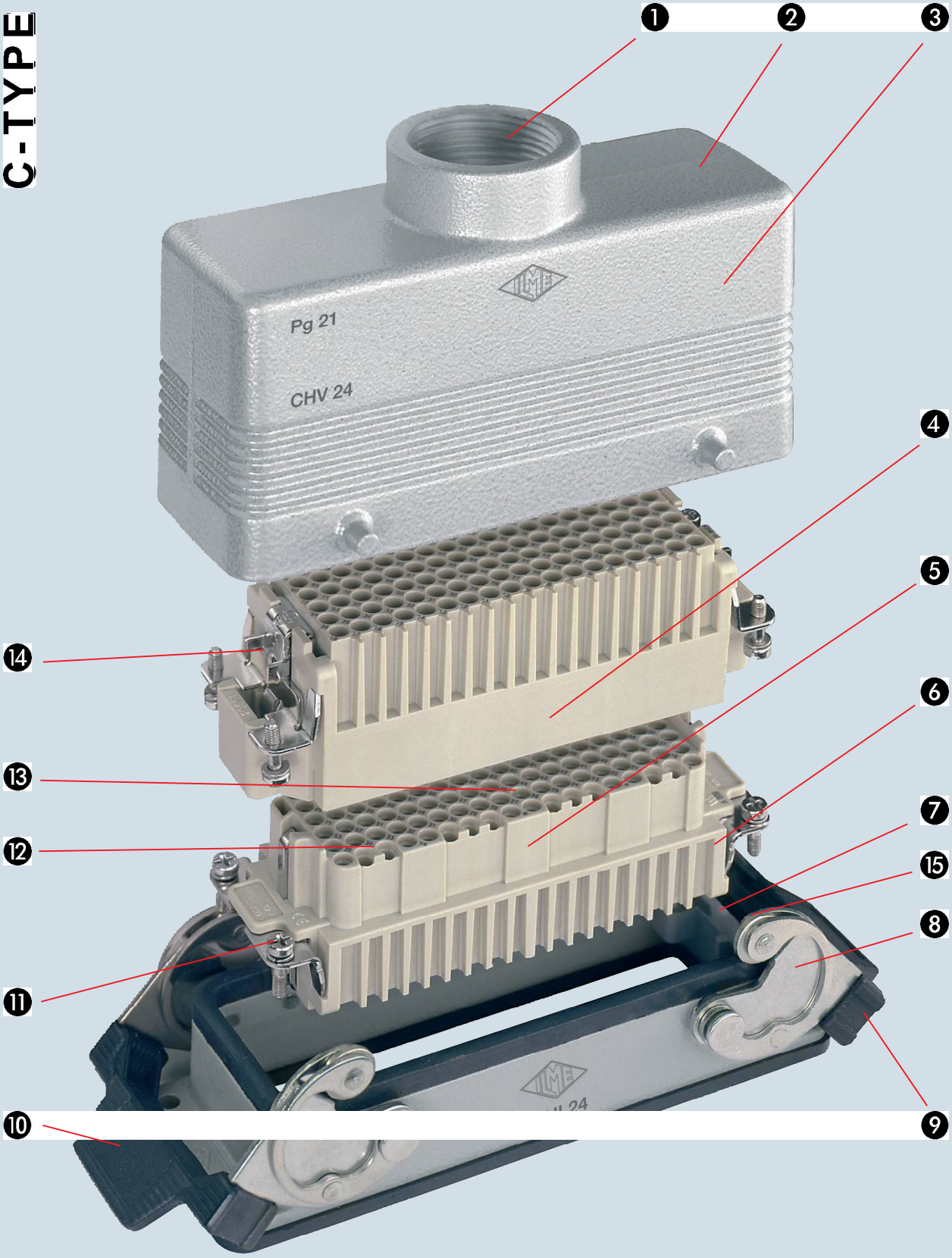
C-TYPE



general features of multipole connectors for industrial purposes

1. Threaded cable passage in various Pg diameters (types with pre-code “C”) or metric passage (types with pre-code “M”) in accordance with EN 60423, for cable entry devices in accordance with EN 50262 (NPT threading on request), may be located vertically, horizontally or frontally.

2. Rugged die-cast aluminum alloy or self-extinguishing thermoplastic enclosures (types CK, MK, CQ 08 and T-Type).
UL approved.
Surface-mounting bulkhead and hood versions are available, with or without fixed covers or with mobile protection covers.
The types of enclosures CH-CA (Pg cable entries) and MH-MA (metric cable entries) have a tab that prevents the insertion of inserts series CME (all) and CMCE (only 16+2 poles), while CM (Pg) enclosures series and MM (metric) do not have any tabs and contain supplementary insulating strips inside.

3. Metallic enclosures with a coated finish of epoxy-polyester with high resistance to mechanical stress and external agents. Enclosures used with temperatures of up to 180 °C and in aggressive environments are treated with special coatings. Where electromagnetic compatibility is necessary, EMC enclosures with high conductivity and high corrosion resistance surface treatment.

4. Inserts are made of UL certified self-extinguishing fibreglass reinforced thermoplastics, and feature an operating temperature range between -40 °C and +125 °C.
The inserts CME (all) and CMCE (only 16+2 poles) for 830V have a key that prevents the insertion of inserts for use other than that prescribed (types CM - Pg and MM - metric).
For some series, inserts in PPS (polyphenylene sulphide) may be requested for special uses with temperatures of up to 180 °C.

5. Insert profiles polarised with asymmetrical guides to avoid incorrect matings.
Inserts have a mechanical life equal to or higher than 500 mating cycles.

6. Inserts are manufactured in compliance with European standard EN 61984 (DIN VDE 0627), certified and identified with UL and CSA markings.

7. Special seal gaskets in vinyl nitrile elastomer or fluoro elastomer (on enclosures for use with maximum temperatures of 180 °C and for aggressive environments), in anti-aging,oil-resistant, fuel-resistant, together with the cable entry devices (not supplied) provide an IP66 degree of protection for coupled connectors.
Special conductive gaskets for EMC enclosures.

8. Stainless steel closure levers and springs guarantee a perfect closure and sealing.

9. Locking device available in two versions, simple (with one lever), or double (with two levers). In metallic enclosures, ILME offers two different types of levers: vertical (V-TYPE) or classic rotative (C-TYPE) closure.

10. Various handle solutions are available: in self-extinguishing, thermoplastic material reinforced with glass fibres; in die-cast aluminium (for special use with temperatures of up to 180 °C); monoblock stainless steel handles (CK, CZ, MK, MZ enclosures and for special uses with temperatures of up to 180 °C).

11. Captive insert fastening screws, with anti-slackening spring washer or under-head knurling.

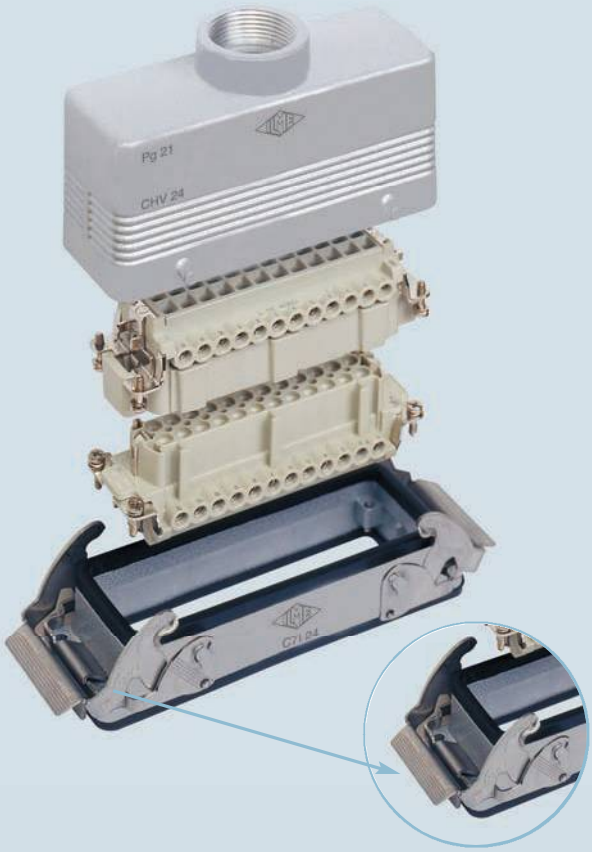
12. Contact position identified with numbers or codes on both sides of each insert and printed with a laser system or from a die.

13. Silver or gold plated brass contacts connected to the wires by means of captive screws supplied already slackened, with spring terminal, by means of crimping (contacts available separately), or with a built-in 45° terminal block (in turn with screw or spring terminal).

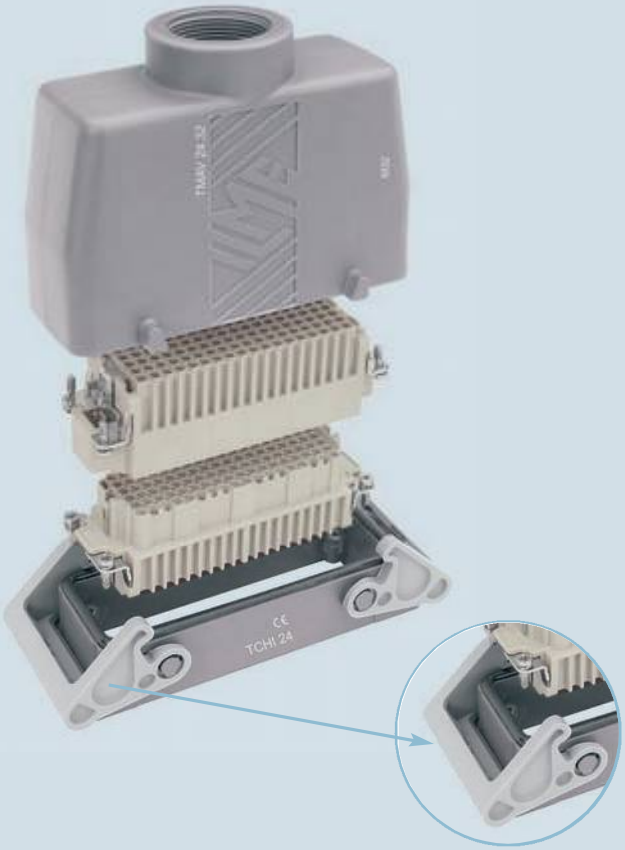
14. Protective earth terminal with a wide contact surface.

15. Pins and levers supplied with anti-friction rings that facilitate closure and limit wear and tear.

V-TYPE



T-TYPE



Dimensioning of clearances and creepage distances

European standard EN 61984 (2009-06) was recently published for safety prescriptions for multipole connectors for industrial uses and for the relevant tests which incorporates without modification the corresponding international standard IEC 61984 Ed EN 2.0 (2008-10).
It is applicable to connectors with rated voltage values of over 50V, and up to 1000V, and rated currents values of up to 125A per pole, for which no dedicated standard exists, or to which the particular specifications or the manufacturer refer as regards the safety aspects. It can be used as a guide for connectors with rated voltage exceeding 125A per pole and those with a rated voltage less than 50V (the latter excluded from the scope of the Low Voltage Directive 2006/95/EC).
The new edition of the EN 61984 standard also introduces the definition of **connector without breaking capacity** (COC) to better distinguish this category of products from **connectors with breaking capacity** (CBC).
For terminal security and performance requirements, according to the connection technique adopted, the standard now integrally refers to the corresponding standards (IEC/EN 60999 series and IEC/EN 60352 series).
For determining the minimum through-air and surface insulation distances, i.e. creepage distances, for connectors, this standard now refers, without any modifications to standard IEC 60664-1 Ed. 2.0 (2007-04)[1].
The following illustrates the method of standard EN 61984, with reference to standard IEC 60664-1, for determining the minimum insulation in connectors. The rated characteristics for each ILME connector family are provided on pages 14 and 15. As in the first edition, the following are now obsolete: the insulation group concept and the distinction of rated voltage values into d.c. and a.c. voltage values 220V and 380V were adapted to standardised values 230V and 400V according to IEC 60038 [2] and some concepts were taken from the regulations for LV electrical systems of the IEC 60364 [3] series, such as:
- the overvoltage categories (I, II, III, IV), according to the use of the equipment [4]: these are correlated with the transient overvoltages taken as a basis for determining the rated impulse withstand voltage;
- the degrees of pollution
- the classification of insulating materials according to their resistance to tracking
- the conditions of the electrical field (homogenous or npn-homogenous).

Overvoltage categories (or impulse withstand)
The overvoltage categories of a circuit or of an electrical system are identified by a conventional number (from I to IV) based on the limit or the control of the assumed transient overvoltage values obtained on a circuit or electrical system and depends on the means used to reduce the overvoltages.

TABLE 1
The rated impulse withstand voltage for equipment powered directly from the low-voltage mains (IEC 60664-1 Ed. 2.0 2008-10)

Rated supply voltage according to IEC 60038 (CENELEC HD 472 S1, CEI 8-6)		Voltage line to neutral derived from nominal voltages a.c. or d.c.	Rated impulse withstand voltage b) Overvoltage category			
V	V	≤ V	V			
Three-phase a)	Single phase		I	II	III	IV
		50	330	500	800	1500
		100	500	800	1500	2500
	120-240	150	800	1500	2500	4000
230/400 } 277/480 }		300	1500	2500	4000	6000
400 / 690		600	2500	4000	6000	8000
1000		1000	4000	6000	8000	12000

a) The "/" symbol indicates a four-wire three phase distribution system (star distribution). The lower value is the voltage between phase and neutral (phase voltage), whereas the higher value is the voltage between the phases (mains voltage). Where only one value is indicated, it refers to three-wire, three-phase systems (delta distribution) and specifies the line-to-line value.
b) Equipment with these rated impulse withstand values can be used in installations in accordance with standard IEC 60364-4-443 (Italian standard CEI 64-8/4 Section 443, German DIN VDE 0100-443).

Table 1 supplies the rated impulse withstand voltage for equipment energised directly from the low voltage mains in function of the rated voltage of the power supply system, the relative voltage line-to-neutral and the overvoltage category.
Industrial machinery and installations with fixed connection to the low voltage supply system and consequently the relative components including multipole connectors, constitute an example of the equipment that belongs to the overvoltage category III.
Examples of general equipment that comes under overvoltage category II are electrical household appliances, portable tools and other household equipment or similar.
For distribution networks with rated voltage of **230/400V** (star distribution with earthed neutral), and over-voltage category III (category **III**: impulse withstanding), the demanded rated impulse withstanding voltage is **4kV**.
For distribution networks with rated voltage of **400** or **500V** (star distribution without neutral or with insulated neutral, or delta distribution, insulated or corner-earthed), and over-voltage category III (category III: impulse withstanding), the demanded rated impulse withstanding voltage is **6kV**.

Pollution degree

Pollution indicates the presence of any kind of foreign matter, whether solid, liquid or gaseous (ionised gas) that can have a negative influence on the dielectric strength or on the surface resistivity of the insulating material.
The standard establishes four degrees of pollution. The categories are identified by conventional numbers based on the quantity of polluting agents or on the frequency of the phenomenon which determines the reduction of the dielectric strength and/or of the surface resistivity.

Pollution degree 1
No pollution or only dry, non-conductive pollution.
The pollution has no influence.
Pollution degree 2
Only non-conductive pollution except that occasionally a temporary conductivity caused by condensation may occur.
Pollution degree 3
Conductive pollution or dry, non-conductive pollution which becomes conductive due to condensation which may occur.
Pollution degree 4
The pollution generates persistent conductivity caused by conductive dust or by rain or snow.

Pollution degree 3 is typical of an industrial environment or similar, while pollution degree 2 is typical of a household environment or similar.

Standard EN 61984 permits the sizing of surface insulation distances of connectors installed in enclosures in protection class ≥IP54 for the degree of pollution immediately below that of the application environment (e.g.: 2 instead of 3).

Extract from standard EN 61984
6.19.2.2 *For a connector in protection rating IP54 or higher, according to Publication IEC 60529, the insulating parts inside the enclosure may be sized for a lower degree of pollution.*
This applies also to coupled connectors, closure of which is ensured by the connector enclosure, and which may be uncoupled for test and maintenance purposes only.
One may therefore use connectors installed in enclosures or containers in protection rating ≥IP54, at the rated data referring to degree pollution 2 in industrial applications with degree of pollution 3, if, in compliance with the standard, the coupling of the connectors is opened only occasionally for tests or maintenance. In the event of temporary or limited duration in uncoupled state, a closing cover is, however, necessary, guaranteeing at least protection class IP54. However, this does not apply to connectors which remain uncoupled and exposed to an industrial atmosphere for an indefinite period. It should be noted, however, that pollution could penetrate inside coupled connectors, also when it comes from remote parts of the electrical system (e.g. through conduits providing cable entry to the connectors enclosure).
Moreover, connector enclosures are usually supplied without cable entry devices, with the installer fitting such devices according to need. The degree of protection marked on the enclosures is guaranteed only for connectors coupled through the use of cable entry devices in equal or higher IP protection rating and expertly installed.

Examples of application for the selection of degree of pollution 2 for a connector
- connector on an electric motor controller, which is uncoupled only to replace a faulty motor, also in cases where degree of pollution 3 is instead specified for the system;
- connector on a module-constructed machine, which is opened only for transport purposes and which is used only for faster installation and for safer putting into service. One must make sure that the connector has not been polluted during transport. To ensure this has not occurred, protective covers or adequate packing must be used;

(1) Assimilated with modifications as European standard EN 60664-1:2007 and published by CENELEC member countries as a national standard: Italian standard CEI EN 60664-1 (class. CEI 109-1) (2008-04), German standard DIN EN 60664-1:2008-01 (VDE 0110-1).
(2) Harmonisation Document CENELEC HD 472 S1, Italian standard CEI 8-6 (1989) + CEI 8-6;V1 (1997), German standard DIN IEC 60038:2002-11.
(3) Italian standard CEI 64-8, German standard DIN VDE 0100.
(4) EN 60664-1 modifies the definition to "impulse withstanding category".

- connector inside a panel in protection rating ≥IP54. In this case one may even renounce equipping the connector with an IP54 enclosure.

Insulating material group

Insulating material influences the determination of the minimum creepage distance. It is characterised according to the damage it suffers from the concentrated release of energy during scintillations when a surface leakage current is interrupted due to the drying of the contaminated surface.
The CTI (comparative tracking index, index of resistance to surface currents) is assumed as index of the resistance to creep currents of the insulating materials in the presence of atmospheric contaminating agents (standard IEC/EN 60112).
The CTI constitutes the numeric value of the maximum voltage at which a material can resist against 50 drops of an electrolytic test solution without tracking, i.e. without a progressive formation of conductive paths on the surface of the solid insulating material (and permanent electric arc between the electrodes of the test equipment) due to the combined effect of electrical stress and electrolytic contamination.
Solid insulating materials are classified into four groups:

group I	600 ≤ CTI
group II	400 ≤ CTI < 600
group IIIa	175 ≤ CTI < 400
group IIIb	100 ≤ CTI < 175

The values for groups IIIa/IIIb (Tab. F.2, IEC 60664-1) are identical for the purpose of determining the creepage distance values.
The insulating materials used to manufacture the ILME multipole connectors belong to groups IIIa / IIIb.

Electric field conditions

The insulation clearance is determined in Table 2 of IEC 60664-1, bearing in mind the following influencing factors:
- rated impulse withstand voltage
- electric field conditions
- altitude: the values specified in Table 2 are valid up to 2.000 m; for higher altitudes, the corrective factors specified in Table F.8 of IEC 60664-1;
- the micro-environment.

The shape and arrangement of the conductive parts influence the homogeneity of the electric field and consequently the clearance needed to withstand a given voltage. The clearances in Case A (non-homogeneous field) have the required impulse withstand voltage under all conditions: clearances not less than those specified in **Table F.2** - **Case A** can be used irrespective of the shape and arrangement of the conductive parts and without verification by an impulse withstand test.

Determination of clearances

In accordance with standard IEC 60664-1, the following must be identified to determine it:
a) The rated voltage of the power supply (usually 230/400V and therefore a conventional voltage line-to-neutral of **300V,** in star distribution networks with earthed neutral, or 400V for star networks without neutral, or with insulated neutral, or in networks with the distribution transformer's secondary winding delta connected, insulated or corner-earthed and, therefore, with conventional phase voltage of 600V);
b) The overvoltage category (usually **III**);
c) The rated impulse withstand voltage determined from Table 1 of IEC 60664-1 (usually **4 kV** or **6 kV**)
d) The type of electric field to which the parts through which the current flows shall be subjected (worse case = **inhomogenous field**) and the degree of pollution (usually **3**).

The standard **EN 61984** requires that the **creepage distance** be dimensioned according to IEC 60664-1. For distances up to 2 mm of insulation, typically to connectors for printed circuits, the reference can be, alternatively, standard IEC 60664-5, to be read in conjunction with IEC 60664-1.
The minimum through-air insulation distance is therefore given by Table F.2 of IEC 60664-1, according to the rated impulse derived from **Table B.1** of the same standard which is part of Attachment B (informative) Rated voltages of power supply networks for different modes of overvoltage control. This table is attributable in particular to devices that do not provide any upstream voltage discharge and represents, therefore the "worst case" and replaces **Table 5** of the previous edition of EN 61984.
The rated impulse withstand voltage must be chosen based on the nominal supply voltage and overvoltage category. The assignment of connectors to a particular overvoltage category (usually **III**) is effected according to the rules of IEC 60664-1.
Rated voltage
Voltage value assigned by the manufacturer to the connector refer to the operating and performance characteristics
NOTE – A connector may have more than one rated voltage value.
[IEC 60664-1:2007, definition 3.9, modified]

As concerns the choice of the type of electric field, the through-air insulation distances via windows and openings in the enclosures of insulating material, must comply with the values of case A in Table of IEC 60664-1. i.e. for non uniform field conditions.

