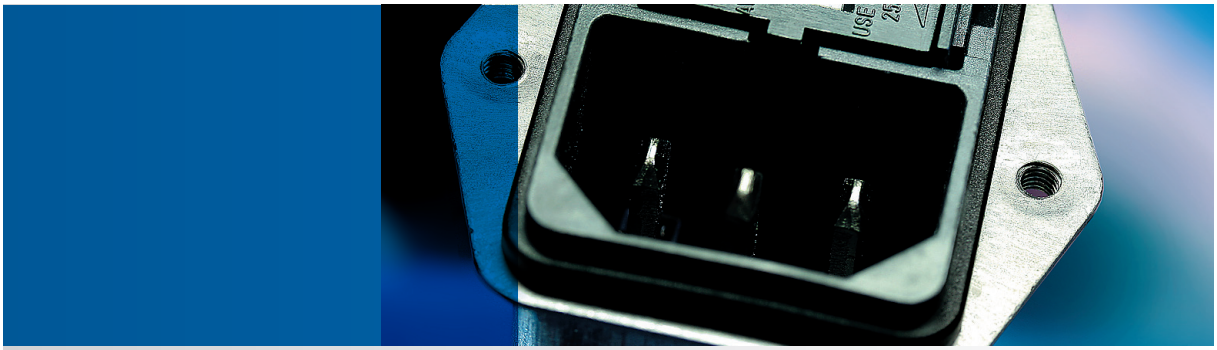

Power entry module with IP 65 for medical applications

The product 5707 with its 2 screw cap fuseholders is IP 65 sealed and can be mounted from the front or the rear side.

The flange seals to the chassis by observing the regired mounting instruction. The product is ideally suited for use in medical applications according IEC 60601-1.

Slim single pole circuit breaker with dust and jetting water protection of IP 65

The threaded-neck type is available with an IP 65 rated cover, which provides protection against environmental conditions such as dust or jetting water.

Medical technology

SCHURTER products are ideal for use in medical equipment.

They meet the typical requirements for high quality medical equipment in terms of reliability, consistent focus on safety and a corresponding design to ensure hygiene, long service life as well as simple operation and maximum function integration.

A product overview can be found at: www.schurter.com/med

SCHURTER's undervoltage protection units

meet international safety standards. Available current ratings range from 2.5 Amps to 20 Amps, for snap-in mounting.

TRIPPING TYPE UNDERVOLTAGE

	**TA45U 2pol Wippe** **Circuit Breaker for Equipment with undervoltage release, Rocker actuation, 2-poles**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **0 - 20A** Number of Poles **2** Tripping Type **Undervoltage**	Actuation type **Rocker**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Overload protection** **Auxiliary switch** **Cover for IP65**
	**TA45U 2pol Drucktaster** **Circuit Breaker for Equipment with undervoltage release, Push button actuation, 2-poles**	Rated Voltage **AC 240V** **DC 48V**	Rated Current **0 - 20A** Number of Poles **2** Tripping Type **Undervoltage**	Actuation type **Pushbutton**	Mounting **Snap-in or flange mounted** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Overload protection** **Auxiliary switch** **Cover for IP65**
	**TA45U 3pol Wippe** **Circuit Breaker for Equipment with undervoltage release, Rocker actuation, 3-poles**	Rated Voltage **AC 400V**	Rated Current **0 - 12A** Number of Poles **3** Tripping Type **Undervoltage**	Actuation type **Rocker**	Mounting **Snap-in version** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Overload protection** **Auxiliary switch** **Cover for IP65**
	**TA45U 3pol Drucktaster** **Circuit Breaker for Equipment with undervoltage release, Push button actuation, 3-poles**	Rated Voltage **AC 400V**	Rated Current **0 - 12A** Number of Poles **3** Tripping Type **Undervoltage**	Actuation type **Pushbutton**	Mounting **Snap-in or flange mounted** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm or screw terminals**	Options **Overload protection** **Auxiliary switch** **Cover for IP65**
 new	**UP1 Rockerswitch** **Undervoltage protection switch, Rocker actuation, 2-poles**	Rated Voltage **AC 115V**	Rated Current **16A** Number of Poles **2** Tripping Type **Undervoltage**	Actuation type **Rocker**	Mounting **Snap-in or flange mounted** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Undervoltage release** **Factory mount cover** **Cover for IP54**
 new	**UP1 Pushbutton** **Undervoltage protection switch, Push button actuation, 2-poles**	Rated Voltage **AC 115V**	Number of Poles **2** Tripping Type **Undervoltage**	Actuation type **Pushbutton**	Mounting **Snap-in or flange mounted** Anschlüsse **Quick connect terminals 6.3 x 0.8 mm**	Options **Undervoltage release** **Factory mount cover** **Cover for IP54 or IP65**

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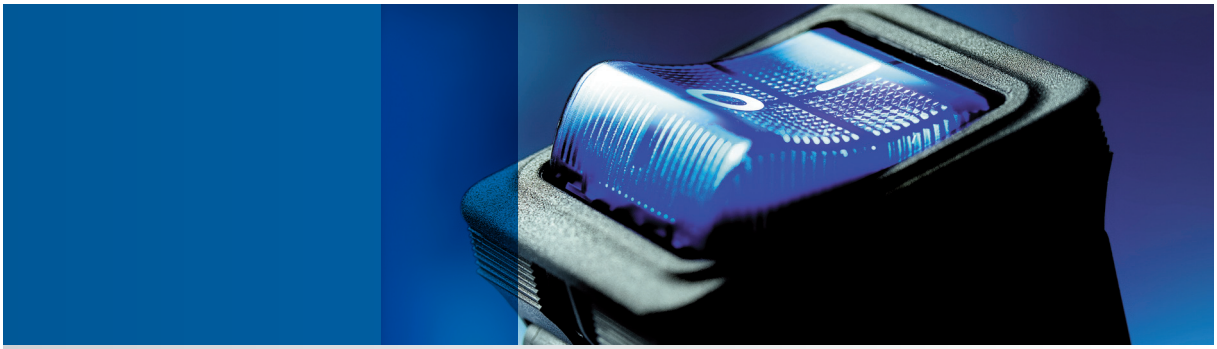


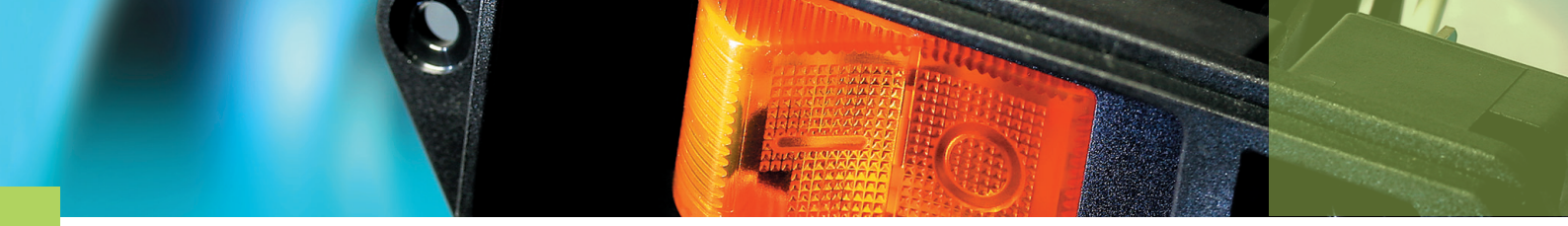
Thermal circuit breaker TA35 with unique blue lighted rocker switch

The circuit breaker TA35 in 1-, 2- or 3-pole version makes an impression because of its compactness and its skillfully designed shape. A unique version is the rocker switch type with the popular blue glow lamp. Further colors and rocker symbols are available in several variations.

An optional protective cover gives a protection class of IP 65, making the unit suitable for applications exposed to dust or splashing water. Typical applications are laboratory equipment for chemical and medical applications, wood and masonry processing machines, construction site equipment, power generators, cleaning equipment, food-processing equipment and appliances.

Mission statement

SCHURTER is the leader in its field as innovator, manufacturer and supplier of fuses, connectors, circuit breakers, EMC products and input systems.



SCHURTER's power entry modules

with built-in circuit breakers meet international safety standards. Available current ratings range from 2.5 Amps to 20 Amps, for screw-in, snap-in, and PCB mounting.

MAX. RATED CURRENT 10 A

6145

IEC Appliance Inlet C14 with Circuit Breaker TA45

Mounting
Screw
Mounting side
Front-Side
Terminals
Quick-Connect

Line Switch
-Rocker switch
-Circuit Breakers
-TA45
-2-pole

C14
70° C

DF11

IEC Appliance Inlet C14 with recessed Circuit Breaker TA45

Mounting
Snap-in or screw-on
Mounting side
Front-/Rear-Side
Terminals
Quick-Connect

Line Switch
-Rocker switch
-Circuit Breakers
-TA45
-2-pole

C14
70° C

DF12

IEC Appliance Inlet C14 with Filter, Circuit Breaker TA45 (recessed)

Mounting
Screw
Mounting side
Front-Side
Terminals
Quick-Connect

Line Switch
-Rocker switch
-Circuit Breakers
-TA45
-2-pole

C14
70° C

5145

IEC Appliance Inlet C14 with Filter, Circuit Breaker TA45

Mounting
Screw
Mounting side
Front-Side
Terminals
Quick-Connect

Line Switch
-Rocker switch
-Circuit Breakers
-TA45
-2-pole

C14
70° C

MAX. RATED CURRENT 16 A

EF11

IEC Appliance Inlet C20 with Circuit Breaker TA45

Mounting
Snap-in or screw-on
Mounting side
Front-/Rear-Side
Terminals
Quick-Connect

Line Switch
-Rocker switch
-Circuit Breakers
-TA45
-2-pole

C20
70° C

EF12

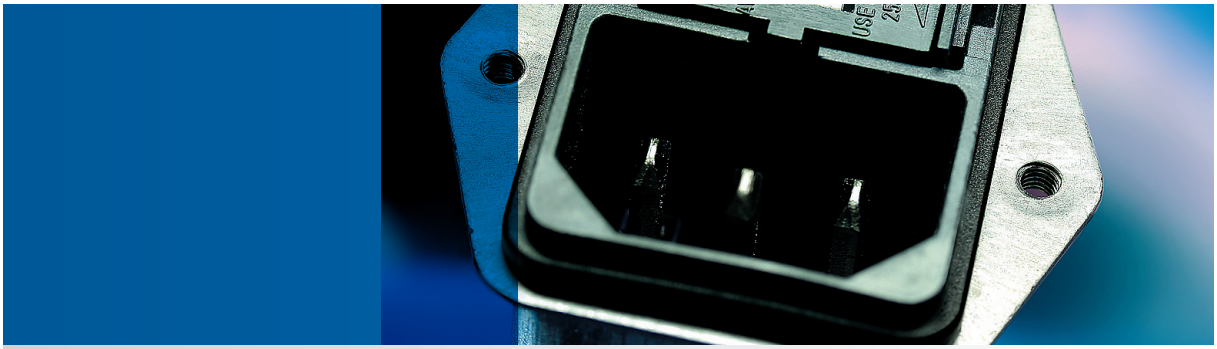
IEC Appliance Inlet C20 with Filter, Circuit Breaker TA45 (recessed)

Mounting
Screw
Mounting side
Front-Side
Terminals
Quick-Connect

Line Switch
-Rocker switch
-Circuit Breakers
-TA45
-2-pole

C20
70° C

For customer specific solutions, please contact us. www.schurter.com/contact



Power entry modules now with metal flange

The new metal flange versions of the SCHURTER types C20F, DC12 and KFA are suitable for mounting from the inner side of the appliance enclosures, simplifying the assembling processes.

Additionally fixating nuts have also been eliminated by an optimized construction of the filter case. The electrical subassemblies, including the power supply, can now be completely tested before they are assembled into the appliance enclosure. These extensions to the product range support appliance manufacturers in their product optimizing efforts and therefore offer them significant competitive advantages.

Detailed information are available on the specific product data sheets C20F, DC12 und KFA

Mission statement

Giving a good example, creating trust, assuming responsibility, accepting change.

SCHURTER's voltage selector switches
are designed for international markets. Series-parallel and step-switch types are available in various styles and sizes and mounting.

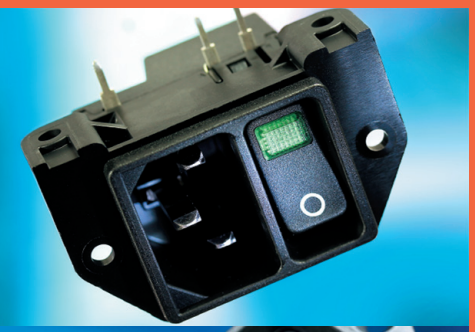
	**SWA1 (Frontpl)** **Voltage selector switch, 2 position, serie-parallel, panel mounting**	Rated Current IEC/ UL **6.3 A** Rated Voltage **250 VAC**	Mounting **Flange type**	Voltage Selector Type **Series-parallel connections** Steps **2 positions** Fuse-Link **None**
	**SWA2 (Print)** **Voltage selector switch, 2 position, serie-parallel, PCB mounting**	Rated Current IEC/ UL **6.3 A** Rated Voltage **250 VAC**	Mounting **PCB Mounting**	Voltage Selector Type **Series-parallel connections** Steps **2 positions** Fuse-Link **None**
	**SWM1 (Frontpl)** **Voltage selector switch, 3 position, step switch, panel mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **Flange type**	Voltage Selector Type **Step switch** Steps **3 positions** Fuse-Link **None**
	**SWM2 (Print)** **Voltage selector switch, 3 position, step switch, PCB mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **PCB Mounting**	Voltage Selector Type **Step switch** Steps **3 positions** Fuse-Link **None**
	**SWZ1 (Frontpl)** **Voltage selector switch, 6 position, serie-parallel, panel mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **Flange type**	Voltage Selector Type **Series-parallel connections** Steps **6 positions** Fuse-Link **None**
	**SWZ2 (Print)** **Voltage selector switch, 6 position, serie-parallel, PCB mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **PCB Mounting**	Voltage Selector Type **Series-parallel connections** Steps **6 positions** Fuse-Link **None**
	**SWP** **Voltage selector switch, 6 position, step switch, panel mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **Flange type**	Voltage Selector Type **Step switch** Steps **6 positions** Fuse-Link **None**
	**SWS** **Voltage selector switch with fuseholder, 6 position, serie-parallel, panel mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **Flange type**	Voltage Selector Type **Series-parallel connections** Steps **6 positions** Fuse-Link **5x20 mm**

	**SWK** **Voltage selector switch with fuseholder, 6 position, step switch, panel mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **Flange type**	Voltage Selector Type **Step switch** Steps **6 positions** Fuse-Link **5x20 mm**
	**SWG** **Voltage selector switch with fuseholder, 6 position, step switch, panel mounting**	Rated Current IEC/ UL **6.3/10 A** Rated Voltage **250 VAC**	Mounting **Flange type**	Voltage Selector Type **Step switch** Steps **6 positions** Fuse-Link **5x20 or 6.3x32 mm**

Voltage selector with integrated fuseholder

The voltage selector SWK with integrated fuseholder for fuse links 5 x 20 mm with its 6 switch positions is suitable to be used for international used appliances with a transformer power supply.

The step switching is made by positioning of the selection part. The used fuseholder with screw head fulfils the requirements according IEC 60601-1. It is therefore perfectly suited to be used in medical applications.



DC21

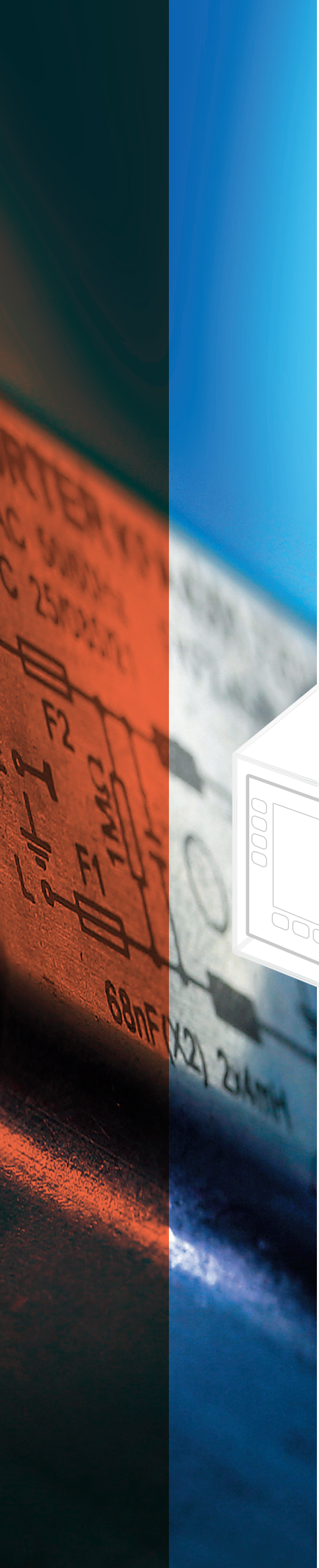
IEC appliance connector C14 with line switch 1- or 2-pole

DD11

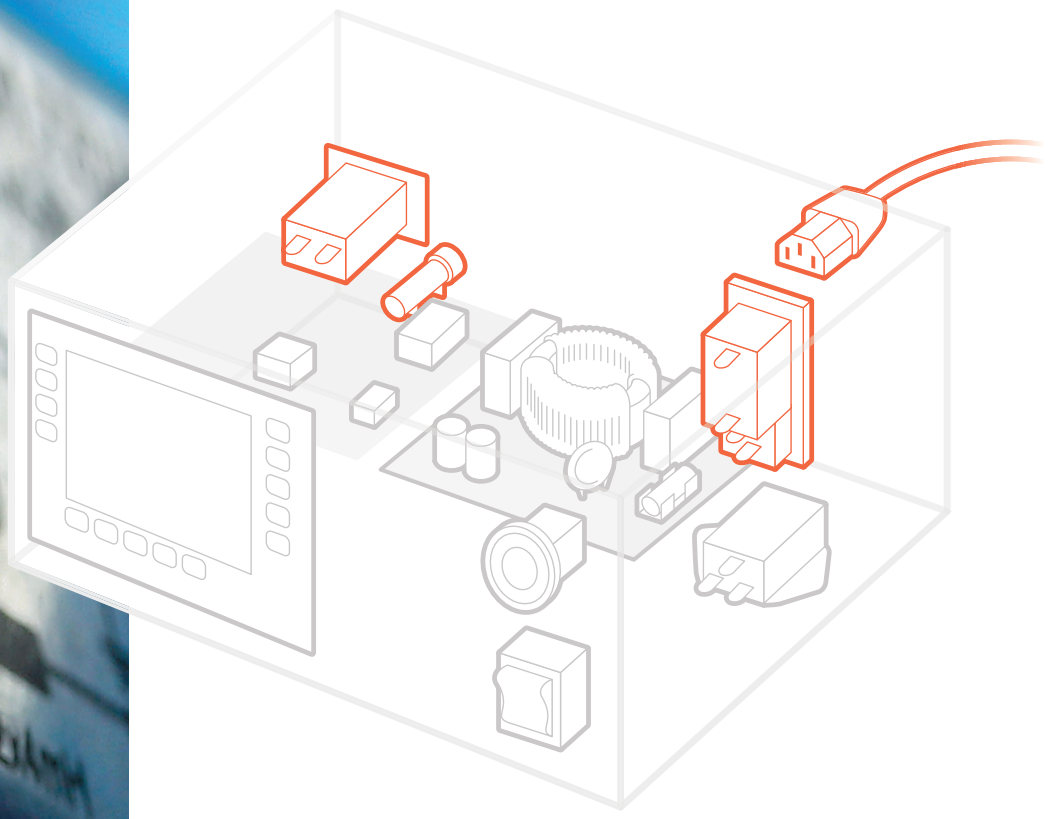
inlet for front- or rear side mounting

5003

DC-inlet filter, front- or rear side mounting



Equipment connections



SCHURTER's devices
are based on IEC connectors with additional functions. They are available for screw-in, snap-in, PCB or sandwich mounting.

MAX. RATED CURRENT 2.5 A				
 **CMF1, CMF4** **IEC Appliance Inlet C8 with Line Switch 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Rear-Side** Terminal **unwired**		Line Switch **Rocker switch 1-pole**	C8 70° C
 **CMF2, CMF5** **IEC Appliance Inlet C8 polarized with Line Switch 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Rear-Side** Terminal **unwired**		Line Switch **Rocker switch 1-pole**	C8 polarized 70° C
 **CMF3, CMF6** **IEC Appliance Inlet C6 with Line Switch 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Rear-Side** Terminal **unwired**		Line Switch **Rocker switch 1-pole**	C6 70° C
MAX. RATED CURRENT 10 A				
 V-Lock **KEB1** **IEC Appliance Inlet C14 with Line Switch 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**		Line Switch **Rocker switch 1-pole**	C14 70° C
 V-Lock **KEB2** **IEC Appliance Inlet C14 with Line Switch 2-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**		Line Switch **Rocker switch 2-pole**	C14 70° C

 V-Lock	**DC11** **IEC Appliance Inlet C14 with Line Switch 1- or 2-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**		Line Switch **Rocker switch 1 or 2 pole**	C14 70° C
	**1074** **IEC Appliance Inlet C14 with Line Switch 1-pole**	Mounting **Snap-in** Mounting side **Front-Side**		Line Switch **Rocker switch 1-pole**	C14 70° C
	**6010-K** **IEC Appliance Inlet C14 with Line Switch 1- or 2-pole**	Mounting **Snap-in** Mounting side **Front-Side**		Line Switch **Rocker switch 1 or 2 pole**	C14 70° C
 V-Lock	**DC21** **IEC Appliance Inlet C14 with Line Switch 1- or 2-pole**	Mounting **Screw** Mounting side **Rear-Side** Terminal **prewired**		Line Switch **Rocker switch 2-pole**	C14 70° C
 V-Lock	**GRM1** **IEC Appliance Inlet C14 with Fuseholder 2-pole, Line Switch 2-pole and Voltage Selector**	Mounting **Snap-in** Mounting side **Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole** Voltage Selectors **jumper optional**	C14 70° C
 V-Lock	**DF11** **IEC Appliance Inlet C14 with recessed Circuit Breaker TA45**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**		Line Switch **Rocker switch Circuit Breakers TA45 2-pole**	C14 70° C

V-Lock

6145

IEC Appliance Inlet C14 with Circuit Breaker TA45

Mounting
Screw
Mounting side
Front-Side
Terminal
prewired

Line Switch
Rocker switch Circuit Breakers TA45 2-pole

C14
70° C

V-Lock new

6135

IEC Appliance Inlet C14 with Circuit Breaker TA35 2-pole

Mounting
Snap-in
Mounting side
Front-Side
Terminal
unwired

Line Switch
TA35 2-pole

C14
70° C

MAX. RATED CURRENT 16 A

V-Lock new

6136

IEC Appliance Inlet C20 with Circuit Breaker TA35 1-pole

Mounting
Snap-in or screw-on
Mounting side
Front-Side
Terminal
unwired

Line Switch
Rocker switch Circuit Breakers TA35 1-pole

C20
70° C

MAX. RATED CURRENT 10 A

V-Lock

KP (Outlet)

IEC Appliance Inlet C14 with Appliance Outlet F

Mounting
Sandwich
Terminal
prewired

F
70° C

V-Lock

KP (Switch)

IEC Appliance Inlet C14 with Line Switch 1- or 2-pole

Mounting
Sandwich
Terminal
prewired

Line Switch
Rocker switch 1 or 2 pole

C14
70° C

V-Lock

KP (FH)

IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole

Mounting
Sandwich
Terminal
prewired

Fuseholder Dimension
5 x 20
Number of Poles
1 or 2 pole

C14
70° C

	**6250 / 6255** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole, mates to Felcom**	Mounting **Snap-in** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**		C14 70° C
	**6050** **Line Switch, fits to Felcom**	Mounting **Snap-in** Mounting side **Front-Side**		Line Switch **Rocker switch 2-pole**	-
 V-Lock	**GSF1** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole**	Mounting **Sandwich** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **optional, 1 or 2 pole**		C14 70° C
 V-Lock	**GSF2** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**		C14 70° C
	**KEA** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired or unwired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Voltage Selectors **step optional**	C14 70° C
	**KEA-Print** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole for PCB**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**		C14 70° C

	**6200** **IEC Appliance Inlet C14 with Fuseholder 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1-pole**		C14 70° C
	**6202** **IEC Appliance Inlet C18 with Fuseholder 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1-pole**		C18 70° C
	**6205** **IEC Appliance Inlet C14 with Fuseholder 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **unwired**	Fuseholder Dimension **5 x 20** Number of Poles **1-pole**		C14 70° C
	**6220** **IEC Appliance Inlet C14 with Fuseholder 2-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **2-pole**		C14 70° C
	**1062** **IEC Appliance Inlet C14 or C18 with Fuseholder 1- or 2-pole**	Mounting **Screw** Mounting side **Frontside**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**		C18 70° C
	**1060** **IEC Appliance Inlet C14 with Fuseholder 1-pole**	Mounting **Screw** Mounting side **Front-/Rear-Side**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**		C14 70° C

1064

IEC Appliance Inlet C14 or C18 with Fuseholder 1- or 2-pole

Mounting
Snap-in
Mounting side
Front-Side
Terminal
prewired or unwired

Fuseholder Dimension
5 x 20
Number of Poles
1 or 2 pole

C14
70° C

V-Lock

4707

IEC Appliance Inlet C14 with Fuseholder 2-pole

Mounting
Screw
Mounting side
Front-/Rear-Side
Terminal
prewired

Fuseholder Dimension
5 x 20
Number of Poles
1 or 2 pole

C14
70° C

8842/8843

IEC Appliance Inlet C14 with Fuseholder 2-pole

Mounting
Screw
Mounting side
Front-Side
Terminal
prewired

Fuseholder Dimension
5 x 20
Number of Poles
1 or 2 pole

C14
70° C

4719

IEC Appliance Outlet F with Fuseholder 1-pole

Mounting
Snap-in
Mounting side
Front-Side
Terminal
prewired

Fuseholder Dimension
5 x 20
Number of Poles
1-pole

F
70° C

V-Lock

KEC

IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole and Voltage Selector

Mounting
Snap-in or screw-on
Mounting side
Front-/Rear-Side
Terminal
prewired or unwired

Fuseholder Dimension
5 x 20 or 6.3 x 32
Number of Poles
1 or 2 pole

Voltage Selectors
step optional

C14
70° C

V-Lock

KE

IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole and Voltage Selector

Mounting
Snap-in or screw-on
Mounting side
Front-/Rear-Side
Terminal
prewired or unwired

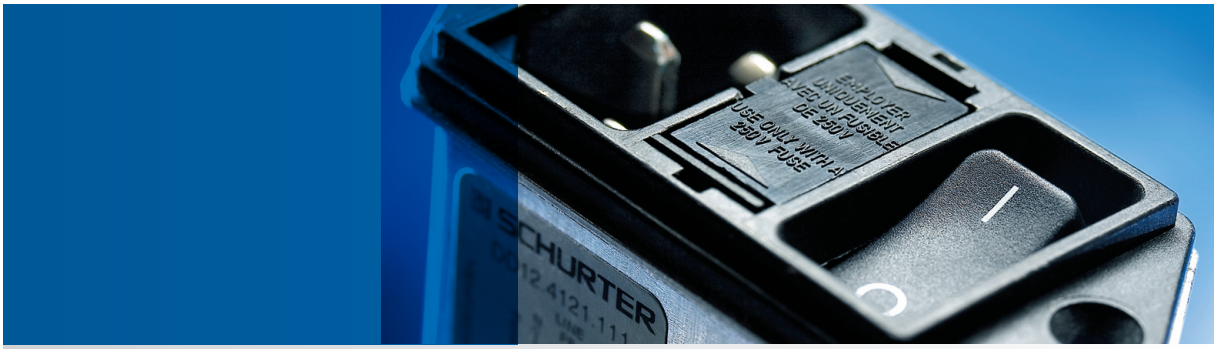
Fuseholder Dimension
5 x 20 or 6.3 x 32
Number of Poles
1 or 2 pole

Voltage Selectors
series-parallel

C14
70° C

MAX. RATED CURRENT 16 A				
 V-Lock **EC11** **IEC Appliance Inlet C20 with Line Switch, 1- or 2-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**		Line Switch **Rocker switch 2-pole**	C20 70° C
 V-Lock **EF11** **IEC Appliance Inlet C20 with Circuit Breaker TA45**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**		Line Switch **Rocker switch Circuit Breakers TA45 2-pole**	C20 70° C

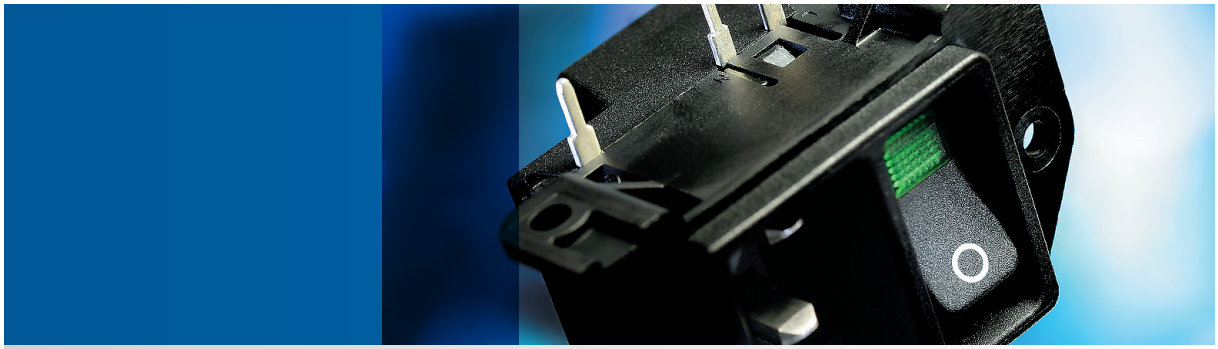
For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176



Maximum functionality within minimal dimensions

The latest power entry modules, series DD11 and DD12, are extremely compact and robustly designed. The excellent performance makes them suitable for nearly any application using detachable power.

The DD11 is equipped with multiple functions including an apliance connector, switch and fuseholder. The DD12 combines the same functions and additionally includes a line filter. The fuseholder is available as 1- or 2-pole version. The switch – with or without illumination – is designed for inrush currents up to 100 A. The filtered version has a broad metal flange inshuring ideal filtering and shielding.



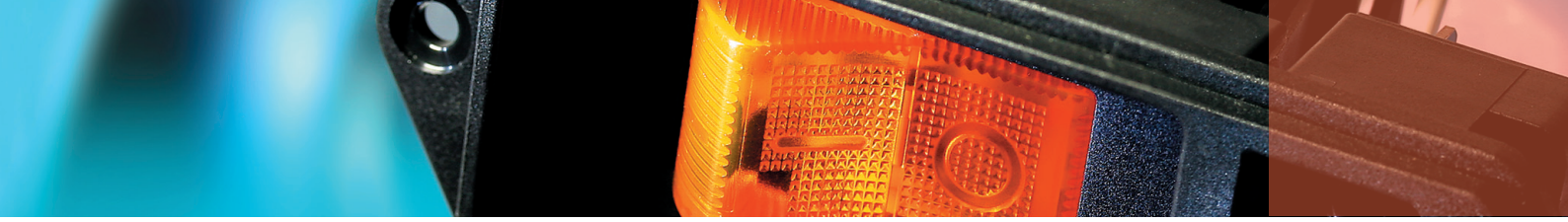
Compact power entry modules for PCB-mounting

The DD21 with IEC-connector and 1-or 2-pole rocker switch is ideally suited for compact mounting styles. The product can be mounted directly to the board and additionally be fixed with screws.

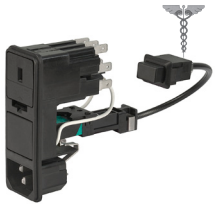
The illuminated switch suits perfectly for 1 unit rack components as e.g. switches and routers.

Systematical employment of SIX SIGMA

SCHURTER distinguishes itself by the highest quality standards in all processes. With the methodes of SIX SIGMA, we arise the customer benefit and strengthen our position in the market continuously.

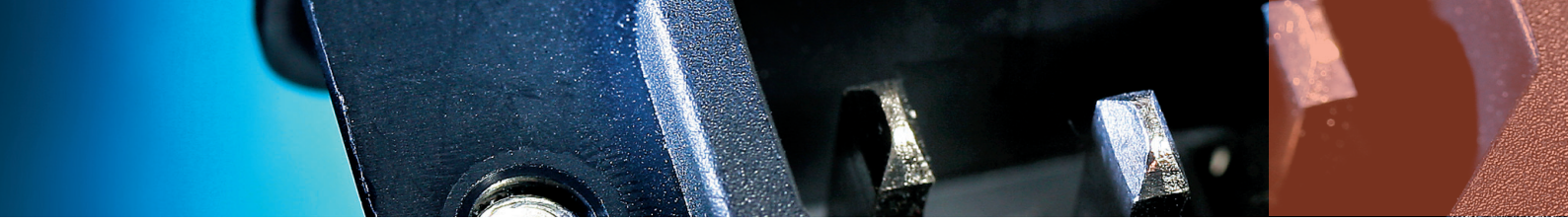


SCHURTER's devices
are based on IEC connectors with additional functions. They are available for screw-in, snap-in, PCB or sandwich mounting.

MAX. RATED CURRENT 6 A				
 **KG-Bowdencable** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole, Bowden-Line Switch 2-pole and Voltage Selector**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **partially wired**	Fuseholder Dimension **5 x 20 or 6.3 x 32** Number of Poles **1 or 2 pole**	Line Switch **Switch for bowdencable 2-pole** Voltage Selectors **series-parallel**	C14 70° C
 **KD-Bowdencable** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole, Bowden-Line Switch 2-pole and Voltage Selector**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20 or 6.3 x 32** Number of Poles **1 or 2 pole**	Line Switch **Switch for bowdencable 2-pole** Voltage Selectors **step optional**	C14 70° C
MAX. RATED CURRENT 10 A				
 **KM** **IEC Appliance Inlet C14 with Fuseholder 2-pole, Line Switch 1- or 2-pole**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole**	C14 70° C
 new **DD11** **IEC Appliance Inlet C14 with Line Switch 2-pole, Fuseholder 1- or 2-pole**	Mounting **Screw** Mounting side **Front-/Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole**	C14 70° C
 new **DD21** **IEC Appliance Inlet C14 with Line Switch 2-pole, Fuseholder 1- or 2-pole, for PCB mounting,**	Mounting **Screw** Mounting side **Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole**	C14 70° C

	**6765** **IEC Appliance Inlet C14 or C18 with Line Switch 2 pole and Fuseholder 1- or 2-pole**	Mounting **Screw** Mounting side **Front-/Rear-Side**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole**	C14 70° C
	**6762** **IEC Appliance Inlet C14 or C18 with Line Switch 2-pole and Fuseholder 1-pole**	Mounting **Snap-in or screw-on** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20** Number of Poles **1-pole**	Line Switch **Rocker switch 1 or 2 pole**	C14 70° C
 V-Lock	**KD** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole, Line Switch 1- or 2-pole and Voltage Selector**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20 or 6.3 x 32** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole** Voltage Selectors **step optional**	C14 70° C
 V-Lock	**KG** **IEC Appliance Inlet C14 with Fuseholder 1- or 2-pole, Line Switch 1- or 2-pole and Voltage Selector**	Mounting **Snap-in or screw-on** Mounting side **Front-/Rear-Side** Terminal **partially wired**	Fuseholder Dimension **5 x 20 or 6.3 x 32** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole** Voltage Selectors **series-parallel**	C14 70° C
 V-Lock	**6766** **IEC Appliance Inlet C14, with Line Switch 2-pole, Voltage Selector and Fuseholder 1or 2-pole**	Mounting **Screw** Mounting side **Front-/Rear-Side**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole** Voltage Selectors **Step switch**	C14 70° C
	**Felcom 64** **IEC Appliance Inlet C14 with modular extended Components**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **prewired**	Fuseholder Dimension **5 x 20** Number of Poles **1 or 2 pole**	Line Switch **Rocker switch 2-pole**	F 70° C

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176



SCHURTER's IEC connectors

meet international safety standards. Available current ratings range from 2.5 Amps to 20 Amps, for screw-in, snap-in, PCB, or sandwich mounting.

MAX. RATED CURRENT 2.5 A			
 **0720-FS** **IEC Appliance Inlet C8, Screw-on Mounting, Rear Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Screw** Mounting side **Rear-Side** Terminal **Solder terminals**	C8 70° C
 **0721-PS** **IEC Appliance Inlet C8, Snap-in Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals**	C8 70° C
 **0720-FP** **IEC Appliance Inlet C8, Screw-on Mounting, Rear Side, PCB-/Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Screw** Mounting side **Rear-Side** Terminal **PCB solder terminals**	C8 70° C
 **0721-PP** **IEC Appliance Inlet C8, Snap-in Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **PCB solder terminals**	C8 70° C
 **2576** **IEC Appliance Inlet C8, Screw-on Mounting, Front Side, Solder or Quick-connect or Print Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Screw** Mounting side **Front-/Rear-Side**	C8 70° C
 **2578** **IEC Appliance Inlet C8, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Snap-in** Mounting side **Front-Side**	C8 70° C
 **0724** **IEC Appliance Inlet C6, Screw-on Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Solder terminals for wires or PCB**	C6 70° C

2565

IEC Appliance Inlet C6, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
2.5A / 2.5A

Mounting
Snap-in
Mounting side
Front-Side

C6
70° C

MAX. RATED CURRENT 10 A

6100-3

IEC Appliance Inlet C14, Screw-on Mounting, Front or Rear Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Screw
Mounting side
Front-/Rear-Side
Terminal
Solder terminals or quick connect terminals

C14
70° C

6100-4

IEC Appliance Inlet C14, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Snap-in
Mounting side
Front-Side
Terminal
Solder terminals or quick connect terminals

C14
70° C

6102-3

IEC Appliance Inlet C18, Screw-on Mounting, Front or Rear Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Screw
Mounting side
Front-/Rear-Side
Terminal
Solder terminals or quick connect terminals

C18
70° C

6102-5

IEC Appliance Inlet C18, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Snap-in
Mounting side
Front-Side
Terminal
Solder terminals or quick connect terminals

C18
70° C

6150

IEC Appliance Inlet C14, mates to Felcom

Rated Current IEC/ UL
10A / 15A

Mounting
Snap-in
Mounting side
Front-Side
Terminal
For PCB mounting

C14
70° C

V-Lock

1061

IEC Appliance Inlet C14, Snap-in Mounting, Front Side, Solder or Quick-connect or Screw-on Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Snap-in
Mounting side
Frontside
Terminal
Solder, Quick Connect or Screw Terminals

C14
70° C

V-Lock

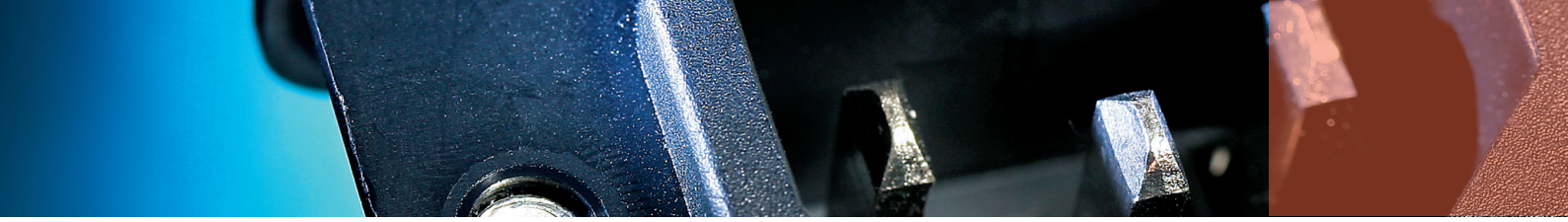
6010

IEC Appliance Inlet C14, Snap-in Mounting, Solder, Quick-connect, Screw or PCB Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Snap-in
Mounting side
Front-Side
Terminal
Solder, quick-connect, screw, PCB

C14
70° C



	**6015** **IEC Appliance Inlet C18, Snap-in Mounting, Solder, Quick-connect, Screw- or PCB Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder, quick-connect, screw, PCB**	C18 70° C
 V-Lock	**6048** **IEC Appliance Inlet C14, Screw-on Mounting, Front or Rear Side, Solder or Quick-connect or Screw-on Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Front-/Rear-Side**	C14 70° C
	**6061-G** **IEC Appliance Inlet C14, Screw-on Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Front-Side**	C14 70° C
	**6130-56** **IEC Appliance Inlet C14, Snap-in Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **For PCB mounting**	C14 70° C
	**8843.ZP30** **IEC Appliance Inlet C14, Screw-on Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **10A / 10A**	Mounting **Screw** Mounting side **Front-Side** Terminal **For PCB mounting**	C14 70° C
	**8843.FL** **IEC Appliance Inlet C14, Screw-on Mounting, Front Side, Quick-connect or Screw-on Terminal**	Rated Current IEC/ UL **10A / 10A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Screw**	C14 70° C
	**8843.FLR** **IEC Appliance Inlet C14, Screw-on Mounting, Front Side, Quick-connect or Screw-on Terminal**	Rated Current IEC/ UL **10A / 10A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Screw**	C14 70° C
 V-Lock	**GSP1** **IEC Appliance Inlet C14 or C18, Screw-on Mounting, Rear Side, PCB- or Solder Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Rear-Side** Terminal **For PCB mounting**	C14 70° C

V-Lock

GSP2

IEC Appliance Inlet C14 or C18, sandwich Mounting, PCB- or Solder Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Sandwich
Terminal
For PCB mounting

C14
70° C

6110-3

IEC Appliance Inlet C16, Screw-on Mounting, Front or Rear Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Screw
Mounting side
Front-/Rear-Side
Terminal
Solder terminals or quick connect terminals

C16
120° C

6110-4

IEC Appliance Inlet C16, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Snap-in
Mounting side
Front-Side
Terminal
Solder terminals or quick connect terminals

C16
120° C

0163

IEC Appliance Inlet C16, Screw-on Mounting, Front or Rear Side, Quick-connect or Screw-on Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Screw
Mounting side
Front-/Rear-Side

C16
120° C

0164

IEC Appliance Inlet C16, Screw-on Mounting, Front Side, Screw-on Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Screw
Mounting side
Front-Side

C16
120° C

6120-3

IEC Appliance Inlet C16A, Screw-on Mounting, Front or Rear Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Screw
Mounting side
Front-/Rear-Side
Terminal
Solder terminals or quick connect terminals

C16 A
155° C

6120-5

IEC Appliance Inlet C16A, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Snap-in
Mounting side
Front-Side
Terminal
Solder terminals or quick connect terminals

C16 A
155° C

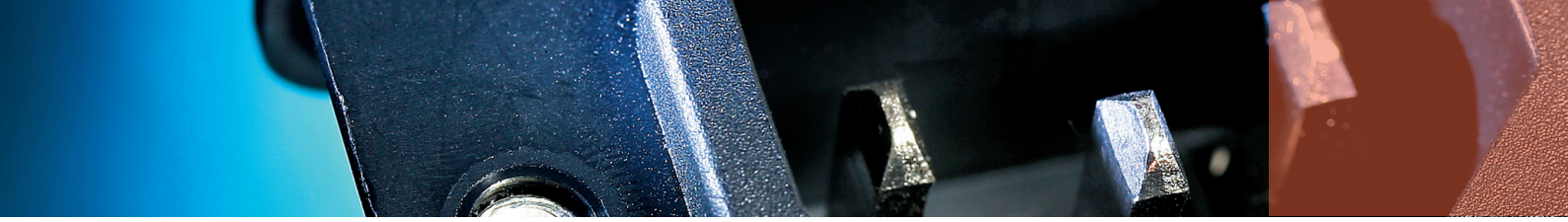
0183

IEC Appliance Inlet C16A, Screw-on Mounting, Front or Rear Side, Quick-connect or Screw-on Terminal

Rated Current IEC/ UL
10A / 15A

Mounting
Screw
Mounting side
Front-/Rear-Side

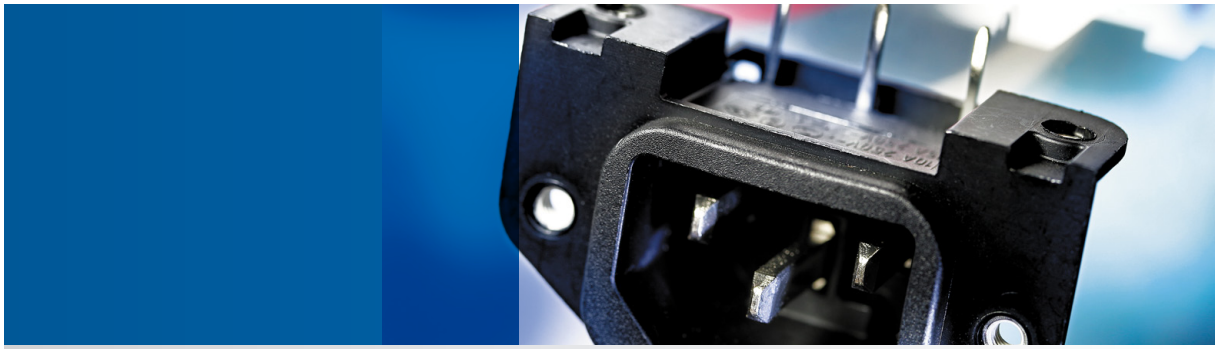
C16 A
155° C



MAX. RATED CURRENT 16 A

 V-Lock	**4798** **IEC Appliance Inlet C20, Screw-on Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **16A / 20A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	C20 70° C
	**4793** **IEC Appliance Inlet C20, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **16A / 20A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	C20 70° C
	**4794** **IEC Appliance Inlet C24, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **16A / 20A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	C24 70° C
 V-Lock new	**1601** **IEC Appliance Inlet C20, Screw-on Mounting, Rear Side, PCB Terminal**	Rated Current IEC/ UL **16A / 21A**	Mounting **Screw** Mounting side **Rear-Side** Terminal **For PCB mounting**	C20 70° C
 V-Lock	**1621** **IEC Appliance Inlet C20, Screw-on Mounting, Front Side, Solder, Quick-connect or Screw Terminal**	Rated Current IEC/ UL **16A / 21A**	Mounting **Screw** Mounting side **Front-Side**	C20 70° C
 new	**1681** **IEC Appliance Inlet C22, Screw-on or Snap-in Mounting, Front Side, Quick connect, Solder or Screw Terminal**	Rated Current IEC/ UL **16A / 21A**	Mounting **Snap-in or screw-on** Mounting side **Frontside**	C22 155 °C

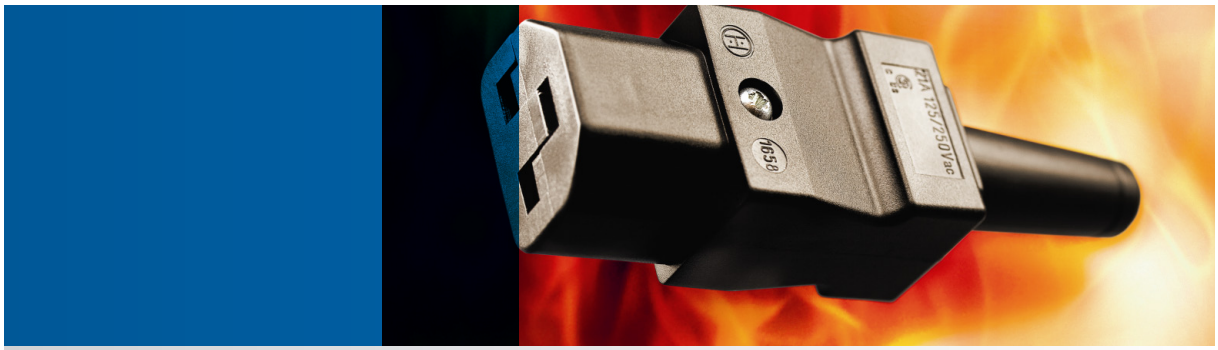
For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176



Robust appliance inlet for PCB mounting

The appliance inlet GSP1 offers a proven and robust mechanical design for a power supply directly onto the circuit board.

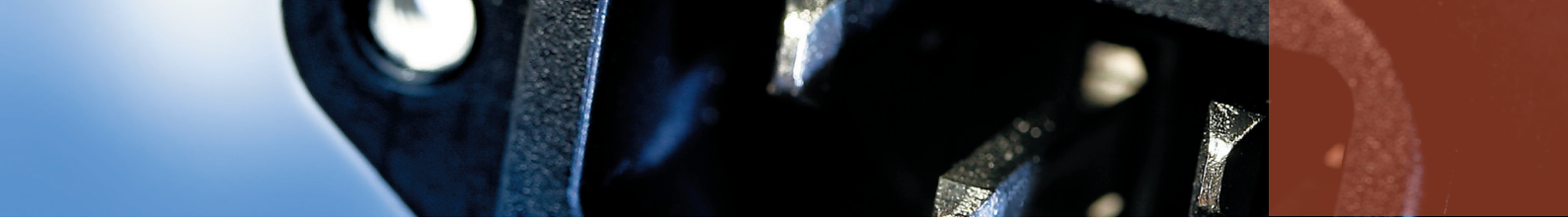
The mechanical mounting styles include self tapping screws, metrical screws with included counter sinks or additional nuts. This assures a vast variaty of design possibilities.



1681/1658/1659, Connectors for very hot applications 155°C / 16 A

These three types extend the range of appliance couplers in accordance with IEC 60320 for applications with increased temperature requirements.

They are for rated currents up to 16 A according to IEC, respectively 21 A according to UL/CSA, and can be used at ambient temperatures up to +155°C.

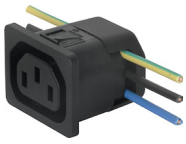


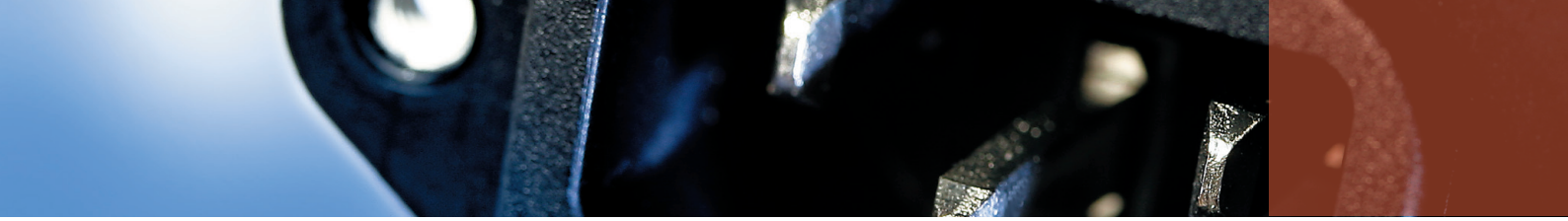
SCHURTER's IEC connectors

meet international safety standards. Available current ratings range from 2.5 Amps to 20 Amps, for screw-in, snap-in, PCB, or sandwich mounting.

