general product information

PRODUCT STANDARD - EQUIPMENT STANDARD

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

COMMENTS ON DEFINITIONS USED

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

CE MARKING CE ACC. TO EU-DIRECTIVES

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

CONFORMITY TO COMPONENT STANDARDS, NATIONAL APPROVALS

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

NATIONAL APPROVALS

(Mark)	European Norms Electrical Certification	
(Mark)	VDE	Verband Deutscher Elektrotechniker
(Certificate of conformity with factory surveillance)		
	UMF	Universal Modular Fuse meets the standard IEC 60127-4
(Recognition)	UL	Underwriters Laboratories (USA, Canada)
(Listing)	UL	Underwriters Laboratories (USA, Canada)
(Recognition)	UL	Underwriters Laboratories (USA)

(Listing)	UL	Underwriters Laboratories (USA, Canada)
	CSA	Canadian Standard Association, Component Acceptance Service
	CSA	Canadian Standard Association
	CCC	China Compulsory Certification
	PSE	Japan Electrical Safety & Environment technology Laboratories
	KTL	Korea Testing Laboratory
	TÜV	Technischer Überwachungs Verein
	NF	Norme française
NNO	NNO	Numéro de nomenclature Otan (OTAN = NATO = North Atlantic Treaty Organisation)
GAM T1	GAM T1	Liste interarmées AIR MER TERRE de composants électroniques
	SEV	Schweizerischer Elektrotechnischer Verein
	BSI	British Standard Institute
	SEMKO	Svenska Elektriska Materielkontrollanstalten
	NEMKO	Norges Elektriske Materiellkontroll
	DEMKO	Danmarks Elektriske Materielkontrol
	FIMKO	Finnish Electrical Inspectorate
	ÖVE	Österreichischer Verband für Elektrotechnik
	KEMA	Keuring van Elektrotechnische Materialien
	IMQ	Instituto italiano del marchio di qualità

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

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

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

IP DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)

Standards IEC 60529; EN 60529

Scope

These standards apply to the classification of degrees of protection provided by enclosures for electrical equipment with a rated voltage not exceeding 72,5 kV.

Object

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

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

Designations

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

Elements of the IP Code and their meanings

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

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

PROTECTION AGAINST ELECTRIC SHOCK

1. Protection against direct and indirect contact General terms

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

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

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

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

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

3. Protection against indirect contact

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

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

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

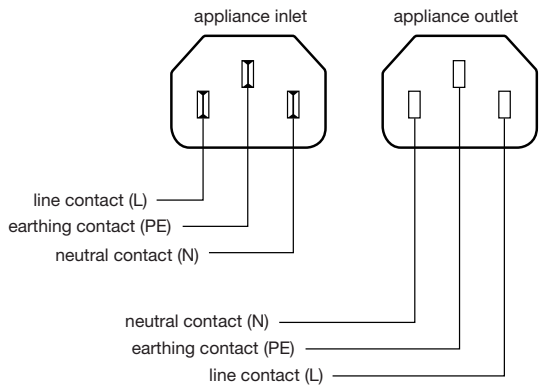
Their outlines are coded in a way, that appliance couplers for hot conditions may also be used under cold conditions and appliance couplers for very hot conditions may also be used under cold or hot conditions.

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

Contact positions

In non-reversible connectors, the contact positions shall be established by looking at the engagement face of the connectors and their disposition shall be as follows:



Definitions

Appliance couplers:

Enabling the connection and disconnection at will, of a flexible cable or cord to an appliance or other equipment. It consists of two parts:
· Connector
· Appliance inlet

Rewirable connector:

are constructed that the flexible cable or cord can be replaced.

Non-rewirable connector:

are constructed to be an integral unit with the flexible cable or cord.

Cord set:

is an assembly consisting of a flexible cable or cord complete with a non-rewirable mains plug and a non-rewirable connector, for connecting an appliance or other equipment with power.

Power interconnection:

is an assembly consisting of a flexible cable or cord with a non-rewirable plug connector and a nonrewirable cord connector, for connecting and disconnecting of any unit or equipment with a power cord to an other unit or equipment.

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 terminations a high number of variations is available.

All SCHURTER standard and non-standard coupler systems meet the

relevant requirements of product safety proved by multiple approval markings of international testing agencies.

comparison chart metric-AWG wire sizes

AWG	CSA in mm²	closest stdd. equivalent in mm²
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

type and min. nominal cross-sectional area for flexible cords or cables

type of connector	types of flexible cords or cable	nominal cross-sectional area (mm²)

type and min. nominal cross-sectional area for flexible cords or cables

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		

FUSEHOLDERS, PART OF A POWER ENTRY MODULE

Explanations, thermal requirements, selection criteria

1. 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:

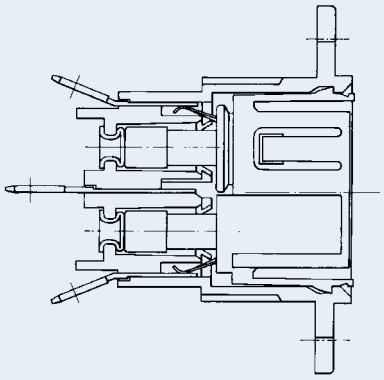
Category	Features
PC1	**Fuseholders without integral protection against electric shock.** They are only suitable for applications where corresponding additional means are provided to protect against electric shock.
PC2	**Fuseholders with integral protection against electric shock** live part is not accessible: - 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.

