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 2006/95/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.

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			Electrical Certification
		VDE	Verband Deutscher Elektrotechniker
	(Certificate of conformity with factory surveillance)	VDE	Verband Deutscher Elektrotechniker
		UMF	
	(Recognition)	UL	Underwriters' Laboratories (USA, Canada)
	1) only for 3pole	UL	Underwriters' Laboratories (USA, Canada)
	(Recognition)	UL	Underwriters' Laboratories (USA)
	1) only for 3pole	UL	Underwriters' Laboratories (USA, Canada)
		CSA	Canadian Standard Association, Component Acceptance Service
		CSA	Canadian Standard Association
		CCC	Chinese Compulsory Certification
		CQC	Chinese Quality Certification (voluntary)
		PSE	Japan Electrical Safety and Environment technology Laboratories
		KTL	Korea Testing Laboratory
		TÜV	Technischer Überwachungsverein
		NF	Norme française
		SEV	Schweizerischer Elektrotechnischer Verein
		SEMKO	Svenska Elektriska Materielkontrollanstalten
		FIMKO	Finnish Electrical Inspectorate
		KEMA	Keuring van Elektrotechnische Materialien
		IMQ	Instituto italiano del marchio di qualità

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.

SCHURTER will check if a voluntary CQC registration can be done when a product does not apply with a Chinese standard.

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

Approval Industry Links

* members of ENEC agreement:

Reference	Key	Country
01	IMQ	Italy
02	KEMA	Netherlands
03	VDE	Germany
04	SEV	Switzerland
05	SEMKO	Sweden

IP DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP CODE)

Standards IEC 60529; EN 60529 and DIN 40050

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

Information about IP Protection

Information about IP protection levels may vary depending on mounting or application for the various components. Following explanations are supplemented for this purpose.

There are cases where more than one IP value is mentioned for a product. Then this values are separated by a slash or by the term "or". This information is given for families or on series level to indicate that there are different variants with respective IP protection degrees. In some cases there will be further information about the respective conditions to ensure the tightness said.
e.g.. 40 / 54 with sealing kit

IP Protection from Front Side

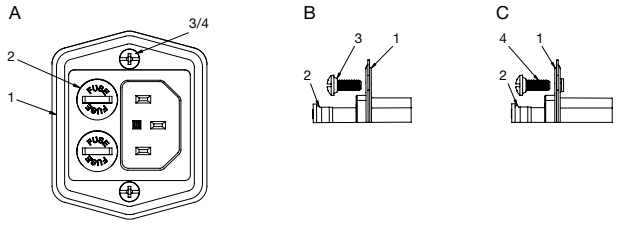
This mounting perspective means the protection against the ingress of foreign substances from the outside into the interior of the appliance. Accordingly, it comes to the sealing of the offered component against the housing and also the sealing of moveable elements which are accessible from the outside.

IP Protection from Rear Side

This is basically the opposite to the mounting of the front side. The listed IP value means the protection level from the rear side of the selected part, so it is focusing on the inside of the appliance. This information can be important when there is an intention of potting the components inside the housing. This specification is also noted whether a component is suitable for this process.

Detailed IP Information According to Product Feature

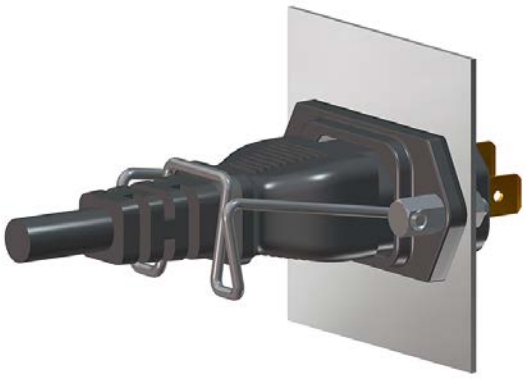
If the IP rating of a component is particularly high, then the respective sealing areas have to be addressed in detail in order to explain the requirements for a successful sealing. These detailed mounting instructions are correspondingly provided for the respective products.
The sealing from the component towards the housing is the primary goal. Accordingly here the seal is described against the flange and the attachment area. In addition, more information coming from the moving parts, or even the insertion region.
Mounting standard versionA) front viewB) detail front mounting typeC) detail rear mounting type



A) Front view B) Details of front mounting C) Details of rear mounting
1) sealing of flange 2) sealing of fuseholder 3) sealing of screw hole (front mounting type: sealing ring on screw head) 4) sealing of screw hole (rear mounting type: sealing on screw thread)

