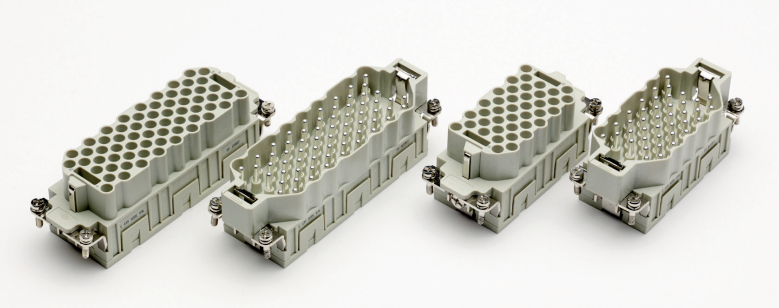
CQEE series

TECHNICAL FEATURES



Connector inserts series **CQEE** are the logical extension of the existing series CQE for removable crimp contacts series CC (16A max, available both in gold plated and in silver plated version) that include the CC…AN pin contacts with anticipated opening (first-to-break) and delayed closing (last-to-make).

Compared with the connector inserts of the same size of series CQE, connector inserts series **CQEE** provide a sensibly higher number of contacts: 64P + ⏚ instead of 46P + ⏚ for size 104.27 (+39%), 40P + ⏚ instead of 32P + ⏚ for size 77.27 (+25%).

With the same number of circuits, it is conversely possible to reduce the size of the connector inserts and of the related hood and housing, thus reducing the overall cost.

Connector inserts series **CQEE** may replace in the same size (77.27, 104.27) and with the same contact density (40P + ⏚ and 64P + ⏚) the corresponding inserts of series CD for removable crimp contacts series CD (10A max).

This may be particularly useful when, as a function of the intended use, it is required:

- to use the connector at a higher rated voltage: CQEE covers use at 500V / 6kV / 3 where CD stops at 250V / 4kV /3;
- to assign a larger current-carrying capacity, both due to the lower contact resistance (1 mΩ instead of 3 mΩ) and the larger wire size available for series CC compared with series CD contacts;
- to use wires with the larger cross-sectional area of 4 mm^2 / AWG 12, in order to contain the percent voltage drop [%] in circuits fed with extra-low voltage and with comparatively high currents, or in circuits of considerable length;
- to use crimp contacts with inherently higher mechanical robustness;
- to use anticipated pin contacts CC…AN (e.g. for the remote signal ling of the “OPEN” or “CLOSED” status of the connector).

CQEE series

TECHNICAL FEATURES

Inserts series		**CQEE**
No. of poles	main contacts + ⏚	**40 + ⏚, 64 + ⏚**
rated current [1)]		16A
EN 61984 pollution degree 3	rated voltage	500V
	rated impulse voltage	6kV
	pollution degree	3
EN 61984 pollution degree 2	rated voltage rated impulse voltage	830V 6kV
	pollution degree	2
UL/CSA certification	rated voltage AC/DC	600V
contact resistance		≤ 1 mΩ
insulation resistance		≥ 10 GΩ
ambient temperature limit (°C)	min	-40 °C
	max	+125 °C
degree of protection	with enclosures (according to version)	**IP65**, **IP66**/IP69, IP66/**IP67**/IP69, IP66/**IP68**/IP69 (according to type and model)
	without enclosures (in mated condition)	**IP20** (IPXXB)
conductor connections		crimp (only ⏚: screw)
conductor cross-section (CC contact series)	mm^2	0,14 4,0
	AWG	26 - 12
stripping length	mm	7,5
mechanical endurance (mating cycles)		≥ 500

[1)] Please check the inserts derating diagrams to establish the actual maximum operating current according to the ambient temperature, the conductor cross-sectional area, the polarity of the connector, and any external constraint that may derive e.g. by the continuous operating temperature sustained by the chosen conductor sheathing or by end-product safety standards fixing max allowed temperature rise on terminals (e.g. 30 K, 45 K or 50 K)

