ODU MAC LC

Modular Attachable Connector System

HVS
PRECONISATEUR DE SOLUTIONS DEPUIS 1985

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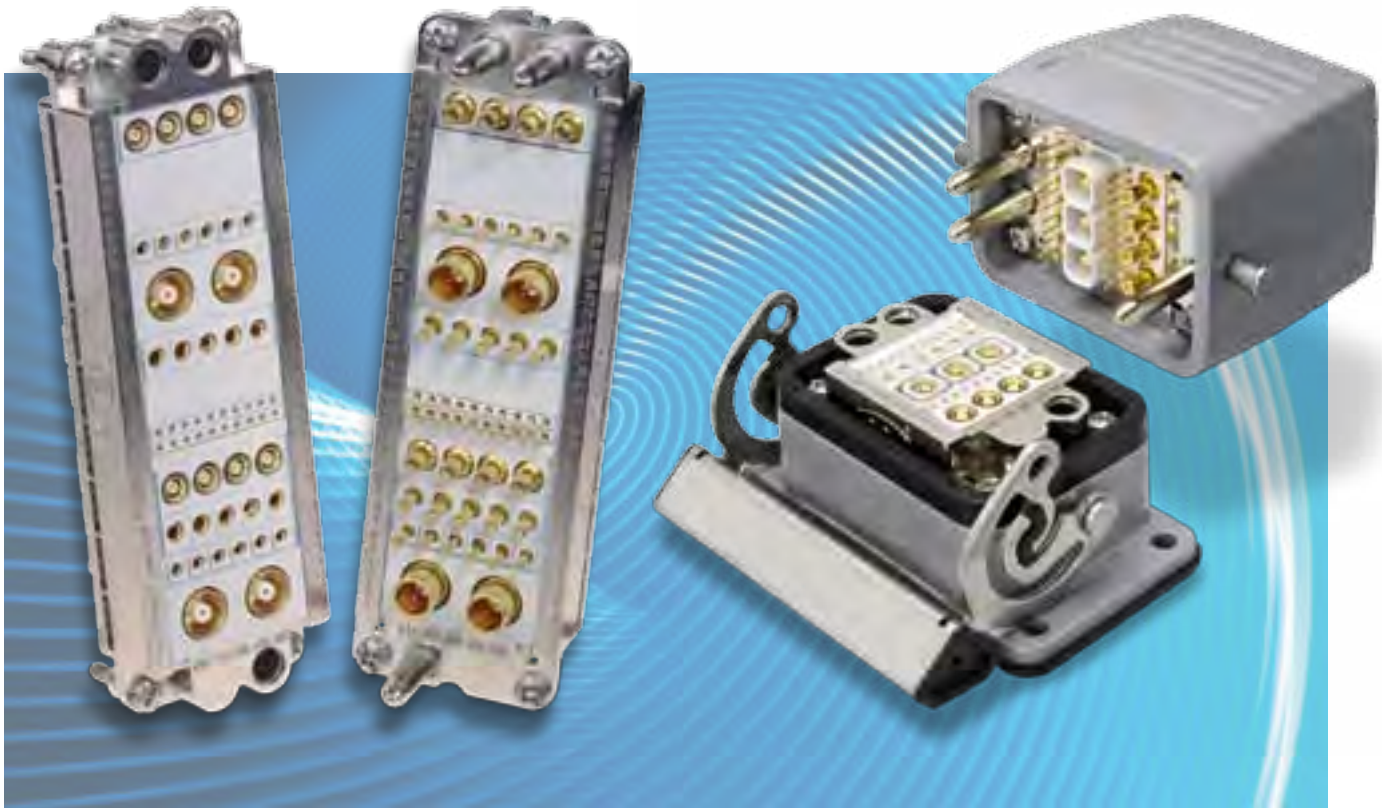
Modular Attachable Connector System



Applications:

– Engineering
– Measurement and testing
– Medical electronics
– Industry

Features:

– Economical solution
– More than 5,000 mating cycles
– Easy assembly
– Robust
– Modular stackable

The latest version of this catalogue is also posted on our website.

www.odu.de

www.odu-usa.com

www.odu-china.com

All shown connectors are according to DIN EN 61984 : 2009 connectors without breaking capacity (COC).

All dimensions in mm.
Most of the pictures are illustrations.
All data and specifications subject to change without notice.

Table of Contents

Order Information

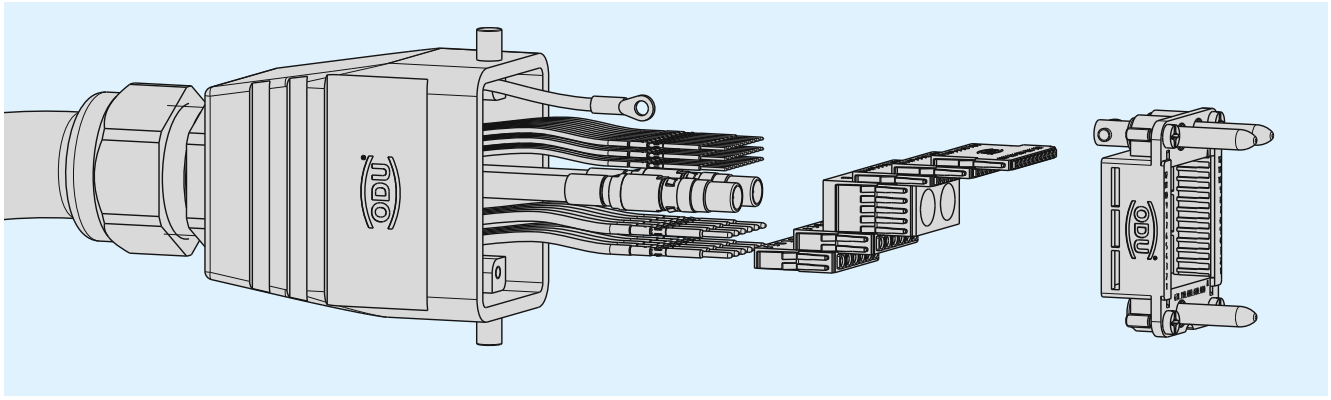
A complete ODU MAC LC connector consists of a frame, a housing, modules, contacts and optionally of spacer modules.

How to find the right part numbers:

– Choose needed frame- or housing size (page 27)

– Choose all needed modules and contacts (page 9)

Oder example:
Socket part, Size 1, ODU MAC LC in DIN housing with signal and coax contacts.



Pin part

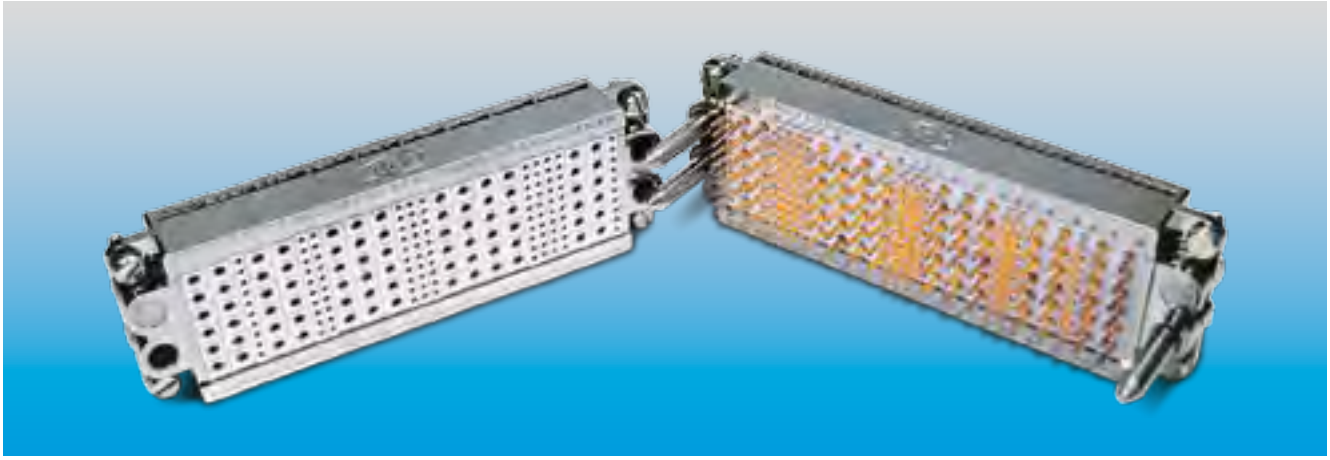
Description	Quantity	Part number
DIN housing – cable hood	1	490.214.450.644.102
Frames for DIN housing	1	631.190.000.600.000
Modul 10 pos.	3	631.110.110.923.000
Pin contacts for 10 pos. modul	30	185.423.000.270.000
Modul 6 pos.	2	631.111.106.923.000
Pin contacts for 6 pos. modul	12	185.424.000.270.000
Modul 75 Ω coax	1	631.120.102.923.000
Pin contacts for 75 Ω coax modul	2	122.131.003.270.000
Cable gland	1	027.825.090.170.007

Socket part

Description	Quantity	Part number
DIN housing – cable mount base	1	490.130.400.644.000
Frames for DIN housing	1	630.190.000.600.000
Modul 10 pos.	3	631.110.110.923.000
Socket contacts for 10 pos. modul	30	175.581.000.270.000
Modul 6 pos.	2	631.111.106.923.000
Socket contacts for 6 pos. modul	12	175.535.000.270.000
Modul 75 Ω coax	1	631.120.102.923.000
Socket contacts for 75 Ω coax modul	2	122.131.004.270.000

Product Description

Important Issues at a Glance

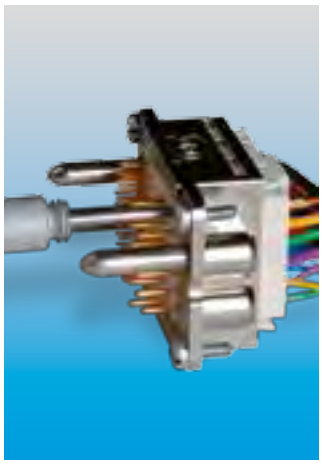


ODU MAC LC is a modular rectangular connector comprising a stable frame, various modules and, if needed, a DIN housing.
The various modules can be strung together in any way – customers receive the connector for their specific application.
Thanks to the modular construction, many individual connectors can be combined in one ODU MAC LC.

The ODU MAC LC has been designed particularly for use as a service and interface connector. Example uses of this new connector are found in machine construction, metrology, medical technology, etc.

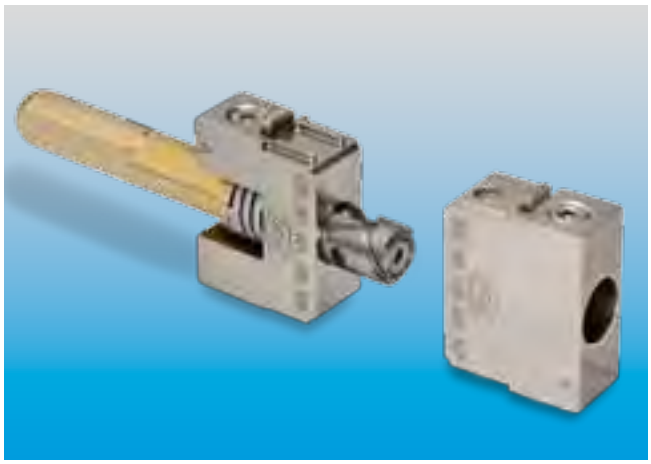
In machine construction, an internal interface connector is often operated only a few times, and so the ODU MAC LC, with its standard contact technology, is the most economical alternative here.

The ODU MAC LC uses the most economical and proven ODU contact technology with turned/slotted contacts, and it offers up to 5,000 mating cycles. The economic aspect is reinforced by the simple processing of the contacts and modules. The most user-friendly assembly and removal, even when built-in, distinguish the ODU MAC LC as a service connector.



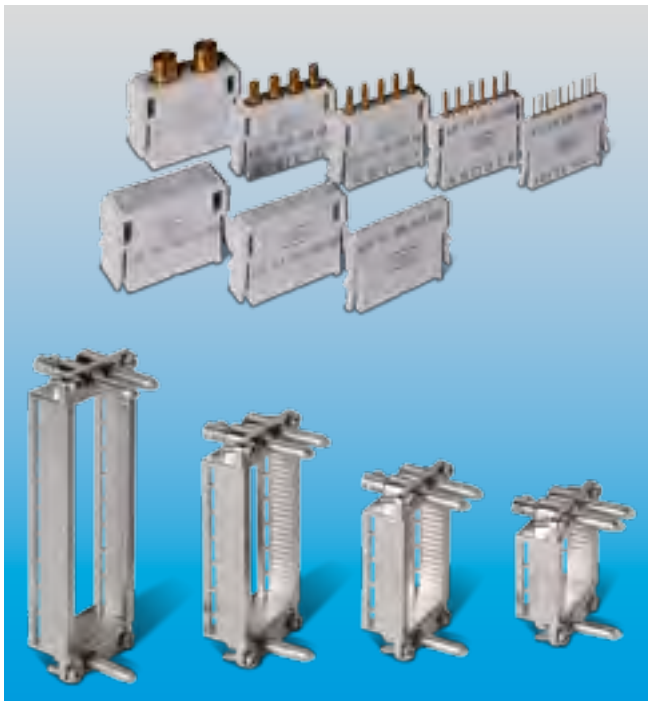
Economical

– Easy assembly because of crimp contacts which clip into the insulation body
– Quick, tool-less assembly and disassembly of the modules
– Disassembly of the contacts from plug side



Robust

– Centering, guiding and grounding with pin-socket-guiding
– Different housings with spindle- and lever locking available



Flexible

– 4 frame sizes (12, 18, 26, 37 units)
– Range of contact inserts for signals, power and high frequency are available

Powerful

– ≥ 5,000 mating cycles
– Up to 370 contacts in one connector
– Proven ODU contact technology (turned, slotted contacts)

Everything from one Source – ODU the System Supplier

Every connection also needs its cable. Make no compromises here when it comes to the quality of the complete connection system. ODU gives you the complete system solution from one source, with no intermediary suppliers.

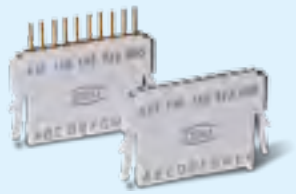
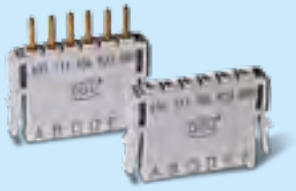
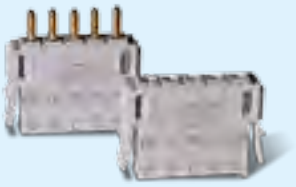
Cable assembly is a very complex subject. It requires equal measures of expertise in the areas of connectors, cables and assembly. ODU meets all these requirements in full.

Benefits for the customer:

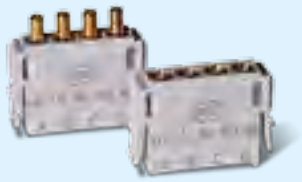
- ODU handles the **complete processing**, from procuring the cable to procuring connectors from other companies, and assembly up to individual extrusion or potting
- **No one knows our products better then we** – no one knows how our products have to be processed better then we do
- **Close cooperation and experience** with well-known cable manufacturers
- Assembly of all **standard lines**, as well as special lines such as **hybrid cable**
- Assembly of **overmolded cable** crossovers
- **100 % inspection** – systems can be used at the customer without testing
- Various **potting options** for water-tight or vacuum-tight system
- **UL approval** (File: E333666) for cable assembly
- **Production in cleanroom** acc. EN ISO 14644-1 possible
- Production acc. **medical certification** ISO 13485 : 2003 + AC : 2007 possible
- **State-of-the-art production facilities** in Mühldorf (Germany), Shanghai (China), Camarillo (USA) and Sibiu (Romania).