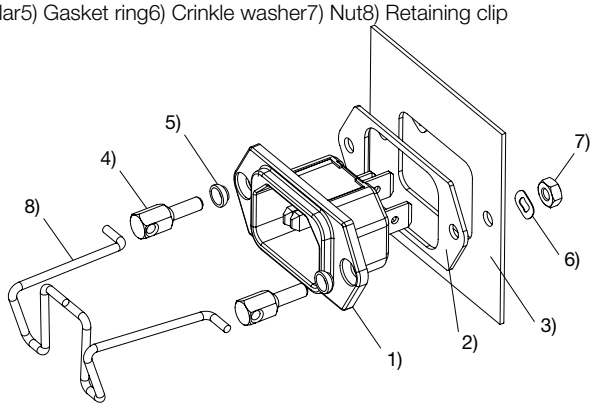
Information on IP Protection in Unmated and Inserted State

In connector systems, the operating condition is taken into account if a unit has to be tight under current supply, this corresponds to the so-called inserted state.
6100-3 with sealing kit IP 54



Otherwise, it may happen that a device must be sealed for transport or cleaning phase in which the power supply cable is not connected to the device. This mentioned case is referred to IP protection when unmated..

Available products to enhance the IP protection level are listed as accessory products. It is important that the necessary components are used according to the specifications as for example using a connector with the proposed cord retainer.
6100-3 incl. sealing kit for IP 541) Appliance inlet 6100-3 with factory-mounted inlet gasket2) Flat gasket3) Chassis4) Pillar5) Gasket ring6) Crinkle washer7) Nut8) Retaining clip



1) Appliance inlet 6100-3 with factory-mounted inlet gasket 2) Flat gasket 3) Chassis 4) Pillar 5) Gasket ring 6) Crinkle washer 7) Nut 8) Retaining clip

Product Overview with IP Protection Level Indication

The IP values are depending on the product range optional or recommended selection criteria in the catalog refinement search. The complementary accessories and matching components are referenced in the respective product data sheets.

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.

Pulse Transformers

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}

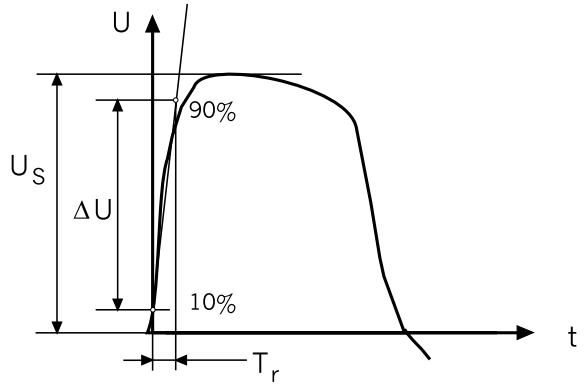
The test voltage for SCHURTER pulse transformers depend on the type of winding and coating on the coil wire. Exact information concerning each type is available in the technical specifications. The test voltage is in each case considerably higher than that prescribed by VDE 110 b.

Partial discharge voltage U_e

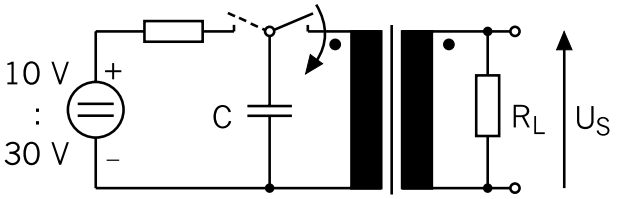
Partial discharges during normal operation have little effect on the operation of the circuit, but can accelerate the ageing of the pulse transformer. The glow discharge and the intermittent voltages are at least 50% higher than the approved working voltages for all SCHURTER pulse transformers. This 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.



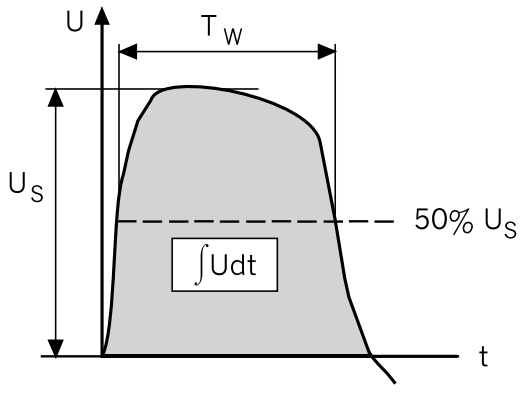
For a turn ratio of 1:1, the test voltage is 10V;
For a turn ratio of 2:1, the test voltage is 20V, and so on.

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.

