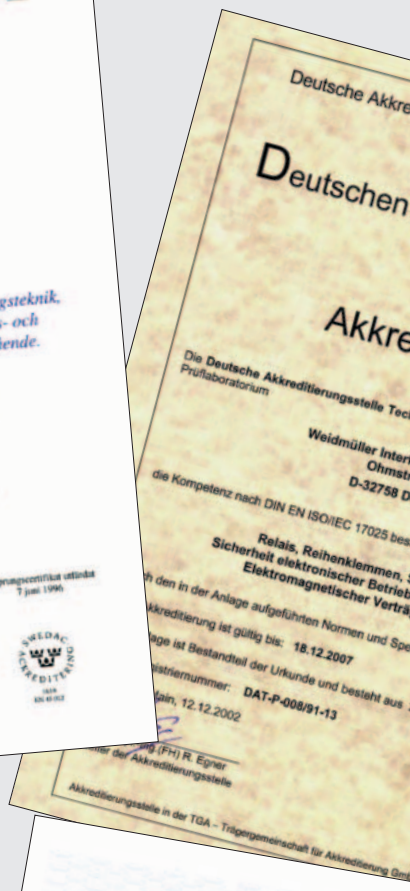
Technical dictionary

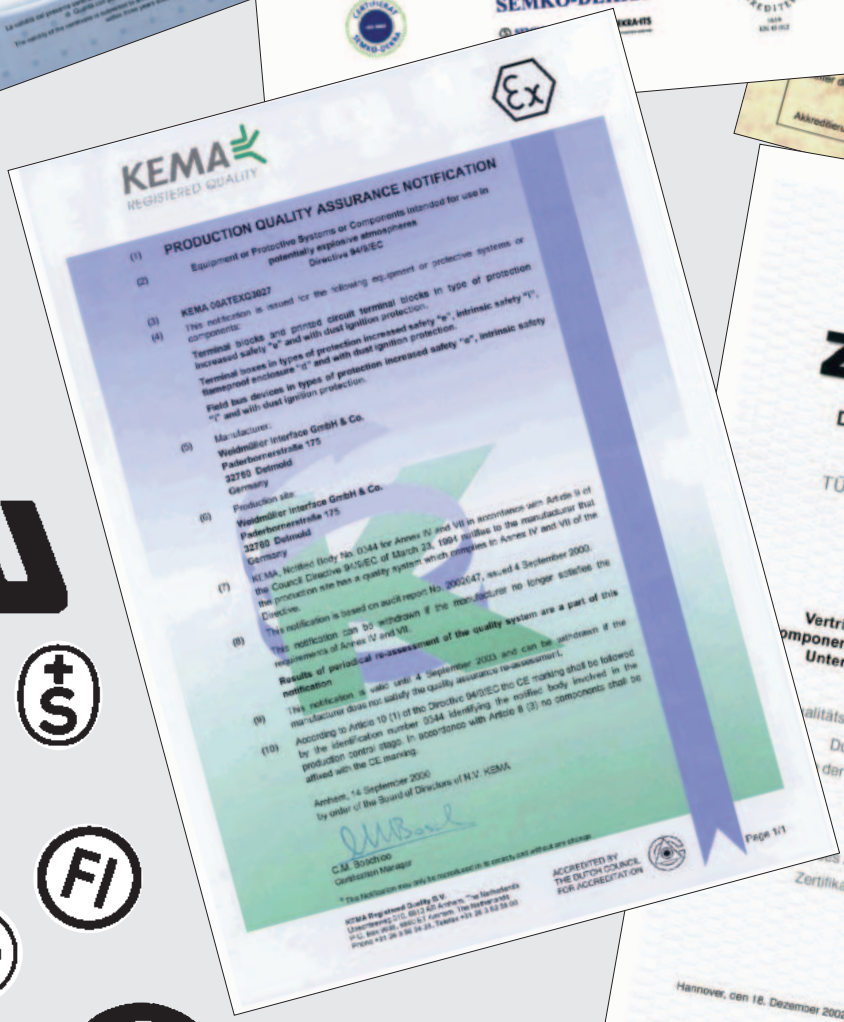
General data

Specific data


CISQ is a member of
IQNet
CERTIFICATO N. 9105.WEID
CERTIFICATE N.
WEIDMULLER SRL
VIA A. EINSTEIN 4 - 20092 CINISELLO BALSAMO (MI)
VIA EINSTEIN, 4 - 20092 CINISELLO BALSAMO (MI)
ISO 9001:2000
EA: 19
Commercializzazione di componenti per tecniche di interfacciamento elettrico (morsetti per montaggio su guida di supporto, morsetti e connettori per circuito stampato, prodotti per l'installazione, moduli elettronici attivi, custodie, connettori di potenza, utensili e realizzazione di moduli elettronici attivi per applicazioni particolari.
Sales of components for electrical interface techniques (rail mounted terminals, PCB connectors, PCB terminals, installation cases, active components, protected components, tools) and actualization of active components for peculiar applications
20 dicembre 2002
1 giugno 1994
SINCERT


CERTIFIKAT
Nr 12335
Weidmüller AB
Stockholm (Bandhagen), Malmö, Göteborg och Sundsvall.
Försäljning av komponenter för förbindning- och anslutningsteknik, elektronik samt apparater avsedda för industri-, process- och transportautomation. Kundspecifikt montage av ovanstående.
SS-EN ISO 9002:1994
Kista, 4 juli 2000
SEMKO-DEKRA Certification AB
SEMKO-DEKRA


Deutsche Akkre
Deutschen
Akkre
Die Deutsche Akkreditierungsstelle
Prüflaboratorium
Weidmüller
Ohmst
D-32758
die Kompetenz nach DIN EN ISO/IEC 17025
Relais, Reihenklemmen,
Sicherheit elektronischer Betrieb
Elektromagnetischer Verträ
18.12.2007
DAT-P-008/91-13
12.12.2002


KEMA
REGISTERED QUALITY
PRODUCTION QUALITY ASSURANCE NOTIFICATION
Equipment or Protective Systems or Components intended for use in potentially explosive atmospheres
Directive 94/9/EC
KEMA 00ATEX3027
Terminal blocks and printed circuit terminal blocks in type of protection increased safety "e" and with dust ignition protection.
Terminal boxes in types of protection increased safety "e", intrinsic safety "i", flameproof enclosure "d" and with dust ignition protection.
Field bus devices in types of protection increased safety "e", intrinsic safety "i" and with dust ignition protection.
Weidmüller Interface GmbH & Co.
Paderbornerstraße 175
32760 Detmold
Germany
Weidmüller Interface GmbH & Co.
Paderbornerstraße 175
32760 Detmold
Germany
Results of periodical re-assessment of the quality system are a part of this notification
Amhem, 14 September 2000
by order of the Board of Directors of N.V. KEMA
C.M. Boschloo
Certification Manager
Page 1/1


TÜV CERT
ZERTIFIK
Die TÜV CERT-Zertifizierungss
TÜV NORD CERT GmbH & C
bescheinigt gemäß
TÜV CERT-Verfahren, dass das Unter
Weidmüller GmbH & Co.
D - 33102 Paderborn
für den Geltungsbereich
Vertrieb und Marketing von elektromechanis
omponenten sowie Hardware - Bausteinen einsc
Unterstützung bei der Schaffung von Lösung
in der Automatisierungstechnik
alitätsmanagementsystem eingeführt hat und ans
Durch ein Audit, Bericht-Nr. 8000 300 255
der Nachweis erbracht, dass die Forderungen d
DIN EN ISO 9001 : 2000
erfüllt sind.
Zertifikat ist gültig bis Oktober 2005
Zertifikat-Registrier-Nr. 08 / 100 / 9535 / 6
Hannover, den 18. Dezember 2002
TÜV NORD CERT


GERMANISCHER LLOYD
1867


c US


LLOYD'S REGISTER OF SHIPPING
FOUNDED 1760


CESI


REGISTRO ITALIANO NAVALE
1861


GL


SA

Weidmüller quality and environmental management for the benefit of our customers

Product certificates create trust

Certification documents verify the quality of our products. They are issued following suitable tests by independent institutes and are the prerequisite for use in certain markets or fields of application.

The accredited test laboratory has its expertise endorsed

The reliability of technical data is of great importance for the user. In confirming the accredited status, officially approved authorities have certified the organisation in accordance with EN 45 001 as well as its expertise in defined assessment of terminals, plug-in connectors, relays and electronic equipment.

Certification as documentation of managed quality

Quality management in the Weidmüller companies is based on ISO 9000 ff. The corresponding certificates from acknowledged, accredited authorities also simplify your supplier appraisal procedures.

Verification of Weidmüller's quality also includes contracts with independent institutions covering the regular monitoring of production facilities, quality management and the laboratory.

Excellent environmental management testifies to our total commitment.

Electrical data

Rating the clearance and creepage distances of electrical equipment

General information

Since April 1997, clearance and creepage distances have been rated according to the regulations of DIN VDE 0110-1, “Insulation coordination for equipment in low voltage systems”.

DIN VDE 0110-1 contains the modified version of the IEC report 664-1 (see IEC 664-1/10.92).

The latest catalogue gives the rating data obtained for each product in compliance with the provisions of this standard, where applicable.

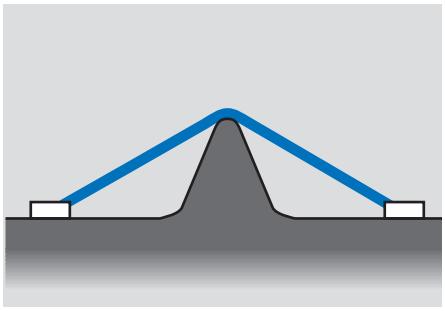
For the rating of clearance and creepage distances, application of the regulations for insulation coordination produces the following interrelationships:

Clearance distances

Clearance distances are rated in accordance with the following factors:

- Anticipated overvoltage
  Rated impulse voltage
- Used
  Overvoltage protection precaution
- Measures to prevent soiling
  Degree of Pollution Serverity

Diagram showing clearance distance

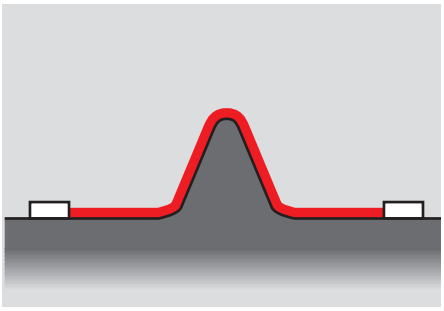


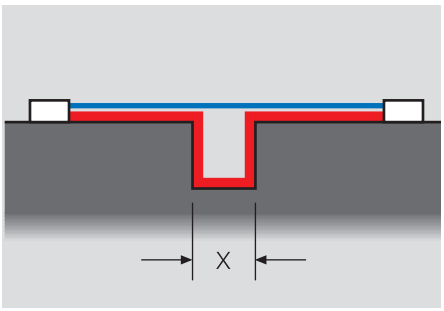
Creepage distance

Creepage distances are rated in accordance with the following factors:

- Intended
  Rated voltage
- Used insulation materials
  Insulation materials group
- Measures to prevent soiling
  Degree of soiling

Diagram showing creepage distance





Grooves are taken into account when measuring creepage distances if their minimum width X is rated according to the following table:

Degree of soiling	Minimum width X in mm
1	0.25
2	1.0
3	1.5
4	2.5

If the corresponding clearance distance is less than 3 mm, the smallest groove width may be reduced to 1/3 of this clearance distance.