Modules

Overview Modules

Modules	Positions	Units width	Current information	Page
	10 pos.	1 Unit (2.4 mm)	Reference voltage: [1] 250 V Rated surge voltage: [1] 2,500 V Degree of pollution: [1] 2 Rated current: [2] 7 A	12
	6 pos.	2 Units (4.8 mm)	Reference voltage: [1] 400 V Rated surge voltage: [1] 2,500 V Degree of pollution: [1] 2 Rated current: [2] 15 A	13
	5 pos.	3 Units (7.2 mm)	Reference voltage: [1] 630 V Rated surge voltage: [1] 2,500 V Degree of pollution: [1] 2 Rated current: [2] 23 A	14
	3 pos. Power modul	4 Units (9.6 mm)	Reference voltage: [1] 2,500 V Rated surge voltage: [1] 10,000 V Degree of pollution: [1] 2 Rated current: [2] 35 A	15
	2 pos. High current contact	5 Units (12.0 mm)	Reference voltage: [1] 400 V / 160 V Rated surge voltage: [1] 4,000 V / 3,000 V Degree of pollution: [1] 2 / 3 Rated current: [2] max 74 A	16
	2 pos. 50 Ω coax	5 Units (12.0 mm)	Frequency range: 1.8 GHz	17

[1] acc. to VDE
[2] per single contact with biggest cross-section

Modules	Positions	Units width	Current information	Page
	4 pos. 50 Ω coax	3 Units (7.2 mm)	Frequency range: 3.3 GHz	18
	2 pos. 75 Ω coax	5 Units (12.0 mm)	Frequency range: 2.2 GHz	19
	1 pos. RJ 45	7 Units (16.8 mm)	10 Gigabit Ethernet acc. to IEEE 802.3 an-2006 category 6A acc. to ANSI/TIA IEIA-568-32-10	20
	2 pos. Compressed air	5 Units (12.0 mm)	Valid operating pressure max. 10 bar	21
	PCB modules 5, 6, 10 pos.	10 pos. 1 Unit (2.4 mm) 6 pos. 2 Units (4.8 mm) 5 pos. 3 Units (7.2 mm)		22
	Spacer modules	1 Unit (2.4 mm) 3 Units (7.2 mm) 5 Units (12 mm)		24

Module 10 positions

1 unit = 2.4 mm

Technical information

Contact diameter	0.7 mm
Operating temperature	–40° C to +125° C
Total mating force (average)	8 N
Total demating force (average)	6 N
Mating cycles	≥ 5,000
Rated current and resistance	see table

Voltage information

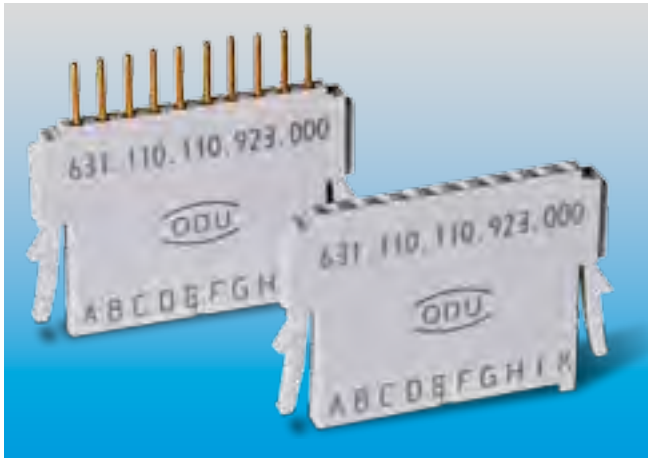
acc. VDE [1)]		
Reference voltage	250 V	50 V
Rated surge voltage	2,500 V	2,500 V
Degree of pollution	2	3

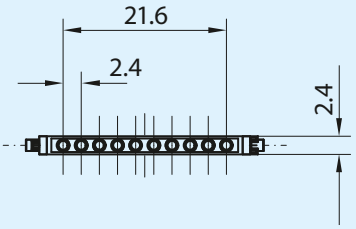
Materials

Insulation body	PBT unreinforced, V0 acc. UL-94
Contact	Cu-Alloy, gold plated

Current load only for single contacts.
For multiple contacts derate acc. to VDE.

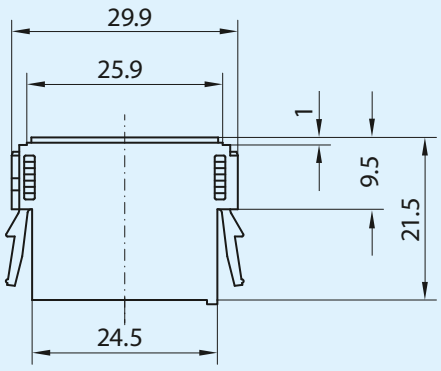
[1] See from page 48.





Tools

Crimp tong	080.000.051.000.000
Positioner	080.000.051.101.000
Removal tool	087.7CC.070.002.000



	Part number	Wire cross-section mm²	Termination AWG	Max. current A	Contact resistance average mΩ
Insulation body	631.110.110.923.000				
Pin contact	185.423.000.270.000	0.15 – 0.38	22 / 26	7.0	3.5
Pin contact short	185.431.000.270.000	0.15 – 0.38	22 / 26	7.0	3.5
Socket contact	175.581.000.270.000	0.15 – 0.38	22 / 26	7.0	3.5

Module 6 positions

2 units = 4.8 mm

Technical information

Contact diameter	1.3 mm
Operating temperature	–40° C to +125° C
Total mating force (average)	8.4 N
Total demating force (average)	7.2 N
Mating cycles	≥ 5,000
Rated current and resistance	see table

Voltage information

acc. VDE[1)]

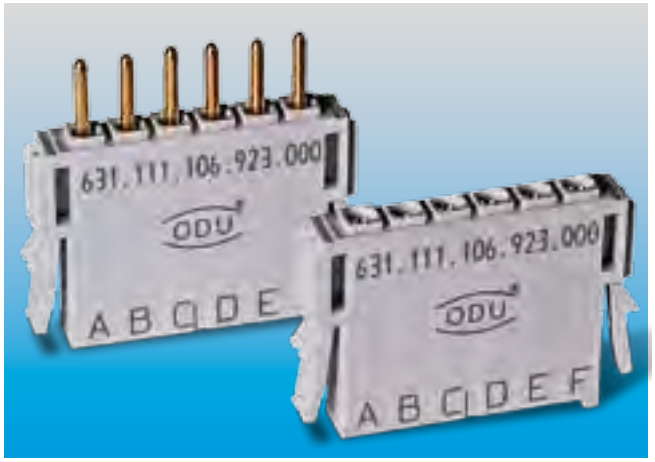
Reference voltage	400 V	160 V
Rated surge voltage	2,500 V	2,500 V
Degree of pollution	2	3

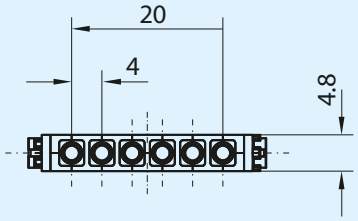
Materials

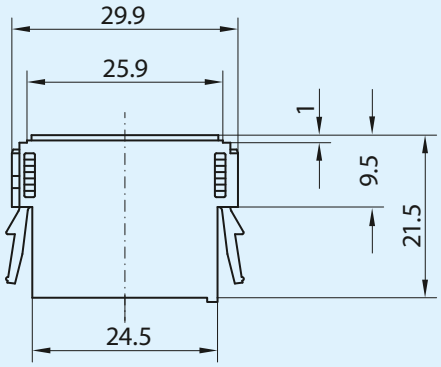
Insulation body	PBT unreinforced, V0 acc. UL-94
Contact	Cu-Alloy, gold plated

Current load only for single contacts.
For multiple contacts derate acc. to VDE.

[1] See from page 48.







Tools

Crimp tong	080.000.051.000.000
Positioner	080.000.051.101.000
Removal tool	087.7CC.130.004.000

	Part number	Wire cross-section mm²	Termination AWG	Max. current A	Contact resistance average mΩ
Insulation body	631.111.106.923.000				
Pin contact	185.424.000.270.000	0.5 – 1.0	18 / 20	15.0	1.8
Pin contact short	185.432.000.270.000	0.5 – 1.0	18 / 20	15.0	1.8
Socket contact	175.535.000.270.000	0.5 – 1.0	18 / 20	15.0	1.8

Module 5 positions

3 units = 7.2 mm

Technical information

Contact diameter	2 mm
Operating temperature	– 40° C to +125° C
Total mating force (average)	15 N
Total demating force (average)	11.5 N
Mating cycles	≥ 5,000
Rated current and resistance	see table

Voltage information

acc. VDE [1)]

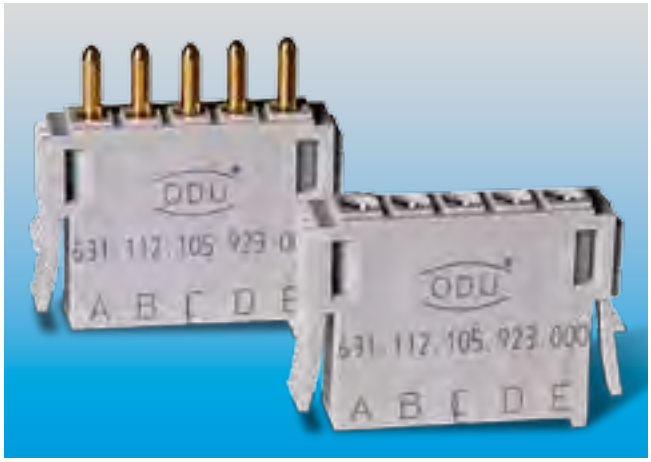
Reference voltage	630 V	250 V
Rated surge voltage	2,500 V	2,500 V
Degree of pollution	2	3

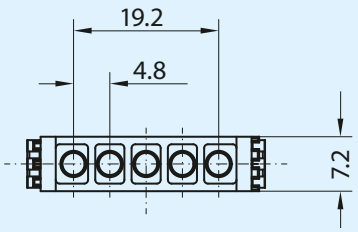
Materials

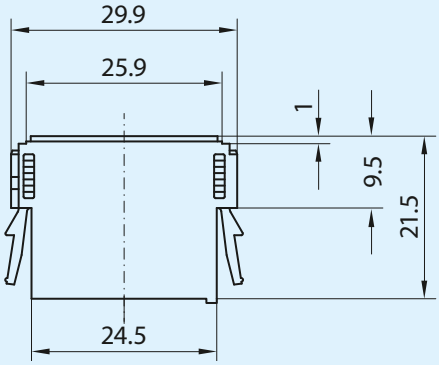
Insulation body	PBT unreinforced, V0 acc. UL-94
Contact	Cu-Alloy, gold plated

Current load only for single contacts.
For multiple contacts derate acc. to VDE.

[1] See from page 48.







Tools

Crimp tong	080.000.051.000.000
Positioner	080.000.051.101.000
Removal tool	087.7CC.200.003.000

	Part number	Wire cross-section mm²	Termination AWG	Max. current A	Contact resistance average mΩ
Insulation body	631.112.105.923.000				
Pin contact	185.440.000.270.000	1.5 – 2.5	14 / 16	23.0	1.0
Pin contact short	185.441.000.270.000	1.5 – 2.5	14 / 16	23.0	1.0
Socket contact	175.570.000.270.000	1.5 – 2.5	14 / 16	23.0	1.0
Pin contact	185.436.000.270.000	1.0 – 1.5	16 / 18	22.0	1.0
Pin contact short	185.437.000.270.000	1.0 – 1.5	16 / 18	22.0	1.0
Socket contact	175.567.000.270.000	1.0 – 1.5	16 / 18	22.0	1.0

Power Module 3 positions

4 units = 9.6 mm

Technical information

Contact diameter	3.5 mm
Operating temperature	–40° C to +125° C
Total mating force (average)	12 N
Total demating force (average)	10 N
Mating cycles	≥ 5,000
Rated current and resistance	see table

Voltage information

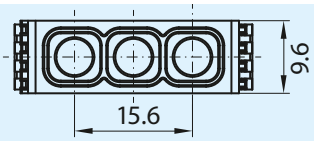
acc. VDE [1)]		
Reference voltage	2,500 V	1,000 V
Rated surge voltage	10,000 V	8,000 V
Degree of pollution	2	3

Materials

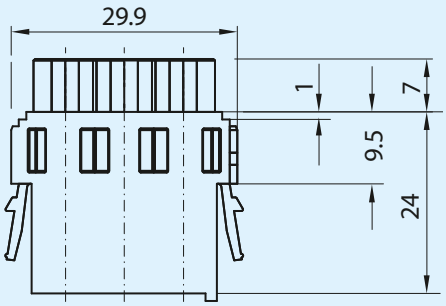
Insulation body	PBT unreinforced, V0 acc. UL-94
Contact	Cu-Alloy, gold plated

Current load only for single contacts.
For multiple contacts derate acc. to VDE.

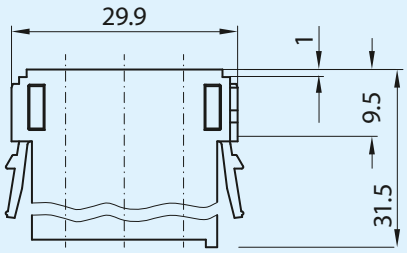
[1] See from page 48.



Pin part



Socket part



Tools

Crimp tong	080.000.057.000.000
Positioner	080.000.057.101.000
Removal tool	087.7CC.350.001.000

	Part number	Wire cross-section mm²	Termination AWG	Max. current A	Contact resistance average mΩ
Insulation body socket	630.113.103.923.000				
Insulation body pin	631.113.103.923.000				
Pin contact 2.5	185.462.000.270.000	1.5 – 2.5	14/16	26	0.4
Pin contact 2.5 short	185.463.000.270.000	1.5 – 2.5	14/16	26	0.4
Pin contact 4	185.460.000.270.000	4	12	30	0.4
Pin contact 4 short	185.461.000.270.000	4	12	30	0.4
Pin contact 6	185.442.000.270.000	6	10	35	0.4
Pin contact 6 short	185.443.000.270.000	6	10	35	0.4
Socket contact 2.5	177.060.000.270.000	1.5 – 2.5	14/16	26	0.4
Socket contact 4	177.059.000.270.000	4	12	30	0.4
Socket contact 6	177.058.000.270.000	6	10	35	0.4

Module 2 positions – High Current Contacts

5 Units = 12 mm

Technical information

Contact diameter	5 mm (ODU lamella contact)
Operating temperature	–40° C to +125° C
Total mating force (average)	34 N
Total demating force (average)	28 N
Mating cycles	≥ 5,000
Rated current and resistance	see table

Voltage information

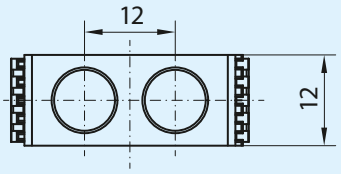
acc. VDE [1)]		
Reference voltage	400 V	160 V
Rated surge voltage	4,000 V	3,000 V
Degree of pollution	2	3

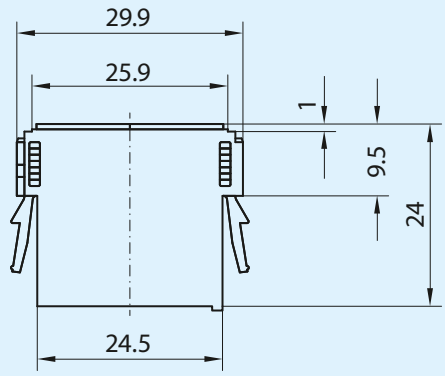
Materials

Insulation body	PBT unreinforced, V0 acc. UL-94
Contact	Cu-Alloy, silver plated

Current load only for single contacts.
For multiple contacts derate acc. to VDE.

[1] See from page 48.





