Technical dictionary


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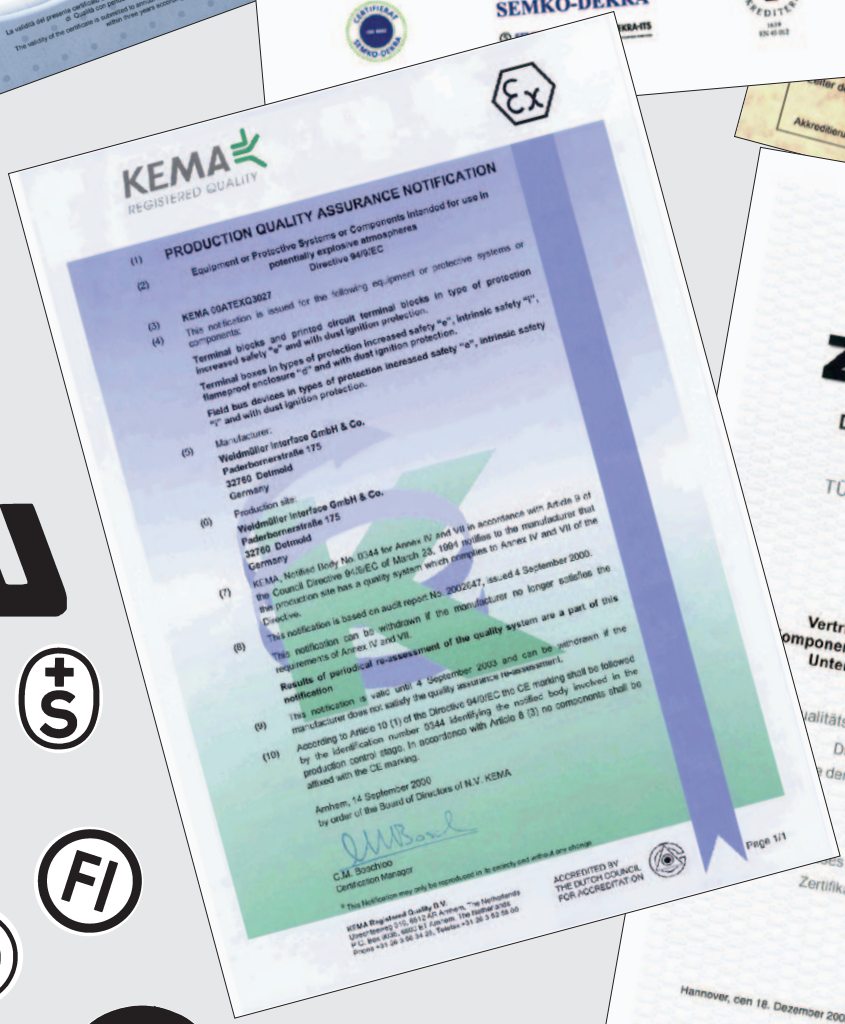
CERTIFICATO N. 9105.WEID
CERTIFICATE N.
WEIDMULLER SRL
VIA A. EINSTEIN 4 - 20092 CINISELLO BALSAMO (MI)
UNITA' OPERATIVE
OPERATIVE UNITS
VIA EINSTEIN, 4 - 20092 CINISELLO BALSAMO (MI)
E' CONFORME ALLA NORMA
IS IN COMPLIANCE WITH THE STANDARD
ISO 9001:2000
PER LE SEGUENTI ATTIVITA'
FOR THE FOLLOWING ACTIVITIES
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 components, active components for particular applications components, tools) and actualization of active components for particular applications
Riferirsi al manuale della qualità per l'applicabilità dei requisiti della norma ISO 9001:2000
Refer to quality manual for details of applications to ISO 9001:2000 requirements
IL PRESENTE CERTIFICATO E SOGGETTO AL RISPETTO DEL REGOLAMENTO PER LA CERTIFICAZIONE DEL SISTEMA QUALITA' E DI GESTIONE DELLE AZIENDE
THE USE AND THE VALIDITY OF THE CERTIFICATE SHALL SATISFY THE REQUIREMENTS OF THE RULES FOR THE CERTIFICATION OF COMPANY QUALITY AND MANAGEMENT SYSTEMS
EMISSIONE CORRENTE
CURRENT ISSUE
20 dicembre 2002
PRIMA EMISSIONE
FIRST ISSUE
1 giugno 1994
IMQ S.p.A. - VIA QUINTILIANO, 43 - 20138 MILANO
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.
Kvalitetssystemet är i överensstämmelse med
SS-EN ISO 9002:1994
Villkor och omfattning för detta certifikat finns angivna i certifieringsbeslutet
Kista, 4 juli 2000
SEMKO-DEKRA Certification AB
Ursprungscertifikat utfärdat
7 juni 1995
SEMKO-DEKRA