CQEE 40 poles + ⏚ 16A - 500V

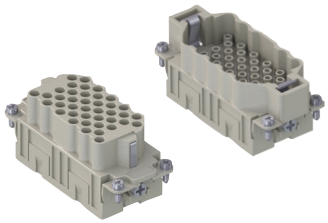
enclosures:
size "77.27"

	page:
C-TYPE IP65 or IP66/IP69	402 - 411
C7 IP67, two levers	439 - 440
V-TYPE IP65 or IP66/IP69, single lever	454 - 458
BIG hoods	470 - 471
T-TYPE IP65 insulating	484 - 485
T-TYPE / W IP66/IP69 insulating	491
HYGIENIC T-TYPE / H IP66/IP69	503
HYGIENIC T-TYPE / C IP66/IP69, -50 °C	508
W-TYPE for aggressive environments	523
E-Xtreme® corrosion proof 534 - 535, 544, 554 - 555	
EMC	580
Central lever	609 - 611
LS-TYPE	622 - 623
IP68	640 - 643

panel supports:

	page:
COB	652 - 653

inserts, crimp connections



16A crimp contacts
standard or for advanced opening
silver and gold plated

STANDARD

ADVANCED OPENING

description	part No.	part No.	part No.
without contacts (to be ordered separately)			
female inserts for female contacts	**CQEEF 40**		
male inserts for male contacts	**CQEEM 40**		
16A female contacts			
0,14-0,37 mm² AWG 26-22 one groove		**CCFA 0.3**	**CCFD 0.3**
0,5 mm² AWG 20 with no grooves		**CCFA 0.5**	**CCFD 0.5**
0,75 mm² AWG 18 one groove (back side)		**CCFA 0.7**	**CCFD 0.7**
1 mm² AWG 18 one groove		**CCFA 1.0**	**CCFD 1.0**
1,5 mm² AWG 16 two grooves		**CCFA 1.5**	**CCFD 1.5**
2,5 mm² AWG 14 three grooves		**CCFA 2.5**	**CCFD 2.5**
3 mm² AWG 12 one wide groove		**CCFA 3.0**	**CCFD 3.0**
4 mm² AWG 12 with no grooves		**CCFA 4.0**	**CCFD 4.0**
16A male contacts			
0,14-0,37 mm² AWG 26-22 one groove		**CCMA 0.3**	**CCMD 0.3**
0,5 mm² AWG 20 with no grooves		**CCMA 0.5**	**CCMD 0.5**
0,75 mm² AWG 18 one groove (back side)		**CCMA 0.7**	**CCMD 0.7**
1 mm² AWG 18 one groove		**CCMA 1.0**	**CCMD 1.0**
1,5 mm² AWG 16 two grooves		**CCMA 1.5**	**CCMD 1.5**
2,5 mm² AWG 14 three grooves		**CCMA 2.5**	**CCMD 2.5**
3 mm² AWG 12 one wide groove		**CCMA 3.0**	**CCMD 3.0**
4 mm² AWG 12 with no grooves		**CCMA 4.0**	**CCMD 4.0**
16A male crimp contacts for advanced opening			
0,5 mm² AWG 20 with no grooves		**CC 0.5 AN**	
0,75 mm² AWG 18 one groove (back side)		**CC 0.7 AN**	
1 mm² AWG 18 one groove		**CC 1.0 AN**	
1,5 mm² AWG 16 two grooves		**CC 1.5 AN**	
2,5 mm² AWG 14 three grooves		**CC 2.5 AN**	