MAX. RATED CURRENT 2.5 A			
 **5081** **IEC Appliance Outlet D, Inlay Mounting, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Drop-in type**	C7 70°C
 **5082** **IEC Appliance Outlet D, Screw-on Mounting, Front or Rear Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Screw** Mounting side **Front-Side**	
 **5084** **IEC Appliance Outlet D, Screw-on Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 4A**	Mounting **Screw** Mounting side **Front-Side**	D 70° C
 **5086** **IEC Appliance Outlet D, insert Mounting, Solder Terminal**	Rated Current IEC/ UL **2.5A / 4A**	Mounting **Drop-in type** Terminal **Solder terminal**	D 70° C
 **5083** **IEC Appliance Outlet D, Snap-in Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Snap-in** Mounting side **Front-Side**	D 70° C
 **5088** **IEC Appliance Outlet D, Screw-on Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 4A**	Mounting **Screw** Mounting side **Front-Side**	D 70° C
 **5888** **IEC Appliance Outlet B, Screw-on Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **2.5A / 2.5A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Solder terminals**	C5 70°C

MAX. RATED CURRENT 10 A

 V-Lock	**6600-3** **IEC Appliance Outlet F, Screw-on Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	F 70° C
 V-Lock	**6600-4** **IEC Appliance Outlet F, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	F 70° C
 V-Lock new	**6610** **IEC Appliance Outlet F, Snap-in Mounting, Front Side, IDC Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **IDC terminals**	F 70° C
	**6650** **IEC Appliance Outlet F, mates to Felcom**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **For PCB mounting**	F 70° C
	**4721** **IEC Appliance Outlet F Shuttered, Screw-on Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	F 70° C
	**4723** **IEC Appliance Outlet F Shuttered, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	F 70° C
	**4787** **IEC Appliance Outlet F, Screw-on Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Front-Side** Terminal **Solder terminals**	F 70° C
	**4788** **IEC Appliance Outlet F, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**	F 70° C



	**5091** **IEC Appliance Outlet F or H, Screw-on Mounting, Front Side, Solder, PCB or Quick-connect Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Front-Side**	H 70° C
 new	**5001** **IEC Appliance Outlet F, Screw-on Mounting, Rear Side, PCB-/Solder Terminal**	Rated Current IEC/ UL **10A / 15A**	Mounting **Screw** Mounting side **Rear-Side** Terminal **For PCB mounting**	H 70° C
MAX. RATED CURRENT 7 A				
	**1201-A** **Appliance inlet for low voltage, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **7A / -**	Mounting **Snap-in** Mounting side **Front-Side**	70° C
	**1201** **Appliance inlet for low voltage, Snap-in Mounting, Front Side, Solder or Quick-connect Terminal**	Rated Current IEC/ UL **7A / -**	Mounting **Snap-in** Mounting side **Front-Side**	70° C
MAX. RATED CURRENT 15 A				
	**0709** **NEMA line Outlet 5-15R, Snap-in Mounting, Front Side, Solder Terminal**	Rated Current IEC/ UL **15A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals**	
	**0709-1** **NEMA line Outlet 5-15R, Snap-in Mounting, Front Side, V-Slot Terminal**	Rated Current IEC/ UL **15A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **V-Slot- Connector**	
	**0710** **NEMA line Outlet 5-15R, Snap-in Mounting, Front Side, IDC- or Quick-connect Terminal**	Rated Current IEC/ UL **- / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Quick-Connect or Wire (solid)**	

MAX. RATED CURRENT 15 A

0715

NEMA line Outlet 5-15R, Snap-in Mounting, Front Side, Solder Terminal

Rated Current IEC/ UL
15A / 15A

Mounting
Snap-in
Mounting side
Front-Side
Terminal
Solder terminals

MAX. RATED CURRENT 16 A

0723

IEC Appliance Outlet J, Screw-on Mounting, Front Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
16A / 20A

Mounting
Screw
Mounting side
Front-Side
Terminal
Solder terminals or quick connect terminals

J
70° C

V-Lock new

4797

IEC Appliance Outlet J, Snap-in/Screw-on Mounting, Front Side, Solder or Quick-connect Terminal

Rated Current IEC/ UL
16A / 20A

Mounting
Snap-in or screw-on
Mounting side
Front-Side
Terminal
Solder terminals or quick connect terminals

J
70° C

5017

IEC Appliance Outlet J, Screw-on Mounting, Front Side, Quick-connect Terminal

Rated Current IEC/ UL
16A / 21A

Mounting
Screw
Mounting side
Front-Side

J
70° C

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176

Appliance outlet shuttered

The appliance plug 4723 with shuttered outlet is suitable for appliances with increased requirements according protection of user and against entry of dust.

The shutters of the appliance outlet type F assures protection against unintended contact to life parts in the unconnected condition. The products suits perfect to be used in distribution units.

SCHURTER's rewireable AC cord connectors

meet international safety standards IEC, UL and CSA where applicable. Available current ratings range from 2.5 Amps to 20 Amps.

MAX. RATED CURRENT 10 A

	**4732** **IEC Plug E, Cord Connector (Rewireable), Straight, max. cable Diameter 8.5 mm**	Rated Current IEC/ UL **10A / 10A**	Mounting **Power Cord** Terminal **Cable**	E 70° C
	**4735** **IEC Plug E, Cord Connector (Rewireable), Straight, max. Cable Diameter 10 mm**	Rated Current IEC/ UL **10A / 15A**	Mounting **Power Cord** Terminal **Cable**	E 70° C
	**9009** **IEC Plug E, Cord Connector (Rewireable), Straight**	Rated Current IEC/ UL **10A / 15A**	Terminal **Screw clamps**	E 70° C
	**4733** **IEC Plug E, Cord Connector (Rewireable), Angled, max. Cable Diameter 10 mm**	Rated Current IEC/ UL **10A / 10A**	Mounting **Power Cord** Terminal **Cable**	E 70° C
	**4736** **IEC Plug E, Cord Connector (Rewireable), Angled, max. Cable Diameter 10 mm**	Rated Current IEC/ UL **10A / 15A**	Mounting **Power Cord** Terminal **Cable**	E 70° C
	**P685** **IEC Plug E, Cord Connector (Rewireable), Angled**	Rated Current IEC/ UL **10A / 10A**	Mounting **Power Cord** Terminal **Cable**	E 70° C

MAX. RATED CURRENT 13 A

	**1363** **UK Power (Mains) Plug, Cord Connector (Rewireable), 3 pole, Angled**	Rated Current IEC/ UL **13A / 13A**	Mounting **Power Cord**	-

MAX. RATED CURRENT 16 A

4796

IEC Plug I, Cord Connector (Rewireable), Straight

Rated Current IEC/ UL
16A / 21A

Mounting
Power Cord
Terminal
Cable

I
70° C

0922

IEC Plug I, Cord Connector (Rewireable), Straight

Rated Current IEC/ UL
16A / 20A

Mounting
Power Cord
Terminal
Cable

I
70° C

new

4789

IEC Plug I, Cord Connector (Rewireable), Angled

Rated Current IEC/ UL
16A / 21A

Mounting
Power Cord
Terminal
Screw

I
70° C

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176

Country–specific cord sets

SCHURTER offers a variety of power cord sets mating the various appliance connectors and plugs.

The several wire sizes as well as the country–specific mains plugs are concidered in the assortment. The products can be configured according customer requests. The customers can also order semi finished components or use the rewireable plug/connectors to complete the power cords.

SCHURTER's rewireable AC cord connectors

meet international safety standards IEC, UL and CSA where applicable. Available current ratings range from 2.5 Amps to 20 Amps.

MAX. RATED CURRENT 7 A

1251

Appliance Outlet, Cord Connector (Rewireable), Straight, for Low Voltage

Rated Current IEC/ UL
7A / 7A

Terminal
Screw clamps

70° C

MAX. RATED CURRENT 10 A

4782

IEC Connector C13, Rewireable, Straight

Rated Current IEC/ UL
10A / 15A

Mounting
Power Cord

Terminal
Cable

C13
70° C

4785

IEC Connector C13, Rewireable, Angled

Rated Current IEC/ UL
10A / 15A

Mounting
Power Cord

Terminal
Cable

C13
70° C

4300-06

IEC Connector C13, Rewireable, Angled

Rated Current IEC/ UL
10A / 15A

Mounting
Power Cord

Terminal
Cable

C13
70° C

4781

IEC Connector C15, Rewireable, Straight

Rated Current IEC/ UL
10A / 15A

Mounting
Power Cord

Terminal
Cable

C15
120° C

4784

IEC Connector C15, Rewireable, Angled

Rated Current IEC/ UL
10A / 15A

Mounting
Power Cord

Terminal
Cable

C15
120° C

0102

IEC Connector C15A, Rewireable, Straight

Rated Current IEC/ UL
10A / 15A

Mounting
Power Supply Cord

Terminal
Screw clamps

C15 A
155° C

	**0102-G** **IEC Connector C15A, Rewireable, Straight**	Rated Current IEC/ UL **10A / 15A**	Mounting **Power Cord** Terminal **Cable**	C15 A 155° C
	**0112** **IEC Connector C15A, Rewireable, Angled**	Rated Current IEC/ UL **10A / 10A**	Terminal **Screw clamps**	C15 A 155° C
MAX. RATED CURRENT 16 A				
	**4795** **IEC Connector C19, Rewireable, Straight**	Rated Current IEC/ UL **16A / 21A**	Mounting **Power Cord** Terminal **Cable**	C19 70° C
	**0921** **IEC Connector C19, Rewireable, Straight**	Rated Current IEC/ UL **16A / 20A**	Mounting **Power Cord** Terminal **Cable**	C19 70° C
 new	**4790** **IEC Connector C19, Rewireable, Angled**	Rated Current IEC/ UL **16A / 21A**	Mounting **Power Cord** Terminal **Screw**	C19 70° C
	**1651** **IEC Connector C19, Rewireable, Angled**	Rated Current IEC/ UL **16A / 21A**	Mounting **Power Supply Cord** Terminal **Bolts and nuts**	C19 70° C
 new	**1658** **IEC Connector C19, Rewireable, Straight**	Rated Current IEC/ UL **16A / 21A**	Mounting **Power Cord** Terminal **Cable**	
 new	**1659** **IEC Connector C19, Rewireable, Straight**	Rated Current IEC/ UL **16A / 21A**	Mounting **Power Cord** Terminal **Cable**	

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176

SCHURTER's power distribution units
meet international safety standards, according to IEC, and CSA where applicable. Available current ratings range from 2.5 Amps to 20 Amps.

	**0712** **Distribution Unit for Snap-in Mounting with 1 IEC Appliance Inlet C14 and 1 Appliance Outlet F**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Quick connect terminals 4.8 x 0.8 mm**	C14 70° C	F 70° C	Terminal **1 In, 1 out**
	**4730** **Plug Coupler IEC C20 / IEC J, Screw-on Mounting**	Rated Current IEC/ UL **16A / 20A**	Mounting **Screw** Mounting side **Front-/Rear-Side**	C20 70° C	J 70° C	Terminal **1 In, 1 out**
	**4741** **Distribution Unit with 1 IEC Appliance Inlet C14 and 2 Appliance Outlets F, Shuttered**	Rated Current IEC/ UL **10A / 10A**		C14 70° C	F 70° C	Terminal **1 In, 2 out**
	**0909** **Strip Block for Snap-in Mounting with up to 7 IEC Appliance Outlets F**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals**		F 70° C	Terminal **7 out**
	**4752** **Strip Block for Snap-in Mounting with 4 IEC Appliance Outlets F**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**		F 70° C	Terminal **4 out**
	**4754** **Strip Block for Snap-in Mounting with 4 IEC Appliance Outlets F and space for extra component**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**		F 70° C	Terminal **1 In, 4 out**

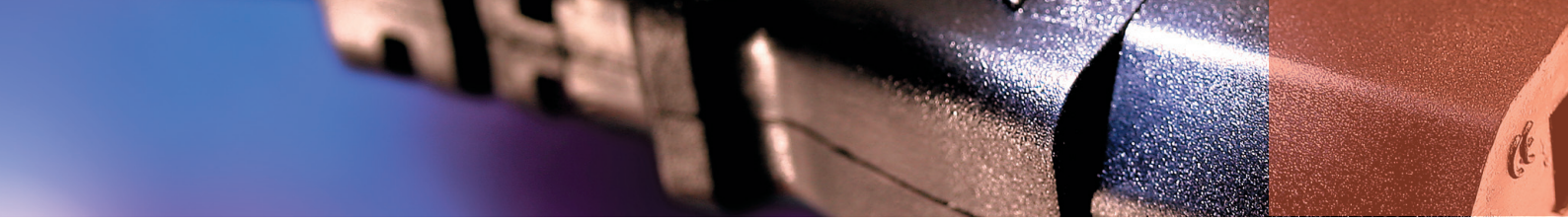
	**4758** **Strip Block for Snap-in Mounting with 4 IEC Appliance Outlets F and Space for 2 Extra Components**	Rated Current IEC/ UL **10A / 15A**	Mounting **Snap-in** Mounting side **Front-Side** Terminal **Solder terminals or quick connect terminals**		F 70° C	Terminal **1 In, 4 out**
	**4747** **Distribution Unit with 1 IEC Appliance Inlet C14 and 4 Appliance Outlets F**	Rated Current IEC/ UL **10A / 15A**		C14 70° C	F 70° C	Terminal **1 In, 4 out**
	**4748** **Distribution Unit with Power Cord and 4 IEC Appliance Outlets F**	Rated Current IEC/ UL **10A / 15A**			F 70° C	Terminal **4 out**
	**4740** **Distribution Unit with 1 IEC Appliance Inlet C14 or Power Cord, 4 IEC Appliance Outlets F and Extra Components**	Rated Current IEC/ UL **10A / 15A**		C14 70° C	F 70° C	Terminal **1 In, 6 out**

General product information see IEC connector page 176

Gender changer 20 A

The gender changer 4730 is designed to connect rack appliances with an appliance coupler type J in a stand alone mode with a standard power cord.

The construction can either be used for screw on mounting or for stand alone installation.



SCHURTER's AC cord sets

meet international safety standards. Available current ratings range from 2.5 Amps to 20 Amps.

MAX. RATED CURRENT 2.5 A

4121

Power Supply Cord with Euro- Power (Mains) Plug, Straight

Rated Current IEC/ UL **2.5A / 2.5A**

Line Plug Standard **Continental Europe diverse**

Power Cord Type **diverse**
Cord Lenght **diverse**
Conductor cross section **diverse**

4810

Power Cord with IEC Connector C7, Straight 70°C

Rated Current IEC/ UL **2.5A / 2.5A**

Line Plug Standard **diverse diverse**

Power Cord Type **diverse**
Cord Lenght **diverse**
Conductor cross section **diverse**

C7

70°C

MAX. RATED CURRENT 10 A

V-Lock new

VAC13KS

Power Supply Cord with IEC Connector C13, V-Lock, straight

Rated Current IEC/ UL **10A / 10A**

Line Plug Standard **diverse diverse**

Power Cord Type **diverse**
Cord Lenght **diverse**
Conductor cross section **diverse**

C13

70° C

V-Lock new

VAC14KC

Power cord with IEC Appliance plug E, V-Lock, straight

Rated Current IEC/ UL **10A / 10A**

Line Plug Standard **diverse diverse**

Power Cord Type **diverse**
Cord Lenght **diverse**
Conductor cross section **diverse**

E

70° C

6000.0214

Divers Power Supply and Interconnection Cords 10 A

Rated Current IEC/ UL **10A / 10A**

Line Plug Standard **uninsulated wires**

Power Cord Type **H05VV-F3G1.0**
Cord Lenght **2.0m**
Conductor cross section **3 x 1 mm²**

C13

70° C

6000.0224

Divers Power Supply and Interconnection Cords 10 A

Rated Current IEC/ UL **10A / 10A**

Line Plug Standard **uninsulated wires**

Power Cord Type **H05VV-F3G1.0**
Cord Lenght **2.0m**
Conductor cross section **3 x 1 mm²**

C13

70° C

6003.0215

Divers Power Supply and Interconnection Cords 10 A

Rated Current IEC/ UL **10A / 10A**

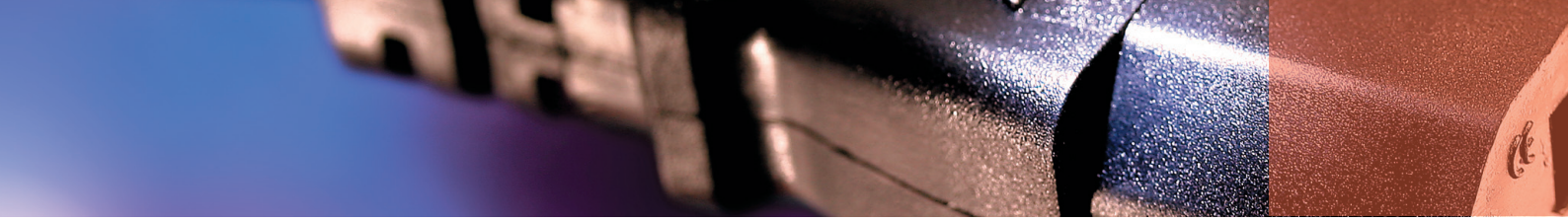
Line Plug Standard **Continental Europe CEE 7 / VII / DIN 49441-R2**

Power Cord Type **H05VV-F3G1.0**
Cord Lenght **2.5m**
Conductor cross section **3 x 1 mm²**

C13

70° C

	**6011.0215** **Divers Power Supply and Interconnection Cords 10 A**	Rated Current IEC/ UL **10A / 10A**	Line Plug Standard **Switzerland ASEV 1011** **Typ 11**	Power Cord Type **H05VV-F3G1.0** Cord Lenght **2.5m** Conductor cross section **3 x 1 mm²**	C13 70° C
	**6026.0215** **Divers Power Supply and Interconnection Cords 10 A**	Rated Current IEC/ UL **10A / 10A**	Line Plug Standard **Italy CEI 23-16 / VII**	Power Cord Type **H05VV-F3G1.0** Cord Lenght **2.5m** Conductor cross section **3 x 1 mm²**	C13 70° C
	**6004.0215** **Divers Power Supply and Interconnection Cords 10 A**	Rated Current IEC/ UL **10A / 10A**	Line Plug Standard **Continental Europe CEE 7 / VII / DIN 49441-R2**	Power Cord Type **H05VV-F3G1.0** Cord Lenght **2.5m** Conductor cross section **3 x 1 mm²**	C13 70° C
	**6009.1315** **Divers Power Supply and Interconnection Cords 10 A**	Rated Current IEC/ UL **10A / 10A**	Line Plug Standard **North America NEMA 5-15**	Power Cord Type **SJT 3x18 AWG** Cord Lenght **2.5m** Conductor cross section **3 x 18 AWG**	C13 70° C
	**4390** **Power Supply Cord with NEMA 5-15 Power (Mains) Plug 3-pole, Straight**	Rated Current IEC/ UL **10A / 10A**	Line Plug Standard **North America NEMA 5-15**	Power Cord Type **diverse** Cord Lenght **diverse** Conductor cross section **diverse**	
	**4321** **Power Supply Cord with CH Power (Mains) Plug 3-pole, Straight**	Rated Current IEC/ UL **10A / 10A**	Line Plug Standard **Switzerland ASEV 1011** **Typ 12**	Power Cord Type **diverse** Cord Lenght **diverse** Conductor cross section **diverse**	
	**0609** **Interconnection Cord with IEC Plug E, Straight**	Rated Current IEC/ UL **10A / 10A**	Line Plug Standard **diverse diverse**	Power Cord Type **diverse** Cord Lenght **diverse** Conductor cross section **diverse**	E 70° C
	**0311** **Power Cord with IEC Connector C13, Angled**	Rated Current IEC/ UL **10A / 15A**	Line Plug Standard **diverse diverse**	Power Cord Type **diverse** Cord Lenght **diverse** Conductor cross section **diverse**	C13 70° C



3013

Power Cord with IEC Connector C13, Angled

Rated Current IEC/ UL
10A / 10A

Line Plug Standard
diverse diverse

Power Cord Type
diverse
Cord Lenght
diverse
Conductor cross section
diverse

C13
70° C

3030

Power Cord with IEC Connector C13, Straight

Rated Current IEC/ UL
10A / 10A

Line Plug Standard
diverse diverse

Power Cord Type
diverse
Cord Lenght
diverse
Conductor cross section
diverse

C13
70° C

311L

Power Cord with IEC Connector C13, Angled

Rated Current IEC/ UL
10A / 10A

Line Plug Standard
diverse diverse

Power Cord Type
diverse
Cord Lenght
diverse
Conductor cross section
diverse

C13
70° C

MAX. RATED CURRENT 13 A

6044.0215

Divers Power Supply and Interconnection Cords 10 A

Rated Current IEC/ UL
13A / 13A

Line Plug Standard
United Kingdom AS 3112

Power Cord Type
H05VV-F3G1.0
Cord Lenght
2.5m
Conductor cross section
3 x 1 mm²

C13
70° C

2343

Power Supply Cord with UK Power (Mains) Plug 3-pole, Angled

Rated Current IEC/ UL
13A / 13A

Line Plug Standard
United Kingdom AS 3112

Power Cord Type
diverse
Cord Lenght
diverse
Conductor cross section
diverse

BS 1363

MAX. RATED CURRENT 16 A

V-Lock new

VAC19KS

Power Cord with IEC Appliance Connector C19, V-Lock, straight

Rated Current IEC/ UL
16A / 16A

Line Plug Standard
diverse diverse

Power Cord Type
diverse
Cord Lenght
diverse
Conductor cross section
diverse

C19
70° C

V-Lock new

VAC20KC

Power Cord with IEC Appliance Plug I, V-Lock, straight

Rated Current IEC/ UL
16A / 16A

Line Plug Standard
diverse diverse

Power Cord Type
diverse
Cord Lenght
diverse
Conductor cross section
diverse

I
70° C

6009.5195

Divers Power Supply and Interconnection Cords 16 A

Rated Current IEC/ UL
16A / 15A

Line Plug Standard
North America NEMA 5-15

Power Cord Type
SJT 3x14 AWG
Cord Lenght
2.5m
Conductor cross section
3 x 14 AWG

C19
70° C

	**422u** **Power Supply Cord with Shako Power (Mains) Plug, Angled**	Rated Current IEC/ UL **16A / 16A**	Line Plug Standard **CEE 7 / VII / DIN 49441-R2**	Power Cord Type **diverse** Cord Lenght **diverse** Conductor cross section **diverse**	
	**4370** **Power Supply Cord with Shako Power (Mains) Plug, Straight**	Rated Current IEC/ UL **16A / 16A**	Line Plug Standard **CEE 7 / VII / DIN 49441-R2**	Power Cord Type **diverse** Cord Lenght **diverse** Conductor cross section **diverse**	

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176

Cord-retaining V-Lock

The cord-retaining system V-Lock prevents unintentional disconnection of the power cord in a simple way.

The locking latches when inserted independently can be unlocked by pushing the release button. Different connectors and power entry modules according to IEC 60320 from the SCHURTER range and various country-specific power cords are offered with this option.

SCHURTER's test jacks and plugs
are made of quality materials meant to last, and manufactured to tight tolerances for reliable operation. A variety of styles and colors is available for PCB or panel mounting.

	**PB 1011** Test Jack, PCB Mounting, single pluggable	Type **Test Jack**	Mounting **PCB Mounting**	Rated Current **10A**
	**PB 1021** Test Jack, PCB Mounting, triple pluggable	Type **Test Jack**	Mounting **PCB Mounting**	Rated Current **6.3A**
	**PB 1151** Test Jack, PCB Mounting, double pluggable, front side	Type **Test Jack**	Mounting **PCB Mounting**	Rated Current **6.3A**
	**PBD 1211** Test Jack, PCB Mounting, single pluggable, Au terminals	Type **Test Jack**	Mounting **PCB Mounting**	Rated Current **6.3A**
	**PS 1061** Test Probe, single pluggable, Au contacts	Type **Test Probe**		Rated Current **6.3A**
	**PS 1161** Test Probe, double pluggable	Type **Test Probe**		Rated Current **6.3A**

Business excellence as a SCHURTER committment

SCHURTER achieves its high level of overall enterprise quality through consistent implementation and training using the EFQM model (European Foundation for Quality Management). Quality and environmental management, social commitment and safety at work are interlinked. We use SIX SIGMA methods for continual improvement of our products and processes. As a result our customers recognise in us a reliable and longterm partner.

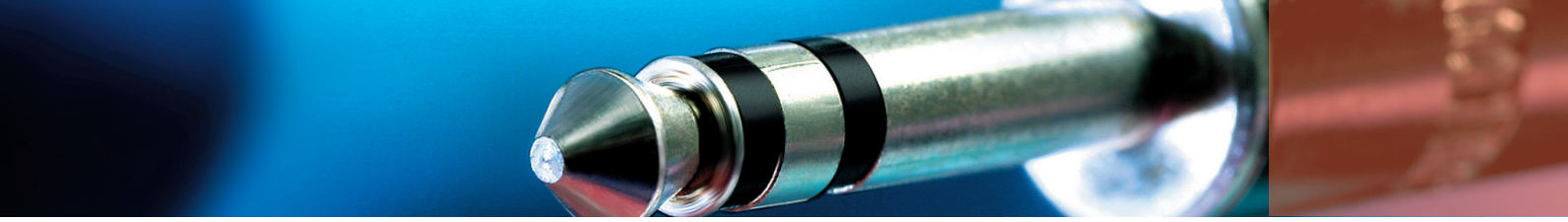
A market leader's statement

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.

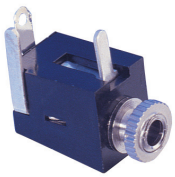
Best products worldwide

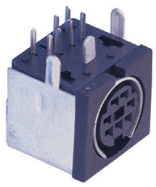
"Both, now and in the future, our customers are guaranteed the best products world-wide; products which perfectly correspond to their individual needs. SCHURTER is permanently committed to the excellent quality of its products and business practices which are ecologically sound."

Hans-Rudolf Schurter, SCHURTER Holding AG



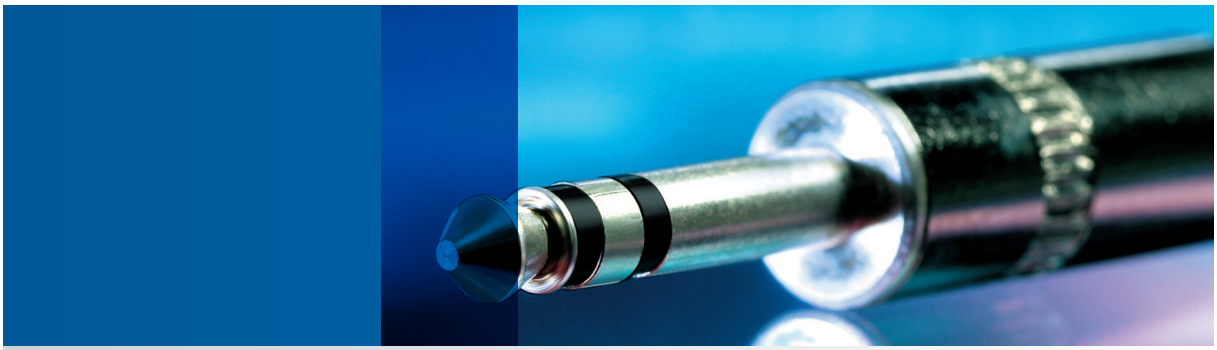
SCHURTER supplies 2.5 mm, 3.5 mm and 6.3 mm shielded and unshielded plugs and jacks for audio signal applications, as well as multi-pin DIN connectors for data.

	**4801 UK-Stecker, D=2,5mm** **Data and Signal connectors, Diameter 2.5 mm, 2 pole**	Ratings **0.65A** **12V**	**Plug/ Socket** Diameter **2.5mm** Number of Poles **2-pole**	Terminal **Solder** Housing **Insulated/ Screened**
	**4802 UK-Stecker, D=3,5mm** **Data and Signal connectors, Diameter 3.5 mm, 2 and 3 pole**	Ratings **1A** **12V**	**Plug/ Socket** Diameter **3.5mm** Number of Poles **2-pole**	Terminal **Solder** Housing **Insulated/ Screened**
	**4803 UK-Stecker, D=6,5mm** **Data and Signal connectors, Diameter 6.3 mm, 2 and 3 pole**	Ratings **2A** **12V**	**Plug/Socket (Line)** Diameter **6.3mm** Number of Poles **2-/ 3-pole**	Terminal **Solder** Housing **Insulated/ Screened**
	**4804 UK-Stecker, D=7,5mm** **Data and Signal connectors, Diameter 7.5 mm, 4 and 6 pole**	Ratings **2A** **12V**	**Plug/ Socket** Diameter **7.5mm** Number of Poles **4-/ 6-pole**	Terminal **Solder** Housing **Insulated/ Screened**
	**4831 Audio-Stecker, D=2,5mm** **Audio connectors, Diameter 2.5 mm, 2 and 3 pole**	Ratings **0.5A** **30V**	**Plug/ Socket** Diameter **2.5mm** Number of Poles **2-/ 3-pole**	Terminal **Solder** Housing **Insulated/ Screened**
	**4832 Audio-Stecker, D=3,5mm** **Audio connectors, Diameter 3.5 mm, 2 and 3-pole**	Ratings **0.5A** **30V**	**Plug/Socket (Line)** Diameter **3.5mm** Number of Poles **2-/ 3-pole**	Terminal **Solder** Housing **Insulated/ Screened**
	**4833 Audio-Stecker, D=6,3mm** **Audio connectors, Diameter 6.3 mm, 2 and 3 pole**	Ratings **1A** **30V**	**Plug/Socket (Line)** Diameter **6.3mm** Number of Poles **2-/ 3-pole**	Terminal **Solder** Housing **Insulated/ Screened**
	**4840 DC-Stecker, verschiedene** **DC plugs and sockets for low voltage power supplies**	Ratings **0.5A** **18V**	**Plug/ Socket** Number of Poles **2-/ 3-pole**	Terminal **Solder**



4850 DIN-Stecker, verschiedene **DIN plugs and sockets 3 to 8 poles**	Ratings **2A** **12V**	**Plug/Socket (Line)** Number of Poles **3- to 8-pole**	Terminal **Solder**

For customer specific solutions, please contact us. www.schurter.com/contact



Data and signal connectors 2 – 6 pole

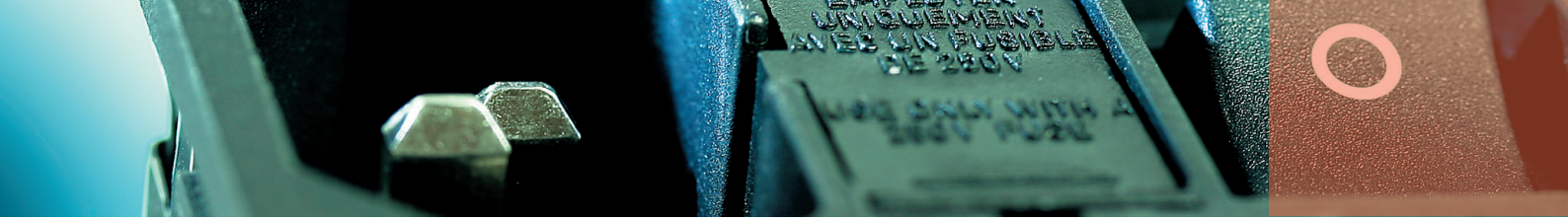
Most plugs are available with either insulated handles or fully screened for ground contiunity. The range consist of 2.5 mm, 3.5 mm, 6.5 mm and 7.5 mm sizes in 2 up to 6 switched poles.

Every unit is manufactured using nickel-plated brass for the connectors and thermoplastics for the insulation. The cable terminations are silver-plated for improved solderability.

Intensive customer interaction

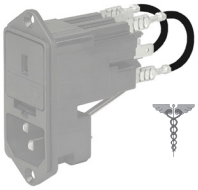
“So what made this thing happen was our good teamwork with their technical department and the close and continuous overall development cooperation with the customer.”

Raimund Hüglin / Martin Zarges

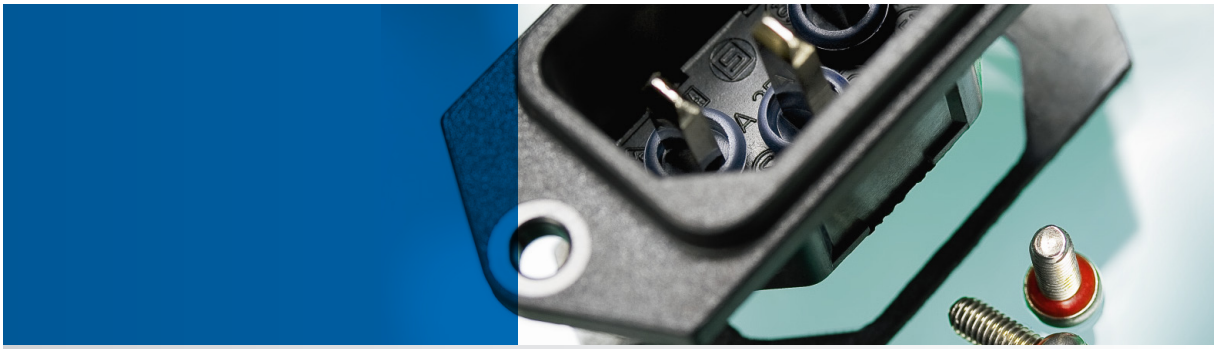


The suitable accessories to the SCHURTER products presented in the overview.Please note that there are certain products to force the necessary accessories which are required for the proper functioning of the product must be ordered separately.

	**Wire Harness** Wire harness for SCHURTER products		Connection to **CD, C20F, DC11, DC12, DD11, DD12, EC11, EC12, KD, KEA, KFA, KM, KMF, 2572, 4719, 4793, 4797, 4798, 5086, 5110, 5120, 5130, 5707, 6100-3, 6100-4, 6600-3, 6600-4, 6762, 6765**
	**Sealing Kit** Sealing for Appliance Inlets		Sealing to **6102-3, 6110-3, 6120-3**
	**Assorted Covers** Rear Cover		
	**Cord retaining kits** Cord retaining strain relief		
	**Strain_Reliefs KT14** PVC Strain Relief		
	**Fusedrawer 1** Fusedrawer for Fuse Links 5x20mm resp.. 6.3x32mm		Drawer to **CE, CG, CG-Bowdencable, KE, KG, KG-Bowdencable**
	**Fusedrawer 2** Fusedrawer with and without Voltage Selector Insert	Kommentar **For added safety "Extra-Safe" fuse drawers are available Fuse drawer meets requirements of medical standard IEC/EN 60601-1**	Drawer to **DD11, DD12, DD21, DD22, KEA-Print, KFA, KMF**
	**Fusedrawer 3** Fusedrawer for Fuse Links 5x20mm resp. 6.3x32mm	Kommentar **For added safety "Extra-Safe" fuse drawers are available Fuse drawer meets requirements of medical standard IEC/EN 60601-1**	Drawer to **CD, CD-Bowdencable, KD, KD-Bowdencable, KEC, KFC**

	**Bowdencables incl. accessory** **Bowden Cable for Power Entry Modules**		bowden cable to **CD-Bowdencable, CG-Bowdencable, KD-Bowdencable, KG-Bowdencable**
	**Jumper Wire 1** **Connection with Stranded Cable**		Connection to **CE, CG, CG-Bowdencable, KE, KG, KG-Bowdencable**

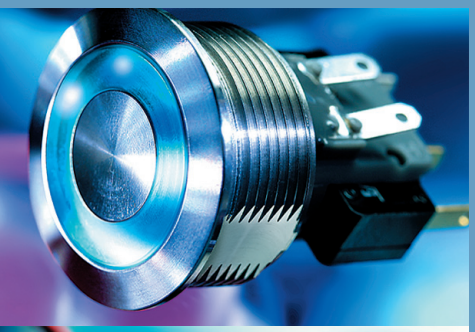
General product information see IEC connector page 176

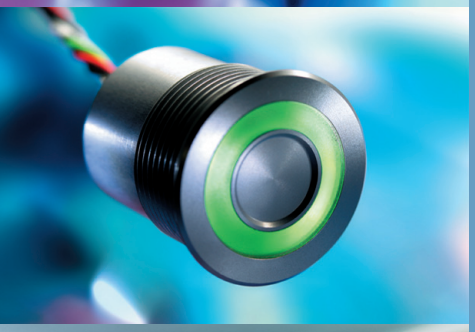


Appliance couplers with IP 54 and IP 65

For applications with increased impermeability requirements, the two connector types 6100 and 5707 can be delivered with IP 54 for the plug-in.

Type 5707 offers IP 65 protection into the equipment as standard, for type 6100 a sealing kit for IP 54 is available. To ensure the tightness of the plug-in, an additional locking device should be used.





MSM

vandal-proof momentary action and latching action switch

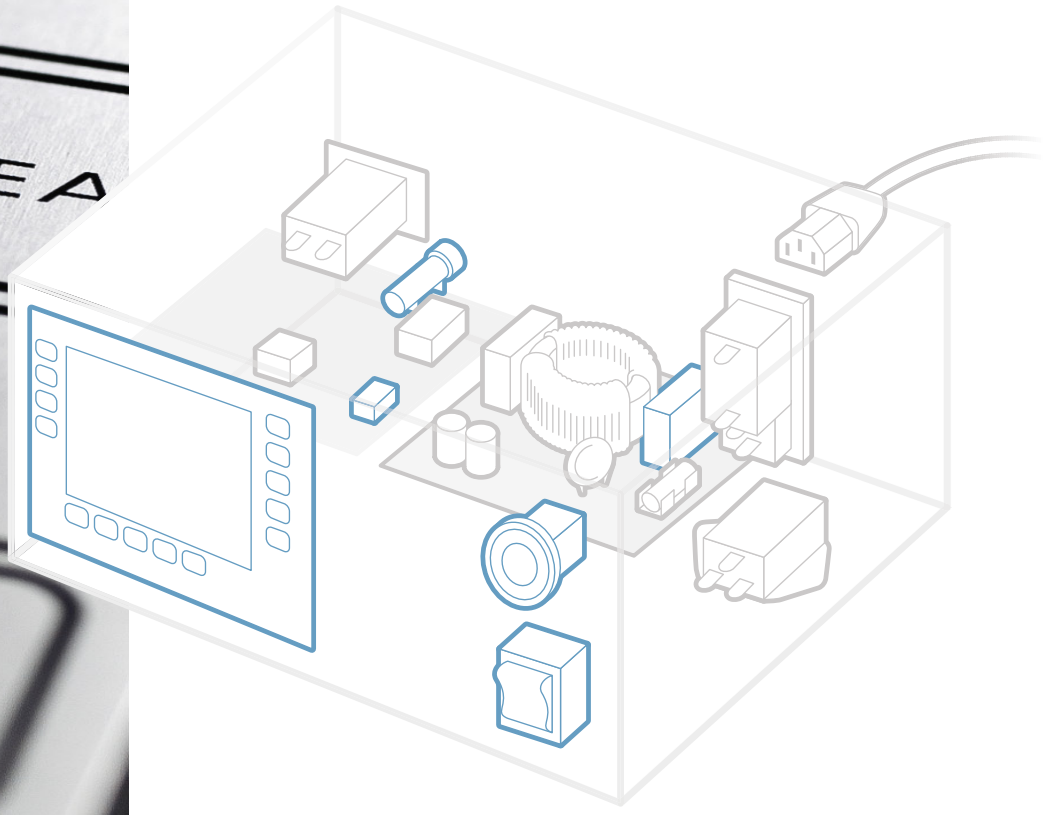
PSE

piezo switch sealed and with long lifetime

Touch Screen

in analog-resistive, matrix or capacitive technology

Input systems



The latching and momentary action switches from the metal line are extremely rugged, feature top quality and attractive design. The piezo switches have a high lifetime of 20 millions of operations and are hermetically sealed according to IP 69K.

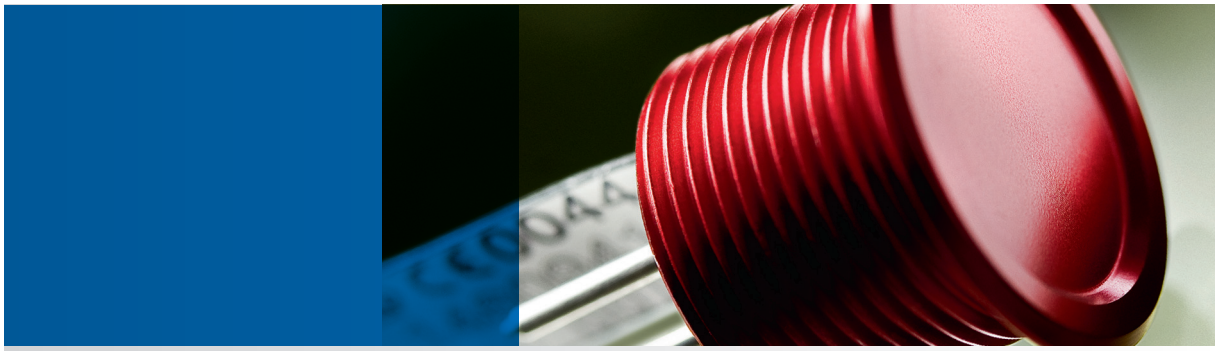
	**MCS 19** **Metal Switch Short Stroke**	Mounting Diameter **19 mm**	Illumination **non-illuminated** Terminal **Pins, Pins with Soldering Aid or Clip for Pins**	IP Protection Class Contact Area Front Side **IP 65** Shock Protection **IK 05**	Switching Voltage **48 VDC, 125 mA**	Operating Temperature **-20 to +60 °C**
	**MCS 19 PI** **Metal Switch Short Stroke**	Mounting Diameter **19 mm**	Illumination **Point Illumination** Terminal **Pins with Soldering Aid**	IP Protection Class Contact Area Front Side **IP 65** Shock Protection **IK 05**	Switching Voltage **48 VDC, 125 mA**	Operating Temperature **-20 to +60 °C**
	**MCS 30 RI** **Metal Switch Short Stroke Ring Illuminated**	Mounting Diameter **30 mm**	Illumination **Ring Illumination** Terminal **Flexible wire**	IP Protection Class Contact Area Front Side **IP 65** Shock Protection **IK 05**	Switching Voltage **48 VDC, 125 mA**	Operating Temperature **-20 to +60 °C**
	**MSM 16** **Metal Switch Medium Stroke, Switching Voltage up to 250 VAC**	Mounting Diameter **16 mm**	Illumination **non-illuminated** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 06**	Switching Voltage **30 VDC, 100 mA** **125 / 250 VAC, 5 / 3 A** **250 VAC, 10 A**	Operating Temperature **-25 to +85 °C**
 new	**MSM 19** **Metal Switch Medium Stroke, Switching Voltage up to 250 VAC**	Mounting Diameter **19 mm**	Illumination **non-illuminated** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **125 / 250 VAC, 5 / 3 A**	Operating Temperature **-25 to +85 °C**
	**MSM 19** **Metal Switch Medium Stroke, Switching Voltage up to 250 VAC**	Mounting Diameter **19 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **30 VDC, 100 mA** **125 / 250 VAC, 5 / 3 A** **250 VAC, 10**	Operating Temperature **-25 to +85 °C**
	**MSM 22** **Metal Switch Medium Stroke, Switching Voltage up to 250 VAC**	Mounting Diameter **22 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **30 VDC, 100 mA** **125 / 250 VAC, 5 / 3 A** **250 VAC, 10 A**	Operating Temperature **-25 to +85 °C**

	**MSM 30** Metal Switch Medium Stroke, Switching Voltage up to 250 VAC	Mounting Diameter **30 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **30 VDC, 100 mA** **125 / 250 VAC, 5 / 3 A** **250 VAC, 10 A**	Operating Temperature **-25 to +85 °C**
	**MSM 19 DP** Metal Switch, 2-pole, Switching Voltage up to 250 VAC	Mounting Diameter **19 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **125 / 250 VAC, 5 / 3 A**	Operating Temperature **-25 to +85 °C**
	**MSM 22 DP** Metal Switch, 2-pole, Switching Voltage up to 250 VAC	Mounting Diameter **22 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **125 / 250 VAC, 5 / 3 A**	Operating Temperature **-25 to +85 °C**
	**MSM 30 DP** Metal Switch, 2-pole, Switching Voltage up to 250 VAC	Mounting Diameter **30 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **125 / 250 VAC, 5 / 3 A**	Operating Temperature **-25 to +85 °C**
 new	**MSM 19 LA** Metal Switch, Latching Action, 1- and 2-pole, Switching Voltage up to 125 VDC / 250 VAC	Mounting Diameter **19 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 64** Shock Protection **IK 07**	Switching Voltage **250 VAC, 12 A**	Operating Temperature **-20 to +85 °C**
 new	**MSM 22 LA** Metal Switch, Latching Action, 1- and 2-pole, Switching Voltage up to 125 VDC / 250 VAC	Mounting Diameter **22 mm**	Illumination **non-illuminated, Point Illumination, Ring Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 64** Shock Protection **IK 07**	Switching Voltage **250 VAC, 12 A**	Operating Temperature **-20 to +85 °C**
	**MSM 22 SI** Metal Switch with Snap-in Mounting	Mounting Diameter **22 mm**	Illumination **non-illuminated, Point Illumination** Terminal **snap-in**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 07**	Switching Voltage **125 / 250 VAC, 5 / 3 A**	Operating Temperature **-25 to +85 °C**
 new	**MSM 22 CS** Metal Switch with Ceramic Actuator, Switching Voltage up to 30 VDC / 250 VAC	Mounting Diameter **22 mm**	Illumination **non-illuminated, backlighted** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 65 / IP 69K** Shock Protection **IK 07**	Switching Voltage **125 / 250 VAC** **5 / 3 A**	Operating Temperature **min. -25 to +85 °C**

	**PSE M 16** **Piezo Switch N.O.**	Mounting Diameter **16 mm**	Illumination **non-illuminated** Terminal **Pins, Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85°C**
	**PSE M 19** **Piezo Switch N.O.**	Mounting Diameter **19 mm**	Illumination **non-illuminated** Terminal **Pins**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85°C**
	**PSE M 22** **Piezo Switch N.O.**	Mounting Diameter **22 mm**	Illumination **non-illuminated** Terminal **Pins**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85°C**
	**PSE M 22 PI** **Piezo Switch N.O.**	Mounting Diameter **22 mm**	Illumination **Point Illumination** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85°C**
	**PSE M 22 RI** **Piezo Switch N.O.**	Mounting Diameter **22 mm**	Illumination **Ring Illumination** Terminal **Wire, Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85°C**
	**PSE M 24 RI** **Piezo Switch N.O.**	Mounting Diameter **24 mm**	Illumination **Ring Illumination** Terminal **Flexible wire**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85°C**
	**PSE M 27 RI** **Piezo Switch N.O.**	Mounting Diameter **27 mm**	Illumination **Ring Illumination** Terminal **Flexible wire**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85°C**

	**PSE M 30 RI** **Piezo Switch N.O.**	Mounting Diameter **30 mm**	Illumination **Ring Illumination** Terminal **Flexible wire**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85 °C**
	**PSE 16 EX** **Piezo Switch for Explosive Environments**	Mounting Diameter **16 mm**	Illumination **non-illuminated** Terminal **Pins**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **24 VAC/DC, 40 mA**	Operating Temperature **-20 to +60 °C**
	**PSE M 16 Prolonged Signal** **Piezo Switch Prolonged Signal**	Mounting Diameter **16 mm**	Illumination **non-illuminated** Terminal **Quick Connect Terminal**	IP Protection Class Contact Area Front Side **IP 69K** Shock Protection **IK 02**	Switching Voltage **42 / 60 VAC/DC, 2,6 A**	Operating Temperature **-20 to +60 °C**
	**PSE M 27 High Impact** **Piezo Switch with Extended Protectin against Vandalism**	Mounting Diameter **27 mm**	Illumination **non-illuminated** Terminal **Flexible wire**	IP Protection Class Contact Area Front Side **IP 67** Shock Protection **IK 06**	Switching Voltage **42 / 60 VAC/DC, 100 mA**	Operating Temperature **-40 to +85 °C**

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/pg70
For customer specific solutions, please contact us. www.schurter.com/contact



Switch for application in explosive environments

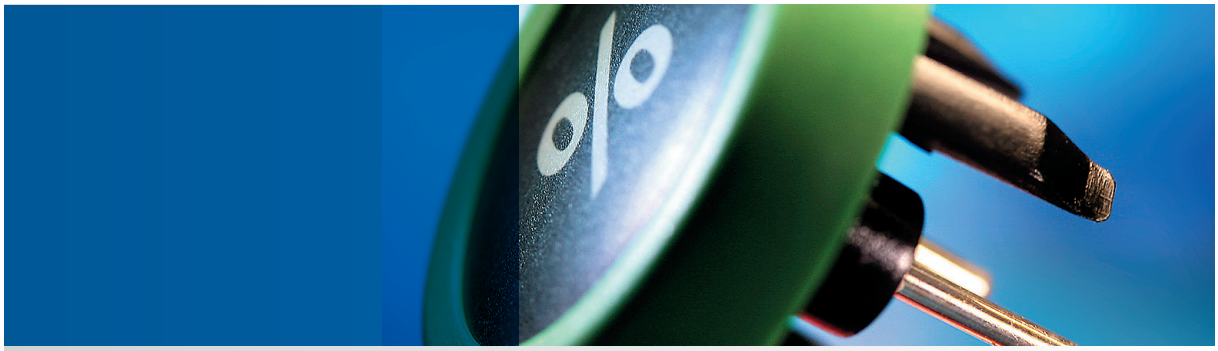
The piezo switch from SCHURTER has achieved approval according to ATEX class II 2 G Ex ib IIB T4. The switch may be typically used in oil/gas production systems, in petrochemistry, as well as in paint and varnish mixing facilities.

The standard design is available for a mounting diameter of 16 mm with pin connections. Additional mounting diameters and connection designs are available upon request.

The frontpanel switches of SCHURTER

are available with different switching functions, number of poles, colors and illumination. The rocker switch range of SCHURTER has different colors and illumination.