Tools

Crimp tong	080.000.026.000.000
Crimp jaws 10 mm²	080.000.026.110.000
Crimp jaws 16 mm²	080.000.026.101.000
Removal tool	087.7CC.680.001.000

	Part number	Wire cross-section mm²	Max. current A	Contact resistance average mΩ
Insulation body	631.120.102.923.000			
Pin contact	185.484.000.201.000	10	57	0.2
Pin contact	185.485.000.201.000	16	74	0.2
Socket contact	178.879.100.201.000	10	57	0.2
Socket contact	178.880.100.201.000	16	74	0.2

Module 2 positions for Coax Contacts, 50 Ω

5 units = 12 mm

Technical information

Frequency range	1.8 GHz
Cable impedance	50 Ω
Insulation resistance	>100 GΩ
Operating temperature	–40°C to +125°C
Total mating force (average)	3.6 N
Total demating force (average)	3.4 N
Mating cycles	≥ 5,000

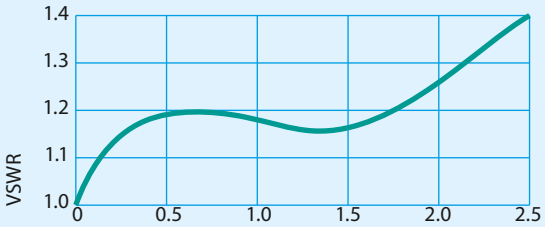
Voltage information nach MIL

Reference voltage	800 V
Test voltage	2,400 V

Materials

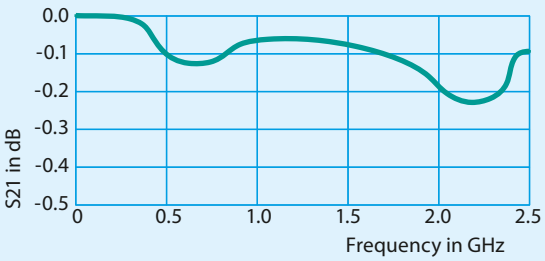
Insulation body	PBT unreinforced, PTFE
Contact	Cu-Alloy, gold plated

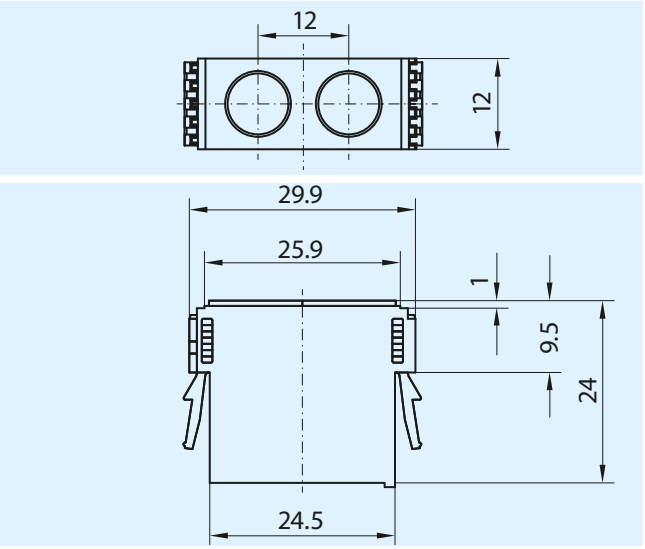
VSWR[*)]



*) voltage standing wave ratio

Insertion loss





Tools

Crimp tong – external conductor	080.000.039.000.000
Crimp tong – internal conductor	080.000.051.000.000
Positioner – internal conductor	080.000.051.102.000
Removal tool	087.7CC.690.001.000

	Part number	Cable impedance Ω	Cable	Crimp insert – external conductor
Insulation body	631.120.102.923.000			
Pin contact	122.132.001.270.000	50	RG 178, RG 196	080.000.039.101.000
Pin contact	122.132.003.270.000	50	RG 174, RG 188, RG 316	080.000.039.102.000
Pin contact	122.132.007.270.000	50	RG 58	080.000.039.106.000
Pin contact	122.132.013.270.000	50	RG 223	080.000.039.108.000
Socket contact	122.132.002.270.000	50	RG 178, RG 196	080.000.039.101.000
Socket contact	122.132.004.270.000	50	RG 174, RG 188, RG 316	080.000.039.102.000
Socket contact	122.132.008.270.000	50	RG 58	080.000.039.106.000
Socket contact	122.132.014.270.000	50	RG 223	080.000.039.108.000

Module 4 positions for Coax Contacts, 50 Ω

3 units = 7.2 mm

Technical information

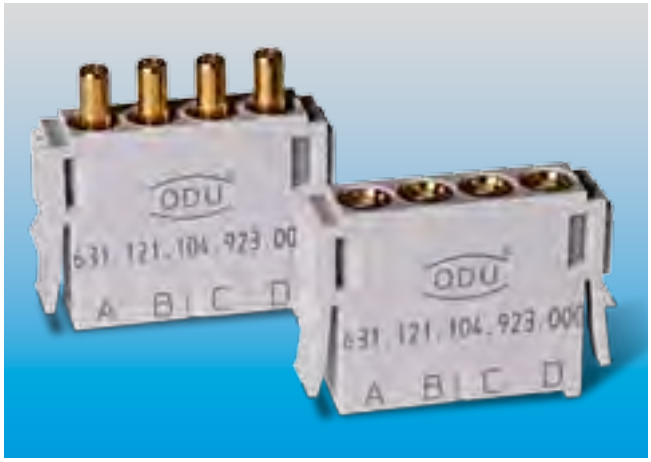
Frequency range	3.3 GHz
Insulation resistance	>100 GΩ
Operating temperature	–40° C to +125° C
Total mating force (average)	7.2 N
Total demating force (average)	6.8 N
Mating cycles	≥ 5,000

Voltage information acc. MIL

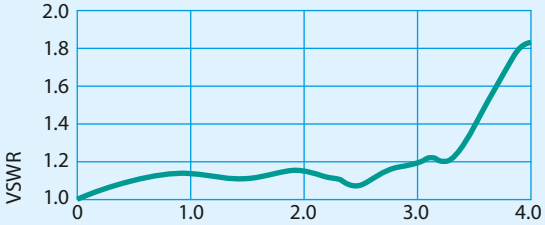
Reference voltage	525 V
Test voltage	1,575 V

Materials

Insulation body	PBT unreinforced, PTFE
Contact	Cu-Alloy, gold plated

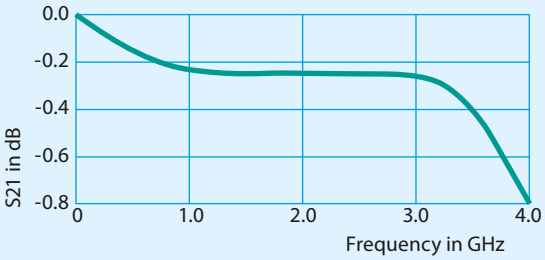


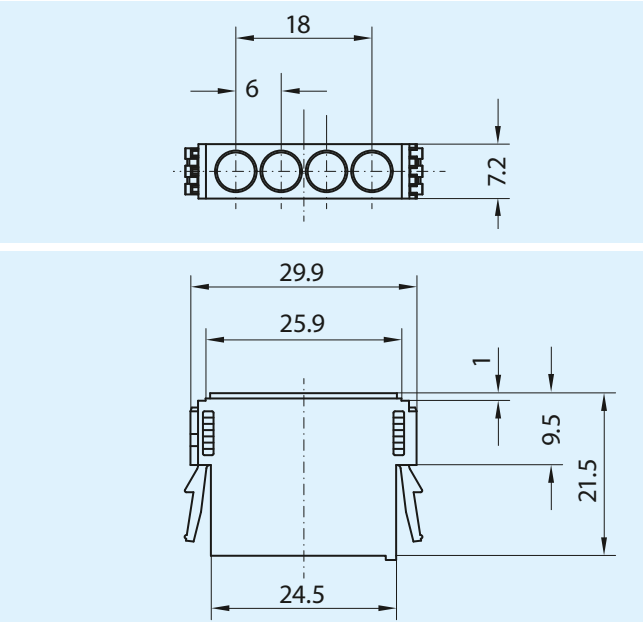
VSWR[*)]



*) voltage standing wave ratio

Insertion loss





Tools

Crimp tong – external conductor	080.000.039.000.000
Crimp tong – internal conductor	080.000.051.100.000
Positioner – internal conductor	080.000.051.102.000
Removal tool	087.7CC.310.001.000

	Part number	Cable impedance Ω	Cable	Crimp insert – external conductor
Insulation body	631.121.104.923.000			
Pin contact	122.133.001.270.000	50	RG 178, RG 196	082.000.039.101.000
Pin contact	122.133.003.270.000	50	RG 174, RG 188, RG 316	082.000.039.102.000
Socket contact	122.133.002.270.000	50	RG 178, RG 196	082.000.039.101.000
Socket contact	122.133.004.270.000	50	RG 174, RG 188, RG 316	082.000.039.102.000

Module 2 positions for Coax Contacts, 75 Ω

5 units = 12 mm

Technical information

Frequency range	2.2 GHz
Cable impedance	75 Ω
Insulation resistance	>100 GΩ
Operating temperature	– 40° C to +125° C
Total mating force (average)	3.6 N
Total demating force (average)	3.2 N
Mating cycles	≥ 5,000

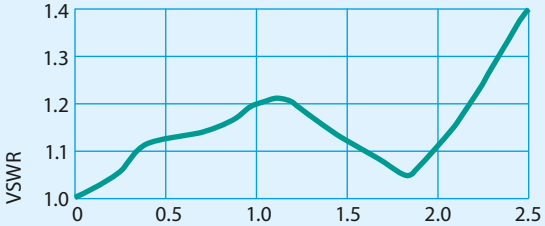
Voltage information acc. MIL

Reference voltage	930 V
Test voltage	2,790 V

Materials

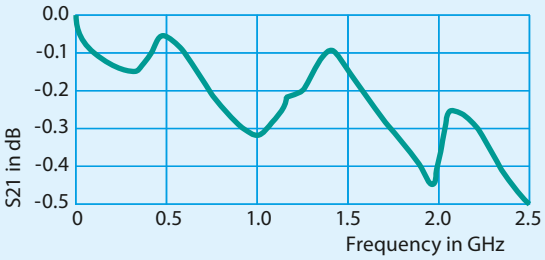
Insulation body	PBT unreinforced, PTFE
Contact	Cu-Alloy, gold plated

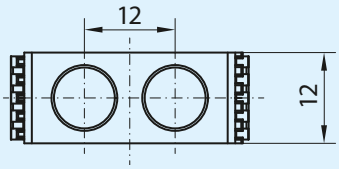
VSWR*)

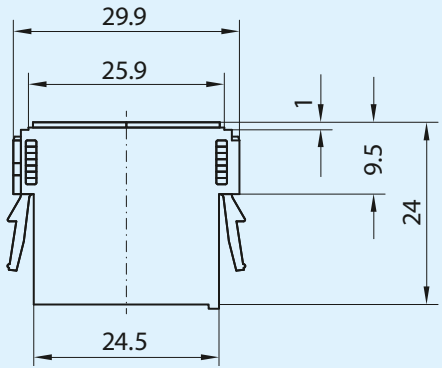


*) voltage standing wave ratio

Insertion loss







Tools

Crimp tong – external conductor	080.000.039.000.000
Crimp tong – internal conductor	080.000.051.100.000
Positioner – internal conductor	080.000.051.102.000
Removal tool	087.7CC.690.001.000

	Part number	Cable impedance Ω	Cable	Crimp insert – external conductor
Insulation body	631 120 102 923 000			
Pin contact	122 131 003 270 000	75	RG 179, RG 187	082 000 039 102 000
Pin contact	122 131 009 270 000	75	RG 59	082 000 039 109 000
Socket contact	122 131 004 270 000	75	RG 179, RG 187	082 000 039 102 000
Socket contact	122 131 010 270 000	75	RG 59	082 000 039 109 000

Module Data Transmission RJ 45

7 units = 16.8 mm

Technical information

Contact resistance	< 20 mΩ
Insulation resistance	< 500 MΩ
Mating cycles	≥ 5,000

Connectors' electric strength

Contact – contact	< 1,000 V, DC
Contact – shield	< 1,500 V, DC
Current load	1 A

Transfer impedance

with 1 MHz	< 100 mΩ
with 10 MHz	< 200 mΩ
with 80 MHz	< 1,600 mΩ

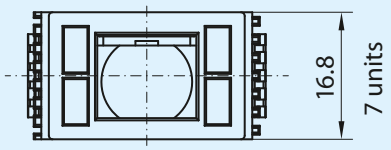
Materials

Insulation body	PBT
Inserts	
– Housing	Zinc diecasting
– Surface	CuSnZn
Screening shield	CuZnNi
Insulation body	PC
PBC	FR4
– Surface	chem. Sn
Contact spring	Spring steel
– Surface	Au
IDC contact	CuNi2Sn
– Surface	Sn

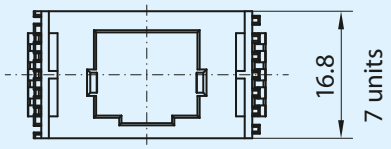
Technical transmission features

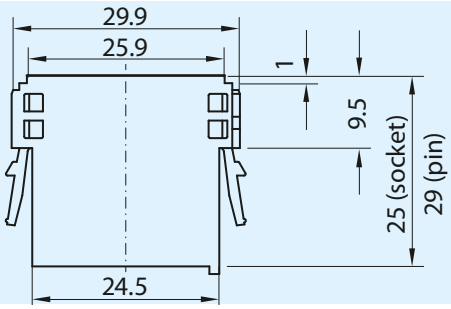
10 Gigabit Ethernet acc. to IEEE 802.3 an-2006
category 6A acc. to ANSI / TIA / EIA-568-B.2-10

Pin part



Socket part





	Part number	Application	Termination AWG
Insulation body socket	630.130.101.923.000		
Insulation body pin	631.130.101.923.000		
Coupling plug	923.000.005.000.145		RJ 45, 8 pos.
Socket insert	923.000.005.000.146	TIA A	22 – 26
Socket insert	923.000.005.000.147	TIA B	22 – 26
Socket insert	923.000.005.000.148	Profinet	22 – 26
Connector insert	923.000.005.000.149	TIAA / TIAB / Profinet	22 – 26

Module 2 positions for compressed Air

5 units = 12 mm

Technical information

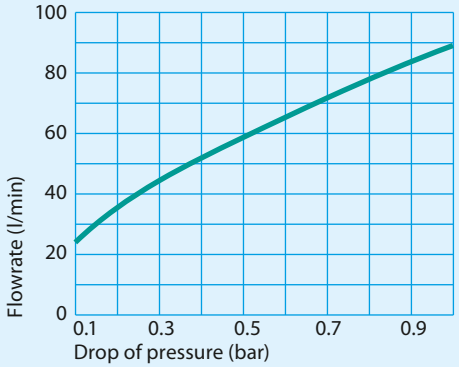
Operating force	10.4 N (2 × 5.2 N)
Mating cycles	≥ 5,000

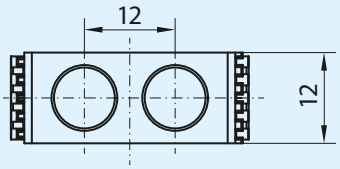
Pressure load

Valid operating pressure	max. 12 bar
Burst pressure	min. 100 bar

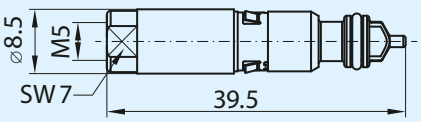
Materials

Insulation body	PBT
Contact	Cu-Alloy
Seal ring	NBR

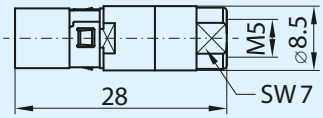


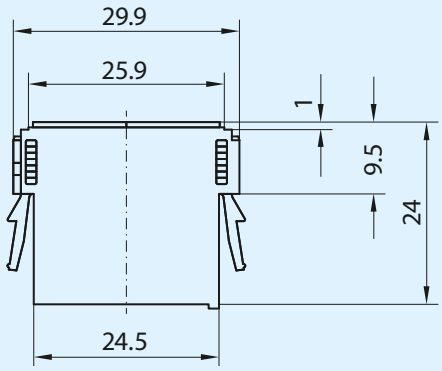


Plug sleeve



Coupling plug





	Part number
Socket insulation body 2 pos.	631.120.102.923.000
Plug sleeve (not shut off)	196.035.001.300.000
Coupling plug (shut off)	196.035.002.300.000
Coupling plug (not shut off)	196.035.003.300.000

Accessories

	Part number	Tube diameter in mm		
		Internal	External	
Plug nipple	945.000.001.000.123	2		
	945.000.001.000.136	3		
	945.000.001.000.137	4		
Threaded union	945.000.001.000.138		3	
	945.000.001.000.139		4	
	945.000.001.000.140		6	
L-threaded union	945.000.001.000.141		3	
	945.000.001.000.142		4	
	945.000.001.000.143		6	

PCB Modules

for easy assembly on PCBs

PCB modules are consisting of two modules.
Module for socket frame and module for PCB assembly.
Max. recommended modules: 10 pieces.