Deutsche Akkre
Deutschen
Akkre
Die Deutsche Akkreditierungsstelle Tec
Prüflaboratorium
Weidmüller Interf
Ohmstr
D-32758 D
die Kompetenz nach DIN EN ISO/IEC 17025 bes
Relais, Reihenklemmen,
Sicherheit elektronischer Betrieb
Elektromagnetischer Verträ
den in der Anlage aufgeführten Normen und Spe
kkreditierung ist gültig bis: 18.12.2007
age ist Bestandteil der Urkunde und besteht aus
istriernummer: DAT-P-008/91-13
gain, 12.12.2002
(FH) R. Egner
ter der Akkreditierungsstelle
Akkreditierungsstelle in der TGA – Trägergemeinschaft für Akkreditierung


KEMA
REGISTERED QUALITY
PRODUCTION QUALITY ASSURANCE NOTIFICATION
(1) Equipment or Protective Systems or Components intended for use in potentially explosive atmospheres
Directive 94/9/EC
(2)
(3) KEMA 00ATEX3027
(4) This notification is issued for the following equipment or protective systems or components:
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.
(5) Manufacturer:
Weidmüller Interface GmbH & Co.
Paderbornerstraße 175
32760 Detmold
Germany
(6) Production site:
Weidmüller Interface GmbH & Co.
Paderbornerstraße 175
32760 Detmold
Germany
(7) KEMA, Notified Body No. 0344 for Annex IV and VII in accordance with Art.de 9 of the Council Directive 94/9/EC of March 23, 1994 notifies to the manufacturer that the production site has a quality system which complies to Annex IV and VII of the Directive.
This notification is based on audit report No. 2002647, issued 4 September 2000.
(8) This notification can be withdrawn if the manufacturer no longer satisfies the requirements of Annex IV and VII.
Results of periodical re-assessment of the quality system are a part of this notification
(9) This notification is valid until 4 September 2003 and can be withdrawn if the manufacturer does not satisfy the quality assurance re-assessment.
(10) According to Article 10 (1) of the Directive 94/9/EC this CE marking shall be followed by the identification number 0344 identifying the notified body involved in the production control stage. In accordance with Article 8 (3) no components shall be affixed with the CE marking.
Arnhem, 14 September 2000
by order of the Board of Directors of N.V. KEMA
C.M. Boschloo
Certification Manager
* This Notification may only be reproduced in its entirety and without any change.
KEMA Registered Quality B.V.
P.O. Box 4130, 6802 EC Arnhem, The Netherlands
Utrechtseweg 310, 6812 AR Arnhem, The Netherlands
Phone +31 26 3 56 35 00, Telefax +31 26 3 52 58 00
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TÜV CERT
ZERTIFIK
Die TÜV CERT-Zertifizierungss
TÜV NORD CERT GmbH & C
bescheinigt gemäß
TÜV CERT-Verfahren, dass das Unte
Weidmüller GmbH & Co.
D - 33102 Paderborn
für den Geltungsbereich
Vertrieb und Marketing von elektromechanis
omponenten sowie Hardware - Bausteinen eins
Unterstützung bei der Schaffung von Lösun
in der Automatisierungstechnik
alitätsmanagementsystem eingeführt hat und an
Durch ein Audit, Bericht-Nr. 8000 300 265
der Nachweis erbracht, dass die Forderungen d
DIN EN ISO 9001 : 2000
erfüllt sind.
es Zertifikat ist gültig bis Oktober 2005
Zertifikat-Registrier-Nr. 08 / 100 / 9535 / 6
Hannover, den 18. Dezember 2002
TÜV NORD
TÜV NORD CERT


GERMANISCHER LLOYD
1867
c UL us
CESI
LLOYDS REGISTER OF SHIPPING
FOUNDED 1760
REGISTRO ITALIANO NAVALE
1861

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.