 **LDT** **Frontpanel Switch, Momentary Action, Medium Stroke, 10 mm**	Technology **Momentary Action Switch**	Illumination **non-illuminated and illuminated**	Switching Function **N.C., N.O., N.C./N.O.** Number of Poles **1 pole and 2 pole**	Switching Voltage Switching Current **60 / 50 VAC/DC, 200 mA**	IP Protection Class Front Side / Rear Side **IP 40**
 **LDS** **Frontpanel Switch, Latching Action, Medium Stroke, 10 mm**	Technology **Latching Action Switch**	Illumination **non-illuminated and illuminated**	Switching Function **N.C., N.O., N.C./N.O.** Number of Poles **1 pole and 2 pole**	Switching Voltage Switching Current **60 / 50 VAC/DC, 200 mA**	IP Protection Class Front Side / Rear Side **IP 40**
 **MCS 18 Front** **Membrane Switch Frontpanel Short Stroke 18 mm**	Technology **Momentary Action Switch**	Illumination **non-illuminated**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **48 VDC, 125 mA or 24 VDC, 80 mA**	IP Protection Class Front Side / Rear Side **IP 65**



Frontpanel switch MCS 18

The membrane switch MCS 18 with tactile feedback and extremely low mounting depth has a degree of protection of IP 65. The switch variety ranges from a round or square design, with additional soldering aids, diverse letterings as well as different colors of the bezel and the face foil.

The membrane switches can be used in diverse fields of application. Due to their extremely low mounting depth and tactile feedback the switches are particularly suitable for hand-held applications with 3 or 4 switching functions.

Process improvement with SIX SIGMA

We deploy SIX SIGMA's systematic problem-solving method DMAIC to improve our processes. At the same time, this involves eliminating waist of any kind consequently.

SSO, our basis for excellent processes

Safety, spruceness and order (SSO) are the basis for an excellent process quality. Doing regular tours, our security people and process owners detect the current situation on safety, spruceness and order. The result is being analyzed and improvements defined.

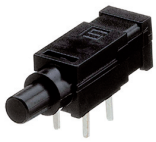
The printmount switches for PCB mounting of SCHURTER
are available in various designs, as through hole or SMD assembly and gullwing or J connection. Variable color designs and letterings can be selected.

	**LSH** **SMD Switch, Short Stroke, 6 mm Horizontal Actuator**	Illumination **non-illuminated**	Terminal **Gullwing**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **12 VDC, 50 mA**	IP-Protection **IP 40**
	**LPH** **Printmount Switch, Short Stroke, 6 mm, Horizontal Actuator**	Illumination **non-illuminated**	Terminal **Through hole**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **12 VDC, 50 mA**	IP-Protection **IP 40**
	**LPS** **Printmount Swicht, Short Stroke, 6 mm, Square Actuator**	Illumination **non-illuminated**	Terminal **Through hole**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **12 VDC, 50 mA**	IP-Protection **IP 40**
	**LPV** **Printmount Switch, Short Stroke, 7.5 mm, Vertical Actuator**	Illumination **non-illuminated**	Terminal **Through hole**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **12 VDC, 50 mA**	IP-Protection **IP 40**
	**LSG** **SMD Switch, Short Stroke, 6 mm, Horizontal Actuator with Ground**	Illumination **non-illuminated**	Terminal **Gullwing**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **12 VDC, 50 mA**	IP-Protection **IP 40**
	**SMS** **Print and SMD Switch Short Stroke 11,4 mm**	Illumination **non-illuminated**	Terminal **Through hole, Gullwing and J-Lead**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **30 VAC / 42 VDC, 50 mA**	IP-Protection **IP 40 and IP 67**
	**PMS** **Print and SMD Switch Short Stroke 11,4 mm**	Illumination **non-illuminated**	Terminal **Through hole**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **30 VAC / 42 VDC, 50 mA**	IP-Protection **IP 40 and IP 67**
	**MTG** **Printmount Switch Short Stroke 12,7 mm**	Illumination **non-illuminated**	Terminal **Through hole**	Switching Function **N.O.** Number of Poles **1 pole**	Switching Voltage Switching Current **24 VDC, 50 mA and 48 VDC, 125 mA**	IP-Protection **IP 40**

MCS 18 Print

Membrane Switch Printmount Short Stroke 18mm

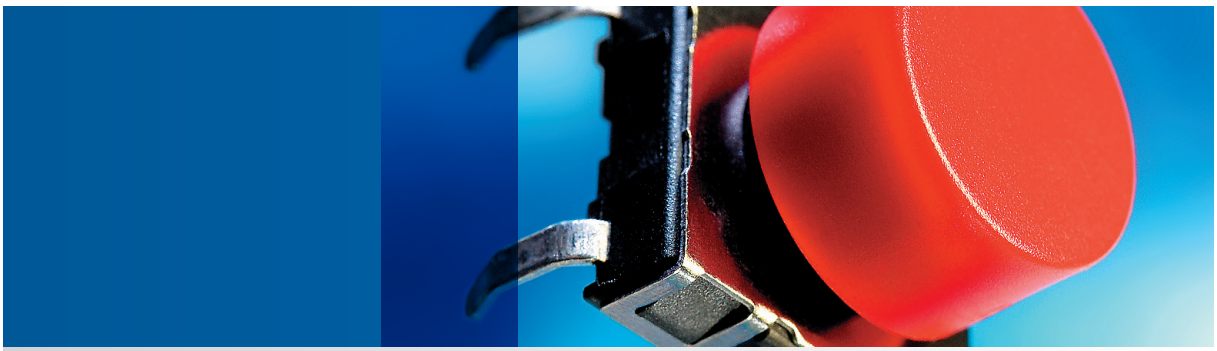
Illumination	Terminal	Switching Function	Switching Voltage Switching Current	IP-Protection
non-illuminated	**Pins**	**N.O.** Number of Poles **1 pole**	**24 VDC, 80 mA and 48 VDC, 125 mA**	**IP 65**



SDK

Printmount Switch, Medium Stroke, 7,5 mm

Illumination	Terminal	Switching Function	Switching Voltage Switching Current	IP-Protection
non-illuminated	**Through hole**	**N.O. / N.C.** Number of Poles **1 pole**	**125 VAC / 50 VDC; Ag: 2A AC / 1.2A DC, Au: 80 mA AC/DC**	**IP 40**



Printmount switch SMS / PMS

The switches of the SMS / PMS lines are available for through hole and SMD assembly, with gullwing or J-leads, with short or long actuator and with additional key caps as well as in a IP 40 and IP 67 degree of protection version.

The printmount switches feature great versatility. From the low-cost version to individually designed special types, the switches are available in various designs and different illumination.

The public transport switch
is designed as a door pushbutton switch for use in public transportation such as trains, buses, trams and undergrounds.

PTS **Switch for Public Transport Systems**	Technology **Momentary Action Switch**	Illumination Color LED **Ring Illumination, yellow or red/ green**	Color Actuator Overlay **nature** Cable Layout **angled**	Supply Voltage Switching Voltage Switching Current **110 V or 24 V, 5-137 VDC, 250 mA**	IP Protection Class Front Side **IP 64**

For customer specific solutions, please contact us. www.schurter.com/contact

Public transport switch

The public transport switch is designed as a door pushbutton switch for usage in public transportation applications such as trains, buses, trams and undergrounds. Due to the user-friendly design the PTS switches can be easily operated by elderly and handicapped people.

The switching status is visually indicated through an illumination ring. A unique feature of the PTS series is the outstanding tactile feedback with a lifetime of 2 million cycles. A further advantage is the illumination with a viewing angle of 180 degree, which gives a wide-range identification of the switching status. The standard versions are available with 24 V and 110V supply voltage ratings and angled cables.

Solid engineering and a customized solutions

“What won our customer over was the combination of solid engineering and a customized solution we could offer them.”

Erick Pieters

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.com/contact

Conformity to components 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 fulfill.

Detailed information about approvals can be looked up here: http://www.schurter.com/approvals

The touch screens

match perfectly to individual requirements by using different mounting versions and thicknesses of ITO glass. Analog-resistive touch screens in 4 - 5 - or 8-wire technology and capacitive touch screens are available in standard sizes or as customized versions. Matrix touch screens are individually manufactured.

Touch Panel

Touch Screen laminated with Graphic Overlay

Touch Screen Type
all types possible

Size
3.85" to 24"

Mounting Style
from Front Side (IP 65) and Rear Side

1070.0432

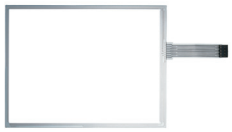
Touch Screen Analog-resistiv

Touch Screen Type
analog-resistive

Wire Technology
4-wire

Terminal
ZIF / AMP / BERG

Size
3.85" bis 15"



1070.0435

Touch Screen Analog-resistiv

Touch Screen Type
analog-resistive

Wire Technology
8-wire

Terminal
ZIF / AMP / BERG

Size
10.44" to 19.1"

1070.0442

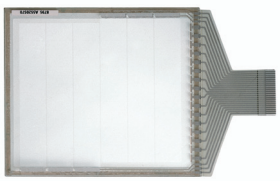
Touch Screen Analog-resistiv

Touch Screen Type
analog-resistive

Wire Technology
5-wire

Terminal
AMP

Size
6,48" to 24"

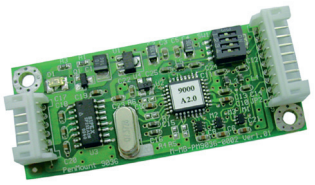
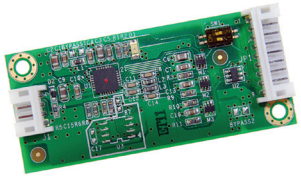
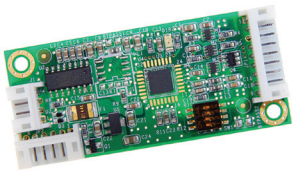


Matrix

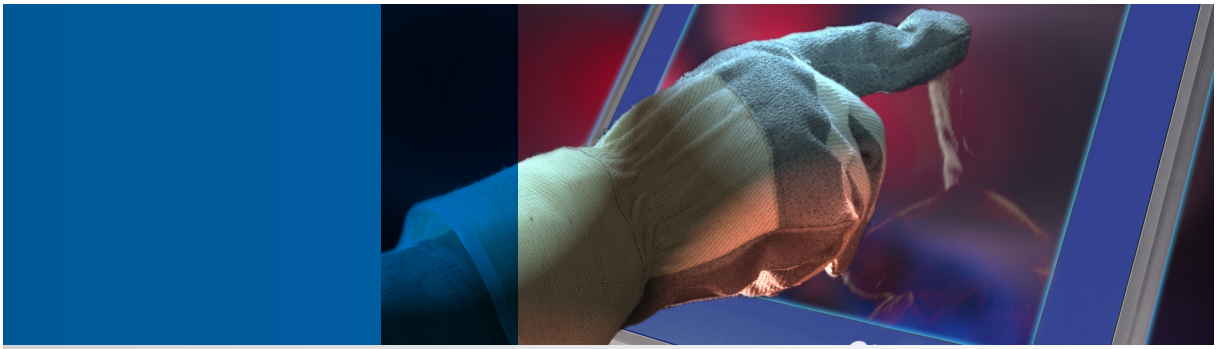
Touch Screen Analog-resistiv

Touch Screen Type
Matrix - on request

Size
according to customer's specifi-cations

	**1070.0038.01** **Touch Screen Controller**	Touch Screen Type **analog-resistive**	Wire Technology **4- / 5- / 8-wire**		Controller / Chipset Type **RS-232**
	**1070.0047.01** **Touch Screen Controller**	Touch Screen Type **analog-resistive**	Wire Technology **4- / 5- / 8-wire**		Controller / Chipset Type **USB**
	**1070.0048.01** **Touch Screen Controller**	Touch Screen Type **analog-resistive**	Wire Technology **4- / 5- / 8-wire**		Controller / Chipset Type **RS-232 and USB**
	**1070.0049** **Touch Screen Controller**		Wire Technology **4- / 5- / 8-wire**		Controller / Chipset Type **RS-232 and USB**

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/pg11_2
For customer specific solutions, please contact us. www.schurter.com/contact



Resistive touch screen with glass surface

Due to its robust glass surface the GFG (glass-film-glass) touch screen is ideal for the use in harsh and rugged environments and for an extended temperature range from –40°C to +90°C. The glass surface provides a very high level of resistance to chemicals and scratching.

The touch screen can therefore be operated with different objects such as keys, pens, gloves or finger nails without causing damage.

Touch screens from 2.0" to 21.1"

SCHURTER offers a wide range of analog-resistive touch screens in 4-, 5- and 8-wire technology as well as touch screens in matrix and capacitive technology.

The touch panels are offered with various input fronts, different thicknesses of supporting glass and several mounting versions. The SCHURTER touch screens can be used in nearly any application, including industrial automation, medical industry, automotive industry, food processing, packaging industry, POS and POI.

Touch Keypad

The membrane keypad with new input technology

The new touch keypad of SCHURTER features a virtually force-free data entry with a slight tap. This feature allows for quick and fatigue-free actuations. By pressing the touch keypad the user feels no difference compared to a touch screen. Actuating force and travel are comparable to analog touch screens. The touch keypad is therefore ideal for vertically positioned input systems. The button sizes are variable and freely configurable. The contact areas of the keypads correspond exactly to the design area of the touch keypad. A safe actuation is possible in every point as well as in the corners of the single button. The contact area is not limited, which means no contact elements are used. Therefore, many new design possibilities can be realized. The touch keypad is very flat designed, has a close surface with a protection degree of IP 65 and shows no dirt edges.

Experience and service

"Many years of experience, coupled with a high level of service in a pleasant work atmosphere is one of SCHURTER's strengths."

Martin Zäch

The capacitive sensor keypad from SCHURTER
offers the optimal solution for operating a device by light touch without pressure. Various switching types, interfaces and illumination options are available. It offers free design possibilities regarding material, form, layout and lettering.

new

	Switching mode	Interfaces	Front Material	Sensor Areas	Illumination
CSK **Capacitive Sensor Keypad**	**Switch, Slider, Wheel, Touchpad**	**USB, I²C, SPI, RS-232, UART, bus interfaces**	**glass, plastics**	**Printed polyester foil, rigid PCB, etched ITO film**	**Point- and Overlay Illumination** IP Protection Class Front Side **IP 67**

For customer specific solutions, please contact us. www.schurter.com/contact

Capacitive sensor keypad

The capacitive sensor keypads offer the best solution for operating a device by light touch without pressure.

The keypads or slider fields can be printed according to the surface material and an individual illumination is possible. The capacitive keypad provides benefits such as vandalism-proof, wear and noise immunity as well as waterproof-sensing, that is a controlled switching at moisturization. It offers free design options regarding material, form, layout and lettering. The modular structure allows a design of exclusive systems according to customer requirements. The new capacitive keypad of SCHURTER can be used in harsh environments. It is resistant to dust, water and high humidity. The capacitive keypads are used in ticket machines, kiosk systems in public areas, industrial controls as well as in the medical industry.

Touch panel – integrated solutions

Touch screens integrated in complete systems provide many possibilities regarding layout and design: due to their variable input fronts, different thicknesses of supporting glass and several mounting versions they can be readily adapted to your individual requirements.

A special coating procedure together with special foils prevent the occurence of Newton rings. Customized touch panel solutions are available with controllers or chipsets for perfect integration.

Efficient use of resources

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

Antje Stein

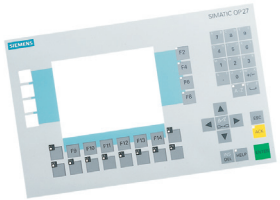
SCHURTER provides complete solutions in highest quality from the concept to the delivery of the systems. Various types of membrane keypads meet individual requirements of design and operating convenience.

Complete Systems **System with PCB, Housing and Decoder**	Keypad Type **Complete System**	Embossing Options **Rim Embossing, Pillow Embossing, Dome Embossing, Switching Dome**	IP-Protection **IP 65 IP 67 possible on request**	

Membrane Keypads - Flat Keypad **Membrane Keypad without Pressure Point**	Keypad Type **Membrane Keypads**	Embossing Options **Rim Embossing optional**	IP-Protection **Front-Side IP 65**	Operating Temperature **-25 to +70 °C**

Membrane Keypads - Embossed Dome **Membrane Keypad with Embossed Dome**	Keypad Type **Membrane Keypads**	Embossing Options **Switching Dome**	IP-Protection **Front-Side IP 65**	Operating Temperature **-25 to +70 °C**

Touch Keypad **Membrane Keypad without Tactile Feedback**	Keypad Type **Without Tactile Feedback**	Embossing Options **Optional**	IP-Protection **Front-Side IP 65**	Operating Temperature **-25 to +70 °C**



Keypads in Snap Dome Technology **Membrane Keypads with Tactile Feedback with and without Embossing**	Keypad Type **Snap Dome Technology**	Embossing Options **Pillow Embossing, Dome Embossing, Rim Embossing optional**	IP-Protection **Front-Side IP 65**	Operating Temperature **-25 to +85 °C**

	Keypad Type	Embossing Options	IP-Protection	Operating Temperature
Modular Input System **Membrane Keypad with Short Travel Switch**	**Modular Front Panel**	**Pillow Embossing, Rim Embossing optional**	**Front-Side IP 65**	**-25 to +70 °C**

	Keypad Type	Embossing Options	IP-Protection	Operating Temperature
Multi-color illuminated Keyboard Luminos **Membrane Keypads with Tactile Feedback with and without Embossing**	**Luminos**	**Rim Embossing**	**Front-Side IP 65**	**-25 to +85 °C**

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/pg11_1
For customer specific solutions, please contact us. www.schurter.com/contact

Dual tip membrane keypad for employment in medical appliances

The SCHURTER dual tip keypad combines advantages of a membrane keypad with those of the two step switching technique.

With this type of membrane keypad, complex circuit technology is unnecessary due to two separated switching contacts, i.e. with one keypoint, two different circuits can be switched independently of each other. Therefore, this membrane keypad is also suitable for the control of drives with different speeds. Furthermore, the dual tip keypads fulfill the product standard IEC 60601 and can therefore be used safely in medical appliances.

The metal line keypads
are extremely resistant and meet protection classes up to IP 67 and IK 07. They provide high operating convenience, a pleasant touch and a wide range of design options. The piezo keypads are resistant to all types of contamination and liquids. Their completely metallic front panels make them absolute vandal-proof.

new

16 key piezo keypad **Piezo Keypad**	Technology Interface **-Piezo Keypad**	Shock Protection **IK 05** IP Protection Class Contact Area Front Side **-IP 69K** **-IP 69K**	Lifetime **20 mill.**	Mounting **Front or Rear Mounting**

new

12 key piezo keypad **Piezo Keypad**	Technology Interface **-Piezo Keypad**	Shock Protection **IK 05** IP Protection Class Contact Area Front Side **-IP 69K** **-IP 69K**	Lifetime **20 mill.**	Mounting **Front or Rear Mounting**

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/pg70b
For customer specific solutions, please contact us. www.schurter.com/contact

Metallic panels convince of resistance and convenience

SCHURTER's functional principle for the metallic panels protects the metal switches against violent destruction, yet provides high operating convenience and a pleasant touch.

The metallic panels are mainly used in applications with rugged ambient conditions. The keypads have a long lifetime due to a high mechanical load capacity. SCHURTER offers a wide range of possible designs for the metallic panels, they are available with different interfaces and letterings.

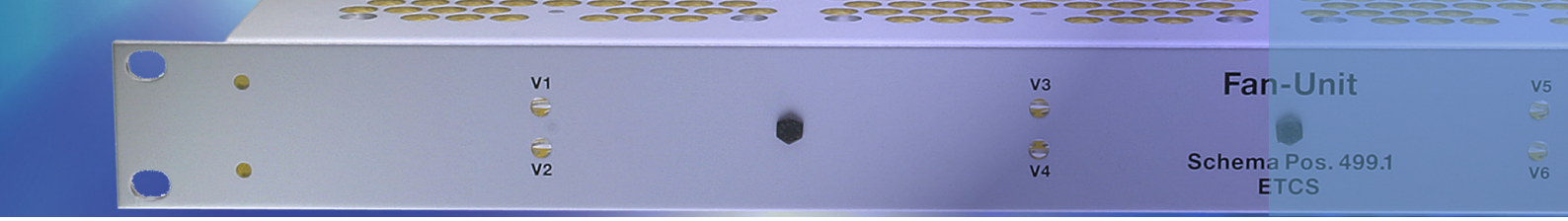
The employees get our full attention

To be social-minded for SCHURTER means «the concerns of employees have absolute priority.» Because healthy, motivated, committed employees, who are eager to learn, show top performance and ensure the company's success.

Pre-compliance information

“What I consider to be very important is getting the pre-compliance information on paper early on.”

Marcel Reiter



SCHURTER develops and manufactures customer specific housing systems and front panels in anodized aluminum, steel and plastic.

GS1/WGR2XX

Front Panels in Aluminium

Panel Thickness
1.0 - 5.0mm

Surface Lettering
Alu natural or coloured anodising, under anodising printing technology or silk-screen printing

Mounting
Threads and Countersinks, Force Fitting of thread bolt, Studs and Nuts or self-adhesive

Overlay
optional with Cover Foil

Machining
Millings, Drillings, Facets

Material
-Aluminum

GS3/WGR2XX

Front Panels in Plastic

Panel Thickness
1.0 - 5.0mm

Surface Lettering
Silk-screen Printing at Rear Side

Mounting
Mounting Holes or self-adhesive

Overlay
optional with Cover Foil

Material
-Acrylic Glass, Glare
-Acrylic Glass, Calendered
-Polycarbonate

GS4/WGR2XX

Housing Systems in Aluminium

Panel Thickness
1.0 - 5.0mm

Surface Lettering
Lettering and Housing Surface anodised, partial anodising and alodining possible

Mounting
Mounting Holes, Nuts, Threads or self-adhesive

Machining
CNC-Punching, Cutting or Milling, Design of Housing

Material
-Aluminum

GS5/WGR2XX

Housing Systems in Steel

Panel Thickness
0.4-2.0mm

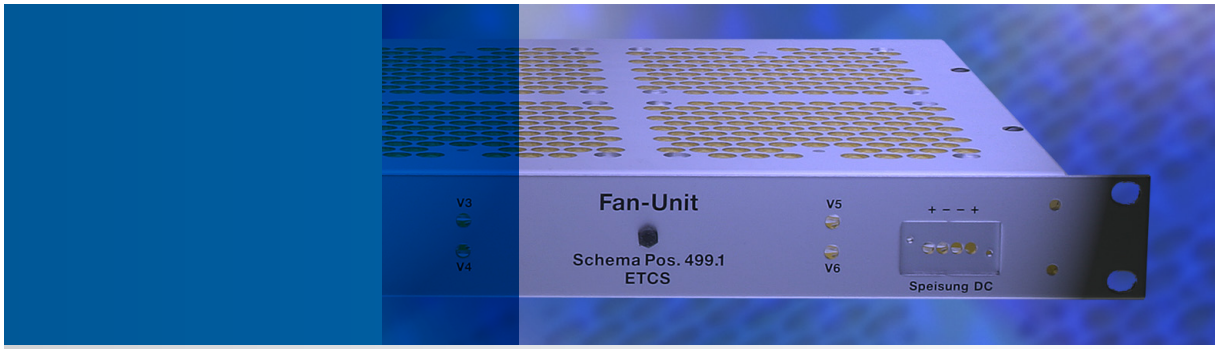
Surface Lettering
Surface zinc-plated, varnished, powder-coated and printed with silk-screen technique

Mounting
Mounting Holes, Nuts, Threads or self-adhesive

Machining
CNC-Punching, Cutting or Milling, Design of Housing

Material
-Steel
-Stainless Steel

For customer specific solutions, please contact us. www.schurter.com/contact



Housing systems and frontpanels

For applications in the field of housing systems, aluminum or steel is used in different strengths.

The aluminum housings can be anodised and alodined. If steel is used, the surface can be galvanized, varnished, powder coated and printed in the screen process procedure. After the CNC punching, cutting or milling or rather the mechanical machining, the housing is bent into the requested shape. For the frontpanel design, the combination of coloured anodising and two-component screen printing offers almost unlimited possibilities in designs.

We life up to sustainability in a conscious and consistent way.

Sustainability at SCHURTER stands for a healthy and longterm economic development, which respects social and ecological matters.

SCHURTER provides both, LEDs in holders and holders without LEDs for PCB and panel mounting. Panel-mount holders are available with built-in reflector and optional built-in current-limiting resistor.

	**AST** **LED Holder for 3 mm and 5 mm LED**	Indicator Type **LED-Holder**	Mounting **PCB Mounting**	Illumination **without LED**	Number of Holders **1-8** Arrangement **in-line and in blocks**
	**ASL** **LED Holder with 3 mm LED**	Indicator Type **LED-Holder**	Mounting **PCB Mounting**	Illumination **with 3 mm LED**	Number of Holders **1-8** Arrangement **in-line and in blocks**
	**SRL** **LED Holder straight with 3 mm and 5 mm LED**	Indicator Type **LED-Holder**	Mounting **Frontpanel and PCB Mounting**	Illumination **with 3 mm and 5 mm LED**	
	**PBL** **LED Holder angled with 3 mm LED**	Indicator Type **LED-Holder**	Mounting **PCB Mounting**	Illumination **with 3 mm LED**	
	**LFM** **LED Reflector Holder round with 3 mm and 5 mm LED**	Indicator Type **LED Reflector Holder**	Mounting **Panel Mounting**	Illumination **with 3 mm and 5 mm LED**	

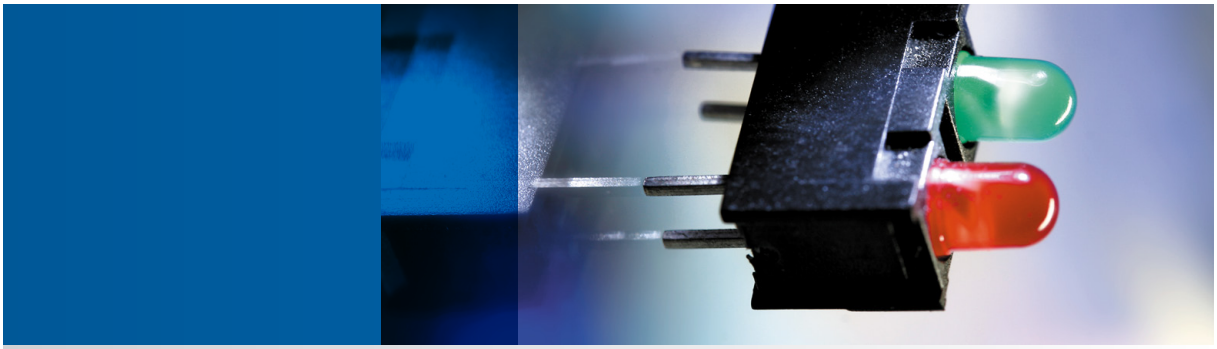
Huge product variety

“The great variety of shapes and colors available makes our products easily adaptable to the customer’s needs.”

Jochen Ullmer

Innovation, customer focus and quality form the base of our success

SCHURTER ensures economic efficiency and company success with high customer focus, innovative solutions, strong partnerships and an excellent product- and service quality.



Indicators type ASL

The indicator type ASL is available for 3 mm LED with different illumination colors of the LED, with straight or angled terminals, arranged in-line or in blocks and equipped with 1-8 LED's.

SCHURTER offers a wide range of indicator variants: LED holders, LED indicator lamps or signal lamps for frontpanel and PCB mounting and with different LED illuminations.

FMEB

1-stage filter for DC systems

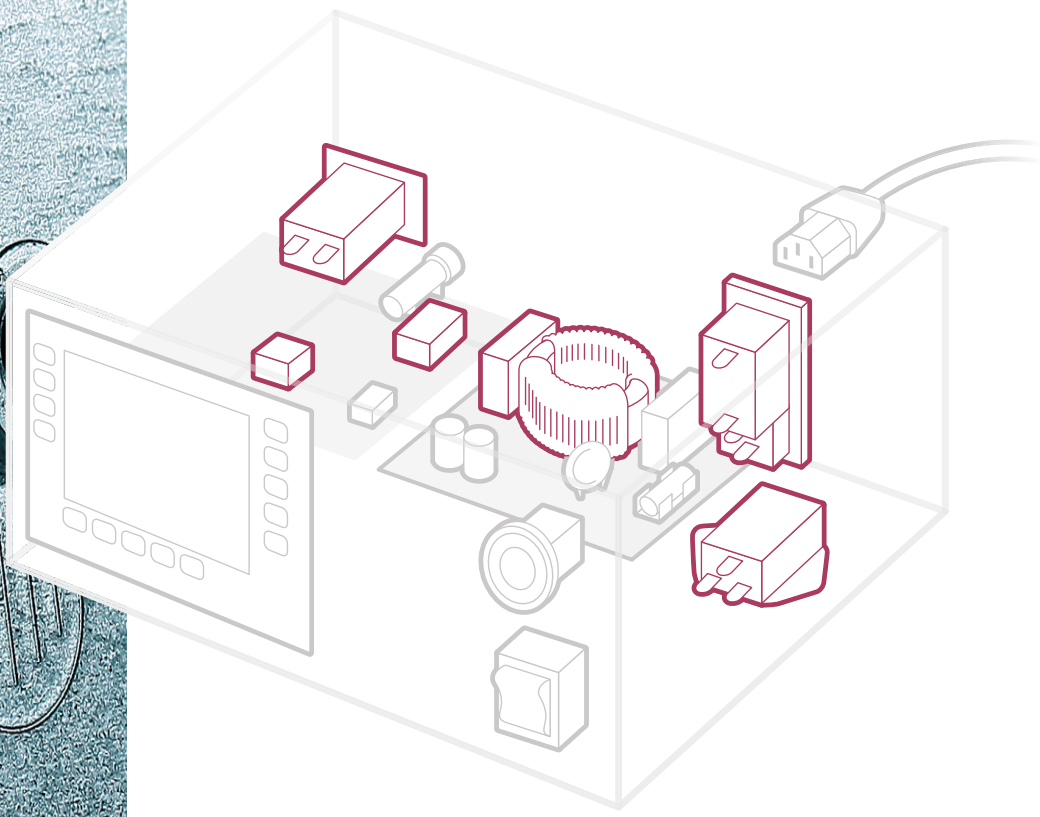
DKLP-1

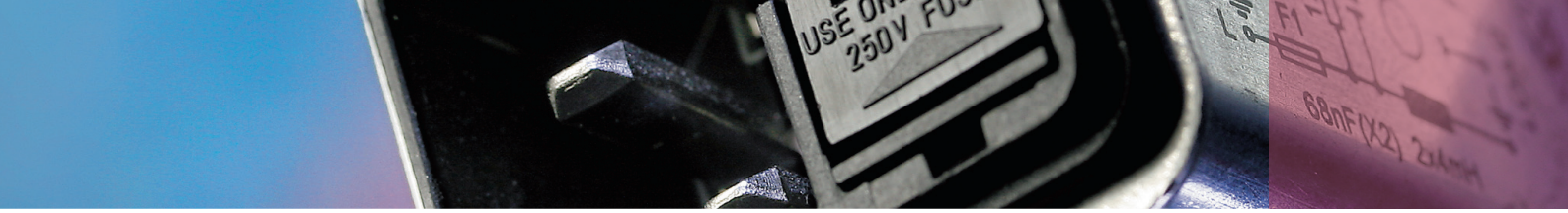
compensated high current choke, 1-phase

5120

inlet filter, ECO design

EMC Products

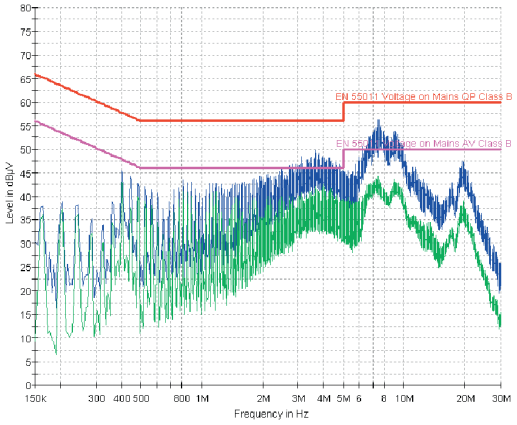




EMC Services

Interference suppression of electrical systems or equipment with the optimal EMC solution.

Individual needs
To meet the needs of customers, SCHURTER offers, in addition to its wide range of products, additional measuring services to ensure EMC. In one test, measurement results for CE certification can be created, or in the event of interference, custom tailored solutions can be developed on site, which comply with required standards.



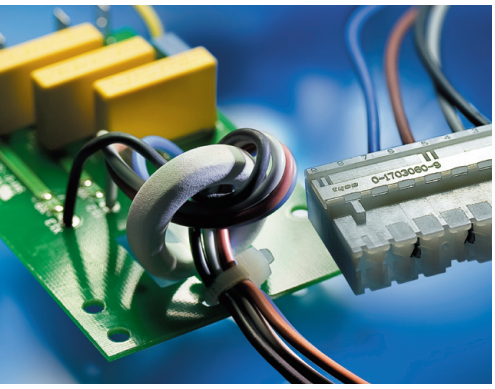
Customized EMC filter for system integration
In addition to the damping effect, filter geometry and system connection play a central roll. The area of application can make a filter housing, for example, often unnecessary. Additional savings on material costs are therefore possible. Open frame filters are subsystems that are developed in exact accordance to the specifications of our OEM customers. SCHURTER creates your customer specific solution. Many years of experience in filter development, the wide range of standard products and the modernly equipped measurement laboratory enables us to offer individual solutions.

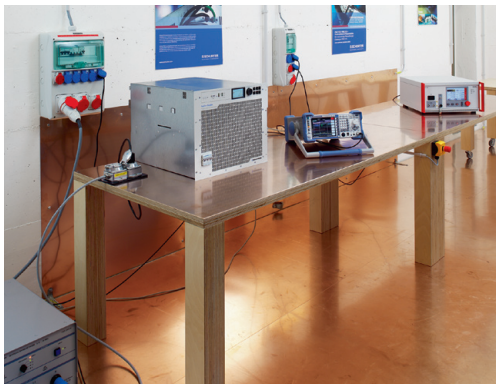
Measuring competence
SCHURTER carries out the necessary preliminary tests for immunity and emissions of your electronic systems or equipment, and offers the appropriate standard or customer specific EMC solution.

Our EMC Service Center is equipped with the latest accredited and certified test receivers and immunity test devices.
All measurements are conducted by SCHURTER in accordance with respective standards, although radiation measurements can only be performed in the laboratory (IEC 61000-4-3 and IEC 61000-4-6).

On site measurement
On request, interference suppression of electronic equipment can be carried out on site, using mobile measurement devices. SCHURTER is equipped with a mobile measurement service with all the necessary devices for grid-bound measurements (IEC 61000-6-3 and IEC 61000-6-4). This allows various compliance tests to be performed directly on site with the manufacturer or operator of the systems or equipment needing testing.

Measurement report
The results of the measurements are recorded in an EMC measurement report.
This measurement report serves as CE verification of conformity.





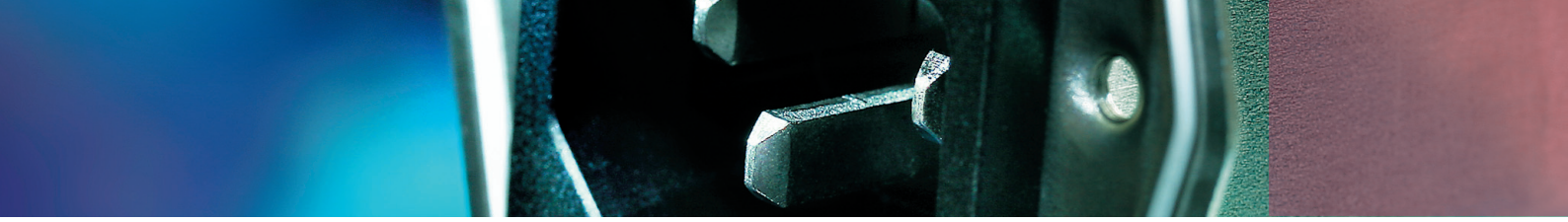
Sample service

In order to solve individual tasks, special filter solutions must be developed. During the collaboration SCHURTER offers samples including documentation within 8 working days. The team of engineers in the measuring service works closely with the work preparation and sourcing, so that the created sample can also be produced during serial production.

Service offer/contact

Test our EMC competence. We will measure your device, advise you during the interference suppression of your implementation and offer, in addition to many standard products, specific EMC solutions for EMC conformity. This service is an important part of the CE certification of your device. It is our pleasure to carry out EMC measurements for you.

Please do not hesitate to contact us. We are ready to take on your problems and offer you an optimal EMC solution.
www.schurter.com/contact
contact@schurter.ch



SCHURTER's devices

are based on IEC connectors with line filters. Available current ratings range from 2.5 Amps to 20 Amps.

MAX. RATED CURRENT 2.5 A

new

5008

IEC Appliance Inlet C8 with Filter, Front Side Mounting

Mounting
Snap-in/screw-on
Mounting side
Front-Side

Line Switch
2-pole

C8
70° C

MAX. RATED CURRENT 15 A

new

5003

Appliance Inlet DC Filter, ECO Design, Front- or Rear Side Mounting

Mounting
Snap-in/screw-on
Mounting side
Front-/Rear-Side

MAX. RATED CURRENT 10 A

5110

IEC Appliance Inlet C14 with Filter

Mounting
Snap-in/screw-on
Mounting side
Front-Side

C14
70° C

V-Lock new

5120

IEC Appliance Inlet C14 or C18 with Filter, ECO design, Front- or Rear Side Mounting

Mounting
Snap-in/screw-on
Mounting side
Front-/Rear-Side

C14
70° C

V-Lock new

5150

IEC Appliance Inlet C14 with High Frequency Filter, X2Y Technology, ECO design, Front- or Rear Side Mounting

Mounting
Screw
Mounting side
Front-/Rear-Side

C14
70° C

V-Lock

KFS

IEC Appliance Inlet C14 with Filter

Mounting
Screw
Mounting side
Front-Side

C14
70° C

✓-Lock

FGS

IEC Appliance Inlet C14 with Filter, Front or Rear side Mounting

Mounting
Snap-in/screw-on
Mounting side
Front-/Rear-Side

C14
70° C

✓-Lock

KFX

IEC Appliance Inlet C14 with Filter, Increased Dielectric Strength

Mounting
Screw
Mounting side
Front-Side

C14
70° C

GRF2

IEC Appliance Inlet C14 with Shielding, "Lock and Shield" Mounting

Mounting
Snap-in
Mounting side
Rear-Side

C14
70° C

GRF4

IEC Appliance Inlet C14 with Filter, "Lock and Shield" Mounting

Mounting
Snap-in
Mounting side
Rear-Side

C14
70° C

✓-Lock

GRM2

IEC Appliance Inlet C14 with Line Switch, Fuseholder 1- or 2-pole, Voltage Selector (series-parallel), "Lock and Shield" Mounting,

Mounting
Snap-in
Mounting side
Rear-Side

Fuseholder Dimension
5 x 20
Number of Poles
1 or 2 pole

Line Switch
2-pole
Voltage Selectors
-jumper optional

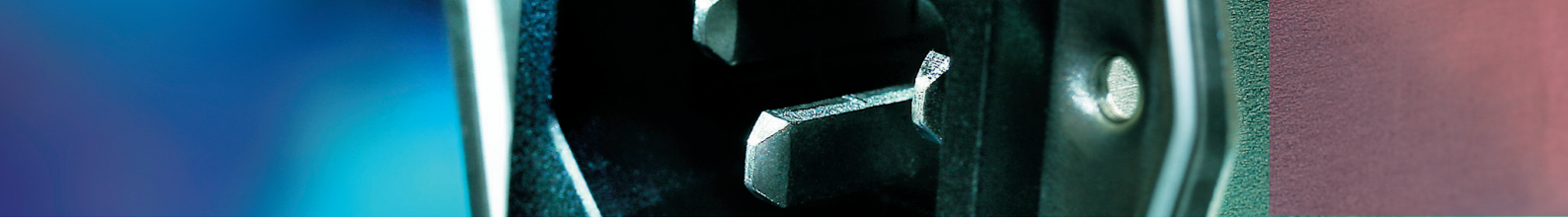
C14
70° C

KPF

Filter for Backpack Mounting to KP01

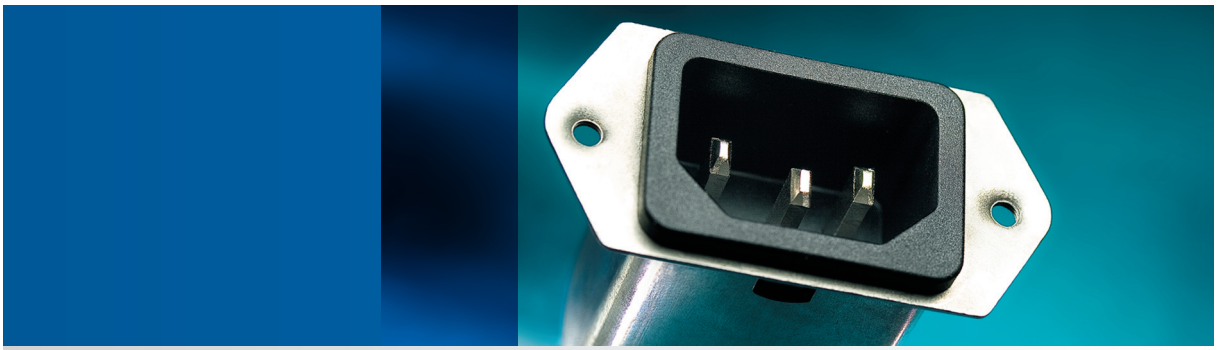
Mounting
Sandwich/rear-side
Mounting side
Rear-Side

-



MAX. RATED CURRENT 16 A				
 V-Lock new **5130** **IEC Appliance Inlet C20 with Filter, ECO design, front or rear side Mounting**	Mounting **Snap-in/screw-on** Mounting side **Front-/Rear-Side**			C20 70° C
 V-Lock **C20F** **IEC Appliance Inlet C20 with Filter, Front or Rear Side Mounting**	Mounting **Snap-in/screw-on** Mounting side **Front-/Rear-Side**			C20 70° C

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC connector page 176



Best perfomance at low cost

The power entry modules series 5120 offer optimal safety regarding EMC emission and immunity. Refined for optimal performance at lowest price, the compact filter is particularly suited for power supplies used in industial equipent, infomration technology and medical devices.

The series is dimensioned as a 1-stage filter for rated currents from 1 to 15 A at 250 VAC. The unit has an outstanding wide-band absorbtion in the frequency range form 100 kHz to 30 MHz. The series offers several mounting options. Besides the standard type we offer versions for protection class 2, for enhanced voltage withstand as well as versions for optimized attenuation.

DC filter provide optimal performance in data critical rquipment

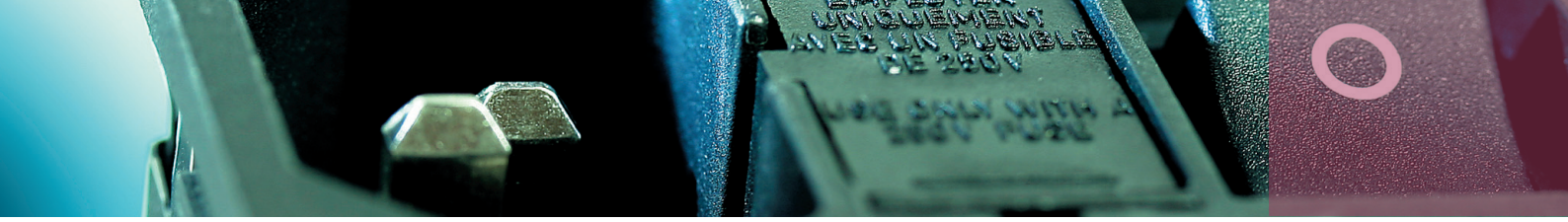
The filtered power entry modules series 5003 are specially designed for DC applications particularly for DC supply of information technology equipment.

The 5003 features a standard DC connector, offered in two different connector styles. The connector is encased with a 1-stage filter for currents up to 15A at 125 VDC. It provides an outstanding wide-band absorption rate in frequencies ranging from 100kHz to 30 MHz. The unit offers different mounting options.

EMC Service

"Speedy service from friendly employees at every step."

Mile Savic



SCHURTER's devices

are based on IEC connectors with line filters. Available current ratings range from 2.5 Amps to 20 Amps.

MAX. RATED CURRENT 8 A

5707

IEC Appliance Inlet C14 or C18 with Filter, Protection Degree IP65, Fuseholder 1- or 2-pole, Front or Rear Mounting

V-Lock new

Mounting	Fuseholder Dimension		
Screw	**5 x 20**		C18
Mounting side	Number of Poles		70° C
Front-/Rear-Side	**1 or 2 pole**		

MAX. RATED CURRENT 10 A

5200

IEC Appliance Inlet C14 with Filter, Fuseholder 1-pole

Mounting	Fuseholder Dimension		
Snap-in/screw-on	**5 x 20**		C14
Mounting side	Number of Poles		70° C
Front-Side	**1-pole**		

5220

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole

Mounting	Fuseholder Dimension		
Snap-in/screw-on	**5 x 20**		C14
Mounting side	Number of Poles		70° C
Front-Side	**2-pole**		

KFA

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole, optional Voltage Selector (step switch)

Mounting	Fuseholder Dimension		
Snap-in/screw-on	**5 x 20**	Voltage Selectors	C14
Mounting side	Number of Poles	**-step optional**	70° C
Front-/Rear-Side	**1 or 2 pole**		

DA22

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole, for PCB Mounting

new

Mounting	Fuseholder Dimension		
Screw	**5 x 20**		C14
Mounting side	Number of Poles		70° C
Rear-Side	**1 or 2 pole**		

KFC

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole (5x20 mm or 6.3x32 mm), optional Voltage Selector (step switch)

V-Lock

Mounting	Fuseholder Dimension		
Screw	**5 x 20 or 6.3 x 32**	Voltage Selectors	C14
Mounting side	Number of Poles	**-step optional**	70° C
Front-Side	**1 or 2 pole**		

V-Lock

CE

IEC Appliance Inlet C14 with Filter, Fuseholder 1-or 2-pole (5 x 20 mm or 6.3x32 mm, with or without voltage selector (series-parallel)

Mounting
Screw
Mounting side
Front-Side

Fuseholder Dimension
5 x 20 or 6.3 x 32
Number of Poles
1 or 2 pole

Voltage Selectors
-series-parallel

C14
70° C

V-Lock new

DC12

IEC Appliance Inlet C14 with Filter, Line Switch 1- or 2-pole, Front or Rear Side Mounting

Mounting
Snap-in/screw-on
Mounting side
Front-/Rear-Side

Line Switch
1 or 2 pole

C14
70° C

V-Lock

KFB1

IEC Appliance Inlet C14 with Filter, Line Switch 1-pole

Mounting
Screw
Mounting side
Front-Side

Line Switch
1-pole

C14
70° C

V-Lock

KFB2

IEC Appliance Inlet C14 with Filter, Line Switch 2-pole

Mounting
Screw
Mounting side
Front-Side

Line Switch
2-pole

C14
70° C

V-Lock new

DC22

IEC Appliance Inlet C14 with Filter, Line Switch 1- or 2-pole, PCB Mounting

Mounting
Screw
Mounting side
Rear-Side

Line Switch
1 or 2 pole

C14
70° C

V-Lock

DF12

IEC Appliance Inlet C14 with Filter, Circuit Breaker TA45 (recessed)

Mounting
Screw
Mounting side
Front-Side

Line Switch
2-pole

C14
70° C

V-Lock

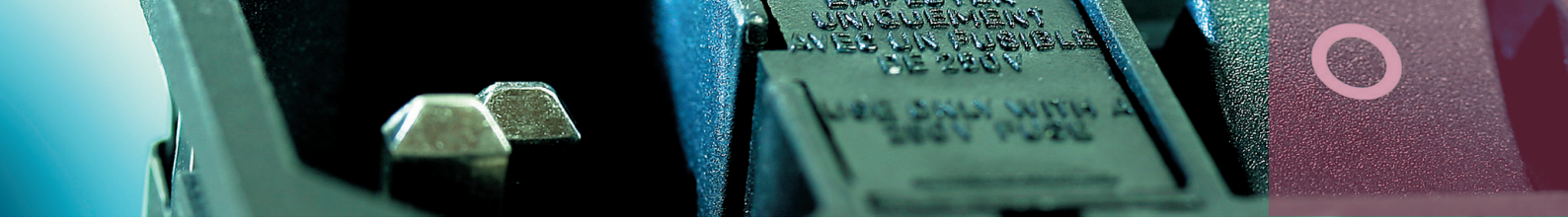
5145

IEC Appliance Inlet C14 with Filter, Circuit Breaker TA45

Mounting
Screw
Mounting side
Front-Side

Line Switch
2-pole

C14
70° C



MAX. RATED CURRENT 16 A				
 V-Lock **EC12** **IEC Appliance Inlet C20 with Filter, Line Switch 2-pole**	Mounting **Screw** Mounting side **Front-Side**		Line Switch **2-pole**	C20 70° C
 V-Lock **EF12** **IEC Appliance Inlet C20 with Filter, Circuit Breaker TA45 (recessed)**	Mounting **Screw** Mounting side **Front-Side**		Line Switch **2-pole**	C20 70° C

For customer specific solutions, please contact us. www.schurter.com/contact
General product information see IEC cnnector page 176

A simple solution for gigahertz applications

The series 5150 is a breakthrough product, providing simple and universal EMC for high frequency applications, using X2Y® filter technology. The series possesses broadband suppression properties to 1 GHz and combines them with the most simple and universal power input.

The X2Y® filter technology combines the X and Y capacitors into a component that is in contact with the filter enclosure over a broad surface. The leads connecting the capacitors are thereby eliminated and parasitic impedances are reduced to a minimum. This results in broadband suppression into high frequency ranges. X2Y® technology has been established for quite some time in the area of signal processing. SCHURTER has now integrated this concept into safety relevant power input.

Power entry module with extra-safe fuse drawer

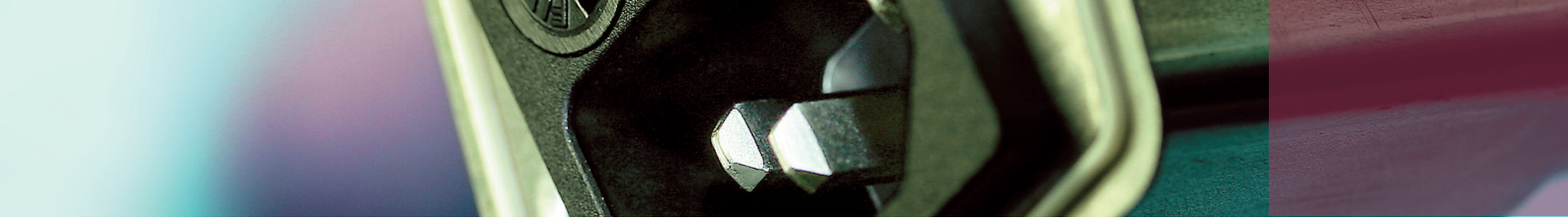
The power entry module KFA with line filter and 1- or 2-pole fuseholder is designed for rated currents from 1 to 10 A. The use of an extra-safe fuse drawer allows the use of the component for medical appliances according IEC 60601-1.

The product KFA offers a wide range of different variants. Different mountig stiles are available as well as a version with voltage selector. The type with metal flange is extra effective regarding EMC protection.