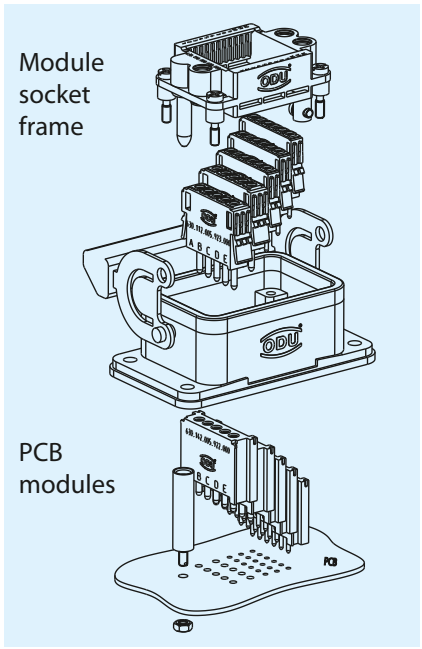
Technical information

	5 pos.		6 pos.		10 pos.
Contact diameter	2.0 mm		1.3 mm		0.7 mm
Total mating force (average)	15 N		8.4 N		8 N
Total demating force (average)	11.5 N		7.2 N		6 N
Voltage information					
acc. VDE [1)]					
Reference voltage	500 V	200 V	320 V	80 V	160 V
Rated surge voltage	2.5 kV	2.5 kV	2.5 kV	2.5 kV	2.5 kV
Degree of pollution	2	3	2	3	2
Operating temperature	–40° C to + 125° C				
Soldering temperatur	260° C for 30 s				
Mating cycles	≥ 5,000				
Current and resistance	see table				

Materials

Insulation body socket frame	PBT unreinforced V0 acc. UL-94 (grey)
Insulation body PCB module	PA (black), V0 acc. UL-94 glass-filled
Contact	Cu-Alloy, gold plated

[1] See page 46.



	Part number	Max. current A	Contact resistance average mΩ
Insulation body socket frame 5 pos.	630.112.005.923.000	23.0	1.0
Insulation body socket frame 6 pos.	630.111.006.923.000	15.0	1.8
Insulation body PCB module 5 pos.	630.142.005.922.000	23.0	1.0
Insulation body PCB module 6 pos.	630.141.006.922.000	15.0	1.8

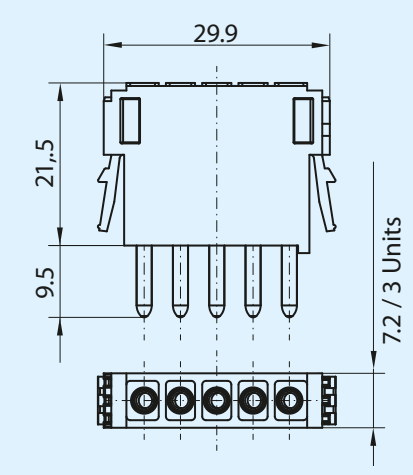
Modules fully assembled.
Modules for pin part see catalog page. 5 pos.: Page 14, 6 pos.: Page 13, 10 pos.: Page 12.

PCB Modules

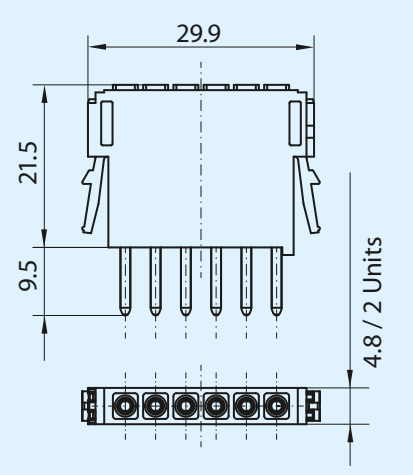
for easy assembly on PCBs

Module for socket frame – insulation body filled up

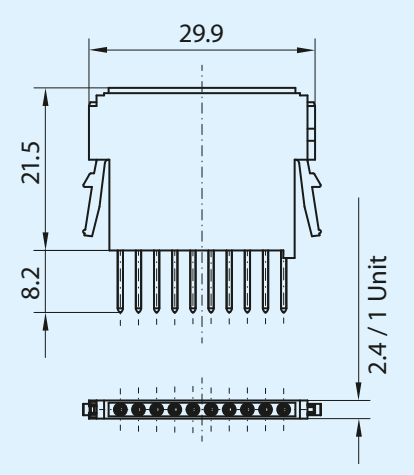
5 pos.



6 pos.

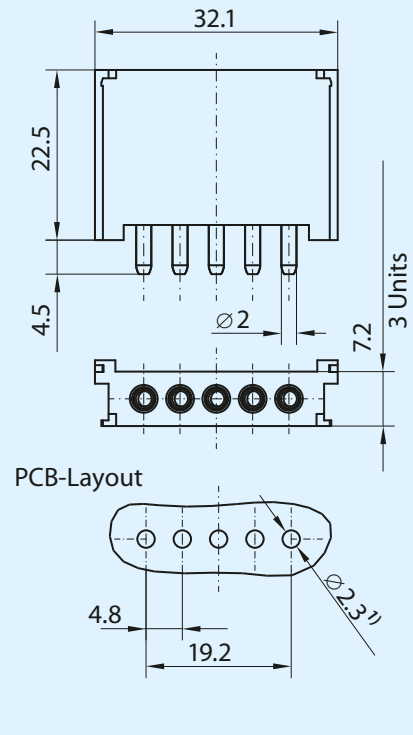


10 pos.

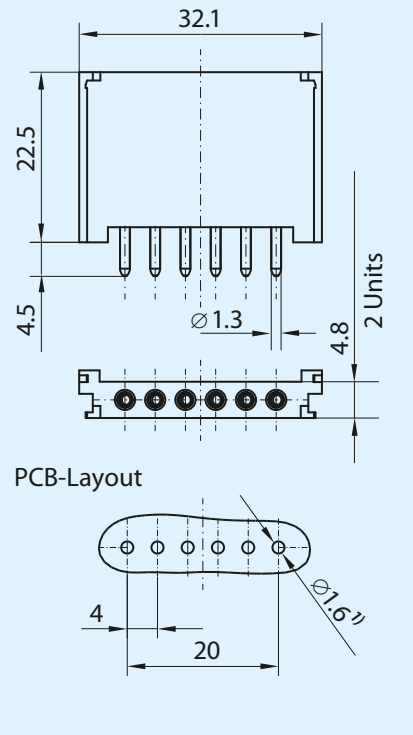


PCB module – insulation body filled up

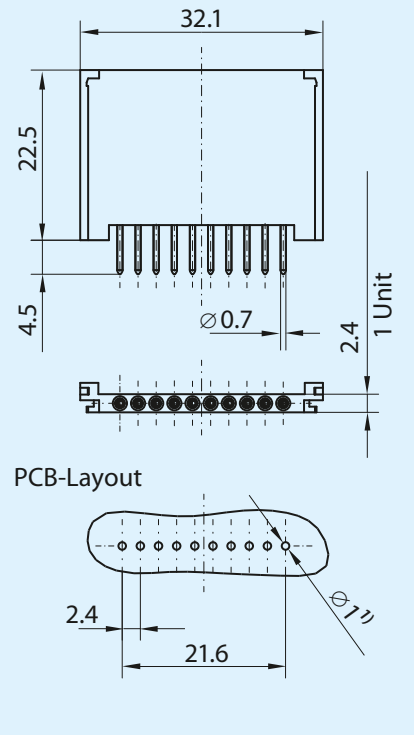
5 pos.



6 pos.



10 pos.

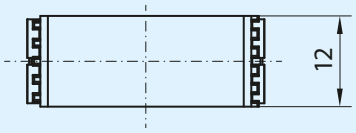


[1] Suggestion drill diameter.

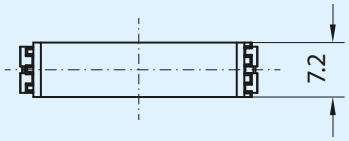
Spacer Modules

– For filling up not completely assembled frames
– All frames must be filled up completely with insulation bodies or spacer modules

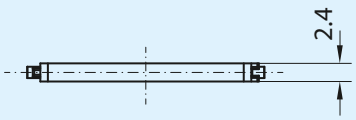
5 units

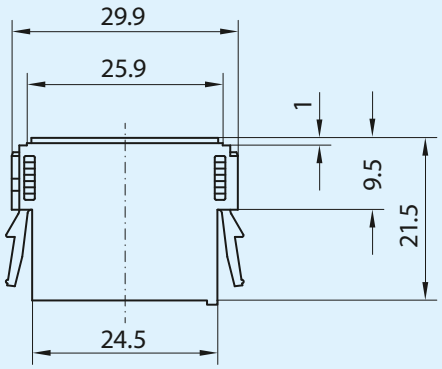


3 units



1 unit





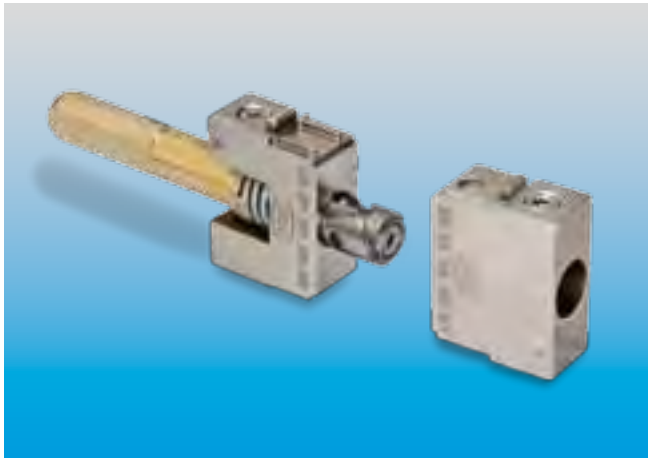
	Part number
Spacer module 1 unit	631.151.000.923.000
Spacer module 3 units	631.153.000.923.000
Spacer module 5 units	631.155.000.923.000

Locking Spindle

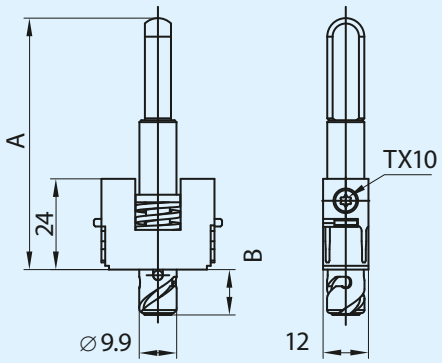
5 units = 12 mm

– Simple to use with one hand
– Force benefit by the insertion/connection
– Hangeable spindle screw

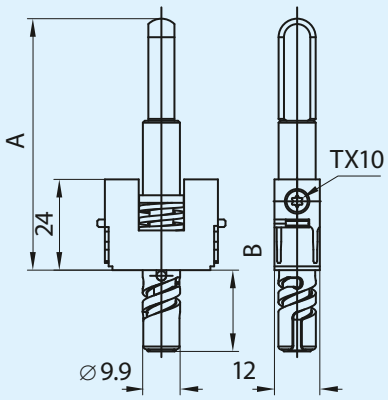
Mating cycles ≥ 5,000



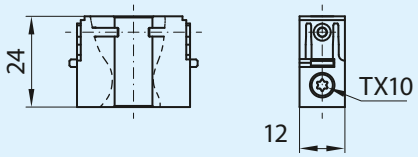
Spindle 12 mm



Spindle 21 mm



Center module



	Part number	For size	Angle of tilt	Dimension A	Dimension B
Locking spindle [1)]	635.091.003.200.000	2 (50 mm high)[3)]	180°	46.5	12.0
Locking spindle [1)]	635.091.001.200.000	2 (70 mm high)[3)]	180°	66.5	12.0
Locking spindle [1)]	635.092.021.200.003	3/4	360°	72.5	21.5
Center module [2)]	634.090.001.304.000	2/3/4	–	–	–

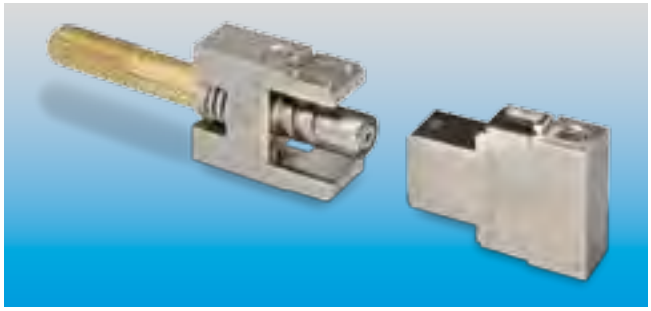
[1] for use in pin frame
[2] for use in socket frame
[3] see page 35, dim. A

Locking Spindle

5 units = 12 mm,
for socker part in cable hood and pin part in box-mounted base

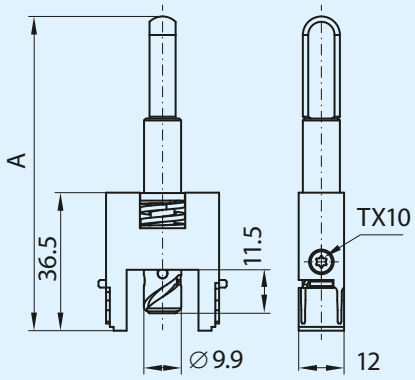
– Simple to use with one hand
– Force benefit by the insertion/connection
– Hangeable spindle screw

Mating cycles ≥ 5,000

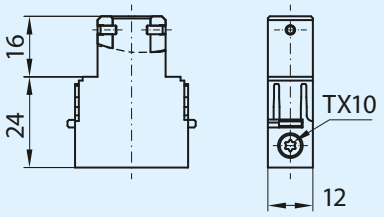


For housing size 2 we recommend locking spindle 11.5 mm inclusive 180° spindle worm.

Spindle 11.5 mm

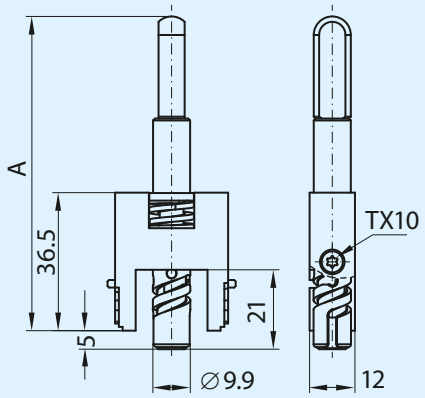


Center module



For housing size 3 and 4 we recommend locking spindle 21 mm inclusive 360° spindle worm.

Spindle 21 mm



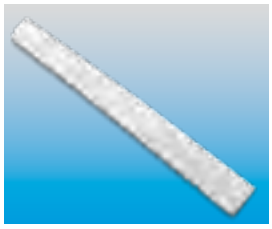
For size	Part number Spindle 11.5 mm	Part number Spindle 21 mm	Part number Center module	Dimension A
2 (height 50 mm)	635.091.004.200.000	635.091.024.200.003	634.090.002.304.000	63.5
2 (height 70 mm)	635.091.002.200.000	635.091.022.200.003		83
3	635.092.002.200.000	635.092.022.200.003		89
4	635.092.002.200.000	635.092.022.200.003		89

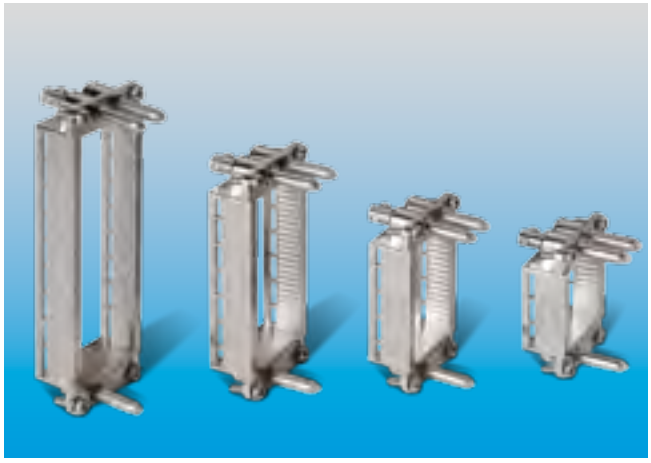
Frames and Housings

Frames

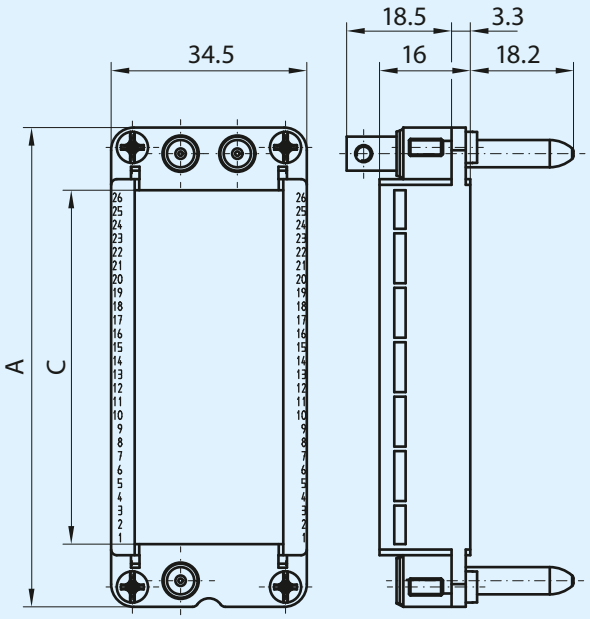
Material:
Zinc diecasting nickel-plated
1 unit = 2.4 mm