Electrical data

Rating the clearance and creepage distances of electrical equipment

Influential factors

Rated impulse voltage

The rated impulse voltage is derived from:

- **Voltage conductor – earth**
  (the rated voltage of the network, taking into account all networks)
- **Overvoltage category**

Table 1: Rated impulse voltage for electrical equipment

Rated voltage of the power supply system *) in V		Rated impulse voltage in kV for			
Three-phase systems	One-phase systems with mid-point	Electrical equipment at the power supply of the installation **(Overvoltage category IV)**	Electrical equipment as part of the permanent installation **(Overvoltage category III)**	Electrical equipment for connection to the perman. installation **(Overvoltage category II)**	Specially protected electrical equipment **(Overvoltage category I)**
	120 to 240	4.00	2.50	1.50	0.80
230/400 277/480		6.00	4.00	2.50	1.50
400/690		8.00	6.00	4.00	2.50
1000		Values for project planning in each individual case. If no values are available, the values in the preceding line apply.			

*) acc. to IEC 38

Stipulating the overvoltage categories

according to national standard DIN VDE 0110-1 (for electrical equipment fed directly from the low voltage network)

Overvoltage category I

- Devices for connection to the permanent electrical installation of a building. Outside the device, measures have been taken either in the permanent installation, or between the permanent installation and the device, to limit the transient overvoltage to the relevant value.

Overvoltage category II

- Devices for connection to the permanent electrical installation of a building,

  e.g. domestic appliances, portable tools.

Overvoltage category III

- Devices which are an integral part of the permanent installation, and other devices expected to have a higher degree of availability.

  e.g. distribution boards, circuit breakers, distribution devices (including cables, busbars, distribution boxes, switches, sockets) in the permanent installation and devices for industrial use, and other devices such as stationary motors with continuous connection to the permanent installation.

Overvoltage category VI

- Devices for use at or near the power supply in the electrical installation of buildings, between the principal distribution and the mains,

  e.g. electricity meters, overcurrent protection switches and centralised controllers.

Degrees of Pollution Serverity

Degree of Pollution Serverity 1

- No or only dry non-conductive soiling. Soiling has no influence.

Degree of Pollution Serverity 2

- Only non-conductive soiling. Temporary conductivity must be expected occasionally as a result of condensation.

Degree of Pollution Serverity 3

- Conductive soiling occurs, or dry non-conductive soiling which becomes conductive because of condensation.

Degree of Pollution Serverity 4

- Soiling results in constant conductivity, e.g. caused by conductive dust, rain or snow.

Unless explicitly stated otherwise, the dimensioning of clearance and creepage distances, and hence the thus-derived rating data for electromechanical products (terminals, terminal strips, PCB connection terminals and plug-in connectors) is based on degree of soiling 3 and overvoltage category III, taking account of all network types.

Electrical data

Rating the clearance and creepage distances of electrical equipment

Influence factors

Rated voltage

The rated voltage is derived from the rated voltage of the power supply and the corresponding network type.

Table 3a:
Single phase 3 or 2 conductor a.c. or d.c. networks

Rated voltage of the power supply system (network)*)	Voltages for table 4	
	for insulation conductor–conductor [1]	for insulation conductor – earth [1]
	all systems	3-conductor systems, with mid-point earthing
V	V	V
12.5	12.5	–
24 / 25 30	25 32	– –
42 / 48 / 50**) 60	50 63	– –
30-60	63	32
100**)	100	–
110 / 120 150**)	125 160	– –
220	250	–
110-220 120-240	250	125
300**)	320	–
220-440	500	250
600**)	630	–
480-960	1000	500
1000**)	1000	–

Table 3b:
Three-phase 4 or 3 conductor a.c. networks

Rated voltage of the power supply system (network) *)	Voltages for table 4		
	for insulation conductor – conductor	for insulation conductor – earth	
	all systems	three-phase 4-conductor systems with earthed neutral [2]	three-phase 3-conductor systems; unearthed [1] or earthed conductor
V	V	V	V
60	63	32	63
110/120/127	125	80	125
150**)	160	–	160
208	200	125	200
220/230/240	250	160	250
300**)	320	–	320
380/400/415	400	250	400
440	500	250	500
480/500	500	320	500
575	630	400	630
600**)	630	–	630
660/690	630	400	630
720/830	800	500	800
960	1000	630	1000
1000**)	1000	–	1000

1) Conductor-earth insulation levels for unearthed or impedance earthed systems are the same as those for conductor-conductor insulation because, in practice, the operating voltage of every conductor to earth can match the conductor-conductor voltage. This is because the actual voltage to earth is defined by the insulation resistance and by the capacitive blind resistance of every conductor to earth. This means that a low (but tolerated) insulation resistance of a conductor can effectively earth it and raise the other two to the value of the conductor-conductor voltage against earth.

2) For electrical equipment intended both for use in three-phase 4-conductor and in three-phase 3-conductor systems, both earthed and unearthed, only the values for the 3-conductor systems should be used.

*) It is presumed that the value of the rated voltage of the electrical equipment is not below the value of the rated voltage of the power supply system.

**) Following jointly undertaken alterations, the meaning of the **) marking has not been adopted in Table 1. Its definition: the /- dash refers to a three-phase 4-conductor system. The lower value is the voltage 'external to neutral conductor', the higher value is the voltage 'external to external conductor'. If only one value is stated, it refers to three-phase 3-conductor systems and refers to the voltage 'external to external conductor'.

Tables 3a and 3b still refer to the values in Table 1 by using the **) marking.

Insulation material group

The insulation materials are divided into four groups depending on the comparative figures for creepage distance (CTI: comparative tracking index):

Insulation material group	
I	600 ≤ CTI
II	400 ≤ CTI < 600
III a	175 ≤ CTI < 400
III b	100 ≤ CTI < 175

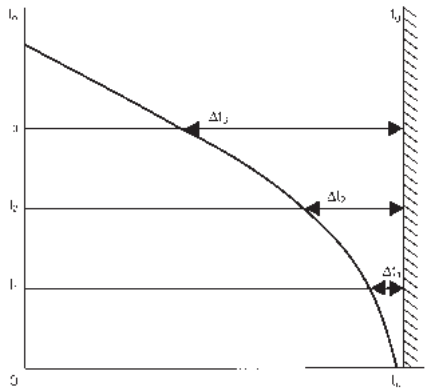
The comparative tracking index is required to have been determined using special samples produced for this purpose with test solution A in compliance with IEC 60112 (DIN IEC 60112/DIN VDE 0303-1).

Electrical data

Current load curve (derating curve)

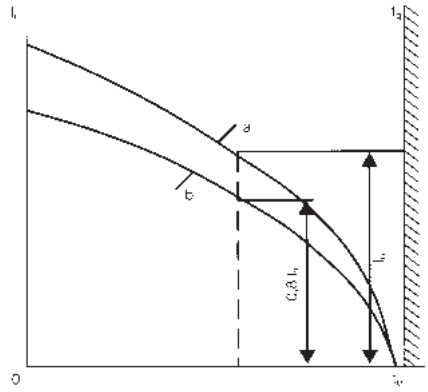
Basic curve

Upper temperature limit of the component



tg = upper temperature limit of component
tu = ambient temperature of component
In = load current

Current loading curve



tg = upper temperature limit of component
tu = ambient temperature of component
In = load current
a = basic curve
b = reduced basic curve (current loading curve)

The **derating curve** shows which currents can flow continuously and simultaneously across all possible connections when the component is exposed to various ambient temperatures below its upper temperature limit.

The **upper temperature limit** of a component is a rating value which depends on the used materials. The sum of ambient temperature and overtemperature produced by the current load (power loss at the forward resistance) must not exceed the upper temperature limit of the component, so as not to damage or destroy it. The current loading ability is therefore not a constant value but falls with increasing component ambient temperature. In addition, the power loading ability is influenced by component geometry, number of pins and connected conductor.

The current loading ability is empirically determined acc. to DIN IEC 60152-3.

For this purpose, the corresponding component temperatures t_{b1}, t_{b2} and the ambient temperatures t_{u1}, t_{u2} are measured for three different loading currents I_1, I_2 …

The values are entered in a linear system of coordinates (as shown in Fig. 1) to illustrate the relationships between the loading currents, the component ambient temperature and the component overtemperature.

The Y-axis is used for the **loading currents** and the X-axis for the **ambient temperatures**. A perpendicular on the X-axis at the component's upper temperature limit t_g completes the coordinate system

For every current I_1, I_2, .. the corresponding mean values for component overtemperatures $\Delta_{t1} = t_{b1} - t_{U1}$, $\Delta_{t2} = t_{b2} - t_{U2}$, are entered starting from the perpendicular and working to the left.
The points found in this way are connected to form a parabolic curve.

In view of the fact that it is effectively not possible to select components with maximum permissible forward resistances for measurement purposes, the basic curve has to be reduced. A reduction of the loading currents to 80 % results in the **“power loading curve”**. Here allowance has to be made for the maximum tolerable forward resistances and inaccuracies incurred in measuring the temperatures, so that these curves are adequate for practical use as indicated by experience. If, within the low ambient temperature range, the current loading curve exceeds the current permissible as based on the current loading ability of the conductor cross-sections requiring connection, then the current loading curve is limited to the smaller current for this temperature range.

General technical data

General information about CE marking

The CE mark on various products and their packaging is neither a quality feature nor an indication of quality or safety.
The CE mark is a control sign that was created and brought into effect for open trading within the European market.
It does not refer to the address of the end consumer. The CE mark only confirms that a manufacturer has complied with all of the directives of the European Union (EU) that are applicable to this product. Therefore the CE mark is proof of directive conformity and is directed towards the responsible control authorities.
The CE mark can be said to be the passport for products that are to be traded within Europe.

Weidmüller considers all relevant EU directives to the best of its knowledge. The currently applicable directives are as follows:

73/23/EEC

Electrical equipment for use within specific voltage ranges (Low voltage directive)

89/336/EEC

Electromagnetic compatiblity (EMC directive)

98/392/EEC

Safety of machines (Machinery directive)

The standards mentioned in the directives have been an element of Weidmüller's standard development for a considerable time. This provides the guarantee of conformity to the European directives. Our testing laboratory, accredited according to EN 45001, performs the standard conform testing. The testing reports are recognised within Europe within the framework of the accreditation process.

73/23 EEC
Low-Voltage Directive (LVG)

Electrical equipment in the sense of this directive are all electrical equipments that are used with a nominal voltage between 50 and 1000 Vac and between 75 and 1500 Vdc.

If an electrical product has the CE mark, it must fulfil the requirements of the EMC directive and if necessary the low-voltage directive (above 50 Vac and above 75 Vdc).

EMC directives

According to the low-voltage directive, a conformity evaluation process must be performed on the product whereby conformity to the directive is assumed where a reference to the harmonised European standards or to the other technical specifications, e.g. IEC standards or national standards, is made.

With the decree of the Directive of the council dated 3rd. May 1989 for the alignment of the legal requirements of the member states concerning **e**lectro**m**agnetic **c**ompatibility (89/336/EEC), the European Union (EU) has declared **EMC** as a protection objective.

The protection objectives are defined in article 4 of the EMC directive dated 19th. November 1992, and state the following:

- the generation of electromagnetic interference must be so reduced so that the intended operation of radio, telecommunications and other devices is possible.
- the devices must have a suitable resistance to electromagnetic interference in order to ensure intended operation.

Devices are defined in the EMC directive as:

- all electrical and electronic equipment, installations and systems that contain electrical and electronic components

This applies to active/passive components and intelligent modules that are produced and stored by Weidmüller.