TABLE B.1
Intrinsic control or control of equivalent protection
(IEC 60664-1 Ed.2.0 (2007-04))

Phase-neutral voltages obtained from AC or DC rated voltages up to and including(1)	Rated voltages currently used throughout the world				Rated impulse withstand voltage for the device(1)			
	Three phase four wire systems neutral earthed 	Three-phase three-wire systems not earthed 	Single-phase two-wire AC or DC systems 	Single-phase three-wire AC or DC systems 				
					Overvoltage category			
V	V	V	V	V	I	II	III	IV
50			12.5 24 25 30 42 48	30-60	330	500	800	1500
100	66/115	60	60		500	800	1500	2500
150	120/208(*) 127/220	115, 120, 127	100(**), 110, 120	100/-200(*) 110-220 120-240	800	1500	2500	4000
300	220/380, 230/400, 240/415, 260/440, 277/480	200(**), 220, 230, 240, 260, 277, 347, 380, 400, 415, 440, 480	220	220-440	1500	2500	4000	6000
600	347/600 380/660 400/690 417/720 480/830	500, 577, 600	480	480-960	2500	4000	6000	8000
1000		660 690, 720 830/1000	1000		4000	6000	8000	12000

(1) These columns are taken from Table F.1 indicating the te rated impulse withstand voltages.
(*) Used in the United States and Canada.
(**) Used in Japan.

With the three values (b) (c) and (d) the minimum clearance is determined in Table 2 IEC 60664-1 through-air insulation distance

TABLE F.2*)
Minimum clearance for insulation co-ordination
(IEC 60664-1 Ed.2.0 (2007-04))

Requested impulse withstand voltage[1] [5]	Minimum clearances up to 2.000 m. above sea level					
	Case A Non-homogeneous field (see 3.15) Pollution degree[6]			Case B Homogeneous field (see 3.14) Pollution degree[6]		
	1	2	3	1	2	3
kV	mm	mm	mm	mm	mm	mm
0,33[2]	0.01	0.2[3] [4]	0,8[4]	0.01	0.2 [3] [4]	0,8[4]
0.40	0.02			0.02		
0,50[2]	0.04			0.04		
0.60	0.06			0.06		
0,80[2]	0.10			0.10		
1.0	0.15			0.15		
1.2	0.25	0.25		0.2		
1,5[2]	0.5	0.5		0.3	0.3	
2.0	1.0	1.0	1.0	0.45	0.45	
2,5[2]	1.5	1.5	1.5	0.60	0.60	
3.0	2.0	2.0	2.0	0.80	0.80	
4,0[2]	3.0	3.0	**3.0**	1.2	1.2	1.2
5.0	4.0	4.0	4.0	1.5	1.5	1.5
6,0[2]	5.5	5.5	**5.5**	2.0	2.0	2.0
8,0[2]	8.0	8.0	**8.0**	3.0	3.0	3.0
10	11	11	11	3.5	3.5	3.5
12[2]	14	14	**14**	4.5	4.5	4.5
15	18	18	18	5.5	5.5	5.5
20	25	25	25	8.0	8.0	8.0
25	33	33	33	10	10	10
30	40	40	40	12.5	12.5	12.5
40	60	60	60	17	17	17
50	75	75	75	22	22	22
60	90	90	90	27	27	27
80	130	130	130	35	35	35
100	170	170	170	45	45	45

(1) This voltage is
— for functional insulation, at the maximum impulse voltage that can occur at the clearance distance (see 5.1.5),
— for primary insulation directly exposed or significantly affected by transient overvoltages from the low voltage power supply (see 4.3.3.3, 4.3.3.4.1 and 5.1.6), the rated equipment impulse voltage,
— for the primary insulations (see 4.3.3.4.2), the maximum impulse voltage that can occur in the circuit.
For reinforced insulation, see 5.1.6.
(2) Preferential values specified in 4.2.3 [? table 1].
(3) For printed circuit material, the values of degree of pollution 1 apply except that the value shall not be less than 0.04 mm as specified in Table F.4
(4) These minimum clearances given for pollution degrees 2, 3 are based on the reduced resistance characteristics of the corresponding surface insulation distance in wet conditions(see IEC 60664-5).
(5) For parts or circuits inside equipment subjected to impulse voltages compliant with 4.3.3.4.2, interpolation of values is allowed. However, normalization is achieved using the series of preferred impulse voltage values of 4.2.3.
(6) The dimensions for degree of pollution 4 are those specified for degree of pollution 3, with the exception that the minimum through-air insulation distance is 1.6 mm.

When the clearance is less than the value indicated for Case A an impulse withstand voltage test certificate is required.
Compared to the previous edition of IEC 60664-1 Table F.2 is has been changed (already with the Variant 2). In particular, the columns referring to degree of pollution 4 have been eliminated. The definition of this degree is varied in 6.2 to: “permanent conductivity occurs, due to conductive dust, rain or other humid conditions”. The through-air insulation distances for degree of pollution 4 area as specified for degree of pollution 3, with the exception that the minimum through-air distance is 1.6 mm.
In 6.3 it states that “the size of the surface distances can not be specified in presence of permanent conductive pollution (pollution degree 4) For temporarily conductive pollution (pollution degree 3) the insulation surface can be designed to avoid the formation of a continuous conductive pollution path, for example using ribs or grooves”.

The values in bold are the most common multipole connectors for industrial purposes.

If the component respects the minimum through-air insulation distance prescribed for live parts of opposing polarities, it is exempted from the impulsed voltage withstanding test. This test is run at sea level using increased voltage values in order to take into account rarefied air at high altitude (the prescribed values refer to 2000 m asl). However, if this distance is not respected, passing the test gives one the right to declare the relevant rated impulse withstanding voltage.
Declaration of the rated impulse withstanding voltage is optional for standard EN 61984: if the manufacturer declares the rated impulse withstanding voltage, the impulse withstanding voltage test is, in any event, necessary as dielectric verification. Alternatively, if the manufacturer does not declare this rated value, the voltage withstanding dielectric test at mains frequencies of 50/60 Hz for 60 s (test 4a of IEC 60512) is necessary, but at reduced values compared to the peak values of the impulsive test voltages of wave shape standardised at 1.2/50 µs.
To this end, standard EN 61984 provides the following cross-reference table:

TABLE 8
Test voltages (EN 61984 Ed. 2.0 - 2009-06)

Rated impulse withstand voltage U_{ipm}	Test voltages Impulse withstand * voltage[a]		Withstand voltage (r.m.s. value)
kV	kV (1.2/50 µs)		kV (50/60 Hz)
	at 2000 above sea level	at sea level	
0.5	0.5	0.55	0.37
0.8	0.8	0.91	0.50
1.5	1.5	1.75	0.84
2.5	2.5	2.95	1.39
4	4	4.8	2.21
6	6	7.3	3.31
8	8	9.8	4.26
12	12	14.8	6.6

*[a] If the test laboratory is situated between sea level and an altitude of 2000 m asl, interpolation of test impulsed voltage is allowed.

NOTE:
This table uses the characteristics of the non-homogeneous field, Case A of IEC 60664-1

Rated impulse withstand voltage
The rated impulse withstanding voltage assigned by the manufacturer to the connector, which refers to the withstanding capacity of its insulation with respect to transient overvoltages [IEC 60664-1:2007, definition 3.9.2, modified].
Impulse withstand voltage
Maximum peak value of a voltage impulse of prescribed shape and polarity which does not cause insulation reduction under specified conditions.
NOTE - The impulse withstand voltage is greater than or equal to the rated impulse withstand voltage [IEC 60664-1:2007, definition 3.8.1, modified].

Determination of creepage distances

For the **minimum surface insulation distance** (creepage distance), i.e. *"the shortest distance along the surface of the insulation material between two conducting parts"* (IEC 60664-1 definition 3.3) standard IEC 61984:2009 for connectors refers to that prescribed by standard **IEC 60664-1:2007** in **Table F.4**. It is determined according to rated voltage, degree of pollution and insulating material group. The rated voltage providing access to Table 6 (rationalised voltage of the power supply system) is determined by Table 3a of IEC 60664-1 for single phase two or three wire a.c. or d.c. systems or Table 3b for three-phase three or four wire a.c. systems. Usually for three-phase systems with 230V/400V rated voltage, the conventional line-to-line insulation voltage is 400V and the line-to-earth for TT or TN systems is 250V. For three-phase systems with 400V or 500V rated voltage the conventional line-to-line insulation voltage is respectively 400V and 500V.
The degree of pollution must be specified according to standard IEC 60664-1. This strongly influences the rated insulation voltage of a connector. Therefore, the rated insulation voltage of a connector should be reconsidered time by time for each degree of pollution.

TABLE F.3a
Single phase two or three wire a.c. or d.c. systems
(IEC 60664-1 Ed. 2.0 - 2007-04)

Rated supply voltage *)	Rationalised voltages for Table F.4	
	For insulation phase-phase[1)]	For insulation phase-phase[1)]
	All systems	Three-wire systems with intermediate earth point
V	V	V
12.5	12.5	-
24	25	-
25	25	-
30	32	-
42	50	-
48	50	-
50 **)	50	-
60	63	-
30-60	63	32
100 **)	100	-
110	125	-
120	125	-
150 **)	160	-
220	250	-
110-220	250	125
120-240	250	125
300 **)	320	-
220-440	500	250
600 **)	630	-
480-960	1000	500
1000 **)	1000	-

TABLE F.3b
Three phase 4 or 3 wire a.c. systems
(IEC 60664-1 Ed. 2.0 - 2007-04)

Rated supply voltage *)	Rationalised voltages for Table F.4		
	For insulation phase-phase[1)]	For insulation phase-phase[1)]	
	All systems	Four-wire three-phase systems with earthed neutral	Four-wire three-phase systems unearthed(1) or with earthed phase
V	V	V	V
63	63	32	63
110	125	80	125
120	125	80	125
127	125	80	125
150 **)	160	-	160
208	200	125	200
220	250	160	250
230	250	160	250
240	250	160	250
300 **)	320	-	320
380	400	250	400
400	400	250	400
415	400	250	400
440	500	250	500
480	500	320	500
500	500	320	500
575	630	400	630
600 **)	630	-	630
660	630	400	630
690	630	400	630
720	800	500	800
830	800	500	800
960	1000	630	1000
1000 **)	1000	-	1000

Legend:
1) The phase-earth insulation for unearthed or impedance-earthed lines is equal to that between phases, because the operating voltage of any phase can, in practice, approach full voltage between the phases [line voltage]. This is because the actual voltage to earth is determined by the insulation resistance and by the capacitive reactance of each phase to earth. Consequently, a low (but acceptable) insulation resistance of a phase can, in effect, earth it and increase voltage to earth of the other two phases at full voltage between the phases [line voltage].
2) For equipment for use on both three-phase three-wire and three-phase four wire supplies, earthed or unearthed, use only the values for three-wire systems.

*) It is assumed that the rated voltage of the equipment is not less than this value.
**) These values correspond to the values given in Table F.1.

With this voltage value, the pollution degree and the materials group the minimum creepage distance can be determined using **Table 6**.

TABLE F.4

Creepage distances to avoid failure due to surface currents
[IEC 60664-1 Ed.2.0 (2007-04)]

Effective voltage[1]	Minimum creepage distances								
	Materials for printed circuits		Pollution degree						
	1	2	1	2			3		
	All material groups mm	All material groups except IIIb mm	All material groups mm	Material group I mm	Material group II mm	Material group III mm	Material group I mm	Material group II mm	Material group III[2] mm
10	0.025	0.040	0.080	0.400	0.400	0.400	1.000	1.000	1.000
12.5	0.025	0.040	0.090	0.420	0.420	0.420	1.050	1.050	1.050
16	0.025	0.040	0.100	0.450	0.450	0.450	1.100	1.100	1.100
20	0.025	0.040	0.110	0.480	0.480	0.480	1.200	1.200	1.200
25	0.025	0.040	0.125	0.500	0.500	0.500	1.250	1.250	1.250
32	0.025	0.040	0.14	0.53	0.53	0.53	1.30	1.30	1.30
40	0.025	0.040	0.16	0.56	0.80	1.10	1.40	1.60	1.80
50	0.025	0.040	0.18	0.60	0.85	1.20	1.50	1.70	1.90
63	0.040	0.063	0.20	0.63	0.90	1.25	1.60	1.80	2.00
80	0.063	0.100	0.22	0.67	0.95	1.30	1.70	1.90	2.10
100	0.100	0.160	0.25	0.71	1.00	1.40	1.80	2.00	2.20
125	0.160	0.250	0.28	0.75	1.05	1.50	1.90	2.10	2.40
160	0.250	0.400	0.32	0.80	1.10	1.60	2.00	2.20	2.50
200	0.400	0.630	0.42	1.00	1.40	2.00	2.50	2.80	3.20
250	0.560	1.000	0.56	1.25	1.80	2.50	3.20	3.60	4.00
320	0.75	1.60	0.75	1.60	2.20	3.20	4.00	4.50	5.00
400	1.0	2.0	1.0	2.0	2.8	4.0	5.0	5.6	6.3
500	1.3	2.5	1.3	2.5	3.6	5.0	6.3	7.1	8.0 (7.9)[4]
630	1.8	3.2	1.8	3.2	4.5	6.3	8.0 (7.9)[4]	9.0 (8.4)[4]	10.0 (9.0)[4]
800	2.4	4.0	2.4	4.0	5.6	8.0	10.0 (9.0)[4]	11.0 (9.6)[4]	12.5 (10.2)[4]
1 000	3.2	5.0	3.2	5.0	7.1	10.0	12.5 (10.2)[4]	14.0 (11.2)[4]	16.0 (12.8)[4]
1 250			4.2	6.3	9.0	12.5	16.0 (12.8)[4]	18.0 (14.4)[4]	20.0 (16.0)[4]
1 600			5.6	8.0	11.0	16.0	20.0 (16.0)[4]	22.0 (17.6)[4]	25.0 (20.0)[4]
2 000			7.5	10.0	14.0	20.0	25.0 (20.0)[4]	28.0 (22.4)[4]	32.0 (25.6)[4]
2 500			10.0	12.5	18.0	25.0	32.0 (25.6)[4]	36.0 (28.8)[4]	40.0 (32.0)[4]
3 200			12.5	16.0	22.0	32.0	40.0 (32.0)[4]	45.0 (36.0)[4]	50.0 (40.0)[4]
4 000			16.0	20.0	28.0	40.0	50.0 (40.0)[4]	56.0 (44.8)[4]	63.0 (50.4)[4]
5 000			20.0	25.0	36.0	50.0	63.0 (50.4)[4]	71.0 (56.8)[4]	80.0 (64.0)[4]
6 300			25.0	32.0	45.0	63.0	80.0 (64.0)[4]	90.0 (72.0)[4]	100.0 (80.0)[4]
8 000			32.0	40.0	56.0	80.0	100.0 (80.0)[4]	110.0 (88.0)[4]	125.0 (100.0)[4]
10 000			40.0	50.0	71.0	100.0	125.0 (100.0)[4]	140.0 (112.0)[4]	160.0 (128.0)[4]
12 500			50.0[3]	63.0[3]	90.0[3]	125.0[3]			
16 000			63.0[3]	80.0[3]	110.0[3]	160.0[3]			
20 000			80.0[3]	100.0[3]	140.0[3]	200.0[3]			
25 000			100.0[3]	125.0[3]	180.0[3]	250.0[3]			
32 000			125.0[3]	160.0[3]	220.0[3]	320.0[3]			
40 000			160.0[3]	200.0[3]	280.0[3]	400.0[3]			
50 000			200.0[3]	250.0[3]	360.0[3]	500.0[3]			
63 000			250.0[3]	320.0[3]	450.0[3]	600.0[3]			

(1) This voltage is
— for insulation according to the working voltage.
— for main and supplementary insulation of the circuit powered directly by the network (see 4.3.2.2.1), at the rationalized voltage of Table F.3a or Table F.3b, on the basis of the rated voltage of the equipment or rated insulation voltage.
— for main and supplementary insulation of the system, device and internal circuits not powered directly by the network (see 4.3.2.2.2), the highest rms voltage which can occur in the system, in the device or in the internal circuit, powered at rated voltage and in the combination of the most onerous operating conditions foreseen by the rated characteristics of the device.

(2) Materials group IIIb is not recommended for application with pollution degree 3 above 630V.
(3) Provisional data based on extrapolations. Technical committees that have other information based on experience can use their dimensions.
(4) The values shown in brackets may be applied to decrease the creepage distance in the presence of ribbing (see 5.2.5).

NOTE: The high precision used in indicating creepage distances in this table does not mean that the uncertainty of measurement should be of the same order of magnitude.

NOTE – in **boldface** the typical values for multipole rectangular connectors for industrial uses are shown.

Fire Safety Standards for the railway industry

The most advanced fire safety standards for the railway industry are the French standards:
- **NF F 16-101** Matériel roulant ferroviaire – Comportement au feu – Choix des matériaux
- **NF F 16-102** Matériel roulant ferroviaire – Comportement au feu – Choix des équipements électriques

which, in turn, refer to the test methods described in the following standards:
- **NF X 70 100** Analyse de gaz de pyrolyse et de combustion
- **NF X 10 702** Détermination de l'opacité des fumées en atmosphère non renouvelée

the latter being very similar in methods to the following American standards:
- **ASTM E 662** Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- **ASTM E 162** Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

Equally as popular is the use of Bombardier Transportation toxicity specifications:
- **SMP 800-C** Toxic Gas Generation.

In Italy, since 2006, for installation on board of rolling-stocks, certification of conformity to the new Italian railway standards (listed below) is required:
- **UNI CEI 11170-1:2005** Trains and trams – Fire safety guidelines for trains, trams and guide vehicles – General principles
- **UNI CEI 11170-2:2005** Trains and trams – Fire safety guidelines for trains, trams and guided vehicles – Design recommendations – Fire containment measures – Indication, monitoring and evacuation systems
- **UNI CEI 11170-3:2005** Trains and trams – Fire safety guidelines for trains, trams and guided vehicles – Material fire behaviour assessment – Acceptance limits

published by UNI and CEI together on 30/11/2005, in the delayed completion of the European standard relating to the effect of fire on materials to be installed on board of rolling-stocks, standard **EN 45545**, divided in 8 sections, only some – of which have recently been published, – after 16 years in the making, whilst the most crucial sections are still unfinished due to disagreements between the member countries (because of strong national interests, protectionism of domestic industries) especially in France, Germany, United Kingdom and Italy. To date, this planned standard, to be published as a simple TS (Technical Specification) and to be complied with on a voluntary basis, cannot yet be used and, as for the implementation of the Directives for the railway industry (interoperability of high-speed and conventional railways), the current national standards in force in the single EU member states are regarded as equivalent in terms of safety. For Italy, the requirements for materials relating to electrical connectors are contained in the 2nd schedule "Acceptability criteria for electrical and electronic materials and components" at the application "All other applications including inflammable materials" (all applications other than electric cables). For these applications, four tests are required to be carried out on the materials:
- The materials being affected by a small flame according to EN ISO 11925-2 with, according to the risk levels, for LR1 and LR2, a resistance to fire of the material of 15 s; for LR3 and LR4, a resistance of 30s.
- Smokiness in compliance with French standard NF F 16-101 with IF better or equal to F2 for all risk levels. The material we use is classified as F1 (better than F2) according to the tests we carried out.
- Fume optical density measurement, in compliance with French standard NF X 10-702 (from NF F 16-101) with values ≤ 100 for all risk levels LR1…4.
- Toxicity measurement, in compliance with Italian standard CEI 20-37/7, with T ≤ 2 for all risk levels LR1…4.

Tests

In 2006, we carried out laboratory tests approved by the French Railways SNCF, according to the above mentioned French standards **NF F 16-101** and **NF F 16-102** , the material we use in our connectors, which has been found to belong to **class F1** (Index Fumée **I.F. ≤ 20**) as well as a toxicity index (Index Toxicité Fumée) **I.T.C. = 20**. Both these values meet the requirements set out by the French standards and by the Italian standard UNI CEI 11170-3 schedule 2, which relates to electrical connectors. We have also commissioned a qualified North American laboratory to carry out tests compliant with American standards, which have confirmed compliance with the requirements set out by the US Federal Transit Administration "Recommended Fire Safety Practices for Rail Transit Material Selection" for methods ASTM E 662 (NFPA 258) (fume specific optical density), ASTM E 162 (ASTM D3635) (surface inflammability ➔ flame propagation index) and Bombardier Transportation SMP 800-C (fumes and gases toxicity).
In 2010, we have further tested, in a laboratory also accredited by the German Railways (Deutsche Bahn) to test fire behaviour according to the German standard DIN 5510-2, the same material used in our connectors, which was found to have flammability class = S4, smoke spreading class = SR2 and drip class = ST2. In addition, toxicity indices were determined according to the same DIN 5510-2 Annex C and according to CEN TS 45545-2 Annex C, iwith the following results:

CEN TS 45545-2		DIN 5510-2	
CITG (4')	CITG (8')	FED (tzul = 30 min)	FED (tzul = 15 min)
0.02	0.05	0.04	0.02

The material tested in accordance with the European Technical Specification CEN/TS 45545-2:2009 showed an oxygen index (LOI) of 40%, a maximum Ds (flaming) of 34.2 and a CITNLP smoke toxicity index of 0.12, compliant with the requirements of CEN/TS 45545-2 for risk levels HL1 – HL2 – HL3.
Finally the material was also tested according to British Standard BS 6853:1999 with an R (max) index = 0.6, i.e. within the limits of Tables 7 and 8 of the standard for vehicle categories Ia, Ib and II.
All requirements have been met.

The RoHS (2002/95/EC) and RAEE (2002/96/EC) Directives

● The **RoHS 2002/95/CE Directive** (with its later amendment 2008/35/EC) bans the use of some harmful substances used in new electrical and electronic equipment commercially available from the 1st of July 2006 (the exceptions for some applications are enclosed in the Directive Enclosure and in some later decisions made by the EU Commission [1]). The banned and/or restricted substances are: **Lead, Mercury, Cadmium, Hexavalent Chromium, Poly-Brominated By-Phenyls and Poly-Brominated Dy-Phenyl Ethers** (PBB and PBDE respectively, fire retardant substances for thermoplastic materials).

● The **RAEE 2002/96/EC Directive** (with its later amendments 2003/108/EC and 2008/34/EC) aims to recycle and reduce the waste produced by electrical and electronic equipment. It also promotes recycling and reusing such technological waste and establishes ambitious recovery rate targets, which vary according to the types of products involved. The manufacturers or their agents in the EU must ensure that the equipment sold after the 13th of August 2005 listed in the Enclosure I A and illustrated in the Enclosure I B of this Directive is collected, treated and recycled (the deadline varies from country to country. In Italy, the deadline has been postponed to 31/12/2007, awaiting for approval by the required executive Ministerial Decrees).