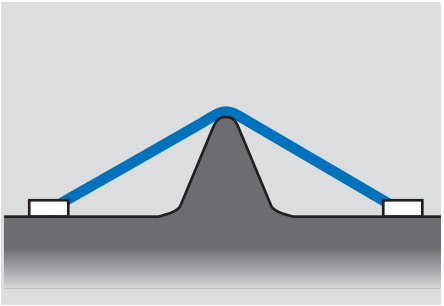
For the rating of clearance and creepage distances, application of the regulations for insulation coordination produces the following interrelationships:

Clearance distances

Clearance distances are rated in accordance with the following factors:

- Anticipated overvoltage
  Rated impuls voltage
- Used
  Overvoltage protection precaution
- Measures to prevent soiling
  Degree of soiling

Diagram showing clearance distance

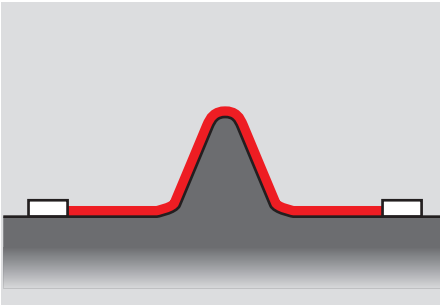


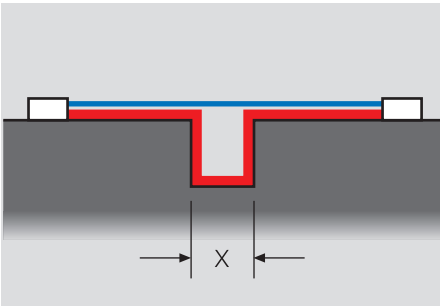
Creepage distance

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 soiling

Degree of soiling 1

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

Degree of soiling 2

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

Degree of soiling 3

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

Degree of soiling 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

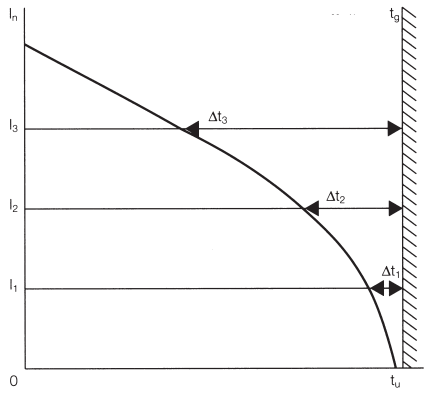
The comparative tracking index is required to have been determined using special samples produced for this purpose with test solution A in compliance with IEC 60112 (DIN IEC 60112/DIN VDE 0303-1).

Electrical data

Current load curve (derating curve)

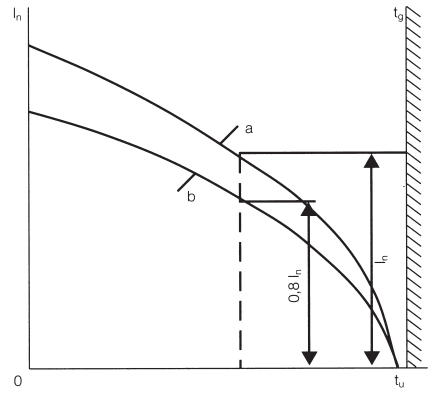
Basic curve

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.

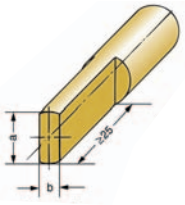
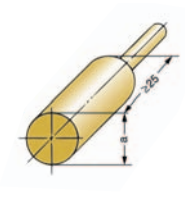
The relationship between AWG and mm² is shown in the following table.

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		
						
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	A 1	2.4	1.5	B 1	1.9	0 – 0.05
2.5	A 2	2.8	2.0	B 2	2.4	
4	A 3	2.8	2.4	B 3	2.7	
6	A 4	3.6	3.1	B 4	3.5	0 – 0.06
10	A 5	4.3	4.0	B 5	4.4	
16	A 6	5.4	5.1	B 6	5.3	
25	A 7	7.1	6.3	B 7	6.9	0 – 0.07
35	A 8	8.3	7.8	B 8	8.2	
50	A 9	10.2	9.2	B 9	10.0	
70	A 10	12.3	11.0	B 10	12.0	0 – 0.08
95	A 11	14.2	13.1	B 11	14.0	
120	A 12	16.2	15.1	B 12	16.0	
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.