The adherence to this directive is assumed for the devices that conform with the harmonised European standards that, for example, are released in the gazette from the Federal Minister for Post and Telecommunications.

The devices are utilised in the following areas:

- industrial installations
- medical and scientific equipment and devices
- information technology devices

Weidmüller tests its electronic products according to the relevant standards in order to fulfil the agreed protection objectives.

Electronic Products from Weidmüller Regarding EMC Guidelines

Category 1

All passive components such as:

- terminals with status displays
- protection terminals with status displays
- passive interface elements with and without status displays
- overvoltage protection

These products cause no interference and they have a suitable immunity to interference. These products are not labelled with the CE mark concerning the EMC directive or the EMC guideline.

Category 2

These products are labelled with the CE mark after the conformity evaluation process has been performed which contains the reference to the harmonised European standards.

The following are harmonised standards:

EN 50081-1
Generic Emission Standard for residential, commercial and light industrial environments

EN 50082-1
Generic Immunity Standard for residential, commercial and light industrial environments companies

EN 50081-2
Generic Emission Standard for heavy industrial environments

EN 50082-2
Generic Immunity Standard for heavy industrial environments

EN 55011
Radio Interference for ISM Devices

EN 55022
Radio Interference for Information Technology Facilities

EN 61000-3-2
Harmonics

EN 61000-3-3
Voltage Fluctuations

EN 6100 0-4-x
approx. 10 partial tests for interference immunity; partly not ratified.

General technical data

EMC directives

Usage of Tests

Generic standards are always used when device-specific product standards do not exist. The generic standards of EN 50081-2 and EN 50082-2 are used as the basis for Weidmüller products.

Remark:
The relevance of EN 50082-1 for certain products must be checked as well as how far EN 50081-1 or 50082-1 was considered during testing.
The environment phenomenon and test interference levels are specified in the generic immunity standard. Additionally, Weidmüller considers the evaluation criteria A, B and C.
Text extract from the Generic Standard EN 50082-2:

Criterion A

The equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a minimum performance level as specified by the manufacturer, when the equipment is used as intended.

In certain cases, the nominal performance level can be replaced by an permissible loss of performance.

If the minimal performance level or permissible loss of performance is not specified by the manufacturer, both of these specifications can be extracted from the description of the product, the relevant documentation and from what the operator expects from the equipment during its intended operation.

Criterion B

The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a minimum performance level as specified by the manufacturer, when the equipment is used as intended.

In certain cases, the minimal performance level can be replaced by an permissible loss of performance. During testing degradation of the performance level is permitted however changes to the specified operation mode or data loss are not permitted.

If the minimal performance level or permissible loss of performance is not specified by the manufacturer, both of these specifications can be extracted from the description of the product, the relevant documentation and from what the operator expects from the equipment during its intended operation.

Criterion C

A temporary loss of function is permitted, provided the loss of function is self recoverable or can be restored by the operation of the controls.

Criterion B is most frequently specified in the generic standards and is used by Weidmüller.

An example of an analogue coupler EMA:

During testing, the analogue coupler can convert values that are outside the permissible tolerances.
After testing however, the values must be within the available tolerances.

General Installation Instructions

In agreement with the performance level and the criteria A and B, the products are allowed and can be affected externally during the occurrence of a fault.

It should be attempted, as far as possible, to prevent this with an optimal installation.

Measures:

- installation of the products in an enclosed metal box (control cabinet, metal housing)
- protect the voltage supply with an overvoltage protection device. (For mains supply of 230/400 Vac with a PU type and for 24 Vdc with an EGU or LPU.)
- only use shielded cables for analogue data signals
- follow ESD measures during installation, maintenance and operation
- distance between electronic modules and interference sources (e.g. invertors) and power lines should be at least 200 mm.
- maintenance of ambient temperature and relative humidity
- long cables are to be protected by overvoltage protection devices.

For safety reasons, the operation of walkie-talkies and mobile telephones should only be performed outside a radius of 2 m.

General technical data

Protection rating according to EN 60 529 / DIN 0470

The protection ratings are indicated by a code consisting of the two invariable letters IP and two digits representing the degree of protection.

Example: **I P 6 5**

- 2nd digit: protection from water
- 1st digit: protection from solid bodies

Number	Degrees of protection from solid foreign bodies (1st digit)
0	Not protected
1	Protected from solid foreign bodies 50 mm in diameter and above. Protection to prevent dangerous parts being touched with the back of the hand.
2	Protected from solid foreign bodies 12.5 mm in diameter and above. Protection to prevent dangerous parts being touched with the fingers (finger-safe).
3	Protected from solid bodies 2.5 mm in diameter and above. Protection to prevent dangerous parts being touched with a tool.
4	Protected from solid bodies 1 mm in diameter and larger. Protection to prevent dangerous parts being touched with a piece of wire.
5	Dust protected. Penetration of dust is not completely prevented, but dust must not penetrate in quantities that would impair satisfactory working of the device or safety.
6	Dust-proof, no penetration by dust.

Number	Degrees of protection from water (2nd digit)
0	Not protected
1	Vertically falling drops must not have any harmful effect.
2	Vertically falling drops must not have any harmful effect if the housing is inclined at an angle of up to 15° to the vertical on both sides.
3	Water sprayed at an angle of up to 60° to the vertical on both sides must not have a harmful effect.
4	Water splashing against the housing from any direction must not have a harmful effect.
5	Water sprayed against the housing from any direction must not have a harmful effect.
6	Water aimed in a strong jet against the housing from any direction must not have a harmful effect.
7	Water must not penetrate in any quantity which causes harmful effects if the housing is temporarily submerged in water under standard pressure and time conditions.
8	Water must not penetrate in any quantity which causes harmful effects if the housing is permanently submerged in water under conditions which must be agreed between manufacturer and user. However, the conditions must be more adverse than under number 7.

General technical data

Converting AWG conductors to mm²

AWG is the abbreviation for "**A**merican **W**ire **G**auge". This gives no indication of the actual conductor cross-sectional area.

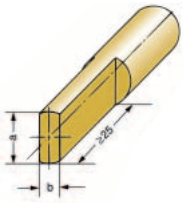
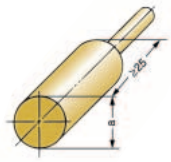
The relationship between AWG and mm² is shown in the following table.

AWG	mm²
28	0.08
26	0.13
24	0.21
22	0.22
20	0.52
19	0.65
18	0.82
17	1.04
16	1.31
15	1.65
14	2.08
13	2.63
12	3.31
11	4.17
10	5.26
9	6.63
8	8.37
7	10.55
6	13.30
5	16.77
4	21.15
3	26.67
2	33.63
1	42.41
0	53.48

Gauge pin acc. to IEC 60947-1 section 8.2.4.5.2 table 7

Possibility of inserting unprepared round conductors with the largest stipulated cross-sectional area

Testing with stipulated gauge, inserted under own weight.

Conductor cross-sectional area		Pin					
		Form A			Form B		
							
Flexible conductor mm²	Rigid conductor (single- or multi-core) mm²	Designation	Diameter a mm	Width b mm	Designation	Diameter a mm	Tolerable deviations for a and b mm
1.5	1,5	A 1	2.4	1.5	B 1	1.9	
2.5	2,5	A 2	2.8	2.0	B 2	2.4	0 – 0.05
2.5	4	A 3	2.8	2.4	B 3	2.7	
4	6	A 4	3.6	3.1	B 4	3.5	
6	10	A 5	4.3	4.0	B 5	4.4	0 – 0.06
10	16	A 6	5.4	5.1	B 6	5.3	
16	25	A 7	7.1	6.3	B 7	6.9	
25	35	A 8	8.3	7.8	B 8	8.2	0 – 0.07
35	50	A 9	10.2	9.2	B 9	10.0	
50	70	A 10	12.3	11.0	B 10	12.0	
70	95	A 11	14.2	13.1	B 11	14.0	0 – 0.08
95	120	A 12	16.2	15.1	B 12	16.0	
120	150	A 13	18.2	17.0	B 13	18.0	

Materials

Insulation materials

In order to satisfy all the different requirements made of our products, we have to use various insulation materials tailor-made to each specific application.

All insulation materials used by Weidmüller are free from harmful substances. It is especially important that these materials contain no cadmium. In addition, they are free from heavy metal colour pigments, dioxin and furan-forming substances.

	Thermosetting plastics		
Plastic Abbreviation	**Germin KrG**	**Stamin KrS**	**Epoxy resin EP**
	Thermosetting plastics have outstanding dimensional stability, low water absorption, excellent creepage current resistance and outstanding fire resistance. Their continuous service temperature is higher than that of thermoplastics. Under high thermal load, thermosetting plastics have better dimensional strength than thermoplastics. Thermosetting plastics are, however, inferior to thermoplastics in terms of their flexibility.		
	Melamine resin pressing compound MF type 150 (DIN EN ISO 14 528) Organic filler	Melamine resin pressing compound MF type 156 (DIN EN ISO 14 528) Inorganic filler	Epoxy resin with inorganic filler
Colour			
	mid-yellow	anthracite	black
Description			
	high continuous service temperature high fire resistance high creepage current resistance inherent flammability protection	continuous service temperature higher (than Germin) high fire resistance high creepage current resistance inherent flammability protection	very good electrical properties very high continuous service temperature resistant to high-energy radiation halogen- and phosphorous-free; flame retardant
Properties			
Specific forward resistance acc. to IEC 93	10^{11}	10^{8}	10^{14}
Dielectric strength acc. to IEC 243-1	10	12.5	160
Creepage current resistance (A) to IEC112	≥ 600	≥ 600	≥ 600
Upper max. tol. limit temperature	130	140	160
Lower max. tol. limit temperature, static	– 60	– 60	– 60
Combustibility acc. to UL 94	V-0 (5 V-A)	V-0 (5 V-A)	V-0
Fire behaviour acc. to railways standard			

Materials

Thermoplastics

Wemid	Polyamide PA	Polyamide PG GF	Polybutylene terephthalate PBT	Polycarbonate PC
Wemid is a modified thermoplastic whose properties are especially tailored to make it suitable for use in our power connectors. Advantages over PA include enhanced fire protection and higher continuous service temperature. Wemid fulfils the strict requirements for use in railway vehicles according to NF F 16-101.	**Polyamide (PA)** is one of the most frequently used technical plastics. The advantages of this material includes its very good electrical and mechanical properties, flexibility and resistance to breakage. In addition, its chemical structure gives PA good fire resistance even without the use of flame retardants.	**Glass-fibre reinforced polyamide (PG GF)** offers excellent dimensional stability and very good mechanical properties. This makes it ideal for use as end bracket. Unlike PA, this material in unreinforced state comes under combustibility class HB in accordance with UL 94.	**Thermoplastic polyester (PBT)** offers excellent dimensional stability (which is why it is used for plug-in connectors) and high continuous service temperature. It has lower creepage current resistance than other insulation materials.	
special Weidmüller insulating material	insulating material	insulating material	with or without glass-fibre reinforcement, depending on use	with or without glass-fibre reinforcement, depending on use
dark beige	beige	dark beige	orange	grey
higher continuous service temperature enhanced fire resistance halogen- and phosphorous-free; flame retardant low smoke permitted for use in railways acc. to NF F 16-101	flexible, resistant to breakage good electrical and mechanical properties self-extinguishing properties	excellent dimensional stability very good mechanical properties	high dimensional stability good electrical and mechanical properties flame retardant, without dioxin and furan-forming substances	high dimensional stability high continuous service temperature high electrical insulating power halogen-free; flame retardant
10^{12}	10^{12}	10^{12}	10^{13}	10^{16}
25	30	30	28	≥ 30
600	600	500	200	≥ 175
120	100	120	115 / 130	115 / 125
– 50	– 50	– 50	– 50	– 50
V-0	V-2	HB	V-0	V-2 / V-0
I2 / F2 *)				I2 / F2

*) also qualified acc. to LUL E 1042

Materials

Metals

Weidmüller uses only tried and tested materials for the electrical components in its products.