As a manufacturer of electrical equipment and components for industrial use, I.L.M.E. acknowledges the regulations introduced by these Directives. The above mentioned Directives are already effective in almost all EU countries. For the products described in this Catalogue, although the usage restriction of the above mentioned hazardous substances is not legally applicable (none of our product does in fact belong to any of the categories described and illustrated in the RoHS and RAEE Directives), the **"RoHS compliance"** may become important and many of our customers may require its compliance. We have therefore carried out the corrective actions, which have led to the **"RoHS compliance"** of all our products, wherever required. **I.L.M.E. products sold after the 1st of July 2006 do not contain any of the restricted substances in higher concentration than those allowed by the RoHS directive and by the later associated Decisions taken by the EU Commission.**

1) At the time of publication of this Catalogue, the following EU Commission Decisions were available: 2005/618/EC, of 18 August 2005, 2005/717/EC, of 13 October 2005, 2005/747/EC, of 21 October 2005, 2006/310/EC, of 21 April 2006, 2006/690/EC, 2006/691/EC and 2006/692/EC of 12 October 2006, 2008/385/EC of 24 January 2008, 2009/428/EC of 4 June 2009, 2009/443/EC, of 10 June 2009 and 2010/122/EU of 25 February 2010.

Recommended tightening torque and size of screwdriver

size of screw	connector type	tightening torque (Nm)	tightening torque (lb.in)	recommended size of screwdriver (mm)
M2.5	CT 40, 64	0.4	3.5	0.5x3
M2.6	CTE 06...24	0.4	3.5	0.5x3
Ø 2.9	CQ 04/2, CQ 08	0.7	6.2	Ph1
M3	screw of earthing terminal series CQ 05, CQ 12	0.5	4.4	0.5x3
M3	CDA	0.5	4.4	Ph0 or 0.6x3.5
M3	CK, CKS, CD 07, CD 08, CQ 05, CQ 12	0.5	4.4	0.5x3
M3	CX 4/2, CX 4/8 (16A)	0.5	4.4	0.6x3.5
M3	CX 4/8 Q (16A)	0.5	4.4	Ph0
M3	CNE, CME	0.5	4.4	Ph0 or 0.8x4
M3	screw of small earthing terminal, MIXO frames series	0.5	4.4	Ph1 or 1.0x5.5
M3	screw for fastening to enclosures, all series except T-Type	0.5 — 0.8	4.4	Ph1 or 0.8x4
M3	screw for fastening to T-Type enclosures	0.5	4.4	Ph1 or 0.8x4
M3,5	screw of earthing terminal series CDA, CDC	0.8	7.1	Ph1 or 1.0x5.5
M4	screw of large earthing terminal, MIXO frames series	1.2	10.6	Ph1 or 1.0x5.5
M4	CP	1.2	10.6	Ph1 or 0.8x4
M4	screw of earthing terminal, all series except CDA, CDC, MIXO	1.2	10.6	Ph2 or 1.0x5.5
M6	CX 4/... (80A)	2.5	22.1	1.0x5.5

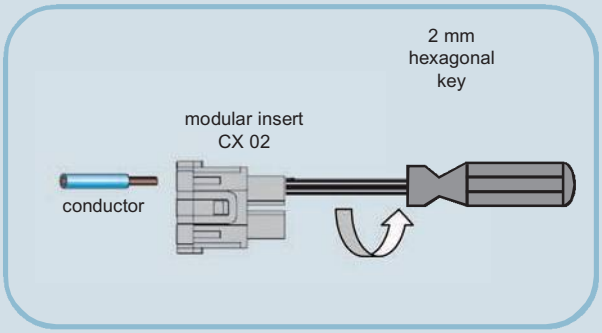
Increasing the tightening torque does not improve considerably the contacts resistances. The screw torques are selected according to standard EN 60999-1, to provide excellent mechanical, thermal and electric behaviour. The conductor or terminal may be damaged if the recommended values are significantly exceeded.

Tightening torque for insert series: CX..A / CX..B

The connections of the conductors to the female and male inserts is made via screws in accordance with standard.
Fully insert the wire in the back of the contact; insert a 2mm hexagonal key in the front of the contact and tighten by holding down the cable.

After assembling the complete connector periodically check that the contact is screwed tight by applying the proper tightening torque.

— usable conductor sections (EN 60228 Class 5):
  from 2.5 to 8 mm^2 (CX 02 4AF/M)
  from 6 to 10 mm^2 (CX 02 4BF/M)
  (extra-flexible EN 60228 class 6: 2.5... 6 mm2)
— use only flexible copper conductors
— do not plait the braids!
— tightening torque with 2 mm hexagonal Allen key:
  1.5 Nm max for conductors with section 2.5 ... 4 mm^2
  2 Nm max for conductors with section 6 ... 10 mm^2
— stripping length: 8^{+1} mm



insert features for multipole connectors

Stripping length			
connector inserts connection technique	conductor section (mm^2)	(AWG)	stripping length (mm)
Screw			
CK	0,75-2,5	18-14	6
CX 4/2, CX 4/8 (poles 16A)[1)]	0,75-4 0,75-2,5	18-12 18-14	7
CNE[1)], JCNE	0,5-4	20-12	7
CNE..X	0,25-2,5	24-14	7
CDA[1)]	0,75-4	18-12	7
CDA..X	0,25-2,5	24-14	7
CTE 06...24	0,75-2,5	18-14	12
CT 40 and 64	0,75-2,5	18-14	12
CME[1)]	0,5-4	20-12	7
CME..X	0,5-2,5	20-14	7
CP[1)]	1,5-6	16-10	10,5
CX 4/.. (80A poles)	4-16	12-5	14
Crimp			
MIXO (5A)	0,08-0,52	28-20	4
CDD, CD, MIXO (10A), CQ 12	0,14-2,5 *	26-14	8 (* 6 for 2,5 mm^2)
CCE, CDC, CMCE, CQ, CQE, MIXO (16A)	0,5-4	20-12	7,5
CX, MIXO (40A)	1,5-2,5 4-6	16-14 12-10	9 9.6
MIXO (70A)	10-25	7-4	15
MIXO (100A)	16-35	5-2	15
MIXO (200A)	16-70	6-2/0	15
Spring			
CSE, CSH, CTSE 06...24, CMSE, MIXO (CX 05 S), CSS, JCSE	0,14-2,5	26-14	9...11
CTS 40/64	0,14-2,5 unprepared 0,14-1 prepared	26-14 unprepared 26-8 prepared	9...11
CKS	0,14-2,5 unprepared 0,14-1,5 prepared	26-14 unprepared 26-16 prepared	9...11

1) For CNE, CDA, CP, CME, “CX 4 / 8 – pole 16A” series connectors with screw terminal and conductor protection plate, the use of ferrules is not necessary (= unprepared conductor).

The use of ferrules (= prepared conductor) causes a reduction in maximum useful section to the lower size (e.g. 4 mm^2 unprepared → 2,5 mm^2 prepared).

insert features for multipole connectors

The 10A and 16A crimp contacts are available either **silver** or **gold-plated**.
The gold-plated crimp contacts are recommended for applications with very low rated currents and rated voltages.
Thanks to the conduction characteristics of gold, the deterioration of signals is prevented and an excellent residence to the superficial oxidation of the contacts is obtained. In particular, gold-plated contacts are recommended with signals with ±5 mA current and ±5V voltage.
Standard ILME gold treatment is carried out in accordance with MIL-G-45204C Class 00, Type II, Grade C and ASTM B428-01 Class 0.5, Type II, Grade C. On request, contacts with special gold-plating are available.

10A crimp contacts
silver and gold plated

16A crimp contacts
normal and for advanced opening
silver and gold plated

gold-plated 5A
crimp contacts

40A, 70A, 100A and 200A silver-plated contacts are also available.

silver-plated crimp contacts

Iron/Constantan thermocouple contacts are also available according to DIN IEC 584 type J.

Constantan (Cu Ni) and Iron (Fe)
crimp contacts

MIXO series can also accommodate POF 1.0 mm and MOST 1/1.5 mm fibre optics.

POF / MOST crimp contacts

Coaxial contacts from 50Ω to 75Ω are also applicable according to DIN 41626-2

coaxial contacts to crimp/solder

insert features for multipole connectors

inserts series	No. of poles[1] main contacts + ⏚	auxiliary contacts	rated current	EN 61984 (2001-11) pollution degree 3 rated voltage	rated impulse withstand voltage	pollution degree	EN 61984 (2001-11) pollution degree 2 rated voltage	rated impulse withstand voltage	pollution degree	UL/CSA [3] certification rated voltage ~ or ⎓	certifications [3]
CK	**3, 4**	—	10A	250V	4kV	3	230/400V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CKS	**3, 4**	—	10A	400V	4kV	3				600V	cUL[A], CSA, CCC, GOST
CD	**8** (without ⏚)	—	10A	50V	0.8kV	3				50V	UL, CSA, (CCC), (GL), GOST
CD	**7, 15, 25, 40, (50), 64, (80), (128)**	—	10A	250V [2]	4kV	3	230/400V [2]	4kV	2	600V	UL, CSA, CCC, GL, GOST
CT	**40, 64**	—	10A	250V	4kV	3	230/400V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CTS	**40, 64**	—	10A	250V	4kV	3	230/400V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CDD	**24, 38, 42, 72, (76), 108, (144), (216)**	—	10A				250V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CQ 12	**12**	—	10A	400V	6kV	3	400/690V	6kV	2	600V	UL, CSA, (CCC), GOST
CQ 05	**5**	—	16A	230/400V	4kV	3	320/500V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CQ 04/2	**4**	—	40A	400/690V	6kV	3				600V	UL, CSA, GOST
		2	10A	250V	4kV	3					
CQ 08	**8**	—	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GOST
CDA	**10, 16, (32)**	—	16A	250V	4kV	3	230/400V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CDC	**10, 16, (32)**	—	16A	250V	4kV	3	230/400V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CQE	**10, 18, (20), 32, 46, (64), (92)**	—	16A	500V [2]	6kV	3	830V [2]	8kV	2	600V	UL, CSA, CCC, GOST
CCE	**6, 10, (12), 16, 24, (32), (48)**	—	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GOST
CNE, JCNE	**6, 10, (12), 16, 24, (32), (48)**	—	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GL, GOST
CSE, JCSE	**6, 10, (12), 16, 24, (32), (48)**	—	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GL, GOST
CSH	**6, 10, (12), 16, 24, (32), (48)**	—	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, (CCC), (GL), GOST
CSS	**6, 10, (12), 16, 24, (32), (48)**	—	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GOST
CT	**6, 10, (12), 16, 24**	—	16A				400V	4kV	2	600V	UL, CSA, CCC, GL, GOST
CTSE	**6, 10, (12), 16, 24**	—	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GL, GOST
CME	**3, 6, 10, (12), (20), (32)**	—	16A	830V	8kV	3	1000V	8kV	2	600V	UL, CSA, CCC, GOST
							720/1250V	8kV	2		
	16	—		400/690V	6kV	3					
		2, (4)		500V	6kV	3					
CMSE	**3, 6, 10, (12), (20)**	—	16A	830V	8kV	3	1000V	8kV	2	600V	UL, CSA, CCC, GOST
							720/1250V	8kV	2		
		2, (4)		500V	6kV	3					
CMCE	**3, 6, 10, (12), (20), (32)**	—	16A	830V	8kV	3	1000V	8kV	2	600V	UL, CSA, CCC, GOST
							720/1250V	8kV	2		
	16	—		400/690V	6kV	3					
		2, (4)		500V	6kV	3					
CP	**6, (12)**	—	35A	400/690V	6kV	3				600V	UL, CSA, CCC, GOST
CX 8/24	**8**	—	16A	230/400V	4kV	3	400V	4kV	2	600V	UL, CSA, CCC, GL, GOST
	24		10A	160V	2.5kV	3	250V	4kV	2		
CX 6/36	**6**	—	40A	690V	8kV	3				600V	UL, CSA, CCC, GL, GOST
	36		10A	160V	2.5kV	3	250V	4kV	2		
CX 12/2	**12**	—	40A	690V	8kV	3				600V	UL, CSA, CCC, GL, GOST
	2		10A	250V	4kV	3					
CX 4/0	**4**	**0**	80A	690V	8kV	3				600V	UL, CSA, CCC, GL, GOST
CX 4/2	**4**	—	80A	690V	8kV	3				600V	UL, CSA, CCC, GL, GOST
		2	16A	400V	6kV	3	400/690V	6kV	2		
CX 4/8	**4**	—	80A	400V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GL, GOST
		8	16A	230/400V	4kV	3	400V	4kV	2		
CXL 2/4	**2**										UL, GOST
		4	10A	25V	0.8kV	3				600V	

(*) = until stocks of CT series connectors with rated voltage 400V - 4kV - 2, UL, CSA certified last

N.B. all inserts have a mechanical life equal to or higher than 500 mating cycles (JEI series 250 cycles)

1) Polarities shown in brackets may be achieved by using two inserts.
2) Contacts partially fitted inside an insert allow inserts to be used for applications requiring rated voltages higher than those shown.
See tables on page 44 (CD inserts), page 58 (CDD inserts) and page 79 (CQE inserts)
3) The certifications shown in brackets are being applied for.
4) Please check the insert load curves to establish the actual maximum operating current according to the ambient temperature. See diagrams on pages 492 to 500.
A) UL for USA and Canada

- UL - with protocol E 115072
- CSA - with protocol LR 82270
- CCC - China Quality Certification
- GL - Germanischer Lloyd - 3356706 HH
- GOST - Russian Gost Certificate

insert features for multipole connectors

inserts series	contact resistance ≤	insulation resistance ≥	ambient temperature limit [5] (°C) min	ambient temperature limit [5] (°C) max	protection rating without enclosures	conductor connection [6] axial screw	screw	spring	connection block at 45°	crimp	page No.
CK	≤ 1 mΩ	≥ 10 GΩ	-40	+100	IP20		✓				40
CKS	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20			✓			41
CD	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	46
CD	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	45
CT	≤ 4 mΩ	≥ 10 GΩ	-40	+125	IP20		✓		✓		56
CTS	≤ 4 mΩ	≥ 10 GΩ	-40	+125	IP20			✓	✓		56
CDD	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	59
CQ 12	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	68
CQ 05	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	69
CQ 04/2	≤ 0.3 mΩ ≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	71
CQ 08	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	70
CDA	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20		✓				72
CDC	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	73
CQE	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	80
CCE	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	94
CNE, JCNE	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20		✓				95 - 106
CSE, JCSE	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20			✓			95 - 106
CSH	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20			✓			88
CSS	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20			✓			118
CT	≤ 4 mΩ	≥ 10 GΩ	-40	+125	IP20		✓		✓		130
CTSE	≤ 4 mΩ	≥ 10 GΩ	-40	+125	IP20			✓	✓		126
CME	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20		✓				135
CMSE	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20			✓			135
CMCE	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	134
CP	≤ 0.5 mΩ	≥ 10 GΩ	-40	+125	IP20		✓				149
CX 8/24	≤ 1 mΩ ≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	151
CX 6/36	≤ 0.3 mΩ ≤ 3 mΩ	≥ 10 GΩ	-40	+125	P20					✓	152
CX 12/2	≤ 0.3 mΩ ≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20		✓			✓	153
CX 4/0	≤ 0.3 mΩ	≥ 10 GΩ	-40	+125	IP20		✓				154
CX 4/2	≤ 0.3 mΩ ≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20		✓				154
CX 4/8	≤ 0.3 mΩ ≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20			✓			155
CXL 2/4	≤ 0.3 mΩ	≥ 10 GΩ	-40	+125	IP20 IP20			✓			456

(*) = until stocks of CT series connectors with rated voltage 400V - 4kV - 2, UL, CSA certified

5) It may be used with ambient temperatures up to 180 °C by using the insert special version made of PPS (polyphenilene solfide)
6) See wire connection details on the next page.

insert features for multipole connectors

inserts series	No. of poles [1] main contacts + ⏚	auxiliary contacts	rated current [4]	EN 61984 (2001-11) pollution degree 3 rated voltage	rated impulse withstand voltage	pollution degree	EN 61984 (2001-11) pollution degree 2 rated voltage	rated impulse withstand voltage	pollution degree	UL/CSA [3] certification rated voltage ~ or ⎓	certifications [3]
MIXO											
CX 01 Y	**1**	—-	200A	1000V	8kV	3	920/1600V	8kV	2	(600V)	(UL), (CSA), (CCC), (GL)
CX 01 YPE	**1 per connection** ⏚)	—-	200A	—-	—-	3				(600V)	(UL), (CSA), (CCC), (GL)
CX 02 G	**2**	—-	100A	1000V	8kV	3	920/1600V	8kV	2	600V	UL, CSA, CCC, GL
CX 02 7	**2**	—-	70A	1000V	8kV	3	1600V	12kV	2	600V	(UL), (CSA), (CCC), (GL)
CX 02 4A	**2** (2.5 - 8 mm²)	—-	40A	1000V	8kV	3				600V	UL, CSA
CX 02 4B	**2** (6 - 10 mm²)	—-	40A	1000V	8kV	3				600V	UL, CSA
CX 03/4 XD	**3**		40A	830V	8kV	3				(600V)	(UL), (CSA), (CCC), (GL)
		4	10A								
CX 03 4 (*)	**3**	—-	40A	400/690V	6kV	3				600V	UL, CSA, CCC, GL
CX 04 X	**4**	—-	40A	830V	8kV	3	1000V	8kV	2	600V	(UL), (CSA), (CCC), (GL)
CX 05 S	**5**	—-	16A	400V	6kV	3	500V	6kV	2	600V	UL, CSA, CCC, GL
CX 06 C	**6**	—-	16A	500V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, GL
CX 08 C	**8**	—-	16A	400V	6kV	3	400/690V	6kV	2	600V	UL, CSA, CCC, (GL)
CX 20 C	**20**	—-	16A	500V	6kV	3	830V	8kV	2	600V	UL, CSA, (CCC), (GL)
CX 12 D	**12**	—-	10A	160V	2.5kV	3	250V	4kV	2	600V	UL, CSA, CCC, GL
CX 17 D	**17**	—-	10A	160V	2.5kV	3	250V	4kV	2	600V	(UL), (CSA), (CCC), (GL)
CX 02 H	**2**	—-	16A	2900/5000V	15kV	3					
CX 25 I	**2**	—-	5A	50V	10A	3				(50V)	(UL), (CSA), (CCC), (GL)
CX P	**3**	—-	—-	pneumatic contacts for up to 8 bar compressed air							UL, CSA, CCC, GL
CX P	**2**	—-	—-	pneumatic contacts for up to 8 bar compressed air							(UL), (CSA), (CCC), (GL)
CX 02 B	**2** (**)	—-	—-	50V	0.8kV	3				50V	UL, CSA, CCC
CX 01 B	**1** (+ shield)	—-	10A	50V	0.8kV	3				50V	UL, CSA
CX 01 BC	**1** (+ shield)	—-	16A	50V	0.8kV	3				(50V)	(UL), (CSA), (CCC), (GL)
CX 04 B	**4** (+ shield)	—-	10A	50V	0.8kV	3				50V	UL, CSA, CCC
CX 08 B	**8** (+ shield)	—-	5A	50V	0.8kV	3				(50V)	(UL), (CSA), (CCC)
CX 01 J	1 RJ45 insert			—-	—-	—-				50V	
		4	10A	250V	4kV	3				600V	
CX 02 J	2 RJ45 inserts			—-	—-	—-				50V	
		8	1A	250V	4kV	3				600V	
CX 01 U	1 USB insert	—-		50V	0.8kV	3				(50V)	(UL), (CSA), (CCC)
CX 09 V	**9** (+ shield)	—-	5A	50V	0.8kV	3				(50V)	
CX 04 L	**4**	—-	—-	contacts POF/MOST/coaxial DIN 41626							(UL), (CSA), (CCC), (GL)

(*) = 500V version CX 03 4B
(**) = CX 04 B (4P) multiaxial connectors or CX 01 B coaxial connector

N.B. all inserts have a mechanical life equal to or higher than 500 mating cycles

- UL - with protocol E 115072
- CSA - with protocol LR 82270
- CCC - China Quality Certification
- GL - Germanischer Lloyd - 3356706 HH
- GOST - Russian Gost Certificate

1) Polarities shown in brackets may be achieved by using two inserts.
3) The certifications shown in brackets are being applied for.
4) Please check the insert load curves to establish the actual maximum operating current according to the ambient temperature. See diagrams on pages 492 to 500.
A) UL for USA and Canada

Rated data

Nominal data complies with requirements of EN 61984 standard.