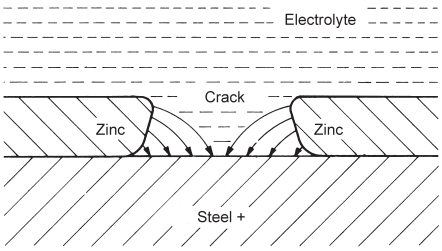
Steels

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.

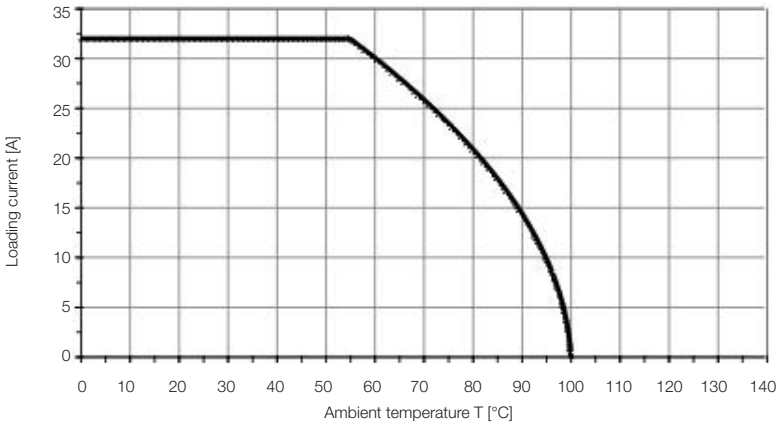
Figs. 1–3 show examples of current heating curves (in this case for a rated current of 32 A) for three different insulating materials:

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

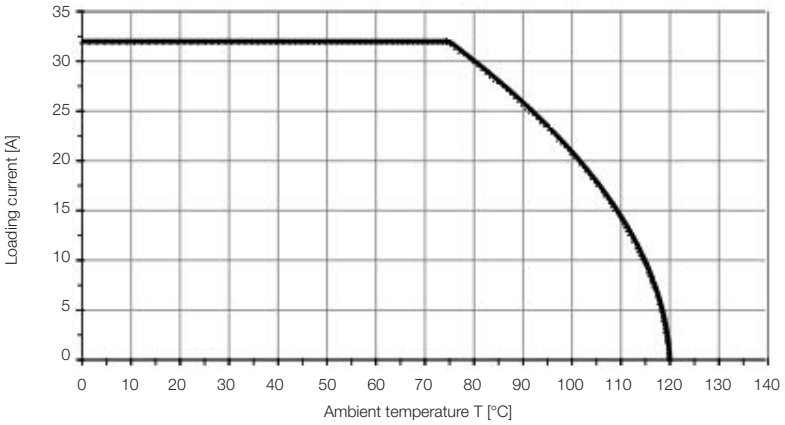
Depending on the insulation material used, the rating current can be conducted up to an ambient temperature of 55 °C for PA 66, 75 °C for Weidmüller's insulation material WEMID, or up to 85 °C for duroplastic insulation materials (KrG).

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

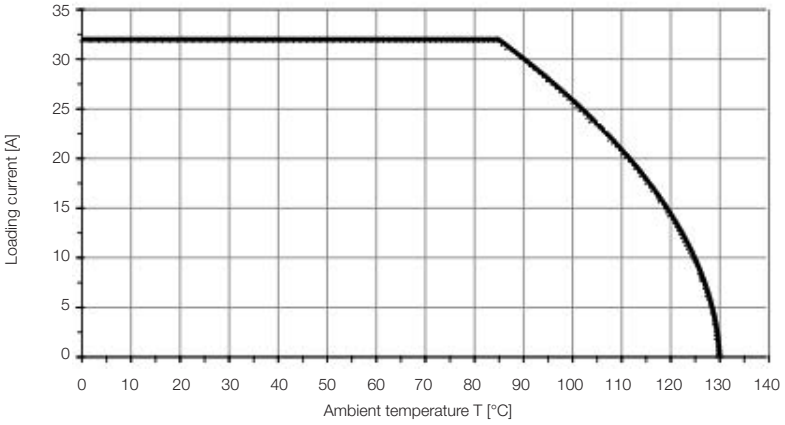
Current loading curve
for upper continuous service temperature 100°C – polyamide 66