Provide the expected product quality

“Quality issues with other manufacturers led the customer to us – plus the support they were not getting!”

Ian McCutcheon



SCHURTER's devices

are based on IEC connectors with line filters. Available current ratings range from 2.5 Amps to 20 Amps.

MAX. RATED CURRENT 6 A

CD-Bowdencable

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole (5x20 mm or 6.3x32 mm), Bowden Line Switch 1- or 2-pole, Voltage Selector (Step)

Mounting **Screw**
Mounting side **Front-Side**

Fuseholder Dimension **5 x 20 or 6.3 x 32**
Number of Poles **1 or 2 pole**

Line Switch **2-pole**
Voltage Selectors **-step optional**

C14
70° C

CG-Bowdencable

With fuseholder 5x20 mm/6.3x32 mm, voltage sel. (series-parallel)

Mounting **Screw**
Mounting side **Front-Side**

Fuseholder Dimension **5 x 20 or 6.3 x 32**
Number of Poles **1 or 2 pole**

Line Switch **2-pole**
Voltage Selectors **-series-parallel**

C14
70° C

MAX. RATED CURRENT 10 A

Felcom 54

IEC Appliance Inlet C14 Modular Assembling Options

Mounting **Snap-in**
Mounting side **Front-Side**

Fuseholder Dimension **5 x 20**
Number of Poles **1 or 2 pole**

Line Switch **2-pole**

F
70° C

KMF

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole, Line Switch 2-pole

Mounting **Snap-in**
Mounting side **Front-Side**

Fuseholder Dimension **5 x 20**
Number of Poles **1 or 2 pole**

Line Switch **2-pole**

C14
70° C

new

DD12

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole, Line Switch 2-pole

Mounting **Screw**
Mounting side **Front-Side**

Fuseholder Dimension **5 x 20**
Number of Poles **1 or 2 pole**

Line Switch **2-pole**

C14
70° C

V-Lock new

DD22

IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole, Line Switch 2-pole, for PCB Mounting

Mounting **Screw**
Mounting side **Rear-Side**

Fuseholder Dimension **5 x 20**
Number of Poles **1 or 2 pole**

Line Switch **2-pole**

C14
70° C

	**FKH** **IEC Appliance Inlet C14 with Filter, Fuseholder 1-pole, Line Switch 2-pole**	Mounting **Screw** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20** Number of Poles **1-pole**	Line Switch **2-pole**	C14 70° C
	**FKI** **IEC Appliance Inlet C14 with Filter, Fuseholder 2-pole, Line Switch 2-pole**	Mounting **Screw** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20** Number of Poles **2-pole**	Line Switch **2-pole**	C14 70° C
	**FKHD** **IEC Appliance Inlet C14 with Filter 2-Stage, Fuseholder 1-pole, Line Switch 2-pole**	Mounting **Screw** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20** Number of Poles **1-pole**	Line Switch **2-pole**	C14 70° C
	**FKID** **IEC Appliance Inlet C14 with Filter 2-Stage, Fuseholder 2-pole, Line Switch 2-pole**	Mounting **Screw** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20** Number of Poles **2-pole**	Line Switch **2-pole**	C14 70° C
 V-Lock	**CD** **IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole (5x20 mm or 6.3x32 mm), Line Switch 1- or 2-pole, Voltage Selector (Step)**	Mounting **Screw** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20 or 6.3 x 32** Number of Poles **1 or 2 pole**	Line Switch **2-pole** Voltage Selectors **-step optional**	C14 70° C
 V-Lock	**CG** **IEC Appliance Inlet C14 with Filter, Fuseholder 1- or 2-pole (5x20 mm or 6.3x32 mm), Line Switch 1- or 2-pole, Voltage Selector (Series-Parallel)**	Mounting **Screw** Mounting side **Front-Side**	Fuseholder Dimension **5 x 20 or 6.3 x 32** Number of Poles **1 or 2 pole**	Line Switch **2-pole** Voltage Selectors **-series-parallel**	C14 70° C

For customer specific solutions, please contact us. www.schurter.com/contact

General product information see IEC connector page 176

Single phase block EMI filters

meet international safety standards. Available current ratings range from 0.5 Amps to 36 Amps, for chassis or PCB mounting.

MOUNTING PCB MOUNTING					
 **FMAB-72** **AC Filter for PCB Mounting in Flat Aluminum Housing**	Rated Current **2 - 16A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Aluminum**
 **5500** **AC Filter for PCB Mounting**	Rated Current **1 - 10A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Thermoplastic**
 **FPP-01** **AC Filter for PCB Mounting Cots Optimized**	Rated Current **0.6 - 6A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Thermoplastic**
 **FPP-02** **AC Filter for PCB Mounting in Flat Housing**	Rated Current **0.5 - 6,5A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Thermoplastic**

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/pg06_1
For customer specific solutions, please contact us. www.schurter.com/contact

Screw clamps for simple assembly

The block filters are offered in various configuration. To highlight are for example the several connection possibilities.

The connectors can be screw clamps, quick connect terminals or with stranded wires. The restrictions are given by the current ratings. The customer may configure the design on his purpose.

We produce environment-friendly products and we do it with respect for our ressources.

A responsible attitude to the environment is a constant part of the SCHURTER corporate culture. We use our resources efficiently, environment friendly products are of great importance to us and we also sensitize employees and partners for environmental matters.

Single phase block EMI filters

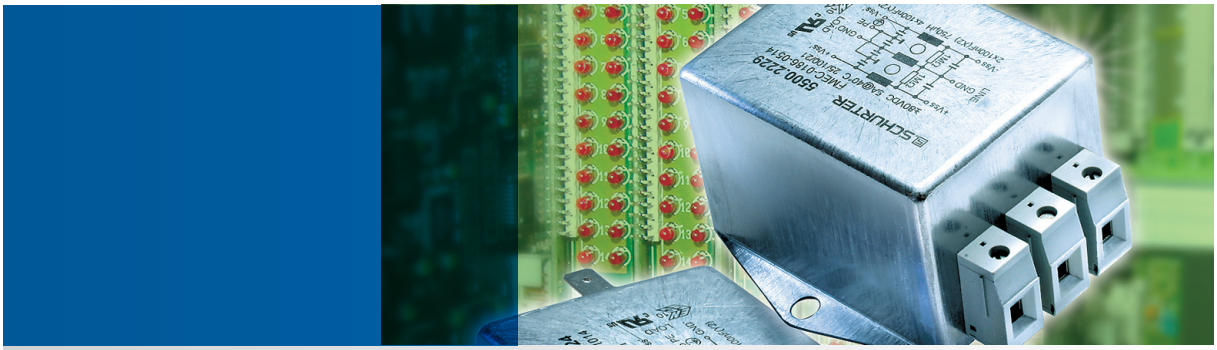
meet international safety standards. Available current ratings range from 0.5 Amps to 36 Amps, for chassis or PCB mounting.

MOUNTING DIN RAIL MOUNTING					
 new **FMBB RAIL** **AC Filter 2-Stage, DIN Rail Mounting, Very Broad Band Attenuation**	Rated Current **1 - 10A**	Filter-Type **Standard and Industrial Version**	Attenuation **High** Steps **2**	Application **High symmetrical and asymmetrical attenuation**	Housing **Metal**
 new **FMAB RAIL** **AC Filter, DIN Rail Mounting**	Rated Current **10 - 20A**	Filter-Type **Industrial Version**	Attenuation **High**	Application **Especially against asymmetrical interference**	Housing **Metal**
MOUNTING SCREW-ON MOUNTING					
 new **FMEB** **DC-Filter, single pole**	Rated Current **5 - 30A**	Filter-Type **Industrial Version**	Attenuation **Standard**		Housing **Aluminum**
 new **FMEC** **DC-Filter, dual pole**	Rated Current **5 - 30A**	Filter-Type **Industrial Version**	Attenuation **Standard**		Housing **Aluminum**
 new **FMBB NEO** **AC Filter 2-Stage, Broad Band Attenuation**	Rated Current **1 - 36A**	Filter-Type **Standard Version**	Attenuation **Excellent** Steps **2**	Application **High attenuation at high loads**	Housing **Aluminum**
 **FMW-52** **AC Filter 2-Stage**	Rated Current **2 - 6A**	Filter-Type **Standard Version**	Attenuation **High** Steps **2**	Application **For high requirements**	Housing **Aluminum**

	**FMW-55** AC Filter	Rated Current **10 - 20A**	Filter-Type **Standard and Industrial Version**	Attenuation **Standard**	Application **General purpose**	Housing **Aluminum**
	**FMLB-09** AC Filter Cost Optimized	Rated Current **6 - 20A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Aluminum**
	**FMLB-41** AC Filter Cost Optimized	Rated Current **1 - 10A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Aluminum**
	**FMLB-51** AC Filter Cost Optimized	Rated Current **6 - 20A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Aluminum**
	**FMW-41** AC Filter	Rated Current **1 - 10A**	Filter-Type **Standard and Medical Version**	Attenuation **Standard**	Application **General purpose**	Housing **Aluminum**
	**FMAB** AC Filter, Broad Band Attenuation	Rated Current **12 - 50A**	Filter-Type **Industrial Version**	Attenuation **Excellent**	Application **High attenuation at high loads**	Housing **Metal**
	**FMBB** AC Filter 2-Stage, Broad Band Attenuation	Rated Current **8 - 25A**	Filter-Type **Standard and Industrial Version**	Attenuation **Excellent** Steps **2**	Application **High attenuation at high loads**	Housing **Metal**

		Rated Current	Filter-Type	Attenuation	Application	Housing
	**FMW-150** **AC Filter 3-Stage, Very High Broad Band Attenuation**	**4 - 30A**	**Industrial Version**	**Medium** Steps **3**	**High symmetrical and asymmetrical attenuation**	**Metal**
	**FSW** **AC Filter 2-Stage, Very High Symmetrical and Asymmetrical Attenuation**	**3 - 36A**	**Standard and Industrial Version**	**High** Steps **2**	**Especially against asymmetrical interference**	**Alu. anodised / Stainless Steel**
	**FSS** **AC Filter 2-Stage, Very High Symmetrical Attenuation**	**1 - 16A**	**Standard and Industrial Version**	**Medium** Steps **2**	**Especially against symmetrical interference**	**Aluminum**

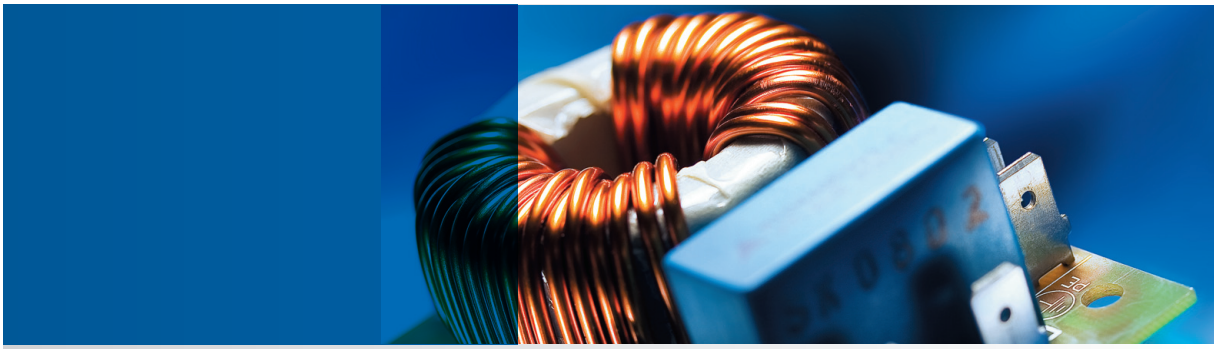
This overview only shows a selection of the current product range of SCHURTER.
You will find additional information about the respective products on our website: www.schurter.com/pg06_1
For customer specific solutions, please contact us. www.schurter.com/contact
General product information see industrial mains filters page 200



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.



Customized filters for system integration

Open frame filters are sub-systems that are engineered exactly to our OEM customers' specifications. Alongside suppression properties, filter geometry and system connection play a central role. Very often the area of application renders the filter housing superfluous. Additional material cost savings are thus possible.

The open frame filters are available in single- or three-phase versions. The method of electrical connection ranges from simple quick connect terminals through to completely assembled cable harness.

Known as technology leader

“The customer contacted us first – because they were looking for a new technology.”

Ian McCutcheon

3-phase block EMI filters

meet international safety standards. Available current ratings range from 3 Amps to 115 Amps at 275, 480 and 520 Volts, for chassis mounting.

new

FMER SOL

DC filter for photovoltaic converters

Rated Current **25A / 25 - 1500A**

Attenuation **Excellent**

new

FMBC NEO

2-stage filter for 3-phase systems

Rated Current **7 - 180A / -**

Attenuation **Excellent**

Steps **2**

new

FMBD NEO

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

Rated Current **8 - 200A / -**

Attenuation **Excellent**

Steps **2**

Application **High attenuation at high loads**

new

FMAC ECO

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

Rated Current **16 - 150A / -**

Attenuation **Standard**

new

FMAC

1- stage filter for 3-phase systems

Rated Current **6 - 1100A / -**

Attenuation **High**

Application **General purpose**

new

FMAC RAIL

1- stage filter for 3-phase systems, DIN rail mounting

Rated Current **3 - 20A / -**

Attenuation **Standard**

Application **General purpose**

new

FMBC ECO

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

Rated Current **10 - 115A / -**

Attenuation **Standard**
Steps **2**

FMBC BOOK STYLE

Compact 2-stage bookform filter

Rated Current **10 - 115A / -**

Attenuation **Very high**
Steps **2**

Application **For high requirements**

FMBC

2-stage filter for 3-phase systems

Rated Current **8 - 64A / -**

Attenuation **Very high**
Steps **2**

Application **For high requirements**

FMAD

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

Rated Current **6 - 550A / -**

Attenuation **High**

Application **High attenuation at high loads**

new

FMAD RAIL

1-stage filter for 3-phase systems with neutral conductor, DIN rail mounting

Rated Current **6 - 20A / -**

Attenuation **High**

Application **High attenuation at high loads**

FMW4-65

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

Rated Current **3 - 20A / -**

Attenuation **Standard**

Application **General purpose**

FMW4-81(95)

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

Rated Current **4 - 6A / -**

Attenuation **Standard**
Steps **2**

		Rated Current	Attenuation
	**FMAC-Out** **Output filter for 3-phase frequency inverter**	**8 - 32A / -**	**Standard**

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 200

FMBC 3-phase filters

The two-stage 3 phase filter of the FMBC series do cover current ratings from 8 to 64 A respective a frequency range from 10 kHz up to 300 MHz. Over the broad range, this filter does have an excellent and broadbandy attenuation.

The filter is effecitve against symmetric as well as asymmetric interferences and is world-wide applicable due to the rated voltage of 480 V. The bookstyle line of the FMBC series is very compact and is used where you have to be considerate of space.

Would you like to check the availability of the required products?

You will find an overview of the current product availability, at the respective SCHURTER company as well as at the distributors, on our website.

www.schurter.com/stockcheck

DC filter FMER SOL

The DC filters FMER SOL are designed for rated currents from 25 A to 1500 A at 55°C ambient temperature, and voltages up to 1200 VDC.

The DC filters FMER SOL are designed with screw clamps for types up to 150 A and copper bars for types upwards of -250 A. Small adjustments can be made to the electrical circuit or to the filter housing on request.

High-end-compact 3-phase 2-stage EMC filter

The FMBC NEO 3-phase filters are arranged for use with 3× 277/480 VAC and 3× 300/520 VAC installations and the FMBD NEO 3-phase filters with neutral are arranged for use with 3× 300/520 VAC intallations.

3-phase block EMI filters

meet international safety standards. Available current ratings range from 3 Amps to 115 Amps at 275, 480 and 520 Volts, for chassis mounting.

new

FMAC SINE **Sine wave output filter**	Rated Current **4 - 16A / -**	Attenuation **Standard**	

new

FMAC SINE DCL **Sine wave output filter with a voltage dc link**	Rated Current **4 - 16A / -**	Attenuation **Standard**	

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 200

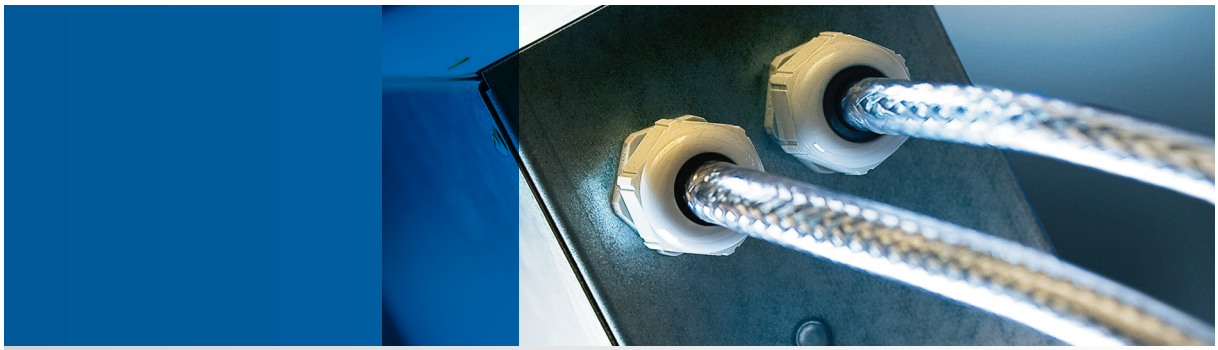
Mission statement

Clear, direct communication. Welcoming of new ideas. Continuous productivity.

2-stage-EMI-line-filter for one phase systems, compact and efficient

The new FMBB NEO filter series for one phase systems consisting of three variations of 2-stage filter designs allows a specific selection of FMBB NEO filter products for efficient EMI solutions.

The 3 FMBB NEO filter designs are characterised by a high symmetrical and asymmetrical attenuation. The FMBB NEO one phase filter is dimensioned as a 250 VAC filter at a rated current of 1-36 A according IEC and 125/250 VAC, 1-30A according UL/CSA. The filter series is available as standard or medical version, with quick connect terminals, bolts and nuts style M4 or optional with flexible wire leads.

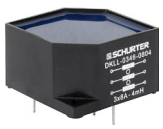


Sine wave output filters to increase motor service life

The SCHURTER sine wave filters series FMAC SINE and FMAC SINE DCL are designed to convert output voltage wave forms produced by PWM frequency converters into low distortion sine wave forms for motor drive and power transformation applications.

Sine wave filters are suited to a wide variety of applications including frequency converters in uninterruptible power supplies, elevators, heating-, ventilating- and air conditioning systems, traction and conveyer systems.

SCHURTER's suppression chokes are available as magnetically compensated, linear, storage and linear/ saturating types. Available current ratings range from 0.4 to 50 Amps.

	STYLE 1- OR 3-PHASE CHOKE			
	**DFK** **Magnetically Compensated Choke, 1- and 3-phase**	Rated Current **0.5 - 15A** Rated Voltage **up to 440VAC**	Rated inductance **1 - 20mH** **Tol. -30% +50%**	Mounting **THT** **Flexible wire**
	STYLE THT-TERMINALS			
	**DKFP** **Magnetically Compensated Choke, compact**	Rated Current **0.3 - 10A** Rated Voltage **up to 250VAC**	Rated inductance **0.5 - 100mH** **Tol. -30% +50%**	Mounting **THT**
new				
	STYLE 1-PHASE CHOKE			
	**DFKF** **Magnetically Compensated Choke, 1-phase, flat design**	Rated Current **0.4 - 4A** Rated Voltage **up to 440VAC**	Rated inductance **0.6 - 40mH** **Tol. -30% +50%**	Mounting **THT**
	**DFKH** **Magnetically Compensated Choke, 1-phase, high design**	Rated Current **0.6 - 6A** Rated Voltage **up to 440VAC**	Rated inductance **0.6 - 50mH** **Tol. -30% +50%**	Mounting **THT**
	**DKIL-1** **Compensated High Current Choke, 1-phase**	Rated Current **10 - 20A** Rated Voltage **up to 540VAC**	Rated inductance **1.1 - 12mH** **Tol. -30% +50%**	Mounting **THT**
	**DKIP-1** **Compensated High Current Choke, 1-phase**	Rated Current **10 - 50A** Rated Voltage **up to 540VAC**	Rated inductance **1.1 - 12mH** **Tol. -30% +50%**	Mounting **Flexible wire**
	**DKLL-1** **Compensated High Inductance Choke, 1-phase**	Rated Current **4 - 7A** Rated Voltage **up to 540VAC**	Rated inductance **14 - 60mH** **Tol. -30% +50%**	Mounting **THT**

	**DKLP-1** **Compensated High Inductance Choke, 1-phase**	Rated Current **4 - 20A** Rated Voltage **up to 540VAC**	Rated inductance **14 - 60mH** **Tol. -30% +50%**	Mounting **Flexible wire**
	STYLE 3-PHASE CHOKE			
	**DKIL-3** **Compensated High Current Choke, 3-phase**	Rated Current **10 - 20A** Rated Voltage **up to 540VAC**	Rated inductance **0.6 - 5mH** **Tol. -30% +50%**	Mounting **THT**
	**DKIP-3** **Compensated High Current Choke, 3-phase**	Rated Current **10 - 50A** Rated Voltage **up to 540VAC**	Rated inductance **0.6 - 5mH** **Tol. -30% +50%**	Mounting **Flexible wire**
	**DKLL-3** **Compensated High Inductance Choke, 3-phase**	Rated Current **3 - 8A** Rated Voltage **up to 540VAC**	Rated inductance **4.0 - 50mH** **Tol. -30% +50%**	Mounting **THT**
	**DKLP-3** **Compensated High Inductance Choke, 3-phase**	Rated Current **8 - 16A** Rated Voltage **up to 540VAC**	Rated inductance **4.0 - 50mH** **Tol. -30% +50%**	Mounting **Flexible wire**
	STYLE SMD-TERMINALS			
	**DKFS** **Magnetically Compensated SMD Choke, compact**	Rated Current **0.5 - 2A** Rated Voltage **up to 250VAC**	Rated inductance **0.5 - 4.0mH** **Tol. -30% +50%**	Mounting **SMD**

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/pg81_82
For customer specific solutions, please contact us. www.schurter.com/contact

SCHURTER's suppression chokes are available as magnetically compensated, linear, storage and linear/ saturating types. Available current ratings range from 0.4 to 50 Amps.

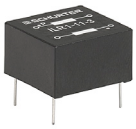
STYLE WIRE LEADS			
 **DLO** Linear Choke, open version, without socket	Rated Current **0.45 - 7A**	Rated inductance **0.02 - 5mH** **Tol. ±15%**	Mounting **Wire leads**
 **DSO** Storage Choke, open version, without socket	Rated Current **0.5 - 16A**	Rated inductance **0.01 - 1mH** **Tol. ±15%**	Mounting **Wire leads**
 **DEH** High frequency ground wire choke, shrink hose	Rated Current **16 - 25A**	Rated inductance **0.02 - 4mH** **Tol. ±15%**	Mounting **Wire leads**
 **DEN** Low frequency ground wire choke, fully potted resign	Rated Current **16 - 25A**	Rated inductance **0.02 - 4mH**	Mounting **Wire leads**
STYLE FLEXIBLE WIRE			
 **DLFP** Linear/Saturating Choke	Rated Current **5 - 45A** Rated Voltage **up to 440VAC**		Mounting **THT** **Flexible wire**
STYLE THT-TERMINALS			
 **DENO** Ground wire choke, open design	Rated Current **16A**	Rated inductance **0.04 - 4mH**	Mounting **THT**
 **DFSG** Saturating Choke	Rated Current **0.8 - 10A** Rated Voltage **up to 440VAC**		Mounting **THT** **Flexible wire**

	**DLF** **Linear Choke, flat design**	Rated Current **0.4 - A**	Rated inductance **0.015 - 3mH** **Tol. ±15%**	Mounting **THT**
	**DLFL** **Linear/Saturating Choke**	Rated Current **5 - 45A** Rated Voltage **up to 440VAC**		Mounting **THT** **Flexible wire**
	**DLH** **Linear Choke, high design**	Rated Current **0.45 - A**	Rated inductance **0.02 - 5.5mH** **Tol. ±15%**	Mounting **THT**
	**DLNP** **Linear Choke, compact**	Rated Current **0.6 - 1A**	Rated inductance **0.05 - 0.1mH** **Tol. ±15%**	Mounting **THT**
	**DS** **Storage Choke, fully potted resign**	Rated Current **0.5 - 16A**	Rated inductance **0.01 - 1mH** **Tol. ±15%**	Mounting **THT**
	**DSF** **Storage Choke, flat design**	Rated Current **0.4 - 6.3A**	Rated inductance **0.011 - 3.7mH** **Tol. ±15%**	Mounting **THT**
	**DSH** **Storage Choke, high design**	Rated Current **0.45 - 6.3A**	Rated inductance **0.01 - 2mH** **Tol. ±15%**	Mounting **THT**
	**DSHP** **Storage Choke, compact**	Rated Current **0.6 - 1A**	Rated inductance **0.04 - 0.1mH** **Tol. ±15%**	Mounting **THT**

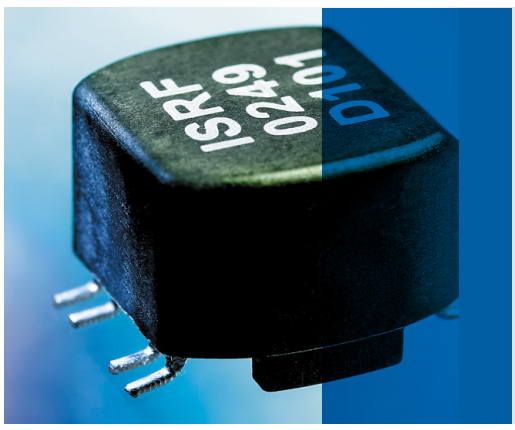
This overview only shows a selection of the current product range of SCHURTER.
You will find additional information about the respective products on our website: www.schurter.com/pg81_82
For customer specific solutions, please contact us. www.schurter.com/contact

SCHURTER's pulse transformers

are designed for providing dielectric isolation between drive controller and power output circuits.

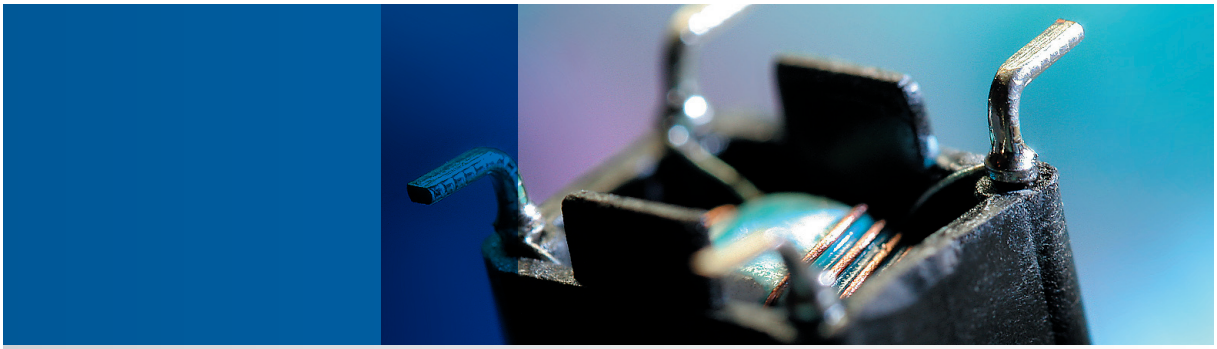
	**IT** **Pulse transformers for THT mounting**	Turns Ratio **1:1 , 2:1 , 1:1:1**	Rated voltage **up to 600VAC**	Voltage Time Integral **150 - 400Vµs**	Pulse Rise Time **0.05 - 1.5µs**	Mounting **THT**
	**IS** **Pulse transformers for SMD mounting**	Turns Ratio **1:1 , 2:1 , 1:1:1**	Rated voltage **up to 600VAC**	Voltage Time Integral **150 - 400Vµs**	Pulse Rise Time **0.05 - 1.5µs**	Mounting **SMD**
	**IL** **Cost optimized pulse transformers for THT mounting**	Turns Ratio **1:1 , 1:1:1 , 3:1:1**	Rated voltage **up to 500VAC**	Voltage Time Integral **200 - 500Vµs**	Pulse Rise Time **0.5 - 1.5µs**	Mounting **THT**
	**ILR** **Cost optimized pulse transformers for THT mounting, short rise time**	Turns Ratio **1:1 , 2:1 , 3:1 , 1:1:1**	Rated voltage **up to 500VAC**	Voltage Time Integral **150 - 300Vµs**	Pulse Rise Time **0.1 - 0.3µs**	Mounting **THT**
	**IX** **Cost optimized pulse transformer for THT mounting, up to 2W**	Turns Ratio **1:1:1 , 3:1:1**	Rated voltage **up to 500VAC**	Voltage Time Integral **500Vµs**	Pulse Rise Time **0.7 - 0.8µs**	Mounting **THT**

General product information see pulse transformers page 210



Pulse transformers

The application range of pulse transofrmers is very broad. In most cases, a signal or a control pulse must be transmitted between electrically isolated circuits.



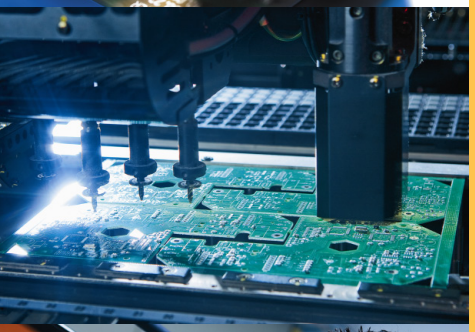
Current compensated choke for SMD mounting

The choke DKFS is ideally suitable to be used for a discrete design of line filters.
Extreme compact circuits may be designed with the SMD style chokes for rated currents up to 2 A.

The hidden values

“Our product may have been more expensive, but then it also helped the customer save mounting and wiring costs.”

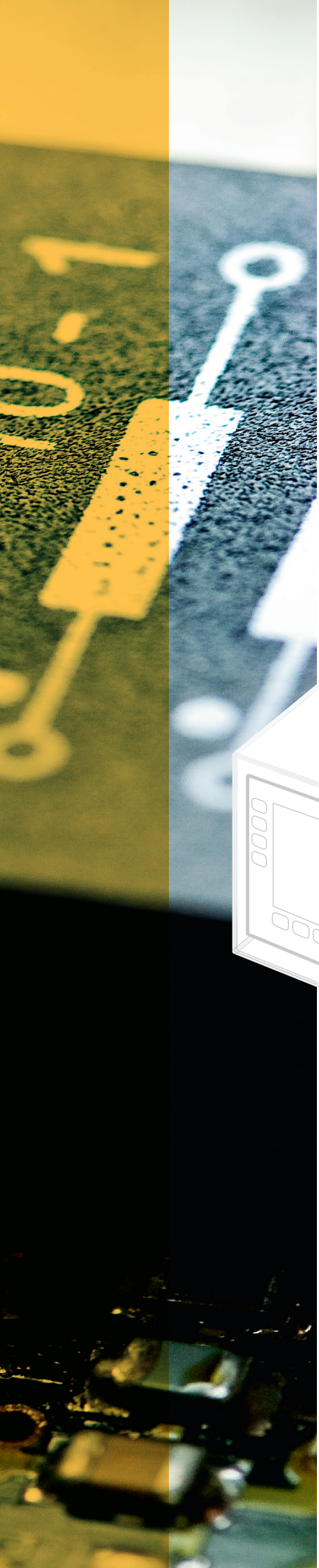
Stefano Mangini



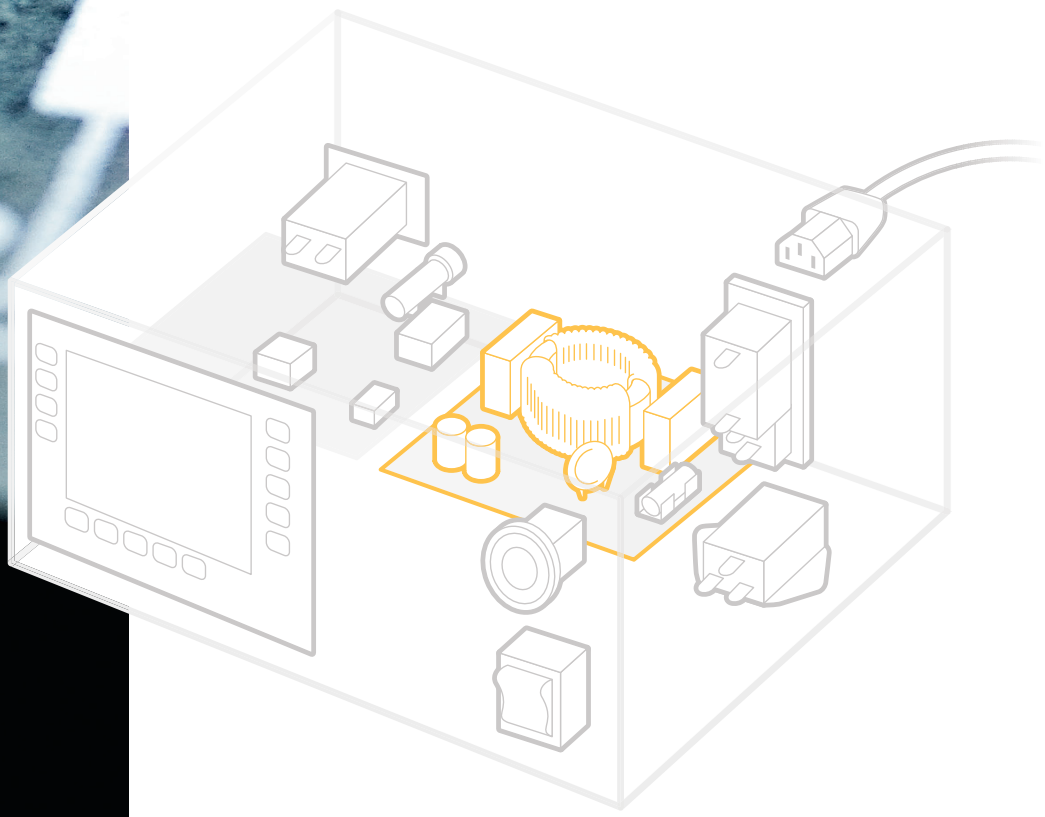
From idea to production

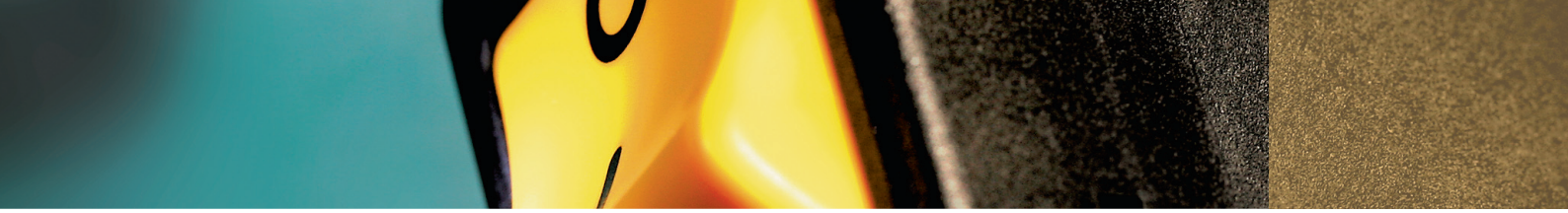
Production

Functional testing



Electronic Manufacturing Services (EMS)





SCHURTER
Electronic Manufacturing Services

Through its EMS Division, with locations in Switzerland, Romania and Italy, SCHURTER Electronic Manufacturing Services offers suitable system solutions for these customer needs as well.

Range of services
Do you have a concept for an electronic assembly, an appliance, or an entire system, and you are looking for an implementation partner? – SCHURTER Electronic Manufacturing Services offers you ideal system solutions, from development, PCB production and the testing concept to delivery. We support your product's life cycle from development to mass production. In other words, we offer support all the way to complete custom-order manufacturing.

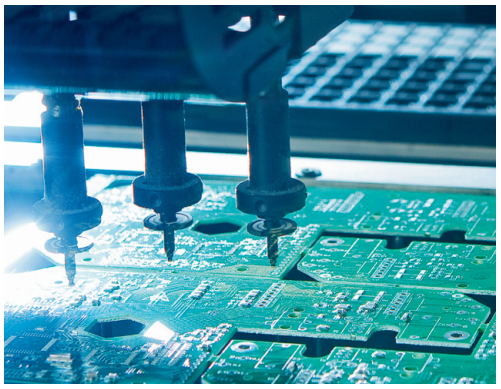
From initial idea to mass production
We will handle and organize all processes according to your requirements:
- Development & product certification
- Design to manufacturing support
- Prototyping and pre-production manufacturing
- Testing equipment & concepts
- Materials & life cycle management
- Production (electromagnetic components, electronics manufacturing, appliance and systems assembly)
- Logistics
- After-Sales Service (repairs and replacement parts service)

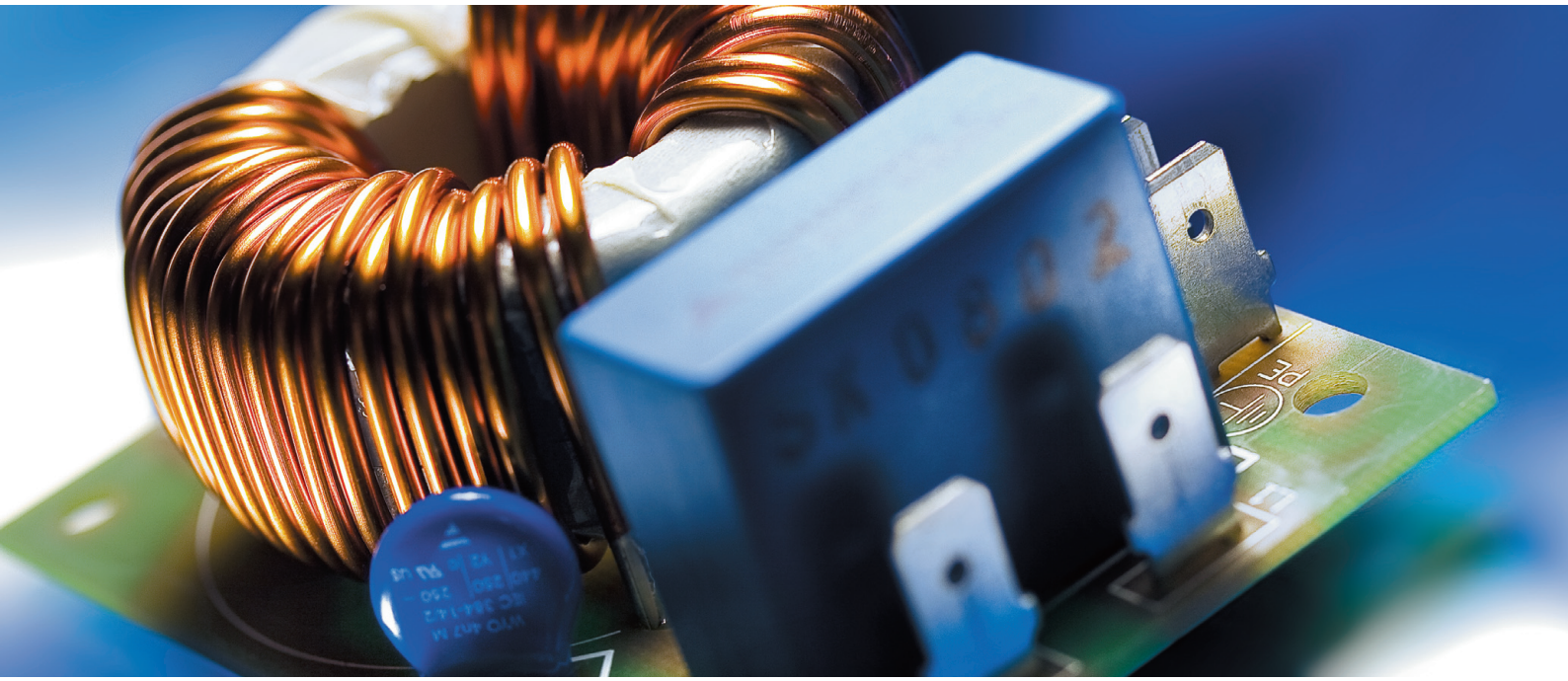
Areas of application
SCHURTER Electronic Manufacturing Services produces and installs electronic assemblies, complete appliances and systems. We specialize in high quality complex industrial input systems and electromagnetic transmissions systems. We have superb expertise in using passive components, particularly to solve EMC problems, and in implementating touch screen operating system concepts.

Partnership
For us, success means realizing your ideas with a perfect solution that is flexible, efficient, and implemented with the best possible support. We are used to innovatively meeting the challenges of different markets, regardless of whether you intend to actualize components, modules, devices, or entire systems with us. With our profound expertise and our wide range of technologies, we are ideally prepared for these challenges.

Production
SCHURTER Electronic Manufacturing Services offers consistent high quality and absolute product reliability. State-of-the-art machinery and up-to-date technical expertise guarantee the realization of our motto: "Safe & Easy".

Production covers the following areas:
- Prototype production
- THT assembly (fully automated axial and radial systems)
- SMD assembly: Package to 0201, BGA, pitch 02
- Assembly capacity: 100k components per hour
- Reflow soldering processes
- Wave soldering equipment
- BGA desoldering stations (certified BGA rework system)
- Winding materials manufacturing
- In-circuit (ICT), functional and flying probe testing
- X-ray inspection
- AOI in/out line
- Burn-in/run-in
- Temperature and climate testing





Quality and certification

The qualification of our products and the provisioning of customer specific test systems is performed using state-of-the-art testing equipment. A high level of process reliability is achieved through automating complex workflows using semi and fully automatic machines. Constant process monitoring ensures that the highest standards are met.

We have attained our position in the market and earned the trust of our customers not least through our dedication to quality. Continuous investment in state-of-the-art equipment and employee training ensures that we can meet the highest expectations. All these goals we achieve by consistently implementing our certified quality and environmental management systems and by adhering to the relevant standards and guidelines:

We manage, monitor and improve our processes using various management systems designed and certified in accordance with ISO 9001, ISO 14001 and OHSAS 18001.

Contact

If you have a product concept and wish to use our services, do not hesitate to get in touch with us. We are happy to accept your challenge.

www.ticomel.ch

contact@ticomel.ch

Application in explosive environments

The Piezo switches from SCHURTER have ATEX Class II 2 G Ex ib IIB T4 approval. With this authorization, they can be used for days in equipment where there is a danger of explosion.

Typical areas of application are oil and gas facilities, petrochemical, paint mixing and painting facilities.

A product overview can be found at: www.schurter.com/ex

Let the customer judge the product quality

“First, the customer said ‘Nooo!’ But then I showed them the product, and they were very surprised about the smaller size and the good design. They simply hadn't known that something like that existed. They needed some convincing just to look at our product, but then we won them over immediately.”

Brigitte Crombez

General product information

PRODUCT STANDARD / COMMENTS ON DEFINITIONS USED / CE MARKING / CONFORMITY TO COMPONENT STANDARDS / NATIONAL APPROVALS / PROTECTION

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 acc. to EU-directives

CE marking is the only marking which indicates that a product conforms to the relevant EU-directive.

CE

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 http://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

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.

Information about approvals

SCHURTER products are certified according to EN / IEC standards and carry country specific approvals in Europe.

During the last few years European countries made much effort to reduce their approval marks to one generally accepted mark. The ENEC approval mark replaces (wherever possible) the previous approval mark. The ENEC mark is offered by all national certification bodies that signed for the European certification agreement (CCA)*.
SCHURTER decided to reduce the variety of European approval marks. For new approbations of SCHURTER parts only the ENEC will be mentioned in the future:

Approvals for the US and Canada are according to the UL and CSA standards:

As UL and CSA are not a member of CENELEC these two are not according to the European approval marks. Wherever possible SCHURTER want to acquire the combined cULus approval mark:

Since Aug. 1st. 2003 the Chinese approval mark is required for a lot of products to import to China. SCHURTER strives to get the approvals for the concerned products. For not testable products we offer an import certificate (free of CCC).

General product information

Further information: http://www.enec.com

Approval Industry Links

* members of ENEC agreement:

01	AENOR	Spain
02	CEBEC	Belgium
03	IMQ	Italy
04	CERTIF	Portugal
05	KEMA	Netherlands
06	NSAI	Ireland
07	SEE	Luxembourg
08	LCIE	France
09	ELOT	Greece
10	VDE	Germany
11	OVE	Austria
12	BSI	Great Britain
13	SEV	Switzerland
14	SEMKO	Sweden
15	DEMKO	Danmark
16	FIMKO	Finland
17	NEMKO	Norway
18	MEEI	Hungary
19	BEAB	Great Britain
20	ASTA	Great Britain
21	EZU	Czech Republic
22	SIQ	Slovenia
23	-	-
24	TÜV	Rheinland
25	TÜV	PS

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 requi rements 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	
y = 9K	high pressure, i.e. steam jet cleaning	

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.

MINIATURE FUSE LINKS

Explanations / Standards

Explanations, application notes

The design engineer of electrical equipment is responsible for its safety and functioning to humans, animals and real values. Above all, it is his task to make sure that the state of the art as well as the valid national and international standards and regulations be observed.

The following information about fuse-links and their application are to be taken into consideration when selecting a fuse-link.

In view of the product liability of electrical equipment the selection of the most suitable fuse-link is of great importance.

1. Fuse

A fuse is a self-acting device that, by the fusing of one of its specially designed and proportioned components, opens the circuit in which it is inserted by breaking the current when this exceeds a given value for a sufficient time.

Definition according to IEC 60127:
The fuse comprises all the parts that form the complete device, that means fuseholder and fuse-link.

Definition according to UL 248-1:
A North American fuse is an IEC fuse-link. An IEC fuse is a North American fuse with a fuse-holder.

2. Fuse-link (IEC 60127)

The part of a fuse including the fuse-element intended to be replaced after the fuse has operated. Fuse-links according to IEC 60127 relate to miniature fuses for the protection of electric appliances, electronic equipment and components thereof normally intended to be used indoors. These fuse-links are not permitted for equipment, which has to operate under special circumstances, e.g. in a corrosive or explosive environment.

3. Miniature fuse-link (IEC 60127)

An enclosed fuse-link of rated breaking capacity not exceeding 2 kA and which has at least one of its principal dimensions exceeding 10 mm.

4. Sub-miniature fuse-link (IEC 60127)

A miniature fuse-link of which the case (body) has no principal dimensions exceeding 10 mm.
Sub-miniature fuse-links are especially suitable for printed circuit boards. They are available for the through hole technique and surface mounting technique (SMT).

5. Standards for fuse-links

IEC 60127	Miniature fuses (general title)	
IEC 60127-1	Part 1:	Definitions for miniature fuses and general requirements for miniature fuse-links
IEC 60127-2	Part 2:	Cartridge fuse-links
IEC 60127-3	Part 3:	Sub-miniature fuse-links
IEC 60127-4	Part 4:	Universal modular fuse-links
IEC 60127-5	Part 5:	Guidelines for quality assessment for miniature fuse-links
NF C 93435		Cartridge fuses with improved characteristics
UL 248-1		Low-voltage fuses: General requirements
UL 248-14		Low-voltage fuses: Supplemental fuses
CSA/C22.2 No. 248.1		Low-voltage fuses: General requirements
CSA/C22.2 No. 248.14		Low-voltage fuses: Supplemental fuses

Electrical ratings

6. Rated voltage U_n

The rated voltage is the voltage up to which the fuse-link correctly interrupts an overcurrent.

The rated voltage of a fuse-link must be greater than or equal to the operating voltage of the equipment which is to be protected.

The use during operating voltages below the rated voltage of the fuse-link is permitted only, when the instructions regarding voltage drop (pos. 8) are taken into consideration.

The fuse-links are on principle suitable for use at alternating and direct voltage. The breaking capacity at direct-voltage is however considerably lower than the one at alternating voltage. The performance of the fuse-link at direct-voltage mainly depends on the size of the time-constant **T** = L/R of the load circuit.

7. Rated current I_n

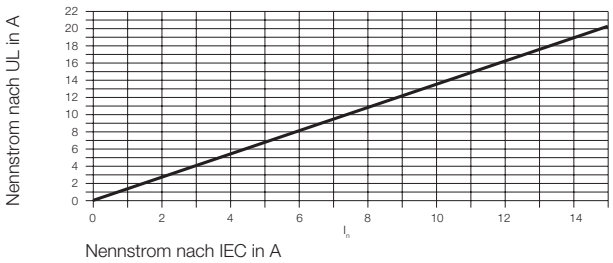
The rated current of the fuse-link corresponds to the operating current of the equipment to be protected. Basically there are two different rated current definitions:

a) On fuse-links according to IEC 60127 and EN 60127 the rated current corresponds to the current, which the fuse-link can be exposed to continually, according to the standardized regulations, without interrupting the fuse-link.

b) On fuse-links according to UL 248-14 however, the rated current corresponds to the current, which would interrupt the fuse-link already after a few hours. The current, which according to IEC, can flow constantly without interrupting the fuse-link, is approx. $0.7 \cdot I_n$.

Regarding influences of ambient air temperatures > 23 °C on the rated current see pos. 1

Correlation between the rated current of fuse-links according to IEC and UL:



8. Voltage drop

The voltage drop across a fuse-link is measured at an ambient air temperature of 23 °C, when the fuse-link has carried its rated current for a time sufficient to reach temperature stability. Attention is drawn to the fact that problems can arise when fuse-links are used at operating voltages considerably lower than their rated voltage. Due to the increase of the voltage drop when the element of a fuse-link approaches its melting point, care should be taken to ensure that there is sufficient circuit voltage available to cause the fuselink to interrupt the current when an electrical fault occurs. Furthermore, fuse-links of the same type and rating may, due to difference in design or element material, have different voltage drops and may therefore not be interchangeable in practice when used in applications with low circuit voltages, especially in combination with fuse-links of lower rated currents.

9. Non fusing current I_{nf}

A value of an over-current specified as that which the fuse-link is capable of carrying for a specified time (typical 1 hour) without melting.

10. Pre-arcing time/current characteristic (at T_a 23 °C)

The time-current-characteristic indicates the relation of the pre-arcing time (melting time) to the fault current.

The pre-arcing time is the interval of time between the beginning of a current large enough to cause a break in the fuse-element and the instant when an arc is initiated.

The arcing time is the interval of time between the instant of the initiation of the arc and the instant of final arc extinction. The arcing time is not considered in the time-current-characteristic.

The operating time (total clearing time) is the sum of the pre-arcing time and the arcing time.

The time-current-characteristics are shown as an envelope for all mentioned rated currents.

Usual time-current-characteristic and their symbols:

FF: denoting very quick acting
F: denoting quick acting
M: denoting medium time-lag
T: denoting time-lag
TT: denoting long time-lag

UL fuse-links are normally divided into:

- Non time delay fuse-links. These fuse-links are sometimes also referred to as normal blow or quick acting types.
- Time delay fuse-links. These fuse-links are sometimes also refered to as slow blow or surge proof types.