Marking example to be applied only in a mains power supply with insulated neutral or with neutral to earth in a corner (see Table B1, IEC 60664-1):

Marking example to be applied in any mains power supplies, including those with insulated neutral and the delta power supplies with earth in a corner (see Table B1, IEC 60664-1):

insert features for multipole connectors

inserts series	contact resistance ≤	insulation resistance ≥	ambient temperature limit [5] (°C) min	ambient temperature limit [5] (°C) max	protection rating without enclosures	conductor connection [6] axial screw	screw	spring	connection block at 45°	crimp	page No.
MIXO											
CX 01 Y	≤ 0.2 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	160
CX 01 YPE	≤ 0.2 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	161
CX 02 G	≤ 0.3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	163
CX 02 7	≤ 0.5 mΩ	≥ 10 GΩ	-40	+125	IP20						164
CX 02 4A	≤ 0.5 mΩ	≥ 10 GΩ	-40	+125	IP20	✓					165
CX 02 4B	≤ 0.5 mΩ	≥ 10 GΩ	-40	+125	IP20	✓					165
CX 03/4 XD	≤ 0.3 mΩ ≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	167
CX 03 4	≤ 0.3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	168 - 169
CX 04 X	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	171
CX 05 S	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	175
CX 06 C	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	172
CX 08 C	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	173
CX 20 C	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	174
CX 12 D	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	177
CX 17 D	≤ 3 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	178
CX 02 H	≤ 1 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	176
CX 25 I	≤ 4 mΩ	≥ 10 GΩ	-40	+125	IP20					✓	179
CX P	—-	≥ 10 GΩ	-40	+125	IP20	coupling					191
CX P	—-	≥ 10 GΩ	-40	+125	IP20	coupling					191
CX 02 B	—-	≥ 10 GΩ	-40	+125	IP20	coupling					182
CX 01 B	≤ 3 mΩ	≥ 10 GΩ	-40	+70	IP20					✓	445
CX 01 BC	≤ 1 mΩ	≥ 10 GΩ	-40	+70	ip20						447
CX 04 B	≤ 3 mΩ	≥ 10 GΩ	-40	+70	IP20					✓	180
CX 08 B	≤ 3 mΩ	≥ 10 GΩ	-40	+70	IP20					✓	446
CX 01 J			-20	+120	IP20					✓	183
	≤ 3 mΩ	≥ 10 GΩ	-20	+120	IP20					✓	
CX 02 J			-20	+120	IP20					✓	184
	≤ 3 mΩ	≥ 10 GΩ	-20	+120	IP20					✓	
CX 01 U	≤ 30 mΩ	≥ 1 GΩ	-25	+80	IP20						185
CX 01 9V	≤ 15 mΩ	≥ 5 GΩ	-40	+125	IP20					✓	186
CX 04 L	—-	≥ 10 GΩ	-40	+85	IP20					✓	189

5) It may be used with ambient temperatures up to 180 °C by using the insert special version made of PPS (polyphenilene solfide)
6) See wire connection details on the next page.

conductor connections

description

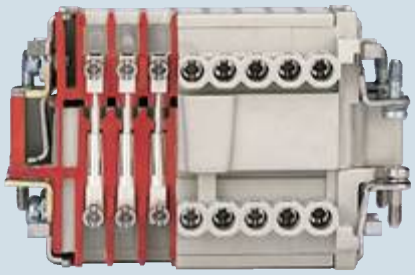
The different types of conductor connections to the male and female inserts are described on the right.
The types are summarised as follows:

- screw terminals
- spring connection terminals
- connectors with incorporated terminal block
- crimp terminals

N.B.:
for all inserts with screw terminals it is important that the right torsional torque is applied to the screws in order to prevent wrong contacts or damage to the conductor, the screw or the terminal (see data mentioned in the inserts pages).

The 10A and 16A crimp contacts are available either **silver** or **gold-plated**.
The gold-plated crimp contacts are recommended for applications with very low rated currents and rated voltages.
Thanks to the conduction characteristics of gold, the deterioration of signals is prevented and an excellent residence to the superficial oxidation of the contacts is obtained.
In particular, gold-plated contacts are recommended with signals with ≤ 5 mA current and ≤ 5V voltage.

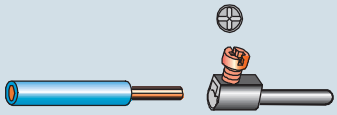
contacts with screw terminal connections with or without wire protection



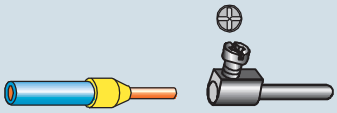
description

inserts: CK - CDA - CN - CNE - CME - CP - CX

The connections of the conductors to the female and male inserts is made via screws (in accordance with standard EN 60999-1).
Two different types of clamping are possible:
- with pressure plate for unprepared conductors
- without wire protection that requires the conductors to be prepared with bush terminals



with wire protection



without wire protection

inserts: CX..A / CX..B

The connections of the conductors to the female and male inserts is made via screws in accordance with standard.
Fully insert the wire in the back of the contact; insert a 2mm hexagonal key in the front of the contact and tighten by holding down the cable (page 21).

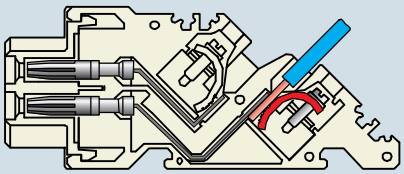
screw connected contacts in built-in terminal block

description

inserts: CTE

In this layout the wires are connected to the socket and plug insert contacts by means of a screw for all CTE inserts (in compliance with EN 60999-1).
The inserts contain:
- a terminal block at 45° for fixed installation on electrical panels or on built-in DIN EN 60715 rail, for easier wire cabling and identification operations
- screw connection with pressure plate which does not require the wires to be prepared (CTE inserts).

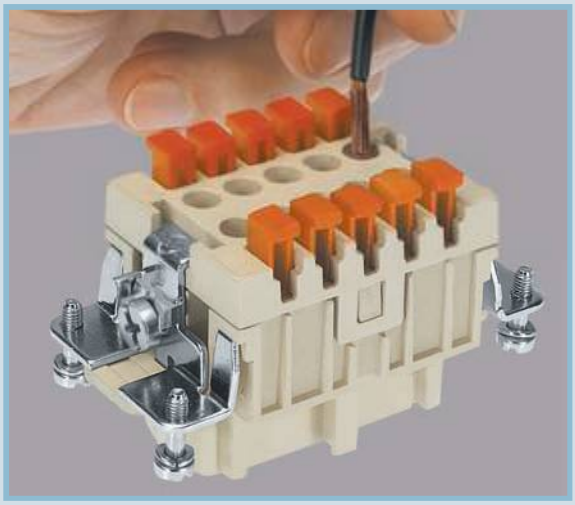
CTE insert connection



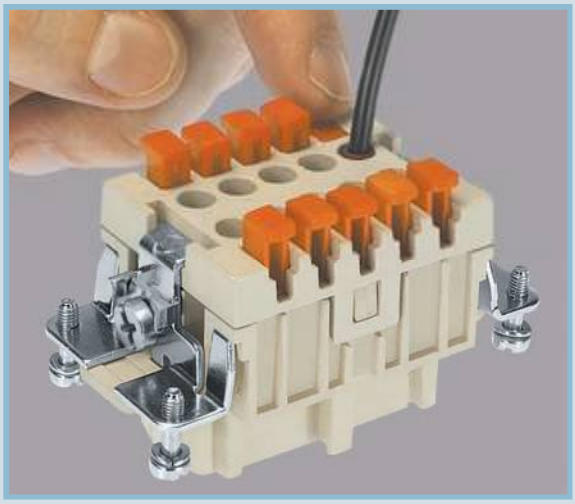
CSH Series

Connections without tools

SQUICH®



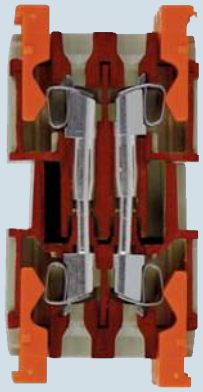
1) insert the wire



2) press

Cabling time:
50% quicker than the screw-type connection and
20% quicker than the conventional spring-type connection

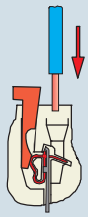
spring connected contacts with actuator button



description

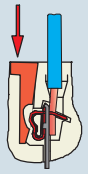
inserts: CSH

In this layout the wires are connected to the socket and plug insert contacts by means of a spring terminal with actuator button.
This type of connection offers the following advantages:
- no special wire preparation **(other than stripping)**
- no cabling tool is necessary
- offers an excellent fastening solution and a great resistance to strong vibrations
- allows rigid and flexible wires with sections between 0.14 and 2.5 mm^2 (26 ÷ 14 AWG) to be used (both with non-prepared conductors and those prepared with ferrule)
- greatly reduces insert preparation and cabling times
- a screwdriver with a 0.5 x 3.5 mm blade is the only tool required to remove the wire from the contact.



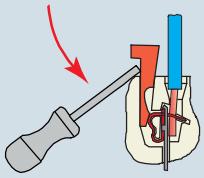
step 1

deep insertion of the conductor (with its insulation removed) in its own round seat.



step 2

press the actuator button to close the terminal.

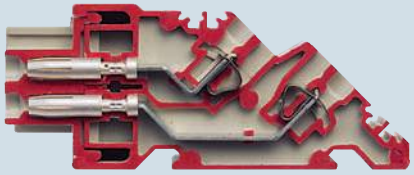


Re-opening

0.5x3.5 mm

conductor connections

contacts connected with in built-in terminal block

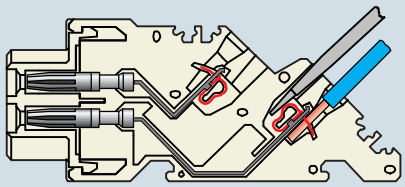


description

inserts: CTSE - CTS

With terminal block at 45° built-in for fixed installation on electrical panels or on built-in DIN EN 60715 rail, for easier wire cabling and identification operations.
Spring terminal connection which does not require wire preparation (CTSE inserts).
A screwdriver with a 3.5 x 0.5 mm blade is the only tool required to insert the wire in the contact.

CTSE insert connection

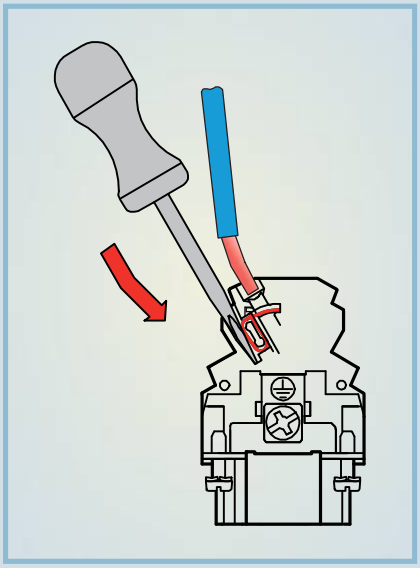


contacts connected with dual spring terminal

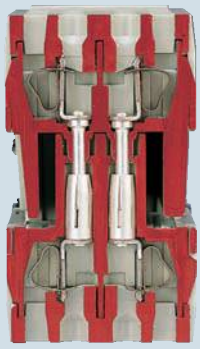
description

inserts: CSS

Equipped with two terminals per contact.
This type of connection allows a circuit to be branched off.
A screwdriver with a 3.5 x 0.5 mm blade is the only tool required to insert the wire in the contact.



contacts connected with spring terminal

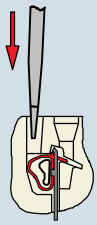


description

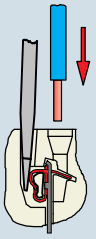
inserts: CSE - CMSE

In this layout the wires are connected to the socket and plug insert contacts by means of a spring terminal.
This type of connection offers the following advantages:
- no special wire preparation
- a screwdriver with a 3.5 x 0.5 mm blade is the only tool required to insert the wire in the contact
- offers an excellent fastening solution and a great resistance to strong vibrations
- allows rigid and flexible wires with sections between 0.14 and 2.5 mm^2 to be used (both with non-prepared conductors and those prepared with ferrule)
- allows conductibility tests under load to be carried out through the screwdriver insertion section, without splitting the insert
- greatly reduces insert preparation and cabling times

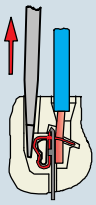
Spring terminal connection operating principles



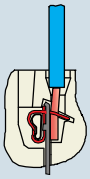
step 1
when the screwdriver is inserted in the square housing provided, the wire housing in the spring is opened.



step 2
the wire is pushed all the way in the round housing provided.



step 3
when the screwdriver is removed, the spring is held down on the inserted wire.



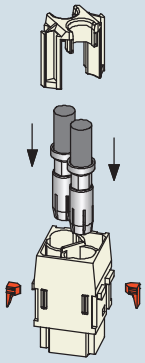
step 4
the connection is complete; pull on the wire to make sure that the spring firmly holds down the wire.

removable crimp contacts (with retainer device)

description

inserts: MIXO 100A - 200A

This layout enables the wires to be connected to the socket and plug insert removable contacts by crimping them with a crimp tool and its locating turret.
This innovative insert design, **patented by ILME,** allows crimped contacts to be quickly fitted and removed.
The special plates provided fasten the contact holder; after the insert has been mated to the other inserts and is inserted in the MIXO frame, connection is ensured and is **extremely resistant even to the most insidious** strains, such as vibrations. Contacts can be removed **without having to use any specific tools,** but by simply using a screwdriver.



100A max contacts

conductor section (mm^2)	AWG	identification
16	6 - 5	hole Ø 5.5 mm
25	4 - 3	hole Ø 7.0 mm
35	2	Ø hole 7.9 / 8.2 mm

Contacts are supplied in the silver plated version only

200A max contacts

conductor section (mm^2)	AWG	identification
16	6	
25	4	
35	2	
50	1	
70	2/0	

Contacts are supplied in the silver plated version only

removable crimp contacts (with retainer device on contacts)

description

inserts: CD - CDD - CX - MIXO

This layout enables the wires to be connected to the socket and plug insert removable contacts by crimping them with a crimp tool and its locating turret.
The crimped connections are then inserted (with a fitting tool for sizes 1 and 2, without any tools for sizes ②, 3, 4 and 5) in the above mentioned sizes and are kept firmly in place by means of the flexible device fitted on the contacts.
The wire housing entry on the contact is tapered to facilitate wire insertion and to avoid any damages occurring after the crimping operation.
To remove connections, a special extractor tool must be used.

5A max contacts

conductor section (mm^2)	AWG	number identification
0.08 ÷ 0.21	28 ÷ 24	hole Ø 0.64 mm
0.13 ÷ 0.33	26 ÷ 22	hole Ø 0.90 mm
0.33 ÷ 0.52	22 ÷ 20	hole Ø 1.12 mm

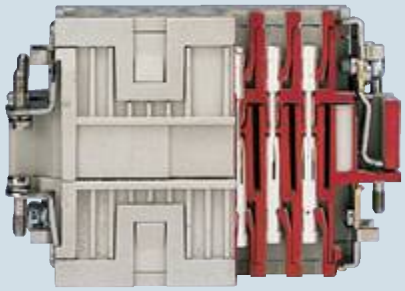
Contacts can be supplied in the silver or gold plated version

10A max contacts

conductor section (mm^2)	AWG	number identification
0.14 ÷ 0.37	26 ÷ 22	
0.5	20	
0.75	18	
1	18	
1.5	16	
2.5	14	

Contacts can be supplied in the silver or gold plated version

removable crimp contacts (with retainer device inside insert)



description

inserts:
CQ - CQE - CCE - CDC - CMCE - CX - MIXO

The connections of the conductors to the removable contacts of the male and female inserts are made via crimping with a crimping tool and locator.
The crimped connections are then introduced in the inserts of the above mentioned series and are firmly held in place by means of a retainer device fitted on the insert which holds down the contact.
The contact can be removed by simply using a flat head 3mm screwdriver through the openings provided in the inserts (CDC, CMCE 16+2, CX 8/24 series) or by means of special extractor tools, to unlock the retainer device and release the contact (CQ, CCE, CMCE, CQE, CX, MIXO series).
The wire housing entry on the contact is tapered to facilitate wire insertion and to avoid any damages occurring after the crimping operation.

16A max contacts

conductor section (mm^2)	AWG	throat identification
0.14 ÷ 0.37	26 ÷ 22	
0.5	20	
0.75	18	
1	18	
1.5	16	
2.5	14	
4	12	

Contacts can be supplied in the silver or gold plated version.
Male contacts can also be supplied in the “advanced” version (shortened contact)

40A max contacts

conductor section (mm^2)	AWG	identification
1.5	16	hole Ø 1.75 mm
2.5	14	hole Ø 2.25 mm
4	12	hole Ø 2.85 mm
6	10	hole Ø 3.5 mm

Contacts are supplied in the silver plated version only

Changeover from Pg threads to M metric threads

After 31st December 1999, the German safety standard DIN VDE 0619 (1987-09) and the standards it refers to - DIN 46319 for dimensions with metric threads and DIN 46320 (T1-T4), DIN 46255 and DIN 46259 for dimensions with Pg threads (Pg= Panzerrohr-Gewinde: literally “threads for armoured pipes”) - were withdrawn and European standard EN 50262 “Metric cable grippers for electrical installations” has been in force since 1st January 2000.
This standard defines the new sizes with metric threads for cable grippers according to EN 60423 and establishes the safety prescriptions.
Conversely, it does not specify the dimensions, such as the size of the tightening wrench, the diagonal dimension, or the dimensions of the tightness seals, as was the case in the withdrawn DIN for Pg cable grippers.
The standard came definitively into force on 1st April 2001, when the contrasting national standards were withdrawn.
It is valid in all member countries of CENELEC (European Electrical Standardisation Committee) and its publication has led to a broadening of the supply of enclosures for multi-pole connectors for industrial use, to include new enclosure versions with cable entry suitable for metric cable grippers.
Cable gripper producers have introduced the new metric series to add to the Pg size series, to gradually replace the latter type. The transition period indicated in the new standard should have ended on 1st March 2001, after which date the use of entry devices for Pg cables and, as a result, enclosures with Pg thread, should have ended in new installations.
Nevertheless, both the cable entry devices and the relevant enclosures with Pg thread, may continue to be used as spare parts.
For the CE marking of these items, observance of the safety conditions specified by the Low Voltage Directive is sufficient.
To distinguish hoods and surface-mounting housings with metric entries from the relevant Pg versions (marked with a C pre-code), the ILME metric types are marked with an M pre-code.
The transposition table below indicates the correspondence rule adopted in most cases by ILME for creating the new metric versions.

Pg ➔ metric transposition

Pg	metric
Pg 11	M 20
Pg 13.5	M 20
Pg 16	M 20
Pg 21	M 25
Pg 29	M 32
Pg 36	M 40
Pg 42	M 50

Cable diameter for use with ILME cable glands (for more information ask for the technical catalogue

Ø in mm	metric thread				
series	**20**	**25**	**32**	**40**	**50**
AS M..P	from 6 to 12.5	from 10 to 18	from 14 to 24	from 15 to 24	from 23 to 30
AS M..E	from 8 to 12.5	from 13.5 to 18	from 17 to 24		
AG M..T	6-8-10	11-14-17	19-21-24	26-29-32	35-38-41
AG M..I	from 5 to 12.5	from 9 to 18	from 14 to 25	from 18 to 32	from 24 to 38.5
AG M..R	6-8-10	11-14-17	19-21-24		

IP degree of protection and the EN 60529 standard

The minimum IP degree of protection is regulated by the CEI 64-8 installation standards (inclusion of the harmonisation documents of the CENELEC HD 384 series and the IEC 60364 publication) which, in part 7, cover a number of special environments: construction and demolition sites, structures designed for agricultural or livestock breeding use, restricted conductor areas, caravans and caravan sites, environments with a greater risk in case of fire, public performance and entertainment areas, pools and, in the future, fountains and marinas and harbour areas. The standard is applicable to enclosures for electric materials with a rated power no greater than 72.5 kW.
All the equipment must be installed according to the rule of art and must comply with any manufacturer’s assembly instructions. When components of different degrees of protection are assembled, the resulting board or distribution system will assume the lowest degree of protection of the mounted components.

The range of ILME enclosures presented in this catalogue offers the following range of protection:

IP44: protection against the *penetration of solid foreign objects* with a diameter equal to or greater than 1 mm and for protection against the intrusion of dangerous parts with an access calibre of Ø 1 mm (1st digit), and protected against the *dangerous effects of water spray* from all directions (2nd digit).
IP55: protection against the *penetration of solid foreign objects* with a diameter equal to or greater than 1 mm and for protection against the *intrusion of dangerous parts* with an access calibre of Ø 1 mm (1st digit), and protected against the *dangerous effects of water spray* from all directions (2nd digit).
IP66: total protection against *dust* and access to *dangerous parts* with an accessibility calibre of Ø 1 mm (1st digit), and protected against *powerful water jets* such as sea waves (2nd digit).
IP67: total protection against *dust*, and from *access to harmful parts* with accessibility of Ø 1mm (1st digit), and protection against *the effects of prolonged submersion* (30’) in water at the maximum depth of 1 m (2nd digit) [14].
IP68: total protection against dust, and from access to harmful parts with accessibility of Ø 1mm (1st digit), and protection against the effects of prolonged submersion (30’) in water at the maximum depth of 1 m (2nd digit).
These enclosure have also successfully passed the tests required for the IPX6 protection rating compliant with EN 60529 standard and for the IPX9K protection rating compliant with DIN 40050-9 standard

The following table shows the different levels of protection required by the IP standard

First Digit
Protection of people against contact with harmful parts

IP	Solid external objects	Protection
0		none
1		against solid objects with Ø over 50 mm (e.g. contact with hand)
2		against solid objects with Ø over 12 mm (e.g. contact with finger)
3		against solid objects with Ø over 2.5 mm (e.g. tools and wires)
4		against solid objects with Ø over 1 mm (e.g. fine tools and wires)
5		against dust (no harmful deposit)
6		total against dust

Second Digit
Protection of materials against harmful penetration of water

IP	Tests	Protection
0		none
1		against vertical drops of water
2		against drops of water with an inclination of 15° from the vertical
3		against drops of water with an inclination of 60° from the vertical
4		against splashing water from all directions
5		against water jets from all directions
6		against powerful water jets similar to sea waves
7		against the effects of temporary immersion o a maximum depth of 1 meter
8		against the effects of submersion in water

[14] The **IP66/IP67** degree of protection will officially be introduced in the next amendment 1 of the standards IEC EN 60309-1 and IEC EN 60309-2 (and of the relating IEC standards). It is already accounted for in the IP degree of protection standard EN 60529 as a ”versatile” form of protection, covering the fact that the temporary immersion resistance test (protection IPX7) does not automatically comply with the two lower degrees of protection IPX6 and IPX5, tested with the respective jet tests. If the end user requires the equipment to resist both against temporary immersions and pressurized water jets, declaredly IP66/IP67 devices with double marking must be selected.

standard version

C-TYPE

description

This series has been developed for application in electric and electronic machinery, control units, electric panels, control equipment, industrial environments, and in general, wherever a sectional and reliable connection is required for power and signal circuits.
The inserts of the CMCE series (excepting the 16+2 poles) and of the CMSE series may use standard enclosures also for uses of up to 830V.

