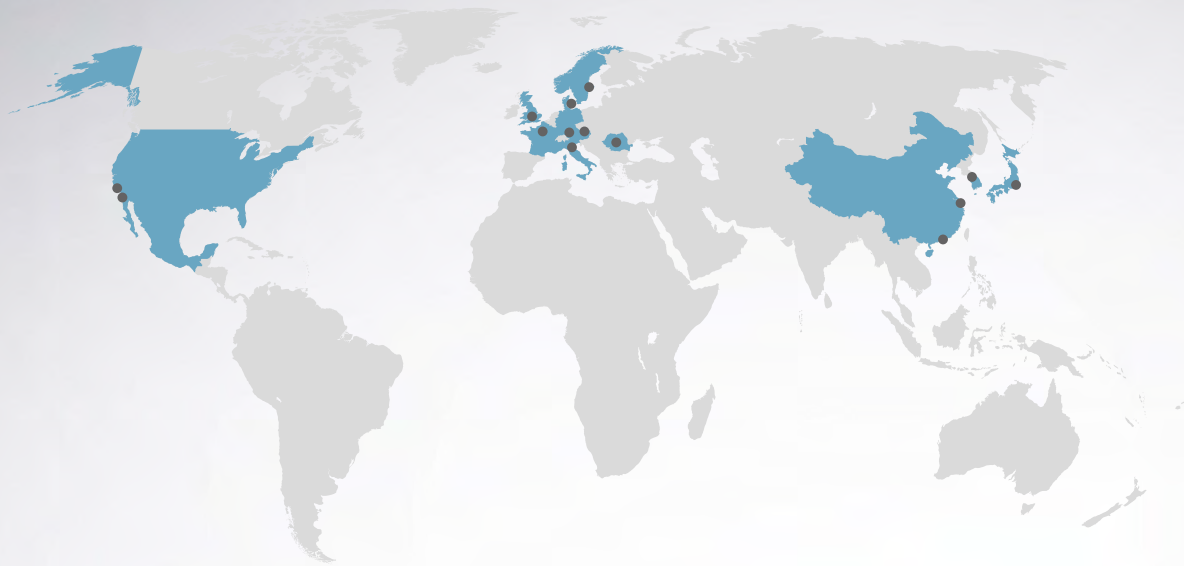


ODU-MAC[®] **Black-Line**

HDMI   
ODU HIGH-SPEED DATA TRANSMISSION



WHY ODU?



- More than 80 years of experience in the connector technology
- Over 2,800 employees worldwide
- 160 R&D employees
- 190 apprentices and dual students
- 90,000 different products
- 80 % vertical integration

- 6,000 customers around the world
- 5 production and logistics sites: Germany, China, Mexico, Romania, USA
- 12 sales locations: Germany, Austria, China, Denmark, France, Hong Kong, Italy, Japan, Korea, Sweden, UK, USA

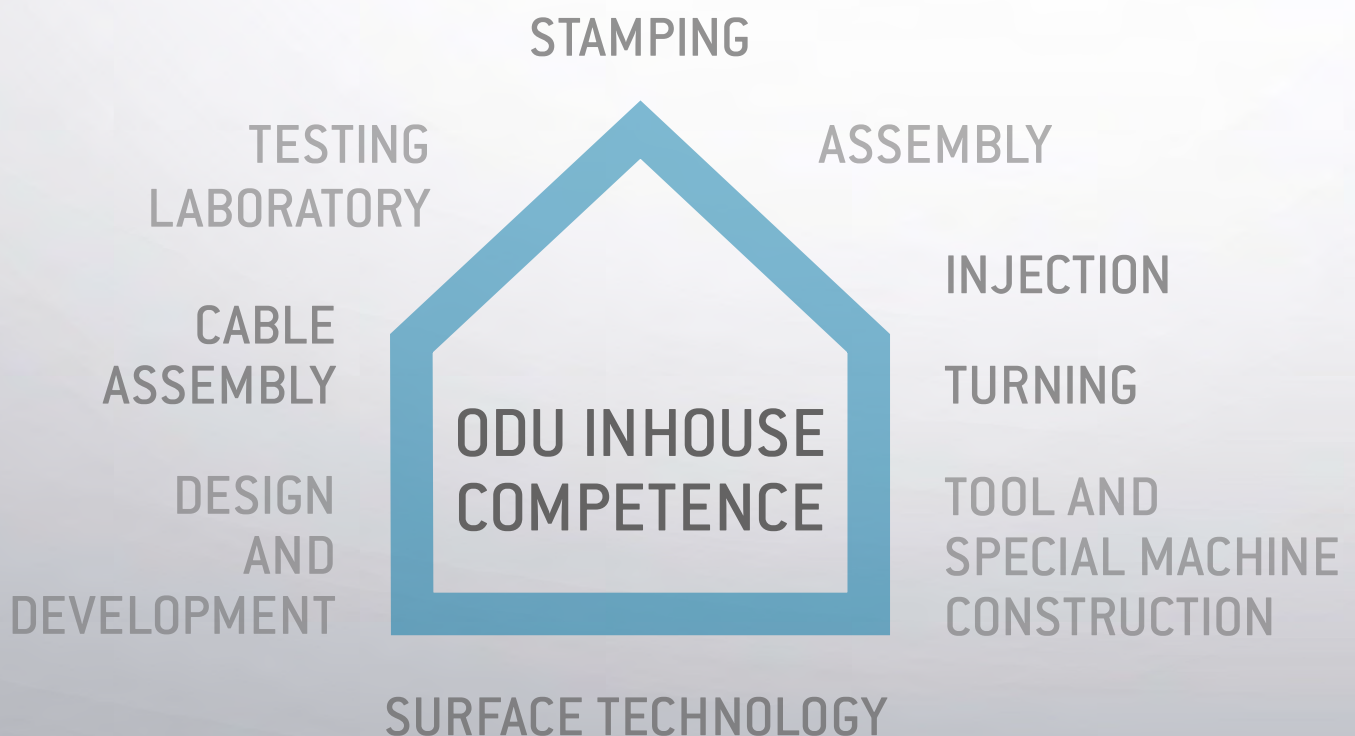


TABLE OF CONTENTS

Clickable page numbers

ODU-MAC® BLACK-LINE 4

Test and measurement for the next level	4
Overview	5
Product information	6
System features	7
12-Flex FOUR A (Advanced Class)	8
12-Flex TWO M (Basic Class)	10
12-Flex TWO M Tabletop (Comfort Class)	12
4-Flex FOUR M (Compact Class)	14
ENCLOSURE 15" and 9" variant	16

ODU-MAC® BLUE-LINE 18

The modular system at a glance	18
Proven ODU-MAC® Modularity	19
The contact principle	20
ODU TURNTAC®	20
ODU LAMTAC®	21
Overview of all modules	22

ODU-MAC® BLACK-LINE SYSTEM COMPONENTS 30

Signal Block	30
GPS Test Adapters	31
Power Block	32
Shielded feed-through / High-speed connector Size 1	33
Compressed air coupling	34
Contacts	35
Compressed air and fluid	35
Receiver	36
ITA	40
Further components	43
Configurator	54
Cable assembly	55

TECHNICAL INFORMATION 56

The majority of ODU-MAC® modules and contacts have been certified according to UL 1977:2022/CSA C22.2 No. 182.3-16:2016 (E file no.: E110586) and tested to MIL / SAE / EIA.

Data transmission protocols

Unless explicitly confirmed otherwise the contact arrangement of an ODU data transmission connector differs from a standard data transmission connector due to the robust ODU specific design. However, the ODU design meets the electrical specifications of the respective standard data transmission protocol.

Safety instructions / protective conductor connection

A protective conductor termination is mandatorily required if the "limits for **TOUCHABLE PARTS**" described in the respective standards are exceeded and no other protective measures against electric shock have been taken. In any case, before commissioning, a check of the protective connection and all **TOUCHABLE PARTS**

must be carried out according to the relevant standards. When mated, the housing listed in this catalog corresponds to the requirements specified in IEC 61984:2008 with regard to protection against contact in accordance with IEC 60529:1989. When using mounting housings or comparable device parts without complete IP protection in the cable connection area or when using the connectors without housing, the required contact protection according to IEC 61984:2008 must be provided by the customer (e.g. by suitable installation in the control cabinet with IP degree of protection). The customer must ensure strain relief for the cables / strands on the device part.



Printed on certified recycled paper.

ODU-MAC® **Black-Line**

Test and measurement for the next level

The ODU-MAC® Black-Line Mass Interconnect interface stands out by its excellent quality and its fantastic modularity and flexibility.

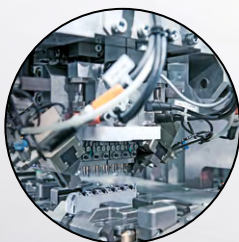
Unlike the signal blocks that are so typical for the sector, ODU primarily relies on the modular ODU-MAC® Blue-Line Connector System. This gives the user a choice of various modules designed for signals, power, high-current, high-voltage, HF signals (coax), compressed air and fluid coupling, vacuums, fiber optic cables and data rates / high-speed data. PCB termination modules round off the range.

The ODU Mass Interconnect Solution is available in two sizes with either three or five rack units (RU). We offer five types of termination technology for connecting the contacts: crimping, soldering, PCB, wire wrap and wire mount.

This modularity and flexibility enable solutions for a wide variety of test requirements.

TEST AND MEASUREMENT APPLICATIONS

CONSUMER
GOODS
INDUSTRIES



AUTOMOTIVE



AEROSPACE



MEDICAL



MILITARY
& SECURITY



TELECOMMUNICATIONS



ODU-MAC[®] **Black-Line**

Overview

The ODU-MAC[®] Black-Line Mass Interconnect solution benefits from the principle of the ODU-MAC[®] Blue-Line Modular Connector System.