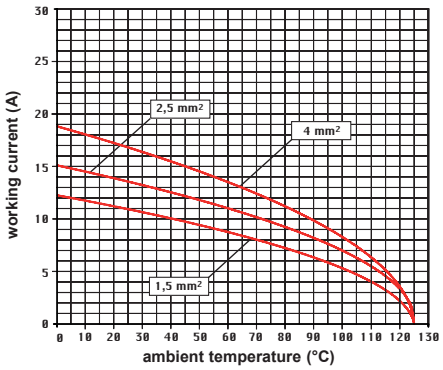
silver plated

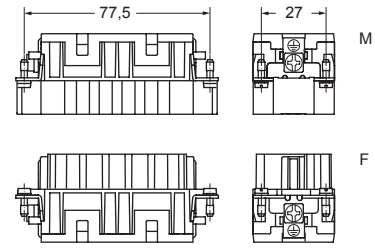
gold plated⁺

⁺ for basic or high thickness gold plating, please refer to page 675

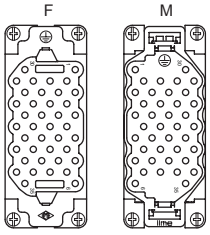
- characteristics according to EN 61984:
  16A 500V 6kV 3
- c UL us (UL for USA and Canada), SP CQC DNV BUREAU VERITAS EAC certified
- rated voltage according to UL/CSA: 600V
- insulation resistance: ≥ 10 GΩ
- ambient temperature limit: -40 °C ... +125 °C
- made of self-extinguishing thermoplastic resin UL 94V-0
- mechanical life: ≥ 500 cycles
- contact resistance: ≤ 1 mΩ
- for max. current load see the connector inserts derating diagram below; for more information see page 28

CQEE 40 poles connector inserts
Maximum current load derating diagram



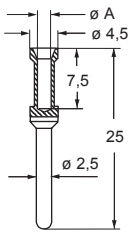


contacts side (front view)

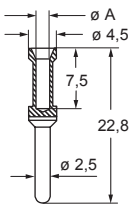


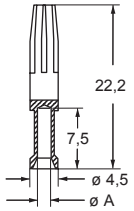
CR CPQ coding pins (page 689)

CCF and CCM



CC...AN





- **it is recommended to crimp the contacts with crimping tools homologated by ILME** (please see the crimping tool section 16A contacts, CCF, CCM and CC...AN series on pages 708 - 741)

CCF, CCM and CC..AN contacts

conductor section mm²	conductor slot ø A (mm)	conductors stripping length (mm)
0,14-0,37	0,9	7,5
0,5	1,1	7,5
0,75	1,3	7,5
1,0	1,45	7,5
1,5	1,8	7,5
2,5	2,2	7,5
3	2,55	7,5
4	2,85	7,5

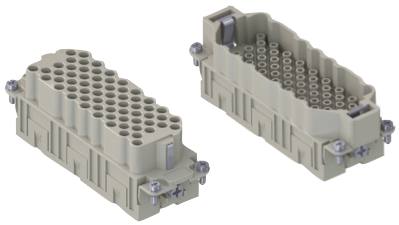
CQEE 64 poles + ⏚ 16A - 500V

enclosures:
size "104.27" **page:**

C-TYPE IP65 or IP66/IP69	412 - 423
C7 IP67, two levers	441 - 442
V-TYPE IP65 or IP66/IP69, single lever	459 - 463
BIG hoods	472 - 473
T-TYPE IP65 insulating	486 - 487
T-TYPE / W IP66/IP69 insulating	492
HYGIENIC T-TYPE / H IP66/IP69	504
HYGIENIC T-TYPE / C IP66/IP69, -50 °C	509
W-TYPE for aggressive environments	524
E-Xtreme® corrosion proof 536 - 537, 545, 556 - 557	
EMC	581
Central lever	612 - 614
LS-TYPE	624 - 625
IP68	644 - 647