UL certified for USA and Canada for NEMA 4, NEMA 4X and NEMA 12 protection ratings, printed on the packaging.
IP65, IP66 and IP69K protection ratings (IP44 and IP67 for CK and MK series).

characteristics of materials used:

CK, MK and CQ series

- in self-extinguishing grey RAL 7035 or black thermoplastic material for insulating (in the CQ version, only available in black) or metallic enclosures
- with epoxy-polyester powder coating for metallic enclosures
- gaskets in anti-aging, oil-resistant, grease-resistant and fuel-resistant vinyl nitrile elastomer
- monoblock locking device in stainless or galvanised steel for metallic enclosures
- monoblock locking device in self-extinguishing thermoplastic material for insulating enclosures

CZ, CH, CA and MZ, MH, MA, MF, MZF series

- made of die cast aluminium alloy
- with epoxy-polyester powder coating
- gaskets in anti-aging, oil-resistant, grease-resistant and fuel-resistant vinyl nitrile elastomer
- locking device with levers, springs and pins in stainless steel
- monoblock lever handles in stainless steel (for CZ and MZ enclosures)
- lever handles in self-extinguishing thermoplastic material reinforced with glass fibres, UL approved (for CH, CA and MH, MA enclosures)

V-TYPE version

V-TYPE IP67

description

To respond to this wide range of needs, **ILME has developed several new solutions, including the innovative V-Type lever.**
The new lever, due to the **vertical closing movement, offers an IP66/IP67** protection rating (according to EN 60529) when fitted with a complete and coupled connector and used **with ILME standard aluminum hoods (without adaptor) with die cast pegs.**
The fixing flanges are the same as those fitted on traditional models.
This means it is possible to use the new enclosures as **alternatives to the traditional version without affecting the interchangeability,** or changing dimensions, spaces, flanges or fixing positions.
The new lever differs from other commercial ones because of its closing movement principle, consisting of 2 hinged elements that are then pivoted on the enclosure.
This composite movement enables to move the lever above the pin of the enclosure that has to be fixed in place with an initial rotatory movement and then press it downwards to engage the locking mechanism.
The tight seal after closure and the simplicity of the movement are key characteristics that **only ILME has managed to combine into a single lever.**
The V-Type lever also has other interesting functional characteristics for several applications:
- The friction on the pin is almost zero because the lever exerts its pressure vertically, thus significantly reducing wear in case of frequent use. Because the lever exerts its pressure vertically, thus significantly reducing wear in case of frequent use.
- The complete lever is manufactured **in stainless steel** and is fitted with a catch that prevents it from being accidentally detached.
- The absence of plastic parts offers a higher resistance to impacts and in case of contact with oils and aggressive chemical substances or high ambient temperatures.
- The lever can be used for applications with vibrations because it has no springs and is therefore more rigid.
- The lever occupies a very small space during the closing phase.
- It is recommended in cases in which the **weight of the cable** tends to open elastic levers, like those with vertically installed connectors and cable exits in the bottom.
The interchangeability with equivalent traditional levers with springs and rollers **simplifies the management of stocks, reduces costs and increases flexibility of use.**

T-TYPE version

T-TYPE

description

Alongside the wide range of traditional metallic enclosures for ILME multipole connectors, there is now available a **new series of enclosures in self-extinguishing** thermoplastic material in the most common sizes of “44.27”, “57.27”, “77.27” and “104.27”.

Quality and low cost are the main features of these enclosures, as an outcome of careful product studies.

Valuable characteristics of these new enclosures:
- **significant structural solidity** and mechanical robustness by virtue of **substantial thickness**;
- **resistance to the main chemical agents,** found in industrial environments;
- **pre-fastened gaskets** for easier installation;
- **external dimensions** of the bulkhead housing are **similar to those of the corresponding metal enclosures**; hole fixing centres **are unchanged**.
- **ample space** inside enclosures for cables, with mounted connectors, similar to the corresponding metal high construction versions;
- possibility of making completely **insulated constructions** (equivalent to Class II);
- **absence of powder paint** for environments in which these are not recommended;
- **non-electrostatic** thermoplastic material.
- manufactured from **insulating material**, **do not require special reinforced insulation as the metal versions do,** for use with series CME higher voltage connector inserts (screw-type terminals);
- protection rating for coupled connectors is **IP65** according to norm **IEC/EN 60529;**
- **UL Type 12** (= NEMA 12) degree of protection according to American standards **ANSI/UL 50** for indoor use;
- each enclosure carries its own part number and conformity markings;
- ambient temperature range: -40 °C / +90 °C.

enclosure versions and applications

JEI version

JEI

description

The tight seal after closure and the simplicity of the movement are key characteristics that **only ILME has managed to combine into a single lever.**
- The lever can be used for applications with vibrations because it has no springs and is therefore more rigid.
- The lever occupies a very small space during the closing phase.
- It is recommended in cases in which the **weight of the cable** tends to open elastic levers, like those with vertically installed connectors and cable exits in the bottom.
The interchangeability with equivalent traditional levers with springs and rollers **simplifies the management of stocks, reduces costs and increases flexibility of use.**

JCV and JMV Series

- made of die cast aluminium alloy
- with epoxy-polyester powder coating
- gaskets in anti-aging, oil-resistant, grease-resistant and fuel-resistant vinyl nitrile elastomer
- lever handle in galvanised steel

BIG version

BIG

description

The **large dimensions** of these innovative enclosures have been chosen to offer customers an **adequate space to store conductors**.
The **width** of the new enclosures is **greater than that of previous versions**: 66 mm compared to the 43 mm for standard enclosures. The **height** of BIG enclosures has also been **increased to 100 mm** for sizes “44.27” and “57.27” (standard versions for high models: 70 and 72 mm), **and to 110 mm** for sizes “77.27” and “104.27” (standard versions for high models: 76 mm).
The cable compartment is now fully accessible during assembly (the connector insert is fully inserted in the lower half of the enclosure), **offering three times the space compared to standard enclosures**. This means it is possible to bend cables and pipes with greater bending radii.
Due to this important feature, the new BIG enclosures are **particularly suitable for MIXO modular inserts**, being versatile and customizable, for multiple cable entries.
Each insert, differentiated according to electric power or signal, pneumatic, optical fiber or Ethernet network current, **may thus have the specific branching. One single large connector can replace what previously required two connectors.**

Particular attention has been given to the number and dimensions of cable entries.
The threaded entry is available in several metric diameters in accordance with EN 60423, for input devices compliant with EN 50262, with vertical or horizontal orientation.

version for aggressive environments

W

description

This series has been developed for industrial applications with particularly aggressive external agents (e.g. salt atmospheres or environments).
The enclosures do not have any internal tabs and also allow insertion of the CME inserts.
These enclosures have supplementary insulating strips inside.
This version is distinguished by the black colour of the enclosures.

UL certified for USA and Canada for NEMA 4, NEMA 4X and NEMA 12 protection ratings, printed on the packaging.
IP65, IP66 and IP69K protection ratings.

characteristics of materials used:

CK..W and MK..W series

- chromate treated die cast
- with epoxy-polyester powder coating
- gaskets in anti-aging fluoro elastomer
- monoblock locking device in stainless steel

CZ..W, CH..W, CA..W series
and MZ..W, MH..W, MA..W series

- made of die cast aluminium alloy
- chromate treated die cast
- with epoxy-polyester powder coating
- gaskets in anti-aging fluoro elastomer
- locking device with levers, springs and pins in stainless steel
- pegs with stainless steel coating
- monoblock lever handles in stainless steel (for CZ...W and MZ..W enclosures)
- lever handles in self-extinguishing thermoplastic material reinforced with glass fibres, UL approved (CH..W, CA..W and MH..W, MA..W versions)
- supplementary insulation inside enclosures

enclosure versions and applications

EMC version

EMC

description

This series has been developed for industrial applications that require electromagnetic compatibility (EMC, Electromagnetic Compatibility), in accordance with the European standards that regulate the emission and immunity of the equipment.

UL certified for USA and Canada for NEMA 4, NEMA 4X and NEMA 12 protection ratings, printed on the packaging.
IP65, IP66 and IP69K protection ratings.

characteristics of materials used:

CK..S and MK..S series

- chromate treated die cast with high surface conductivity
- special gaskets in highly conductive material
- monoblock locking device in stainless steel

CZ..S, CH..S, CA..S and MZ..S, MH..S, MA..S series

- made of die cast aluminium alloy
- chromate treated die cast with high surface conductivity
- special gaskets in highly conductive material
- locking device with levers, springs and pins in stainless steel
- lever handles in self-extinguishing thermoplastic material reinforced with glass fibres, UL approved

180 °C version

180 °C

description

Series specifically developed for industrial applications where the ambient temperatures are particularly harsh (from -40°C to +180°C).
The enclosures do not have any internal tabs and also allow insertion of the CME inserts.
These enclosures have supplementary insulating strips inside.
For use with inserts in self-extinguishing thermoplastic material (PPS polyphenylene sulphide).
This version is distinguished by the red colour of the enclosures.

UL certified for USA and Canada for NEMA 4, NEMA 4X and NEMA 12 protection ratings, printed on the packaging.
IP65 and IP69K protection ratings.

characteristics of materials used:

CK..R, CZ..R, CH..R, CA..R and MK..R, MZ..R, MH..R, MA..R series

- made of die cast aluminium alloy
- chromate treated die cast
- coated with special thermoset powder with high resistant to high temperatures
- gaskets in anti-aging fluoro elastomer
- locking device with levers, springs and pins in stainless steel
- monoblock levers in stainless steel (for CZ..R, CH..R 48 and MZ..R, MH..R 48 versions)
- lever handles in aluminium with special die-cast coating (for CH..R 10, 16, 24 and MH..R 10, 16, 24 versions)
- supplementary insulation inside enclosures

single central lever version

CENTRAL LEVER

description

Series specifically designed for industrial applications with limited installation space. These enclosures can be installed, placed side-by-side and handled in a single operation. Furthermore, the lever's shape reduces the effort required to uncouple the inner fittings.

characteristics of materials used:

CH..YC, CA..YC and MA..YC, CA..YX and MF..YX series

- made of die cast aluminium alloy
- with epoxy-polyester powder coating
- gaskets in anti-aging, oil-resistant, grease-resistant and fuel-resistant vinyl nitrile elastomer
- locking device with single stainless steel lever

enclosure versions and applications

high protection IP68 version

IP68

description

For applications in the railway sector and whenever the following characteristics are demanded: high pressure, impact and corrosion resistance, in protection rating IP68. They also ensure a good screening for electromagnetic compatibility.
The IP66 e IP68 protection ratings printed on the enclosure are ensured if the enclosures are correctly installed and the cable entry devices have equal or higher rating.

UL certified for USA and Canada for NEMA 4, NEMA 4X and NEMA 12 protection ratings, printed on the packaging.
IP69K protection rating for tightness to pressurized water jets.

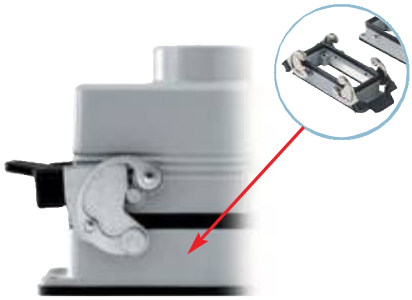
characteristics of materials used:

CG and MG series

- made of anti-corrosion aluminium alloy
- with black epoxy powder coating
- gaskets in anti-aging, oil-resistant, grease-resistant and fuel-resistant vinyl nitrile elastomer
- closure with stainless steel hex-head or bayonet screws.

insulated 830V version

C-TYPE 830V



description

Applications as for the standard version.
The enclosures do not have tabs and allow the insertion of inserts with rated voltage up to 830V (series CME).
The inserts of CME series connectors (screw) have a lateral key encryption that prevents installation in metal housings without additional insulation.
These enclosures have supplementary insulating strips inside.

UL certified for USA and Canada for NEMA 4, NEMA 4X and NEMA 12 protection ratings, printed on the packaging.
IP65, IP66 and IP69K protection ratings.

characteristics of materials used:

CM, CMA and MM, MMA, MMF series

- made of die cast aluminium alloy
- with epoxy-polyester powder coating
- gaskets in anti-aging, oil-resistant, grease-resistant and fuel-resistant vinyl nitrile elastomer
- locking device with levers, springs and pins in stainless steel
- lever handles in self-extinguishing thermoplastic material reinforced with glass fibres, UL approved
- supplementary insulation inside enclosures

COB

COB

description

The COB system makes it possible to use multipole connectors within electric panels without the traditional metallic enclosure as protection is assured by the electric panel itself or other container.

N.B.: connectors must not be handled live.

The COB system may be assembled in the three following ways:

- on panels with window snap fastening device* (**Figure 1**)
- on DIN EN 60715 rails, both lengthways and crossways to the support (**Figure 2**)
- on fixed panels using screws (**Figure 2**)

The COB system offers the following advantages:

- reduction in cost and space with respect to metallic enclosures and traditional terminal boards
- possibility of rewiring at the connector bench with connected devices
- easy wiring inspection and tests with coupled connectors, thanks to rear access to the inserts via the turnover device
- fast mounting in panels thanks to the snap fastening device on the DIN EN 60715 rails
- sturdy support structure, specific to the size of each insert and does not require any preparation
- broad passage for housing of conductor cables
- mobile parts prearranged for the clamping of bundles of conductors of multipolar cables to prevent contact with the connector contacts

The technical features of items are available on the web site:

www.ilme.com

Family	inserts
Version	screw terminal connections
Series	CNE
Product type	with male contacts
Type	with plate
Model	male insert
Reference standard	EN 61984 (2001-11)
Contact type	silver plated

combinations between enclosures and inserts

enclosure versions

enclosures size	standard pages	insulated 830V pages	180 °C pages	for aggressive environments pages	EMC pages	high protection IP68 pages	vertical closure V-TYPE pages	insulating T-TYPE pages	hoods BIG pages
21.21	✔ 201 ÷ 205	✗	✔ 353	✔ 325	✔ 343	✔ 372 ÷ 373	✗	✗	✗
32.13	✔ 206 ÷ 207	✗	✗	✗	✔ 344 ÷ 345	✗	✗	✗	✗
49.16	✔ 208 ÷ 210	✗	✎ on request	✔ 326	✔ 346	✗	✗	✗	✗
66.16	✔ 211 ÷ 213	✗	✎ on request	✔ 327	✔ 347	✗	✗	✗	✗
66.40	✔ 215 ÷ 217	✗	✗	✔ 328	✗	✗	✗	✗	✗
44.27	✔ 218 ÷ 221	✗	✔ 354	✔ 329	✔ 348	✔ 374 ÷ 377	✔ 254/260	✔ 282	✔ 304 ÷ 306
57.27	✔ 222 ÷ 227	✔ 391 ÷ 395	✔ 355	✔ 330	✔ 349	✔ 378 ÷ 381	✔ 255/264	✔ 283	✔ 308 ÷ 311
77.27	✔ 228 ÷ 234	✔ 397 ÷ 401	✔ 356	✔ 331	✔ 350	✔ 382 ÷ 385	✔ 256/268	✔ 284	✔ 312 ÷ 315
104.27	✔ 236 ÷ 243	✔ 403 ÷ 407	✔ 357	✔ 332	✔ 351	✔ 386 ÷ 389	✔ 257/272	✔ 285	✔ 316 ÷ 319
77.62	✔ 244 ÷ 247	✔ see standard enclosures	✗	✔ 333	✗	✗	✗	✗	✗
104.62	✔ 248	✔ see standard enclosures	✔ 358	✔ 334	✗	✗	✗	✗	✗

✔ = normal production
✎ = may be supplied on request, contact our sales offices
✗ = currently unavailable

ENCLOSURE CHARACTERISTICS

Series	Version	Enclosure material	Size		Pg or M passage diameter	
CK/MK	Standard C-Type	Insulating	21.21	(03)	M 20	Pg 11
CKA/MKA **CKAX/MKAX**	Standard C-Type W (aggressive environments) S (EMC)	Metallic	21.21	(03)	M 20	Pg 11
CKG/MKG	Standard C-Type	Insulating	21.21	(03)	M 20	Pg 11
CKAG/MKAG	Standard C-Type	Metallic	21.21	(03)		
CGK/MGK	IP68	Metallic	21.21	(03)	M 20	Pg 13.5
CQ	Standard C-Type	Insulating	32.13	(08)	—-	Pg 16 ÷ 21
	S (EMC)	Metallic insulating				
CZ/MZ	Standard C-Type W (aggressive environments) S (EMC)	Metallic	49.16 66.16 66.40	(15) (25) (50)	M 20 ÷ 25 M 20 ÷ 25 M 25 ÷ 29	Pg 13.5 ÷ 21 Pg 16 ÷ 21 Pg 21 ÷ 29
CH / CA/MH / MA	Standard C-Type W (aggressive environments) S (EMC) R (high temperatures)	Metallic	44.27 57.27 77.27 104.27 77.62 104.62	(6) (10) (16) (24) (32) (48)	M 20 ÷ 40 M 20 ÷ 40 M 25 ÷ 50 M 25 ÷ 50 M 32 ÷ 50 M 32 ÷ 50	Pg 13.5 ÷ 29 Pg 16 ÷ 29 Pg 21 ÷ 36 Pg 21 ÷ 36 Pg 29 ÷ 42 Pg 29 ÷ 42
T-TYPE **TCH / TMA**	Standard (RAL 7012 grey)	Insulating	44.27 57.27 77.27 104.27	(6) (10) (16) (24)	M 25 ÷ 32 M 25 ÷ 32 M 32 ÷ 40 M 32 ÷ 40	 —-
V-Type IP67 **(C7I, C7P/M7P, ...)**	IP67 stainless steel levers	Metallic	44.27 57.27 77.27 104.27	(6) (10) (16) (24)	M 20 ÷ 40 M 20 ÷ 40 M 25 ÷ 40 M 25 ÷ 40	Pg 16 ÷ 29 Pg 16 ÷ 29 Pg 21 ÷ 29 Pg 21 ÷ 29
V-Type IP66 **(CVI L, CVP/MVP L, ...)**	IP66/IP65 stainless steel levers	Metallic	44.27 57.27 77.27 104.27	(6) (10) (16) (24)	M 20 ÷ 40 M 20 ÷ 40 M 25 ÷ 40 M 25 ÷ 40	Pg 16 ÷ 29 Pg 16 ÷ 29 Pg 21 ÷ 29 Pg 21 ÷ 29
JEI **(JCVI, JCVP/JMVP, ...)**	Standard, galvanised steel levers	Metallic	44.27 57.27 77.27 104.27	(6) (10) (16) (24)	M 20 M 20 M 25 M 25	Pg 16 Pg 16 Pg 21 Pg 21
BIG **large hoods** **CB - MB**	Standard, W (aggressive environments)	Metallic	44.27 57.27 77.27 104.27	(6) (10) (16) (24)	M 20 ÷ 50 M 20 ÷ 50 M 20 ÷ 50 M 20 ÷ 50	 —-
CG/MG	IP68	Metallic	44.27 57.27 77.27 104.27	(6) (10) (16) (24)	M 25 ÷ 32 M 25 ÷ 32 M 32 ÷ 50 M 32 ÷ 50	Pg 16 ÷ 29 Pg 16 ÷ 29 Pg 21 ÷ 36 Pg 21 ÷ 36
Central YX - YC Lever **CH - CA - MH - MA**	Standard	Metallic	44.27 57.27 77.27 104.27	(6) (10) (16) (24)	M 25 ÷ 32 M 25 ÷ 32 M 32 ÷ 40 M 32 ÷ 50	Pg 21 ÷ 29 Pg 21 ÷ 29 Pg 21 ÷ 36 Pg 21 ÷ 36
COB	Standard	Insulating	44.27 57.27 77.27 104.27	(6) (10) (16)[1)] (24)	—- 	—-

[1)] 49.16 (15) and 66.16 (25) with adaptor CR xx/16; [3)] according to DIN 40050-9; [4)] not approved versions with plastic cover.

ENCLOSURE CHARACTERISTICS

Series	Locking device	Variant	IP (EN 60529) [2]	UL 50 Type (NEMA 250 Type)	Environmental temperature range	from page
CK/MK	single		IP44	12	-40 °C ÷ +125 °C	201
		with CKR 65 (D)	IP66/IP67, IP69K [3]	12, 4, 4X	-40 °C ÷ +125 °C	
CKA/MKA CKAX/MKAX	single		IP44	12	-40 °C ÷ +125 °C	203
		with CKR 65 (D)	IP66/IP67, IP69K [3]	12, 4, 4X	-40 °C ÷ +125 °C	
CKG/MKG	single	for CXL, CJ K and CX 1/2 BD inserts	IP66/IP67, IP69K [3]	12, 4, 4X	-40 °C ÷ +125 °C	459
CKAG/MKAG						
CGK/MGK	screw		IP68, IP69K [3]		-40 °C ÷ +125 °C	372
CQ	single	with conductive gasket	IP66/IP67, IP69K [3]		-40 °C ÷ +125 °C	206
CZ/MZ	single		IP66, IP69K [3]	12, 4, 4X	-40 °C ÷ +125 °C	208
	dual					
CH, CA/MH,	single		IP66, IP69K [3]	12, 4, 4X [4]	-40 °C ÷ +125 °C	215
	dual				(R -40 °C ÷ 180 °C)	
T-TYPE	single		IP65	12	-40 °C ÷ +90 °C	282
	dual					
V-Type IP67	single (44.27)		IP67, IP69K [3]	12, 4, 4X [4]	-40 °C ÷ +125 °C	254
	dual (57.27, 77.27 104.27)					
V-Type IP66	single		IP66, IP69K [3]	12, 4, 4X [4]	-40 °C ÷ +125 °C	262
JEI	single		IP66		-40 °C ÷ +125 °C	288
	dual					
BIG enclosures	single (44.27)		IP66		-40 °C ÷ +125 °C	304
	dual (57.77, 77.27 104.27)					
CG/MG	screw or bayonet		IP66, IP68, IP69K [3]	12, 4, 4X	-40 °C ÷ +125 °C	372
Central Lever	single central lever		IP65		-40 °C ÷ +125 °C	360
COB	dual		IP20		-40 °C ÷ +125 °C	410

[2] the enclosures ensure IP protection rating when coupled and locked with the locking lever. The cover (CS, CP) only provides mechanical protection without ensuring the protection rating

CK and CKD series
CKS series

general

load curves

The permitted current carrying capacity for connectors is variable: it becomes lower with the increase of the number of poles and of the ambient temperature in which the connector is installed and it depends upon the thermal properties of the material used for the contacts and the insulating parts including those of the type of conductor used.