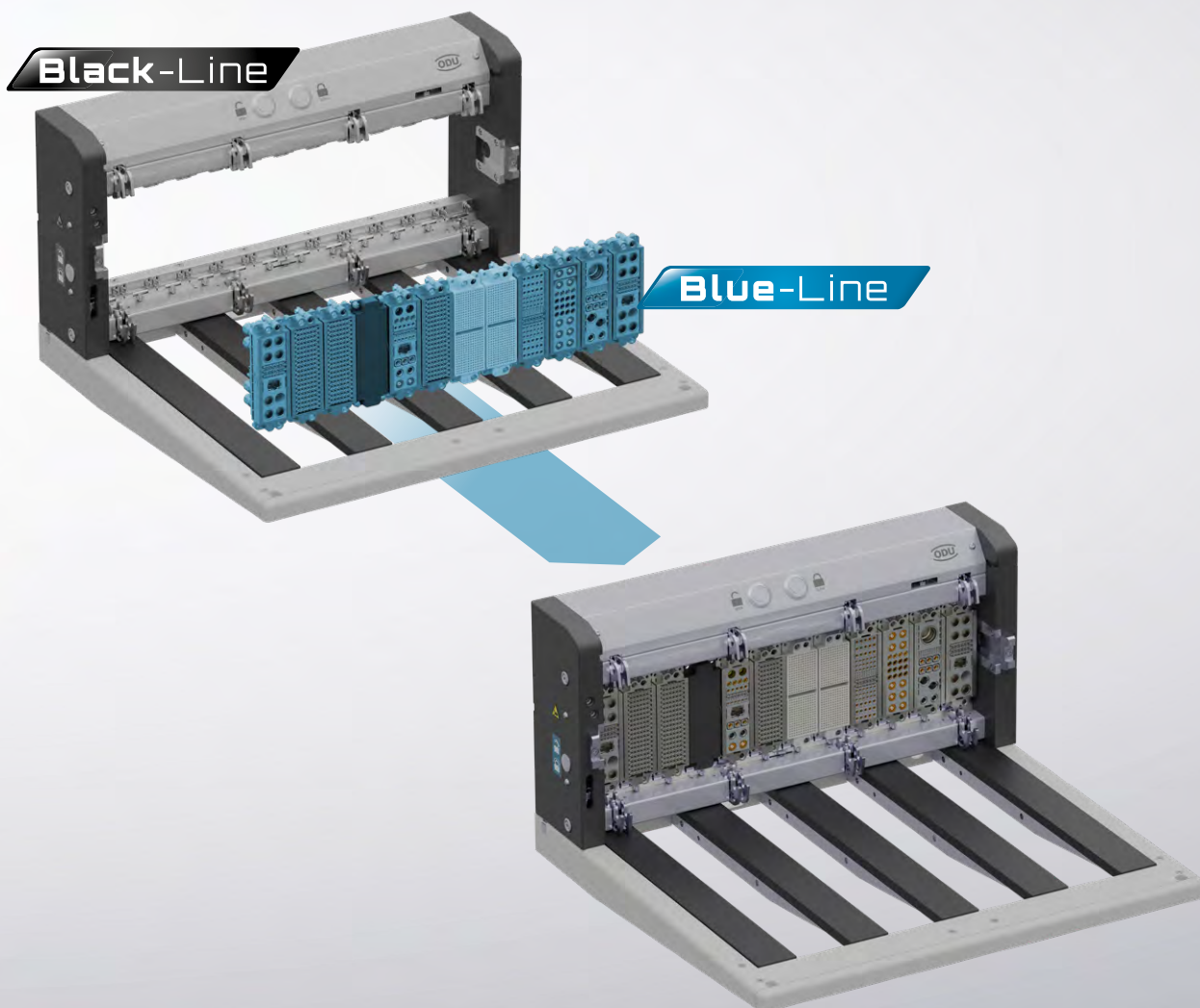
The modular design and the variety of transmission possibilities are characteristics of the proven, hybrid ODU-MAC[®] Blue-Line System.

Due to the high compatibility the ODU Mass Interconnect interface can be individually equipped with the existing modules depending on the test requirements.

It is also possible to combine it with signal blocks. The biggest interface can be equipped with up to 4,608 signal contacts.

FEATURES

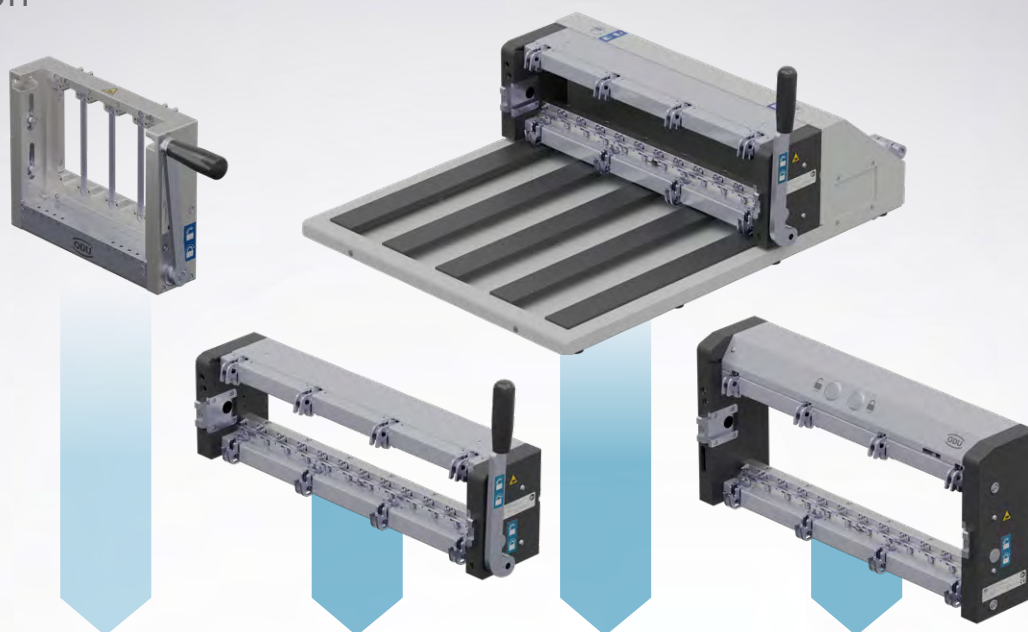
- Maximum flexibility with ODU-MAC[®] Blue-Line modules and signal blocks
- Innovative engagement option: electromechanical version with remote control available
- Eight tensioning points to stop frame distortion
- Complete solution including cable assembly
- Up to 4,608 signal contacts



DOCK. TEST. DONE.

ODU-MAC® **Black-Line**

Product information



	4-Flex FOUR M (Compact Class)	12-Flex TWO M (Basic Class)	12-Flex TWO M Tabletop (Comfort Class)	12-Flex FOUR A (Advanced Class)
Mating principle	Hand lever	Hand lever	Hand lever	Electromechanical (Remote possible)
Configuration	Rack mount	Rack mount	Tabletop	Rack mount / Inline tester
Rack units (without platform)	4	3	3	5
Max. signals	1,536	2,304	2,304	4,608
Resistance coding (optional)	–	•	•	•
RFID coding (optional)	–	•	•	•
Mechanical coding (optional)	•	–	–	–
Condition monitoring (optional)	included	•	•	•
Slide mount (optional)	–	•	–	•
Platform (optional)	•	•	Uniformly with 4-Flex FOUR M/condition monitoring included	•

FRAMES

SIZES

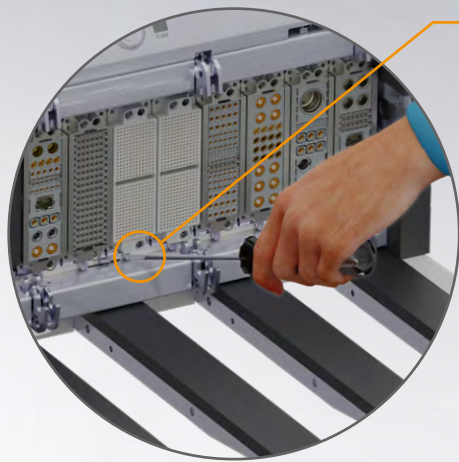
A variety of ODU-MAC® Blue-Line modules can be integrated in different frame sizes (size 2 or 4).

ENGAGEMENT

The ODU-MAC® Black-Line is available with different engagement options. You can choose between hand lever and electromechanical version.

ODU-MAC[®] **Black-Line**

System features

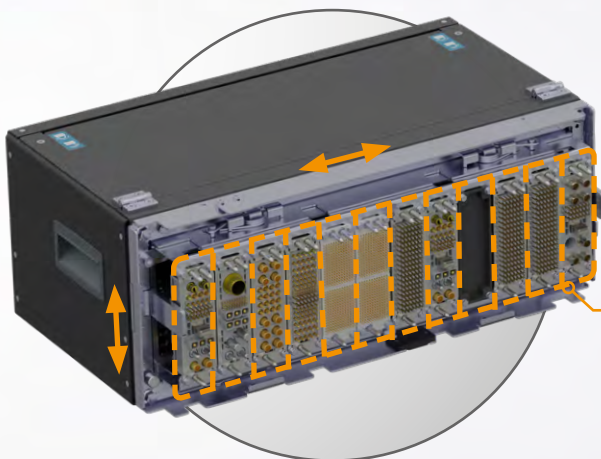


QUICK-LOCK

Time-saving **socket frame unlock / lock** on receiver side with just a 1/4 turn

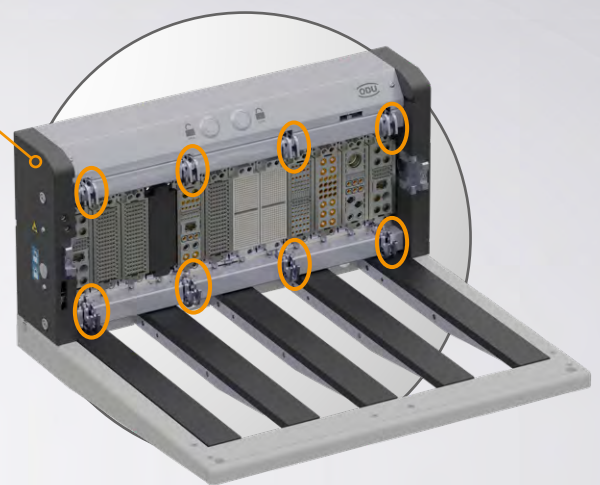
8 TENSIONING POINTS

Equal tensioning ensures safe and reliable connections and prevents interface distortion



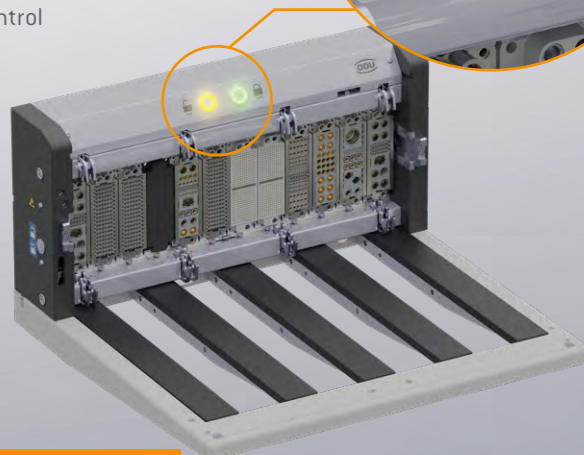
UP TO 12 INDIVIDUAL FLOATING DOCKING FRAMES

Tolerance protection for extended lifespan



ELECTROMECHANICAL ENGAGEMENT OPTION

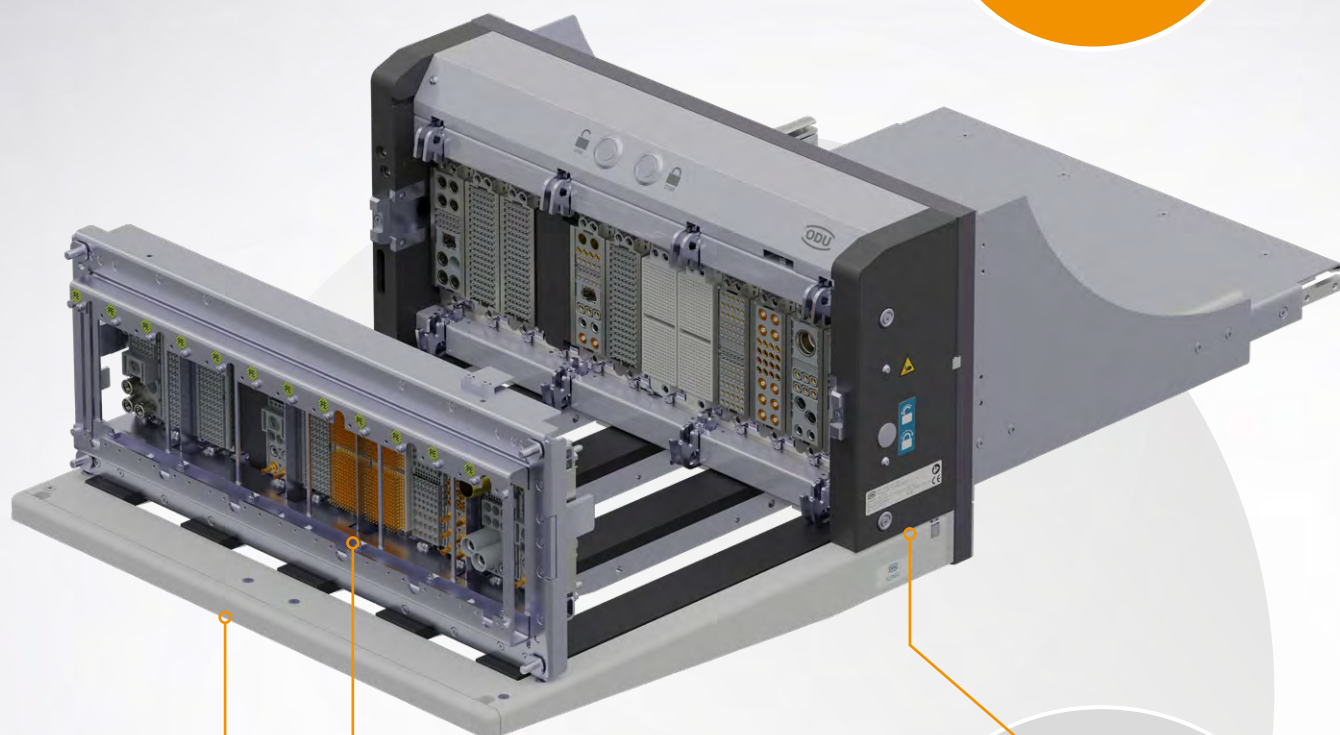
- + Increased safety through push-button operation compared to the mechanical version
- + Optimum use of space by eliminating the hand lever (reduced space requirement)
- + Time-saving automation is possible through remote control
- + Suitable for easy integration into an inline tester
- + Energy-efficient drive – power consumption only during mating and demating