panel supports: **page:**
COB **652 - 653**

inserts, crimp connections



16A crimp contacts
standard or for advanced opening
silver and gold plated

STANDARD

ADVANCED OPENING

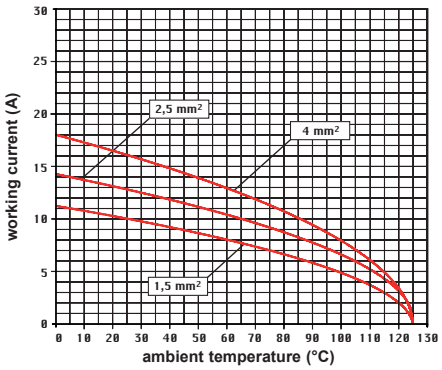
CQEE

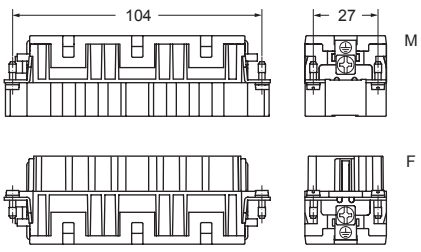
description			part No.	part No. silver plated	part No. gold plated+
without contacts (to be ordered separately)					
female inserts for female contacts			**CQEEF 64**		
male inserts for male contacts			**CQEEM 64**		
16A female contacts					
0,14-0,37 mm²	AWG 26-22	one groove		**CCFA 0.3**	**CCFD 0.3**
0,5 mm²	AWG 20	with no grooves		**CCFA 0.5**	**CCFD 0.5**
0,75 mm²	AWG 18	one groove (back side)		**CCFA 0.7**	**CCFD 0.7**
1 mm²	AWG 18	one groove		**CCFA 1.0**	**CCFD 1.0**
1,5 mm²	AWG 16	two grooves		**CCFA 1.5**	**CCFD 1.5**
2,5 mm²	AWG 14	three grooves		**CCFA 2.5**	**CCFD 2.5**
3 mm²	AWG 12	one wide groove		**CCFA 3.0**	**CCFD 3.0**
4 mm²	AWG 12	with no grooves		**CCFA 4.0**	**CCFD 4.0**
16A male contacts					
0,14-0,37 mm²	AWG 26-22	one groove		**CCMA 0.3**	**CCMD 0.3**
0,5 mm²	AWG 20	with no grooves		**CCMA 0.5**	**CCMD 0.5**
0,75 mm²	AWG 18	one groove (back side)		**CCMA 0.7**	**CCMD 0.7**
1 mm²	AWG 18	one groove		**CCMA 1.0**	**CCMD 1.0**
1,5 mm²	AWG 16	two grooves		**CCMA 1.5**	**CCMD 1.5**
2,5 mm²	AWG 14	three grooves		**CCMA 2.5**	**CCMD 2.5**
3 mm²	AWG 12	one wide groove		**CCMA 3.0**	**CCMD 3.0**
4 mm²	AWG 12	with no grooves		**CCMA 4.0**	**CCMD 4.0**
16A male crimp contacts for advanced opening					
0,5 mm²	AWG 20	with no grooves		**CC 0.5 AN**	
0,75 mm²	AWG 18	one groove (back side)		**CC 0.7 AN**	
1 mm²	AWG 18	one groove		**CC 1.0 AN**	
1,5 mm²	AWG 16	two grooves		**CC 1.5 AN**	
2,5 mm²	AWG 14	three grooves		**CC 2.5 AN**	

+ for basic or high thickness gold plating, please refer to page 675

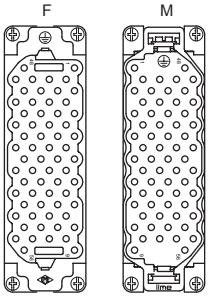
- characteristics according to EN 61984:
  16A 500V 6kV 3
- c UL us (UL for USA and Canada), CSA CQC DNV BUREAU VERITAS EAC certified
- rated voltage according to UL/CSA: 600V
- insulation resistance: ≥ 10 GΩ
- ambient temperature limit: -40 °C ... +125 °C
- made of self-extinguishing thermoplastic resin UL 94V-0
- mechanical life: ≥ 500 cycles
- contact resistance: ≤ 1 mΩ
- for max. current load see the connector inserts derating diagram below; for more information see page 28

CQEE 64 poles connector inserts
Maximum current load derating diagram



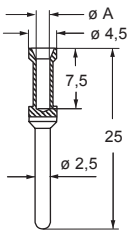


contacts side (front view)

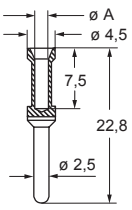


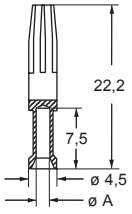
CR CPQ coding pins (page 689)