Application notes for the various characteristics:

FF: Super-quick-acting fuse-links
Protection of semiconductors (thyristors, triacs, diodes).
This fuse type tolerates small overcurrents only during a short period of time and limits the current at small short circuit currents. Current limiting even with low short circuit currents.

F: Quick-acting fuse-links
Protection of semiconductors and of an equipment with no current surge when operating or switching on and also for such devices where high overcurrent or high short-circuit current must be interrupted quickly.

M: Medium time lag fuse-links
Protection devices subjected to moderate in-rush currents and/or overcurrent peaks for a short time. Low voltage drop.

T: Time-lag fuse-links
Protection of devices subjected to high in rush currents and/or overcurrent peaks which decrease only slowly (e.g. transformers and motors).

TT: Super time-lag fuse-links
Protection of devices subjected to longer lasting in-rush currents and/or high overcurrent peaks.

11. Breaking capacity of a fuse-link (UL: interrupting rating IR)

A value (r.m.s. for alternating current) of prospective current that a fuse-link is capable of breaking at a stated voltage under prescribed conditions of use and behaviour.

The max. short-circuit current, which can occur in electric circuit of an equipment, due to fault conditions, may not exceed the breaking capacity of the fuse-link. Non-compliance of this rule can cause the danger of explosions and fire.

At direct current the breaking capacity of a fuse-link is lower than at alternating current. Values are given on request.

IEC 60127 miniature fuse-links are classified into two categories (for sub-miniature fuse-links other breaking capacities are defined).

Fuse-links with low breaking capacity, symbol L:

Typically, the fuse-element of this type of fuse-link is visible. The insulation tube consists of transparent material, normally glass. There is no extinguishing medium, the arc is quenched in air.

The breaking capacity is:
250 VAC/35A or 10.In p.f.1 whichever is greater.

Fuse-links with high breaking capacity, symbol H:

Typically, the fuse-element of this type of fuse-link is not visible. The insulation tube normally is of ceramic material or glass. To quench the arc, there is often an extinguishing medium.

The breaking capacity is:
250 VAC 1500A p.f. 0.7 to 0.8

UL's and CSA's short circuit requirements (interrupting rating IR) are different as relates to IEC.

Interrupting ratings at 125 VAC = 10'000 A } p.f. 0.7-0.8
250 VAC = 35 to 1500 A
depending on rated current of the fuse-link.

12. Power dissipations

12.1. Max. sustained power dissipation
a) Fuse-links according to IEC 60127:

The test is carried out according to a standardised test procedure (open fuse-holder, room temperature).

The power dissipation produced by the non fusing current I_{nf} after one hour is determined.

Non fusing currents are different and depend on the fuse-link type.

In the SCHURTER catalogue you will usually find two values of sustained power dissipation, namely:

- the maximum sustained power dissipation i.e. according to IEC 60127.
- The typical sustained power dissipation of the SCHURTER fuse-links.

These values are mostly lower than the standardised ones.

b) Fuse-links according to UL 248-14:

UL does not, like IEC, determine the sustained power dissipation, but measures the maximum permissible temperature increase from 75 °C at 1 · I_n on the outer surface of the fuse-link according to the UL standard.

12.2. Rated power dissipation
The power dissipation caused by the rated current (over a long period). With respect to the power acceptance for the selection of a suitable fuseholder this rated power dissipation is considered.

13. Pulse strength/thermal behaviour

I^2t-value (joule integral)

The integral of the square of the current over a given time interval. The I^2t-value is a measure of the energy required to disrupt the fuselink. That means for heating up the fuse-element to its melting temperature, for melting the fuse-element and for interruption of the current via an arcing period. Normally, distinction is made between.

- the pre-arcing I^2t (or fusing I^2t)
  is the I^2t integral extended over the pre-arcing time of the fuse-link. It represents the energy for heating up and melting the fuseelement. At high over-currents with melting times <10 ms the prearcing I^2t remains constant (adiabatic conditions). Sometimes the pre-arcing I^2t is determined by 10.times the rated current, based on the time-current-characteristic. The pre-arcing I^2t is a characteristic value of a fuse-link and informs about his resistance to pulses and in-rush-currents.

- the arcing I^2t
  is the I^2t integral extended over the arcing time of the fuse-links. It represents the arc-energy. The arcing I^2t depends on the electrical circuit parameters (e.g. operation voltage, power factor, closing angle etc.) of an electrical circuit.

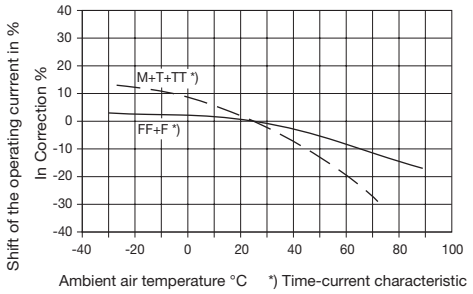
- the operating I^2t (or: total I^2t)
  is the sum of pre-arcing and arcing I^2t. This value is an important parameter for the application of a fuse-link. It characterises the energy exposed to the object (let-through-energy) to be protected by the fuse-link in case of a fault current.

Application notes:
In order to choose the right fuse-link, the permitted I^2t-value of the component or component group to be protected, has to be known.

Selection criteria:
The electric circuit to be protected contains:
- Components, which can cause in-rush currents, e.g. transformers. In this case, a fuse-link has to be chosen with a pre-arcing I^2t-value which is higher than the one of the in-rush-current.

- Components, which are sensitive to current impulses, e.g. semiconductors. In this case a fuse-link has to be chosen, with an operating I^2t-value which is lower than the one of the components to be protected.

Shift of the operating current as a function of ambient air temperature



14. Ambient air temperatures

The standardised current carrying capacity tests (IEC and UL) of fuse-links are performed at 23 °C and 25 °C respectively. In practical applications, the fuse-link's ambient temperature may be significantly higher, especially if the fuse-link is used in an unexposed fuseholder or mounted near other heat generating components. For such applications, the shift of the operating current according to the following diagram has to be considered.

15. Marking of the fuse-links

Marking according to IEC 127
Example: T[1] 200 mA[2] L[3] 250 V[4] [5]
Additional marking: the respective approval marks

[1] symbol, denoting the relative pre-arcing time-current-characteristic
[2] rated current in mA or A
[3] symbol, denoting the rated breaking capacity
[4] rated voltage in V
[5] SCHURTER Logo

16. Interchangeability of IEC- by UL fuse-links and vice versa

Fuse-links according to IEC und UL have different features and are on principle not interchangeable. However, after a thorough check of the technical data it may be possible to interchange, when the following, most important requirements are met.

- The rated currents must be adapted (see pos.7)
- The breaking capacity must be compatible.
- The time-current characteristic and voltage drop must be roughly the same.

17. Exchange of fuse-links under load

A fuseholder with an installed fuse-link shall not be used as a «switch» for turning power "on" and "off".

An opening and closing of electric-circuits may cause current- and voltage surges, depending on the dimension of the electric circuit. Such current or voltage peaks produce an arc between the contact points, which causes an increase of the contact resistance. In order to prevent the fuseholder from permanent damage, a fuselink shall only be exchanged when power in an electric circuit is switched off.

Quality / Reliability / Selection

18. Quality assessment of fuse-links

SCHURTER fuse-links meet with the requirements according to IEC 60127-5 and EN 60127-5.
More detailled information is available on request.

19. Reliability of fuse-link (MIL-HDBK-217F)

The reliability modeling of fuses presents a unique problem. Unlike most other components, there is very little correlation between the number of fuse replacements and actual fuse failures. Generally when a fuse opens, or "blows" something else in the circuit has created an overload condition and the fuse is simply functioning as designed.

Fuse-link selection guide

1. The operating voltage U_B of the equipment to be protected defines the rated voltage U_N of the fuse-link (see pos. 6) $U_N \geq U_B$ For $U_B << U_N$ please refer to the remarks regarding voltage drop (see pos. 8).

2. The max. operating current of the equipment to be protected defines the rated current of the fuse-link. The different definitions for rated current according to IEC or UL as well as the influence of higher ambient temperatures are to be taken into consideration (see pos. 6 and 14).

3. The possible fault current as well as its permitted operating times in the electric circuit of the equipment to be protected define the time-current-characteristic of the fuse-link (see pos. 10).

4. The necessary breaking capacity of the fuse-link depends on the max. short-circuit current, which can occur under fault conditions in the electric circuit of the equipment to be protected. It must be lower than the max. current which can be interrupted by the fuselink (see pos. 11).

5. The rated power dissipation of the fuse-link is of importance for the selection of the suitable fuseholder (see pos. 12.2).

6. If current impulses occur in the electric circuit of the equipment to be protected, which may not interrupt the fuse-link under any circumstances or if the let-through-energy of the fuse-link may only reach a certain value (eg. protection of semi-conductors) the I^2t values have to be taken into consideration accordingly (see pos. 13).

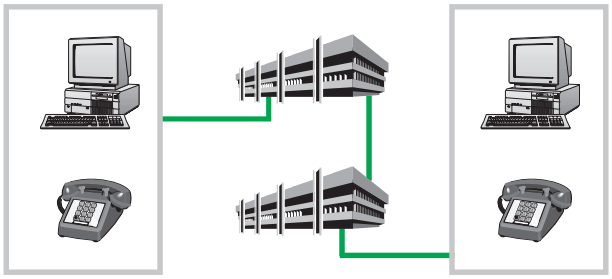
7. The necessary approvals are mostly defined by national and international standards for equipment. SCHURTER fuse-links are according to international standards and were approved by the different agencies (refer to data sheets for the individual fuse-links).

8. It is essential that the selected fuse-links/fuse-holders that are fitted to the equipment to be protected, are being tested under normal and fault conditions, even if all relevant criteria for selection have been taken into consideration.

TELECOM FUSES

Introduction

Telecommunication equipments serve for data exchange between a variety of subscribers. Communication takes place in various ways, e. g. per telephone, FAX etc.
This gives rise to the following classical network topology:

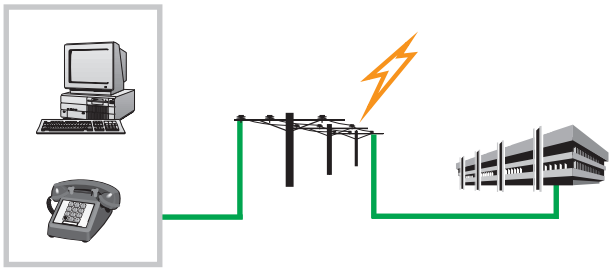


There can be extremely diverse distances between individual subscribers (man, machine). This means that network connections (overhead lines, signal cables) can be subject to various interference sources.

· Atmospheric interference, (lightning discharge, switching operations)
· Interference by power induction (equalizing currents, vicinity of power cables)
· Direct contact with energy network (short-circuits)

Interference sources

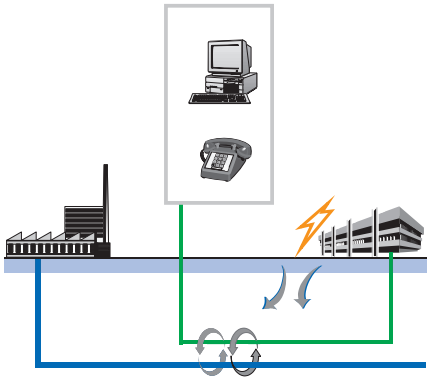
Atmospheric interference (Lightning Surge)



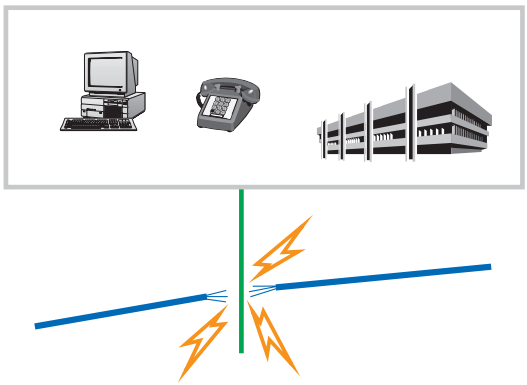
Interference through atmospheric discharge is very frequent. Occurring voltages are of the order of 100 kV with discharge currents up to 150 kA. Effects due to direct lightning stroke are principally to be expected on exposed signal lines (overhead lines).

Interference by induction (Power Induction)

Induction voltages occurring as interference on telecom lines are usually a result of circulating or equalizing currents in the earth or are produced by strong currents in adjacent power cables.



Direct contact with the power network (Power Contact)



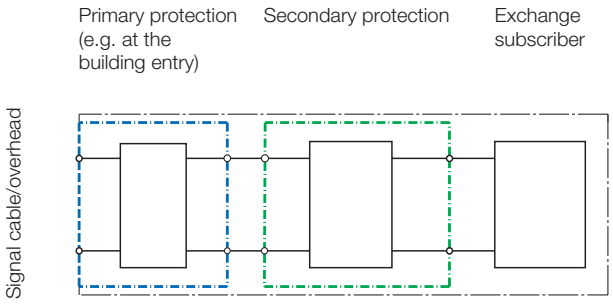
The highest intensity and usually long duration influence on a telephone line (a few seconds to several minutes) is by direct contact with the power network, e.g. short-circuit with an adjacent power cable.

Protection equipment

Regardless of which interference acts on the telecom equipment, it must be guaranteed at all times that no damage occurs, or only limited damage whose effects can be calculated.

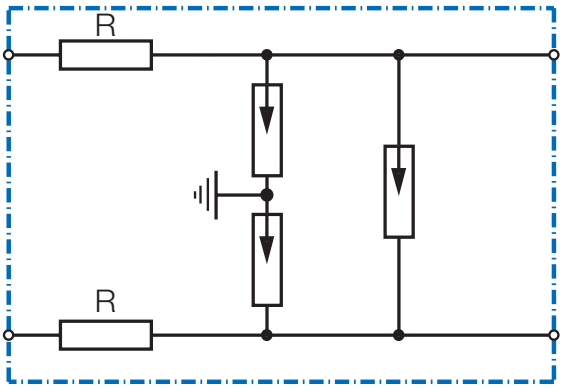
As shown below, this requirement can be satsified by the use of appropriate protection circuits.

Protection circuits in the telecom branch are usually designed on the two-stage principle. They comprise a primary and secondary protection.



Primary protection

Primary protection frequently comprises a combination of resistors and surge arrestors and is usually located at the «building entry» interface.
The task of the illustrated primary protection circuit is to sufficiently reduce the high-energy interference distortion so that they can be safely absorbed by the following secondary protection.



The secondary protection

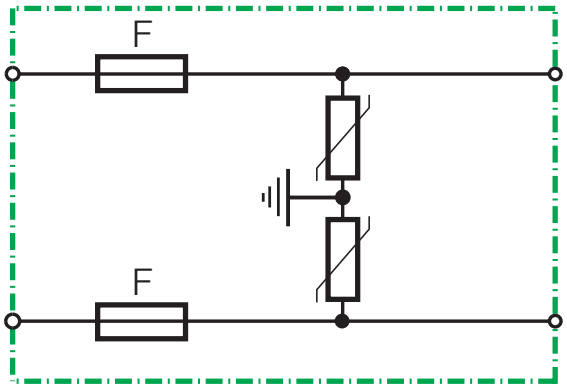
The secondary protection is normally located directly at the appliance entry of the telecom equipment and has two objectives.

1. It operates as a voltage limiter which ensures that interference up to a defined amplitude, not yet capable of activating the primary protection, is absorbed or reduced to a level harmless for the telecom equipment.

2. It effectively suppresses high energy level interferences, which can no longer be adequately absorbed by the primary protection (e.g. in case of direct contact between the signal lines and the power network), by galvanic decoupling of the circuit. This prevents the occurrence of serious damage, even fire, in the telecom equipment.

The following schematic diagram shows a frequently used and extremely reliable protection circuit for this purpose. The circuit, which in its simplest form comprises two fuse-links and two varistors, is characterised by an extremely attractive cost-benefit ratio. The varistors limit the interference voltage peaks to a level compatible for the telephone exchange, respectively subscriber circuit. Under these normal conditions, the fuse-links remain intact.

Under worst-case conditions, e.g. direct contact with the power network, where both the telecom equipment components and the varistors in the protection circuit would be seriously damaged or destroyed, the fuse-links interrupt the circuit, thus effectively and reliably protecting the telecom equipment.



Standards, introduction

Several standards have been established for the telecom application field, all of which are aimed at combining the interference influences, lightning surge, power induction, power contact, previously described under the title "Application Note" together with the associated safety aspects, and to derive suitable testing methods for the components in question.

Various kinds of loads have been defined and standardised as testing criteria. They can be simulated with the aid of an appropriate test circuit. This provides circuit designers with the facility for optimally adapting the stages of a protection circuit to one another.

The presently relevant standards are:

ITU-T K.20	International Telecommunication Union
UL 60950	UL Standard for Safety for Information Technology Equipment
IEC 60950	IEC Standard for Safety for Information Technology Equipment
Telcordia GR-1089	Telcordia Technologies
TIA-968-A	Telecommunications Industry Association

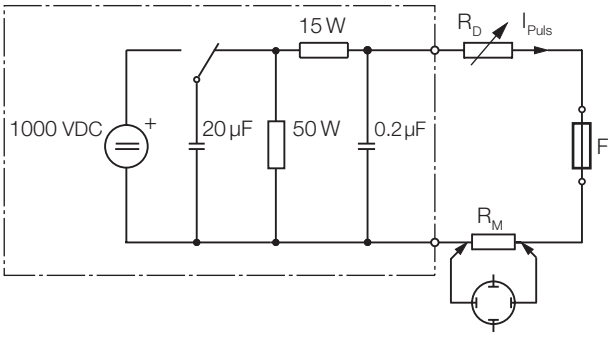
(The list is not exhaustive)

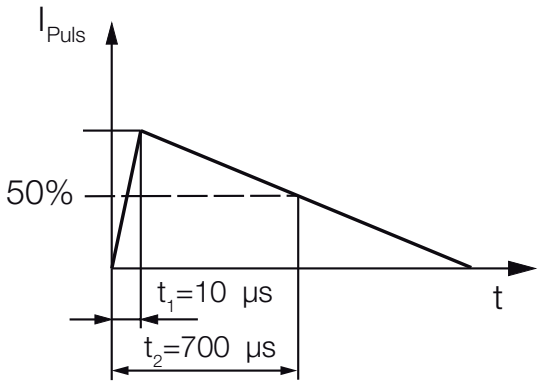
Tests:
SCHURTER fuselinks have been tested according to the following standards and testing criteria:

Standards

1. ITU-T K.20

Lightning surge: Test circuit
Test:
1. The pulse amplitude (generator no-load) is set to 1000 V and the pulse shape to 10 µs / 700 µs.



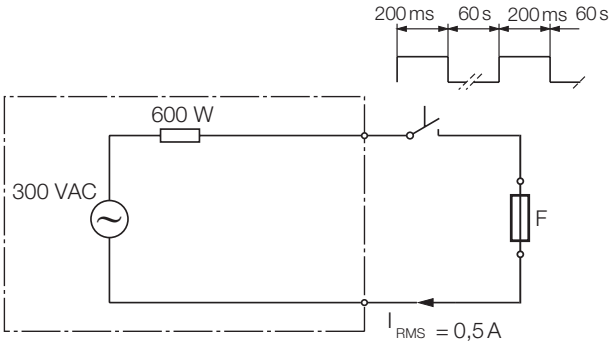


2. The pulse current I_{puls} is set to the value I_{puls} max. stated in the

3. Test mode : 10 single pulses, at an interval of 60 sec. alternating polarity.
Requirement: The fuse shall not interrupt the circuit.

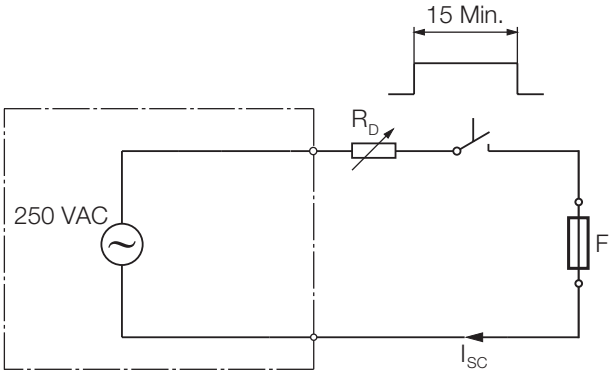
Note:
With a charge voltage of UC = 1000 V, the standardized pulse generator in Para. 1 supplies a maximum pulse current Ipuls = 67 A, providing the current limiting resistor is $R_D = 0\Omega$. The shunt R_M for the current monitoring has a very low resistance and has therfore no notable influence to the current amplitude. This means that the data sheet current 67 A does not represent the maximum permissible pulse amplitude of the fuselink in question, but the maximum current amplitude which can be supplied by the pulse generator. If a max. current higher than 67 A is to be expected in a circuit, the I^2t-values of the fuse-link can be calculated using the formula $I^2t = 0.72 \times I^2_{peak} \times t^2$, as a good approximation in order that the selected fuse-link can accept the expected current pulse without interrupting the circuit.

Power induction: Test circuit



Test: The fuse-link in the test circuit AC 300 V / 50 Hz is loaded 5 times with I_{eff} = 0.5 A for 200 ms at intervals of 60 sec.
Requirement: The fuse-link shall not interrupt the circuit.

Power contact: Test circuit

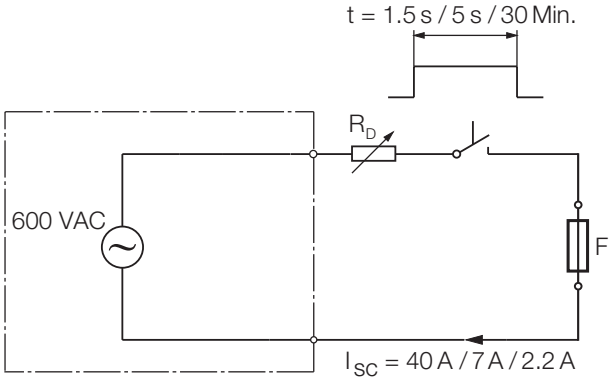


Test: The fuselink in the test circuit AC 250 V / 50 Hz is loaded with the current value I_{SC} stated in the data sheet. The supply voltage is maintained for 15 minutes.

Requirement: The fuse-link shall interrupt the circuit.

2. UL 60950/IEC 60950

Test circuit



Test 1
The fuse-link in the test current circuit is loaded with a test current of I_{SC} = 40 A .
The AC 600 V / 50 Hz source voltage is applied for a total of 1.5 sec.

Requirement: The fuse-link shall interrupt the circuit.

Test 2
The fuse-link in the test current circuit is loaded with a test current of I_{SC} = 7 A .
The AC 600 V / 50 Hz source voltage is applied for a total of 5 sec.

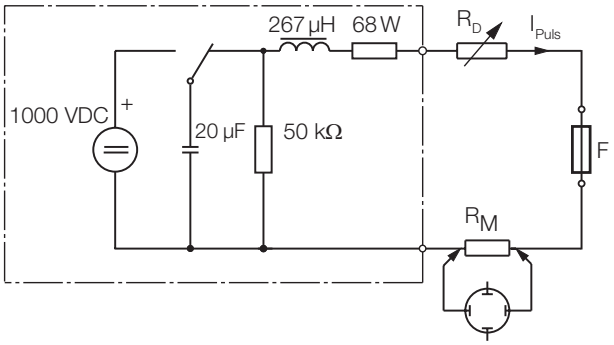
Requirement: The fuse-link shall interrupt the circuit.

Test 3
The fuse-link in the test current circuit is loaded with a test current of ISC = 2.2 A .
The AC 600 V / 50Hz source voltage is applied for at least 30 minutes, or until stable thermal conditions are achieved in the telecom unit or until the fuse-link interrupts the circuit. This test is performed together with the equipment in which the fuse-link is installed.

3. Telcordia GR-1089

3.1 Lightning surge

Test circuit



Test:
1. The pulse amplitude (generator no-load) is set to 1000 V and the pulse shape to 10 µs / 1000 µs.
2. The pulse current Ipuls is set to the value I_{puls} max. stated in the data sheet with limiting resistor RD.
3. Test mode: 50 single pulses, at an interval of 60 sec. alternating polarity.

Requirement: The fuse shall not interrupt the circuit.

Note: With a charge voltage of U_C = 1000 V, the standardized pulse generator in Para. 3.1 supplies a maximum pulse current I_{puls} = 14 A, providing the current limiting resistor is R_D = 0Ω . The shunt R_M for the current monitoring has a very low resistance and has no notable influence to the current amplitude. This means that the data sheet current 14 A does not represent the maximum permissible pulse amplitude of the fuse-link in question, but the maximum current amplitude which can be supplied by the pulse generator. If a max. current higher than 14 A is to be expected in a circuit, the I^2t- values of the fuse-link can be calculated using the formula $I^2t = 0.72 \times I^2_{peak} \times t^2$, as a good approximation in order that the selected fuse-link can accept the expected current pulse without interrupting the circuit.

3.2 Power cross

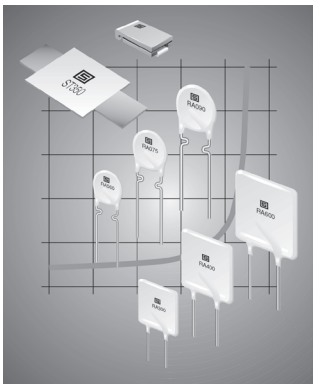
Test circuit
see UL 60950/IEC 60950
Test 2, Second Level (only TF 600)
The fuse-link in the test current circuit is loaded with a test current of ISC = 60 A .
The AC 600 V / 50 Hz source voltage is applied for a total of 5 sec.

Requirement: The fuse-link shall interrupt the circuit.

PTC CIRCUIT PROTECTION

Introduciton PTC-circuit protection

When it comes to Polymeric Positive Temperature Coefficient (PPTC) circuit protection, you now have a choice. If you need a reliable source, look to SCHURTER resettable overcurrent protectors. SCHURTER'S PTC products are made from a conductive plastic formed into thin sheets, with electrodes attached to either side. The conductive plastic is manufactured from a nonconductive crystalline polymer and a highly conductive carbon black. The electrodes ensure even distribution of power through the device, and provide a surface for leads to be attached or for custom mounting.
The phenomenon that allows conductive plastic materials to be used for resettable overcurrent protection devices is that they exhibit a very large non-linear Positive Temperature Coefficient (PTC) effect when heated. PTC is a characteristic that many materials exhibit whereby resistance increases with temperature. What makes the SCHURTER PTC conductive plastic material unique is the magnitude of its resistance increase. At a specific transition temperature, the increase in resistance is so great that it is typically expressed on a log scale.



Mode of operation

How SCHURTER resettable overcurrent protectors work

The conductive carbon black filler material in the PTC fuse device is dispersed in a polymer that has a crystalline structure. The crystalline structure densely packs the carbon particles into its crystalline boundary so they are close enough together to allow current to flow through the polymer insulator via these carbon "chains".

When the conductive plastic material is at normal room temperature, there are numerous carbon chains forming conductive paths through the material.

Under fault conditions, excessive current flows through the PTC fuse device. I^2R heating causes the conductive plastic material's temperature to rise. As this self heating continues, the material's temperature continues to rise until it exceeds its phase transformation temperature.

As the material passes through this phase transformation temperature, the densely packed crystalline polymer matrix changes to an amorphous structure. This phase change is accompanied by a small expansion. As the conductive particles move apart from each other, most of them no longer conduct current and the resistance of the device increases sharply.

The material will stay "hot", remaining in this high resistance state as long as the power is applied. The device will remain latched, providing continuous protection, until the fault is cleared and the power is removed. Reversing the phase transformation allows the carbon chains to re-form as the polymer re-crystallizes. The resistance quickly returns to its original value.

Product selection

To select the correct SCHURTER PTC circuit protection device, complete the information listed below for the application and then refer to the resettable overcurrent protector data sheets.

1. Determine the normal operating current:
   _____ amps

2. Determine the maximum circuit voltage
   (V_{max}): _____ volts

3. Determine the fault current (I_{max}):
   _____ amps

4. Determine the operating temperature range:
   Minimum temperature: _____ °C
   Maximum temperature: _____ °C

5. Select a product family so that the maximum rating for V_{max} and I_{max} is higher than the maximum circuit voltage and fault current in the application.

6. Using the I_{hold} vs. temperature table on the product family data sheet, select the SCHURTER PTC device at the maximum operating temperature with an I_{hold} greater than or equal to the normal operating current.

7. Verify that the selected device will trip under fault conditions by checking in the I_{trip} table that the fault current is greater than I_{trip} for the selected device, at the lowest operating temperature.

8. Order samples and test in application.

Applications

The benefits of SCHURTER resettable overcurrent protectors are being recognized by more and more design engineers and new applications are being discovered every day.
The use of polymeric fuses has been widely accepted in the following applications and industries:

- **Personal computers**
- **Laptop computers**
- **Personal digital assistants**
- **Transformers**
- **Small and medium electric motor**
- **Audio equipment and speakers**
- **Test and measurement equipment**
- **Security and fire alarm systems**
- **Medical electronic**
- **Personal care products**
- **Point-of-sale equipment**
- **Industrial controls**
- **Automotive electronics and harness protection**
- **Marine electronic**
- **Battery-operated toys**
- **Telecom electronics**

FUSEHOLDERS

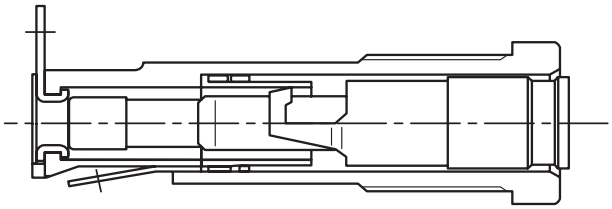
Protection aggainst contact

Protection against electric shock (against direct contact with live parts), for fuseholders
The assessment of the protection against electric shock assumes that the fuseholder is properly assembled, installed and operated as in normal use, e.g. on the front panel of the equipment.

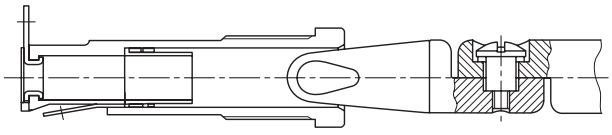
IEC 60127-6 and EN 60127-6 divides into three categories:

Category	Features
PC1	**Fuseholders without integral protection against electric shock.** They are only suitable for applications where corresponding additional means are provided to protect against electric shock.
PC2	**Fuseholders with integral protection against electric shock** live part is not accessible: - when the fuseholder is closed - after the fuse carrier (incl. fuse-link) has been removed - either during insertion or removal of the fuse carrier (incl. fuse-link) Compliance is checked by using the standard test finger specified in IEC 60529.
PC3	**Fuseholder with enhanced integral protection against electric shock** The requirements for this category are the same as those for category PC2, with the exception that the testing is carried out with a rigid test wire of 1 mm diameter accor ding to IEC 60529, table VI, instead of the standard test finger.

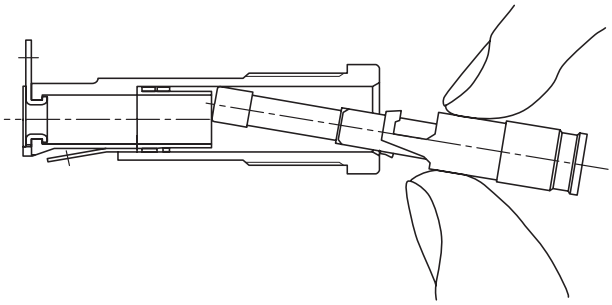
a) Closed fuseholder



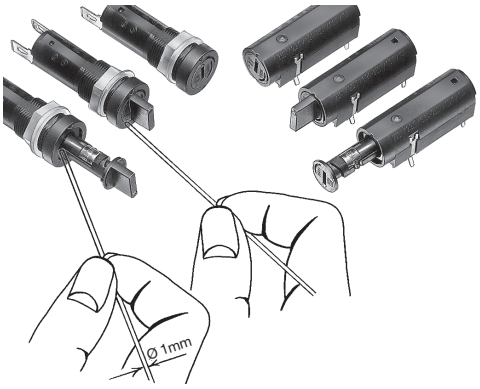
b) When the fuse carrier is removed, no live parts can be touched.



c) During insertion or removal of a fuse-link no live parts can be touched neither through the fuse-link nor the fuse carrier.



Remarks on PC 3



Thermal requirements of the fuseholder

Influencing factors

The design engineer of electrical equipment is responsible for its safety and functioning to humans, animals and real values. Above all, it is his task to make sure that the state of the art as well as the valid national and international standards and regulations be observed.

In view of the safety of electrical equipment the selection of the most suitable fuseholder is of great importance. Among other parameters, one has to make sure that the maximum admissible power acceptances and temperatures defined by the manufacturer are followed. Differing definitions and requirements in the most important standards for fuse-links and fuseholders are time and again origin for the incorrect selection of fuseholders.

To equate the rated current of a fuse-link with the rated current of the fuseholder, may, especially at higher currents, cause high, not admissible temperatures, when the influence of the power dissipation in the contacts of the fuseholder was not taken into consideration.

For a correct selection the follwing influence factors depending on the application and mounting method, have to be taken into consideration.
It is recommended testing the fuseholder with the choosen fuse-link in the worst case operating condition.

1. Rated power dissipation of the suitable fuse-link.
2. Admissible power acceptance, operating current and temperatures of the suitable fuseholder.
3. Differing ambient air temperature outside and inside of the equipment.
4. Electrical load alternation
5. Long time (> 500 h) operation with load > 0.7 I_n.
6. Heat dissipation/cooling and ventilation. Heat influence of adjacent components.
7. Length and cross section of the connecting wire.

Rated current of a fuseholder

The value of current assigned by the manufacturer of the fuseholder and to which the rated power acceptance is referred.

Rated power dissipation of the fuse-link

(power dissipation at rated current)

Rated power acceptance and admissible temperatures of a fuseholder.

The rated power acceptance of a fuseholder is determined by a standardised testing procedure according to IEC 60127-6. It is intended to be the power dissipation caused by the inserted dummy fuse-link at the rated current of the fuseholder and at an ambient air temperature of T_{A1}= T_{A2} = 23 °C (over a long period). During this test the following temperatures must not be exceeded on the surface of the fuseholder:

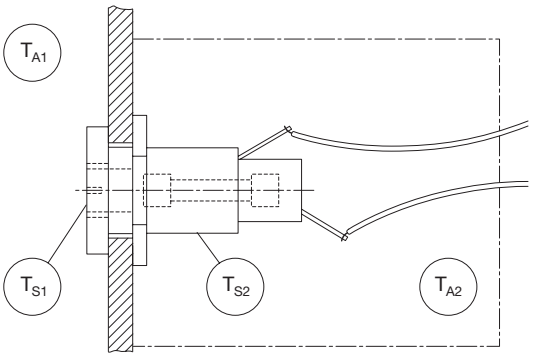
Fuseholder surface area	Maximum allowable temperature measuring points (see figure 1)	°C
1. Accessible parts [1]	T_{S1}	85
2. Inaccessible parts [1] Insulating parts	T_{S2}	[2]

Notes:

[1] When the fuse-holder is properly assembled, installed and operated as in normal use, e.g. on the front panel of equipment.

[2] The maximum allowable temperature of the used insulating materials corresponds to the Relative Temperature Index (RTI) according to IEC 60216-1 or UL 746 B.

Illustration of temperatures experienced in practice

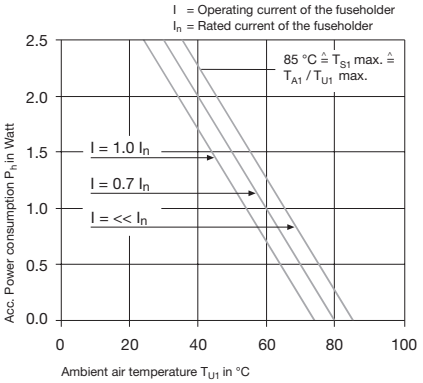


T_{A1} = ambient air temperature, surrounding the equipment
T_{A2} = ambient air temperature in the equipment
T_{S1} = temperature of accessible parts on fuseholder surface
T_{S2} = temperature of inaccessible parts on fuseholder surface

Correlation between operating current I, ambient air temperature T_{A1} and the power acceptance P_h of the fuseholder.

This correlation is demonstrated by derating curves.

Example of a derating curve



I = operating current of the fuseholder
I_n = rated current of the fuseholder

The derating curves demonstrate the admissible power acceptance of a fuseholder depending on the ambient air temperature T_{A1} for the following fuseholder operating currents: I << I_n, I = 0.7 · I_n and I = 1.0 · I_n. This power acceptance corresponds to the max. admissible power dissipation of a fuse-link.
The corresponding values for other operating currents can be interpolated between the existing curves or calculated as follows:

$$\mathbf{P_h = P_o - P_c = P_o - (R_c \cdot I^2)}$$

P_h= admissible power acceptance in watt of the fuseholder, depending on T_{A1}.
P_o= admissible power acceptance in watt of a fuseholder at I << I_n, depending on T_{A1}. The values can be taken from the derating curve I << I_n of the corresponding fuseholder.
P_c= power dissipation in watt in the fuseholder contacts at the operating current in ampere.
I = operating current in ampere of the fuseholder.
R_c= contact resistance in ohm between the fuseholder terminals according to SCHURTER's catalogue.

Selection

Selection of a suitable fuseholder with respect to the power acceptance at the corresponding ambient air temperature.

Summary
The adherence to the limits, indicated by SCHURTER, in particular the power acceptance limits at the corresponding ambient air temperatures and mounting conditions of the fuseholder, is important for the safety of the product. It is therefore necessary to observe the following two steps:

Step 1
Selection of the fuseholder based on the power acceptance P_h at operating current I and maximum ambient air temperature T_{A1}.
$P_f \leq$ $P_h = P_o - P_c = P_o - (R_c \cdot I^2)$
P_f = rated power dissipation in watt of the fuse-link, calculated from (I_n . U), whereas:
I_n = rated current in ampere of the fuse-link
ΔU= voltage drop in volt at I_n; values according to SCHURTER's catalogue.
P_h, P_o, P_c, R_c = see pos. 2.5

Step 2
The reduction of the power acceptance of the fuseholder (from step 1) based on the different conditions at the mounting place etc. have to be determined by the design engineer responsible.

Examples:
- ambient air temperature is considerably higher inside of an equipment than outside ($T_{A2} > T_{A1}$)
- cross-section of the conductor, unfavourable heat dissipation
- heat influence of adjacent components

Therefore, temperature measurements on the appliance under normal and faulty conditions are absolutely necessary.

Example

What's given?

- Fuse-link FSF 0034.1523, rated current I_n = 5 A. Voltage drop ΔU at I_n = 80 mV, typ.

Rated power dissipation $P_f = (In \cdot \Delta) = (5\ A \cdot 0.08\ V) = 0.4\ W$.
- Fuseholder FEF 0031.1081, rated current I_n = 10 A
  Rated power acceptance at T_{A1} 23 °C = 3,2 W.
- Ambient air temperature = 50 °C.
  Admissible power acceptance P_h at an ambient air temperature T_{A1} 50 °C according to the derating curve:

P_h at I << I_n = 2.5W
I = 0.7 · I_n = 7 A = 2.2W
I = 1.0 · I_n = 10 A = 2 W

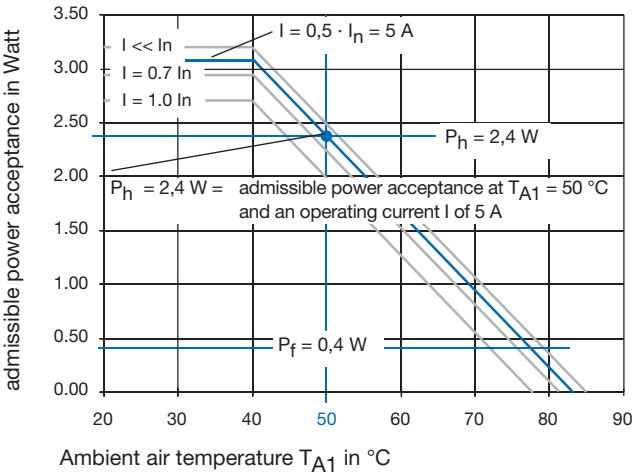
- Contact resistance R_c = 5 mΩ

What is the admissible power acceptance P_h of the fuseholder?

Solutions

The result of the interpolation for the rated current I = 5 A
is a P_h of approx. 2,4 W.
The result of the calculation is
$P_h = P_o\ (R_c \cdot I2) = 2.5\ (0.005 \cdot 52) = 2.37$ W P≈2.4 W.

Derating curves of the fuseholder, type FEF, rated current I_n = 10 A



Verification of the thermal requirements

Step 1
The following condition must be fulfilled:
P_f P_h this means: the rated power dissipation Pf of the fuse-link must be less/equal than the admissible power acceptance Ph of the fuseholder.

P_f = 0.4 W; P_h = 2.4 W at T_{A1} = 50 °C

Step 2
To consider the different conditions at the mounting place

Conclusion (without consideration of step 2)

- The value P_f is less than P_h. The condition according to formula is fulfilled. It has been chosen a suitable fuseholder.
- If the value P_f were greater than P_h the condition wouldn't be fulfilled. In that case, do select another fuseholder with a higher power acceptance or change the thermal conditions at the fuseholder mounting place.

Standards for fuseholders

IEC 60127-6	Fuseholders for miniature fuse-links
NF C93-436	Fuseholders for professional purposes
UL 512	Fuseholders
CSA C22.2 no. 39	Fuseholder assemblies

IEC: International Electrotechnical Commission
UL: Underwriters Laboratories Inc. USA
CSA: Canadian Standards Association
NF: French Standard

Explanation to the main fuseholder standards

As mentioned in section 2, the most relevant standards define rated current and rated power acceptance differently. This lead in the past often to confusion or even to a wrong fuseholder design-in.

For example the standard UL 512 does not define a maximum power acceptance value, but sets a certain value of temperature rise for the fuseholder. For this reason the marked amperage values on the fuseholder, defined by UL and CSA, are not suggested to be used except in special cases.

In order to eliminate such confusion, SCHURTER new decided to define the rated current and rated power acceptance values according to IEC 60127-6 and EN 60127-6.
The most important definitions are to be found in section 2.

Conclusion
- The high UL and CSA current ratings are replaced by more realistic rated currents defined by SCHURTER.
- Focused on the new fuseholder standard IEC 60127-6 and EN 60127-6, the power acceptance of several fuseholders had to be reduced.
- The design-in procedure and in particular to choose the correct fuseholder in terms of thermal requirements (refer to section 2-4) is now made much easier.

Your advantages:
- **More security for your equipment**
- **Faster and much easier selection of the correct fuseholder**

VARISTORS

Introduction

Varistors (Variable Resistors) are voltage-dependent, nonlinear resistors with a symmetrical current-voltage characteristic curve (Figure 1) where the impedance decreases when the voltage decreases. Varistors are often also referred to as MOV (Metal Oxide Varistors), ZnO (Zinc Oxide Varistors), VDR (Voltage Dependent Resistors) and TVSS (Transient Voltage Surge Suppressors).

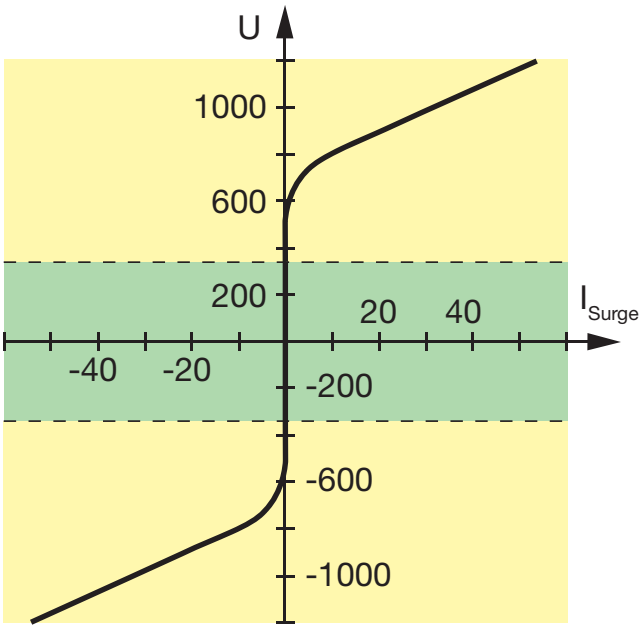


Figure 1: Voltage/current curve, green: Normal operation, yellow: Conductive in the event of high voltages

Varistors come into operation when a power surge occurs, which may be caused by a lightning strike or by inductive load switching. Parallel-connected to the protective circuit, they keep the surge from exceeding a predefined level and thus prevent the downstream-connected components from being exposed to large voltage spikes (figure 2).

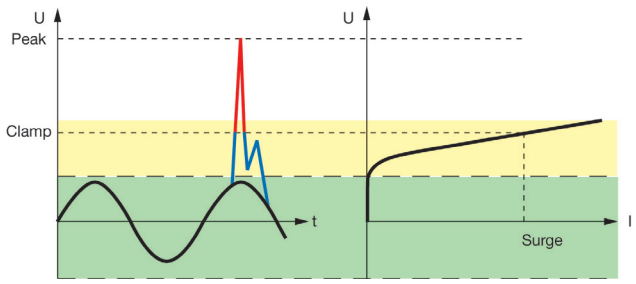


Figure 2: Voltage peak, red: Absorbed by the varistor, blue: Absorbed by downstream-connected components

A varistor's current flow during normal operation (high-impedance state) and its current flow when a malfunction caused by voltage transient occurs (low-impedance state) are shown in figures 3 and 4.

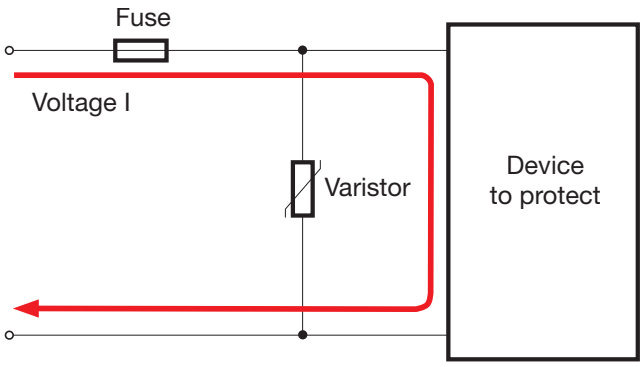


Figure 3: Current flow during normal operation (high impedance)

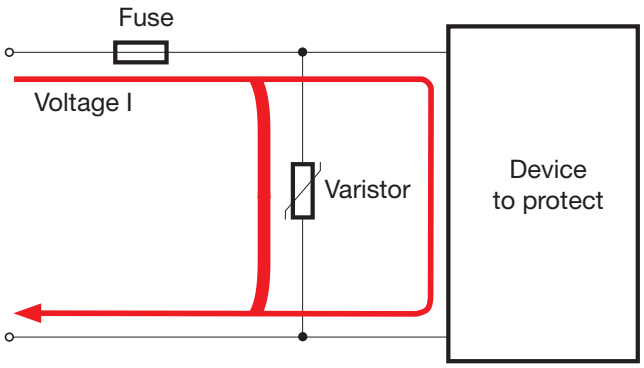


Figure 4: Current flow when a malfunction caused by voltage transient occurs (low impedance)

Working principle

Varistors are made from a polycrystalline ceramic material, mainly zinc oxide and a number of metal oxides, sintered at a temperature of approx. 1250 °C. Their impedance changes depending on the voltage applied. The dependency is not linear, but symmetrical, and the impedance, within a small voltage range, changes abruptly from a high-impedance (MΩ) to a low-impedance (a few Ω) state

Technical properties

High nonlinearity	Very low leakage current
Short response time	A highly important property with regard to protecting semiconductor circuits
Broad coverage	Varistors are available for a wide range of voltage and energy absorption applications.

Parameters

Operating voltage:

The catalogue data sheet's table of variants specifies a maximal AC and DC rated voltage which should not be exceeded when in operation; hence the voltage supply's tolerance range needs also to be taken into account when selecting a component.

Max. clamping voltage when transients/surges occurs:

This parameter defines the maximal voltage when a spike occurs. The voltage/current curves (figure 5) show the maximal clamp voltage on a standard surge (8/20 µs) according to IEC 60060. The downstream-connected components must be capable of withstanding this voltage level with a tolerance of between 10 and 20%.

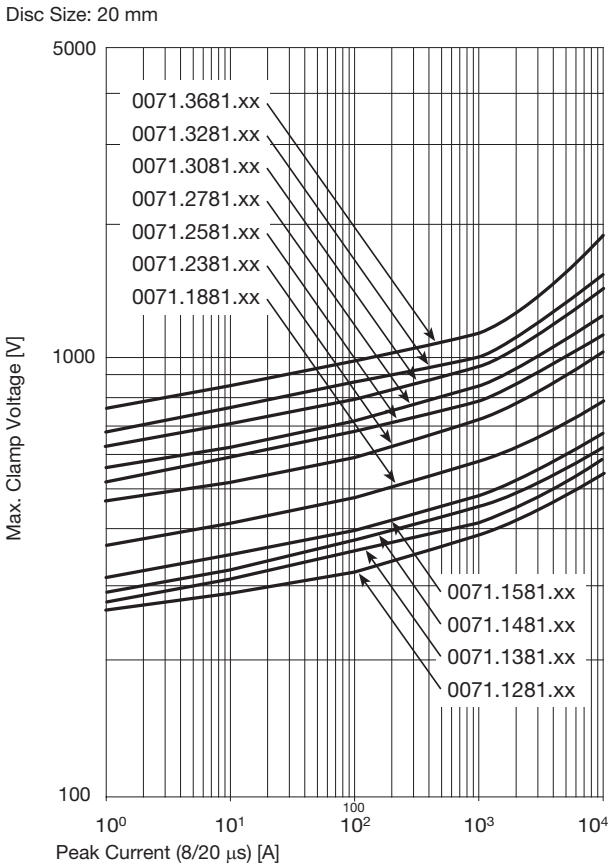


Figure 5: Voltage/current curves for maximal clamping voltage, shown on the example of the AVTP, 20 mm disc size

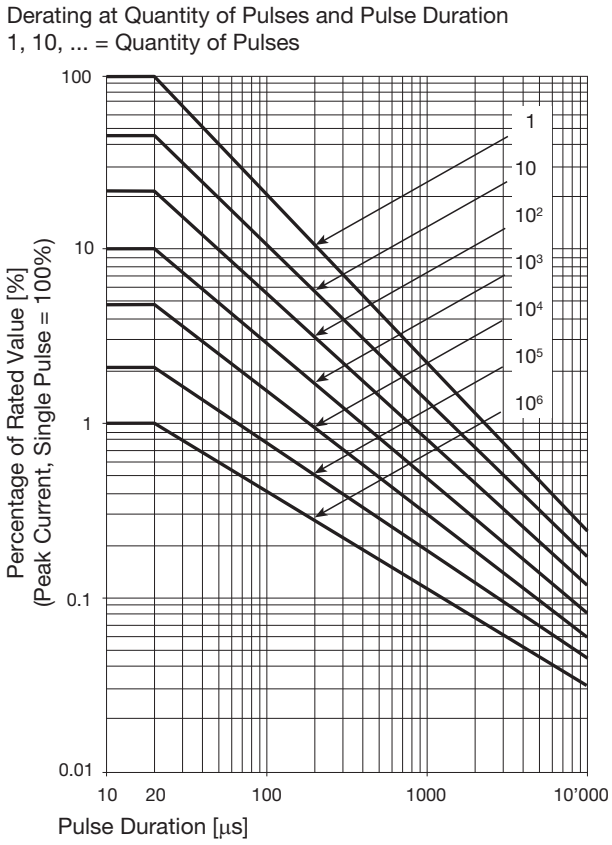


Figure 6: Derating curve for quantity of surges and pulse duration

Permissible peak current:

The number of peak currents (surges, transients) that a varistor can absorb over its lifespan depends on the amplitude and the surge duration. The catalogue data sheet's table of variants specifies how many one-time and two-time non-repeated standard surges (8/20 µs) according to IEC 60060 a varistor can withstand. Longer and/or repeated surges require an appropriate derating, as shown in figure 6.