Included in delivery: Secondary locking

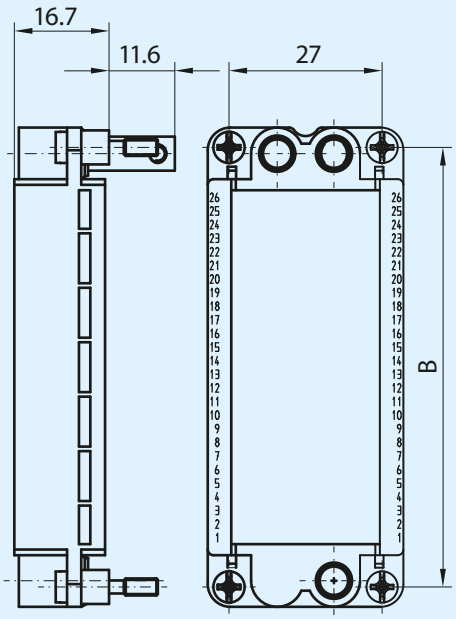




Pin frame



Socket frame



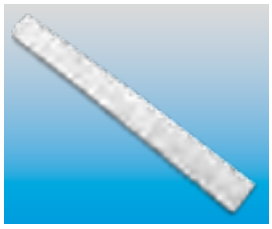
Size	Part number	Description	Units	Dimension A	Dimension B	Dimension C
1	630.190.000.600.000 631.190.000.600.000	Socket frame Pin frame	12	51	44	12 × 2.4 = 28.8
2	630.191.000.600.000 631.191.000.600.000	Socket frame Pin frame	18	64	57	18 × 2.4 = 43.2
3	630.192.000.600.000 631.192.000.600.000	Socket frame Pin frame	26	84.5	77.5	26 × 2.4 = 62.4
4	630.193.000.600.000 631.193.000.600.000	Socket frame Pin frame	37	111	104	37 × 2.4 = 88.8

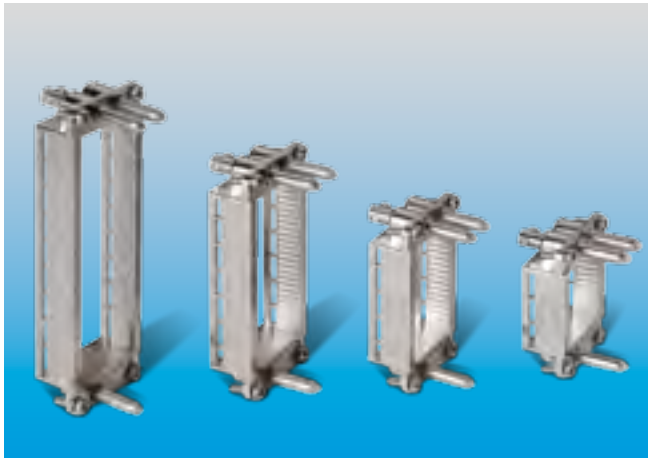
Torque value of frame screws: 1.25 Nm.

Pin Frames – Floating Mounting

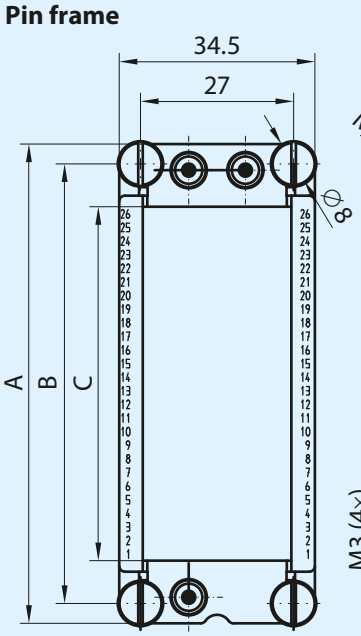
Radial ± 0.6 mm – axial min. 0.1 mm
fit for automatic docking processes

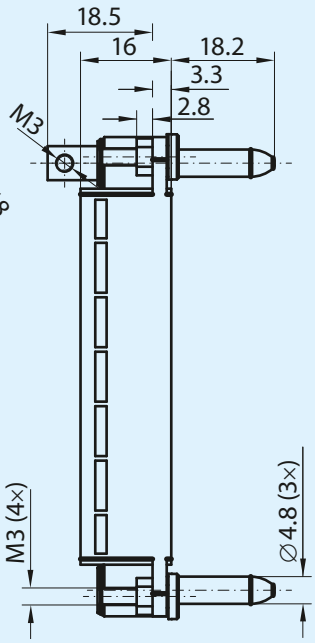
Included in delivery: Secondary locking



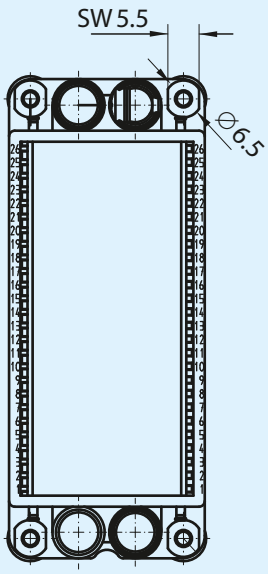


Pin frame



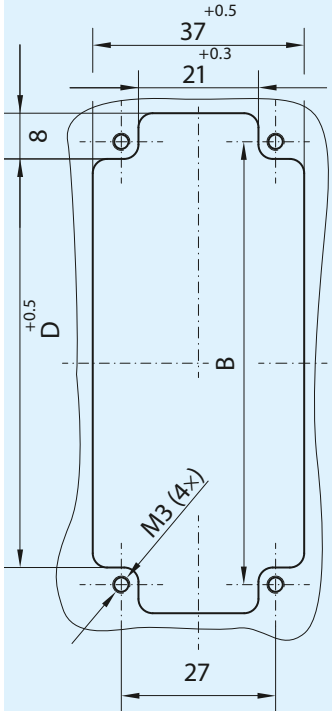


Socket frame



Torque value of frame screws: 1.25 Nm

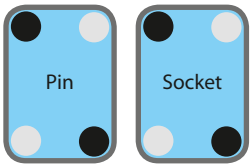
Panel cut-out



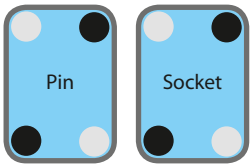
Size	Part number	Units	Dimension A	Dimension B	Dimension C	Dimension D
1	631.190.020.600.000	12	51.0	44.0	12 x 2.4 = 28.8	38.0
2	631.191.020.600.000	18	64.0	57.0	18 x 2.4 = 43.2	51.0
3	631.192.020.600.000	26	84.5	77.5	26 x 2.4 = 62.4	71.5
4	631.193.020.600.000	37	111.0	104.0	37 x 2.4 = 88.8	98.0

Keying Possibilities for Frames in DIN Housing

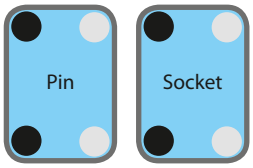
Code 1



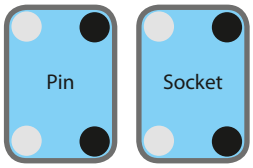
Code 2



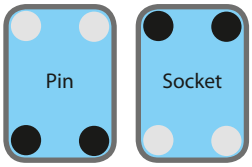
Code 3



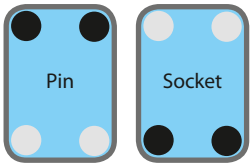
Code 4



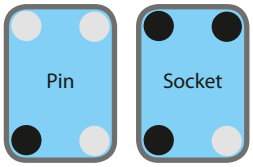
Code 5



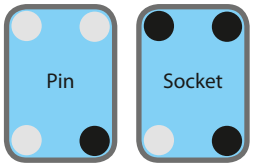
Code 6



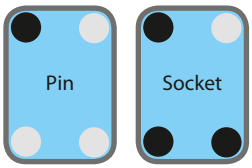
Code 7



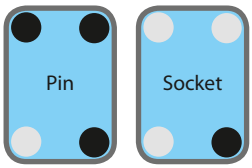
Code 8



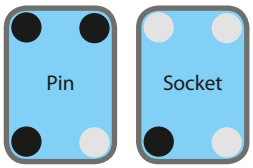
Code 9



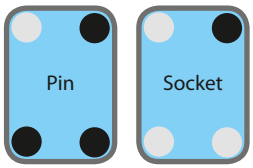
Code 10



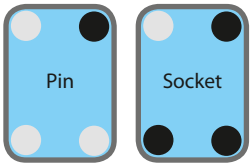
Code 11



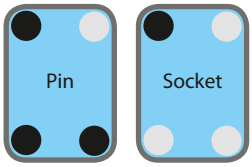
Code 12



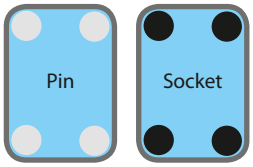
Code 13



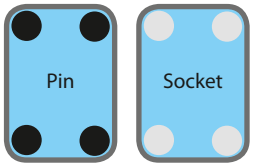
Code 14



Code 15

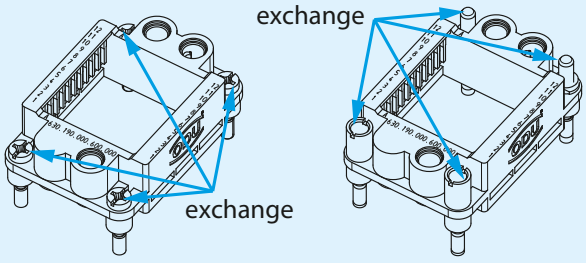


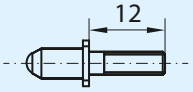
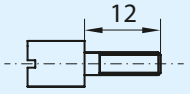
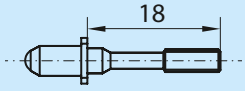
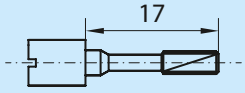
Code 16



Keying order separately.
Exchange screw either keying socket or keying pin!
Torque value 1.25 Nm.

Example: Socket frame Size 1

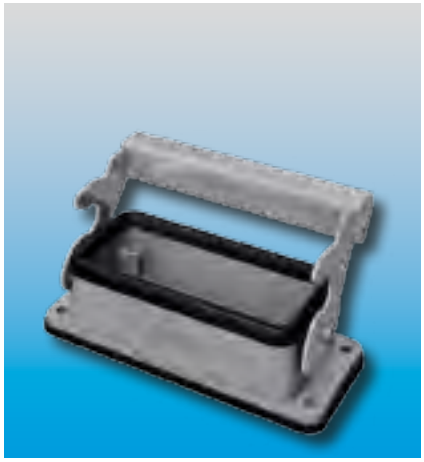


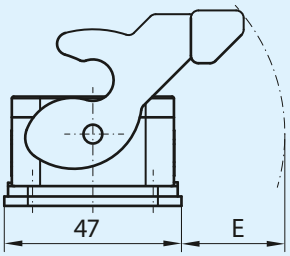
Frame	Keying	
	Pin	Socket
631.19. .000.600.000	631.090.301.700.000 	630.090.302.700.000 
630.19. .000.600.000	631.090.302.700.000 	630.090.301.700.000 

Panel-Mount Bases including Lever Locking

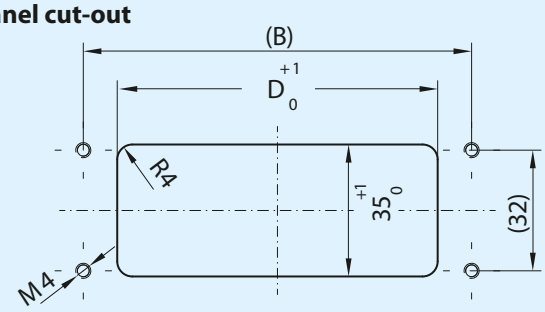
IP 65 in mated condition, standard colour of housing: grey, with and without protection cover available

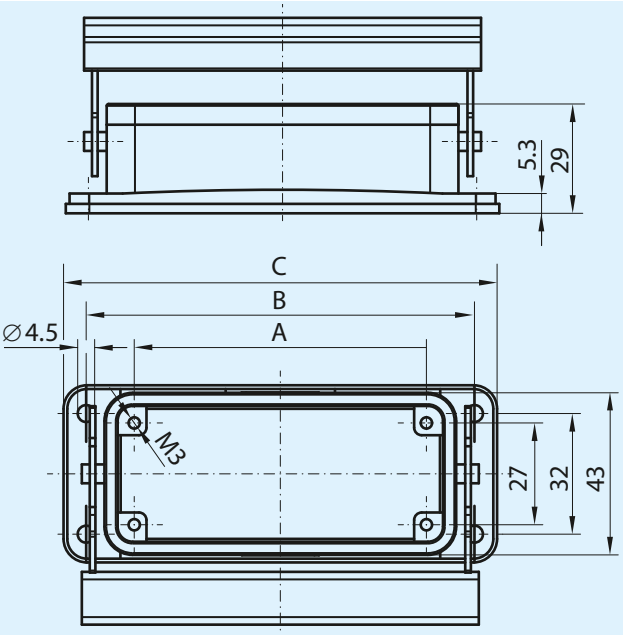
Material: aluminium-diecast





Panel cut-out



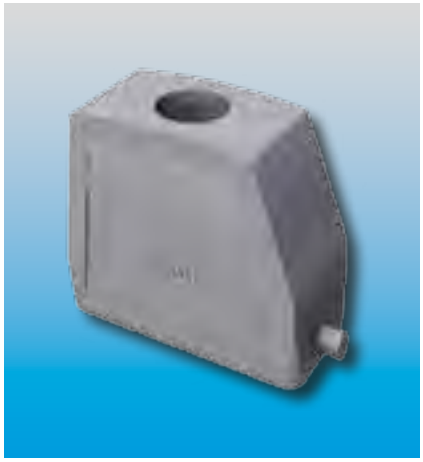


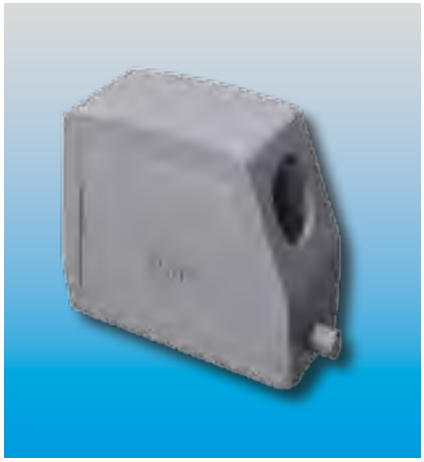
Size	Part number panel-mounted base	Part number panel-mounted base with protection cover	Dimension A	Dimension B	Dimension C	Dimension D Panel cut-out	Dimension E
1	490.130.400.644.000	490.131.400.644.000	44.0	70	82	52.2	~ 21
2	491.130.400.644.000	491.131.400.644.000	57.0	83	95	65.2	~ 28
3	492.130.400.644.000	492.131.400.644.000	77.5	103	115	85.5	~ 28
4	493.130.400.644.000	493.131.400.644.000	104.0	130	143	112.2	~ 28

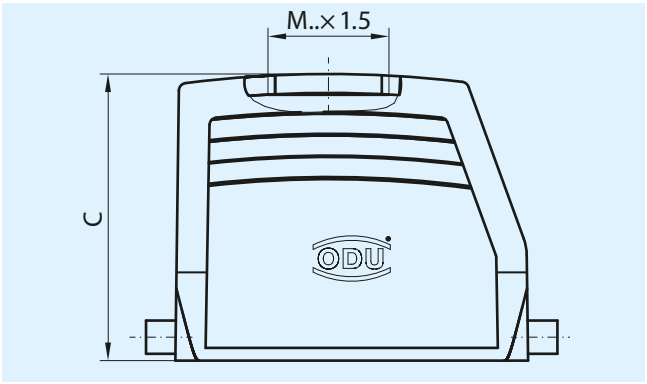
Cable Hood with straight or right angled Exit