CCF and CCM



CC...AN





- **it is recommended to crimp the contacts with crimping tools homologated by ILME** (please see the crimping tool section 16A contacts, CCF, CCM and CC...AN series on pages 708 - 741)

CCF, CCM and CC..AN contacts

conductor section mm²	conductor slot ø A (mm)	conductors stripping length (mm)
0,14-0,37	0,9	7,5
0,5	1,1	7,5
0,75	1,3	7,5
1,0	1,45	7,5
1,5	1,8	7,5
2,5	2,2	7,5
3	2,55	7,5
4	2,85	7,5

RECOMMENDED TIGHTENING TORQUE

- insert terminal screws, including PE terminal and fixing screws
- axial screw insert, MIXO series CX 02 4A / CX 02 4B
- enclosures assembly screws

Insert terminal screws, including PE terminal and fixing screws

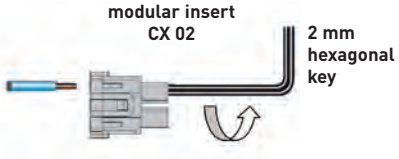
Increasing the tightening torque of terminal screws does not considerably improve the contact resistance. The screw torques are selected according to standard EN 60999-1, to provide excellent mechanical, thermal and electric behaviour. The conductor or terminal may be damaged if the recommended values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

Screw size	Connector type	Recommended tightening torque		Recommended size of screwdriver
		(Nm)	(lb.in)	
	LINE TERMINALS			
M2,5	CT 40, 64	0,4	3,5	0,5 x 3
M2,6	CT 06..24	0,4	3,5	0,5 x 3
M3	CK	0,5	4,4	0,5 x 3
M3	CDA	0,5	4,4	Ph0 or 0,6 x 3,5
M3	CNE, CME	0,5	4,4	Ph0 or 0,8 x 4
M3	CX 4/2, CX 4/8 (16A)	0,5	4,4	0,6 x 3,5
M3	CX 4/8 Q (16A)	0,5	4,4	Ph0
M4	CP	1,2	10,6	Ph1 or 0,8 x 4
M6	CX 4/.. (80A)	2,5	22,1	1,0 x 5,5
	PE TERMINAL			
M3	CK, CQ 05, CQ 07, CQ 12	0,5	4,4	0,5x3
M4	all series except CD 15, CD 25, CDA, CDC, CSAH, MIXO	1,2	10,6	Ph2 or 1,0 x 5,5
M3,5	series CD 15, CD 25, CDA, CDC, CSAH	0,8	7,1	Ph1 or 0,8 x 5,5
M3	small PE terminal, MIXO frames series	0,5	4,4	Ph1 or 1,0 x 4,5
M4	large PE terminal, MIXO frames series	1,2	10,6	Ph1 or 1,0 x 5,5
M4	PE terminal, MIXO ONE enclosures	1,2	10,6	Ph1 or 1,0 x 5,5
	FASTENING SCREWS			
M3	CK, CKS, CKSH, CD 07, CD 08, CQ 05, CQ 07, CQ 12, CQ 21, CQ4 02 /02 H, CQ4 03, CX 1/2 BD	0,5	4,4	Ph1 or 0,8 x 5,5
M3	screw for fastening inserts to enclosures of all series except T-TYPE, CQ-MQ 08 and MIXO ONE	0,8	7,1	Ph1 or 0,8 x 4
Ø 2,9	screws for fastening "32.13" inserts CQ 04/2, CQ 08, CQ 17 to CQ-MQ 08 enclosures	0,7	6,2	Ph1
M3	screw for fastening inserts to T-TYPE enclosures	0,5	4,4	Ph1 or 0,8 x 4
Ø 2,9	series MIXO ONE enclosures, assembly of top and bottom parts	0,8	7,1	Ph1
M4	CYR 16.3, CYR 24.4 cable pass-through hoods, assembly of two halves	1,2	10,6	Ph2 or 1,0 x 5,5
M4	CYG 16 in-line joint, assembly of two halves and mounting of two bulkhead mounting housings size "77.27"	1,2	10,6	Ph2 or 1,0 x 5,5
M5	series BIG enclosures, assembly of top and bottom parts	1,0	8,8	Ph2