All materials are subjected to rigorous quality monitoring under a quality management system certified to DIN EN ISO 9001.

Environmental compatibility plays a crucial role in the selection of materials.

All metals used by Weidmüller are selected, processed and surface-treated according to the very latest technical findings.

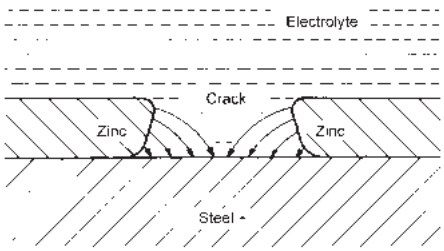
Steels

Steel parts whose function is to permanently maintain contact force are zinc electroplated, with an additional chromate layer added to provide additional passivation.

Surface protection complies with the very highest standards. Results from laboratory tests are incorporated in producing the surface finish.

Zinc still offers corrosion protection over a longer period of time even if the zinc coating is partially damaged by scratches or pores.

Zinc acquires a negative charge in relation to steel under the influence of an electrolytic fluid. The metal ions in the zinc migrate to the steel giving the base material lasting protection against corrosive attack.



Conductive materials

The current-carrying materials copper, brass and bronze are characterised by both high conductivity and good mechanical properties.

The surfaces are usually finished with tin plating. This guarantees that the contact has outstanding “adaptive” properties with low transition resistance. The tin plating not only gives consistently good electrical properties but also affords excellent protection from corrosion.

Soldered connections are also provided with tin plating. To safeguard soldering ability over longer periods of time (storage periods), brass parts are also given an additional nickel layer to serve as a diffusion barrier.

The nickel layer is highly effective in preventing zinc atoms from diffusing out of the brass.

Materials

Current loading curves

The maximum current which a terminal can carry depends on:

- the inherent temperature rise of the terminal
- the ambient temperature
- the cross-sectional area of the connected conductor

An upper service temperature has been defined for every Weidmüller terminal, and this must not be exceeded in continuous operation.

The continuous service temperature depends on the insulation material used in the terminal. According to EN 60 947-7-1, a terminal may not heat up by more than 45 K.

When the input current is at least equivalent to the rated current, the maximum ambient temperature to which a terminal may be subjected is equal to the continuous service temperature for the insulation material used, less the maximum tolerable temperature rise of the terminal acc. to EN 60 947-7-1.

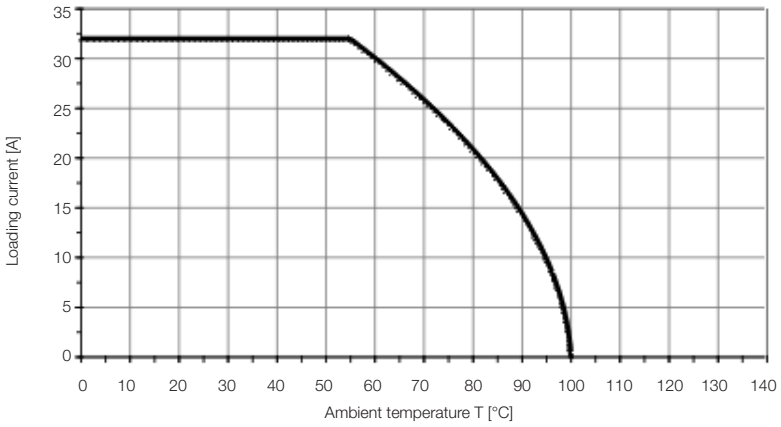
Figs. 1–3 show examples of current heating curves (in this case for a rated current of 32 A) for three different insulating materials:

- Thermoplastic (polyamide 66)
- WEMID
- Duroplastic (MF 150 KrG)

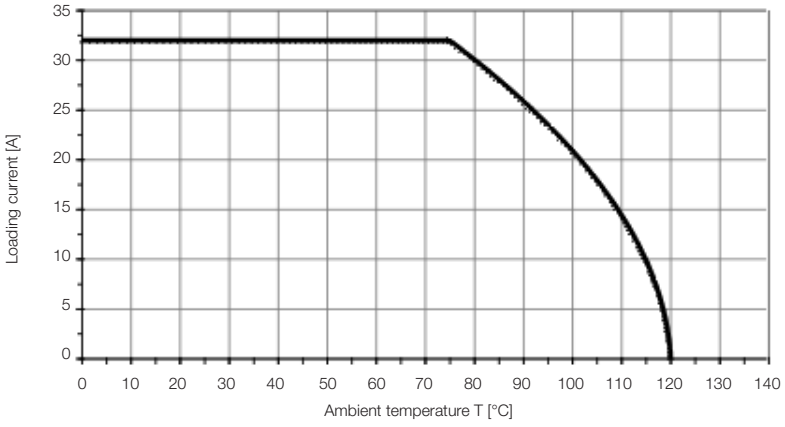
Depending on the insulation material used, the rating current can be conducted up to an ambient temperature of 55 °C for PA 66, 75 °C for Weidmüller's insulation material WEMID, or up to 85 °C for duroplastic insulation materials (KrG).

Above these temperature limits, the current is to be reduced in accordance with the current expectancy curves.

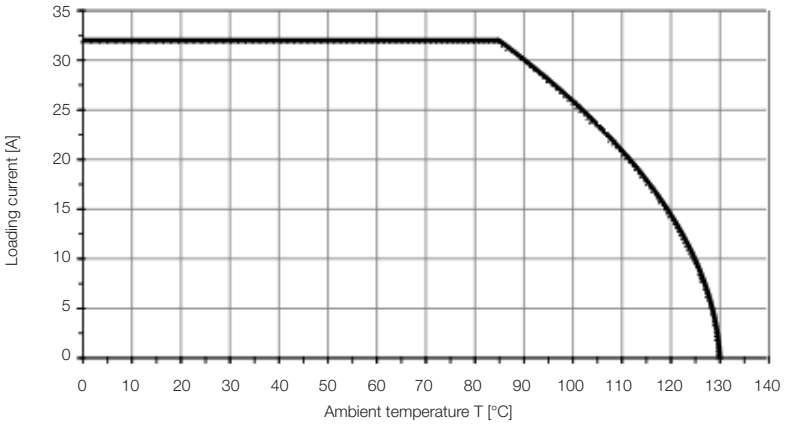
Current loading curve
for upper continuous service temperature 100°C – polyamide 66



Current loading curve
for upper continuous service temperature 120°C – Wemid

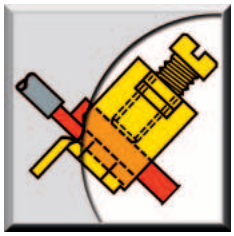


Current loading curve
for upper continuous service temperature 130°C – MF 150 KrG

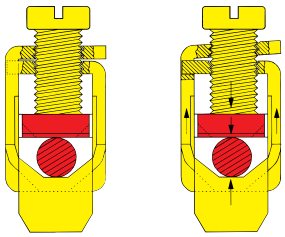


Connection types

Clamping yoke connection



Weidmüller's tension clamp system optically combines the specific properties of steel and copper. The system has proven its worth billions of times over in various Weidmüller products. Both the tension clamp and the clamping screw consist of hardened steel. This clamping yoke unit generates the necessary contact force. Connection of the conductor involves the tension clamp pressing the conductor against the busbar, which is made of copper or high-quality brass. Weidmüller's tension clamp produces a gas-tight, vibration-resistant connection between the conductor and the busbar.

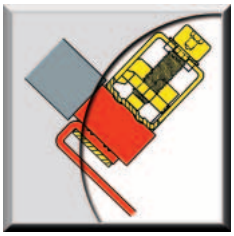


Vibration resistance
The force generated by turning the clamping screw means that the upper thread overlap springs back and exerts a counter-effect on the screw.

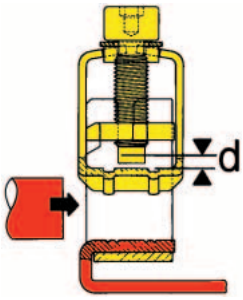
Weidmüller's tension clamp system is vibration-resistant.

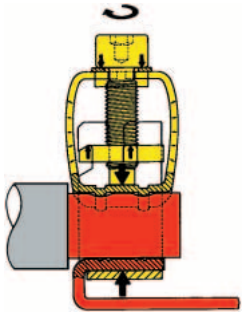
Any settling of the connected conductor is counteracted by the elastic behaviour of Weidmüller's tension clamp. This means it is not necessary to "tighten" the clamping screw.

Pressure clamp connection



With its patented **pressure clamp connection**, Weidmüller has developed a screw connection system for conductors with large cross-sectional areas. The screw unit can be taken right out of the terminal, making it easier to insert larger conductors (which often otherwise proves difficult). The conductor is placed directly on the busbar, the screw unit replaced and the conductor clamped in position.





Vibration resistance
The difference in length "d" between the shank of the clamping screw and the resilient pressure clamp means that the pressure clamp undergoes elastic deformation when the screw is tightened. The high spring force of the pressure clamp gives rise to vibration resistance and at the same time counteracts the tendency for the connected conductor to settle. It is not, therefore, necessary to "tighten" the clamping screw.

TOP connection

Weidmüller's TOP connection system fulfils the requirement that conductor insertion and screw actuation take place in parallel. This brings wiring advantages in certain installation situations, for example with close lateral spacing in installation boxes. The TOP connection system combines the special properties of steel and copper. The hardened steel pressure clamp presses the conductor directly against the copper or brass busbar. The high contact force guarantees a gas-tight connection between conductor and busbar.

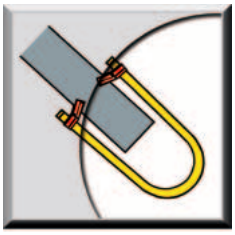
Vibration resistance
The force exerted by the steel pressure clamp when the screw is tightened pulls the two halves of the TOP connection thread apart, as in the tension clamp. This exerts a braking effect on the screw and guarantees outstanding vibration resistance.

Connection types

Tension clamp connection

Weidmüller's tension clamp system functions in similar fashion to the tried and tested clamping yoke. As with the latter, the tension clamp preserves the separation of mechanical and electrical functions. The tension clamp of high-quality rust- and acid-resistant steel pulls the conductor against the galvanised copper busbar. The surface-treated busbar has low contact resistance and is highly resistant to corrosion. These properties are preserved by the balancing effect of the tension clamp.

IDC technology



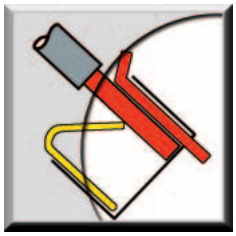
IDC (insulation displacement connection) technology is a means of connecting copper conductors which involves absolutely no preparation of the conductor – in other words, no stripping and no crimping.

When the conductor is connected, its insulation is penetrated and, at the same time, the electrical contact is produced between the conductor and the busbar.

As with the other types of connection, Weidmüller's IDC principle ensures separation of mechanical and electrical functions.

A stainless steel spring presses the busbar against the conductor, thus guaranteeing low contact resistance and a gas-tight, vibration-resistant connection.