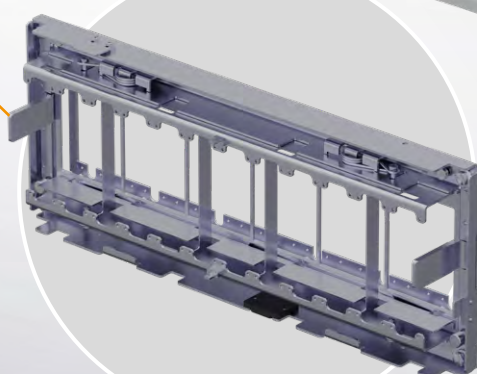
ODU-MAC[®] **Black-Line**

12-Flex FOUR A (Advanced Class)

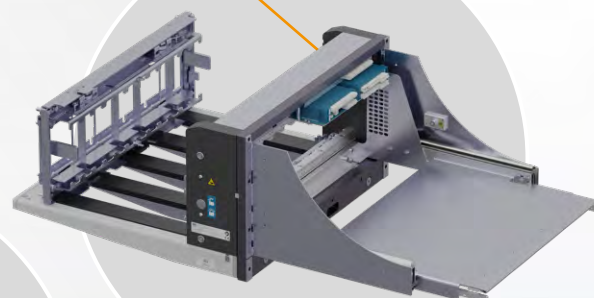
Innovative
engagement option:
**electromechanical
version**



Platform

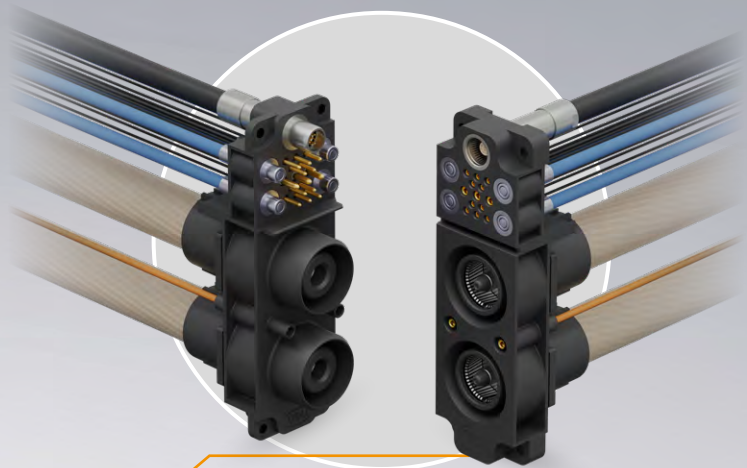


Front view of
12-Flex FOUR A Adapter
(ITA)



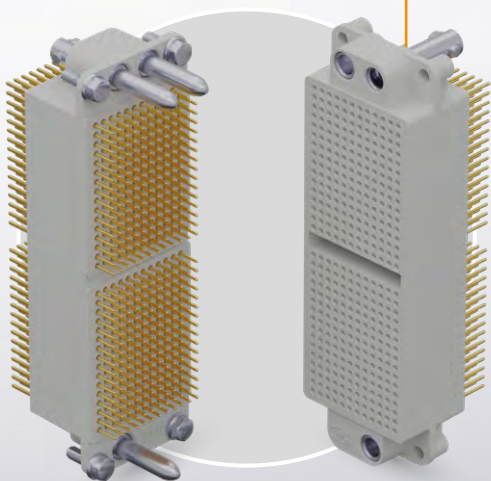
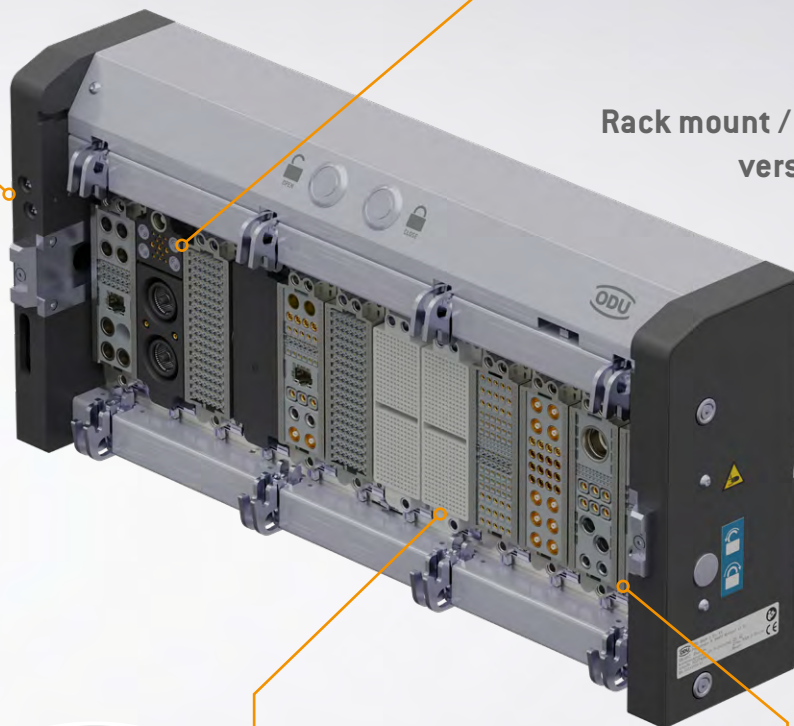
Back view of
slide mount

Optional
resistance
coding



POWER BLOCK

Rack mount / In-line tester
version



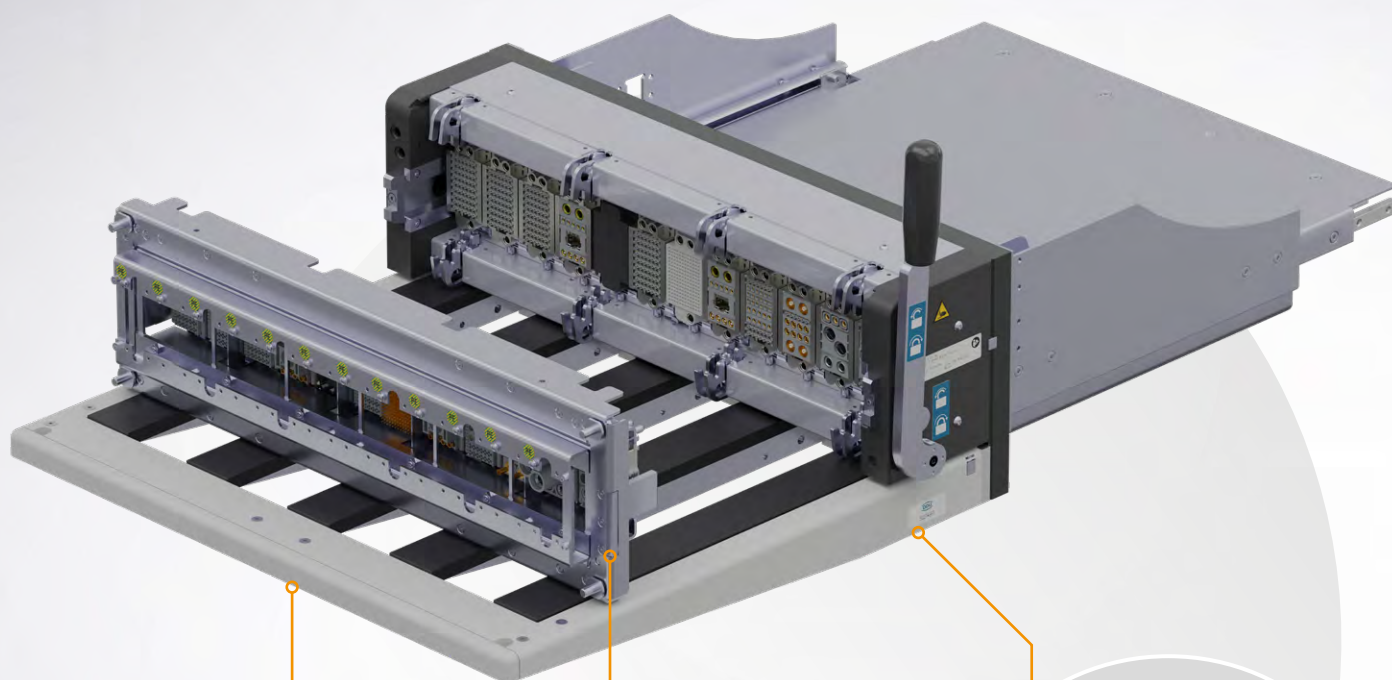
Signal Blocks
Size 4



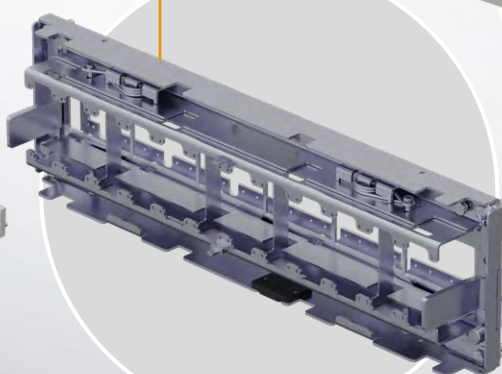
Frames
Size 4

ODU-MAC[®] **Black-Line**

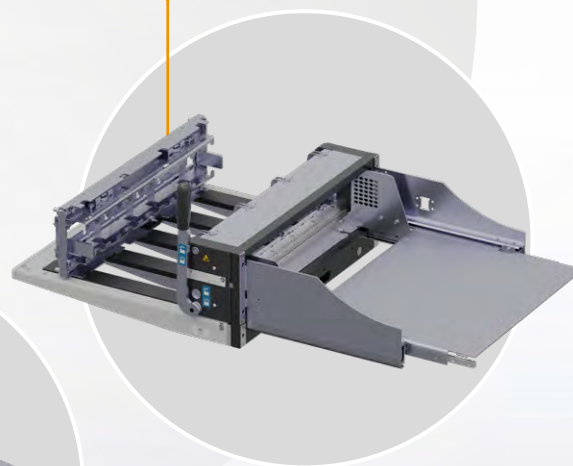
12-Flex TWO M (Basic Class)