Axial screw insert, MIXO series CX 02 4A / CX 02 4B

The connections of the conductors to the female and male inserts are made via axial screw. Fully insert the stripped wire in the back of the contact (axial screw terminals are supplied fully opened); while holding the wire down, insert a 2 mm hexagonal key in the front of the contact and tighten to recommended torque. After assembling the complete connector periodically check that the contact is screwed tight by re-applying the proper tightening torque.

— Usable conductor cross-sections (EN 60228 Class 5):
  from 2,5 to 8 mm^2 (14 AWG to 10 AWG) (CX 02 4AF/M)
  from 6 to 10 mm^2 (10 AWG to 8 AWG) (CX 02 4BF/M)
  (extra-flexible EN 60228 class 6: 2,5... 6 mm^2 (14 AWG to 10 AWG)
— Use only stranded flexible copper conductors
— Do not twist the strands!
— Tightening torque with 2 mm hexagonal Allen key:
  1,5 Nm (13,3 lb.in) max for conductors with section 2,5 ... 4 mm^2 (14 AWG to 12 AWG)
  2 Nm (17,7 lb.in) max for conductors with section 6 ... 10 mm^2 (10 AWG to 8 AWG)
— Stripping length: 8^{+1} mm



Enclosures assembly screws

In the table below, the recommended minimum and maximum tightening torque to apply to the fixing screws of ILME bulkhead mounting housings are shown, assuming the use of steel screws with 8.8 resistance class and a good fixing panel surface according to the requirements mentioned therein.

Series	Number of screws	Screw size	Recommended torque		Flange sealing element
			(Nm)	(lb.in)	
CK/MK, CKX, CKA/MKA, CQ	2	M3	0,8 – 1,0	7,1 – 8,9	Gasket
MIXO ONE	4	M3	0,5 – 0,9	4,4 - 8,0	Gasket
CZI 15 /25	4	M3	0,8 – 1,0	7,1 – 8,9	Gasket
CHI 50	4	M4	1,2 – 1,8	10,6 – 15,9	Gasket
CHI 06 /10 /16 /24	4	M4	0,8 – 1,2	7,1 – 10,6	Gasket
CHI 32	4	M4	1,2 – 1,8	10,6 – 15,9	Gasket
CHI 48	4	M6	3,0 – 3,6	26,6 – 31,9	Gasket
CGK/MGK (IP68)	2	M4	0,8 – 1,2	7,1 – 10,6	O-ring
CGI/ MGI 06/ 10/ 16/ 24 (IP68)	2	M6	3,0 – 3,6	26,6 – 31,9	O-ring
T-TYPE, T-TYPE/H, T-TYPE/C, T-TYPE/ W	4	M4	0,8 – 1,2	7,1 – 10,6	Gasket

To guarantee the declared IP degree of protection of the housings reported in this catalogue, according to EN IEC 60529 or to the relevant Type rating per ANSI/UL 50 and 50E (for those products bearing approval to those ratings), the surface of the mounting panel must meet the following requirements (definitions are provided in ISO 4287 standard):

– Waviness Wt ≤ 0,2 mm over a distance of 200 mm (measured on the panel without load)

– Roughness Ra ≤ 16 µm

NOTE: The values of tightening torque indicated in the above table are just recommended values, that must be related – by the designer of the final application – to the resistance class of the screws (not included in the delivery), with the assumption that the mounting panel is sufficiently rigid (stiff). If the deflection of the panel, under the effect of tightening the screws, is greater than 0,7 mm over a distance of 100 mm, it is necessary to use the counter-flanges mentioned in our catalogue or the special flange gaskets available upon request (please contact our Sales Department). For the CGI/MGI IP68 enclosures the specific counter-flanges mentioned in our catalogue are always recommended.