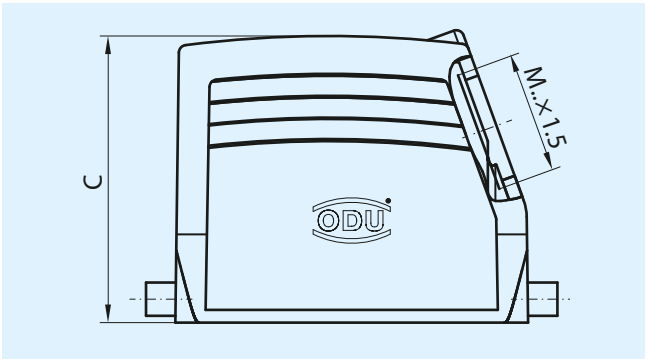
for lever locking, IP 65 in mated condition

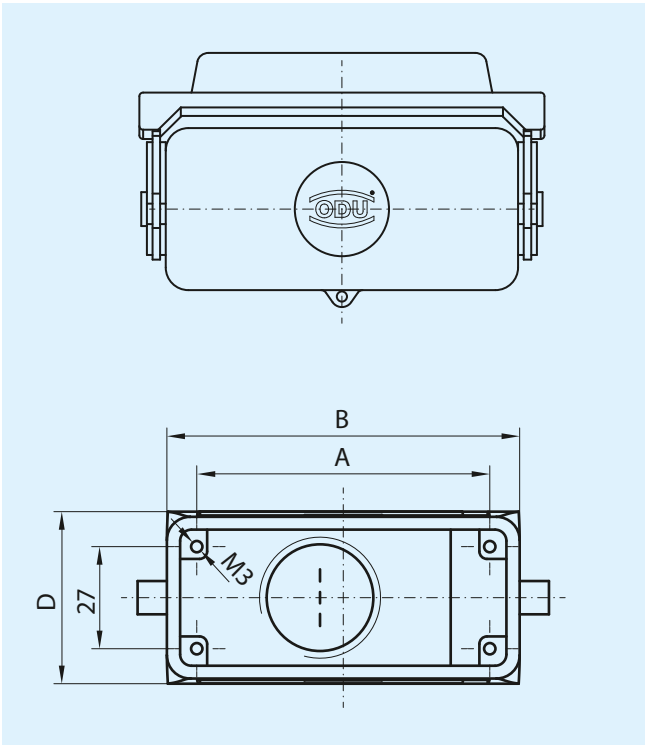
Material: aluminium-diecast









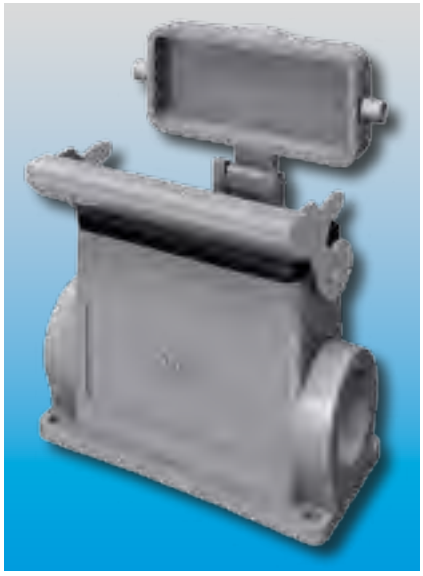


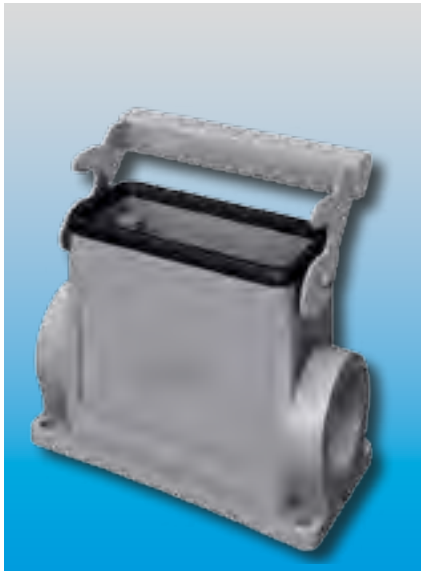
Size	Part number right angled exit	Part number straight exit	Dimension A	Dimension B	Dimension C	Dimension D	Dimension M Cable exit	Part number protection cover
1	490.414.450.644.102 490.415.450.644.102	490.214.450.644.102 490.215.450.644.102	44	60	52 72	43.0	M 25 × 1.5 M 32 × 1.5	490.097.212.644.000
2	491.414.450.644.102 491.415.450.644.102	491.214.450.644.102 491.215.450.644.102	57	73	52 72	43.0	M 25 × 1.5 M 32 × 1.5	491.097.212.644.000
3	492.415.450.644.102	492.215.450.644.102	77.5	93.5	76	45.5	M 32 × 1.5	492.097.214.644.000
4	493.415.450.644.102	493.215.450.644.102	104	120	76	45.5	M 32 × 1.5	493.097.214.644.000

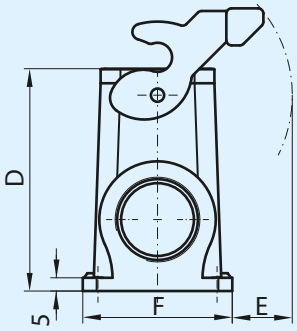
Box-Mounted Base including two right angled Exits

for lever locking – with or without protection cover, IP 65 in mated condition

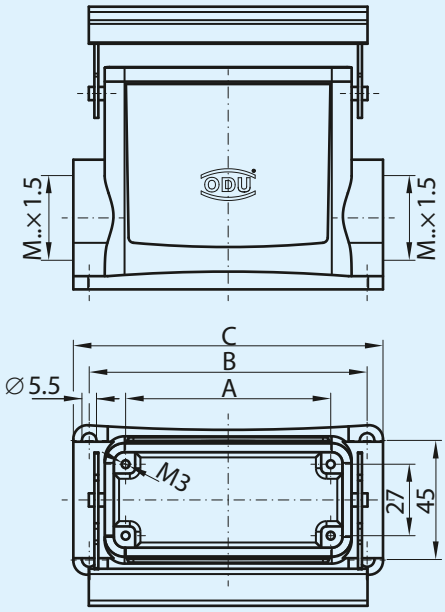
Material: aluminium-diecast







Example of lever locking



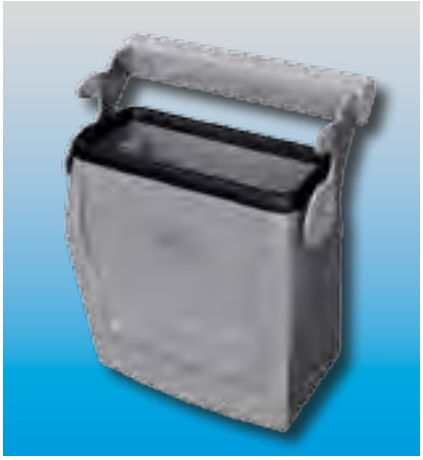
Size	Part number without protection cover	Part number with protection cover	Dimension A	Dimension B	Dimension C	Dimension D	Dimension E	Dimension F	Dimension M Cable exit
1	490.133.450.644.102	490.135.450.644.102	44	70	82	74	~ 17	55.5	32 × 1.5
2	491.133.450.644.102	491.135.450.644.102	57	82	92.5	74	~ 23	55.5	
3	492.133.450.644.102	492.135.450.644.102	77.5	105	117	84	~ 23	56.5	
4	493.133.450.644.102	493.135.450.644.102	104	132	144	84	~ 23	58	

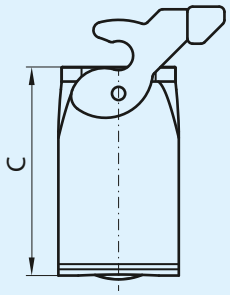
Accessories see page 36.

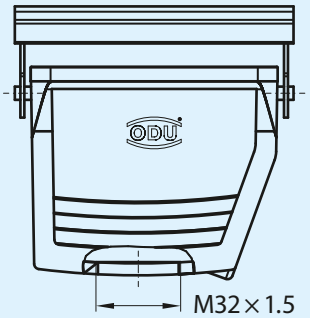
Cable-to-Cable hood with straight Exit

for lever locking, IP 65 in mated condition. For a cable-to-cable connection. Adaptable with cable hood (page 32).

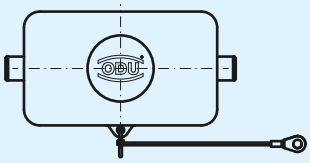
Material: aluminium-diecast

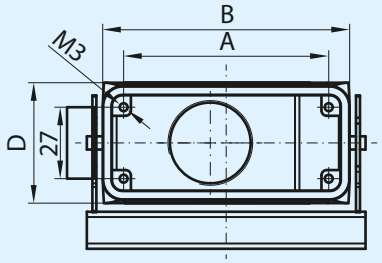






Protection cover



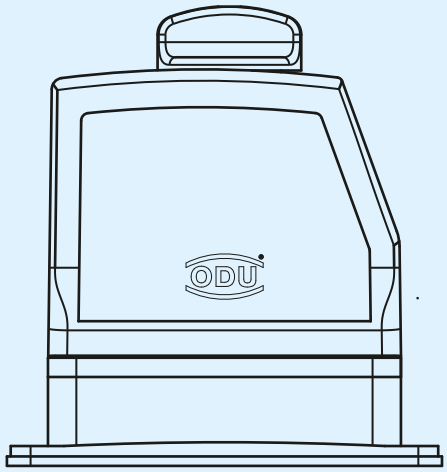


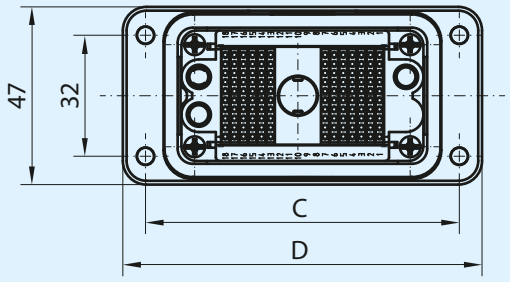
Size	Part number cable-to-cable hood	Dimension A	Dimension B	Dimension C	Dimension D	Part number protection cover
1	490.331.450.644.102	44	60	75	43.0	490.097.133.644.000
2	491.331.450.644.102	57	73	75	43.0	491.097.133.644.000
3	492.331.450.644.102	77.5	93.5	79	45.5	492.097.133.644.000
4	493.331.450.644.102	104	120	79	45.5	493.097.133.644.000

ODU MAC LC DIN-Housing

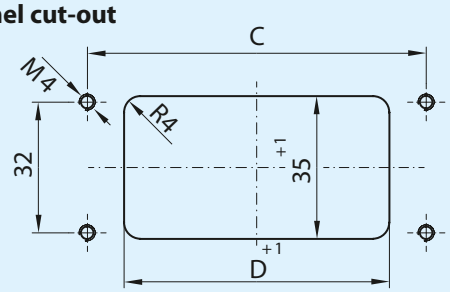
with Spindle locking

Material: aluminium-diecast





Panel cut-out



Size	Part number cable Hood	Part number panel-mounted base	Dimension A	Dimension B	Dimension C	Dimension D Panel cut-out	X1	X2	M cable exit	Spindle head
Colour of housing: white										
2	613.091.513.653.203	612.091.010.653.000	50	73	83	60	7	6	M 25 x 1.5	white
2	613.091.514.653.203	612.091.010.653.000	70	73	83	60	7	6	M 32 x 1.5	
3	613.092.514.653.203	612.092.010.653.000	76	93.5	103	82	11	10	M 32 x 1.5	
4	613.093.514.653.203	612.093.010.653.000	78	120	130	108	16	16	M 32 x 1.5	
Colour of housing: grey										
2	613.091.513.644.208	612.091.010.644.000	50	73	83	60	7	6	M 25 x 1.5	black
2	613.091.514.644.208	612.091.010.644.000	70	73	83	60	7	6	M 32 x 1.5	
3	613.092.514.644.208	612.092.010.644.000	76	93.5	103	82	11	10	M 32 x 1.5	
4	613.093.514.644.208	612.093.010.644.000	78	120	130	108	16	16	M 32 x 1.5	

Box-mounted base on request! Cable gland see page 36.

Accessories for Frames and Housings

Cable gland for DIN housings (acc. EN 50262)

Temperature area	–40° C to +100° C
Protection class	IP 68 to 5 bar
Material	PA grey, NBR

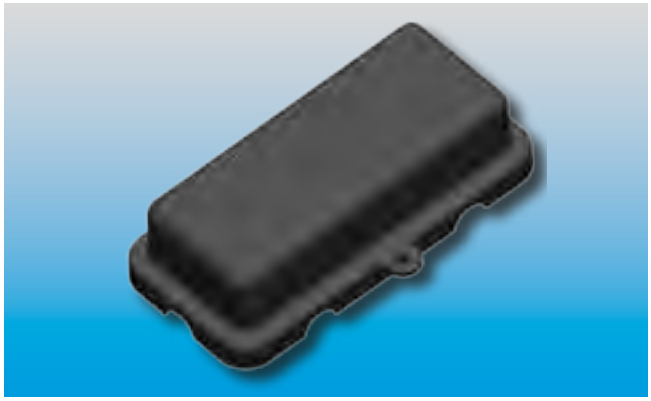
Termination	Cable diameter	Part number	Wrench size
M 25 × 1.5	6.0 – 13.0	027.825.060.130.007	30
	9.0 – 17.0	027.825.090.170.007	30
M 32 × 1.5	7.0 – 15.0	027.832.070.150.007	36
	11.0 – 21.0	027.832.110.210.007	36

Torque specifications: M 25: 8 Nm
M 32: 10 Nm

Cover (transport cover)

Size	Part number with holding rope	Part number without holding rope
1	490.097.900.924.000	490.097.900.924.101
2	491.097.900.924.000	491.097.900.924.101
3	492.097.900.924.000	492.097.900.924.101
4	493.097.900.924.000	493.097.900.924.101

Material: PP black



Adapter cable exit (metrical to PG)

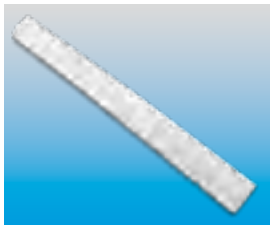
Cable exit M	With adapter cable exit PG	Part number
M 25 × 1.5	PG 21	921.000.006.000.254
M 32 × 1.5	PG 29	921.000.006.000.255

Dummy plug (plastic with sealing)

For metrical cable exit	Part number
M 25 × 1.5	921.000.006.000.279
M 32 × 1.5	921.000.006.000.268

Secondary locking

Size	Part number	
1	631.000.001.923.190	
2	631.000.001.923.191	
3	631.000.001.923.192	
4	631.000.001.923.000	



Tools and Assembly Instructions

Crimp Tools and Contact Preparation

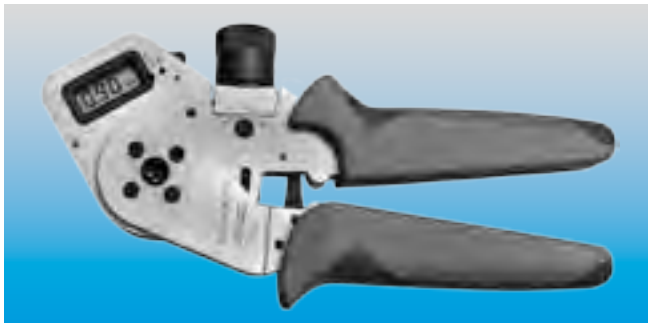
Crimping creates an easy, reliable, corrosion-free and long-term connection between conductor and contact. It requires little skill and can be performed by non-experts. Crimping causes cold-flow of the conductor and contact material, creating a gas-tight connection between contact and conductor. A stiffening of the conductor at the connection, as it is possible with soldering, cannot occur.

Crimping can be performed on very small or very large conductor cross-sections.