Platform



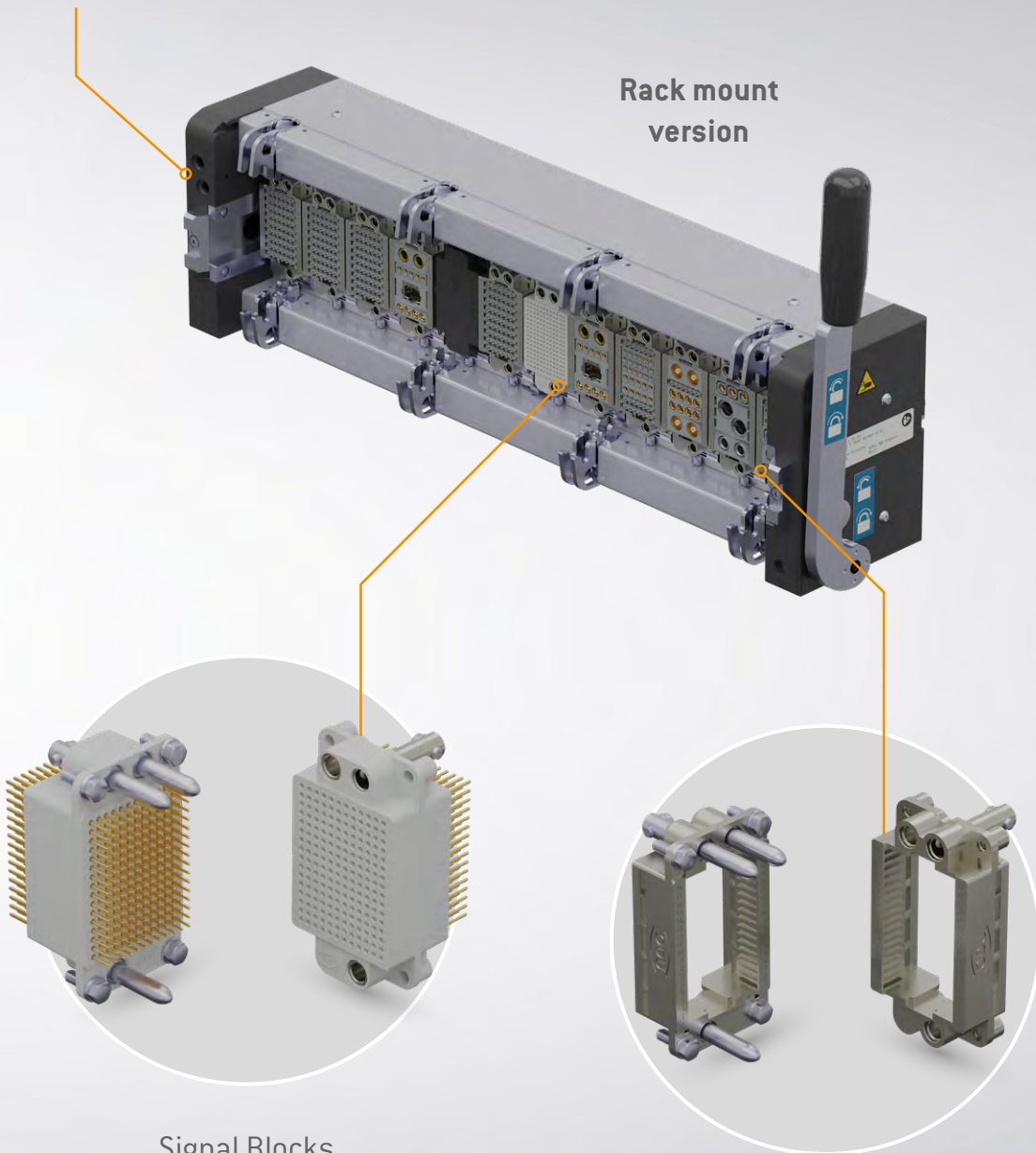
Front view of
12-Flex TWO M Adapter (ITA)



Back view of
slide mount

Optional
resistance
coding

Rack mount
version



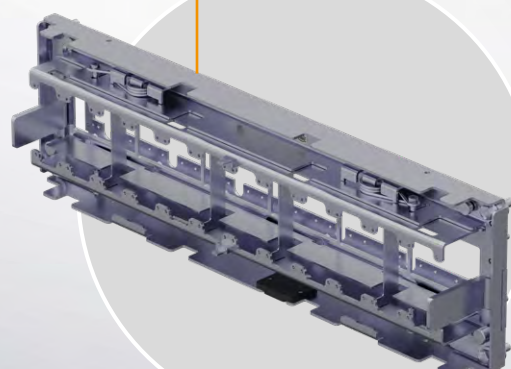
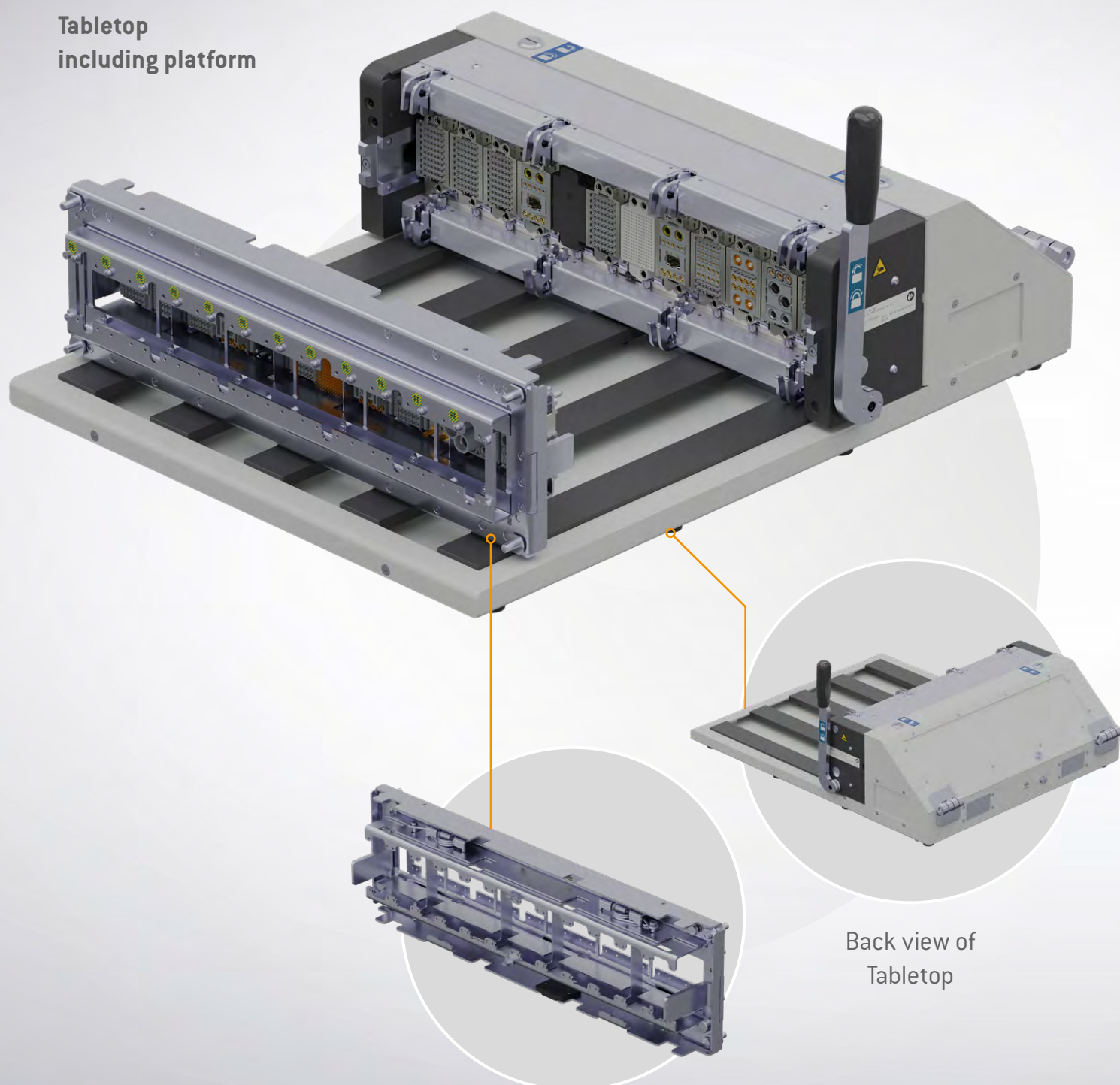
Signal Blocks
Size 2

Frames
Size 2

ODU-MAC[®] **Black-Line**

12-Flex TWO M Tabletop (Comfort Class)

Tabletop
including platform

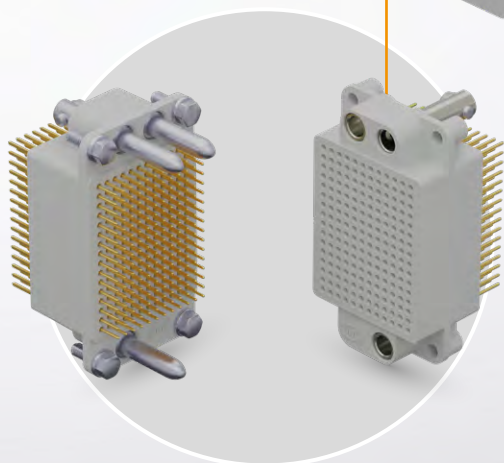
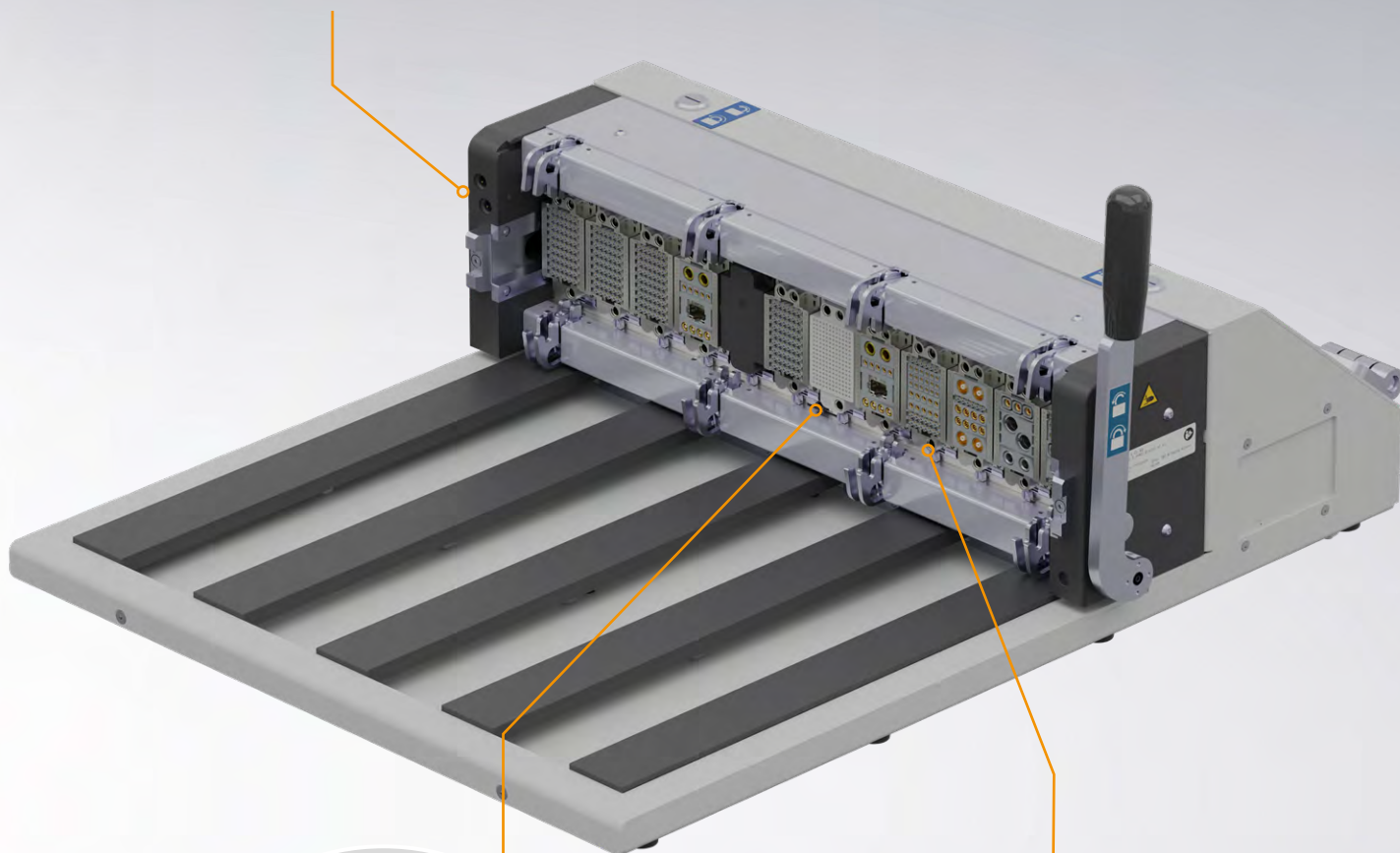