Direct push in technology



Direct push in technology involves the stripped solid conductor simply being pushed into the terminal as far as it will go – that's all there is to it. No tools are required, and a reliable, vibration-resistant and gas-tight connection is produced. Even flexible conductors with crimped wire end ferrules or ultrasonic welded conductors can be connected without any problems.

A stainless steel spring, held in a separate cage, guarantees that the conductor exerts a strong contact force on the busbar (copper- and tin coated). The conductor pull-out forces are even higher here than in the tension spring system.

In the steel cage, a spring and a conductor stopper guarantee optimum conditions for connection and guide the screwdriver for the purpose of releasing the conductor.

ATEX

ATEX 95 (formerly ATEX 100a)

The former directive for Ex protection issued by the European Council under 76/117 EEC became invalid with effect from 1 July 2003. Now only directive 94/9/EEC or ATEX 95 applies (ATEX: Atmosphère Explosive); this is one of the so-called “new approach” directives.
It applies in all countries of the European Union together with Iceland, Liechtenstein and Norway.
In these countries it refers to the sale and commissioning of products which have been specially developed for areas in which the presence of gases, vapours, fog or dust give rise to a potentially explosive atmosphere. It now also covers the mining industry and purely mechanical devices.

The ATEX directive has been in force since March 1996. It was valid on an optional basis through to 30 June 2003 (interim period) in parallel to the existing directives. As of this date, all new systems and devices for installation in explosion-risk areas must conform with the ATEX directive and be certified accordingly. The former categorisation into zones (zone 0, 1 or 2) and protection classes (e.g. “i”: inherent safety, “e” enhanced safety) still apply.

Protection class

Protection	Code	CENELEC EN	IEC	Device category explosion-protected
Gen. requirements	–	50014	60079-0	–
Oil encapsulation	o	50015	60079-6	2
Overpressure encapsulation	p	50016	60079-2	2
Sand encapsulation	q	50017	60079-5	2
Pressure-resistant encapsulation	d	50018	60079-1	2
Increased safety	e	50019	60079-7	2
Inherent safety	ia	50020	60079-11	1
Inherent safety	ib	50020	60079-11	2
Type n (EEx n)	n	50021	60079-15	3
Sealing encapsulation	m	50028	60079-18	2

Classification for explosion-risk areas

CENELEC classification IEC60079-10	Presence of a potentially explosive atmosphere	Device category	US Classification NEC 500	Flammable media
Zone 0	constant, long-term	1G	Class I, Div 1	Gases, vapours
Zone 20	or frequent	1D	Class II, Div 1	Dust
Zone 1	occasional	2G	Class I, Div 1	Gases, vapours
Zone 20		2D	Class II, Div 1	Dust
Zone 2	rare and	3G	Class I, Div 2	Gases, vapours
Zone 22	short-term	3D	Class II, Div 2	Dust

Explosion groups

Gas (e.g.)	CONELEC	NEC 500
Propane	IIA	D
Ethylene	IIB	C
Hydrogen	IIC	B
Acetylene	IIC	A
Methane (mining)	I	Mining (MSHA)

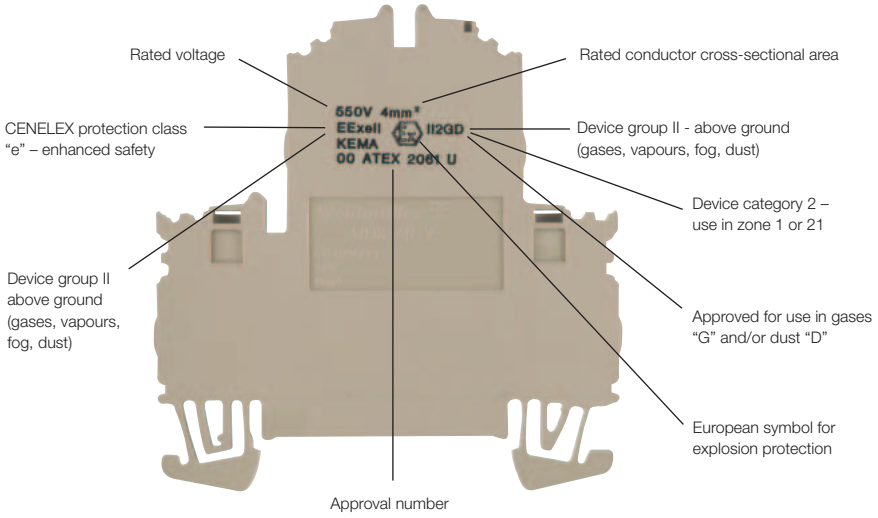
Temperature classes

Max. surface temperature (°C)	Temperature class CENELEC	Temperature class NEC 500-3
450	T1	T1
300	T2	T2
280	–	T2A
260	–	T2B
230	–	T2C
215	–	T2D
200	T3	T3
180	–	T3A
165	–	T3B
160	–	T3C
135	T4	T4
120	–	T4A
100	T5	T5
85	T6	T6

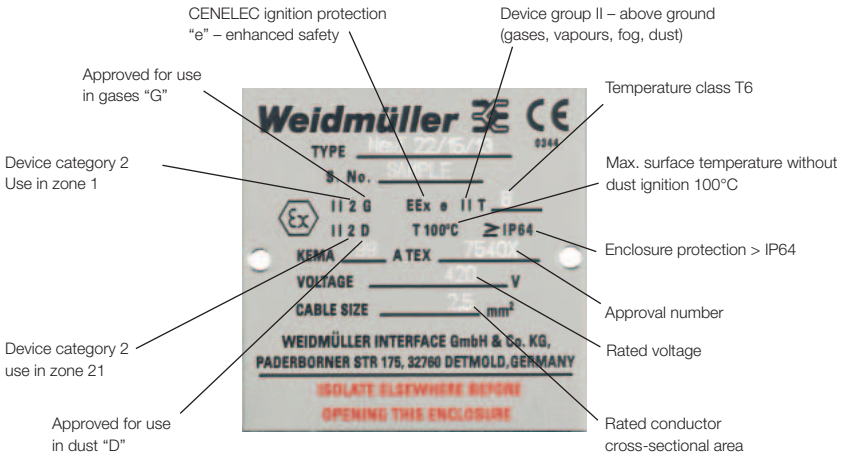
ATEX

ATEX 95 (formerly ATEX 100a)

Marking example
Terminal WDK 4 N V



Example of marking
Assembled enclosure
for enhanced safety



Terminals

Regulations / definitions

Terminals acc. to VDE 0611-1

This standard was published in Germany in August 1992:

VDE 0611-1 Low-voltage switchgear part 7: Ancillary equipment section 1 – Terminal blocks for copper conductors.

The contents of this standard correspond to the international standard:

IEC 60947-7-1:

1989 Low voltage switchgear and control gear part 7: Ancillary equipment section 1 – Terminal blocks for copper conductors

At the European level this standard has been ratified by CENELEC, making it valid in the following countries:

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Holland, Iceland, Ireland, Italy, Luxembourg, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom

Combined application in order of priority:
IEC 60947-1
Low-voltage switchgear and control gear part 1: General Rules
EN 60947-1
VDE 0660 part 100
Low-voltage switchgear part 1: General Rule

Scope VDE 0611-1

(EN 60947-7-1)
(IEC 60947-7-1)

This standard stipulates the requirements for terminals with screwed or screwless terminal strips intended primarily for industrial or similar use, with the terminals fastened to a carrier to produce both electrical and mechanical connections between copper conductors. It applies to terminals used for connecting round copper conductors with a cross-section between 0.2 mm^2 and 300 mm^2 (AWG 24/600 kcmil), and for electronic circuits up to 1000 Vac 1000 Hz or up to 1500 Vdc.

Remarks:
This standard is also used as guide for special kinds of terminals (e.g. isolating terminals) for which no special standards are available.

Terminals/ feed-through terminals

An insulating part which carries one or several mutually insulated terminal arrays intended for fastening to a carrier.

Rated cross-section

The rated cross-section of a terminal is the cross-section of the conductor to be connected by the terminal as stated by the manufacturer. It is determined by certain thermal, mechanical and electrical requirements, and is one of the specifications marked on the terminal.

The rated cross-section is selected from the following standard cross-sections:

0.2 – 0.5 – 0.75 – 1 – 1.5 – 2.5 – 4 – 6 – 10 – 16 – 25 – 35 – 50 – 70 – 95 – 120 – 150 – 240 – 300 mm^2.

The terminals have a rated connection capability, which is at least two stages smaller than the rated cross-section. The conductors may be solid, stranded or flexible and, if necessary, may have their ends pre-treated. The rated cross-section is verified using the gauges stipulated by VDE 0660 part 100 table 7 (see page W.14).

Rated current

Each rated cross-section is assigned a particular test current stipulated by VDE 0611-1. At these rated currents, terminals are not subject to non-permissible increases in temperature.

mm^2	1.5	2.5	4.0	6.0
A	17.5	24	32	41
mm^2	10	16	25	35
A	57	76	101	125
mm^2	50	70	95	120
A	150	192	232	269
mm^2	150	185	240	300
A	309	353	415	520

Rated voltage VDE 0611-1 / VDE 0660 part 100

The rated voltage of a terminal is the rated insulation voltage to which the insulation tests and creepage distances refer. It is defined analogously to DIN VDE 0110-1, and is one of the specifications marked on the terminal.

CE mark

Rated surge voltage DIN VDE 0110-1 / VDE 0660 part 100

Peak values of a surge voltage which can be applied to the terminals and to which the clearance distances acc. to VDE 0660 part 100 or DIN VDE 0110-1 refer.

Degree of soiling DIN VDE 0110-1 / VDE 0660 part 100

The degree of soiling stipulates the influence of solid, liquid or gaseous foreign particles, which may reduce the dielectric strength or specific surface resistance (see also page W.5).

Terminals for use in the industrial field of application are assigned degree of soiling 3: either conductive contamination may occur or, alternatively, dry, non-conductive contamination which becomes conductive in the likely event of condensation.

The minimum clearance distance is stipulated in combination with the rated surge voltage in VDE 0660 part 100 or DIN VDE 0110-1.

Operating conditions

Terminals can be operated under the following normal conditions:

- Ambient temperature – 5 °C … +40 °C, mean temperature 24 h + 35 °C
- Altitude up to 2000 m a.s.l.
- Relative humidity 50% at + 40 °C, 90% at 20 °C.

CE mark

A EU directive stipulates that labelling with the CE mark is carried out by the manufacturer. The mark indicates to the state authorities that the item complies with the relevant directives. It thus guarantees free trade within Europe.

Conductor connectors from ≥ 50 V ~ / 75 V- comply with the basic safety requirements stated in the low-voltage directive 73/23/EEC (amended by 93/68/EEC).

CE marking acc. to the marking directive 93/68/EEC has been mandatory since 1 January 1997.

It is affixed to the packaging.

Declarations of conformity are kept available for inspection by the relevant national supervisory agencies as part of the technical documentation.

Terminals

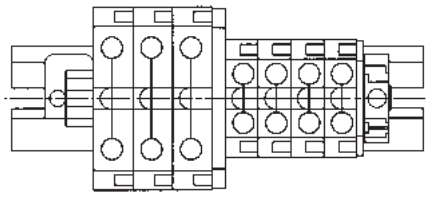
Assembling terminal strips

Mounting and end brackets

- Terminal strips mounted from left to right
- Closed side on the left, open side on the right
- Open side of the terminal always closed using end plates or partition plates (WAP/TW; ZAP/TW and IAP)
- End brackets placed at the beginning and end of the terminal strip
- End bracket not required next to PE terminals. Exceptions: WDK/PE and ZPE

Combinations of different terminals

- End plates or partition plates (WAP/TW, ZAP/TW and IAP) must be used when the contour changes.
- For adjacent terminals with differing rated voltages, end plates or partition plates (WAP/TW, ZAP/TW and IAP) must be used in order that the respective rated voltages are adhered to.
- When the PE terminal is positioned next to or between corresponding feed-through terminals of the same series and size, this does not influence the rated voltage or rated surge voltage of the feed-through terminals.