Extra-safe handling with SCHURTER power entry modules

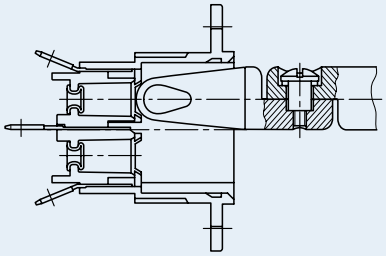
Protection against contact with live parts is an important aspect when dealing with electrical connecting devices. Both your customers and your servicing engineers will appreciate the greatest possible protection against accidental contact with live parts something which can easily happen as a result 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

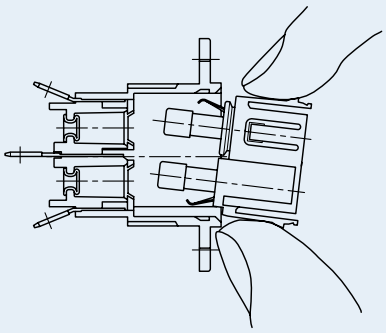
Closed fuseholder and appliance inlet.



It is not possible to touch any live parts on the SCHURTER fuseholders when the fuse-carrier is extracted.



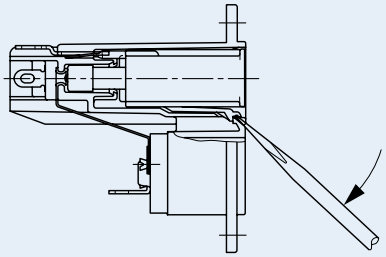
When a fuse-link 5 x 20 mm or 6,3 x 32 mm (1/4'' x 11/4'') is inserted or replaced, neither the fuse nor the fuse-carrier can come in contact with any live parts.



The **Extra-Safe versions** of shock-safe power entry modules are now available.

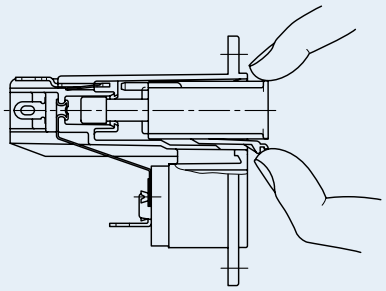
They are thus also able to satisfy requirements of the following standard: IEC 60601-1 (medical equipments)

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 the be inserted by hand.



2. Thermal requirements of the fuseholder

2.1. 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 temperatures outside and inside of the equipment.
4. Length and cross section of the connecting wire.
5. Heat dissipation/cooling, ventilation. Heat influence of adjacent components.
6. Frequency of electrical load alternation
7. Long time operation (>500 h) with load >0,7 I_N

2.2 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.

2.3 Rated power dissipation of the fuse-link

(power dissipation at rated current)
See sep. catalogue "fuses".

2.4 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:

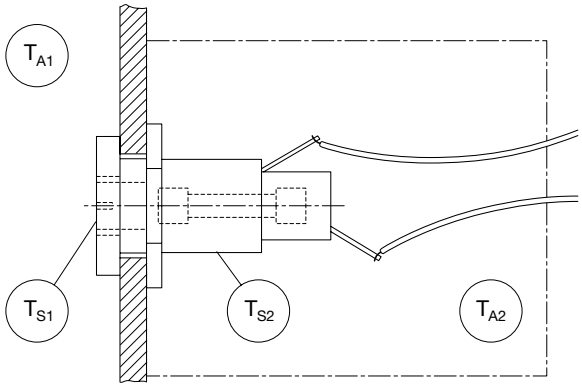
Fuseholder surface area	Maximum allowable temperature measuring points (see figure 1)	°C
1. Accessible parts [1]	T_{S1}	85
2. Inaccessible parts [1] Insulating parts	T_{S2}	[2]

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

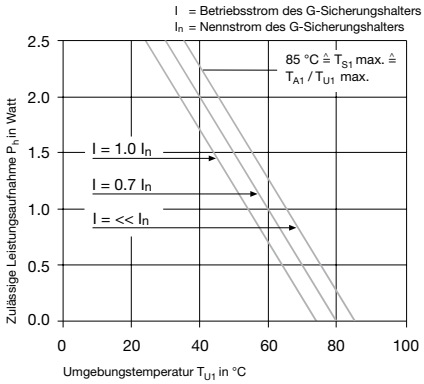


T_{A1} = ambient air temperature, surrounding the equipment
T_{A2} = ambient air temperature in the equipment
T_{S1} = temperature of accessible parts on fuseholder surface
T_{S2} = temperature of inaccessible parts on fuseholder surface

2.5 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.

TECHNICAL DATA TO LINE SWITCHES

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, 3-4 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, 3-4 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 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, 3-4 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

TECHNICAL DATA TO LINE SWITCHES

Line switch used by type	Technical data	
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
	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, 3-4 ms continuous current 5 A 10 000 switch operations
	Contact gap	≥3 mm