Front view of
12-Flex TWO M Adapter (ITA)

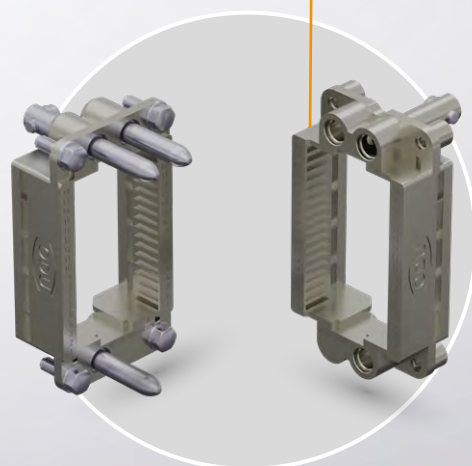


Back view of
Tabletop

Optional
resistance
coding



Signal Blocks
Size 2

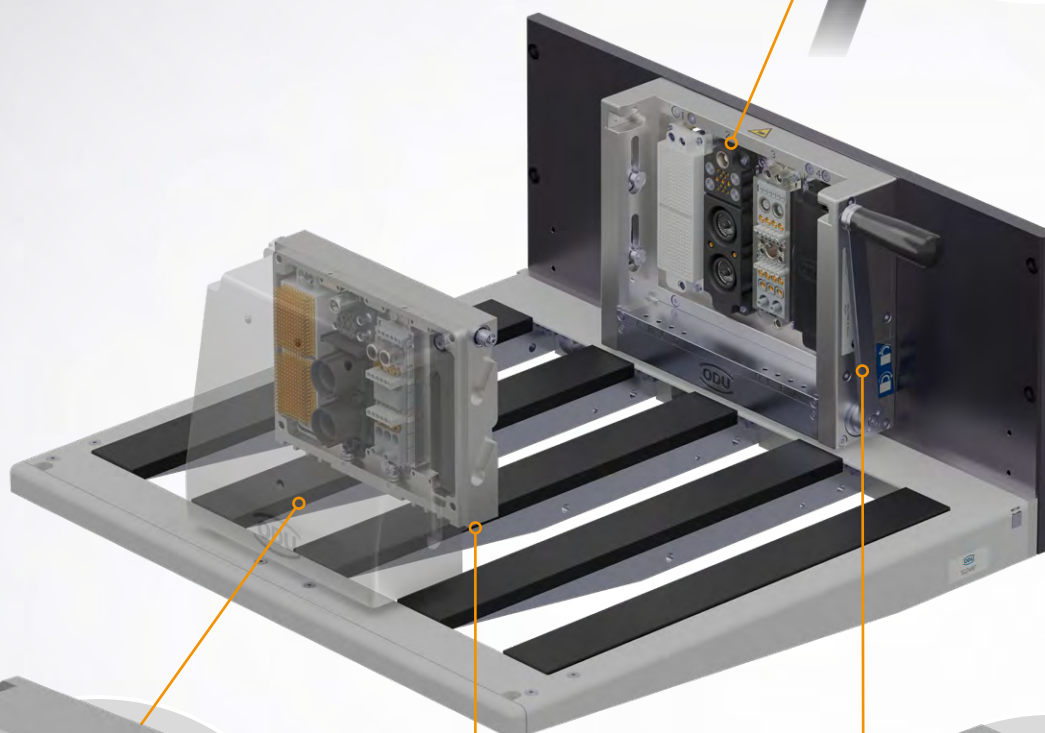


Frames
Size 2

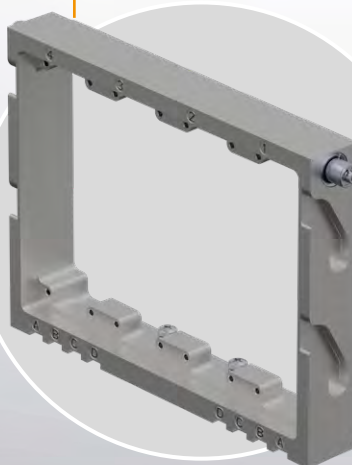
ODU-MAC[®] **Black-Line**

4-Flex FOUR M (Compact Class)

Direct connection with
ODU-MAC[®] RAPID



Housing
Adapter



Front view of
4-Flex FOUR M Adapter (ITA)



Front view of
Rack mount version
with hand lever

Mechanical
coding

Power Block

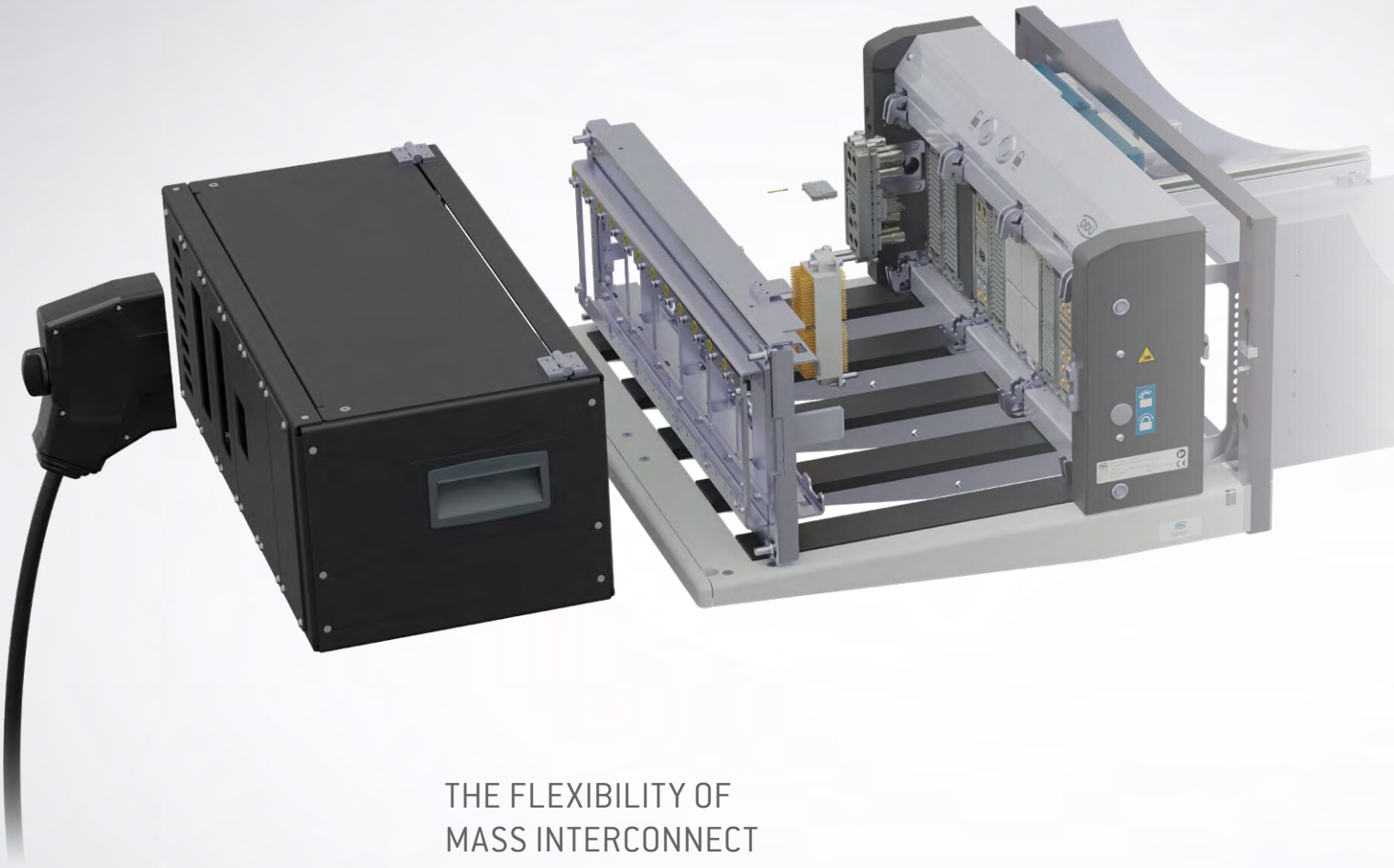
Rack mount
version

Signal Blocks
Size 4

Frames
Size 4

ODU-MAC® **Black-Line**

ENCLOSURE 15" and 9" variant



THE FLEXIBILITY OF MASS INTERCONNECT

- + Additional interface for device test
(climate chamber, oven, and so on)
- + High flexibility due to standard and
customizable flange plates for various connectors
- + Facilitating the use of existing interfaces
- + Wide space for cable harnessing, PCB boards and
additional equipment like electronics

Enclosure 15"



Enclosure 9"

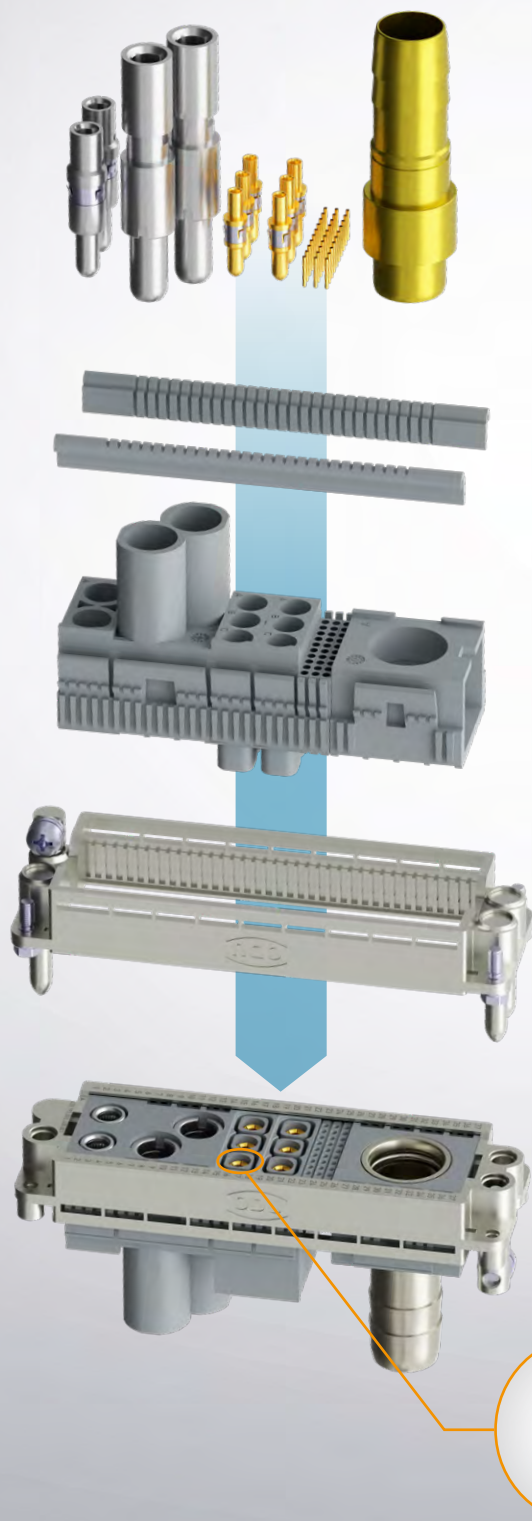


Flange plates in various sizes

ODU-MAC® **Blue-Line**

The modular system at a glance

The modules of the ODU-MAC® Blue-Line stand out due to their easy handling, flexibility and high performance. You can choose between a variety of modules to get the perfect solution for every application. Due to the tool-free assembly and removal of the modules in the frame, the system is very user-friendly. The exchange of the crimp-clip contacts is easy, even when assembled.