Energy absorption capability:

Energy absorption correlates to the permissible peak current. This parameter is stated in the catalogue data sheet using the standard surge waveform (10/1000 µs) according to IEC 60060. This value supports the selection process, when e.g. for a protection of a choke a varistor needs to be choosen. The energy of a choke can be directly calculated by the inductance and the current.

Minimal leackage current:

Figure 7 represents the varistor's behavior during normal operation (high-impedance state), showing the minimal leakage current at a given voltage.

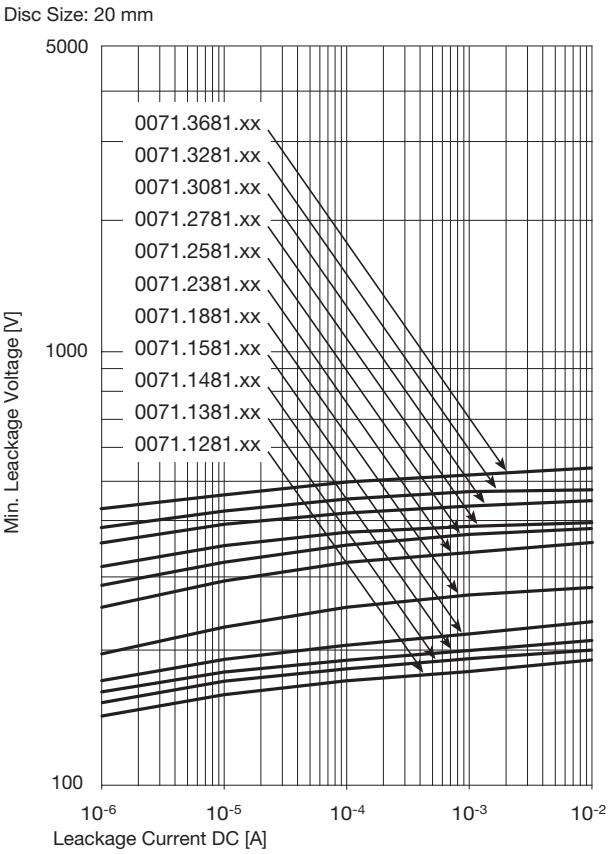


Figure 7: Voltage/current curves for leakage voltage, shown on the example of the AVTP, 20 mm disc size

Varistor voltage at the 1 mA point:

The catalogue data sheet states minimal and maximal voltage values for when a 1 mA current is flowing through the varistor. This parameter, a standard by now, permits the comparison of varistors. If it deviates by more than 10% from the original value, the varistor is deemed defective. The term used in such cases is degradation.

Average power dissipation:

This parameter is negligible under normal operating conditions. Power dissipation becomes meaningful where there is not enough time for the varistor to cool down between two surges. When temperature rises, the varistor voltage at the 1 mA point decreases and the power dissipation is getting more. When this is the case, the varistor becomes defective.

Operation at high temperatures:

If a varistor operates at more than 85 °C, voltage, current and energy must be derated as shown in figure 8.

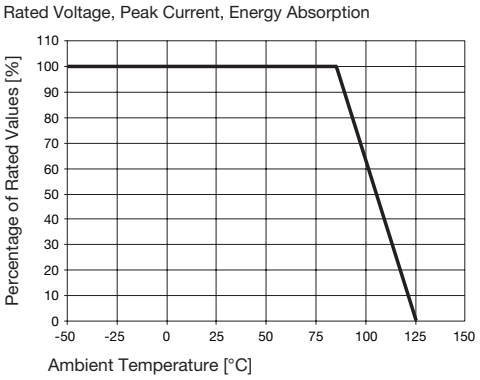


Figure 8: Temperature derating curve

Response time:

Radial leaded varistors typically feature response times of 50 ns or less.

Varistor voltage tolerance range:

All SCHURTER varistors have a tolerance range of 10%.

Intrinsic capacitance:

The catalogue data sheet shows information on the capacitance at 1 kHz, which increases along with disc size, while it decreases in proportion to the rise in nominal voltage. This show, that varistors are not suitable for protection in high frequency circuits. Varistors work in a very efficient way at line frequency of 50/60 Hz.

Approvals

The following component standards apply to zinc oxide varistors:

IEC 61051	Varistors for Use in Electronic Equipment	VDE
UL 1449	Transient Voltage Surge Suppressors	
UL 1414	Across-the-Line Components	
CSA C22.2	Accessories and Parts for Electronic Equipment	

Typical application circuit diagrams

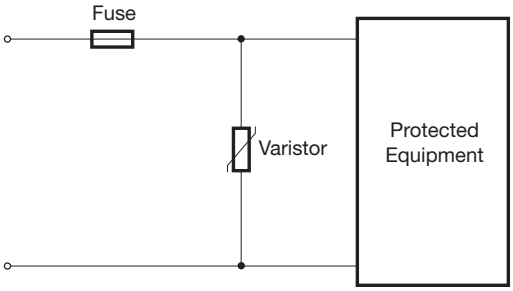


Figure 9: AC or DC circuit

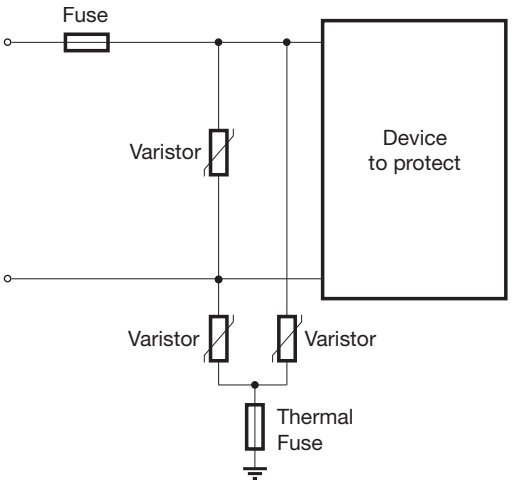


Figure 10: AC or DC circuit with thermal fuse

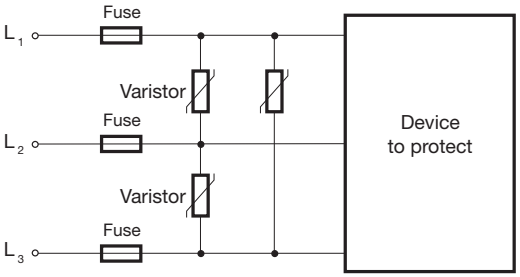


Figure 11: AC 3-phase circuit

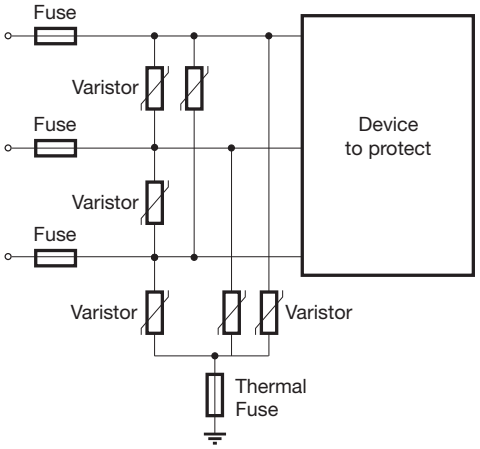


Figure 12: AC 3-phase circuit with thermal fuse

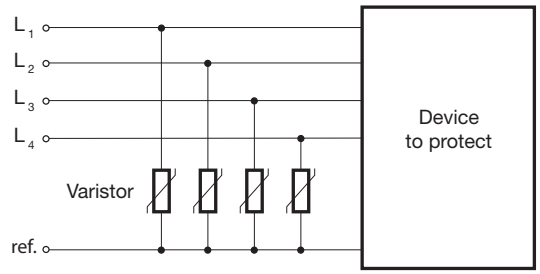


Figure 13: Data lines

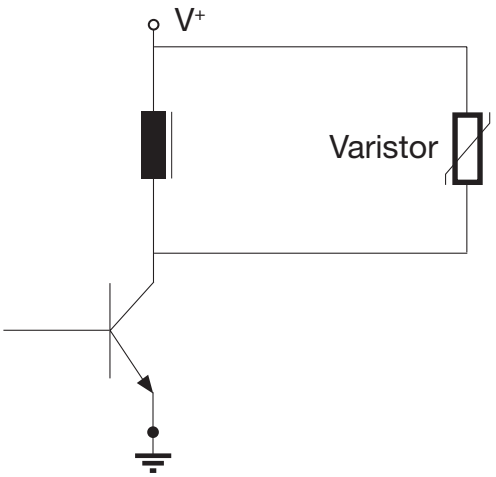


Figure 14: Switch-off protection

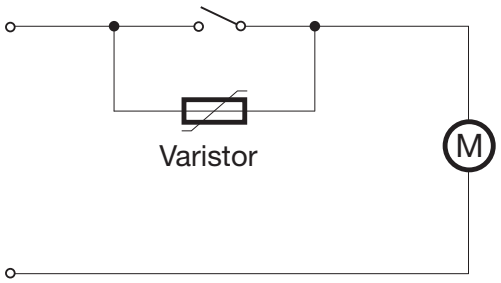


Figure 15: Switch protection (arc suppression)

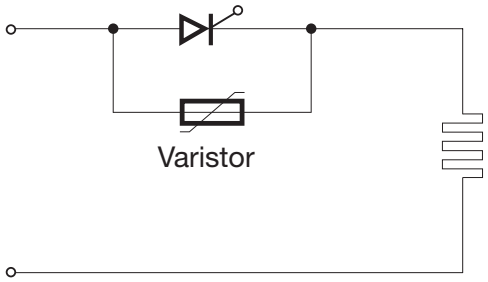


Figure 16: Semiconductor protection

EMC, surge test, IEC 61000-4-5

Varistores are typically used to enable appliance to pass the surge test according to IEC 61000-4-5. To give an example: An appliance must withstand ten 2 kV surges at 2 Ω line impedance and meet the required criterion B, i.e. the appliance may be temporarily impaired in terms of its purpose and/or properties as a result of the test, but it must reset itself autonomously. No permanent or temporary shutoff is permitted. Varistors make it possible, for instance, to reduce the 2 kV surges to a lower level (figure 17), which in turn allows manufacturers to include less expensive components offering lower surge voltage resistance in their circuits.

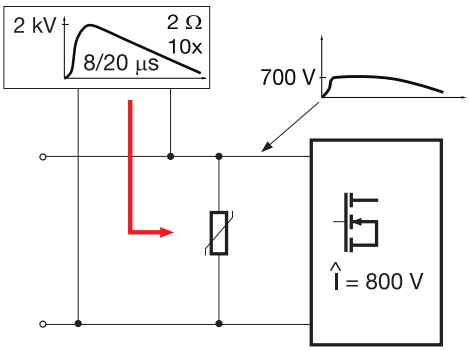


Figure 17: Test circuit for surge test according to IEC 61000-4-5.

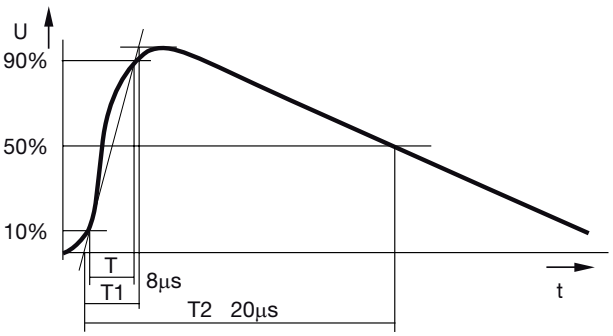


Figure 18: Standard waveform (8/20 µs) according to IEC 60060

Selection procedure

Step 1: Establishing the varistor's voltage
The lowest varistor voltage depends on the highest AC or DC voltage applied. Usually, the tolerance range is assumed to be between +/- 10 and 20%, by which the voltage supply may fluctuate. The following varistor voltages are commonly used:

- 24 VDC secondary voltage
  Recommended varistor voltage:
  26 VDC (AVTS, 0070.20xx.xx)
  31 VDC (AVTS, 0070.25xx.xx)
  38 VDC (AVTS, 0070.30xx.xx)

- 120 VAC line voltage (USA
  Recommended varistor voltage:
  130 VAC (AVTP, 0071.13xx.xx)
  140 VAC (AVTP, 0071.14xx.xx)
  150 VAC (AVTP, 0071.15xx.xx)

- 230 VAC line voltage (EU)
  Recommended varistor voltage:
  270 VAC (AVTP, 0071.27xx.xx)
  300 VAC (AVTP, 0071.30xx.xx)

- 400 VAC 3-phase line voltage (EU)
  Recommended varistor voltage:
  460 VAC (AVTT, 0072.46xx.xx)

- 480 VAC 3-phase line voltage (USA)
  Recommended varistor voltage:
  550 VAC (AVTT, 0072.55xx.xx)

Another approach leading to the same result is to check whether the minimal voltage at the 1 mA point exceeds the peak value of the applied voltage including tolerance, such as is the case in Europe, where the line voltage is 230 V * 1.1 * √2 = 358 VAC. The 270 VAC (AVTP, 0071.27xx.xx) version, according to the catalogue data sheet, has a minimal voltage at the 1 mA point of 382 VAC and therefore meets the requirement.

If a varistor operates at temperatures of up to 85 °C, a voltage temperature derating of -0.05% / °C is to be taken into account in addition to the above. The catalogue data sheet parameters apply to an operating temperature of 25 °C. Ambient temperatures above 85 C and up to 125 °C necessitate the use of the temperature derating curve (figure 8).

Once the varistor voltage has been established, the maximal clamping voltage, which depends on the expected peak current, can be determined using the voltage/current curve (figure 6) as a reference. The circuit to be protected will require components capable of withstanding this level of interference voltage. The relevant data are usually available from the manufacturer. And again, a safety margin of between 10 and 20% needs to be maintained here as well.

Step 2: Establishing the maximum permissible peak current
Step 3: Establishing energy absorption
Step 4: Establishing power dissipation
Step 5: Testing the protective performance in practice

All important information regarding steps 2 to 4 can be found in the section on "Parameters".

IEC APPLIANCE COUPLERS

IEC connectors

Appliance couplers approved according IEC 60320 are designed as two pole appliance couplers for alternate current with or without protective conductor with a rated voltage of 250 V and a rated current of 16A for technical application that are desired for interconnection to flexible cords of electrical equipment for power supply of 50Hz or 60Hz.

Appliance couplers according mentioned standard are suitable for operation under environmental temperatures of normally 25°C and do not have to exceed 35°C.

Appliance couplers are designed for use without especial moisture protection. So the design of the appliance needs to assure ingress protection if it is designed to be used under these circumstances.

Following figures need to be respected in order to meet standard IEC 60320:
- Rated voltage: 250 VAC
- Rated current according type: 0.2A, 2.5A, 6A, 10A, 16A

The appliance couplers are separated according the maximum operation temperature at the base of the connector pin:
- Pin temperature up to 70°C: Appliance couplers for cold condition
- Pin temperature up to 120°C: Appliance couplers for warm condition
- Pin temperature up to 155°C: Appliance couplers for hot condition

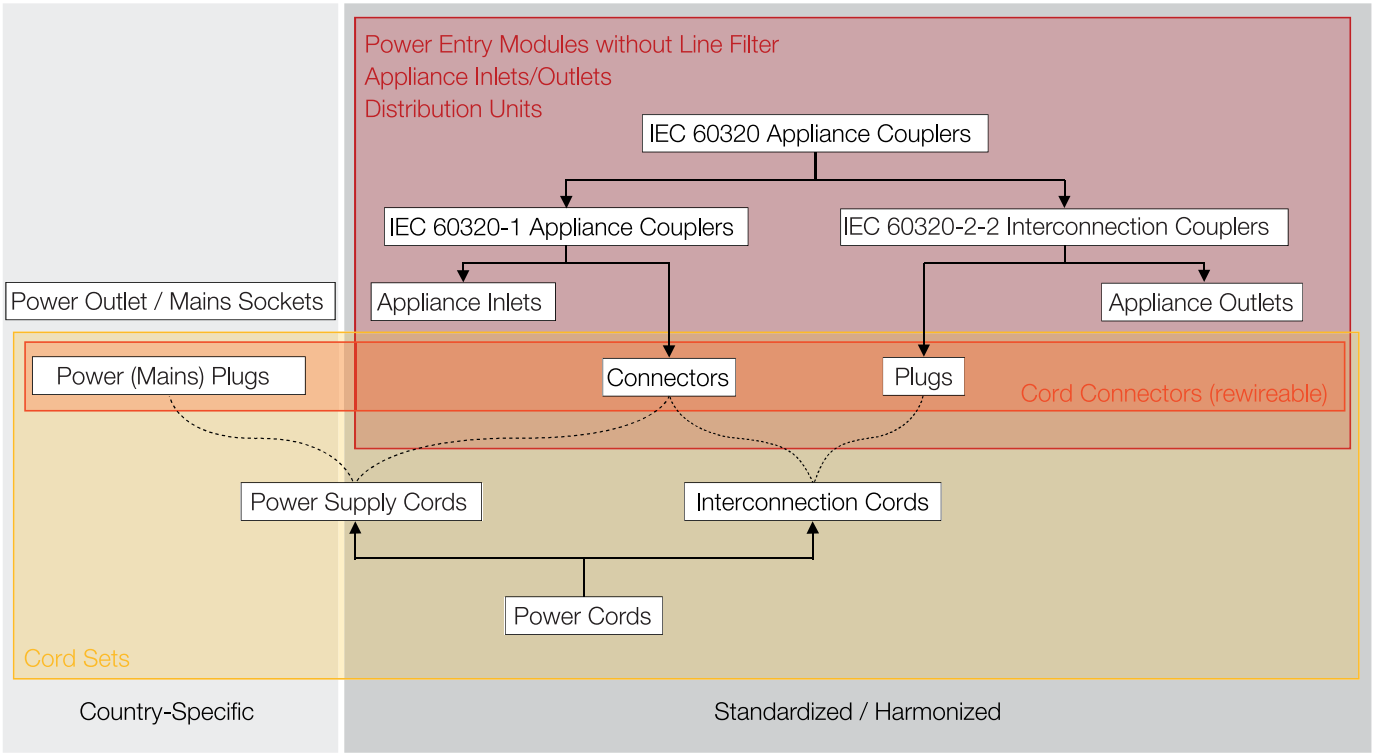
Their outlines are coded in a way, that appliance couplers for hot conditions may also be used under cold conditions, and appliance couplers for very hot conditions may also be used under cold or hot conditions.

The appliance couplers are separated according the categories of equipment:
- Appliance couplers for appliances according protection class I
- Appliance couplers for appliances according protection class II
- The protection classes are described in standard IEC 61140

Appliance couplers will be additionally separated according the connection method to a flexible cord:
- Rewireable connectors
- Non-rewireable connectors

IEC appliance couplers

Appliance couplers, interconnection couplers and power plugs are developed and manufactured in accordance with national and international standards. These standards are issued in order to create a general consensus on the basic dimensions and safety goals of the appliance couplers. Following this approach, safety has been achieved, in the overwhelming majority of cases, when combining components. While the design of power plug systems is governed by the relevant national standards, appliance couplers follow the IEC 60320 standard, including its subsections.
The power supply of various electrical appliances follows country-specific requirements in terms of voltage and current. It is therefore practical for international appliance manufacturers to use IEC appliance couplers and interconnection couplers for their respective appliances power supply. SCHURTER, i.e. its connectors http://www.schurter.ch/products/connectors_filters_overview.asp?Mating_Connectors strategic division, provides a wide range of products for such purposes. In order to ensure full compliance with the given standards, SCHURTER products are tested by independent testing organizations (see approvals).



General product information

Application area

Two-pole AC-only appliance couplers, with or without earthing contact, rated for voltages up to 250VAC and nominal currents of up to 16A, used for connecting a flexible power supply cord to electrical appliances or other electrical installations at 50 or 60Hz (cf. IEC 60320-1 http://www.schurter.ch/products/iec_connector_overview.asp?active=4#7.3).

Two-pole AC-only interconnection couplers, with or without earthing contact, rated for voltages up to 250VAC and nominal currents of up to 16A, used for interconnecting the power supply and appliances or installations at 50Hz or 60Hz (cf. IEC 60320-2-2 http://www.schurter.ch/products/iec_connector_overview.asp?active=4#7.4).

Requirements / categories

Parameter	Example	Distinguishing Features
Protection Class	C14  Protection Class I C18  Protection Class II	with / without earth conductor contact
Rated Current	C8 A  2.5A C9  6A C14  10A C20  16A	varying plug outlines
Pin Temperature	C14  70°C for cold applications C16  120°C for hot applications C16 A  155°C for very hot applications	plug outlines feature additional notches

Pin temperature

The requirements placed on connectors are contingent on the maximum temperature of the corresponding appliance inlets, i.e.:

Plug temperature	corresponds to	Comment
70°C	Appliance couplers for cold conditions	(colloquially referred to as a "cold condition" appliance couplers)
120°C	Appliance couplers for hot conditions	(colloquially referred to as a "worm condition" appliance couplers acc. translation of a German terminology)
155°C	Appliance couplers for very hot conditions	(colloquially referred to as a "hot condition" appliance couplers)

"Cold condition" appliance inlets may not be used in appliances with exterior parts whose temperature increase can exceed 75K and which, when used properly, can come into contact with the movable power cord.

Nominal currents

According to IEC 60320, the following nominal currents apply: 2.5A / 6A / 10A /16A. The nominal current ratings of SCHURTER's components are based on the relevant approval standards which may differ from one country to another (see Approval Bodies http://www.schurter.ch/support/approval_industry_links.asp). The table below shows the differences between the IEC's nominal current ratings and those approved by VDE, UL and CSA (SCHURTER reference components).

IEC 60320, to prevent improper use, provides for contour coding for the nominal currents listed above.

IEC	VDE	UL	CSA
2.5 A	2.5 A max.	2.5 A	6 A max.
6 A	6 A max.	n/a	n/a
10 A	10 A max.	15 A max.	16 A max.
16 A	16 A max.	20 A max.	21 A max.

Protection classes according to IEC 60536

With regard to protection against direct contact, the appliance couplers are categorized as follows:
· Class 1 appliances (with earth conductor)
· Class 2 appliances (without earth conductor)
See detailed explanations on Electric Shock Protection http://www.schurter.ch/products/iec_connector_overview.asp?active=2#6

Special designs

Appliance couplers in compliance with the present standards are designed to connect appliances without special protection against humidity (see IP Protection Class http://www.schurter.ch/products/iec_connector_overview.asp?active=2#5). Appliances whose operation, when used properly, may involve overflowing liquids or dust emissions must themselves be protected against humidity. IEC standard 60320-2-3 provides that the power supply's IP protection rating must be at least identical to that of the appliance.
Special designs may also become necessary in environments involving special conditions (e.g. on ships or in motor vehicles) and in dangerous locations (e.g. involving explosives).

SUITABLE APPLIANCE COUPLERS

Suitable appliance couplers according to IEC 60320-1

The suitable connection options for appliance couplers are listed below. The appliance couplers' contours are coded (type, symbol) so as to allow a "hot condition" connector to fit into a "cold condition" appliance inlet, but not vice versa. Important note: The appliance inlet nominal current rating must be at least identical to that of the appliance!

Mating Appliance Coupler IEC60320-1					Appliance Inlets										
					Gender Male										
				Symbol											
				Type	C6	C8	C8p	C10	C14	C16	C16A	C18	C20	C22	C24
				Current [A]	2.5	2.5	2.5	6	10	10	10	10	16	16	16
				Temperature [°C]	70	70	70	70	70	120	155	70	70	155	70
	Symbol	Type	Current [A]	Temperature [°C]	Protection classe	1	2	2	2	1	1	1	2	1	1	2
IEC60320 Connectors		C5	2.5	70	1	•										
		C7	2.5	70	2		•									
		C7p	2.5	70	2			•								
		C9	6	70	2				•							
Gendre Female		C13	10	70	1					•			□			
		C15	10	120	1					□	•		□			
		C15A	10	155	1					□	□	•	□			
		C17	10	70	2								•			
		C19	16	70	1									•		□
		C21	16	155	1									•	•	•
		C23	16	70	2											•

Combinations according to IEC 60320-1: • intended, □ possible
The available product combinations can be selected under Mating IEC Connectors http://www.schurter.ch/wwwmc/wwwmc.asp.

Suitable Interconnection Couplers according to IEC 60320-2-2

The suitable connection options for interconnection couplers are listed below. The regulatory framework applicable here is identical to that governing IEC 60320-1 http://www.schurter.ch/products/iec_connector_overview.asp?active=4#7.3.

Mating Appliance Coupler IEC60320-1					Plugs						
					Gender Male						
				Symbol							
				Type	A	C	E	G	I	K	
				Current [A]	2.5	2.5	10	10	16	16	
				Temperature [°C]	70	70	70	70	70	70	
	Symbol	Type	Current [A]	Temperature [°C]	Protection class	1	2	1	2	1	2	
IEC60320 Connectors		C5	2.5	70	1	•						
		C7	2.5	70	2		•					
		C13	10	70	1			•	□			
		C15	10	120	1			□	□			
Gendre Female		C15A	10	155	1			□	□			
		C17	10	70	2				•			
		C19	16	70	1					•		
		C21	16	155	1					•	•	
		C23	16	70	2						•	

Combinations according to IEC 60320-1: • intended, □ possible

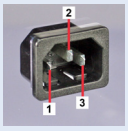
The available product combinations can be selected under Mating IEC Connectors http://www.schurter.ch/wwwmc/wwwmc.asp.

Mating Interconnection Coupler IEC 60320-2-2					Plugs						
					Gender Male						
				Symbo l							
				Type	A	C	E	G	I	K	
				Current [A]	2.5	2.5	10	10	16	16	
				Temperature [°C]	70	70	70	70	70	70	
	Symbo l	Typ e	Current [A]	Temperature [°C]	Protection class	1	2	1	2	1	2	
IEC 60320 Appliance Outlets		B	2.5	70	1	•						
		D	2.5	70	2		•					
Gender Femal e		F	10	70	1			•	□			
		H	10	70	2				•			
		J	16	70	1					•	□	
		L	16	70	2						•	

Combinations according to IEC 60320-2-2: • intended, □ possible

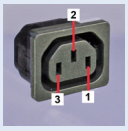
Contact Configuration

On standard, non-reversible appliance inlets/outlets, the contacts, when viewing the engagement surfaces from above, must be configured as follows:



Appliance inlet

Plug



Appliance outlet

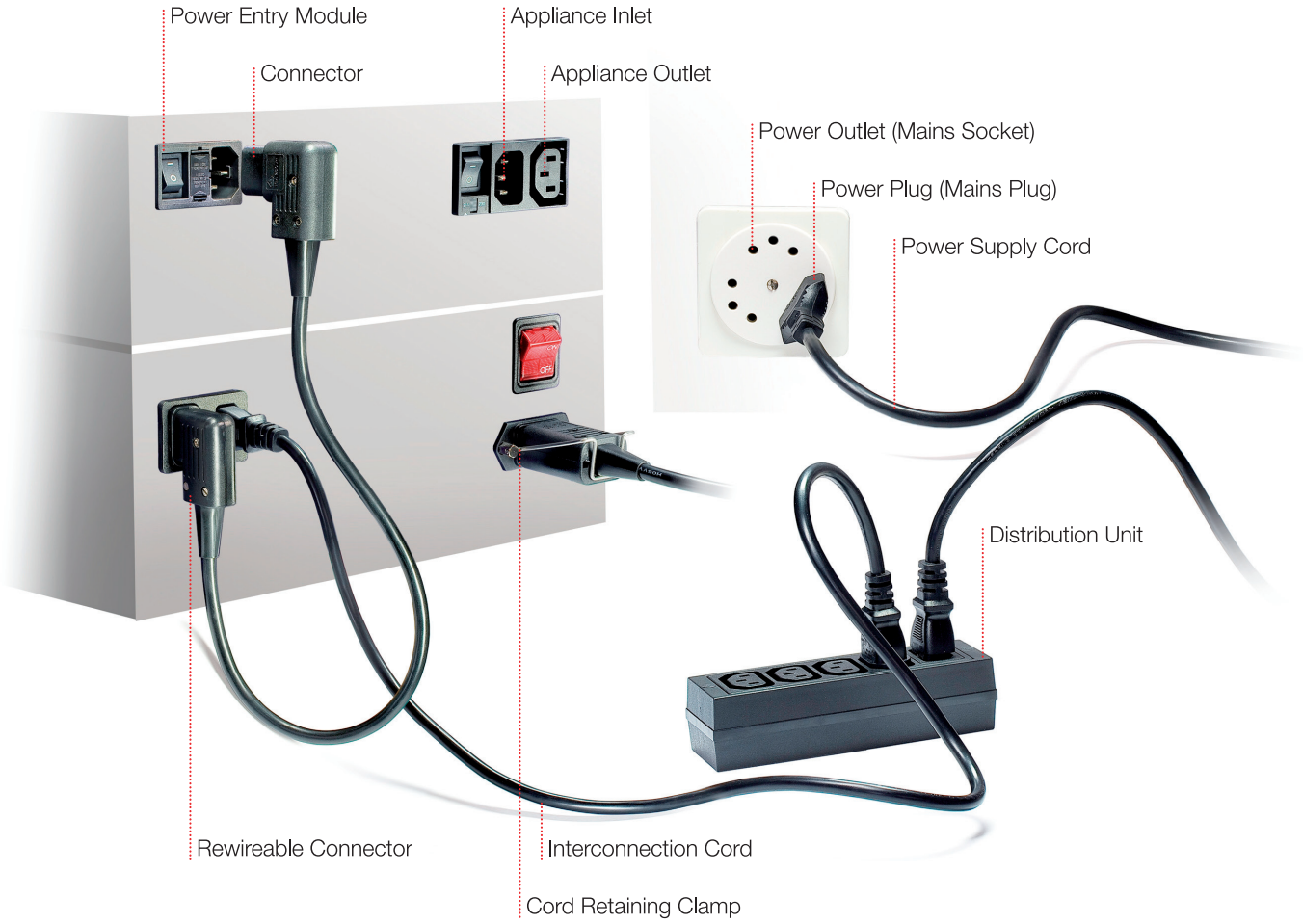
Connector

1) Live conductor: L;
2) Ground conductor: PE;
3) Neutral conductor: N (Neutral)

EXPLANATION OF TERMS

Explanation of IEC 60320 connector terms

The illustration below shows a possible component configuration, properly naming the various components which will be explained in detail further down, including the distinguishing characteristics.



Appliance coupler
Appliance coupler means devices for connecting a flexible power cord to an appliance or another installation. You will find a product overview under 'Gerätestecker http://www.schurter.ch/products/connectors_filters_overview.asp?Mating_Connectors. Appliance couplers essentially comprise the following components:

- Connector
- Appliance Inlet

Interconnection cords

Interconnection cords means structural units consisting of a flexible cord fitted with a plug and a connector built for interconnecting or disconnecting any appliance or installation with/from any other appliance or installation by means of a power cord. You will find a product overview under 'Cord Sets http://www.schurter.ch/wwwsc/con_pg07_2.asp?language_id=10.
Configurator http://www.schurter.ch/wwwpc/configurator_overview.asp?language_id=10 | Webselector Chart http://www.schurter.ch/wwwsc/con_pg07_2.asp?language_id=10 | Mating Connector http://www.schurter.ch/wwwmc/wwwmc.asp

General product information

Rewireable plug and connectors

Rewireable plugs and connectors means structural units built to allow the flexible cord to be exchanged/replaced, colloquially referred to as 'cord plugs/connectors. You will find a product overview under 'Cord Connectors http://www.schurter.ch/wwwsc/con_pg07b.asp?language_id=10. That overview also includes the power plugs available.
Configurator http://www.schurter.ch/wwwpc/configurator_overview.asp?language_id=10 | Webselector Chart http://www.schurter.ch/wwwsc/con_pg07b.asp?language_id=10 | Mating Connector http://www.schurter.ch/wwwmc/wwwmc.asp

Non-rewireable plug and connectors

Non-rewireable plugs and connectors means structural units which, in contrast to removable plug and connectors, are built to form an integrated, inseparable whole with the flexible cord. You will find a product overview under 'Cord Sets http://www.schurter.ch/wwwsc/con_pg07_2.asp?language_id=10.
Configurator http://www.schurter.ch/wwwpc/configurator_overview.asp?language_id=10 | Webselector Chart http://www.schurter.ch/wwwsc/con_pg07_2.asp?language_id=10 | Mating Connector http://www.schurter.ch/wwwmc/wwwmc.asp

Power supply cords

Means structural units consisting of a flexible cord fitted with a power (mains) plug and an connector for connecting an electrical appliance to the power supply. You will find a product overview under 'Cord Sets http://www.schurter.ch/wwwsc/con_pg07_2.asp?language_id=10.
Configurator http://www.schurter.ch/wwwpc/configurator_overview.asp?language_id=10 | Webselector Chart http://www.schurter.ch/wwwsc/con_pg07_2.asp?language_id=10 | Mating Connector http://www.schurter.ch/wwwmc/wwwmc.asp

Power entry modules with or without filter

Means power entry modules (PEM), i.e. modules including different functional elements, such as:
- IEC appliance inlet / outlet
- switch including bowden cable actuation
- circuit breaker
- fuseholder
- voltage selector
- EMC filter

The advantages of PEM over individual components include:
- compact design
- only one product with electrically linked individual components
- efficient assembly
- alternative design options with similar dimensions
- Protected, assembled and already tested/approved power supply components

You will find a detailed product overview under 'Power Entry Modules without Filter http://www.schurter.ch/wwwsc/con_pg05.asp?language_id=10 and 'Power Entry Modules with Filter http://www.schurter.ch/wwwsc/con_pg06.asp?language_id=10.

IEC appliance inlets / outlets

The IEC appliance inlets and outlets correspond to the individual components already presented in compliance with the IEC's appliance couplers standards. You will find a detailed product overview under 'appliance inlets/outlets http://www.schurter.ch/wwwsc/con_pg07.asp?language_id=10.
A specific approach is the shuttered outlet that protects unintended contact with life parts by movable protection shutters. They will be moved away by the insertion of the plug connector. The product is herewith ideally suitable to be used in applications to be used by children.
A special design is the protected outlet. The individual connections of a distribution unit can be limited by its power consumption by using a fuse-link http://www.schurter.ch/wwwsc/con_pg02.asp?language_id=10. The optional neon indicates the correct operation stage of the power line.
Configurator http://www.schurter.ch/wwwpc/configurator_overview.asp?language_id=10 | Webselector Chart http://www.schurter.ch/wwwsc/con_pg07.asp?language_id=10 | Mating Connector http://www.schurter.ch/wwwmc/wwwmc.asp

Switches including Bowden cable actuation

Switches can be built both as 1-pole (phase conductor disconnection) and 2-pole (phase and neutral conductor disconnection) units to ensure compliance with the relevant power supply standards. As a matter of principle, high-quality products are used which meet the current requirements and which are well within the given nominal current boundaries as defined by the IEC 60320 standard http://www.schurter.ch/products/iec_connector_overview.asp?active=5#7.5.1 on appliance couplers.

Line switch used by type	Technical data	
CMF1, CMF2, CMF3, CMF4	Electrical rating acc. to IEC/EN 61058-1	10 (4) A / 250 VAC, 10 000 switch operations 6 (4) A / 250 VAC, 50 000 switch operations
		Statement in ( ) at inductive load with p. f. 0.6
	Electrical rating acc. to UL 1054	6 A, 125250 VAC, 6000 switch operations (1⁄4) HP, 125 VAC (1⁄2) HP, 250 VAC
		Statement in ( ) at inductive load with p. f. 0,45
	Inrush current acc. to IEC/EN 61058-1	capacitive 70 A, 34 ms continuous current 5 A 10 000 switch operations
	Contact gap	≥3 mm
KM, KMF, PMM, GRM1, GRM2, GRM4	Electrical rating acc. to IEC/EN 61058-1	10 (4) A / 250 VAC, 10 000 switch operations 6 (4) A / 250 VAC, 50 000 switch operations
		Statement in ( ) at inductive load with p. f. 0.6
	Electrical rating acc. to UL 1054	12 A, 125250 VAC, 6000 switch operations (1⁄3) HP, 125 VAC (1⁄2) HP, 250 VAC
		Statement in ( ) at inductive load with p. f. 0.45
		Meets switching current test acc. to UL 1054, TV-3
	Inrush current acc. to IEC/EN 61058-1	capacitive 100 A, 34 ms continuous current 5 A 10 000 switch operations
	Contact gap	≥3 mm
KEB1, KFB1	Electrical rating acc. to DIN/VDE 0630	12 (3) A / 250 VAC, 10 000 switch operations
		Statement in ( ) at inductive load with p. f. 0.6
	Inrush current acc. to	capacitive 20 A, < 5 ms continuous current 5 A
	IEC/EN 61058-1	10 000 switch operations
	Contact gap	≥3 mm
DC11, DC12, DC21, DC22, DD11, DD12, DD21, DD22	Electrical rating acc. to IEC/EN 61058-1	16 (4) A / 250 VAC, 10 000 switch operations 10 (4) A / 250 VAC, 50 000 switch operations Statement in ( ) at inductive load with p. f. 0.6
	Electrical rating acc. to UL 1054	16 A / 125250 VAC, 6000 switch operations (1) HP 125 VAC / (2) HP 250 VAC Statement in ( ) at inductive load with p. f. 0.45
	Inrush current acc. to IEC/EN 61058-1	capacitive 100 A, 3-4 ms
		continuos current 5 A
KP (Schalter), KEB2, KFB2, KD, CD, KG, CG, Felcom 54, Felcom 64, FKH, FKI, FKHD, FKID	Electrical rating acc. to IEC/EN 61058-1	12 (4) A / 250 VAC, 10 000 switch operations 8 (8) A / 250 VAC, 50 000 switch operations
		Statement in ( ) at inductive load with p. f. 0.6
	Electrical rating acc. to UL 1054	15 A, 125250 VAC, 6000 switch operations (3⁄4) HP, 125 VAC (1 1⁄2) HP, 250 VAC
		Statement in ( ) at inductive load with p. f. 0.45
		Meets switching current test acc. to UL 1054, TV-3
	Inrush current acc. to IEC/EN 61058-1	capacitive 70 A, 34 ms continuous current 5 A 10 000 switch operations
	Contact gap	≥3 mm
KD Bowden cable, CD Bowden cable, KG Bowden cable, CG Bowden cable	Electrical rating acc. to IEC/EN 61058-1	6 (4) A / 250 VAC, 10 000 switch operations
		Statement in ( ) at inductive load with p. f. 0.6
	Electrical rating acc. to UL 1054	6 A, 250 VAC, 10 000 switch operations 8 A, 125 VAC, 10 000 switch operations
	Inrush current acc. to IEC/EN 61058-1	capacitive 36 A, < 5 ms continuous current 6 A 6000 switch operations
	Contact gap	≥3 mm
EC11, EC12	Electrical rating acc. to IEC/EN 61058-1	16 (4) A / 250 VAC, 10 000 switch operations 10 (4) A / 250 VAC, 50 000 switch operations
		Statement in ( ) at inductive load with p. f. 0.6

Line switch used by type	Technical data	
	Electrical rating acc. to UL 1054	20 A, 125250 VAC, 6000 switch operations (1) HP, 125 VAC (2) HP, 250 VAC
		Statement in ( ) at inductive load with p. f. 0.45
		Meets switching current test acc. to UL 1054, TV-3
	Inrush current acc. to IEC/EN 61058-1	capacitive 100 A, 34 ms continuous current 5 A 10 000 switch operations
	Contact gap	≥3 mm

Bowden cable for type KD/KG, CD/CGD/CG

Remote actuator technology
The remote actuator cable assembly consists of a wire cable inside of a plastic insulated spiral wire casing. Identifying a proper routing of the cable assembly is important. Deviations from line to line placement will require bends in the cable with resulting losses in the overall assembly. These inefficiencies show up as friction losses and lost motion. Frictional losses are increases in actuation force due to losses in the assembly. Lost motion is an undesirable difference between the input end of the assembly and the output end. The principle element of lost motion is backlash and deflection. Backlash is caused by the wire cable moving inside the casing with the change in direction of motion. It is the function of clearance between the wire cable and casing, plus the number of degrees of bend in the cable assembly. Deflection of the cable assembly, while usually low, can be minimized by anchoring the casing. This is especially true in those applications of cable assemblies with long lengths and/or large degrees of bend in the system All of these losses and resulting inefficiencies can be reduced by the equipment designer through minimizing the total degress of bend in the assembly. Because of the number of variables effecting proper operation of any remotely actuated switch assembly, it is important that the ordering instructions be used to determine proper cable length and to provide samples for customer approval.
Consult figure for minimum information required to describe cable assembly application.

Order details and description
How to specify length of Bowden cable
R Mounting parallel to direction of actuation
B1 Actuating part
B2 Power entry module
Dimensions in mm (center of mounting hole [B1], outer surface to center of mounting hole [B2], outer surface)
R a/ b c/

S Mounting 90° to direction of actuation
B1 Actuating part
B2 Power entry module
Dimensions in mm (center of mounting hole [B1], outer surface to center of mounting hole [B2], outer surface)
S a/ b/ c/

Ordering example
1. Order No. socket KD14.4199.151
2. Order No. fuse drawer 4303.2024.03
3. Bowden cable (type of mounting / dimensions in mm) * R a/200 b/180 c/40

*The order No. for a customer specific Bowden cable you'll get with the acknowledgment.
Delivery time for a customer specific Bowden cable sample approx. 2 weeks.
Standard Bowden cable sample, Order No. 0886.0101, ex stock

Circuit breakers for equipment

In addition to switching, a Circuit Breakers for Equipment http://www.schurter.ch/products/cb_overview.asp?language_id=10 (CBE) ensures protection against overload. You will find detailed information on Circuit Breakers for Equipment http://www.schurter.ch/products/cb_overview.asp?language_id=10 as well as a product overview of Power Entry Modules with CBE http://www.schurter.ch/wwwsc/con_pg19_1.asp?language_id=10 in the product overview under 'Circuit Breakers for Equipment.

Fuseholders, part of a power entry module

Fusedrawer 1:
http://www.schurter.ch/pdf/english/typ_Fusedrawer_1.pdf
Fusedrawer 2:
http://www.schurter.ch/pdf/english/typ_Fusedrawer_2.pdf
Fusedrawer 3:
http://www.schurter.ch/pdf/english/typ_Fusedrawer_3.pdf

Explanations, thermal requirements, selection criteria

Protection against electric shock (against direct contact with live parts) for fuseholders
The assessment of the protection against electric shock assumes that the fuseholder is properly assembled, installed and operated as in normal use, e.g. on the front panel of the equipment. IEC 60127-6 and EN 60127-6 divides into three categories:

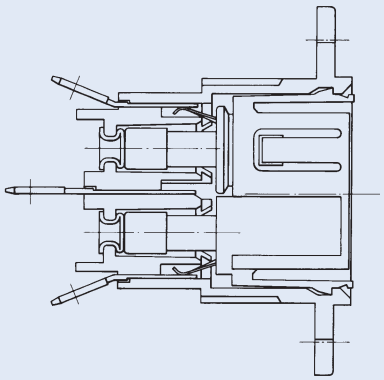
Category	Features
PC1	**Fuseholders without integral protection against electric shock.** They are only suitable for applications where corresponding additional means are provided to protect against electric shock.
PC2	**Fuseholders with integral protection against electric shock** live part is not accessible: - when the fuseholder is closed - after the fuse carrier (incl. fuse-link) has been removed - either during insertion or removal of the fuse carrier (incl. fuse-link) Compliance is checked by using the standard test finger specified in IEC 60529.
PC3	**Fuseholder with enhanced integral protection against electric shock** The requirements for this category are the same as those for category PC2, with the exception that the testing is carried

Extra-safe handling with SCHURTER power entry modules

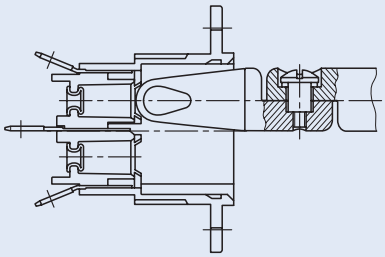
Protection against contact with live parts is an important aspect when dealing with electrical connecting devices. Both your customers and your servicing engineers will appreciate the greatest possible protection against accidental contact with live parts something which can easily happen as a result of inappropriate use, or during servicing or repair work.
In particular, our "shock-safe", "extra-safe fuse-drawers" and "protective covers" precautions are effective ways of protecting against accidental contact when using the power entry modules.

Example: Power entry module with fuseholder, shocksafe category PC2

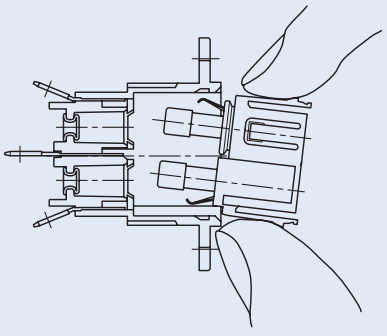
Closed fuseholder and appliance inlet.



It is not possible to touch any live parts on the SCHURTER fuseholders when the fuse-carrier is extracted.



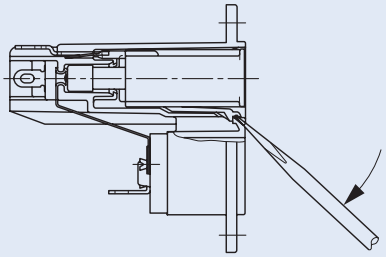
When a fuse-link 5 x 20 mm or 6,3 x 32 mm (1/4'' x 11/4'') is inserted or replaced, neither the fuse nor the fuse-carrier can come in contact with any live parts.



The extra-safe versions of shock-safe power entry modules are now available.

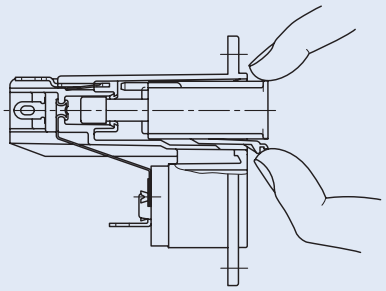
They are thus also able to satisfy requirements of the following standard: IEC 60601-1 (medical equipments).

The drawer can only be extracted with the aid of a tool (e.g. screwdriver) so that opening by hand is quite impossible.



With some types it is also necessary to pull out the mains outlet first. Only then can the drawer be removed from the socket.

The drawer can then be removed by hand.



Influencing factors

The design engineer of electrical equipment is responsible for its safety and functioning to humans, animals and real values. Above all, it is his task to make sure that the state of the art as well as the valid national and international standards and regulations be observed.

In view of the safety of electrical equipment the selection of the most suitable fuseholder is of great importance. Among other parameters, one has to make sure that the maximum admissible power acceptances and temperatures defined by the manufacturer are followed. Differing definitions and requirements in the most important standards for fuse-links and fuseholders are time and again origin for the incorrect selection of fuseholders.

To equate the rated current of a fuse-link with the rated current of the fuseholder, may, especially at higher currents, cause high, not admissible temperatures, when the influence of the power dissipation in the contacts of the fuseholder was not taken into consideration.

For a correct selection the following influence factors depending on the application and mounting method, have to be followed:
1. Rated power dissipation of the suitable fuse-link.
2. Admissible power acceptance, operating current and temperatures of the suitable fuseholder.
3. Differing ambient air temperature outside and inside of the equipment.
4. Electrical load alternation
5. Long time (> 500 h) operation with load > 0.7 I_n.
6. Heat dissipation/cooling and ventilation. Heat influence of adjacent components.
7. Length and cross section of the connecting wire.

Rated current of a fuseholder

The value of current assigned by the manufacturer of the fuseholder and to which the rated power acceptance is referred.

Rated power dissipation of the fuse-link

(power dissipation at rated current)
See sep. catalogue "fuses".

Rated power acceptance and admissible temperatures of a fuseholder

The rated power acceptance of a fuseholder is determined by a standardised testing procedure according to IEC 60127-6. It is intended to be the power dissipation caused by the inserted dummy fuse-link at the rated current of the fuseholder and at an ambient air temperature of T_{A1}= T_{A2} = 23 °C (over a long period). During this test the following temperatures must not be exceeded on the surface of the fuseholder:

Fuseholder surface area	Maximum allowable temperature measuring points (see figure 1)	°C
1. Accessible parts [1]	T_{S1}	85
2. Inaccessible parts [1] Insulating parts	T_{S2}	[2]

NOTES:
1) When the fuse-holder is properly assembled, installed and operated as in normal use, e.g. on the front panel of equipment.
2) The maximum allowable temperature of the used insulating materials corresponds to the Relative Temperature Index (RTI) according to IEC 60216-1 or UL 746 B.

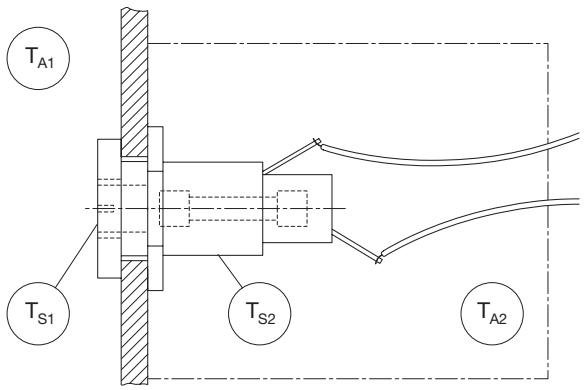


Illustration of temperatures experienced

T_{A1} = ambient air temperature, surrounding the equipment

T_{A2} = ambient air temperature in the equipment

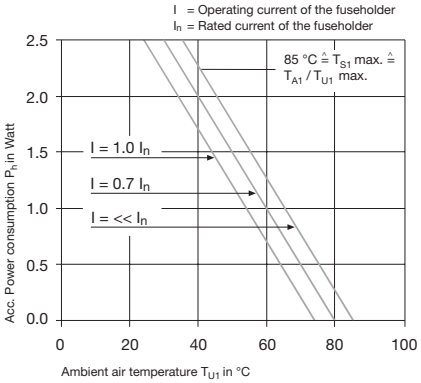
T_{S1} = temperature of accessible parts on fuseholder surface

T_{S2} = temperature of inaccessible parts on fuseholder surface

Correlation between operating current I, ambient air temperature T_{A1} and the power acceptance P_h of the fuseholder

This correlation is demonstrated by derating curves.