Enclosures locking screws

Series	Number of screws	Screw size	Recommended tightening torque		Recommended size of screwdriver
			(Nm)	(lb.in)	
CGK/MGK	2	M4	1,2	10,6	1,0 x 5,5 or 7 mm hexagonal key
CG/MG	2	M6	2,5	22,1	1,6 x 10 or 10 mm hexagonal key

RANGE OF CONDUCTOR CROSS-SECTIONAL AREA AND STRIPPING LENGTH

Connector inserts connection technique	Range of conductor cross-sectional area		Stripping length
Screw	**(mm^2)**	**AWG**	**(mm)**
CK	0,75 – 2,5	18 – 14	6
CX 4/2, CX 4/8 (poles 16A) [1]	0,75 – 4	18 – 12	7
	0,75 – 2,5	18 – 14	7
CNE [1]	0,5 – 4	20 – 12	7
CNE..X	0,25 – 2,5	24 – 14	7
CDA [1]	0,5 – 4	20 – 12	7
CDA..X	0,25 – 2,5	24 – 14	7
CT 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]	0,75 – 6	18 – 10	10,5
CX 4/.. (80A poles)	4 – 16	12 – 5	14
Crimp			
MIXO (5A), CX 25 IB	0,08 – 0,75	28 – 18	4
CQ 21	0,08 – 0,5	28 – 20	4
CDD, CD, MIXO (10A), CQ 12, CQ 07	0,14 – [2,5]*	26 – 14	8 – *[6 for 2,5 mm^2]
CCE, CDC, CMCE, CQ, CQE, CQEE, MIXO (16A)	0,14 – 4	26 – 12	7,5
CX, MIXO (40A), CQ4 03	1,5 – 2,5	16 – 14	9
	4 – 6	12 – 10	9.6
MIXO (70A)	10 – 25	7 – 4	15
MIXO (100A), CX 6/6	10 – 35	7 - 2	15
MIXO (200A)	16 – 70	6 - 2/0	15
Spring			
CSE, CSH, CTSE 06..24, CMSH, MIXO [CX 05 S [2], CX 05 SH], CSS	0,14 – 2,5	26 – 14	9 - 11
CTS 40/64	0,14 – 2,5 unprepared 0,14 – 1 prepared	26 – 14 unprepared 26 – 18 prepared	9 - 11
CKS, CKSH, CDS, CDSH, CSAH	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 cross-section to the lower size (e.g. 4 mm^2 unprepared - 2,5 mm^2 prepared).

[2] Available upon request.

LOAD CURVES

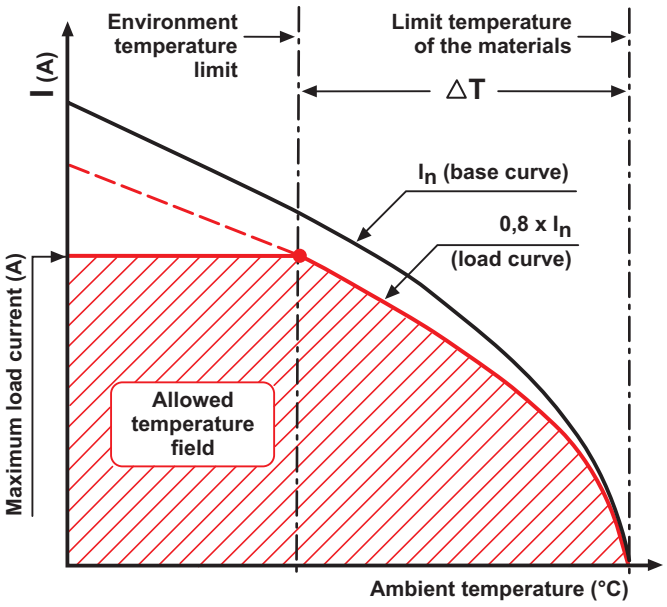
The permitted current carrying capacity for connectors is variable: it becomes lower with the increase of the number of poles and of the ambient temperature in which the connector is installed and it depends upon the thermal properties of the material used for the contacts and the insulating parts including 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 in this catalogue include the correction. See figure below.



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.

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 ΔT (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.