+ Contacts for solder, crimp, PCB termination, wire wrap and wire mount

+ Secondary locking part

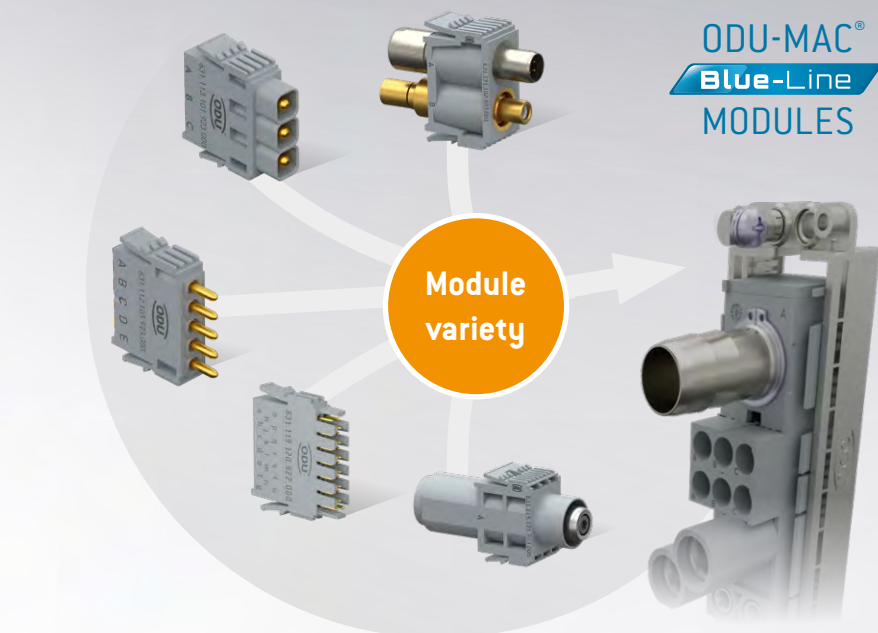
+ Variety of modules to choose from

+ Pin frame

+ Socket frame

+ Contacts with clip principle can be removed even when assembled

Proven ODU-MAC® Modularity



ODU-MAC®
Blue-Line
MODULES

Module
variety

+ Economical

Easy handling: clip-in assembly and removal of the modules in the frame without using tools

+ Flexible

- 2 frame sizes
- Different modules available: transmission of signals, power, high-current, high-voltage, coax, compressed air, fluid, vacuum, data and fiber optic
- Maximum contact density via the 2.4 mm grid (1 unit)
- Easy disassembling of most contacts from the module front side

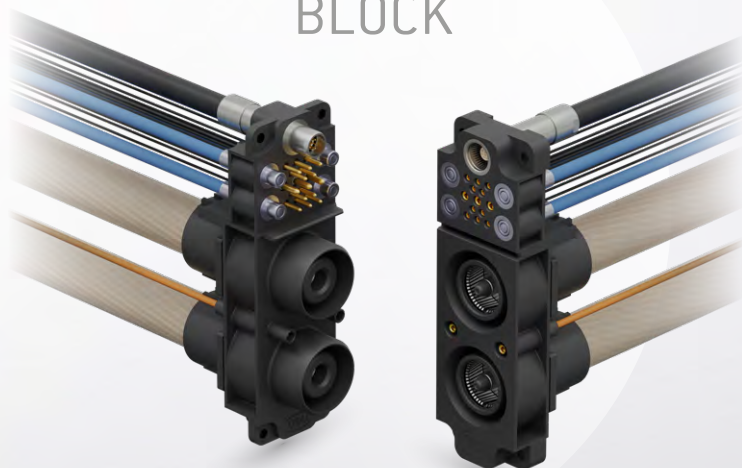
+ Rugged

- Impressive adapter frame (ITA) including a pre-guiding system
- Each of the 12 connectors that can be integrated is also fitted with guiding pins and bearings that allow for radial play of ± 0.6 mm.

+ Reliable

ODU Contact Technology with five types of termination technology for connecting the turned contacts: crimping, soldering, PCB / print, wire wrap and wire mount socket

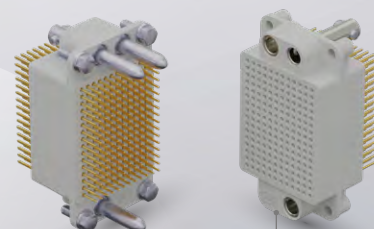
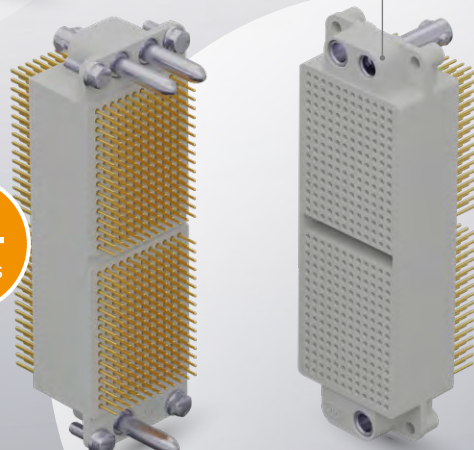
POWER
BLOCK



192
contacts

Size 4 +

384
contacts



Size 2 +

SIGNAL BLOCK

The contact principle

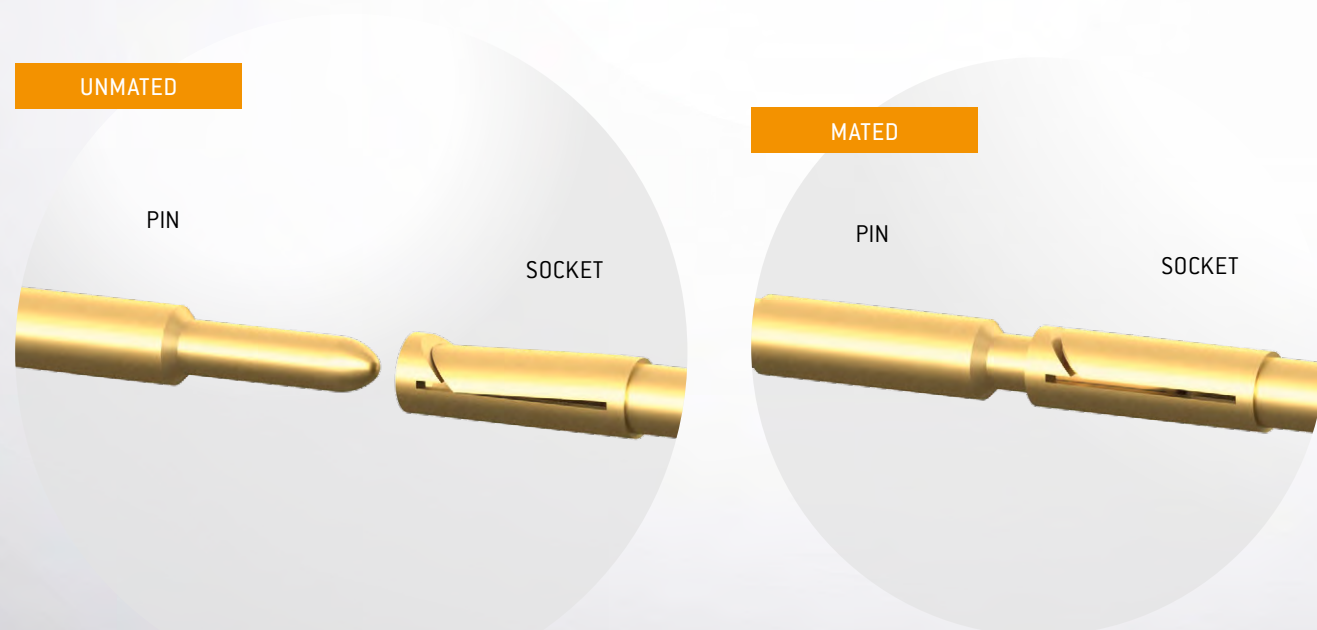
ODU Contacts meet the highest quality standards and enable safe and reliable connections. In order to achieve this, ODU relies on high-performance contact technologies with constant contact resistance. In the turned contact category, we essentially distinguish between lamella and slotted contacts. The socket pieces differ, but the pins are always the same and always solid.

ODU TURNTAC®

Contacts in slotted version

The universal ODU TURNTAC® contact system combines the very good contact properties and high quality with economical prices. By means of optimum guidance and assembly in the ODU-MAC® system, the longevity of 10,000 mating cycles and more can be achieved.

The contact principle can even be used in dimensions as tiny as 0.3 mm in diameter. Depending on the version of the slotted contact, the connector system offers two, four, six or more contact areas.



BENEFITS

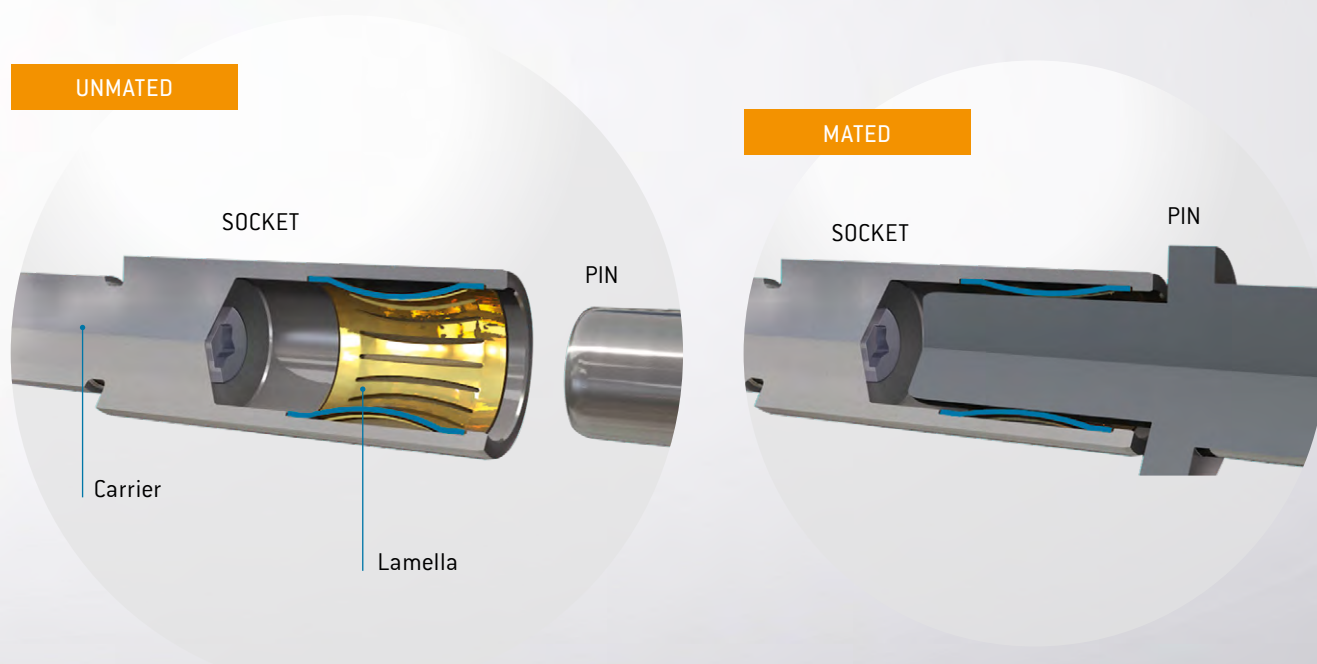
- > 10,000 mating cycles
- Economical solution
- Very small dimensions are possible

Standard contact principle for:	
Signal / high-voltage contact	Ø 0.7–2 mm
Power contact	Ø 3.5 mm
Coax	2 and 4 contacts
Shielded feedthrough	Signal contacts

ODU LAMTAC®

Contacts with lamella technology

The ODU LAMTAC® consists of a turned carrier in which one or several stamped lamella strips are mounted in a fully automated process. The lamella's individual slats make for a multitude of contact points, thereby guaranteeing a high level of contact safety and ease of connecting. The adapted contact force ensures low mating and demating forces, and a long service life with low wear. The mating cycles here are minimum 10,000.