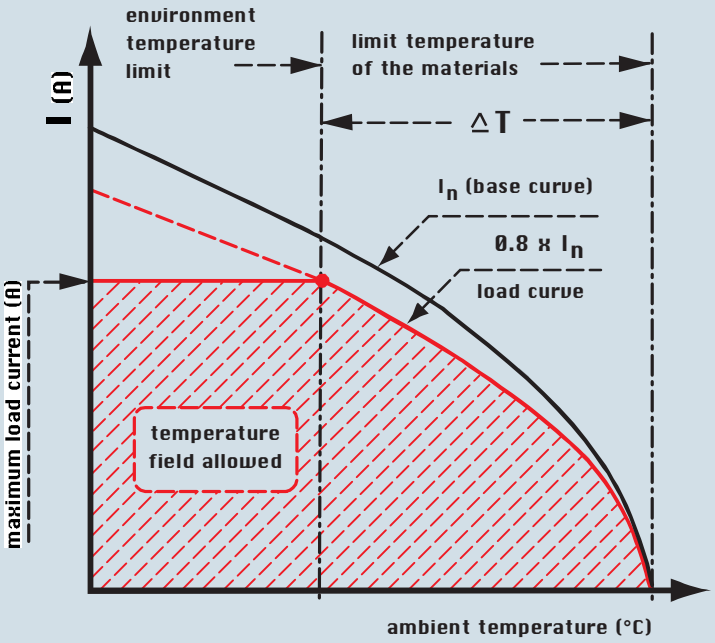
The current carrying capacity is obtained from the load curves which are constructed according to standard IEC 60512-5-2 for currents circulating simultaneously in all poles.

The limit current curves express current values that determine the achievement of the upper limit temperature of the materials. The choice of the permanent load applicable on the contacts must be made within the field of operation possible delimited by the above mentioned curves.

Since use of connectors at the limit values of their characteristics is not recommended, **the base curve** is de-rated. The reduction of the load currents to 80% defines the correction curve where both the maximum permissible contact resistances and the inaccuracy of the temperature measurements are sufficiently taken into consideration.

The correction curve represents the final **limit current curve (load curve)** as defined by standard IEC 60512-5-2. It therefore bears in consideration the differences between the various connector inserts, as well as errors in the temperature measurements.

All the load curves presented here below include the correction.



Legend:

Maximum load current (A): value for which the connector reaches the upper limit temperature of the material at the corresponding ambient temperature intersected on the load curve.

Upper limit temperature of the materials: value determined by the characteristics of the material used. The sum of the environmental temperature and the increase of the ¢t (temperature rise) caused by the current flow must not exceed the limit temperature of the materials.

Environment temperature limit: the environmental conditions must not exceed this value. It may be known and determines the maximum load current, or it may be directly obtained from the load curve.

Base curve: set of current and temperature values obtained from laboratory tests and influenced by the connector's characteristics (number of poles, construction shape, thermal conductivity of the materials, etc.) and the cross-section of the conductor used.

Load curve (limit current curve): obtained from the base curve via the safety coefficient.

ΔT (temperature rise): temperature rise produced by a permanent current circulating through all the poles of a connector coupling; difference between the upper limit temperature of the material and the ambient temperature obtained on the limit current curve.

curves

diagram CK and CKD 03 poles

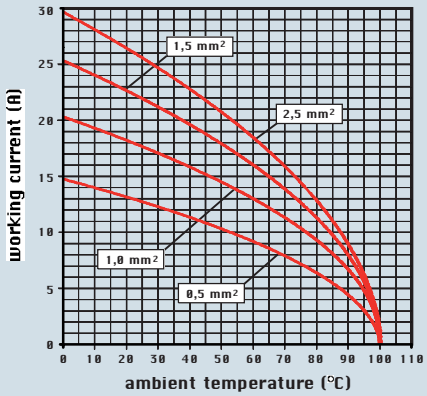


diagram CK and CKD 04 poles

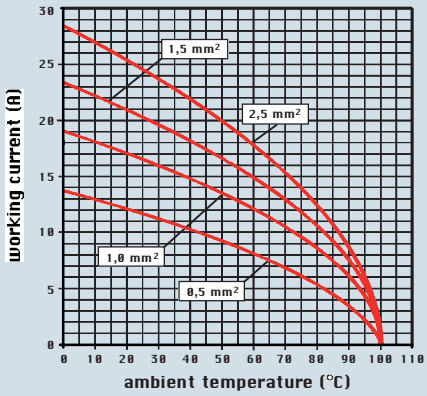


diagram CKS 03 poles

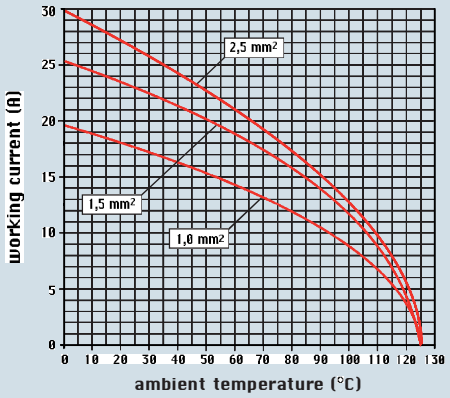
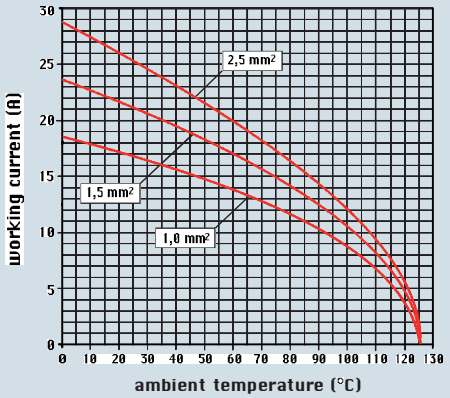


diagram CKS 04 poles



load curves

CK...RY series
CD series

curves

diagram CK...RY 03 poles

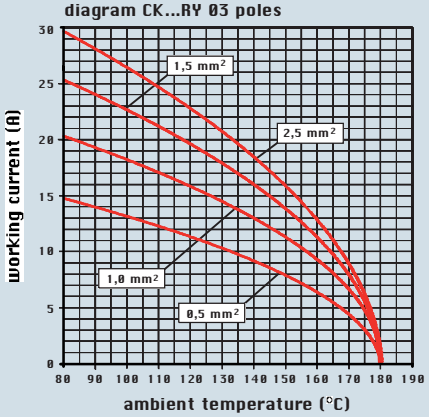


diagram CK...RY 04 poles

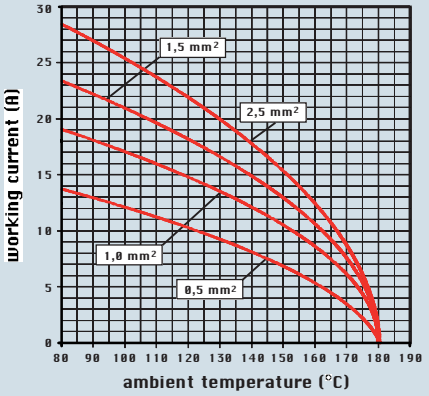
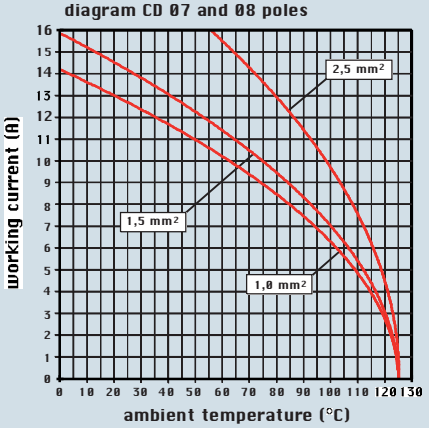


diagram CD 07 and 08 poles



CD series

curves

diagram CD 15 poles

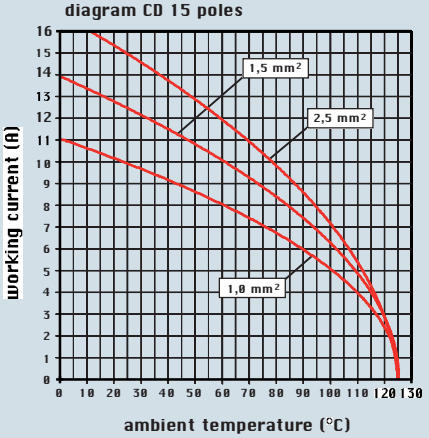


diagram CD 25 and 50 poles

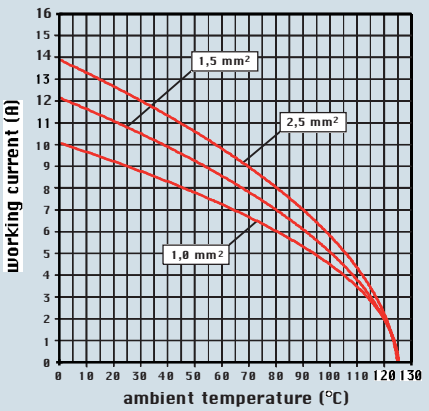


diagram CD 40 and 80 poles

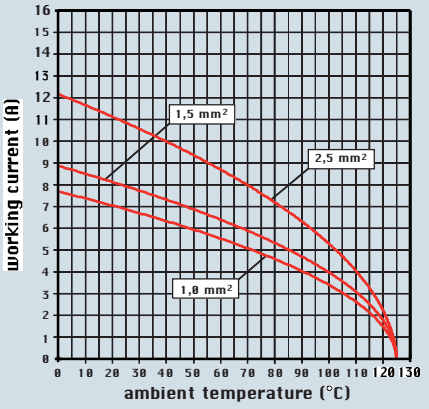
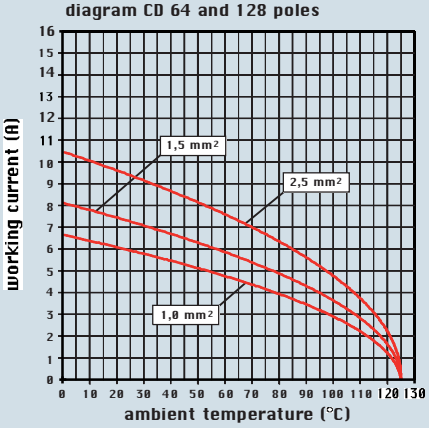


diagram CD 64 and 128 poles



CT and CTS (10A) series

curves

diagram CT and CTS 40 poles

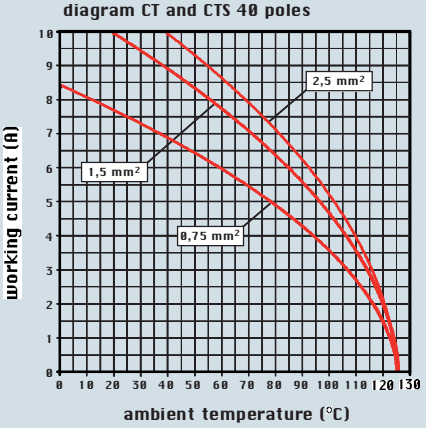
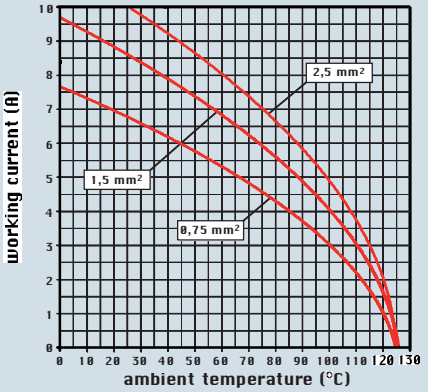


diagram CT and CTS 64 poles



limit current curves of the inserts

CDD series

curves

diagram CDD 24 poles

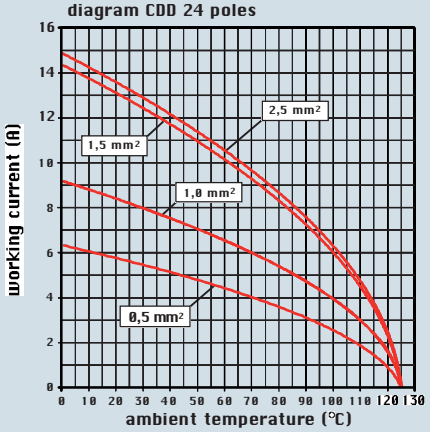


diagram CDD 38 and 76 poles

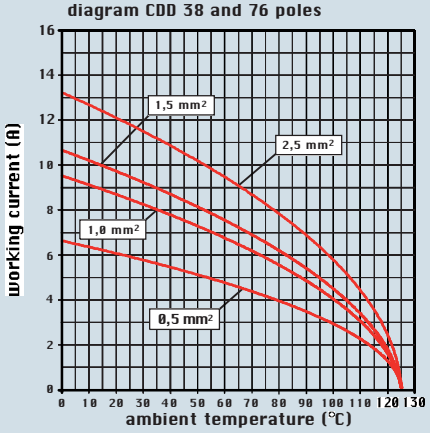


diagram CDD 42 poles

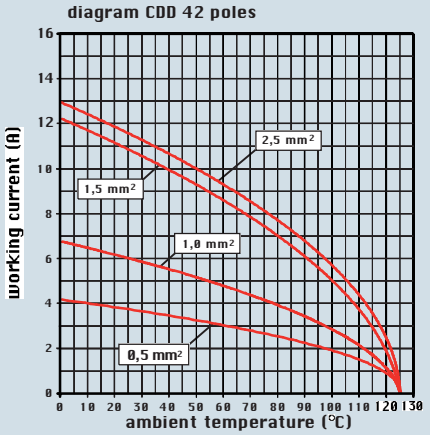
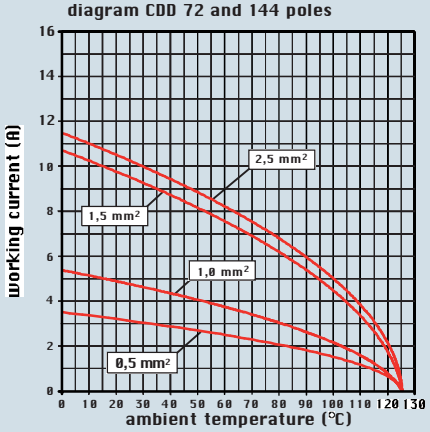


diagram CDD 72 and 144 poles



CDD series
CQ series

curves

diagram CDD 108 and 216 poles

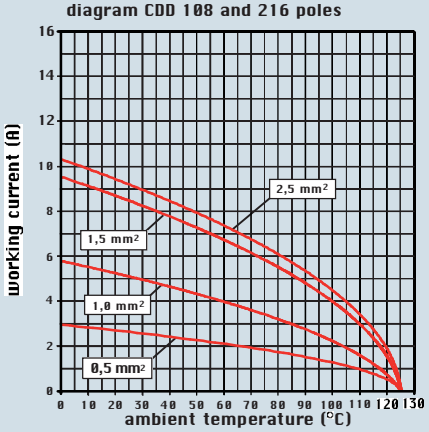


diagram CQ 12 poles

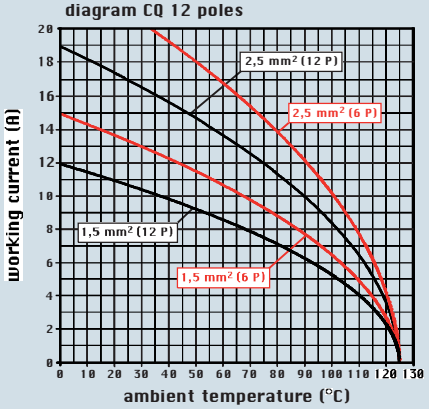


diagram CQ 05 poles

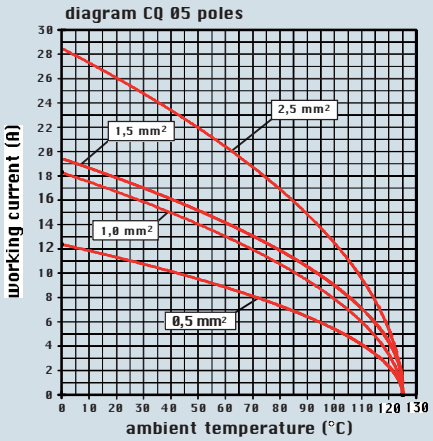
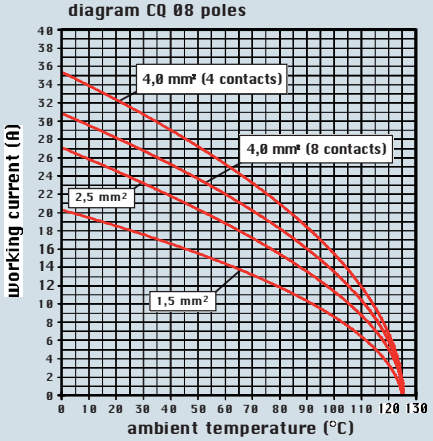


diagram CQ 08 poles



CQ series
CDA and CDC series

curves

diagram CQ 04/2 poles power poles

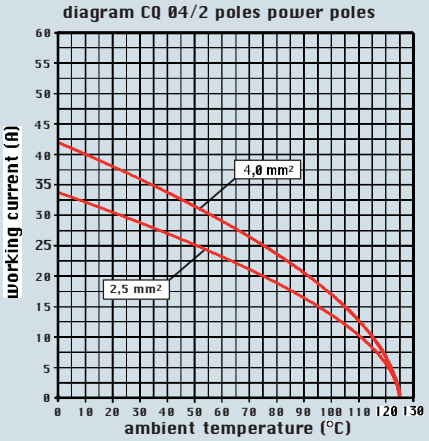


diagram CDA and CDC 10 poles

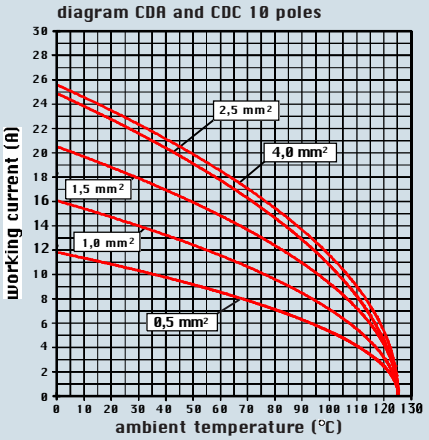
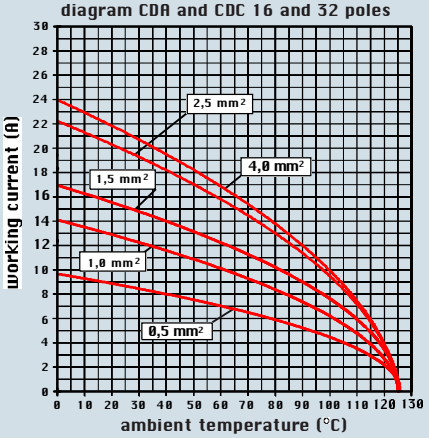


diagram CDA and CDC 16 and 32 poles



CQE series

curves

diagram CQE 10 poles

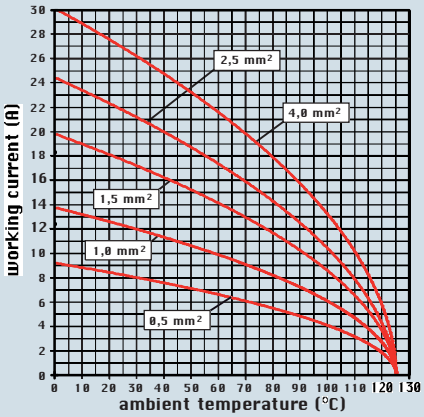


diagram CQE 18 poles

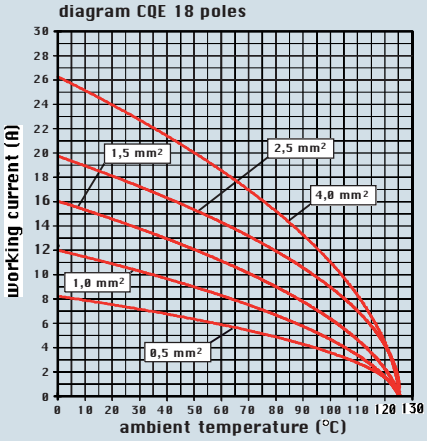


diagram CQE 32 and 64 poles

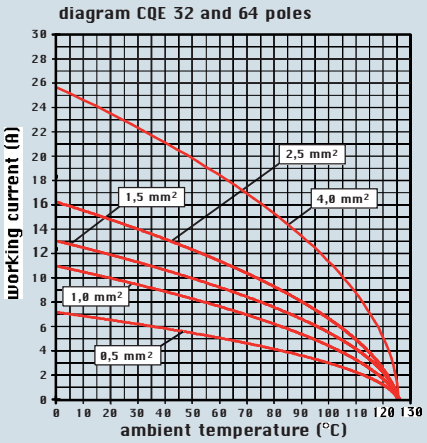
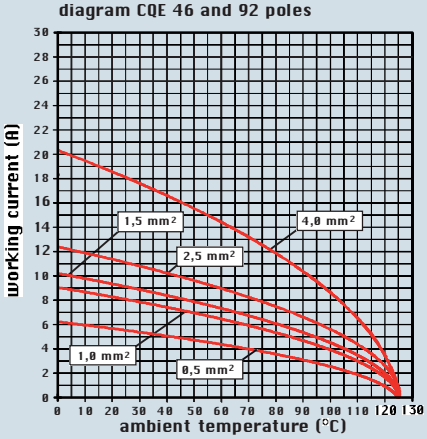