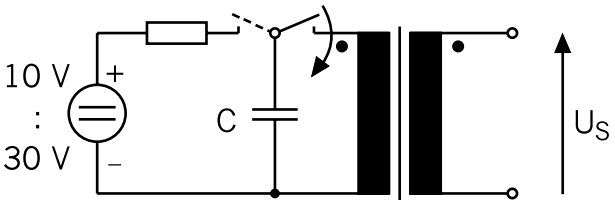
The voltage-time integral $U_s \cdot t_w$

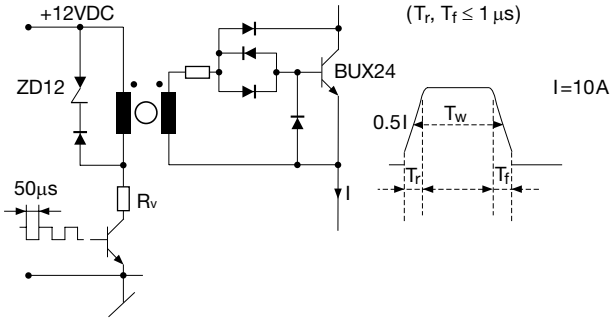
The voltage-time integral is the product of the pulse height and width, measured at half pulse height. The voltage-time area is measured on the secondary side during operation under no load.



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.





Power transistor in pulse operation

Primary and secondary inductances L_p, L_s

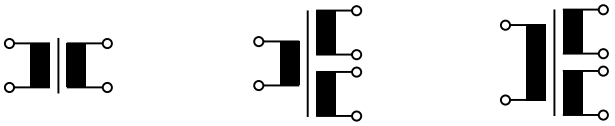
Primary and secondary inductances are measured with a low-power signal of 0.1 mA/10 kHz at 25°C. The tolerance is -30% / +50%. The measured value can also vary up to ± 25% under temperature variation in the range 0°C to 70°C.

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

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·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

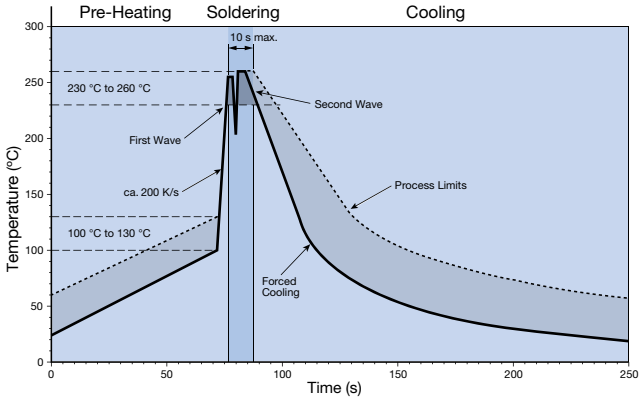
I[1] T[2] N[3] F[4] - 0[5] 2[6] 35[7] - D1[8] 03[9]

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

SOLDERING PROFILE

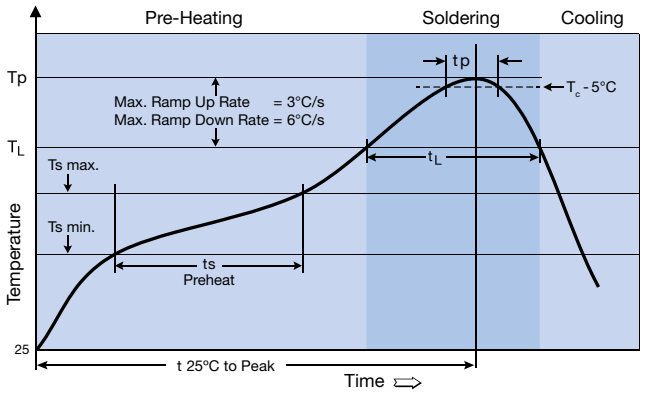
SCHURTER components for printed circuit boards are suitable for common solder processes. THT components can be wave soldered with a peak temperature of 230 to 260°C. SMD componets are suitable for reflow soldering with a peak temperature of 260°C.
Please note the soldering specification on the product data sheet.

Recommended Wave Soldering Profile



The solder temperature 230°C 260°c depends on the solder classification of the components.

Recomended Reflow Soldering Profile



Soldering Profile

Reflow feature		Pb-Free assembly
Preheat	Temperature Min ($T_{s\ min}$)	150°C
	Temperature Max ($T_{s\ max}$)	200°C
	Time (t_s) for ($T_{s\ min}$ to $T_{s\ max}$)	60 - 120 secs
Ramp-up rate (T_L to T_p)		3°C / secs max.
Liquidous temperature (T_L)		217°C
Time (t_L) maintained above (T_L)		60 - 150 secs
Time (t_p) below 5°C of max. peak temperature		30 secs max.
Ramp-down rate (T_P to T_L)		6°C / secs max.
Time 25°C to peak temperature		8 mins max.
Peak temperature maximum		260°C
* The peak temperature depends also on the component volume (see JEDEC J-STD-020D)		