Dimensions

The overall dimensions of the terminals with fastening parts are stipulated, but without tolerances. A mounting tolerance of 0.2 mm must be added to the terminal width when planning projects.

Partition plate

The partition plate is necessary for visual separation of circuits or for electrical separation of neighbouring cross-connections.

Partition disc

Partition discs can be retrofitted between cross connectors or sockets in terminals up to a max. terminal width of 12 mm.

Compliance with the rated insulation voltage

The required stripping length for every Weidmüller product is stated in mm. These lengths, such as < 6 mm ± 0.5 mm, > 10 mm ± 1 mm, must be adhered to. This also applies when using ferrules.

The external dimensions of crimped ferrules must comply with IE 60947-1 (1999 version).

Working on electrical connection elements with non-insulated screwdrivers

Work using non-insulated screwdrivers may only be carried out in disconnected systems.

The following five safety rules must be observed when disconnecting a system before beginning work and in order to ensure the system remains disconnected at the working site for the duration of this work:

- **Disconnect**
- **Secure to prevent the system from being switched on again**
- **Ascertain that the system is not live**
- **Earth and short circuit the system**
- **Cover or cordon off any neighbouring live parts**

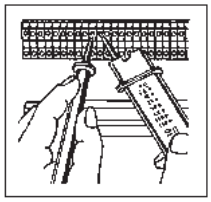
These five rules constitute the safety precautions for working with electrical systems and equipment. The measures to be taken in accordance with operating and local conditions, e.g. for high- and low-voltage overhead lines, cables or switchgear, are stipulated in detail in VDE 0105 part 100.

Live terminals which are not in use

Any terminals which are not in use and which could carry live voltage are to be fitted with suitable covers (e.g. ADP 1...4) to prevent them from being inadvertently touched. The clamping screws of terminals, which are not in use, even those that are not live, are to be screwed tight.

VDE 0105 part 100 Operation of electrical installations: Work

Troubleshooting with two-pole voltage detectors including voltage tester acc. to IEC 61243-3.



Terminals

Connecting terminals

Two conductors in one terminal

The optimum solution in terms of allocating conductors to individual circuits and marking and organising individual functional units involves just one conductor being connected to each terminal.

If it is necessary to connect two conductors with the same cross-section in one terminal, then this may be carried out using W-series terminals (screw connection).

DIN IEC 60999-1 does not prohibit the use of twin ferrules for connecting two conductors in one terminal point using Z-series terminals (tension spring technology).

DIN IEC 60999-1 prohibits the use of screwless IDC terminals (I-series) for connecting two conductors.

• Continuous current for two conductors

The total current of two conductors must not exceed the continuous current of the terminal. The continuous current is the maximum current, which a terminal can carry without the increase in temperature exceeding 45 K.

• Rated insulation voltage

The rated insulation voltage of the terminal does not change when two conductors have been connected correctly.

Cross-connection systems

Weidmüller's WQV and ZQV cross-connectors are systems which are fully insulated and finger-safe in the event that they are directly (and inadvertently) touched; they are available with different numbers of poles (2-pole to 50-pole). Note: the rated voltage is always reduced when using cross-connections.

Cross-connections which have been cut off do not, however, offer this protection if the cut edge is directly (inadvertently) touched.

Partition plates or end plates must be used with these cross-connections to preserve the rated voltage.

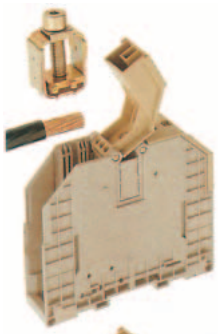
Conductor connection with pressure clamp for large cross-sections

It is now no longer necessary to force conductors with large cross-sections into the terminal: they can be inserted simply and easily into the terminal block. All terminal types are available not only as individual terminals but also in block versions with three-, four- and five-pole blocks. All blocks are firmly screwed together to offer additional distortion resistance. Longitudinal holes in the bottom of the terminals allow for direct assembly.

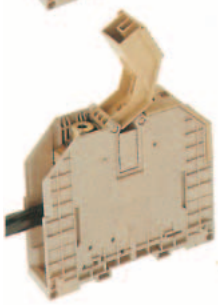
Terminal blocks can be screwed directly to mounting plates with a 25 mm grid.

Other advantages include:

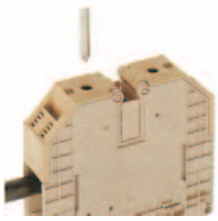
- constant transfer of forces with self-adjusting connection system
- any mounting direction possible
- finger-safe (VBG 4) even with cross-connection
- extremely distortion-proof



Open cover and remove screw unit



Insert conductor and replace screw unit



Close cover and tighten screw with Allen key

Torque ranges for clamping screws

Tightening the clamping screws in this torque range guarantees:

- secure, gas-proof clamping
- no mechanical destruction of the tension clamp
- voltage drop far below the required limit

The test torque acc. to IEC 60947-1 (supplemented by Annex C1 of IEC 60947-1-7 or the torque stated by the manufacturer) is the lower value of the torque range, at which all tests are successfully passed.

The upper value of the torque range is the maximum torque to be applied by the user.

The electric screwdriver should preferably be set to the middle torque of the clamping torque range.

The table gives the generally applicable values. Product-specific data are listed elsewhere for the respective products.

Products with head screw with slotted head

Thread	Torque range Steel screws min. 8.8 [Nm]	A 2/A 4-80 [Nm]
M 2.5	0.4…0.8	0.4…0.8
M 3	0.5…1.0	0.5…1.0
M 3.5	0.8…1.6	0.8…1.6
M 4	1.2…2.4	…
M 5	2.0…4.0	…
M 6	2.5…5.0	…

Products with head screw with slotted head

Thread	Torque range NE screws Cu 2 (CuZn) [Nm]	Cu 5 (CuNi 60) [Nm]
M 2.5	0.4…0.45	…
M 3	0.5…0.6	0.5…1.0
M 3.5	…	0.8…1.6
M 4	1.2…1.9	1.2…2.4
M 5	2.0…3.0	2.0…4.0
M 6	…	2.5…5.0

Products with head screw with hexagon

Thread	Torque range Steel screws [Nm]
M 4	1.2…2.4
M 5	2.0…4.0
M 6	3.0…6.0
M 8	6.0…12
M 10	10.0…20
M 12	14.0…31
M 16	25.0…60

Terminals

Use of aluminium conductors

Weidmüller terminals are suitable for the direct connection of **solid round** and **sector-shaped aluminium conductors**.

Unlike copper, aluminium has certain material properties, which have to be taken into consideration when it is used as a conductor in electrical systems.

When exposed to air, the bare surface of the aluminium immediately becomes covered with a thin, non-conductive layer of oxide. This increases the contact resistance between the aluminium conductor and the busbar in the terminal. In the worst case, this may develop into a so-called glowing contact.

In the case of stranded conductors, this phenomenon is exacerbated by the contact resistance of the individual wires.

Despite these disadvantageous properties, aluminium conductors can be connected to Weidmüller terminals if the reduced rating currents for aluminium conductors and the following assembly instructions are observed:

1. Carefully clean the oxide layer from the stripped end of the conductor, for example using a knife.
Caution: do not use brushes, files or sandpaper, to which aluminium particles may adhere and be transferred to other conductors.

2. Immediately after removing the oxide layer, rub neutral grease – such as acid- and alkali-free Vaseline – into the end of the conductor and connect it directly to the terminal.

3. After disconnecting the conductor, repeat 1 and 2 prior to reconnection.

4. The instructions only apply to solid round or sector-shaped aluminium conductors.

solid round or sector-shaped

Terminal type	Rated cross- section	Reduced rated current when connecting an aluminium conductor	Thread size of terminal screw	Tightening torque
W-series	mm²	„A“		Nm
WDU 2.5	2.5	20	M 2.5	0.5
WDU 4	4	27	M 3	0.6
WDU 6	6	35	M 3.5	1.2
WDU 10	10	48	M 4	2.0
WDU 16	16	64	M 5	3.0
WDU 35	35	105	M 6	4.0
WDU 70	70	163	M 8	10.0
WDU 120	120	230	M 10	15.0
SAK series				
SAK 2.5	2.5	20	M 2.5	0.5
SAK 4	4	27	M 3	0.6
SAK 6	6	35	M 3.5	1.2
SAK 10	10	48	M 4	2.0
SAK 16	16	64	M 4	2.0
SAK 35	35	105	M 6	4.0

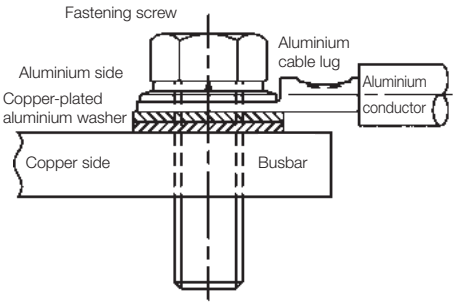
stranded

W-series				
WFF 35	35	105	M 6	3.0
WFF 70	70	163	M 8	6.0
WFF 120	120	230	M 10	10.0
WFF 185	185	300	M 12	15.5
WFF 300	300	409	M 16	30.0

Tips during installation:
When tightening the terminals, it is advisable to hold up the conductor to avoid deformation to the mounting rail and to keep the foot of the terminal free of torsion forces.

Stranded aluminium conductors are connected to terminals using an aluminium cable lug selected according to its conductor shape and connected by following the instructions issued by the cable lug manufacturer.

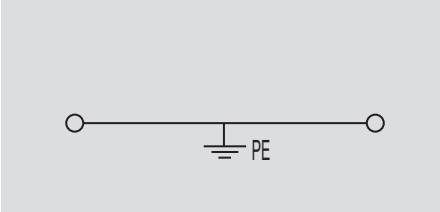
Copper-plated aluminium washers are necessary for the transition from aluminium cable lugs to the busbar of the terminals. This is the only way to ensure reliable transition from copper to aluminium. The washers are fitted so that the copper side is in contact with the busbar and the aluminium side with the aluminium cable lug.



Terminals

Definition of the various types

PE terminals



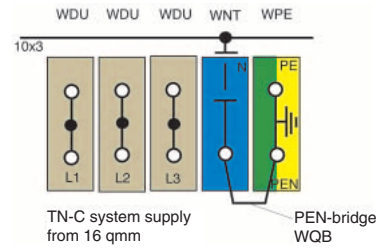
A PE terminal is a component with either one or several clamping positions for connecting and/or branching PE conductors (PE and PEN conductors) with a conductive connection to their support. Partially insulated PE terminals are insulated from adjacent live parts of terminals; the partial insulation is marked green/yellow.

Scope (IEC 60947-7-2)

This standard applies to PE terminals (with PE function) up to 120 mm² and to PE terminals (with PEN function) for sizes upwards of10 mm² with screw clamping points or screwless clamping points for connecting round copper conductors with a cross- section between 0.2 mm² and 120 mm² (AWG 24/250 kcmil) for circuits up to 1000 Vac 1000 Hz or up to 1500 Vdc. PE terminals are used to produce the electrical and mechanical connection between copper conductors and the fastening base.