BENEFITS

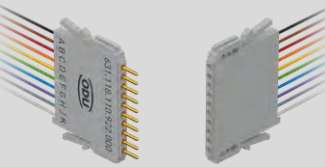
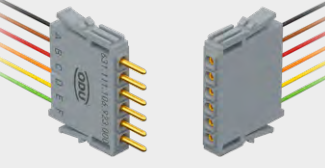
- > 10,000 mating cycles
- High current-carrying capacity
- Low contact resistances
- Low mating and demating forces
- High vibration and shock resistance
- Individual contacts on request

Standard contact principle for:	
Power contact	Ø 5–12 mm
Shielded feedthrough	Shielded transmission
PE	Ø 8 mm

OVERVIEW OF ALL MODULES

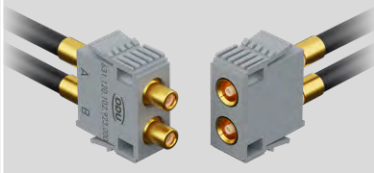
Suitable for ODU-MAC® Black-Line

All modules are also available pre-assembled.

	Modules	Description	Units / width	Features (refer to module level only)
Signal		20 contacts Contact-Ø: 0.7 mm	 4.8 mm	Operating voltage ¹ 200 V Rated surge voltage ¹ 2,000 V Max. continuous current ² 11 A for 0.38 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000 + Maximum contact density and pin protection
		10 contacts Contact-Ø: 0.7 mm	 2.4 mm	Operating voltage ¹ 320 V Rated surge voltage ¹ 2,500 V Max. continuous current ² 11 A for 0.38 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000 + Maximum contact density
		6 contacts Contact-Ø: 1.3 mm	 4.8 mm	Operating voltage ¹ 400 V Rated surge voltage ¹ 3,000 V Max. continuous current ² 19.5 A for 1 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000
		5 contacts Contact-Ø: 2 mm	 7.2 mm	Operating voltage ¹ 630 V Rated surge voltage ¹ 3,000 V Max. continuous current ² 33 A for 2.5 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000
PCB termination	 Available for Receiver side	20 contacts Contact-Ø: 0.7 mm	 4.8 mm	Operating voltage ¹ 200 V Rated surge voltage ¹ 2,000 V Max. continuous current ² 7 A Pollution degree ¹ 2 Mating cycles min. 10,000 + Maximum contact density and pin protection
	 Available for Receiver side	10 contacts Contact-Ø: 0.7 mm	 2.4 mm	Operating voltage ¹ 320 V Rated surge voltage ¹ 2,500 V Max. continuous current ² 7 A Pollution degree ¹ 2 Mating cycles min. 10,000 + Maximum contact density

¹ According to IEC 60664-1:2020 (VDE 0110-1:2022-07) for pollution degree 2 ² For a definition of max. continuous current, see page [71](#)

For more technical details on modules
see the [ODU-MAC® Blue-Line catalog](#)

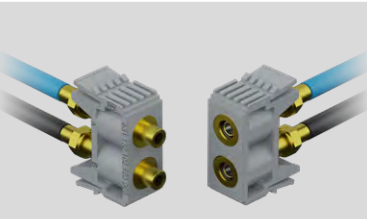
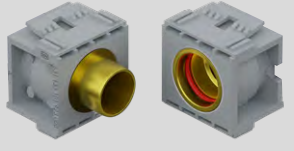
	Modules	Description	Units / width	Features (refer to module level only)
PCB termination	 Available for Receiver side	6 contacts Contact-Ø: 1.3 mm	 4.8 mm	Operating voltage ¹ 400 V Rated surge voltage ¹ 3,000 V Max. continuous current ² 13 A Pollution degree ¹ 2 Mating cycles min. 10,000
	 Available for Receiver side	5 contacts Contact-Ø: 2 mm	 7.2 mm	Operating voltage ¹ 550 V Rated surge voltage ¹ 3,000 V Max. continuous current ² 25 A Pollution degree ¹ 2 Mating cycles min. 10,000
Coax		4 contacts for 50 Ω coax contacts	 7.2 mm	Frequency range 0 – 2.8 GHz Mating cycles min. 10,000  High contact density
		2 contacts for 50 Ω coax contacts	 12 mm	Frequency range 0 – 4 GHz Mating cycles min. 10,000
		2 contacts for 50 Ω coax contacts SMA termination	 12 mm	Frequency range 0 – 12 GHz Mating cycles min. 10,000  12 GHz
		2 contacts for 75 Ω coax contacts	 12 mm	Frequency range 0 – 2.6 GHz Mating cycles min. 10,000

¹According to IEC 60664-1:2020 (VDE 0110-1:2022-07) for pollution degree 2 ²For a definition of max. continuous current, see page [71](#)

OVERVIEW OF ALL MODULES

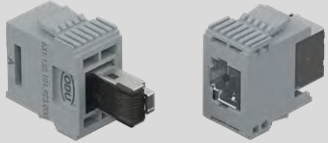
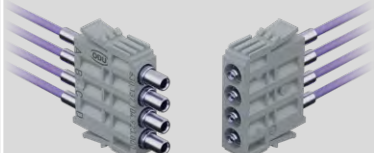
Suitable for ODU-MAC® Black-Line

All modules are also available pre-assembled.

	Modules	Description	Units / width	Features (refer to module level only)
Compressed air / fluid / vacuum coupling		2 contacts	5 Units 12 mm	Tube-Ø Mating cycles + 12 bar inner-Ø: max. 4 mm outer-Ø push-in: max. 6 mm min. 10,000
		2 contacts	5 Units 12 mm	Tube-Ø Mating cycles + 10 bar M5 max. 4 mm min. 10,000
		2 contacts	5 Units 12 mm	Tube-Ø Mating cycles + 10 bar M5 inside thread min. 10,000
		1 contact	12 Units 28.8 mm	Tube inner-Ø Mating cycles + -0.8 bar 16 mm min. 10,000
Shielded feedthrough / high-speed connector		2 to 14 contacts for 2 insert size 1	6 Units 14.4 mm	Mating cycles min. 10,000 Suitable for all common bus systems CAT 5, USB® 2.0, USB® 3.2 Gen 1x1, FireWire®, Ethernet, SPE 10G BASE-T1¹
		2 to 14 contacts for 1 insert size 1	6 Units 14.4 mm	Mating cycles min. 10,000 Suitable for all common bus systems CAT 5, USB® 2.0, USB® 3.2 Gen 1x1, FireWire®, Ethernet, SPE 10G BASE-T1¹

¹ Single Pair Ethernet according to IEC 63171-6:2020(IEEE 802.3ch)

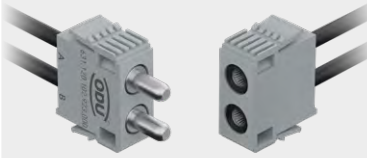
For more technical details on modules
see the [ODU-MAC® Blue-Line catalog](#)

	Modules	Description	Units / width	Features (refer to module level only)
Shielded feedthrough / high-speed connector		3 to 22 contacts for 1 insert size 2	 16.8 mm	Mating cycles min. 10,000 Suitable for all common bus systems HDMI® up to 48 Gbit/s, DisplayPort® up to 40 Gbit/s, USB® up to 10 Gbit/s
		RJ45 insert	 16.8 mm	Mating cycles min. 5,000 10 gigabit Ethernet ¹ according to IEEE 802.3:2022 an CAT 6 according to ANSI/TIA/EIA-568-C.2 CAT 6 _A according to ANSI/TIA-568.2-D
Fiber optic (on request)		4 contacts for fiber optic only pre-assembled Physical Contact	 7.2 mm	Mating cycles min. 1,000 max. insertion loss 0.5 dB Single mode 9 / 125 µm Multi mode 50 / 125 µm
		4 contacts for fiber optic only pre-assembled Expanded Beam	 7.2 mm	Mating cycles min. 10,000 Max. insertion loss 1.5 dB Multi mode 50 / 125 µm
		5 contacts for fiber optic POF	 7.2 mm	Mating cycles min. 10,000 Insertion loss typical 1.5 dB for 660 nm

OVERVIEW OF ALL MODULES

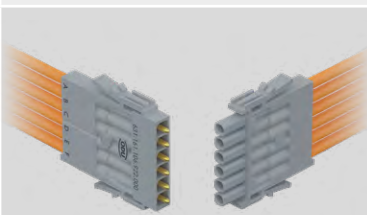
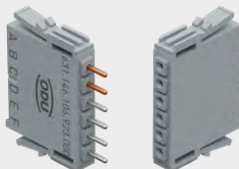
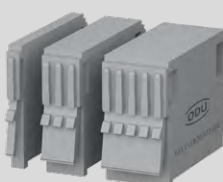
Suitable for ODU-MAC® Black-Line

All modules are also available pre-assembled.