Example of a derating curve



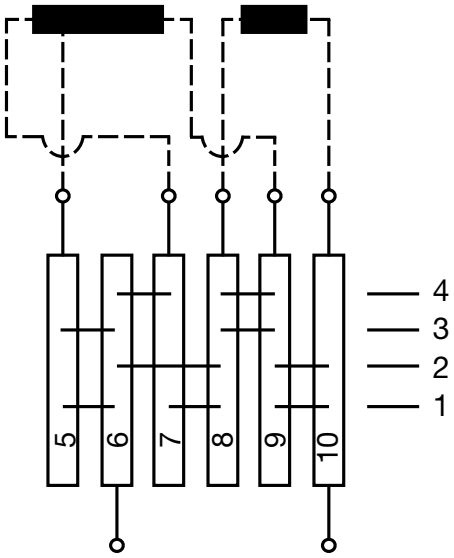
I =operating current of the fuseholder
In =rated current of the fuseholder

The derating curves demonstrate the admissible power acceptance of a fuseholder depending on the ambient air temperature T_{A1} for the following fuseholder operating currents: I << I_n, I = 0,7 · I_n and I = 1,0 · I_n. This power acceptance corresponds to the max. admissible power dissipation of a fuse-link.
A calculation example can be looked up in the technical information for fuses.

Voltage selectors

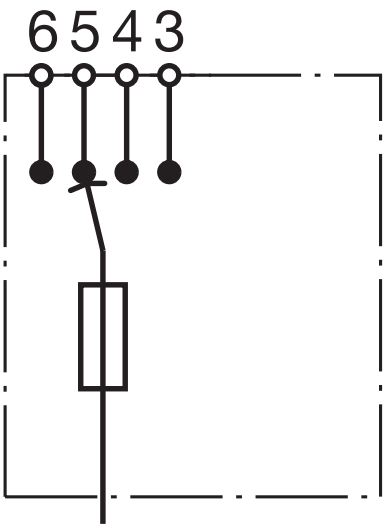
Operating appliances in international markets requires taking into account the country-specific power supply systems. An appliance capable of operating under different voltages must allow the user to select and display such voltages. SCHURTER provides three differently configurable voltage selectors for such purposes.
Voltage Selector http://www.schurter.ch/pdf/english/typ_Voltage_Selectors_Insert_1.pdf

Series-parallel connection



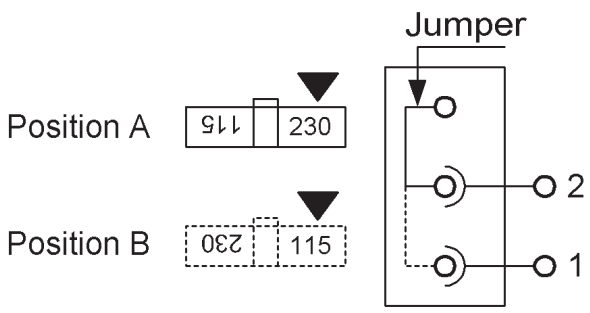
Allows the user to achieve a multitude of line voltages with one transformer with three primary windings and one secondary winding.

Step switch



This circuit allows the user to select up to four primary voltages.

Jumper



The easiest way to set only two voltages is by using a jumper.

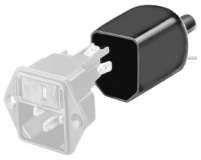
EMC filters

Ensuring the electromagnetic compliance (EMC) of specific appliances may necessitate the use of filter components, colloquially referred to as inlet filters or IEC inlet filters. Filters may also be used in addition to the PEM described above. You will find a detailed product overview under 'Power Entry Modules with Filter http://www.schurter.ch/ww-wsc/con_pg06.asp?language_id=10'.

Distribution units

Means components used to, for instance, supply a multitude of appliances equipped with IEC appliance couplers with power from only one country-specific power supply cord via several interconnection cords. You will find a detailed product overview under 'Distribution Units http://www.schurter.ch/wwwsc/con_pg07_1.asp?language_id=10. Since, due to the lack of standards, distribution units have only limited UL and VDE approval, modular solutions assembled from approved individual components (inlets/outlets) have been made available. The applicable nominal voltage, the cord retainers and the necessary conductor cross-sectional areas (gauge) can be specifically selected depending on the relevant application area.

Covers



Protective caps or covers for appliance inlets and power entry modules prevent inadvertent contact with the live parts on the appliance's interior. They are made from flexible plastic and can be pushed onto the components from the rear. Compatibility information on the various types of covers is available in a relevant data sheet.

Cord retaining clamps

Cord retaining clamps ensure firm push-on connections. The compatibility of the selected appliance couplers is imperative for reliable protection. You will find a detailed product overview on cord retaining clamps in the chapter "pullout prevention on pluggable power supplies".

FLEXIBLE CORDS

The power supply cords and the interconnection cords are based on standardized individual components (connectors, power plugs or appliance outlets and various power cord types).
The individual conductors of the flexible cords are, depending on their use in power supply cords and interconnection cords, divided into IEC-compliant nominal current classes and therefore require a length-dependent minimum nominal cross-sectional area (gauge).

Type and min. nominal cross-sectional area for flexible cords or cables

		types of flexible cords or cable	nominal cross-sectional area (mm^2)
2.5 A	for class-I-equipment	60227 IEC 52	0.75
2.5 A	for class-II-equipment	60227 IEC 52	0.75*
6 A		60227 IEC 52	0.75
10 A	for cold conditions	60227 IEC 53 or 60245 IEC 53	0.75**
10 A	for hot conditions	60245 IEC 51 or 60245 IEC 53	0.75**
10A	for very hot conditions	60245 IEC 51 or 60245 IEC 53	0.75*
16A	for cold conditions	60227 IEC 53 or 60245 IEC 53	1**

* if the flexible cord or cable is not longer than 2 m, a nominal cross-sectional area of 0.5 mm^2 is admissible.
** if the flexible cord or cable is longer than 2 m, the nominal cross-sectional area for the connectors have to be:
- 1 mm2 for connectors 10 A
- 1.5 mm2 for connectors 16 A

These cross-sectional areas are likewise subdivided, in compliance with American standards, into classes according to AWG. Hence, cord configurations can be made on the basis of the conductor cross-sectional areas and the AWG classes.

Comparison chart metric-AWG wire sizes

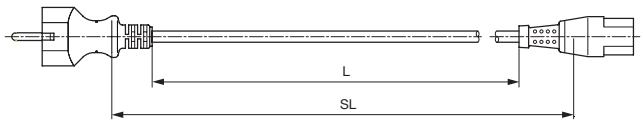
AWG	CSA in mm^2	closest stdd. equivalent in mm^2
30	0.0503	0.05
29	0.0646	-
28	0.0804	-
27	0.102	0.1
26	0.128	0.14
25	0.163	-
24	0.205	0.2
23	0.259	0.25
22	0.325	-
21	0.412	-
20	0.519	0.5
19	0.653	-
18	0.823	0.75
17	1.04	1
16	1.31	-
15	1.65	1.5
14	2.08	-
13	2.63	2.5
12	3.13	-
11	4.15	4
10	5.27	-
9	6.62	6
8	8.35	-
7	10.6	10
6	13.3	-
5	16.8	16
4	21.2	-
3	26.7	25
2	33.6	35
1	42.4	-
0	53.4	50
2/0	67.5	70
3/0	85	95
4/0	107.2	120
5/0	135.1	150
6/0	170.3	185

The various cord types have been internationally harmonized using the following configuration key:

Definition of cord lengths

Definition of cord length for complete power supply cords (plug and connector)

According to EN 60320-1 §21, the lengths of the power supply cord is defined by the visible length of the cord, form the bushing to the bushing. The length SL is a dimension which is necessary for the manufacturing process and results from the length of the cord and its components.

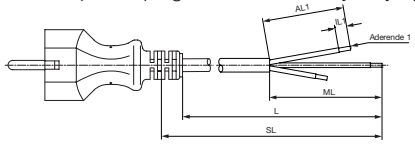


Definition of cord lengths for open-end power supply cords

The length of the open-end cord is defined as the length of the cord from the bushing to the cut (if there are several conductors of different length, the longest individual conductor (ML) is used for establishing the length of the cord). The lenght SL is a dimension which is necessary for the manufactoring process and results from the lenght of the cord and its components. In order to properly treat the open end, we need the following information from you:

- Sheath stripping length ML (i.e. length of the longest individual conductor)
- Stripping length (AL1 ...)
- Conductor stripping length (IL1 ...)

Treatment of conductor ends (if any) (e.g. tinned, conductor end bushings, flat pin bushings, ring tongue...)
(When simply stripping the conductor, the stripped insulation is usually left on the conductor in order to keep the stranded wire from becoming frayed.)
Stockpiling and manufacturing reasons, the cord length per injection-molded power plug or connector may vary by +/- 60mm.



MOUNTING

Mounting appliance couplers

Different applications require different approaches to the optimal mounting of appliance inlets and outlets, taking into account both minimal dimensions and customer-specific assembly methods, e.g. the module design possibilities that allow electrical testing even before mounting.

Mounting side

Mounting appliance inlets and outlets into front panels is possible both from the front (exterior of the appliance's mounting board) and from the rear (interior of the appliance's mounting board) to respond to different customer-specific assembly scenarios.

Usually, the appliance couplers are, together with other control components, mounted (and then wired) from the front into the appliance's housing. Under certain circumstances it is practical to test the entire electrical unit before mounting. In such cases it is imperative that the appliance coupler be mounted from the rear.

Mounting method

The mounting method describes the procedure of mounting the appliance coupler onto the mounting board.

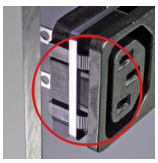
Snap-in mounting

Snap-in mounting facilitates the insertion of the appliance coupler into the properly prepared panel cutout. Mounting is done by locking snap-in lugs or snap locks (parts of the supplied component) into place. Usually, snap-in mounting is done from the front.
We distinguish between three categories:

One-step snap lock

This snap lock fits perfectly when mounted onto a board with the same thickness as specified in the relevant data sheet.

Incremental snap lock



This snap lock fits perfectly when mounted onto boards with the same respective thicknesses as specified in the data sheet. Hence one product can be used for different housing systems, provided that their panel thicknesses match the snap lock's specs.

Universal snap lock

Universal snap locks do not require a specific panel thickness. They fit perfectly when mounted onto boards with any thickness within the range specified in the relevant data sheet.

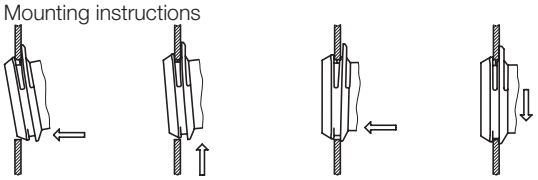
Screw-on mounting

Screw-on mounting is largely independent from panel thickness and ensures better firmness. Mounting can be done both from the front and the rear; however, in contrast to snap-in mounting, this method requires screws and possibly nuts as well (which are not included, unless specified otherwise). For safe mounting, the specified screw tightening torques must be observed, in order to prevent d amaging the component while ensuring secure fastening.
The standard version is mounted using countersunk head screws. Depending on the information in the data sheet, other product types, i.e. with a through hole or flat head machine screws, may be used.
A special type of screw-on mounting appliance coupler comes with the tapped holes for screw-on mounting already in place on the mounting flange, thus reducing the number of components which, in specific cases, may also ensure the product's tightness to the mounting board (see 5707)

Sandwich mounting

Sandwich mounting makes it possible to mount appliance couplers without the need for additional components. Mounting can be done both from the front and the rear, as specified in the relevant data sheet.

Mounting instructions



Rivet mounting

Rivet mounting is essentially identical to screw-on mounting when using the mounting holes as through holes or using flat head machine screws with the corresponding dimensions as specified in the relevant data sheet.

Mounting position

The mounting position indicates, with regard to the connector pin's orientation, on what side the mounting elements are, treating snap-in and screw-on positions identically.

TERMINALS

The appliance couplers' terminals refer to the contacts on the appliance's interior, designed according to the customers' individual needs. We distinguish between the following types:

Solder tabs

The solder tab is a plated metal tongue for fastening a connecting stranded wire by soldering it on. The solder tabs' geometry may vary. The corresponding connection dimensions are listed in the relevant data sheet.

PCB connectors

The PCB connector is a plated metal contact for soldering onto a contact conductor's contact point on a PCB. We basically distinguish between Through-Hole Technology (THT) and Surface Mount Technology (SMT). The connections' geometry is specified in the relevant data sheet.

Quick-connect terminals

Quick connect, push-on or blade terminals feature metal blades with standardized dimensions. They are also referred to as faston terminals, typically measuring 4.8 x 0.8 mm, 6.3 x 0.8 mm. The terminal dimensions are specified in the relevant data sheet. Correspondingly, the connecting stranded wires must be fitted with flat pin bushings of identical dimensions.

IDC terminals

In IDC terminals respectively connectors (IDC meaning "Insulation Displacement Connector"), the strands of the connecting stranded wire or wire are, without prior preparation of the power cord, pushed onto the insulation cutting terminal, the terminal cutting the insulation open and the clamping connection fastening the stranded wire or wire ensuring the electrical connection. In order to ensure a perfect connection, the conductors' cross-sectional areas as specified in the relevant data sheet must be observed.

Screw-on terminals

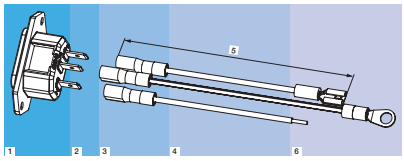
Screw-on terminals are simple clamp fasteners using stud screws for fastening the connecting stranded wires.

Stranded wires

Power supply is also possible without using additional cabling components, because appliance couplers are available pre-fitted with the connecting stranded wires. Stranded wires pre-fitted with plugs are also available upon request for mounting the power entry module into the target appliance without the need for any further process steps.

WIRE HARNESS

The wire harness service includes several types of ready to install wires, cables or wire harnesses with custom specific end terminal connections. The SCHURTER products such as IEC 320 connectors, power entry modules or filter products with quick connect, solder or screw on terminals can be assembled with above custom specific interconnection solutions.



1) SCHURTER connector type, 2) Connector terminals, 3) Receptacles, 4) Wire-type and colour, 5) Wire length, 6) Wire end terminal

General product information

Connector / power entry module products

As power entry elements or so-called PEM (Abbreviation for Power Entry Module) refer to items that contain, in addition to a pure plug-in device more functional elements, such as switch, circuit breaker, fuse holder, voltage selector.

EMC connector filter

EMC connectors and PEMs are IEC60320 inlets equipped with an EMC filter function and provide the necessary attenuation to meet in the stringent EMC requirements in the various application fields.

The above-mentioned components with various interconnection terminal types such as quick connect, solder or screw-on terminals are available with wire harness (for details see catalogue data sheet respectively the WEB selector).

Quick connect / fast-on terminals

The quick connect or fast-on terminals correspond to metal mounting clamps with standard dimensions, typically in the size of 4.8 x 0.8 mm, 6.3 x 0.8 mm. The dimensions of the connections are specified in the product data sheet of the connector or power entry module component. Accordingly, the flexible wire end needs to be assembled by a quick connect terminal of a female type with the same dimensions.

Solder terminals

Solder connections are made of a coated metal tab for attaching a flexible wire by soldering. The soldering terminals may be of geometrically different characteristics. The dimensions of the solder terminals are given in the product catalogue data sheet.

Screw-on terminals

Screw on terminals are clamp fixtures, connecting flexble wires using threaded pins or wholes with screws or nuts.

Flexible wires

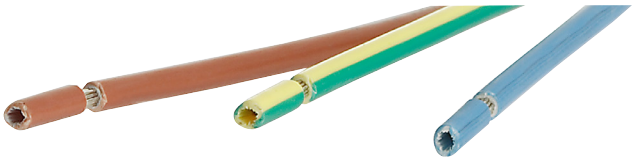
Wires used will be available as AWG18, AWG16, AWG14 cables according UL3266 in standard colours such as brown, black, bright blue, yellow-green and customized lengths.
(AWG stands for American Wire Gauge and is a coding for wire diameter, which is mainly used in North America. It features electric lines of stranded and solid wire and is used mainly in electrical engineering to describe the cross section of wires.)

Wire end terminals

The connections of the wire harness are determined by the selected Power Entry Module part. At the free end the flexible wires are individually assembled to customers' specifications.
Standard connections are provided as for example quick connect terminals 6.3 mm or 4.8 mm, ring terminals M4 or individual leads. Connections are possible with a full insulation, partly insulated or without.

Quick connect terminals 4.8 x 0.8 mm or 6.3 x 0.8 mm

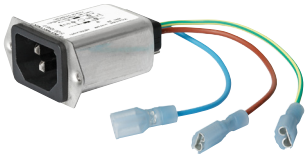
Terminal ring M4 and M5



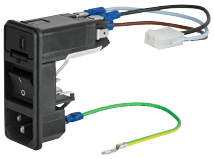
Wire end stripped

Custom specific

Product samples with wire harness



5120 Inlet filter with flexible wires and quick connect terminals, fully insulated



KD power entry module with wire harness and custom specific end terminals

Other product types of the large SCHURTER catalog offering will be included in the wire harness service in the near future.

Further details

At the start of the project, initial sample are provided by the manufacture to confirm the quality of the components and the interconnections. The serial production can start as soon as the customer release of the initial samples and the drawingis is ready.

6600

EC11

KFC

Samples with wire harness

Further details about SCHURTER's wire harness options can be found on the SCHURTER website inquiry form for wire harness.

PULLOUT PREVENTION ON PLUGGABLE POWER SUPPLIES

To avoid the danger of accidentally unplugging a power cable from the device, several various types of pullout preventers are offered.

V-Lock locking system for the IEC-appliance couplers

V-Lock

The V-Lock locking system can be used for 10 A and 16 A power inlets and connectors according to IEC 60320. This system works in such a way that there is a pin in the socket, interlocking with a notch in the plug and thus prevents an unintentional pullout of the power cable.

The locking is released by pressing on the releasing lever. This lever is easily detected by its bright yellow colour and thus distinguishes this system from existing power cable connections.

V-Lock pullout prevention system prevents accidentally pulling out power cables in a simple manner

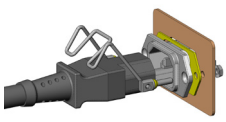
Plug connection with retaining clip

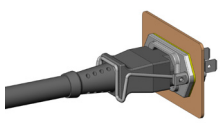
Another type of pullout prevention on pluggable power supplies are retaining clips, which are mounted to the device plug and are pressed over the cord connector. Regardless of device plug type and the multitude of electrical sockets shapes, the correct selection of retaining clip must be made. This retaining clip system ensures that the plug is correct, i.e. adequately deep, inserted to avoid the danger of accidentally unplugging a power cable from the device.

IP protection to the device including power supply protection

A special sealing kit increases the IP protection to the device including the protection of the plug connection. This additional safeguard assures a certain protection against the unwanted entry of moisture and dust when working with power cables that are plugged in. The power supply seal is produced with an inlet gasket around the plug pin. When plugged into a cable socket, the seal prevents liquids and dust on the plug pins from reaching live parts, as well as from ending up in the socket.

The device plug with inlet gasket is approved by IEC and UL. To be sure that the cord connector really is properly and completely plugged in, and to additionally protect the connection from accidentally being unplugged, device plugs should be equipped with a pullout preventer. Only in this way can an IP-protected connection be secured, regardless of operating conditions.





Plug connection with retaining clip and additional sealing kit

CUSTOMER SPECIFIC CONNECTORS

The SCHURTER power mains plugs, power interconnection plugs, and cord connectors displayed in this catalogue are designed and manufactured in accordance with national and international standards. These standard have been published to create a worldwide understanding about basic dimensions and safety targets of coupler systems. This way a high degree of compatibility of components of different origins has been achived.

Power mains plugs are designed to the relevant national standards whereas appliance couplers meet the standards as followes: DIN VDE 0625, EN 60320, IEC320 "Appliance couplers for household and similar general purposes, Part 2: interconnection couplers for household and similar equipment".

For different reasons you might consider or be forced to use **a coupler system on your application that does not mate or interchange with standardized couplers**:

- The **applicable standard for your appliance defines a certain coupleer system or provides a certain restriction concerning couplers that can be used**. For example IEC335-1 "Safety of household and similar electrical appliances, Part 1: General requirements" states in §24.5:
  "Plugs and socket-outlets and other connecting devices on flexible cord, used for an intermediate connection between different parts of an appliance, shall not be interchangeable (...) with connectors and appliance inlets complying with the standard sheets of IEC 60320, if direct supply of these parts from the mains could cause danger to persons or surroundings, or danger to the appliance".

- For marketing reasons it might be desirable to **use a unique and non-interchangeable coupler system for your appliance or appliance family**.

Down-sizing of housing is an aspect that is ever more important for design of new appliances. You might consider a modification of standard or non-standard **coupler systems that perfectly adapts your mounting requirements**. The broad range of SCHURTER's standardized interconnection plugs and connectors is constantly being extended by new variations. When it comes to a special cord end ter

All SCHURTER standard and non-standard coupler systems meet the relevant requirements of product safety proved by multiple approval markings of international testing agencies.

THERMAL CIRCUIT BREAKERS

Overload protection by thermally operated CBEs

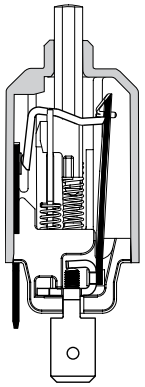


Fig. 1 Thermal only CBE

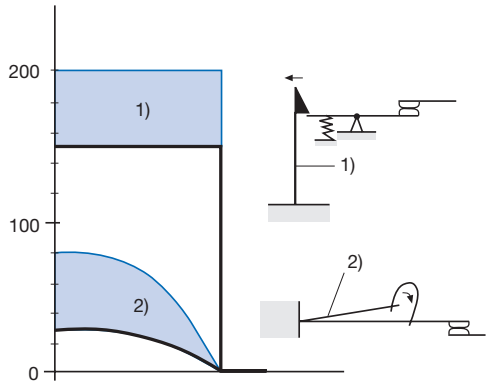


Fig. 2 Contact force versus deflection
1) Latch-type mechanism
2) Spring-type mechanism

Thermal circuit breakers for equipment, CBEs, (figure 1), simulate the electrothermal behaviour of the protected components (conductors in wiring, motors, transformers, etc.) by a simple, but very clever device: The thermo-bimetal.

This mechanical element can simulate the heating effect of the current, can transform electric energy into a motion (deflection) and trigger a mechanism to cause automatic interruption of the current which produces these effects.

To use the heat created by the current instead of the magnitude of the current itself offers a great advantage, because heat determines the admissible stress of the insulation and the admissible duration of the various overload conditions encountered in practical applications.

Thermally operated CBEs, therefore, take good care of the surplus energy required for start-up or high-torque operation of motors. They cope well with high inrush spikes which occur in switching power supplies, transformers, tungsten filament lamps, etc. and avoid nuisance tripping due to such transients.

The CBEs of the T-Line use a «latch-type» mechanism. High contact force can be maintained until the unit trips. This prevents electrical «noise» due to contact bounce and reduces the risk of contact welding which may occur with spring type mechanisms (figure 2).

Advantages

The strong points of thermal CBEs are:
- Good simulation of the thermal behaviour of the protected com ponent
- Capability of coping with start-up and inrush currents
- Suitability for a wide range of frequencies
- Simplicity / reliability
- Favourable price

Thermally operated CBEs are temperature sensitive. This, in most applications, is an advantage because the withstand capacity of the component to be protected is almost always temperature sensitive, too. The variation of the operating characteristics of thermal breakers with ambient temperature is closely matched to the admissible thermal stress of PVC insulations. For other insulations, the matching is not as close but the tendency exists, in principle, in any application where the protective device and the component to be protected are operating in an environment of practically identical ambient air temperature.
Thermal CBEs can, to a certain degree, be adjusted to special requirements concerning the withstand capacity of the protected item.
Their delay time can be influenced in several ways. The task may be achieved by using a different method of heating the bimetal. Figure 3 illustrates two methods.
The most widely used method is the direct heating of a bimetal strip by the internal losses produced by the current passing through the bimetal (example A). Where such losses are insufficient to produce enough heat and to cause sufficient deflection, a heater winding is wrapped around the bimetal strip to obtain the required heat. Since the heat has to pass through an insulation before it reaches the bimetal, a time lag will occur and a delayed action will result (example B).

The typical tripping zone of thermal CBEs is shown by figure 4. It changes with ambient temperature in a similar way as the withstand characteristic of a PVC insulated wire does (figure 5). The possibilities can be extended by using a shunt terminal as shown in figure 6.

The shunt terminal provides a parallel switched circuit to the main current sensing circuit.

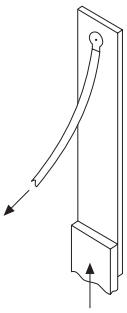


Fig. 3a Simulation by bimetals (directly heated)

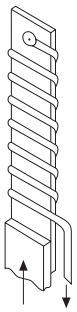


Fig. 3b Simulation by bimetals (indirectly heated)

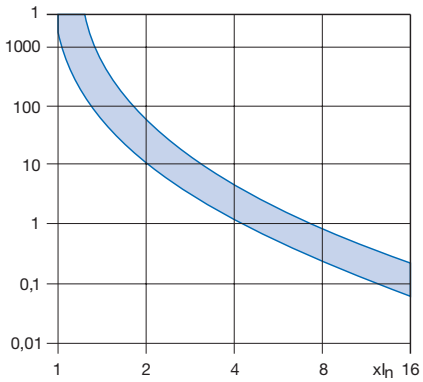


Fig. 4 Typical tripping zone

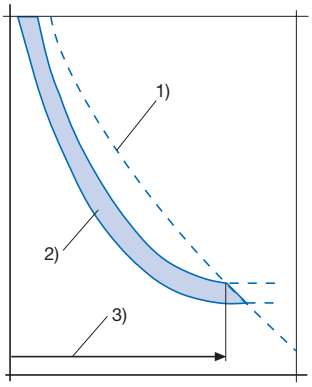


Fig. 5 Range of protection

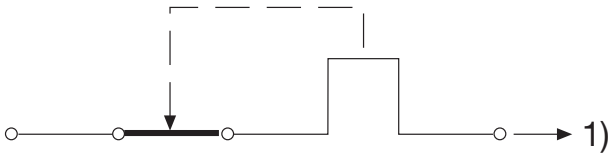


Fig. 6a Circuit diagrams - standard version

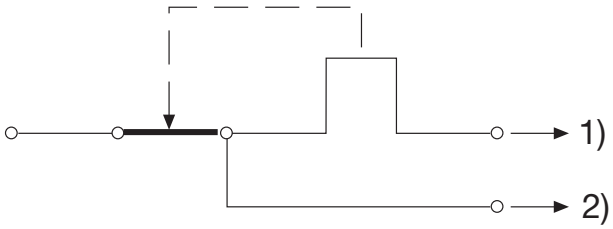


Fig. 6b Circuit diagrams - shunt terminal

THERMAL-MAGNETIC CIRCUIT BREAKERS

Overcurrent protection

General information circuit breakers

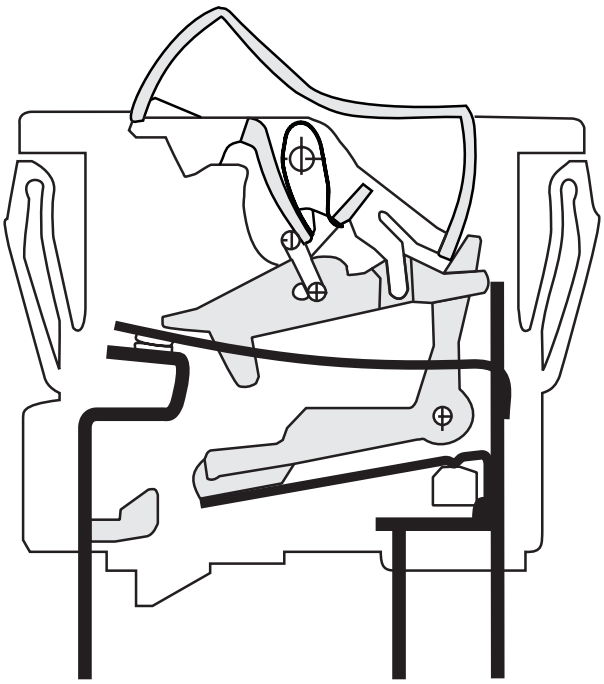


Fig. 1 Thermischer CBE

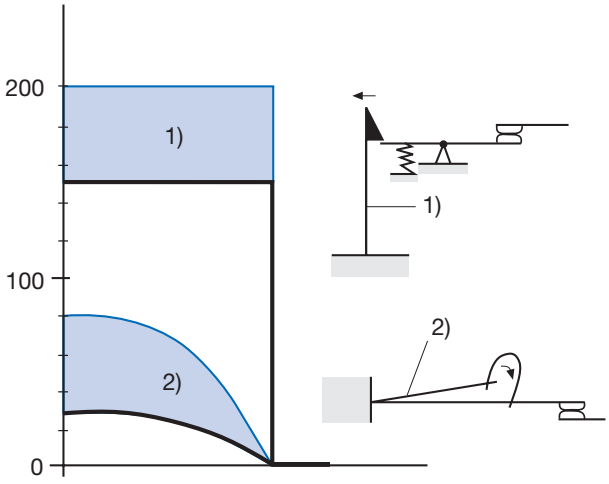


Fig. 2 Contact force versus deflection
1) Latch-type mechanism
2) Spring-type mechanism

Circuit breakers for equipment, CBEs, provide protection against hazards of electricity in equipment. For the TA45-line «Protection» includes the safeguarding against harmful thermal effects of overcurrents and the prevention of accidents caused by electricity.

Overcurrent protection is achieved by the automatic interruption of sustained overcurrents with the help of a thermal release tripping the CBE when the duration of an overcurrent exceeds a predetermined limit. The essential part of such a release is a thermo bimetal (figure 1, figure 6a). This mechanical element can simulate the heating effect of the current, can transform electric energy into a motion (deflection) and trigger a mechanism to cause automatic interruption of the current which produces these effects.

To use the heat created by the current instead of the magnitude of the current itself offers a great advantage, because heat determines the admissible stress of the insulation and the admissible duration of the various overload conditions encountered in practical applications. Thermally operated CBEs, therefore, take good care of the surplus energy required for start-up or high-torque operation of motors. They cope well with high inrush spikes which occur in switching power supplies, transformers, tungsten filament lamps, etc. and avoid nuisance tripping due to such transients.

Bimetals can also handle frequencies in a fairly wide range, e.g. from DC to 400 Hz, without necessitating any change in ratings or characteristics. The CBEs of the TA45-line use a «latch-type» thermal release. High contact force can be maintained until the unit trips. This prevents electrical «noise» due to contact bounce and reduces the risk of contact welding which may occur with spring type mechanisms (figure 2).

Thermally operated CBEs are temperature sensitive. This, in most applications, is an advantage because the withstand capacity of the component to be protected is almost always temperature sensitive too.

Overcurrent protection by thermal magnetic CBEs

Thermal magnetic CBEs have two releases to achieve automatic interruption of an overcurrent (figure 7):

1) A thermo-bimetal for overload current
2) An electro magnet for short circuit current

Consequently, the operating characteristic is essentially composed of two zones, linked by a zone (3) where either one or the other mode of tripping will be effective (figure 8).
The electro magnet should be dimensioned so that it will not trip during transients likely to occur in the intended application. This determines the level of the current below which instantaneous tripping should not occur.
The upper level, indicating the current above which instantaneous tripping must occur, is of interest in considerations concerning the selective action of two protective devices.
In the short circuit range of overcurrents (above 8....12 times the rated current), the faster interruption obtainable with the magnetic release is an advantage. It can help to save the heater windings of indirectly heated bimetals from overheating and it can improve the breaking capacity of the CBE. The CBEs primarily intended for overload protection are usually capable of interrupting, without back-up assistance, currents up to 100 to 300 amps and be fit for further use after such an interruption. The performance at higher fault levels usually relies on back-up assistance by fuses or breakers.

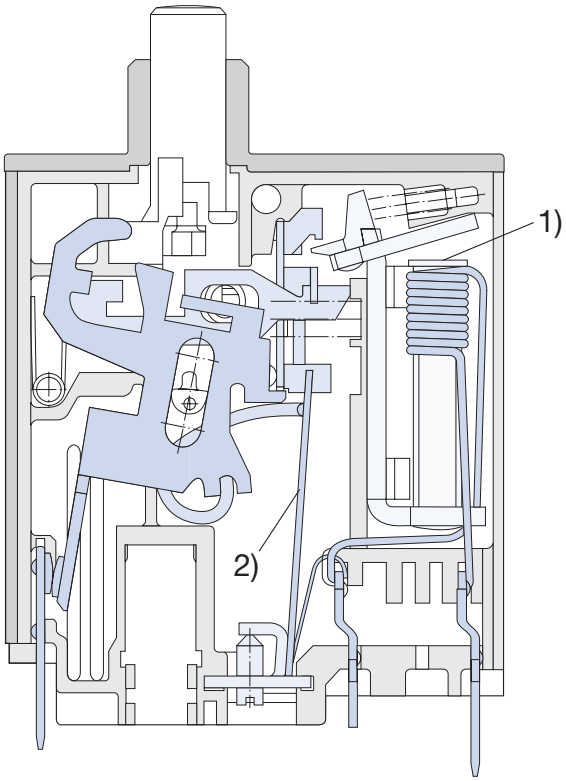


Fig. 7 Thermal-magnetic CBE
1) Thermo-bimetal
2) Electro magnet

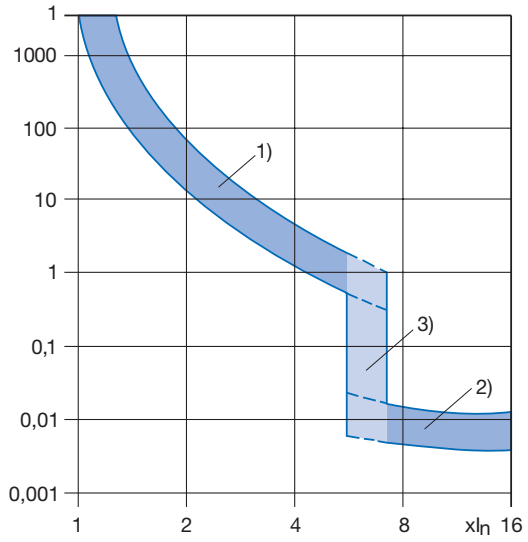


Fig. 8 Tripping zones of thermal magnetic CBEs
1) Thermal mode of tripping
2) Magnetic mode of tripping
3) Either thermal or magnetic mode

Prevention of accidents

The prevention of accidents can be achieved in several ways. To safeguard persons from the possible risks of injuries arising from an unexpected restarting of an electric motor when the voltage recovers after a power failure, undervoltage releases can be fitted to the basic CBE. This release will trip the CBE when the voltage drops below a certain level. The restarting requires a manual ON operation.

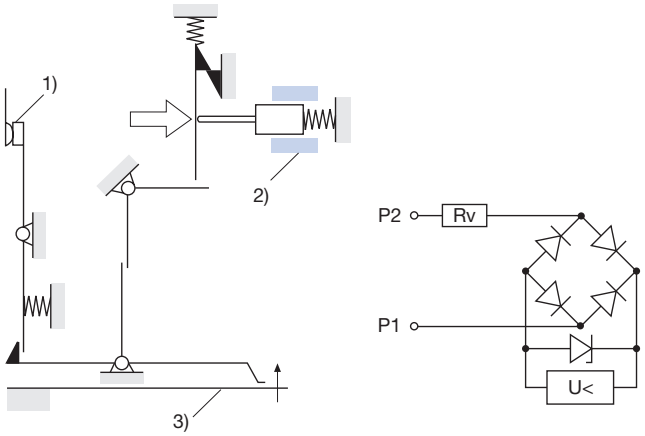


Fig. 3 Undervoltage release

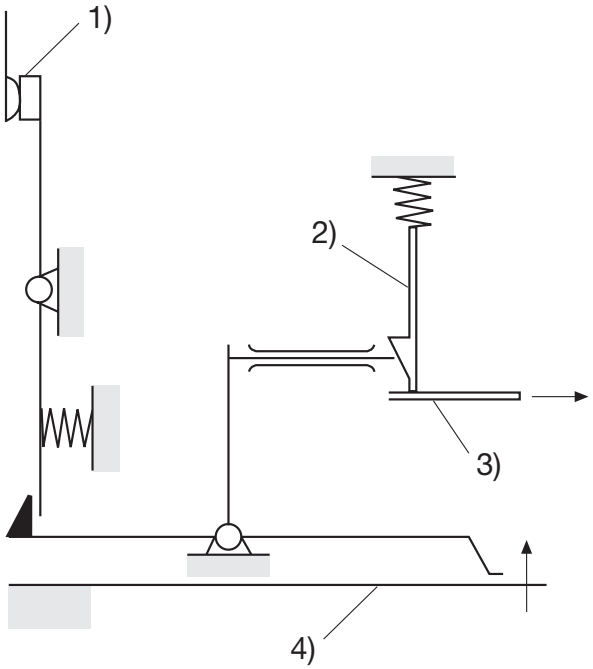


Fig. 4 Mechanical lock-out latch

Undervoltage releases can be combined with overcurrent releases in one integral unit. The TA45-line utilizes a special version of an undervoltage release as illustrated by figure 3. It differs from the conventional version by using an additional latch, reducing the anlatching force significantly. The release can thus be operated with far less power and utilize rectified AC to avoid any humm while the CBE is in the ON position. The wiring diagram is shown by figure 6b. Typical examples for the use of undervoltage releases are floor cleaning machines, high pressure cleaning equipment etc.

To prevent injuries caused by dangerously exposed moving parts of a machine, a mechanical lock-out latch can be fitted to the basic CBE. A spring loaded pin will cause the CBE to trip when a protective cover is removed from dangerous parts, like the cutting knifes of a shredder. The CBE can not be switched ON as long as the protective cover is not in its place. Figure 4 shows the operating principle. Figure 6c shows the wiring diagram.

Protection may also be necessary when at a remote location a dangerous situation occurs which could escalate if the CBE did not interrupt the current. To avoid such a risk, a remote trip release ca be fitted to the basic CBE to achieve tripping on sensor command. The operating principle is shown by figure 5, the working diagram by figure 6d.

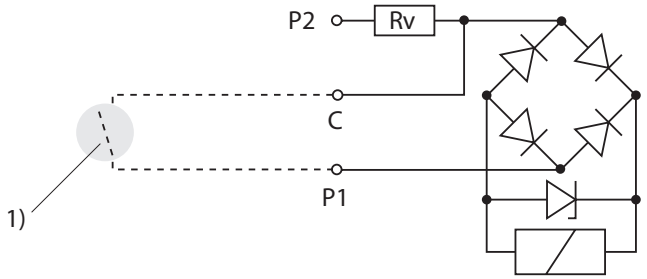


Fig. 5 Remote trip release

The various possibilities of combining different protective functions is also reflected by the wiring diagrams as shown in figure 6.

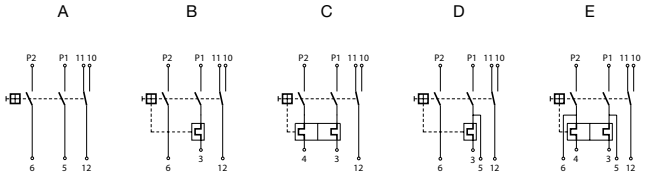


Fig. 6a shows the wiring diagram fo the basic CBE, with one protected pole. The TA45 can be outfitted with two protected poles for additional safety against faults to earth.

Fig. 6e shows the more complex diagram, utilizing a shunt connection (P1-5) and a change over auxiliary contact.

The wiring diagrams for CBEs with an undervoltage release, a mechanical lock-out latch and a remote trip release are shown by Fig. 6b, d, and c.

CBEs of the TA45-line are available with rocker or push button actuators and protective covers to obtain the desired degree of protection.

Advantages

The strong points of the TA45-line are:

- Thermal overload protection
- Undervoltage release
- Remote trip release
- Mechanical lock-out latch
- 3 pole version
- Rocker actuation
- Push button actuation
- Auxiliary contact.
- Shunt terminal

Special features:

- Good simulation of the thermal behaviour of the protected component
- Capability of coping with start-up and inrush currents
- Suitability for a wide range of frequencies
- Simplicity / reliability
- Favourable price
- Approvals

METAL LINE

Input Systems METAL LINE

Various designs and materials, SCHURTER offers a wide range of possible designs and materials in order to create an ideal input system matching your individual requirements.

Surface and material

According to requirements and fields of application the switches and keypads are available with various housing materials.

The ideal material for rough environments is high quality stainless steel* with resistant surface. Especially for piezo switches, aluminium or flameproof unbreakable plastic versions are available.

For the mechanical switches, SCHURTER offers housings made of aluminium or diecasted zinc with nickel-plated surface in addition to stainless steel.

For external applications we certainly recommend resistant materials such as stainless steel or aluminum. An additional finish for the keypads is possible with a glass-bead coating.

* Stainless steel surfaces may have slight differences in colour as a result of different batches of preliminary materials.

Colour design

The surfaces of the input systems can be finished according to customer requirements.

Varnishing of switches and keypads in various signal colours is possible. Additional inscriptions are sealed by transparent lacquer. The aluminium housings of the switches can be delivered in various anodised colours. Colouring of the switches using powder coating is available on request.

Shapes and sizes

With a wide variety of shapes and sizes a broad range of standard solutions can be offered.

Keypads are available with round or rectangular actuators. The size of the switch surface is variable up to a diameter of 35 mm.

Piezo switches with a minimum mounting diameter of 16 mm can be adapted in shape and size to customer requirements. Adaptations for integration into individual layouts are also available at short notice.

Lettering / standard colours

Depending on the application and font, there are various lettering possibilities.

Switches and PC keypads are laser-lettered as standard. For special applications, the lettering can also be etched or engraved with a coloured background.

PC keypads with German, British or U.S. layouts are usually laser-lettered. Further country-specific letterings are available on request ex works.

The following standards can be used for key letterings:

Order index lettering

A = 001	0 = 027	CTRL = 053
B = 002	1 = 028	RETURN = 054
C = 003	2 = 029	SHIFT = 055
D = 004	3 = 030	LOCK = 056
E = 005	4 = 031	STOP = 057
F = 006	5 = 032	ENTER = 058
G = 007	6 = 033	BACK = 059
H = 008	7 = 034	LINE = 060
I = 009	8 = 035	EIN = 061
J = 010	9 = 036	AUS = 062
K = 011	= 037	AUF = 063
L = 012	- = 038	AB = 064
M = 013	. = 039	ON = 065
N = 014	x = 040	OFF = 066
O = 015	÷ = 041	UP = 067
P = 016	✳ = 042	DOWN = 068
Q = 017	= = 043	HIGH = 069
R = 018	# = 044	LOW = 070
S = 019	↔ = 045	ON/OFF = 071
T = 020	↕ = 046	START = 072
U = 021	→ = 047	
V = 022	← = 048	
W = 023	↓ = 049	
X = 024	↑ = 050	
Y = 025	% = 051	
Z = 026	√ = 052	

Symbols 053-060 and 067-072
are only for MCS 19 Metallic, MCS 30 Ring Illuminated and MSM series.

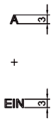
General product information

Standard colours for lettering

Stainless steel	black, filled lettering	
Aluminum natural	grey, filled lettering	Aluminum natural only after receipt of technical release statement of the customer.
Aluminum anodised	white, filled lettering	
Plastics	on request	

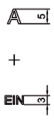
Lettering PSE / MCS / MSM:

PSE M16 indicator



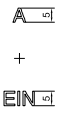
	Single characters	Helvetica normal DIN 1451-1E, Font size 3 mm
Symbols (037-052)	True Type symbol, Font size 3 mm	
Legends with max. 3 characters in a line	Helvetica normal DIN 1451-1E, Font size 3 mm	

PSE M16, M19, M24/27/30 RI



	Single characters	Helvetica normal DIN1451-1E, Font size 5 mm
Symbols (037-052)	True Type symbol, Font size 5 mm	
Legends with max. 3 characters in a line	Helvetica normal DIN 1451-1E, Font size 3 mm	

PSE M22 non-illuminated / point illuminated

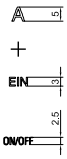


	Single characters	Helvetica normal DIN 1451-1E, Font size 5 mm
Symbols (037-052)	True Type symbol, Font size 5 mm	
Legends with max. 3 characters in a line	Helvetica normal DIN 1451-1E, Font size 5 mm	

MCS 19 non-illuminated / point illuminated, MCS 30 ring illuminated

	Single characters	Helvetica normal DIN 1451-1E, Font size 5 mm
Symbols (037-052)	True Type symbol, Font size 5 mm	
Legends with max. 3 characters in a line	Helvetica condensed DIN 1451-3E, Font size 2,5 mm	
Legends with max. 6 characters in a line	Helvetica condensed DIN 1451-3E, Font size 2,5 mm	

MSM 16



	Single characters	Helvetica normal DIN1451-1E, Font size 5 mm
Symbols (037-052)	True Type symbol, Font size 5 mm	
Legends with max. 3 characters in a line	Helvetica normal DIN 1451-1E, Font size 3 mm	
Legends with max. 6 characters in a line	Helvetica condensed DIN 1451-3E, Font size 2,5 mm	

MSM 19 non-illuminated / point illuminated

	Single characters	Helvetica normal DIN 1451-1E, Font size 8 mm
Symbols (037-052)	True Type symbol, Font size 8 mm	
Legends with max. 3 characters in a line	Helvetica normal DIN 1451-1E, Font size 3 mm	
Legends with max. 6 characters in a line	Helvetica condensed DIN 1451-3E, Font size 2,5 mm	

General product information

MSM 22 non-illuminated / point illuminated

	Single characters	Helvetica normal DIN 1451-1E, Font size 8 mm
Symbols (037-052)	True Type symbol, Font size 8 mm	
Legends with max. 3 characters in a line	Helvetica normal DIN 1451-1E, Font size 5 mm	
Legends with max. 6 characters in a line	Helvetica condensed DIN 1451-3E, Font size 2,5 mm	

MSM 30 non-illuminated / point illuminated

	Single characters	Helvetica normal DIN 1451-1E, Font size 12 mm
Symbols (037-052)	True Type symbol, Font size 12 mm	
Legends with max. 3 characters in a line	Helvetica normal DIN 1451-1E, Font size 7 mm	
Legends with max. 6 characters in a line	Helvetica condensed DIN 1451-3E, Font size 3,5 mm	

Integration as system solution

According to customer requirements, SCHURTER also offers complete function units. The switches or keypads are individually installed in the specific front panel. SCHURTER additionally offers completely assembled system solutions for integration of further components and electronic modules. An example is the desktop version for metallic panel keypads: the input system is installed in a desktop housing with integral trackball for mouse control.

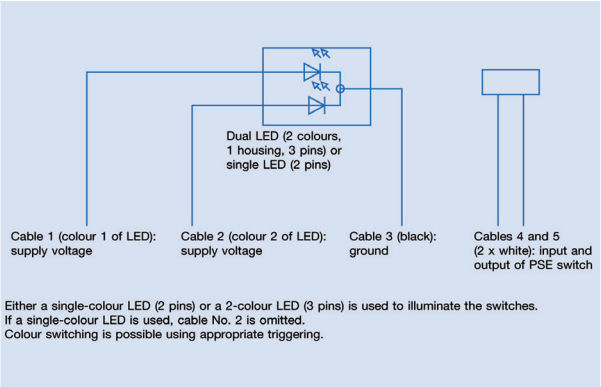
Lighting technology

1. Point illumination

SCHURTER offers the standard colours red, green, yellow, blue as well as bi-coloured red/green for the point illumination of the switches. Point illuminations in other colours are available on request.

Data of standard LEDs:

Colour	Forward current I_F [mA]	Forward voltage U_F [V]
red	40	2,0 (I_F = 10 mA)
green	40	2,0 (I_F = 10 mA)
yellow	40	2,0 (I_F = 10 mA)
blue	20	3,2 (I_F = 10 mA)
red/green (piezo switches)	20	2,0 (I_F = 10 mA)
red/green (switches with stroke)	25	2,0 / 2,2 (I_F = 20 mA)

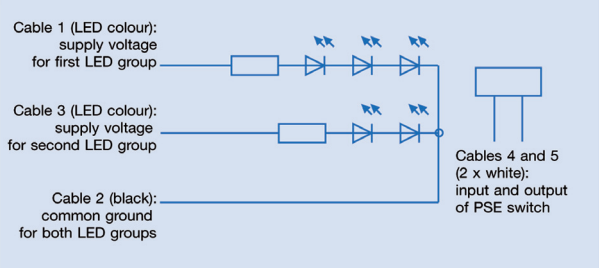


2. Ring illumination

This design is homogeneous and available in red, green, yellow, blue and bi-coloured red/green as standard colours. Ring illuminations in other colours are also possible.

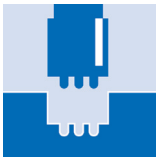
Data of standard LEDs:

Colour	Current I_F [mA]
red	20
green	20
yellow	20
blue	20



Characteristics for connection:
Supply voltage: 24 VDC

Connecting technology and switching options



1. Decoder

The metallic panel keypads are designed with an XY matrix. The PC keypads are available with a corresponding keypad decoder and can therefore be used as standard in German, British and U.S. versions. Further country-specific programming can be realised according to customer requirements ex works.

2. Interfaces

Depending on the version, AT PS/2 or USB connections are available as ports with mini-DIN or USB connectors.

3. Connecting technology

Depending on the design, the switches are available with quick connect terminals, flexible wires, pins or clip for pins. Plug-compatible adapters are available for the MCS 19 to achieve rational wiring of components.