8-crimp tool
with user-friendly digital display

– For cross-section 0.08 – 2.50 mm^2
  Part number 080.000.051.000.000

– For cross-section 1.50 – 6.00 mm^2
  Part number 080.000.057.000.000



Hexagonal crimp tool

– For coax contact, with locking system (ratchet)
  Part number 080.000.039.000.000

Coax-cable	Crimp dies
RG 178, RG 196	082.000.039.101.000
RG 174, RG 188, RG 316, RG 179, RG 187	082.000.039.102.000
RG 59	082.000.039.109.000

Hydraulic crimp tool

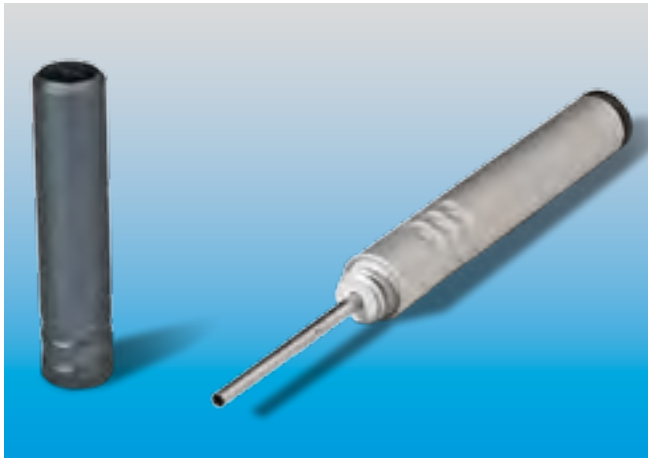
– With safety valve fot automatic release when correct pressure is reached.
  Part number for cross section 10 mm^2 / 16 mm^2
  080.000.026.000.000

– Crimp die
  Part number 080.000.026.110.000

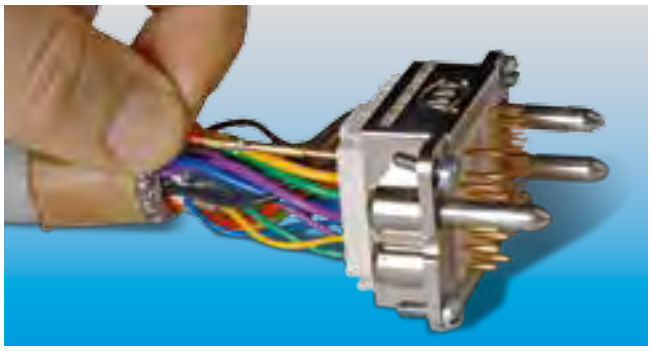
Removal Tools

Removal of the contact from the front. Cable of assembled contacts must **not** be cut off.

Contact diameter mm	Part number
0.7	087.7CC.070.002.000
1.3	087.7CC.130.004.000
2.0	087.7CC.200.003.000
3.5	087.7CC.350.001.000

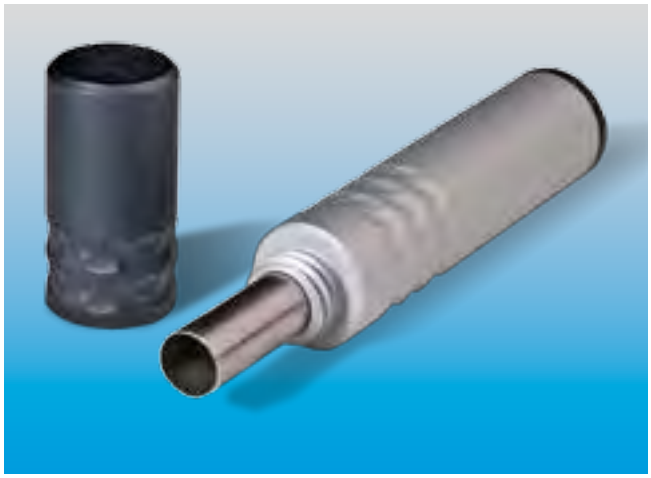


Removal of the contacts
Press the removal tool from the front into the insulation body till a quiet "click" is heard. Pulling on the cable removes the contact from the insulation body.
To release contact, please push forward the contact from behind of the connector with help of the conductor.

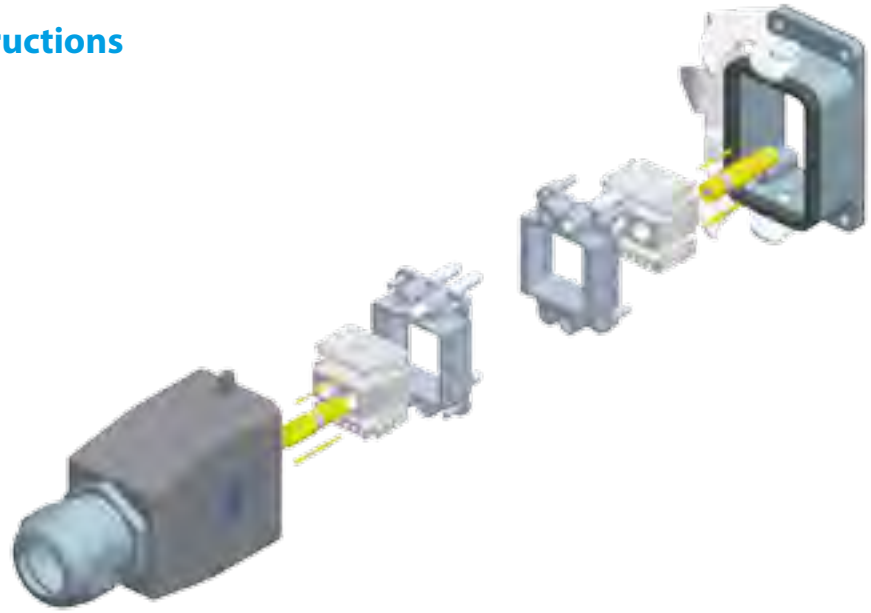


Removal tools for coax contacts

Contact diameter mm	Part number	See page
3.1	087.7CC.310.001.000	18
6.9	087.7CC.690.001.000	17
Compressed air valve	087.7CC.680.001.000	21

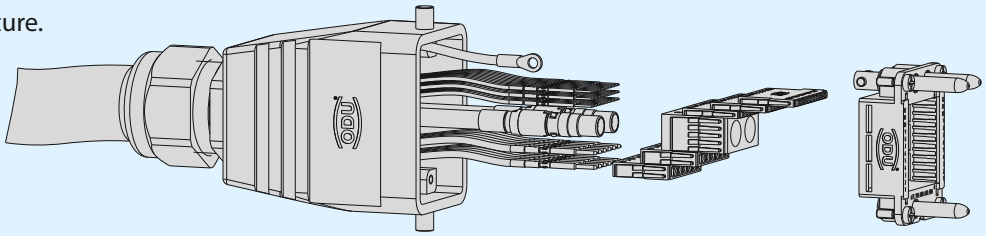


Assembly Instructions

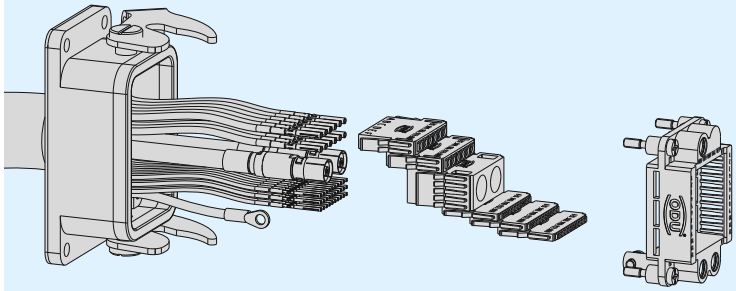


Step 1
Slide cable through housing, cable gland, mounting operture.

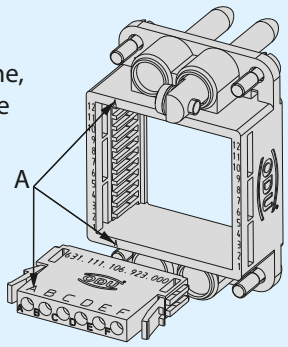
Step 2
Strip cable and wire.
Fit wire into the contact barrel and crimp.



Step 3
Insert contacts into insulator according to the numbering.

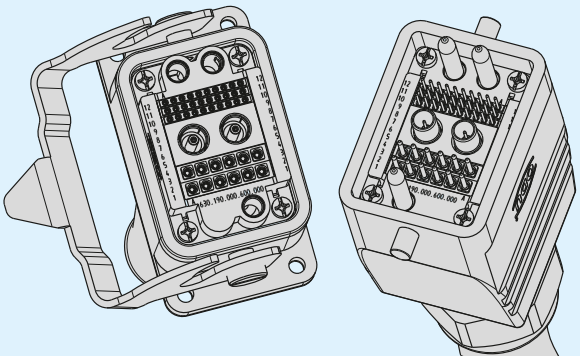


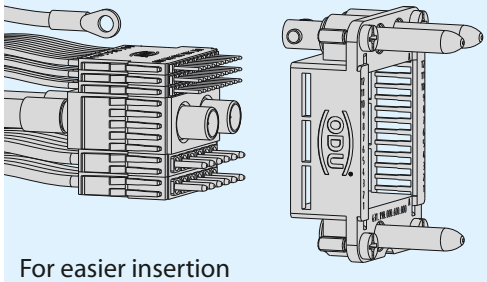
Step 4
Put assembled insulators into frame, observe (A to A) the coding and clamp PE/Shield onto frame.



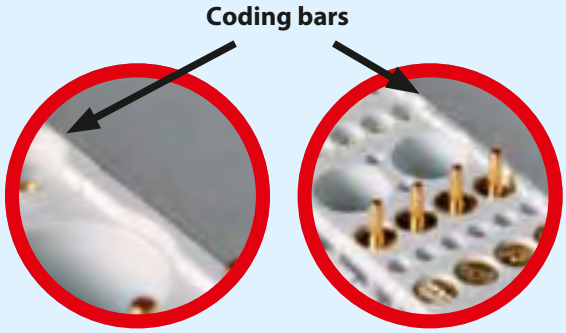
Step 5
Mount complete assembled frame in housing, observe locking torque of max. 1.25 Nm.
Fix cable on strain relief.

Step 6
Visual inspection/mating test. Frames always have to be filled up with insulators or spacers.

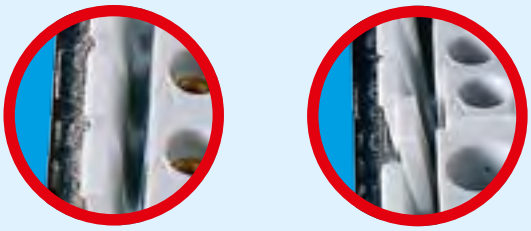




For easier insertion
of the populated insulators in the frame, locate them in the correct position before inserting.

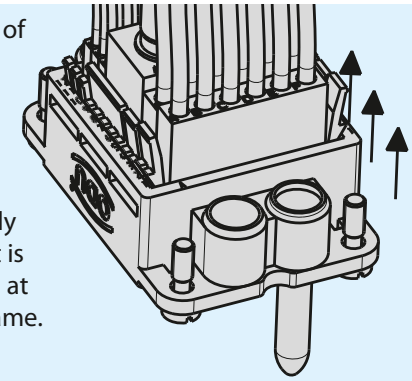


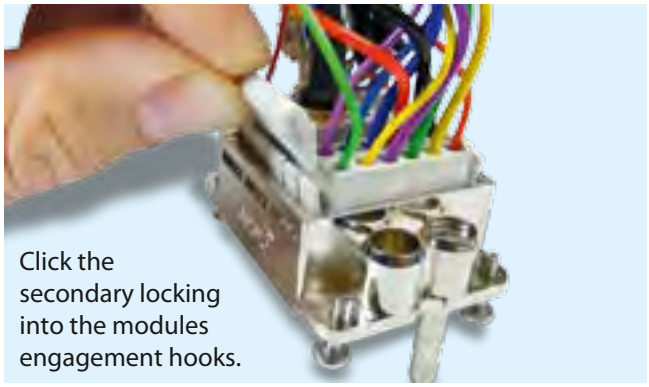
All coding bars should be in one line.



See that all insulators were snapped in correctly.
All snap fits should be in line.

For disassembling of insulators, always disassemble several insulators. Don't pull on the cable.
For the disassembly of the insulators, it is advisable to begin at the edge of the frame.

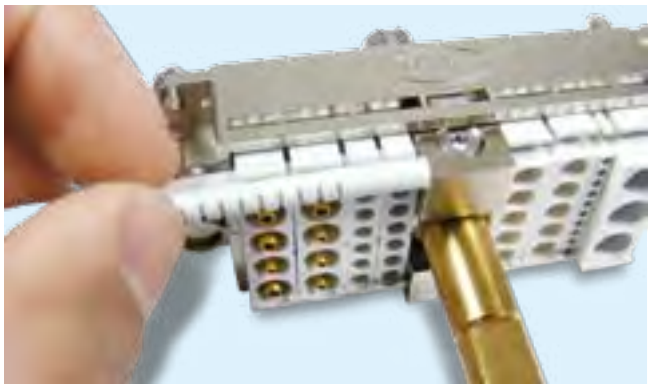




Click the secondary locking into the modules engagement hooks.

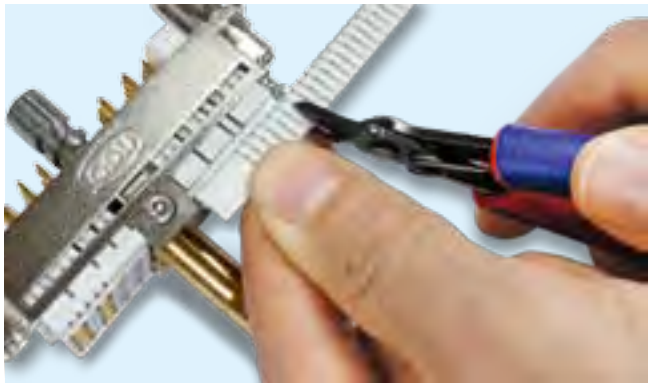
The correctly mounted secondary locking ensures that all modules are correctly snapped into place in the frame.

Assembly of the Secondary Locking with Locking Spindle



If a spindle locking is used, the secondary locking must be mounted to the left and right of the spindle.
Measure the required length of each secondary locking ...

...and cut the secondary locking to length with the help of the available raster (2.4 mm).

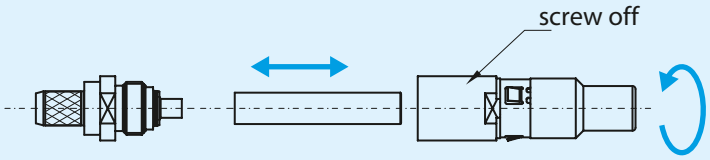


Then click the secondary lockings into the engagement hooks of the moulds.

The secondary locking ensures that all modules are correctly snapped into place in the frame.

Assembly Instruction Module 2 pos., Coax-Contacts 50 Ω

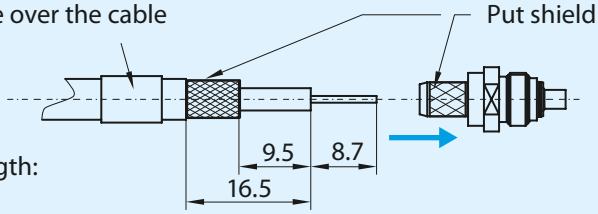
Step 1
Separate coax



Step 2
Fix cable in insert

Push sleeve over the cable

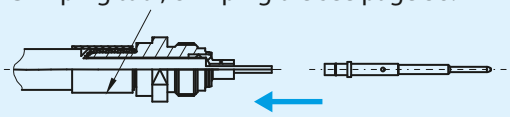
Put shield onto knurl



Stip off length:

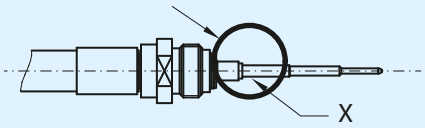
Step 3
Crimping

Crimp shield:
Crimping tool, crimping die see page 38.

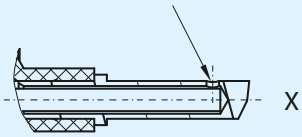


Push center conductor into the insert. Pay attention to right position of the center wire.

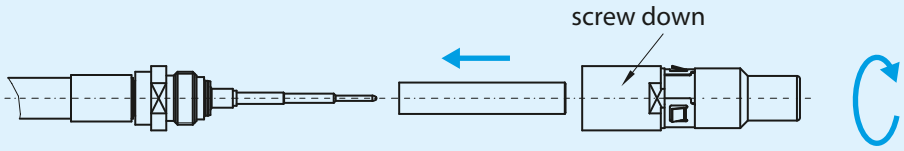
Crimp internal conductor: Cable strain could avoid damage of the inner conductor. Crimping tool, crimping die see page 38.



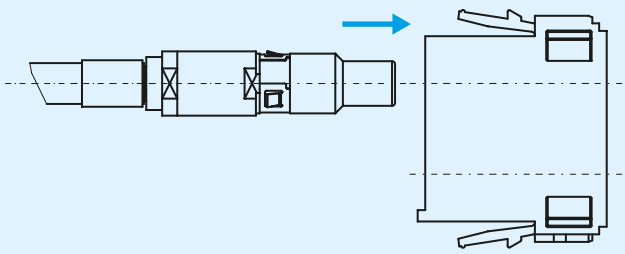
Cable stand must be in sight.