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



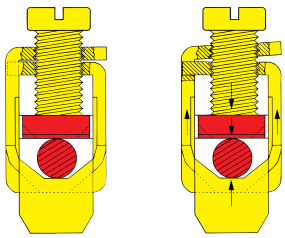
Current loading curve
for upper continuous service temperature 130°C – MF 150 KrG



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.

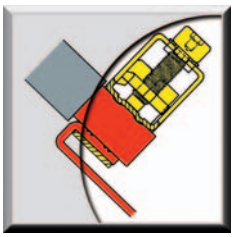


Vibration resistance
The force generated by turning the clamping screw means that the upper thread overlap springs back and exerts a counter-effect on the screw.

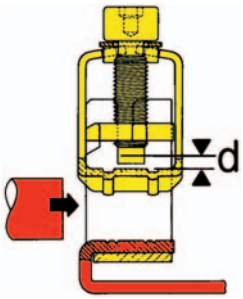
Weidmüller's tension clamp system is vibration-resistant.

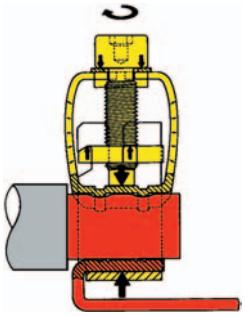
Any settling of the connected conductor is counteracted by the elastic behaviour of Weidmüller's tension clamp. This means it is not necessary to "tighten" the clamping screw.

Pressure clamp connection



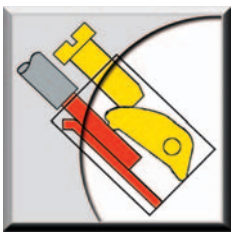
With its patented **pressure clamp connection**, Weidmüller has developed a screw connection system for conductors with large cross-sectional areas. The screw unit can be taken right out of the terminal, making it easier to insert larger conductors (which often otherwise proves difficult). The conductor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

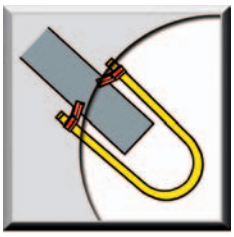
Vibration resistance
The force exerted by the steel pressure clamp when the screw is tightened pulls the two halves of the TOP connection thread apart, as in the tension clamp. This exerts a braking effect on the screw and guarantees outstanding vibration resistance.

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

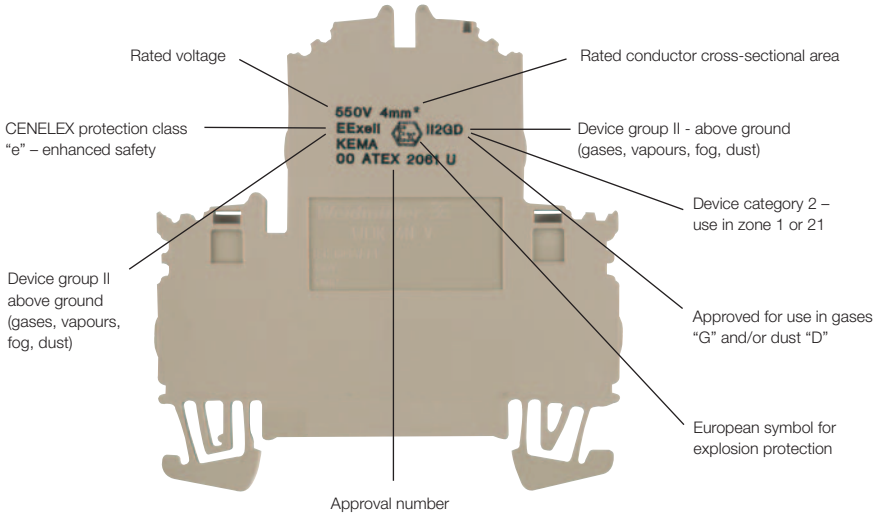
Temperature classes

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