4. Switching options

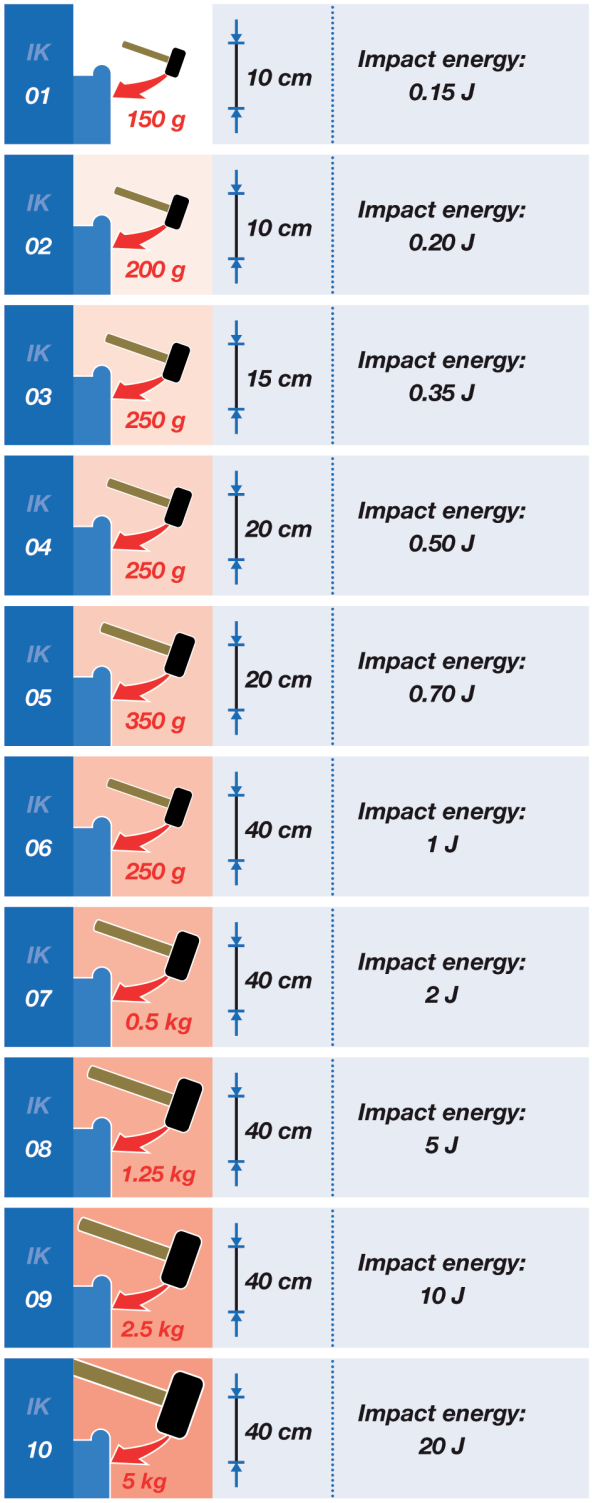
High capacity with the SCHURTER power card: the small design of the piezo switches only allows the switching of small signals or powers in general. With the SCHURTER power card, which is connected directly to the piezo switches, large powers can also be switched. The relays on the SCHURTER power card allow higher voltages, currents and powers to be used and significantly extend the range of applications of the piezo switches.

Increased ease of use is offered for the piezo switches by the prolonged signal version from SCHURTER. Piezo switches usually have a short closing pulse which depends on the activating force, duration and speed. For the piezo switches with prolonged signal, the signal is passed on for the duration in which the switch is pressed (max. 50 seconds).

Protection against pyroelectric effects for the piezo switches with prolonged signal is provided by a specially developed circuit which compensates any pyroelectric effects resulting from the occurrence of large changes in temperature. The switches with integral temperature compensation are of course tested for functional safety by using specific individual tests.

Protection aganist external mechanical use

The input systems of the SCHURTER metal line are protected against external mechanical use. The degree of protection is stated in IK values according to DIN EN 50102.



POWER ENTRY MODULES WITH FILTER

Same requirements are valid for filters as for RF suppression chokes.

INDUSTRIAL MAINS FILTERS

Frequency range 0.01 MHz ... 1000 MHz

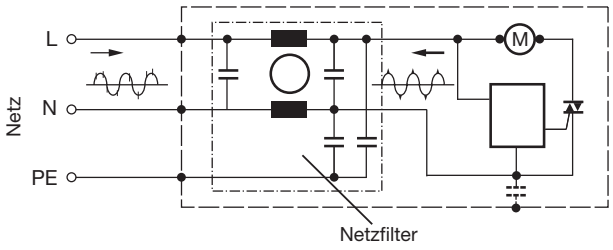
General information

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:

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)

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.

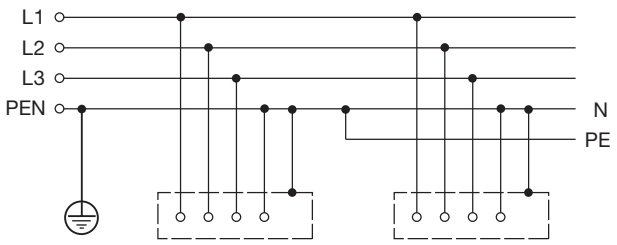
The line frequency f_N (50/60 Hz) may be exceeded under certain conditions. We recommend the users to consult in any case our technical department. DC power operation is possible in most cases.

Power distribution system

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

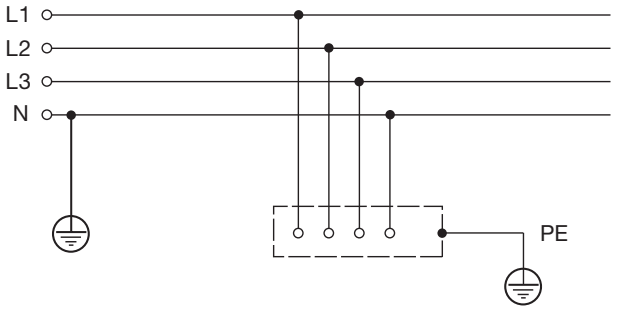
The TN POWER SYSTEM is a power distribution system having one point directly earthed, the exposed conductive parts of the installation being connected to that point by protective earth conductors. Three types of TN POWER SYSTEMS are recognized according to the arrangement of neutral and protective earth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

Example of a TN-C-S system



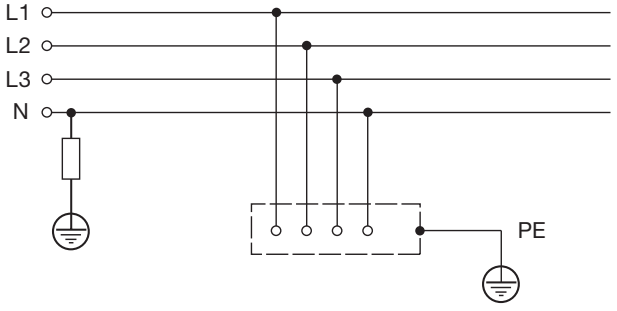
TN-C-S is in a system which neutral and protective functions are combined in a single conductors in a part of the system.

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/va. The SCHURTER range generally differentiates between two types of filters:

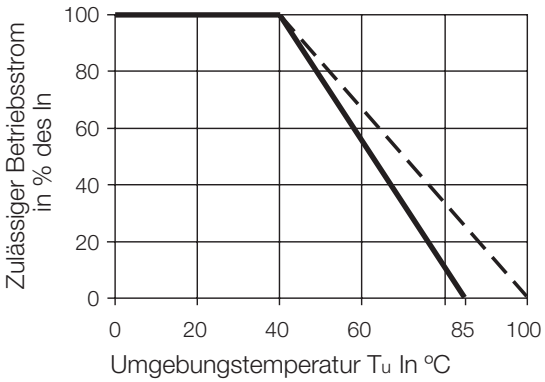
- High-current filter: va at I_N = 40°C
  va_{max} = 100°C
- All other filters: va at I_N = 40°C
  va_{max} = 85°C

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)

Leakage current

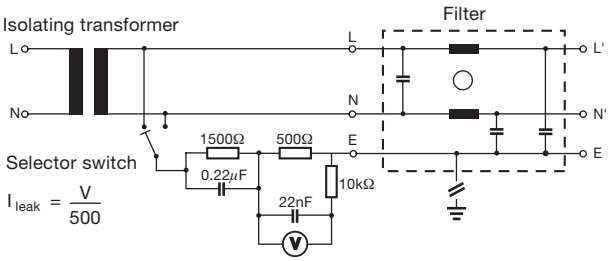
(see also chapter RF suppression capacitors: General information)
1-Phase measuring techniques

Measurment method

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).



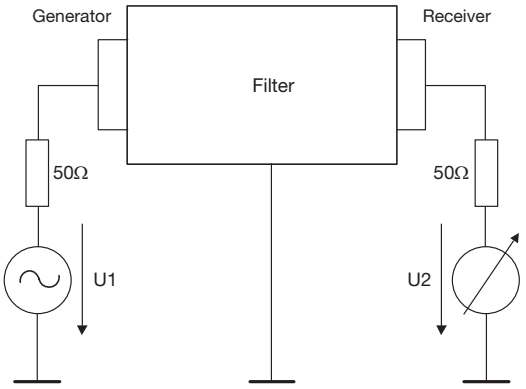
TT or TN Power System according to IEC 60950 - 5.2.3 - Annex D

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.

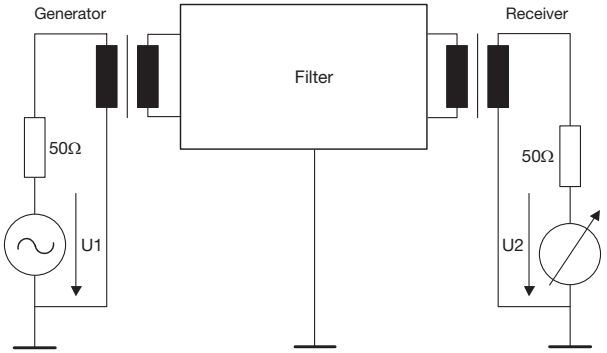
Insertion loss acc. CISPR 17 (common- and differential mode)

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



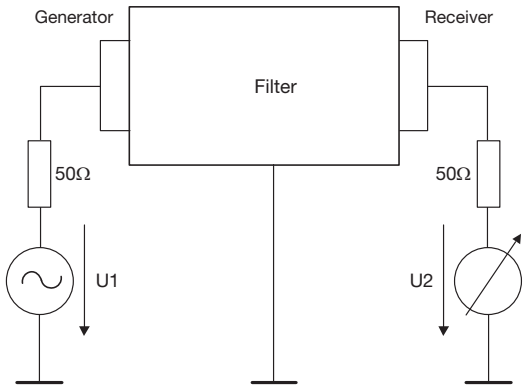
In differential mode measurements, the insertion transmission loss is measured between line and neutral through a balancing transformer; the earth wire is not used.
4-pole network with integrated balancing transformer for the measurement of insertion transmission loss in the symmetric case.

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:

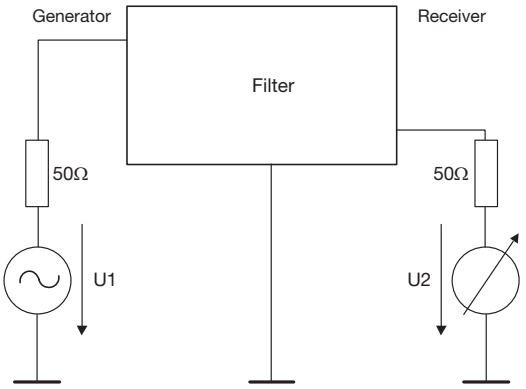
$$D_{dB} = \frac{20 \log (U_G)}{2\ U_2}$$

Insertion loss "alternate test method"

Asymmetrical measurement



Symmetrical measurement



The alternate test method allows the measurement in the GHz frequency range whereas the CISPR 17 method does not cover frequencies above 30MHz. The insertion loss is measured in a throughput method (common mode) and a cross coupled method (differential mode). The differential mode measurement of the alternate test method is not directly comparable to the conventional measurement acc. CISPR 17.

Voltage tests on noise suppression filters complying to EN 133200 II

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

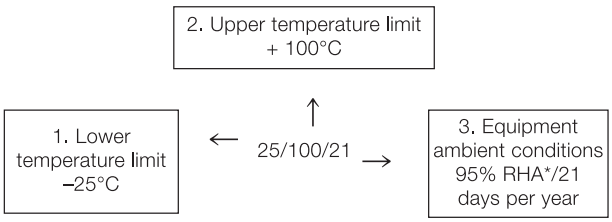
- 2 sec for production test
- 60 sec for types test

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).

Application classes (IEC 60068-1)

The aim of this standard is to create a basis for classification of telecommunication engineering electrical components according to application classes which correspond to their climatic and mechanical suitability.

Example:

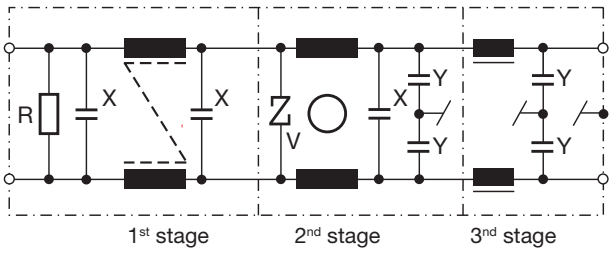


* relative humidity

MTBF

The high reliability of the filters can be excelled from MTBF (meantime between failures). These values are according MIL-HB-217-F class G_B at an amient temperatur 40§C at rated voltage and current.

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.

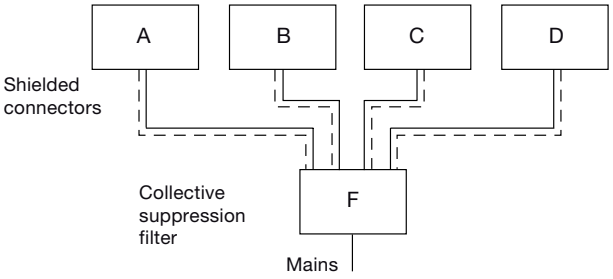
3rd stage

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

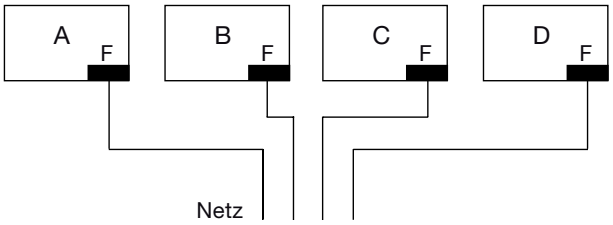
Three types of mains noise suppression filter assemblies are used in practice:

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



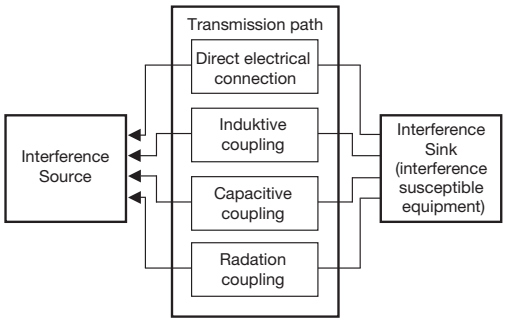
Combined single and collective suppressor

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.

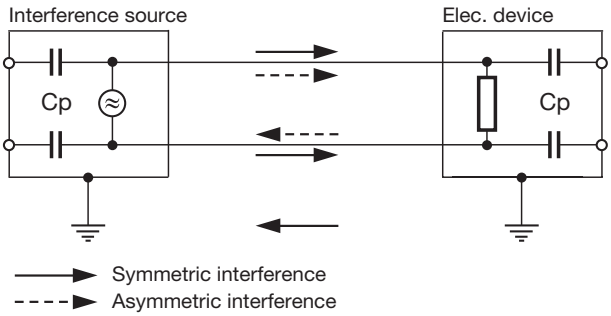
RF SUPPRESSION FILTERS impede the propagation of RF interference, generated by an electronic or electrical device into the mains. They also ensure an interference-free radio reception in the immediate vicinity.

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.

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

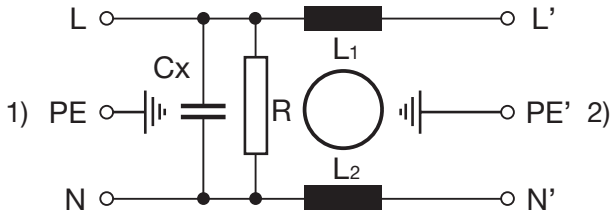
Leakage current classification

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

Medical filter

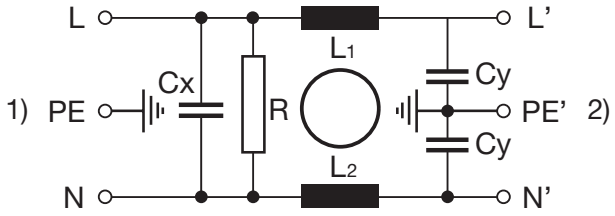
SCHURTER medical filters comply with UL544 and IEC 60601-1 standard specifications and are available in two versions, which differ in terms of their leakage current values.

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.

CHOKES

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:

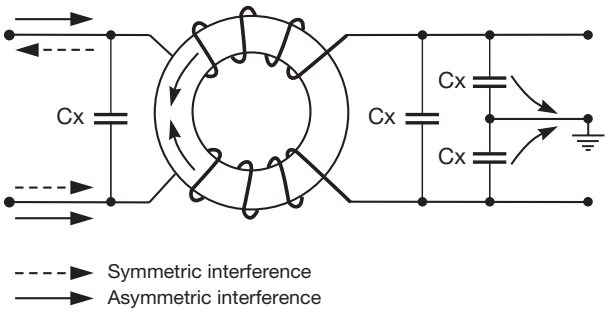
Maximum variation of 30% / +50% for compensated inductance,
15% / +15% for linear and storage
Testfrequency: 1MHz ± 20% at L 10 µH
100kHz ± 20% at 10 µH < L 1 mH
10kHz ± 20% at 1 mH < L 50 mH
50 to 120 Hz ± 20% at L > 50 mH
Testcurrent: 0.1 mA
Testtemperature: 25°C ± 3°C
Insulation resistance R_{is}: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

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

Temperature rise at nominal current: ΔT = 60°C
Short-circuit strength:
EN and VDE: not applicable
SEV→: 25 x I_N (2 half-waves)

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 U_{eff} = 250 V with increased electrical and mechanical safety and limited capacitance.

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

X2Y® filter

X2Y® filter combines the X and Y capacitors into a component that is in contact with the filter enclosure over a broad surface. The leads connecting the capacitors are thereby eliminated and parasitic impedances are reduced to a minimum. This results in broadband suppression into high frequency ranges.

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	EN 55011 Harmonics (IEC 61000-3-2) Voltage fluctuation (IEC 61000-3-3)
Harmonic (IEC 61000-3-2) Voltage fluctuations (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

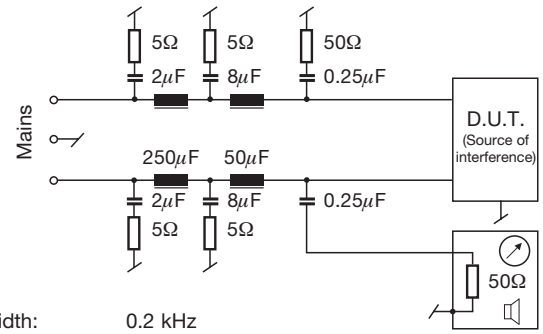
The most important safety standards for equipment/installations are listed in the following:

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 appartus
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

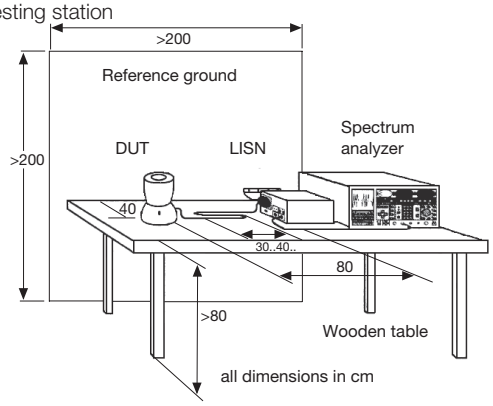


Bandwidth: 0.2 kHz
Impedance: 50 Ohm/1 MHz
Frequency range: 10 kHz–30 MHz

Test Receiver

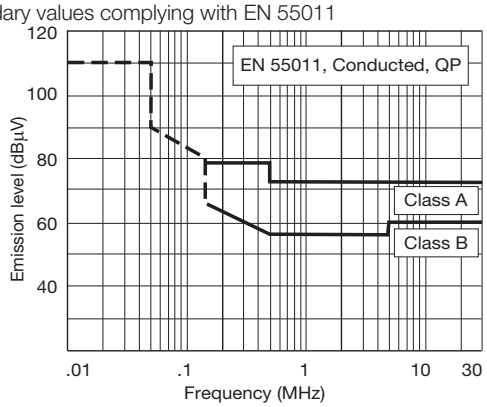
Radio frequency interference boundary values

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.

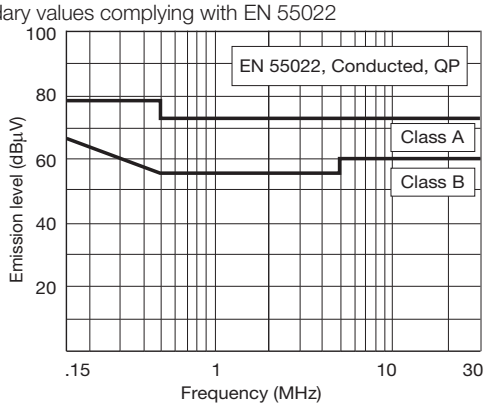
Boundary values are divided into class A and B.

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.
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.

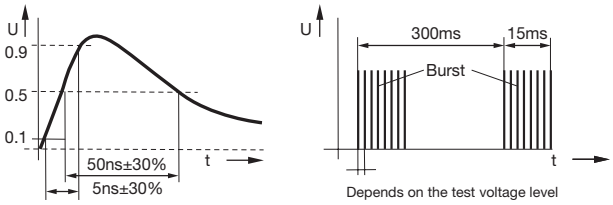
Burst

(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.

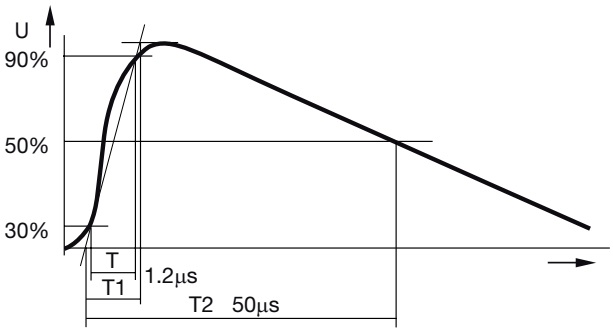
Surge

(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 communication 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 [2kΩ]	L/N → PE [12Ω]
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
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

PULSE TRANSFORMERS

Introduction

The application range of pulse transformers is very broad. In most cases, a signal or a control pulse must be transmitted between electrically isolated circuits. This problem exists in the activation of thyristors and triacs, or in the operation of FETs or IGBTs in highpower switching circuits. Another application involves electrical isolation in telephone switchboards and data transfer systems.

High insulation rating

When used in power electronics, the secondary side of pulse transformers is normally at a high voltage potential. This requires a high insulation strength for pulse transformers.

Complying with VDE 110 b, Part 1, the following test voltages between the primary and the secondary circuits are required for transformers of protection class I and choke coils, as a function of the working voltage:

Working Voltage [V]	Test Voltage U_{isol} [V]
250	1500
500	2500
1000	3000

Test voltage U_{isol}

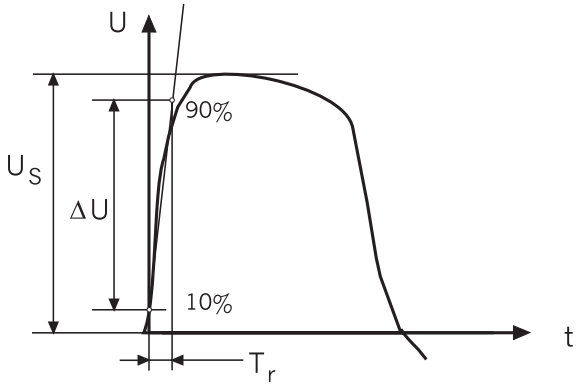
The test voltage for SCHURTER pulse transformers depend on the type of winding and coating on the coil wire. Exact information concerning each type is available in the technical specifications. The test voltage is in each case considerably higher than that prescribed by VDE 110 b.

Partial discharge voltage U_e

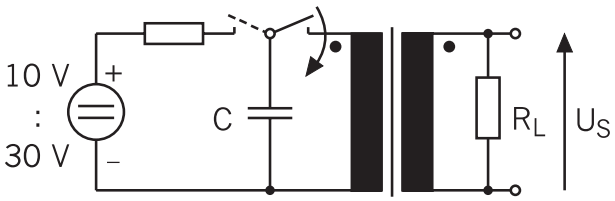
Partial discharges during normal operation have little effect on the operation of the circuit, but can accelerate the ageing of the pulse transformer. The glow discharge and the intermittent voltages are at least 50% higher than the approved working voltages for all SCHURTER pulse transformers. This provides the best assurance against long-term damage.

Definition of the rise time T_r

Over the almost straight-line in the lower 2/3 of the rise curve, i.e. in the area where the semiconductor is triggered with certainty, we draw a line and measure the time from 10% to 90% of the overall pulse height.



The measurement is made with the following circuit. The load resistance R_L is given for each type.



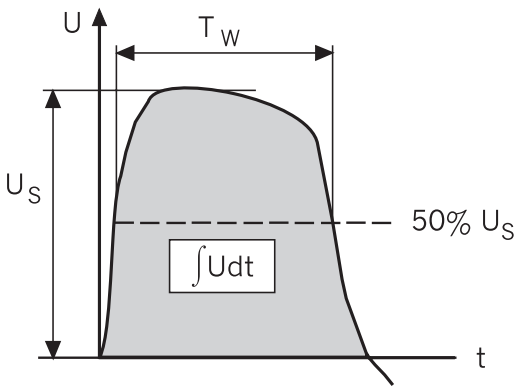
For a turn ratio of 1:1, the test voltage is 10V;
For a turn ratio of 2:1, the test voltage is 20V, and so on.

Trigger current I_{ign}

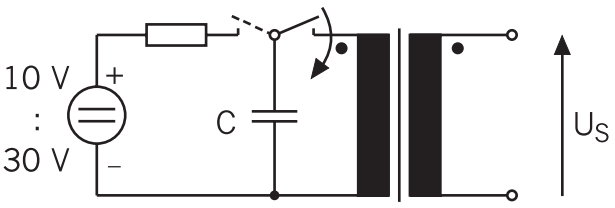
The maximum trigger current is a guide value. For a given current, the drop in voltage over the secondary winding resistance is smaller than one volt.

The voltage-time integral $U_s \cdot t_w$

The voltage-time integral is the product of the pulse height and width, measured at half pulse height. The voltage-time area is measured on the secondary side during operation under no load.



The voltage-time integral $U_s \cdot T_w$ is measured according to the principle of the following circuit. The same voltages as used for measuring the rise time are used.



Primary and secondary inductances L_p, L_s

Primary and secondary inductances are measured with a low-power signal of 0.1 mA/10 kHz at 25°C. The tolerance is -30% / +50%. The measured value can also vary up to ± 25% under temperature variation in the range 0°C to 70°C.

Coupling capacity C_c

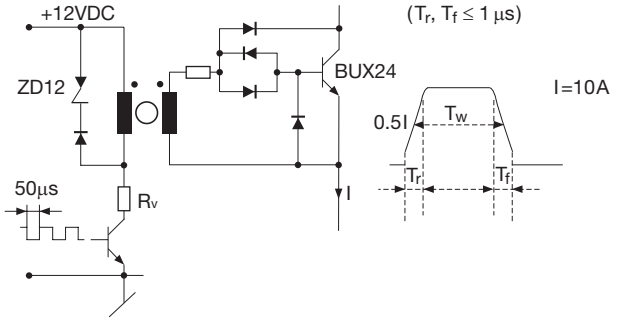
The coupling capacity is measured between the primary and one secondary winding. This value varies depending on the type of winding. Bifilar windings, designed for models with faster rise times, have higher coupling capacitances than the layer or selection windings.
In general, this value is not important with regards transmission properties. To guarantee effective interference protection from the control electronics, however, the smallest possible coupling capacity is desired.

Turn ratio N

In the given turn ratios, the first figure always refers to the primary winding. Hence a «1:1» pulse transformer has the same number of winding on both the primary and the secondary windings. The turn ratio «3:1:1» stands for one primary and two secondary windings with a transformation ratio of three to one between the primary and the secondary windings.

SCHURTER offers pulse transformers with other turn ratios than specified on the data sheets upon request.

Example of application



Power transistor in pulse operation

General information

UL approbation

The plastic cases and the potting resin of all SCHURTER pulse transformers are fire resistant in compliance with UL 94 V-0.

Abbreviations used in the technical data

∫Udt	Voltage-time integral ($U_s \cdot T_w$)
T_r	Pulse rise time
P_m	Power dissipation at ambient 50°C
P	Power dissipation at elevated temperature
ϑa	Ambient temperature
I_{ign}	Trigger current
C_c	Coupling capacity
R_L	Test load resistance (secondary)
R_p	Primary resistance
R_s	Secondary resistance
L_p	Primary inductance = L_s x N^2
L_s	Secondary inductance
U_{eff}	Working voltage primary-secondary in $_{VRMS}$
U_{isol}	Test voltage
N	Turns ratio

Code

I[1] T[2] N[3] F[4] - 0[5] 2[6] 35[7] - D1[8] 03[9]

[1] Pulse transf.
[2] T.. conventional
S.. SMD
[3] N.. normal
R.. small rise time
[4] A.. 1:1 / B.. 2:1/C.. 3:1
F.. 1:1:1 / H.. 3:1:1
[5] Brandlabel SCHURTER
[6] C_K:1..≤10pF / 2..>10..≤100pF
[7] Case code
[8] Trigger current
[9] Inductance

DRIVER MODULES

DC/DC converter module

The PSDM-0DN1-5040 module is a DC/DC power supply converter designed to provide a galvanic isolated, regulated and monitored power to IGBT and MOSFET drivers. The module requires an input voltage of $12V_{DC}$ ± 10% and has dual outputs of 15V and 4V with a maximum supply current of 140 mA. This DC/DC module has a unique diagnostic output permitting the user to monitor the converter output voltage and thus to avoid damage to the power stages resulting from under voltages.

IGBT driver modules

The IGBT driver modules PSDM-0DO2-5040 and PSDM-0DT2-5020 were developed to drive IGBT or MOSFET power transistors in an easy, safe and reliable way. The modules have an internal turnoff circuit that protects the output power stage in the event of a short circuit. The PSDM has an isolated DC/DC converter with a 2.4W output power for the drive circuit supply. (see PSDM-0DN1-5040). Data is transfered by an optocoupler or a transformer.

Connection description

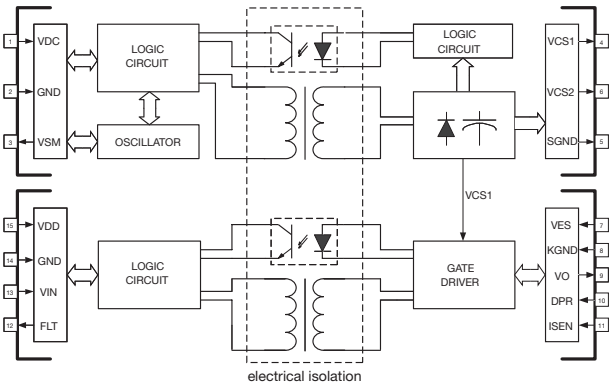


Fig. 1: PSDM

PIN1: V_{DC}
A stabilised voltage supply between 10V and 15V with respect to GND.

PIN2: GND
GND is connected to the frame of the electronic power supply.

PIN3: V_{SM}
This output refelects the output voltage of the DC/DC converter. When more current is needed at the output stage, the voltage across V_{SM} decreases. When V_{SM} reaches the value of the DC/DC converter power supply, then the DC/DC converter has reached the maximum transfer current.

PIN4: V_{CS1}
VCS1 is the isolated positive output power supply for the driver logic.

PIN5: SGND
SGND is the electrically isolated output ground from the DC/DC converter.

PIN6: VC_{S2}
VCS2 is the isolated negative output power supply for the driver logic.

PIN7: V_{ES}
VES is the external power supply for the driver logic. V_{ES} is connected to V_{CS2} to turn off the MOSFET/IGBT connected to the module.

PIN8: KGND
KGND is the isolated Kelvin ground that is connected to SGND.

PIN9: V_O
Output V_O is the signal output for the IGBT gate drive. In order to permit the switching speed to be set independently during turn-on and turn-off, two gate resistors and a diode must be used
(for example, R_{g1} = 22 Ω and R_{g2} = 100 Ω).

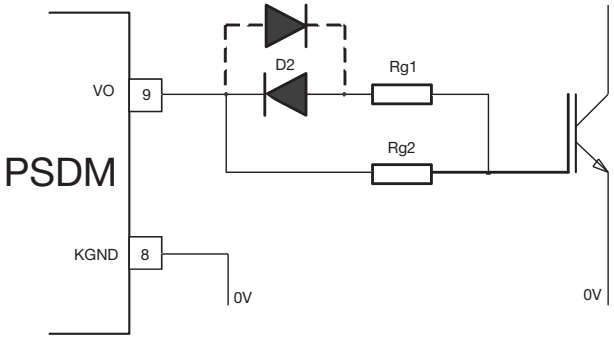


Fig. 2: Gate Driver

PIN10: D_{PR}
This connection is used to monitor the voltage drop across the turned-on current transistor, so as to provide protection against short circuits and overloading on the IGBT. This involves monitoring the collector voltage and turning off the power transistor if this voltage rises above a certain threshold value. The best method of detecting an excess threshold value is through the use of an external fast or super-fast high voltage diode D1 (for example 1N4937) and an internal comparitor. The PSDM has power transistor supervision, which monitors the collector voltage on the IGBT. Under normal operating conditions when the IGBT is turned on and saturated, the voltage across DPR is kept low. When the IGBT is no longer saturated or turned off, the internal current source (270 µA) will trip out the comparitor. The comparitor threshold value is typically 6.5 V (D_{PRth}). Resistor RRV is required to protect the PSDM from reverse voltage transients and should not be larger than 1kΩ. The fault event is transferred to the output pin FLT by an internal optocoupler.

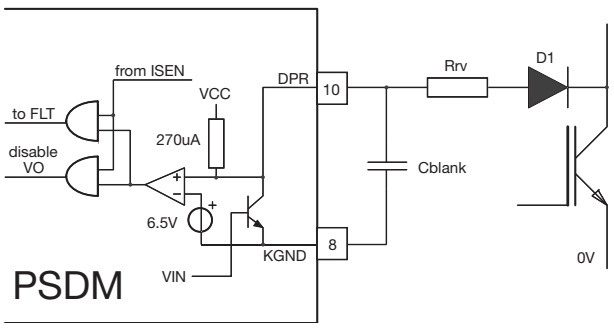


Fig. 3: Power transistor supervision D_{pr}

PIN11: I_{SEN}
Input I_{SEN} is required to check the supply current across Risen, serving thus as a protection against short circuits and overvoltages on the IGBT. An RC filter is used across pins 8 and 11 to attenuate any high

frerquency noise. If an overcurrent (V_{ISOC} > 65 mV) takes place across R_{ISEN}, IGBT will be turned off by an internal circuit. The signal fault is reset when another impulse appears at the signal input V_{IN}. In the event of a short circuit across the output (V_{ISSC} > 130 mV), inductance will be very small. Measured across resistor Risen, the short circuit signal is transfered by an internal optocoupler to the output pin FLT. If a short circuit is detected, the IGBT remains turned off until the next impulse (V_{in}).

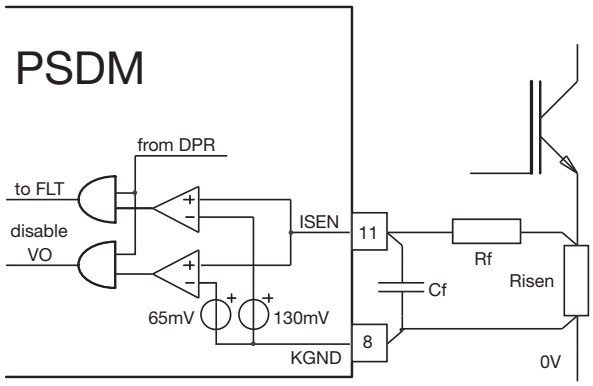


Fig. 4: Fault current detection I_{sen}

PIN12: FLT
The PSDM has an active fault output. This fault output is internally interfaced to an optocoupler. In a turned-on state, the current range of the optocoupler is between 10 to 20 mA, possessing a high impedance in the turned-off state. The integrated circuit is shown below.

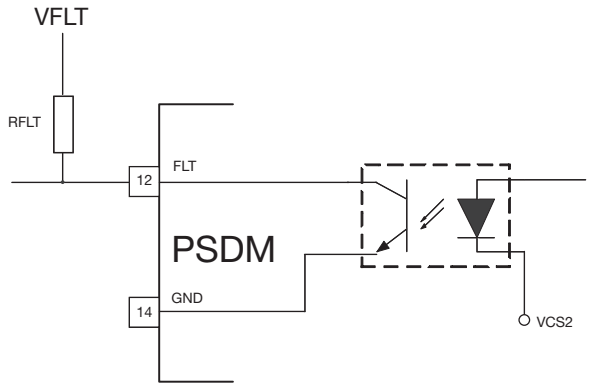


Fig. 5: Fault output

The FLT pin is only enabled when it is used together with a D_{PR} or I_{SEN} signal. Voltage V_{FLT} can be taken from 5V to 15V with a resistor. The supply current permitted is 10mA. In the event of a fault, output FLT is switched to GND.

PIN13: V_{IN}
This input has a SchmittTrigger characteristic. HIGH level turns the power transistor on, LOW turns it off.

PIN15: V_{DD}
A stabilised voltage supply between 4.5V and 5.5V with respect to GND.

Application example: Power supply 0-15V (figure 6)

With this circuitry example, an output voltage of 0-15V is generated at $V_{0.}$ The two functions fault current detection (ISEN) and power transistor supervision (D_{PR}) are inactively switched for this application. With this, SGND is connected to I_{SEN}, D_{PR}, V_{ES} and KGND. If necessary, a seprate resistor can be connected between V_0 and IGBT in order to optimize the turning on and off of the semi-conductor.

Application example: Power supply -4-15V (figure 7)

With this circuitry example, an output voltage of -4-15V is generated at V_0. The two functions fault current detection (I_{SEN}) and power transistor supervision (D_{PR}) are inactively switched for this application. With this, SGND is connected to I_{SEN}, D_{PR}, V_{ES} and KGND. If necessary, a seprate resistor can be connected between V0 and IGBT in order to optimize the turning on and off of the semi-conductor.

Application example: Power transistor supervision (figure 8)

In this example, power transistor supervision is presented for the IGBTs. For this, output V_{CS2} (-4V) is connected to V_{ES}. Supervision is actively switched with the connection of V_{CS1} to I_{SEN}. In addition, a high voltage diode is connected in series to a resistor between D_{PR} and the IGBT collector. The capacitor is switched from D_{PR} to SGND.

Application example: Fault current detection (figure 9)

With this example, a fault current detection circuitry is presented for the IGBTs. For this, output V_{CS2} (-4V) is connected to V_{ES}. A resistor R_{ISEN} is connected between I_{SEN} and KGND. An RC filter is used to attenuate high frequency noise. A capacitor is needed between D_{PR} and KGND.

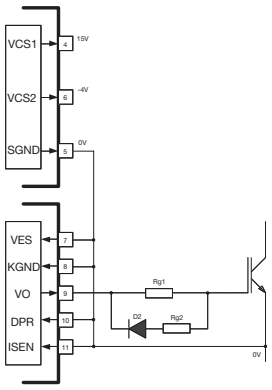


Fig. 6: Power supply 0-15V

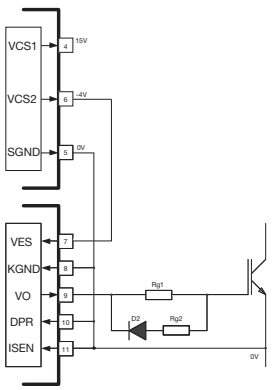


Fig. 7: Power supply -4-15V

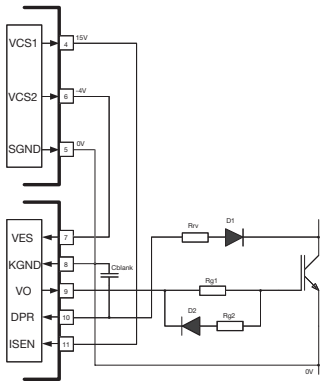


Fig. 8: Power transistor supervision

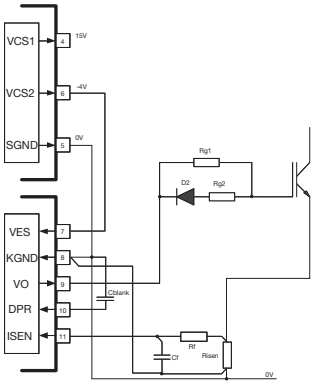


Fig. 9: Fault current detection

Automatic undervoltage turn-off

The PSDM module is equipped with undervoltage protection for the gate drive of the IGBT/MOSFET. Should the gate voltage be too low, the IGBT can quickly overheat; to avoid this, the undervoltage protection is arranged such that when the voltage drops below 10V, the gate voltage on the PSDM is turned off.

Layout and wiring (figure 10)

The driver module should be placed as close as possible to the power transistor so that the wiring is kept short. Long wiring connections should be avoided; it is recommended to twist the wires here.

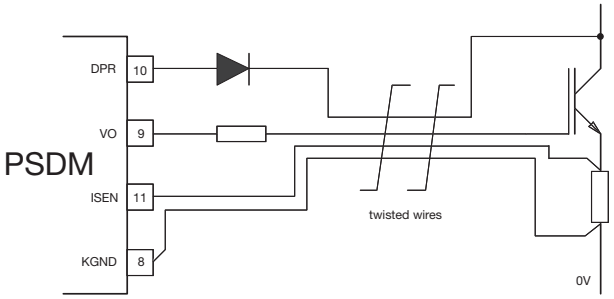
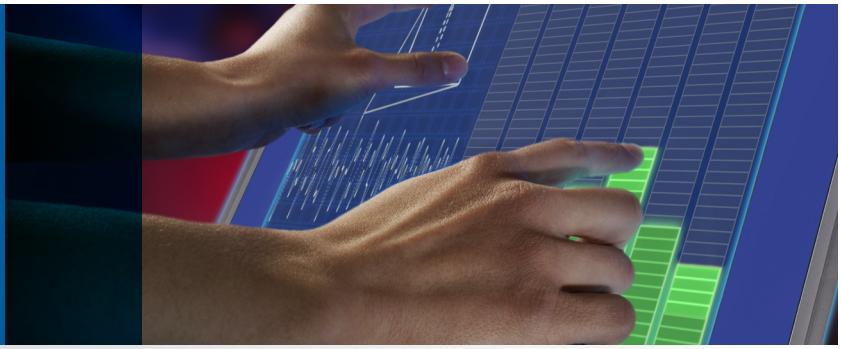


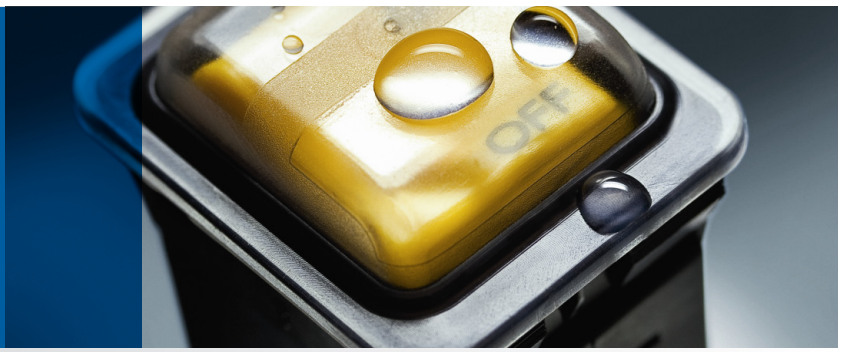
Fig. 10: Wiring



Touch screen with multi-finger operation

With the MFO (multi-finger operation) touch screen, data entry with two or more fingers at the same time is possible.

It is based on the 5-wire analog-resistive technology and is available in diagonal sizes of 3” to 22” and offers a variety of new designs and user interfaces. The driver software for the MFO controller enables a broad gesture recognition, many functions are available.



Circuit breaker TA35 spots factory-mounted protection cover

The TA35 circuit breaker 2-pole version is available with factory-mounted protection cover for protection class IP 65. There are transparent covers with or without raised collars respectively raised collars with or without protection covers.

This design reduces the installation time and also provides an attractive aesthetic. Typical applications are in medical, chemistry, food processing or woodworking equipment.

Keyword index

Keyword index

Keyword index

Keyword index

Keyword index

Keyword index

Keyword index

Type index

Type index

Type index

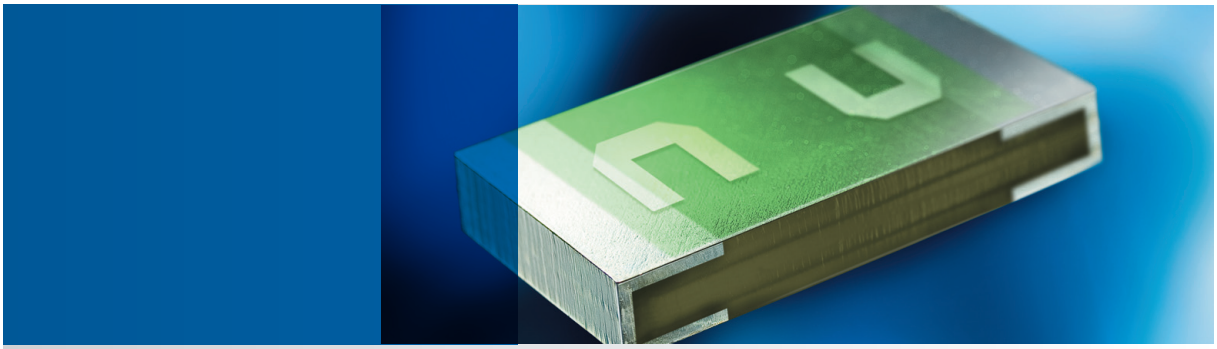
Type index

Type index

Index by order numbers

Index by order numbers

Index by order numbers



USI 1206: First IEC compliant secondary fuse with 1206 footprint

The 1206 footprint [3.2 x 1.6 mm] becomes standard size for industrial applications in secondary overcurrent protection. The "Universal Modular Fuse UMF" has quick-acting characteristic according to IEC 60127-4 and it saves space on the printed circuit boards and increases the density of components.

Compact power supply

Safe decoupling and simple installation. Energy efficiency in the design of electronic devices is becoming increasingly important. For this reason, much effort is being put into decreasing standby consumption.

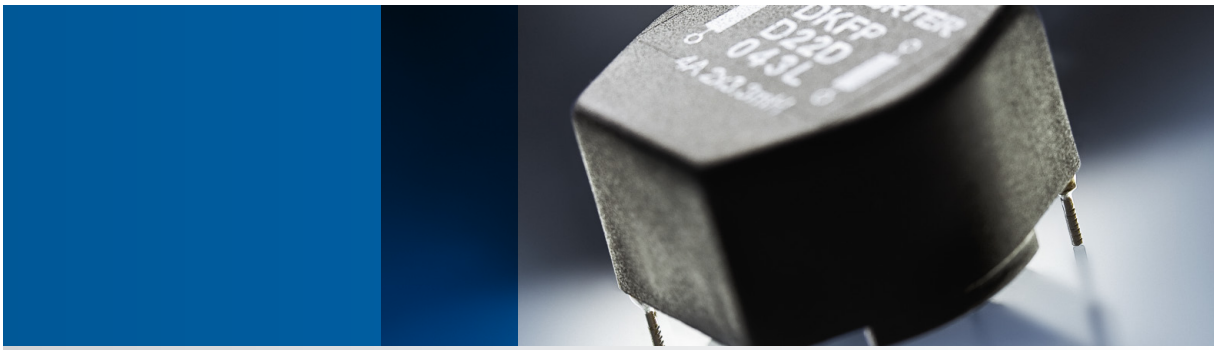
Reliable implementation is reflected in the secure decoupling by means of a mechanical switch. The aspects of service provisions, referenced usage standards, ergonomic requirements for operation, as well as the installation and processing methods are essential for the design of combined elements.

More information on this topic can be found here: www.schurter.com/white_paper

Metal switch with colored anodized design

Due to the design possibility for coloring the housing and the actuator, the MSM switch may be better adapted to the housing design.

With the signal colors red and green the switching function of the MSM switch can be visually enhanced. For this version the housing or the actuator is made of aluminum.



Extended range of current-compensated chokes

The rated voltage of the DKFP current-compensated chokes is 250 VAC. The chokes with currents of 300 mA to 10 A are designed for temperatures between –40 °C und +125 °C. The chokes are available in both vertical and horizontal versions.

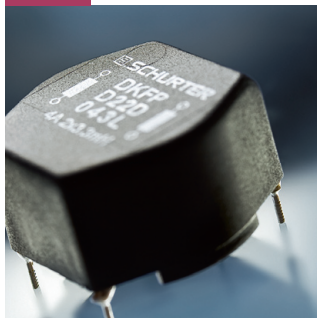
The DKFP current-compensated chokes have high interference elimination for common mode interferences less than 20 kHz to 100 MHz.

V-LOCK

1681 | 1658 | 1659

57007 | 6100

DKFP



FMBB NEO

FMER SOL

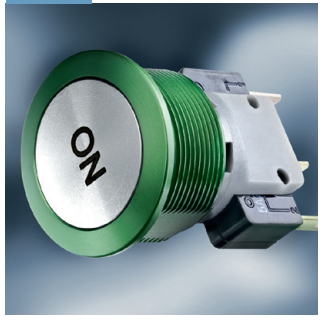
TA35

TA35 with rotary knob

USFF 1206

FMBC NEO | FMBD NEO

MSM

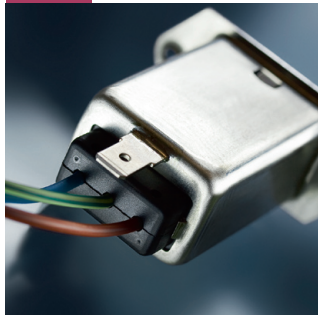


MSM CS

ASO | FSO

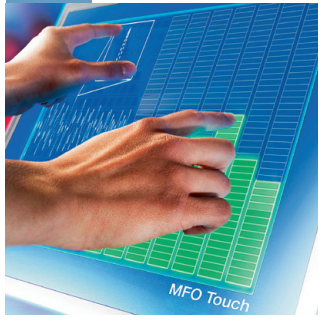
5008

5120EX



PSE EX

MFO Touch Screen



GFG Touch Screen



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