Step 4
Assembly coax contact



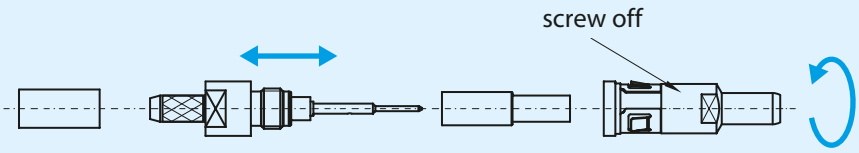
Step 5
Assembly coax contact in insulation body



Removal tool
part number 087.7CC.690.001.000

Assembly Instruction Module 4 pos., Coax-Contacts 50 Ω

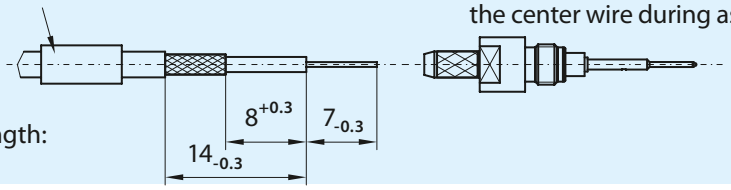
Step 1
Separate coax



Step 2
Fix cable in insert

Push sleeve over the cable

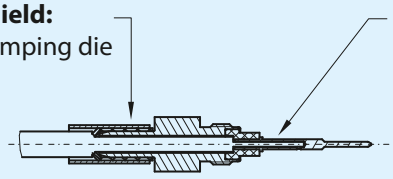
Pay attention to right position of the center wire during assembly.



Stip off length:

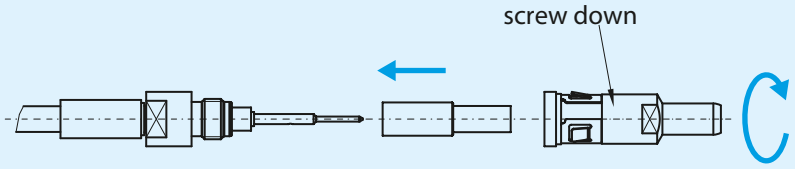
Step 3
Crimping

Second crimp shield:
Crimping tool, crimping die see page 38.

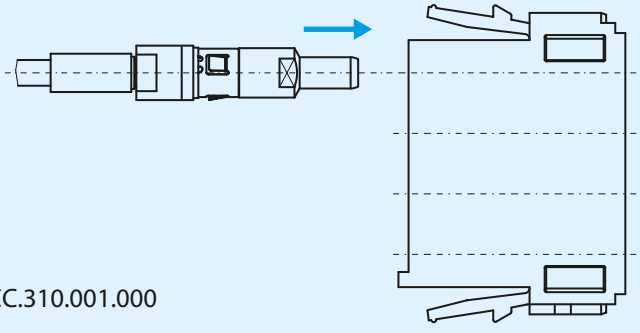


First crimp internal conductor:
Cable strain could avoid damage of the inner conductor. Crimping tool, crimping die see page 38.

Step 1
Assembly coax contact



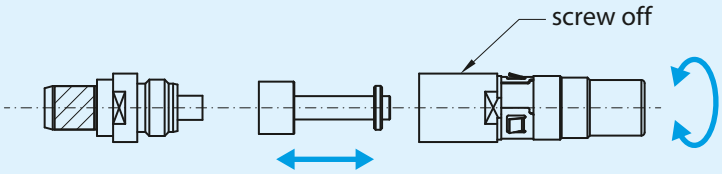
Step 5
Assembly coax contact in insulation body



Removal tool
part number 087.7CC.310.001.000

Assembly Instruction Module 2 pos., Coax-Contacts 75 Ω

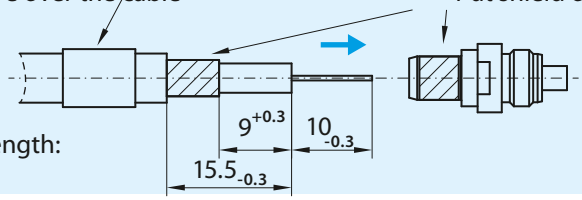
Step 1
Separate coax



Step 2
Fix cable in insert

Push sleeve over the cable

Put shield onto knurl

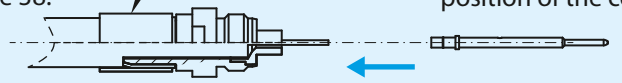


Strip off length:

Step 3
Crimping

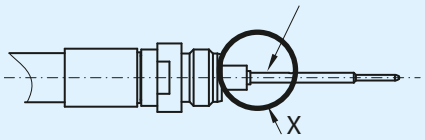
Crimp shield: Cable strain could avoid damage of the inner conductor. Crimping tool, crimping die see page 38.

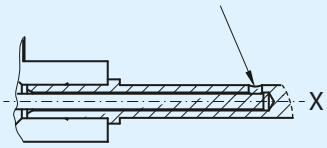
Push center conductor into the insert. Pay attention to right position of the center wire.



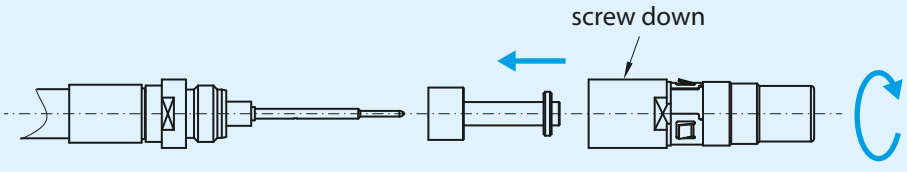
Crimping internal conductor:
Crimping tool, crimping die see page 38.

Cable stand must be in sight.

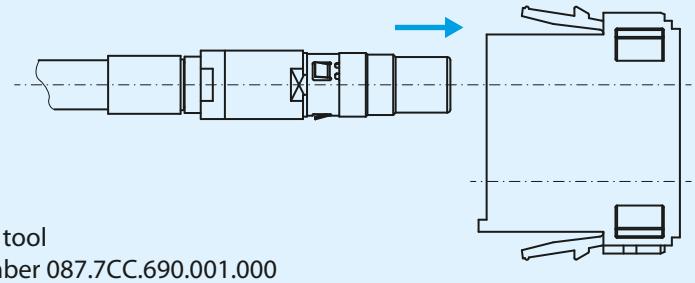




Step 4
Assembly coax contact



Step 5
Assembly coax contact into insulation body



Removal tool
part number 087.7CC.690.001.000

Technical Information

Explanations of Voltage Information in Compliance with VDE

Standards applied
DIN EN 60664-1 (VDE 0110 – Part 1)
DIN EN 61984 (VDE 0627)

General information
A connector cannot be chosen by taking into consideration only functionality, number of contacts and current or voltage characteristics. The consideration of the place where it will be used and the installation conditions that prevail there are essential. Depending on the installation conditions and local conditions, the connector can be used in different voltage and current ranges, according to the standardization.

All voltage information listed in this catalog refers to use of insulators in ODU MAC LC.
All shown connectors are according to DIN EN 61984:2009 connectors without breaking capacity (COC).

The most important influencing quantities and the electrical characteristics tuned to them are explained in more detail in the following. If you have further questions, we would happy to provide support.

The following texts and tables are excerpts from the specified standards. The originals are DIN EN 60664-1:2007 and DIN EN 61984:2009.

Overvoltage category
Using the overvoltage category, the necessary rated surge voltage is defined according to table F.1 and the nominal voltage used. The particular overvoltage category for the device, depending on the installation location, is selected according to the criteria listed below.

– **Overvoltage category I**
Devices for connection to electric circuits in which measures have been taken to limit transient overvoltages to a suitable low level.
For example: Connectors for the power supply of computer hardware that is permanently connected to a power pack with electronic overvoltage limiting.
– **Overvoltage category II**
Devices that consume energy and that are supplied from the fixed wiring system.
For example: Household appliances, portable tools and similar devices.
– **Overvoltage category III**
Devices in fixed wiring systems and for those cases in which particular demands are placed on the reliability and availability of the devices.
For example: Switches in fixed wiring systems and devices for industrial use with permanent connection to the fixed wiring system.
– **Überspannungskategorie IV**
Devices for use at the wiring system connecting point.
For example: Electric meters and primary overvoltage protective devices.

Table F.1

Nominal voltage of the electric power supply system according to IEC 60038		**Voltage line to neutral** derived from nominal voltages a.c. or d.c. up to and including	**Rated impulse voltage in V** Overvoltage category			
Three-phase-system in V	Single-phase-system in V	in V	I	II	III	IV
	120 – 240	50	330	500	800	1,500
		100	500	800	1,500	2,500
		150	800	1,500	2,500	4,000
230 / 400 277 / 480		300	1,500	2,500	4,000	6,000
400 / 690		600	2,500	4,000	6,000	8,000
1,000		1,000	4,000	6,000	8,000	12,000

Pollution degree
Combined with moisture, any pollution that may arise can influence the insulating property on the surface of the connector. For defining the different rated values, a pollution degree must be selected for the device, according to the criteria listed below.
For a connector with a degree of protection of at least IP 54 (to IEC 60529), the insulating parts inside the encapsulation may be measured for a lower pollution degree according to the standard. This also applies to inserted connectors where the encapsulation is ensured by the connector housing and that are detached only for testing and maintenance purposes.

- **Pollution degree 1**
  There is either no pollution or only dry, non-conductive pollution; the pollution has no influence.
  For example: Measuring instruments and hardware in computer systems.
- **Pollution degree 2**
  Only non-conductive pollution occurs. Transient conductivity caused by dewfall must be expected occasionally, however.
  For example: Devices in laboratories and in living areas and sales and other commercial areas.
- **Pollution degree 3**
  Conductive pollution occurs or dry, non-conductive pollution that becomes conductive because of dewfall must be expected.
  For example: Devices in industrial, commercial and agricultural operations, unheated storage areas and workshops.
- **Pollution degree 4**
  Continuous conductivity occurs, caused by conductive dust, rain or wetness.
  For example: Devices in open-air plants and on construction machines.

Operating voltage (VDE: rated voltage)
The level of a voltage that is specified by the manufacturer for a component, device or piece of equipment and to which the operating and performance parameters apply. The rated voltage depends on the connectors' insulating material group and the respective creepage distances between the separate contacts, according to the specified pollution degree.
By using empty modules and by differing the positioning of the contacts in the insulators, it is possible to influence the rated voltage considerably.
(Devices are permitted to have more than one value for the rated voltage or to have a range of rated voltages).

Nominal voltage
A suitable rounded voltage level, which is specified for a device by the manufacturer for labeling or identification. In these explanations, the term nominal voltage is used for the value of the output voltage specified by the power company or the manufacturer of the voltage source for classification of the overvoltage category.

Rated impulse voltage
Value of the impulse test voltage that is specified by the manufacturer for a device or a part thereof and that indicates the defined staying power of its accompanying insulation against transient (short-term, lasting a few milliseconds) overvoltages. The impulse test voltage here is the highest level of the impulse voltage of a defined shape and polarity that is not permitted to lead to any insulation disruptive discharge under defined conditions. The rated impulse voltage depends on the clearance distance between the separate contacts, according to the specified pollution degree.
By using empty modules and by differing the positioning of the contacts in the insulators, it is possible to influence the rated impulse voltage considerably.

Impulse test voltage/power-frequency test voltage
Highest value of the impulse voltage of a defined shape and polarity that is not permitted to lead to any insulation disruptive discharge or sparkover under defined conditions.

Clearance distance
Shortest distance between two conductive parts, through the air.

Creepage distance
Shortest distance between two conductive parts, along the surface of an insulating material. (The creepage distance is influenced by the pollution degree used).

Test Voltage
The connectors' electric strength is tested to the standard according to the specified rated impulse voltage by applying the test voltage (impulse test voltage or power-frequency test voltage according to table F.5) over a defined time period.

Table F.5

Rated impulse voltage	Impuls test voltage in kV		
kV	Sea level	Up to 200 m	Up to 500 m
0.33	0.357	0.355	0.350
0.5	0.541	0.537	0.531
0.8	0.934	0.920	0.899
1.5	1.751	1.725	1.685
2.5	2.920	2.874	2.808
4.0	4.923	4.824	4.675
6.0	7.385	7.236	7.013
8.0	9.847	9.648	9.350
12.0	14.770	14.471	14.025

A interpolation of the rated impulse voltage is acceptable, if the testing laboratory ist between sea level and 2,000 m.

Electrical Data

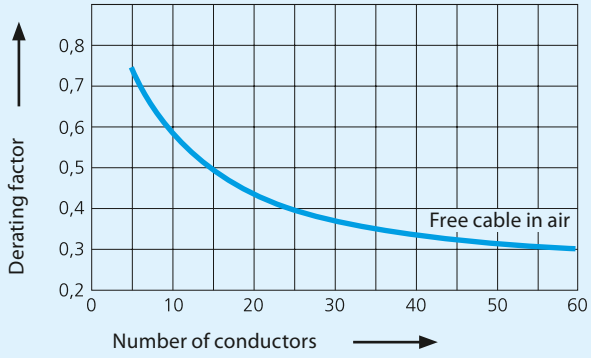
Current load
(nominal and max. continuous)
Data is based on contacts terminated to correct size of conductors. No additional contact temperature rise occurs due to incorrect conductors or cables. All measured contact temperature rise is due to contact resistance, only.

Nominal current
The current which causes a 45°C temperature rise (for example: for 23° C to 68°C).

Derating Factor

Current load values given in the connector and contact specifications in previous sections are single contact current loads.
With multi-position connectors and cables, the temperature increase is higher than with single contacts. It is therefore necessary to apply a derating factor to calculate the maximum current load per contact in multi-pole connectors. There is no precise specification for connectors. In practice, one uses the derating factor from VDE 0276-1000:1995-06 for multi-conductor cables.

Load derating factor
plastic jacketed cable in air form 1.5 – 10 mm² in air



Load derating factor for plastic jacketed cable in air from 1.5 mm² to 10 mm².

Number of conductors	In air
5	0.75
7	0.65
10	0.55
14	0.50
19	0.45
24	0.40
40	0.35
61	0.30

Example
The cable has 24 conductors with a cross-section of 6 mm² each. From the diagram, the derating factor is determined as 0.4.
A single copper conductor with 6 mm² cross-section can carry a load of 44 A. Therefore, a cable with 24 conductors, each having a 6 mm² cross-section, can carry a maximum 17.6 A per conductor (44 A x 0.4 = 17.6 A).

International Protecting (IP) Classes DIN EN 60529 (respectively IEC 529 / VDE 0470 T1)

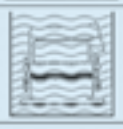
The housing and the locking system of the ODU MAC LC protect the contacts against outside mechanical influence, such as impact shocks, impurities, dust, unintended contact and penetration of moisture, waster or other liquids (coolants, oils, etc.)

Protection classification is indicated with the letters **IP** and two numbers.

Code letters (international protection) **IP**

First index figure (foreign bodies protection) **6**

Second index figure (water protection) **8**

Index	Degree of protection		Index	Degree of protection	
0		No protection against accidental contact, no protection against intrusion of solid foreign bodies	0		No protection against water
1		Protection against contact with any large area by hand and against large solid foreign bodies with ∅ > 50 mm	1		Protection against vertical water drips
2		Protection against contact with the fingers, protection against large solid foreign bodies with ∅ > 12 mm	2		Protection against water drips (up to a 15° angle)
3		Protection against tools, wires or similar objects with ∅ > 2.5 mm. Protection against small foreign solid bodies with Ø > 2.5 mm	3		Protection against diagonal water drips (up to a 60° angle)
4		As 3 however ∅ > 1 mm	4		Protection against splashed water from all directions
5		Full protection against contact. Protection against interior detrimental dust deposition	5		Protection against water spray from all directions
6		Total protection against contact. Protection against intrusion of dust	6		Protection against temporary flooding
			7		Protection against temporary immersion
			8		Protection against water pressure

In accordance with DIN VDE 0470, DIN EN 60 529, IEC 529
Source: ZVEI = German Association of the Electrotechnical and Electronic Industry e.V.

Quality Management

ODU has had a powerful quality management system in place for years. ODU has been successfully certified to ISO 9001 since 1994. In addition, the automotive sector of the company group is certified to ISO TS 16949.
The certification process was carried out by the internationally active BVQI (Bureau Veritas Quality International) company.

ODU is also certified according the medical norm ISO 13485 : 2003 + AC : 2007.

Additional to this ODU ist approved to different certifications: VDE, UL, UL wiring harness, SCA, VG und MIL.

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