PEN function

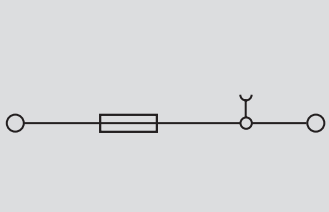
Acc. to IEC 60947-7-2, only copper mounting rails may be used for application of the PEN function. Steel mounting rails must not be used.



Use of TS 35 x 15

In order to comply with the current capability required by IEC 60947-7-2, the TS 35 x 15 mounting rail must be used for PE terminals with a rated cross-section of 16 mm² and upwards.

Fuse terminals



Fuse terminals consist of a terminal base and a fuse insert holder.

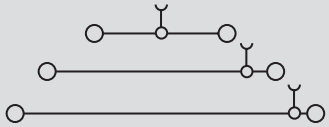
In the case of fuse terminals for low-voltage fuse inserts (D-system), the technical data are defined by IEC 60947-7-3 in conjunction with VDE 0636 part 301.

In the case of fuse terminals for device protection fuse inserts, the technical data are defined by standard IEC 60947-7-3 pertaining to the specific range of applications of these products.

Fuse terminals for device protection are rated for a certain maximum power loss on the basis of standard IEC 60127-2 valid for G-fuse inserts.

The product pages contain details about the maximum power loss for individual or composite arrangements for short-circuit and/or overload protection.

Multi-tier distribution terminals



A multi-storey distribution terminal is a unit with clamping points for connecting and/or linking external, neutral and PE conductors to their fastening support with a conductive PE connection.

These terminals can be fitted on top of or next to each other and assembled to form terminal strips.

They have several connection levels, all of which are isolated from each other.

Scope IEC 60947-7-1 / IEC 60947-7-2 DIN VDE 0611-4 (partially)

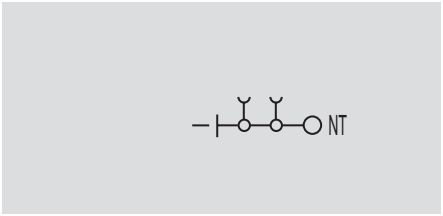
These standards apply to multi-storey distributor terminals with clamping points and screw connections, and/or screwless connections for connecting or linking solid, stranded or flexible copper conductors. In distributor terminals, external conductor and/or N and PE conductor connections are all present together within a confined space.

The N-conductor can be divided for insulation measurement; it is not used for disconnecting or switching.

Terminals

Definition of the various types

Neutral conductor isolating terminals



A neutral conductor disconnect terminal is a unit with clamping points for connecting and/or linking neutral conductors with disconnect connection.

These terminals can be fitted on top of or next to each other and assembled to form terminal strips.

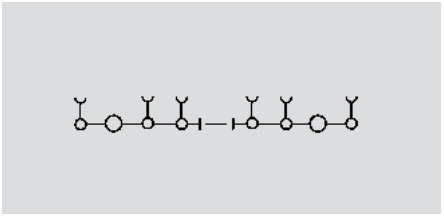
Rated voltage
IEC 60947-7-1
IEC 60947-1

The rated voltage given conforms to IEC 60947-7-1. It is the rated insulation voltage and is defined acc. to IEC 60947-1 or IEC 60947-7-1.

400 V applies to
external conductor / external conductor

250 V applies to
external conductor / N-conductor
external conductor / PE conductor
N-conductor / PE conductor

Measuring and isolating terminals



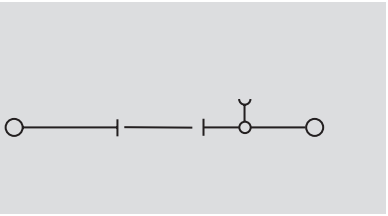
Measuring and isolating terminals are used for partial disconnection of circuits for measuring purposes in unloaded state.

The rated voltage of the measuring and isolating terminal is the rated insulation voltage, to which the insulation tests and creepage distances refer.

It is defined acc. to IEC 60664-1 and is one of the specifications marked on the terminal.

The opened disconnect point is dimensioned according to the allocated rated surge voltage.

Isolating terminals



Isolating terminals are used for operational disconnection of circuits in unloaded state.

The rated voltage of the isolating terminals is the rated insulation voltage to which the insulation tests and creepage distances refer, and is defined acc. to IEC 60664-1.

The opened disconnect point is dimensioned acc. to the rated surge voltage allocated for devices with disconnect function acc. to DIN VDE 0100-537 and IEC 60947-7-1.

The disconnects of the isolating terminals are rated for unloaded actuation (use category AC20 acc. to IEC 60947-1) and used to clear a system or part of a system.

Terminals

Ex terminals

Confirmed according to the new European Ex-Directive 94/9/EC – ATEX –

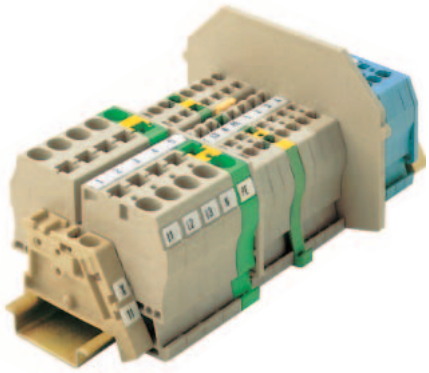
Basic specifications

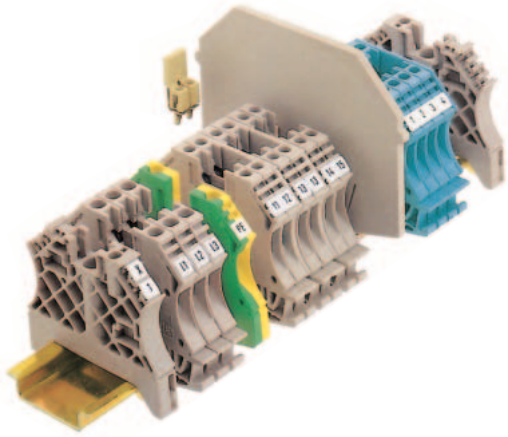
IEC 60947-7-1 (EN 60 947-7-1/ VDE 0611P.1) and IEC 60 947-7-2 (EN 60 947-7-2/ VDE 0611P.3) are the basic specifications for terminals, and also protective conductor terminals. For use in potentially explosive atmospheres the following standards also apply: EN 50 014 (IEC 60 079-0/ VDE 0170/0171 P.1) and for increased safety “e” EN 50 019 (IEC 60 079-7/ VDE 0170/0171 P. 6). Ex terminals are so-called Ex-components according to EN 50014.

Components means any item essential to the safe functioning of equipment and protective systems, but with no autonomous function.

Components according to the Ex-directive 94/9/EC are not marked with CE.

Ex terminals are certified for the type of protection increased safety “e”.





According to the directive 94/9/EC, the European notified bodies have been issuing EC-type examination certificates of the so-called ATEX-Generation since 1997 in accordance with EN 50014 / 50019 and the Ex directive 94/9/EC.

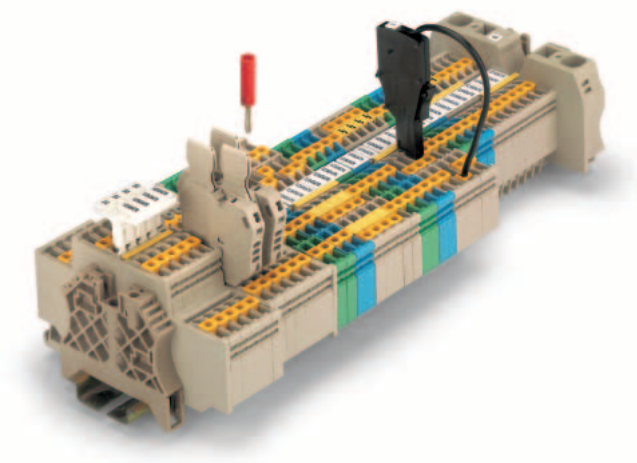
A prerequisite is a notification of the manufacturer’s quality system. This exists for Weidmüller since 1997. Copies of these type examination certificates, the notification document and the declarations of conformity are available on request in electronic form.

The former component certifications (A to D generation) according to the Ex directive 76/117/EEC are still valid until 30/6/2003.

The clamping yoke, tension clamp and IDC clamping system of the terminals provide increased protection against self-release, and are so designed that conductor ends of flexible conductors do not have to be pre-prepared. The cross-sections and connection data specified in the selection tables are included in the certification.

Marking

Ex-RL94/9EG: ⟨Ex⟩ II 2 G D	
⟨Ex⟩	Ex electrical equipment
II 2 G	Equipment group II category 2 (zone 1 electrical equipment)
II 2 D	Equipment group II category 2 (zone 21 electrical equipment)
EN	**50014/19:** EEx e II
E	Conformity with EN standards
Ex	Explosion protection
e	Increased safety
II	Equipment group
KEMA	**97ATEX4677U** (Example)
KEMA	Notified body
ATEX	Conformity with 94/9/EC
U	Component



Terminals

Ex terminals

Confirmed according to the new European Ex-Directive 94/9/EC – ATEX –

Electrical data

The specified values of the current carrying capacity are related to an ambient temperature of 40 °C. At rated current load (+ 10%), the temperature of the currentbar of the terminal increases by a maximum of 40 K.

Recognizing an additional factor of safety according to EN 50 014, gives the following results:

Temperature class	Ambient temperature
T6, T5	– 50 °C to + 40 °C
T4 to T1	– 50 °C to + 55 °C

If the real ambient temperature is higher, the permitted operating current must be reduced accordingly. As defined in EN 50 014, the continuous operating temperature for Wemid and KrG is 100 °C, for PA material 80 °C.

Accessories

The accessories listed in the tables can be used, and are listed in the Ex certifications. To maintain the creepage and clearance distances for “e”, end plates or partitions should be used, as specified in the table.

Design for EEx i

Terminals for “i” intrinsically-safe circuits are passive components, whose temperature-rise behaviour and the electrical characteristics are known.

Therefore, there is no requirement for certification when being used in intrinsically-safe circuits.

The terminals are light blue to ensure clear identification and easy recognition.

These terminals conform to the construction type as terminals corresponding to the EEx e specifications.

Accessories

The accessories listed in the tables can be used and conform to EN 50 020 (IEC 60 079-11/VDE 0170/0171 P. 7).

Mounting

The general statements also apply here for EEx i applications. Additionally, the EEx i requirements always apply to the complete circuit, therefore also for parts in non-potentially explosive atmospheres.

Clampability of 2 conductors in EExe

For our W-series terminals, it is fundamentally permitted to connect 2 wires to each clamping point. It is, however, necessary to use the next size down from the rated wire cross-section. For detailed information see section “Terminals”.

Current carrying capacity of cables and conductors

Rated currents

Cross-section	VDE 0298 Part 4 (IEC364-5-523) Current carrying capacity of conductors		EN 50019 2nd. edtition Increased-safety type of protection connection terminals Ambient temperature 40 °C 40 K rise Current equivalent to connect conductor
	Ambient temperature 30 °C Routing type C + 3 for PVC 70 °C conductors	Ambient temperature 40 °C Factor 0.87 Routing type C + 3 for PVC 70 °C conductors	
	A	A	A
1.5	17.5	15.225	15
2.5	24	20.88	21
4	32	27.84	28
6	41	35.67	36
10	57	49.59	50
16	76	66.12	66
25	101	87.87	88
35	125	108.75	109
50	150	130.5	131
70	192	167.04	167
90	232	201.84	202
120	269	234.03	234
150	309	268.83	267
185	353	307.11	307
240	415	361.05	361
300	520	452.4	452

The current carrying capacity of cables and conductors in the installation is normally specified at 30 °C ambient temperature according to VDE 0298 Part 4.
At 40 °C, the operating current shall be reduced by a factor of 0.87.