diagram CQE 46 and 92 poles



CCE, CNE and JCNE series

curves

diagram CCE, CNE and JCNE 06 poles

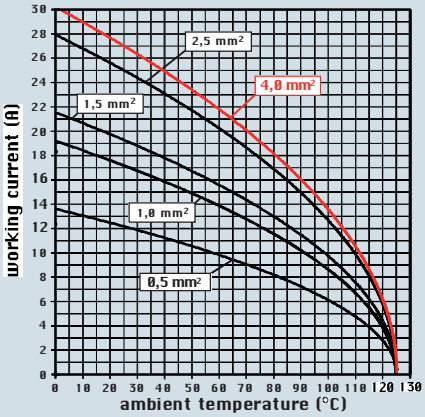


diagram CCE, CNE and JCNE 10 poles

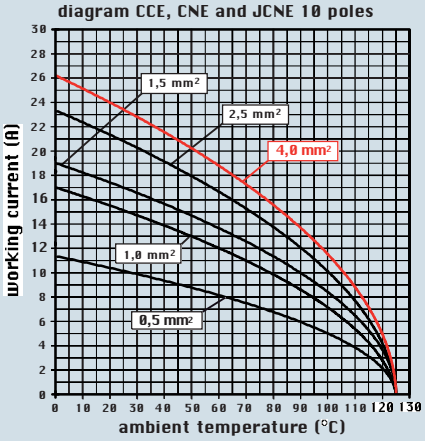


diagram CCE, CNE and JCNE 16 and 32 poles

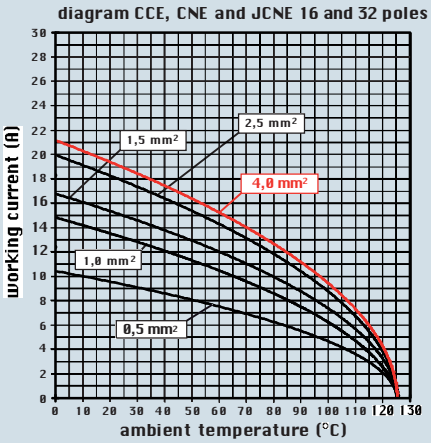
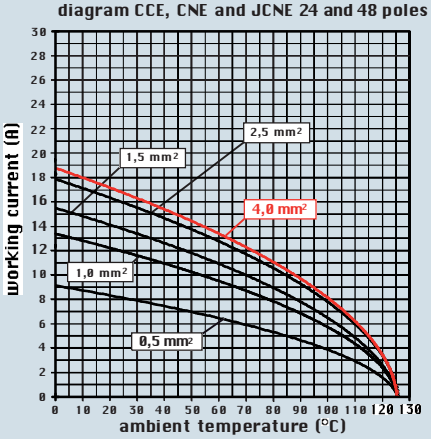


diagram CCE, CNE and JCNE 24 and 48 poles



CNE..RY series

curves

diagram CNE..RY 06 poles

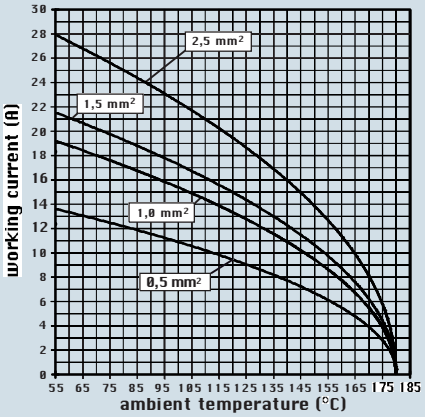


diagram CNE..RY 10 poles

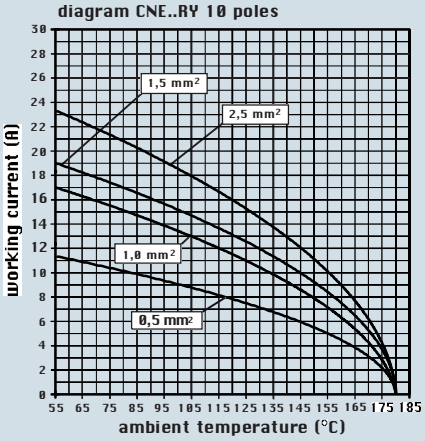


diagram CNE..RY 16 poles

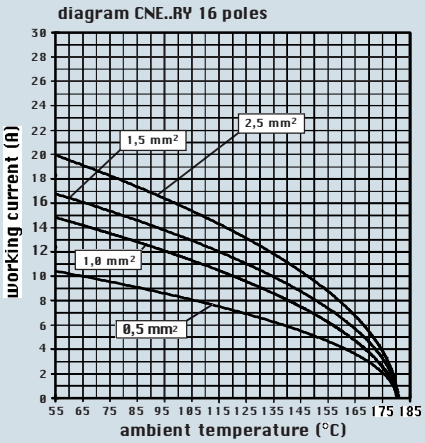
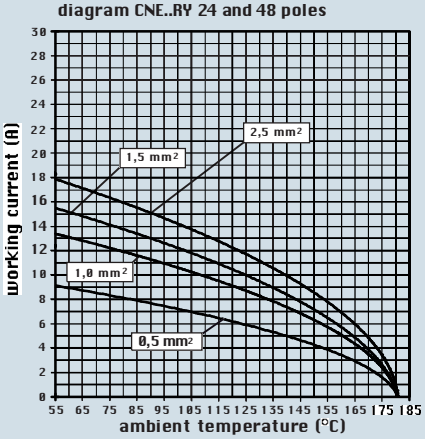


diagram CNE..RY 24 and 48 poles



load curves

CSH, CSE and JCSE series

curves

diagram CSH, CSE and JCSE 06 poles

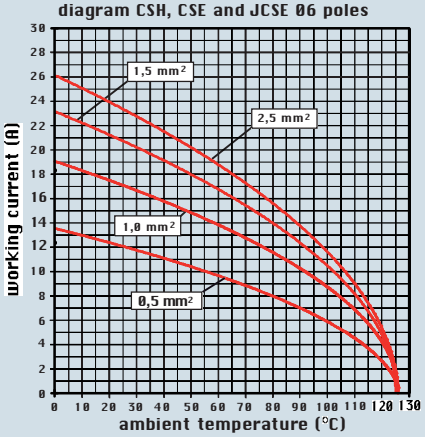


diagram CSH, CSE and JCSE 10 poles

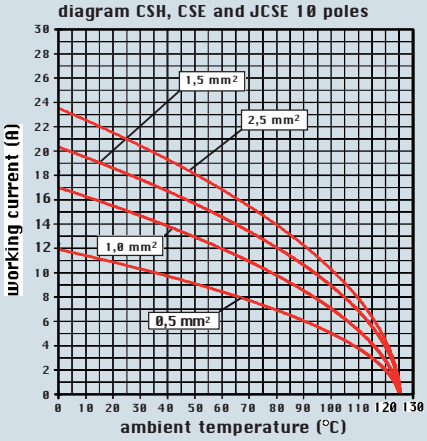


diagram CSH, CSE and JCSE 16 and 32 poles

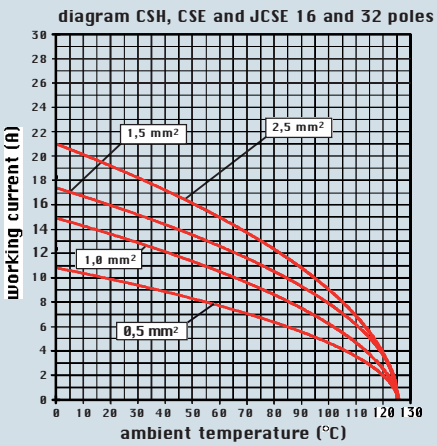
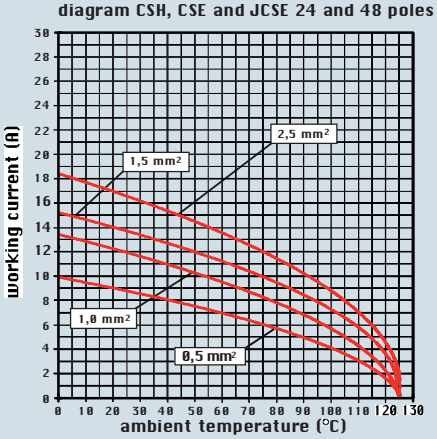


diagram CSH, CSE and JCSE 24 and 48 poles



CSS series

curves

diagram CSS 06 poles

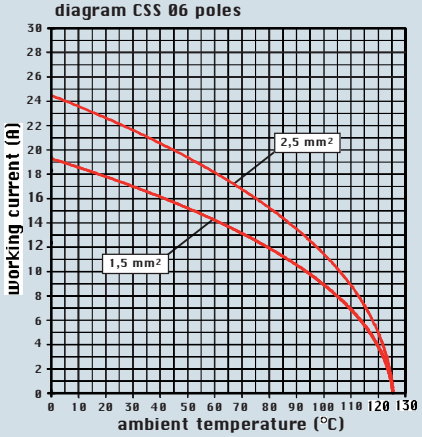


diagram CSS 10 poles

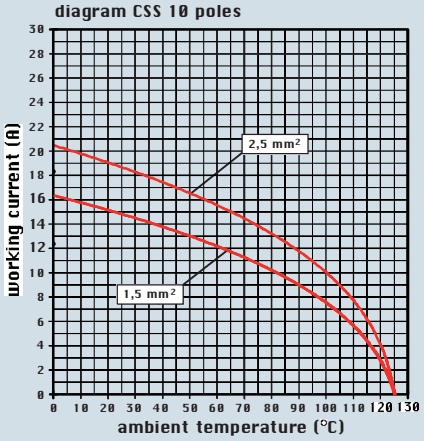


diagram CSS 16 and 32 poles

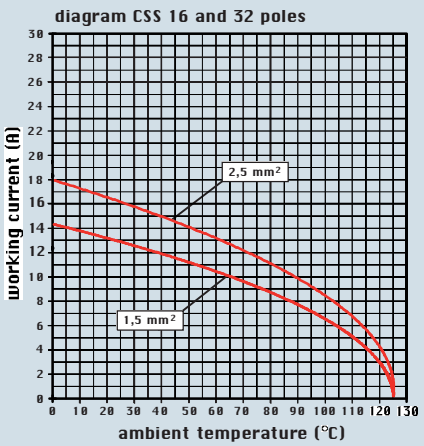
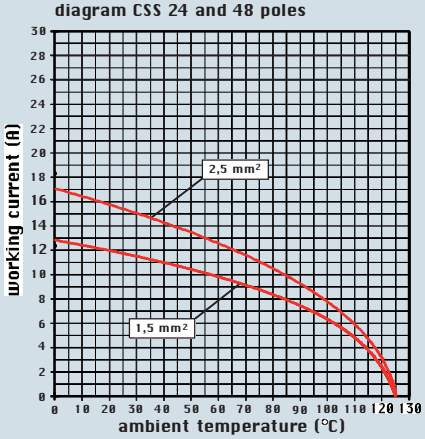


diagram CSS 24 and 48 poles



CTSE (16A) series

curves

diagram CTSE 06 poles

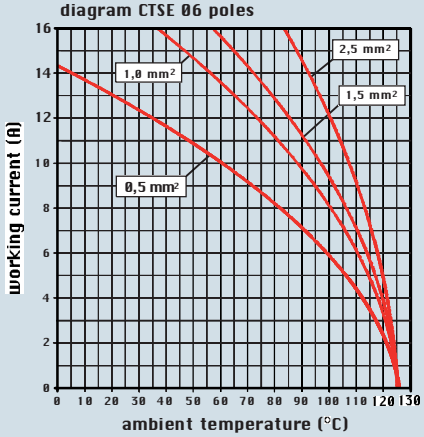


diagram CTSE 10 poles

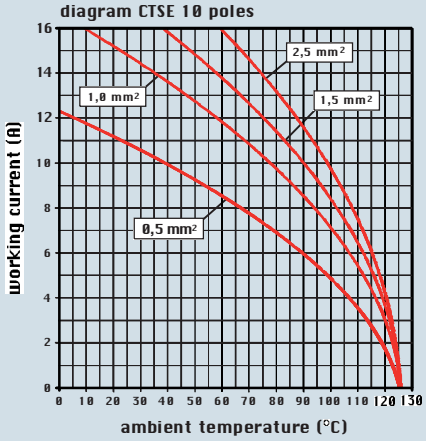


diagram CTSE 16 poles

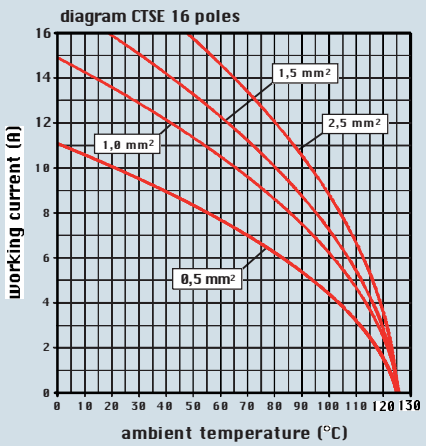
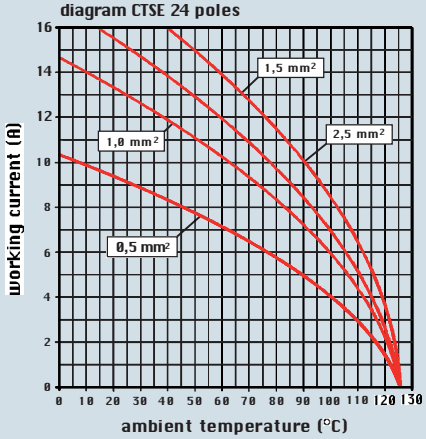


diagram CTSE 24 poles



CT (16A) series

curves

diagram CT 06 poles

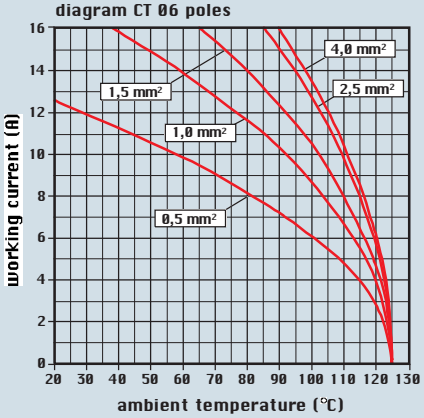


diagram CT 10 poles

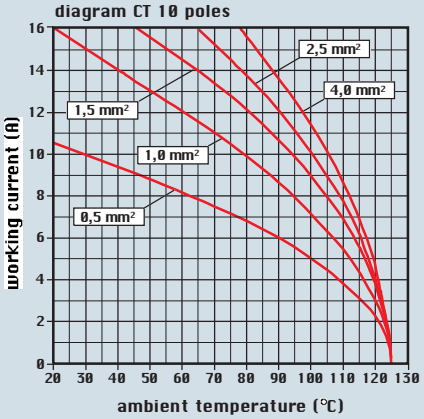


diagram CT 16 poles

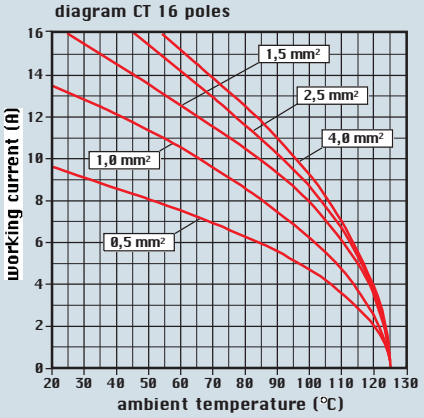
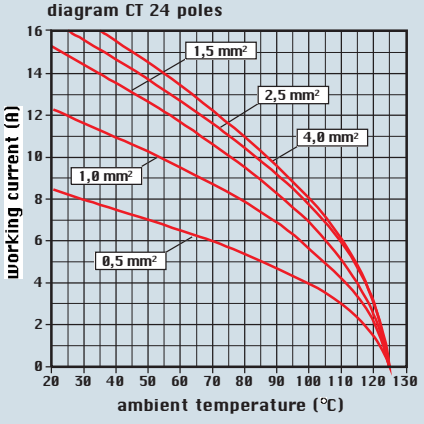


diagram CT 24 poles



CMCE and CME series

curves

diagram CMCE and CME 03 poles

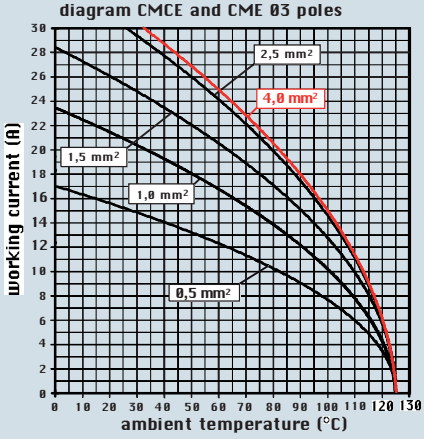


diagram CMCE and CME 06 and 12 poles

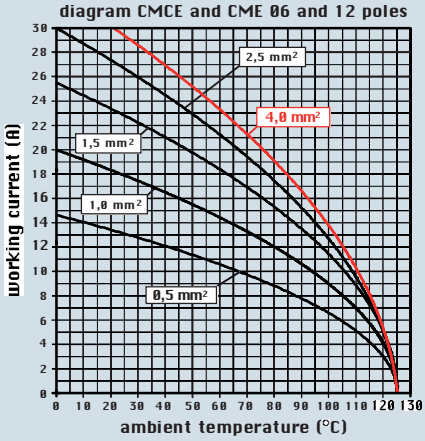


diagram CMCE and CME 10 and 20 poles

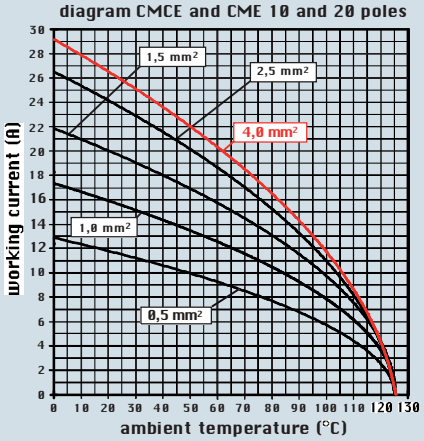
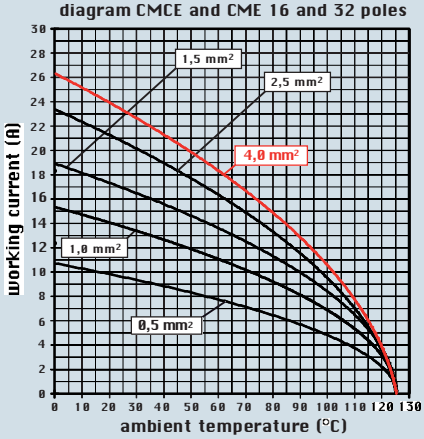


diagram CMCE and CME 16 and 32 poles



CMSE series

curves

diagram CMSE 03 poles

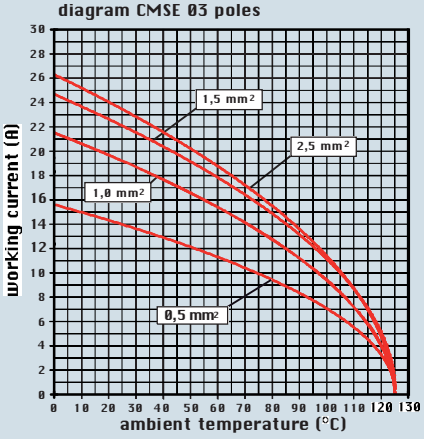


diagram CMSE 06 and 12 poles

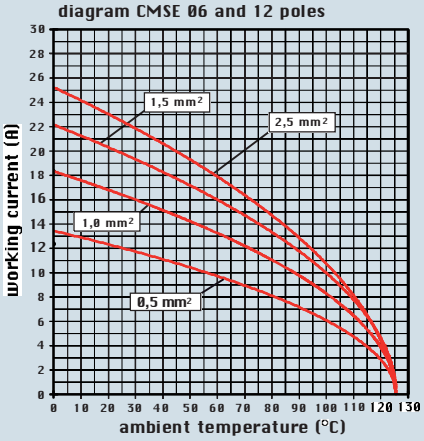
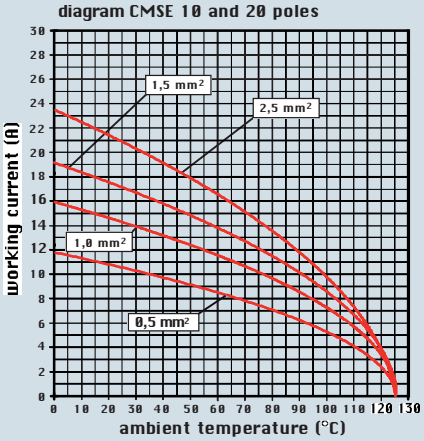


diagram CMSE 10 and 20 poles



limit current curves of the inserts

CP series
CP..RY series

curves

diagram CP 06 and 12 poles

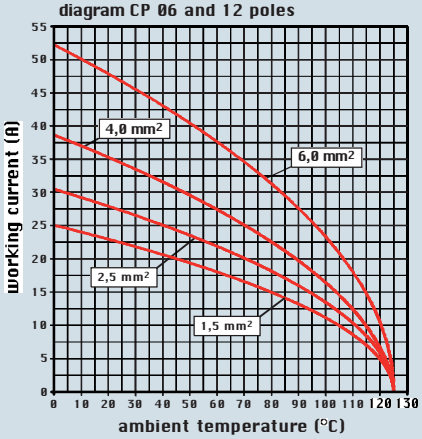
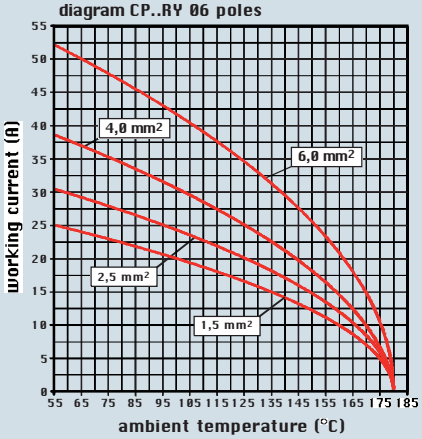


diagram CP..RY 06 poles



CX 8/24 series
CX 6/36 series

curves

diagram CX 8/24 power poles

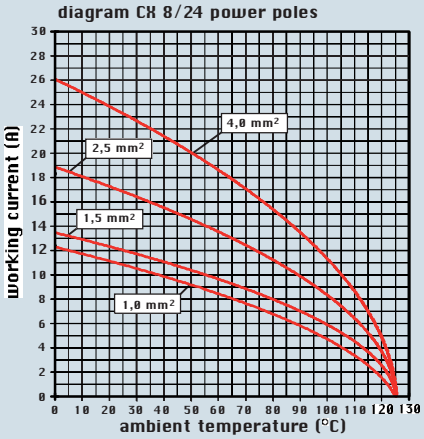
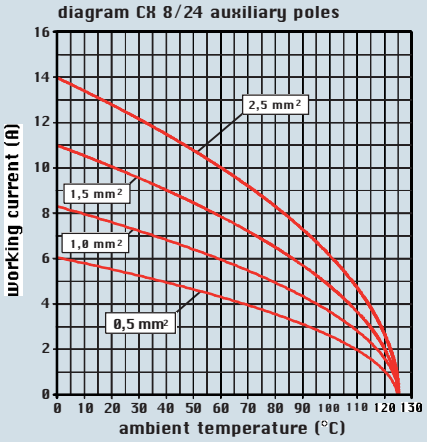


diagram CX 8/24 auxiliary poles

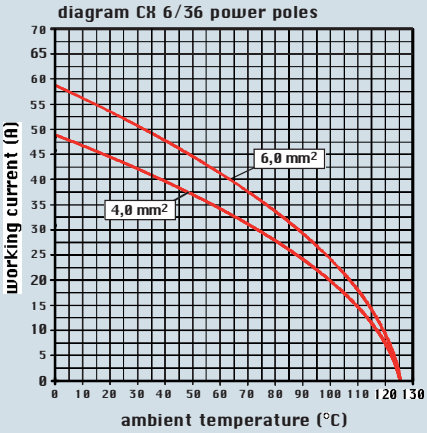


Note: for connector with power poles and auxiliary poles simultaneously loaded in the combinations

power poles	auxiliary poles
4.0 mm²	2.5 mm²
2.5 mm²	1.5 mm²
1.5 mm²	1.0 mm²
1.0 mm²	0.5 mm²

with power / auxiliary current ratios = 1.6 / 1

diagram CX 6/36 power poles



CX 12/2 series
CX 4/0 series

curves

diagram CX 12/2 power poles

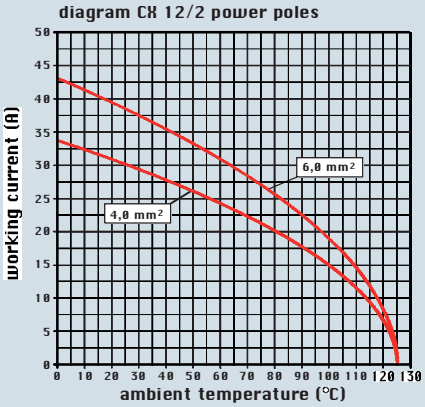
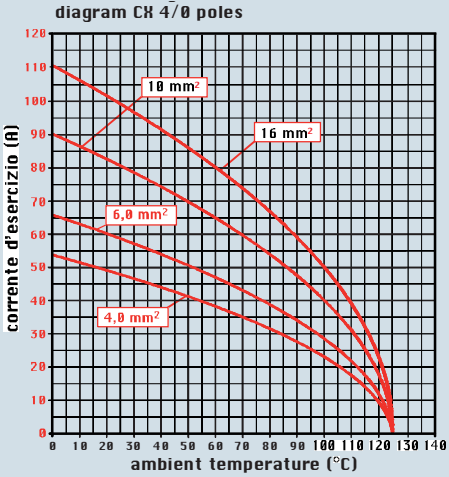


diagram CX 4/0 poles



CX 4/2 series

curves

diagram CX 4/2 poles

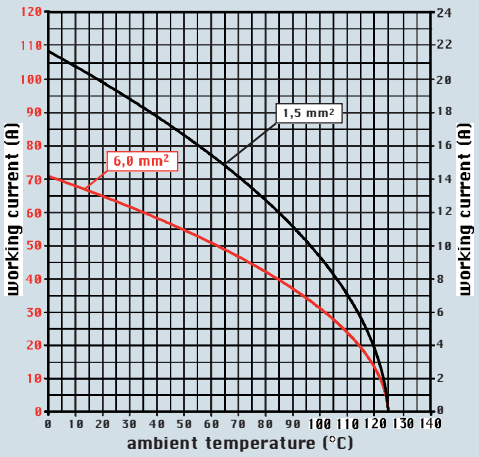


diagram CX 4/2 poles

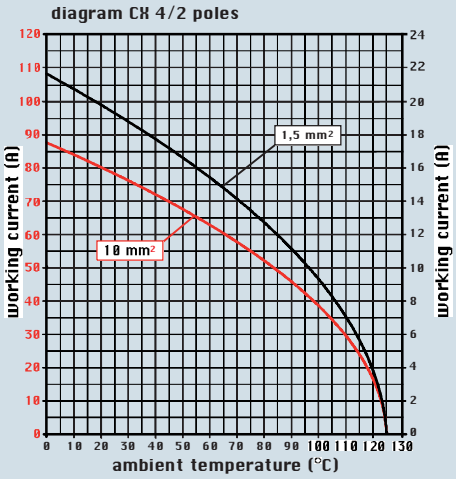
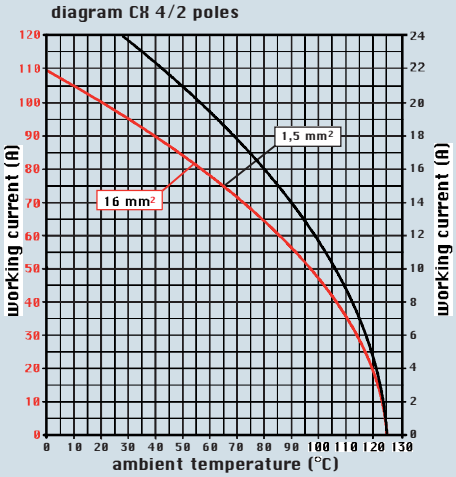


diagram CX 4/2 poles



CX 4/8 series

curves

diagram CX 4/8 poles

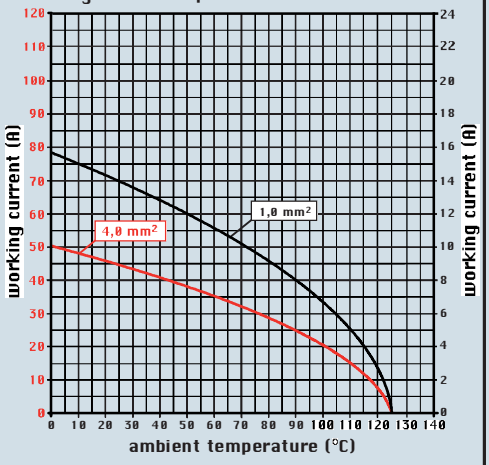


diagram CX 4/8 poles

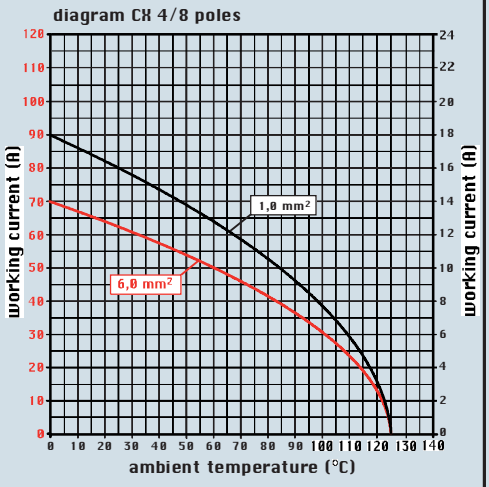
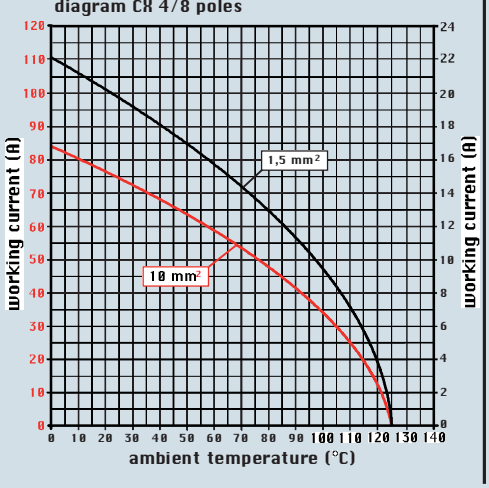


diagram CX 4/8 poles



CX 4/8 series
MIXO (CX 01, CX 02) series

curves

diagram CX 4/8 poles

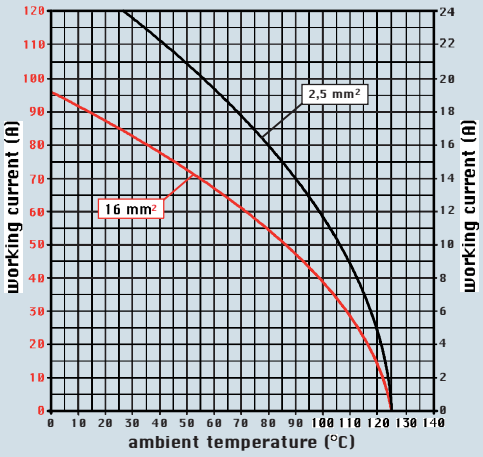


diagram CX 01 Y - 1 pole (MIXO 200A)

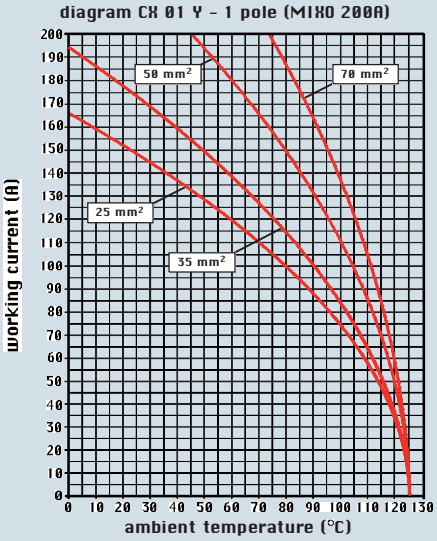
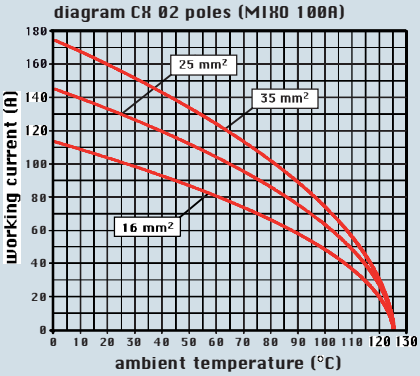


diagram CX 02 poles (MIXO 100A)



load curves

series MIXO (CX 02 4A/B, CX 03, CX 03 4B, CX 3/4)

curves

diagram CX 02 4A/B poles

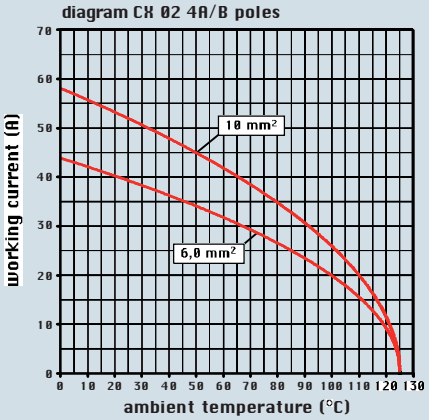


diagram CX 03 poles

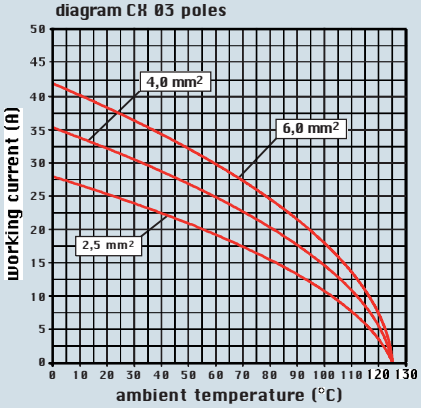


diagram CX 03 4B poles

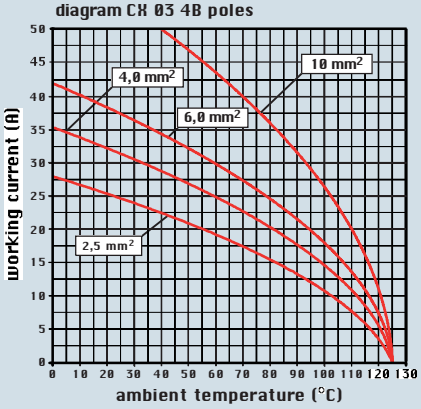
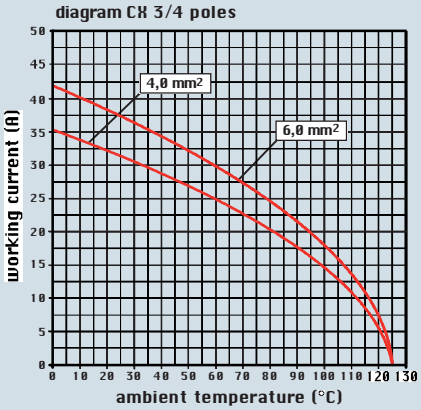


diagram CX 3/4 poles



series MIXO (CX 04, CX 05, CX 06, CX 08)

curves

diagram CX 04 poles

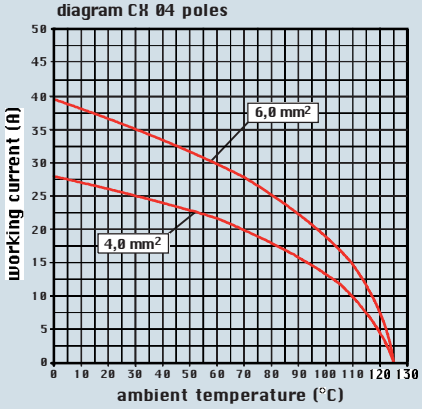


diagram CX 05 poles

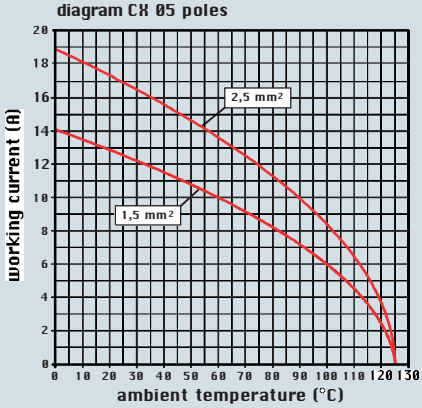


diagram CX 06 poles

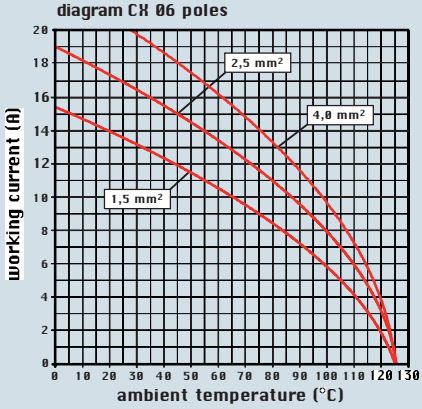
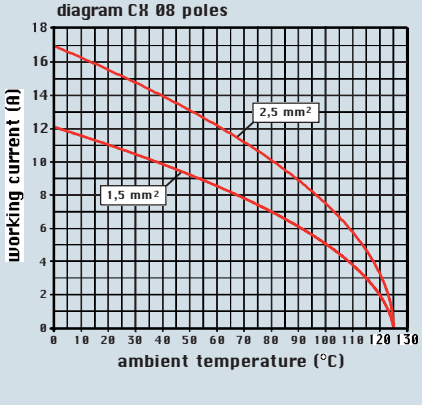


diagram CX 08 poles



series MIXO (CX 12, CX 17, CX 20, CX 25)

curves

diagram CX 12 poles

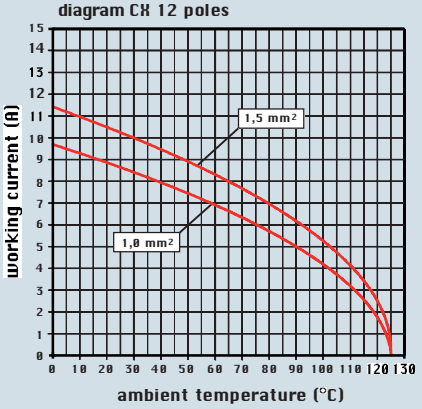


diagram CX 17 poles

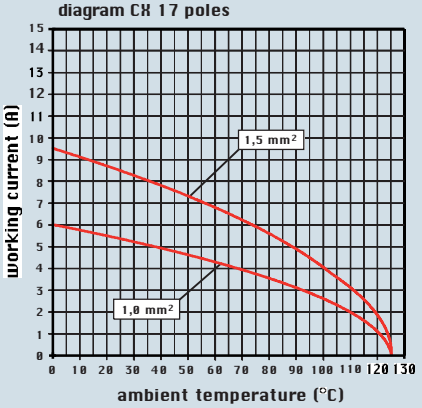


diagram CX 20 poles

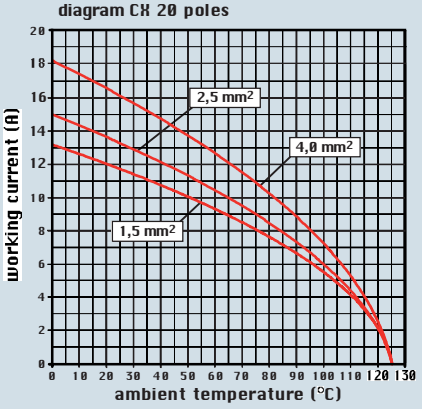
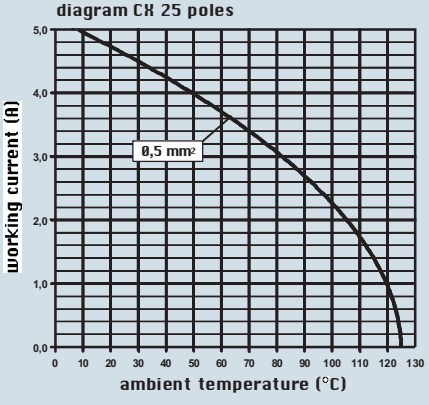
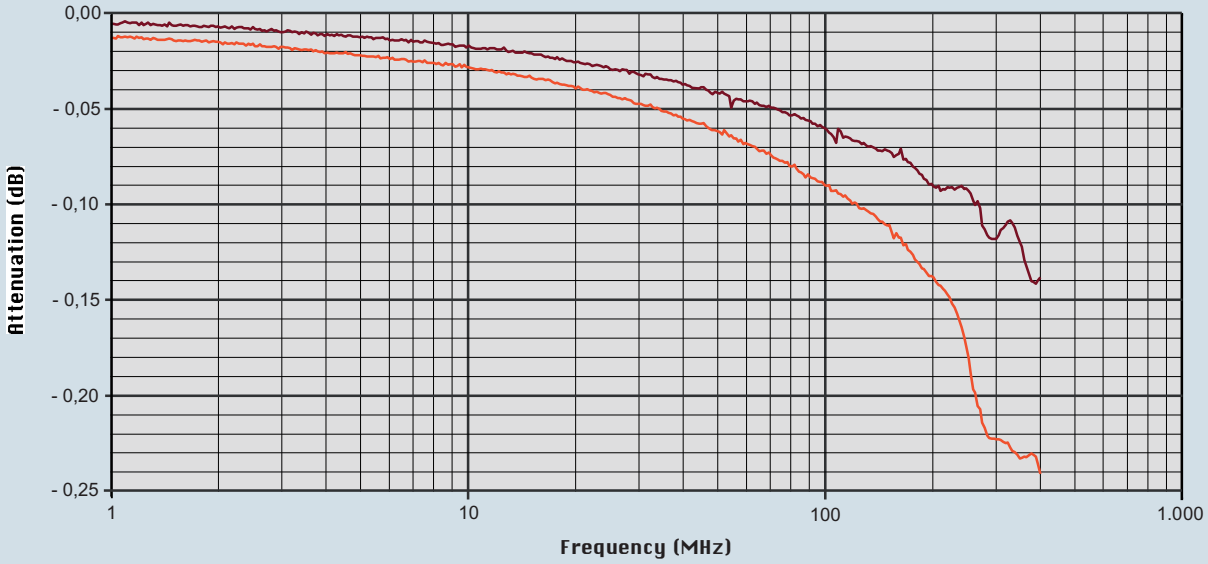


diagram CX 25 poles



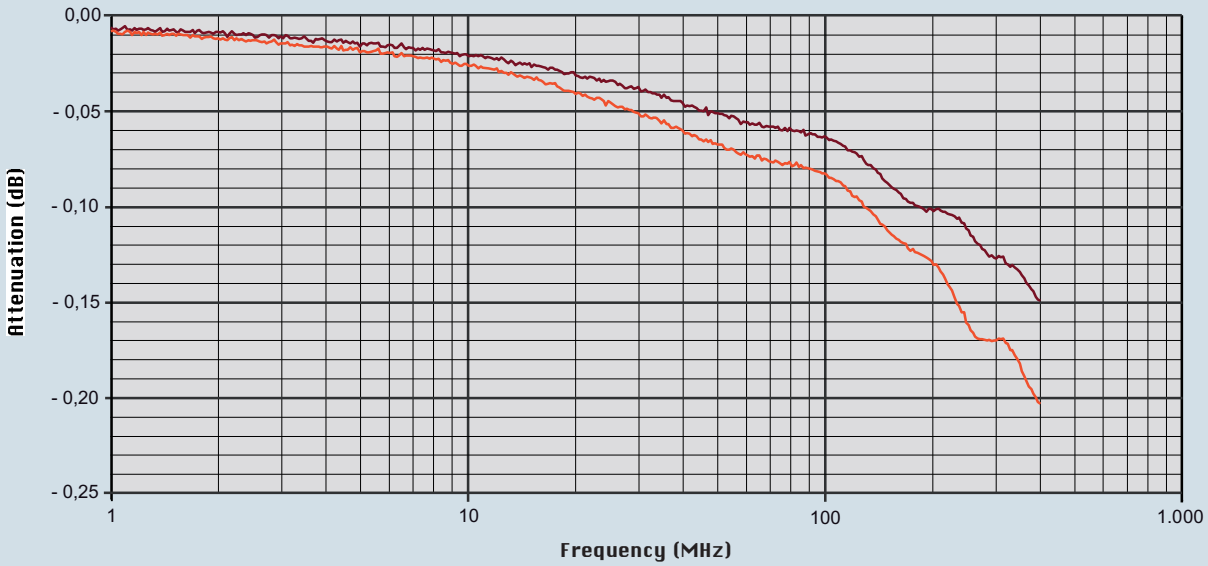
Test performed in accordance with IEC/EN 60512-25-2 (2002), 4.1.3.2 (coaxial cable only) and 4.2.2.2 (coaxial cable and connector)

Attenuation (insertion loss)
50 ohm coaxial connector (CX 01 BCF / BCM)



— RG 213/U cable and CX 01 BC connector (50 ohm)
— RG 213/U cable (50 ohm)

Attenuation (insertion loss)
75 ohm coaxial connector (CX 01 BF / BM)



— RG 11 A/U cable and CX 01 B connector (75 ohm)
— RG 11 A/U cable (75 ohm)