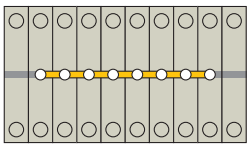
Terminals

ATEX cross-connection instructions

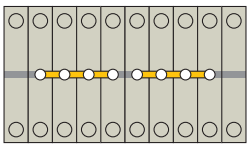
Arrangements of terminals and cross-connections

The maximum voltages for EEx e applications given below are determined on the basis of the terminals used, their cross-connection and which of the arrangements A-J is used.

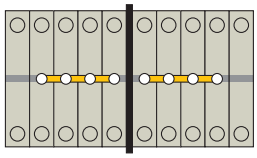
A Continuous



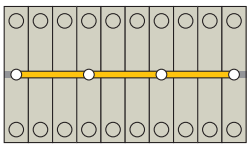
B Adjacent (To use with WQV)
Not separated by a partition plate or end plate



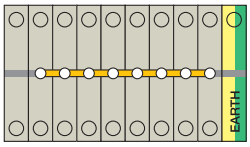
C Adjacent (To use with QV)
Separated by a partition plate or end plate



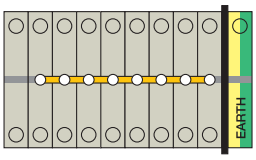
D Skipping
Bridging one or several not connected terminals (e.g. every third)



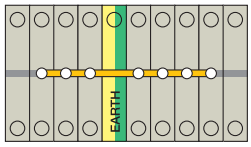
E Adjacent to a PE terminal (earth)
Without partition plate or end plate



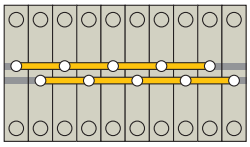
F Adjacent to a PE terminal (earth)
With partition plate or end plate



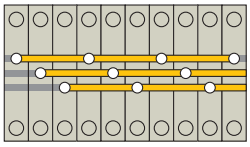
G Bridging a PE terminal (earth)



H 2 parallel cross-connections



I 3 parallel cross-connections



Maximum voltage

Family [1]	Certificate no.	Rated voltage	Rated current	Nominal cross-section	Maximum voltage (V) (letters refer to the above diagrams)								
AKZ ...		V	A	mm²	A	B	C	D	E	F	G	H	I
AKZ 1.5	SIRA 02ATEX3001U	175	15	1.5	175	175	175	175	175	175	175	–	–
AKZ 2.5	SIRA 02ATEX3001U	175	21	2.5	175	175	175	175	175	175	175	–	–
AKZ 4	SIRA 02ATEX3001U	275	28	4.0	275	275	275	275	275	275	275	–	–
BK ...													
BK 2/E ... BK 12/E	SIRA 01ATEX3247U	275	28	4.0	175	175	275	175	–	–	275	–	–
I-series / IDK ...													
IDK 1.5N	KEMA 02ATEX2241 U	275	15	1.5	275	275	275	275	–	–	–	–	–
I-series / IDU ...													
IDU 1.5N	KEMA 02ATEX2241 U	275	15	1.5	275	275	275	275	275	275	275	275	–
IDU 2.5N	DEMKO 03ATEX134054 U	550	21	2.5	550	420	550	550	550	550	550	550	–
IDU 2.5N/ZF	DEMKO 03ATEX134054 U	550	21	2.5	550	420	550	275	275	550	275	550	–
IDU 2.5N/ZB	DEMKO 03ATEX134054 U	550	21	2.5	550	420	550	275	275	550	275	550	–
IDU 1.5 TE/E	KEMA 99ATEX4329 U	275	15	1.5	275	275	275	110	275	275	110	275	–
IDU 2.5 TE/E	KEMA 99ATEX4329 U	275	21	2.5	275	275	275	110	275	275	110	275	–
MK ...													
MK 3/.../E	SIRA 01ATEX3248U	275	21	2.5	175	175	275	175	–	–	–	–	–
MK 6/.../E	SIRA 01ATEX3249U	420	36	6.0	275	275	420	275	–	–	–	–	–

[1] Please refer to the catalogue and the certificate showing precisely which article is approved.

Terminals

Maximum voltage

Family 1)	Certificate no.	Rated voltage	Rated current	Rated cross-section	Maximum voltage (V) (letters refer to the above diagrams)								
SAK-series		V	A	mm²	A	B	C	D	E	F	G	H	I
SAK 2.5	KEMA 97ATEX1798 U	550	21	2.5	550	550	550	175	550	550	175	–	–
SAK 4	KEMA 97ATEX1798 U	550	28	4.0	550	550	550	175	550	550	175	–	–
SAK 6N	KEMA 97ATEX1798 U	550	36	6.0	550	550	550	175	550	550	175	–	–
SAK 10	KEMA 97ATEX1798 U	550	50	10.0	550	550	550	175	550	550	175	–	–
SAK 16	KEMA 97ATEX1798 U	750	66	16.0	550	550	550	175	550	750	175	–	–
SAK 35	KEMA 97ATEX1798 U	550	109	35.0	550	550	550	175	550	550	175	–	–
W-series / WDK ...													
WDK 1.5/R3.5	KEMA 99ATEX6545 U	275	15	1.5	175	175	275	175	175	–	–	–	–
WDK 2.5	KEMA 98ATEX1687 U	275	21	2.5	275	275	275	60	275	275	60	–	–
WDK 2.5N	KEMA 00ATEX2061U	550	21	2.5	550	550	550	275	550	550	275	–	–
WDK 4N	KEMA 00ATEX2061U	550	28	4.0	550	550	550	275	550	550	275	–	–
W-series / WDU ...													
WDU 1.5/ZZ	KEMA 98ATEX1685 U	550	14	1.5	550	550	550	110	550	550	110	110	–
WDU 2.5/1.5/ZR	KEMA 98ATEX1685 U	550	15	1.5	550	550	550	110	550	550	110	110	–
WDU 2.5/TC	SIRA 02ATEX3153 U	50	15	1.5	–	–	–	–	–	–	–	–	–
WDU 1.5/R3.5	KEMA 99ATEX6545 U	275	1	2.5	175	175	275	175	175	–	–	–	–
WDU 2.5N	KEMA 98ATEX1683 U	420	21	2.5	420	420	420	110	420	420	110	–	–
WDU 2.5	KEMA 98ATEX1683 U	550	21	2.5	550	550	550	110	420	550	110	110 [2)]	60 [3)]
WDU 4	KEMA 98ATEX1683 U	750	28	4.0	750	750	750	110	420	750	110	–	–
WDU 6	KEMA 98ATEX1683 U	550	36	6.0	550	550	550	110	420	550	110	–	–
WDU 10	KEMA 98ATEX1683 U	550	50	10.0	550	550	550	110	420	550	110	–	–
WDU 16	KEMA 98ATEX1683 U	750	66	16.0	750	750	750	110	750	750	110	–	–
WDU 35	KEMA 98ATEX1683 U	750	109	35	750	750	750	110	750	750	110	–	–
WDU 70N/35	KEMA 98ATEX1683 U	750	167	70	750	750	750	–	750	750	–	–	–
WDU 70/95	KEMA 98ATEX1686 U	750	202	70	750	750	750	–	750	750	–	–	–
WDU 120/150	KEMA 98ATEX1686 U	1100	234	120	1100	1100	1100	–	1100	1100	–	–	–
WDU 240	KEMA 01ATEX2186 U	750	300	240	–	–	–	–	–	–	–	–	–
WDU 4 SL	SIRA 02ATEX3242 U	275	28	4	275	275	275	175	275	275	175	175	–
WDU 6 SL	SIRA 02ATEX3242 U	275	36	6	275	275	275	175	275	275	175	175	–
WDU 10 SL	SIRA 02ATEX3242 U	275	50	10	275	275	275	175	275	275	175	175	–
Stud terminals / WFF ...													
WFF 35	KEMA 98ATEX1684 U	1100	109	35	1100	1100	1100	–	1100	1100	–	–	–
WFF 70	KEMA 98ATEX1684 U	1100	167	70	1100	1100	1100	–	1100	1100	–	–	–
WFF 120	KEMA 98ATEX1684 U	1100	234	120	1100	1100	1100	–	1100	1100	–	–	–
WFF 185	KEMA 98ATEX1684 U	1100	307	185	1100	1100	1100	–	1100	1100	–	–	–
WFF 300	KEMA 98ATEX1684 U	1100	452	300	1100	1100	1100	–	1100	1100	–	–	–
Z-series / ZDK ...													
ZDK 2.5/1.5	KEMA 97ATEX4677 U	275	18	2.5	275	275	275	275	275	275	275	–	–
Z-series / ZDU ...													
ZDU 1.5	KEMA 01ATEX2106 U	550	15	1.5	275	275	275	175	275	550	175	275	–
ZDU 1.5/3AN	KEMA 01ATEX2106 U	550	15	1.5	275	275	275	175	275	550	175	275	–
ZDU 1.5/4AN	KEMA 01ATEX2106 U	550	15	1.5	275	275	275	175	275	550	175	275	–
ZDU 2.5	KEMA 97ATEX2521 U	550	21	2.5	275	275	275	275	275	275	275	275	–
ZDU 2.5/2X2AN	KEMA 97ATEX2521 U	550	21	2.5	–	–	–	–	–	–	–	–	–
ZDU 2.5/3AN	KEMA 97ATEX2521 U	550	21	2.5	275	275	275	275	275	275	275	–	–
ZDU 2.5/4AN	KEMA 97ATEX2521 U	550	21	2.5	275	275	275	275	275	275	275	–	–
ZDU 4	KEMA 97ATEX2521 U	550	28	4	275	275	275	275	275	275	275	275	–
ZDU 6	KEMA 97ATEX2521 U	550	36	6	275	275	275	275	275	275	275	275	–
ZDU 6/3AN	KEMA 00ATEX2107 U	550	36	6	275	275	275	275	275	275	275	–	–
ZDU 10	KEMA 99ATEX5514 U	550	50	10	550	550	550	–	550	550	–	–	–
ZDU 10/3AN	KEMA 00ATEX2107 U	550	50	10	550	550	550	275	550	550	–	–	–
ZDU 16	KEMA 99ATEX5514 U	550	66	16	550	550	550	–	550	550	–	–	–
ZDU 16/3AN	KEMA 00ATEX2107 U	550	66	16	–	–	–	–	–	–	–	–	–
ZDU 35	KEMA 00ATEX2107 U	750	109	35	550	550	550	–	550	750	–	–	–
ZDU 2.5-2/3AN	KEMA 97ATEX4677 U	550	21	2.5	420	420	420	275	550	550	275	110	–
ZDU 2.5-2/4AN	KEMA 97ATEX4677 U	550	21	2.5	–	–	–	–	–	–	–	–	–
ZDUA 2.5-2	KEMA 97ATEX4678 U	275	20	2.5	275	275	275	110	275	275	110	–	–
ZDUB 2.5-2/...	KEMA 97ATEX2755 U	550	21	2.5	–	–	–	–	–	–	–	–	–

[1)] Please refer to the catalogue and the certificate showing precisely which article is approved.

[2)] For ZQV, the outer channels must be used in these cases.
[3)] Only possible with ZQV.