	Modules	Description	Units / width	Features (refer to module level only)
High-current		2 contacts for turned contacts with ODU LAMTAC® ² Contact-Ø: 5 mm	5 Units 12 mm	Operating voltage ¹ 400 V Rated surge voltage ¹ 4,000 V Max. continuous current ² 108 A for 16 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000
		2 contacts for turned contacts with ODU LAMTAC® ² Contact-Ø: 8 mm	9 Units 21.6 mm	Operating voltage ¹ 400 V Rated surge voltage ¹ 3,000 V Max. continuous current ² 154 A for 25 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000
		1 contact for turned contacts with ODU LAMTAC® ² Contact-Ø: 12 mm	8 Units 19.2 mm	Operating voltage ¹ 2,500 V Rated surge voltage ¹ 10,000 V Max. continuous current ² 225 A for 50 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000 + High-voltage
		3 contacts Contact-Ø: 3.5 mm	4 Units 9.6 mm	Operating voltage ¹ 2,500 V Rated surge voltage ¹ 10,000 V Max. continuous current ² 58 A for 6 mm ² Pollution degree ¹ 2 Mating cycles min. 10,000 + High-voltage
PE		1 contact with ODU LAMTAC® ² Contact-Ø: 8 mm	5 Units 12 mm	Mating cycles min. 10,000 Conduct cross-section 10 / 16 / 25 mm ²

¹ Single Pair Ethernet according to IEC 63171-6:2020 (IEEE 802.3ch) ² Contact with lamella technology

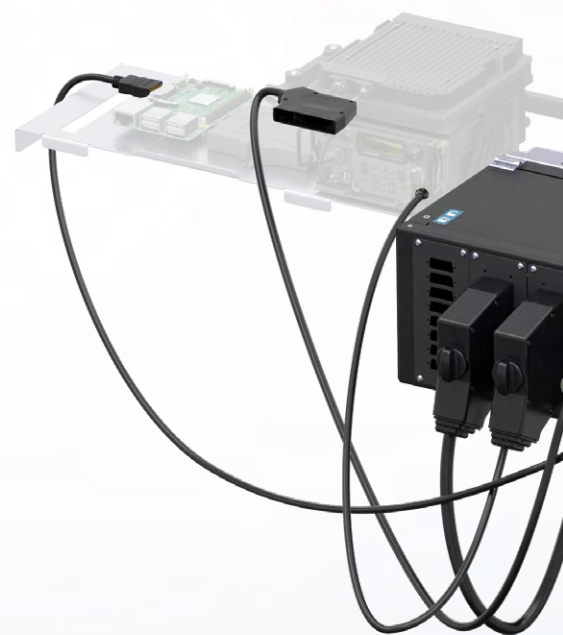
For more technical details on modules
see the [ODU-MAC® Blue-Line catalog](#)

	Modules	Description	Units / width	Features (refer to module level only)
High-voltage		2 contacts Contact-Ø: 1.3 mm	5 Units 12 mm	Operating voltage ¹ 4,000 V Rated surge voltage ¹ 12,000 V Pollution degree ¹ 2 Mating cycles min. 10,000
		6 contacts Contact-Ø: 1.3 mm	2 Units 4.8 mm	Operating voltage ¹ 1,500 V Rated surge voltage ¹ 6,000 V Pollution degree ¹ 2 Mating cycles min. 10,000
Combination		2 contacts High-speed & coax	6 Units 14.4 mm	Mating cycles min. 10,000 Coax 50 Ω/4 GHz or 75 Ω/2.2 GHz Selected inserts are suitable and qualified for data rates up to 5 Gbit/s. Suitable for CAT 5, USB® 2.0, USB® 3.2 Gen 1x1, FireWire®, Ethernet, SPE 10G BASE-T1 ²
		2 contacts High-speed & compressed air	6 Units 14.4 mm	Mating cycles min. 10,000 Compressed air 12 bar Selected inserts are suitable and qualified for data rates up to 5 Gbit/s. Suitable for CAT 5, USB® 2.0, USB® 3.2 Gen 1x1, FireWire®, Ethernet, SPE 10G BASE-T1 ²
Thermocoupling		6 contacts Contact-Ø: 1.0 mm	2 Units 4.8 mm	Thermocouple type K & T, others on request Mating cycles min. 5,000
Blank modules		Blank modules	1 Units 2.4 mm 3 Units 7.2 mm 5 Units 12 mm	Used to fill incomplete frames.

¹ According to IEC 60664-1:2020 (VDE 0110-1:2022-07) for pollution degree 2 ² Single Pair Ethernet according to IEC 63171-6:2020 (IEEE 802.3ch)

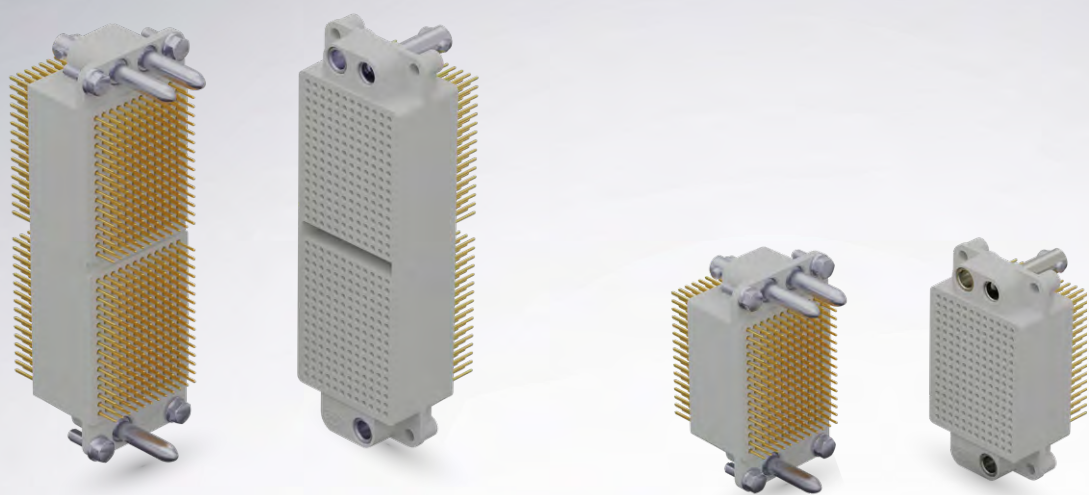
ODU-MAC[®] **Black-Line**

DOCK. TEST. DONE.





Signal Block



Part number	Description
SIZE 4	
637.114.384.922.001	Receiver Signal Block (socket)
638.114.384.922.001	ITA (Adapter) Signal Block (pin)
637.114.384.922.004	4-Flex FOUR Receiver (socket)
SIZE 2	
637.112.192.922.001	Receiver Signal Block (socket)
638.112.192.922.001	ITA (Adapter) Signal Block (pin)
CONTACTS	
185.720.000.270.000	Wire wrap pin 0.7 mm (termination 9.0 mm)
175.569.000.270.000	Print socket 0.7 mm
ODU-MAC® Blue-Line catalog	0.7 mm contacts from the ODU-MAC Blue-Line® catalog
PRE-ASSEMBLED SIGNAL BLOCK	
637.114.384.922.003	Receiver Signal Block (socket) fully equipped with 384 print sockets 0.7 mm
638.114.384.922.002	ITA / Adapter Signal Block (pin) fully equipped with 384 wire wrap pins 0.7 mm (termination 9.0 mm)
637.112.192.922.003	Receiver Signal Block (socket) fully equipped with 192 PCB sockets 0.7 mm
638.112.192.922.002	ITA / Adapter Signal Block (pin) fully equipped with 192 wire wrap pin 0.7mm (termination 9.0 mm)

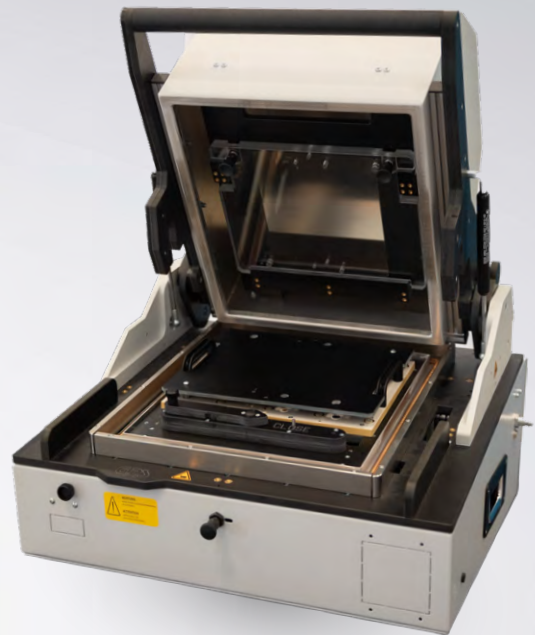
ODU-MAC® **Black-Line**

FLEXIBLE TESTING

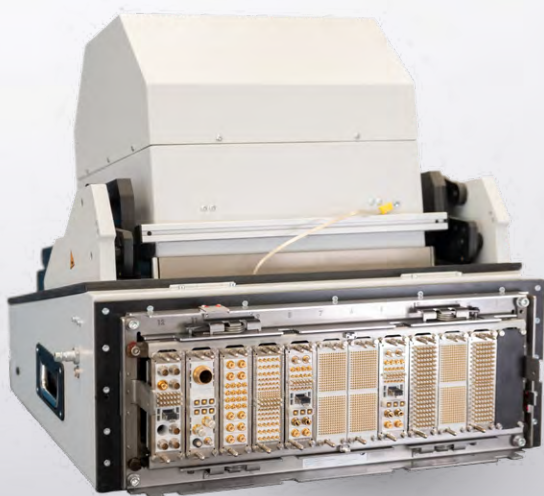
YOUR BENEFITS

WITH THE MASS INTERCONNECT SOLUTION ODU-MAC® BLACK-LINE

- + Consistent connector solution with the ODU-MAC® Blue-Line series – also suitable for interchangeable cassettes
- + As a docking solution, the ODU-MAC® Blue-Line series enables insertion in interchangeable cassettes within adapters. This means that the advantages of consistently low contact resistance and the wide variety of different modules can also be optimally utilized in this application.
- + Thanks to its high modularity, the series allows the flexible combination of a broad spectrum of contact types for signal, power, data or pneumatic transmission – all in a single connector. This means that individual interfaces can be implemented efficiently, in a space-saving and application-optimized manner.
- + The proven ODU contact technology ensures uniform contacting and permanently low contact resistance. This ensures stable, low-loss transmission and maximum process reliability – even with high mating cycles and demanding test conditions.



Single-sided floating mount in combination with guiding pins enables a safe insertion process.

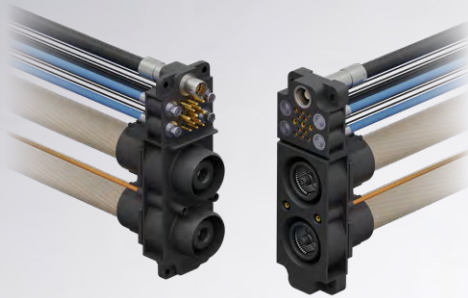


Consistent solution with the ODU-MAC® Blue-Line series. Integrated into the interface to the test track on the left. Right with additional interchangeable cassette in the adapter. Example shows an HF adapter from GPS.



Power Block

with 2 x 16 mm ODU LAMTAC® FLEX



Contact diameter: 16 mm
Mating cycles: min. 10,000
Current-carrying capacity¹: 600 A

TECHNICAL NOTES

- The current load information is valid for single contacts or fully equipped modules. For use in connector systems, the load should be reduced according to VDE 0298-4:2023-06 see page 67
- The separation between the ODU-MAC® Power contacts Ø 16 mm and touchable parts is designed as basic insulation. For a complete protection against electrical shock, it is necessary that the customer integrates an additional protection. For more information see cross-section standard IEC 61140:2016.
 Samples of an additional protection: connection to the protected earth conductor, voltage or current limiting device.
- For outer slots (12-Flex FOUR: slot 1 and slot 12) it is not allowed to use the Power Blocks

NOTE: Voltage values of the insulator are not valid for busbar mounting.

The voltage values are dependent on the width of the busbar.

Voltage specifications must be recalculated based on customer setup.

Materials	
Insulator	PBT
Flammability plastic	UL 94 V-0
16 mm Lamtac Flex	
Touch protection	PPSU
Contact	Cu alloy
Lamella	CuCr
Flammability	UL 94 V-0

Technical data	
Voltage data according to DIN EN IEC 60664-1:2022-07 ²	
Operating voltage	1,800 V DC
Rated impulse voltage	5 kV
Pollution degree	2
Clearance and creepage distances according to IEC 60664-1:2022	
Clearance distance	5.1 mm
Creepage distance	21.0 mm

Voltage data according to
IEC 61010-1:2010 and
(VDE 0411-1:2020-03)³

Supply voltage on primary side:

150 V < U_{eff} ≤ 300 V

(over voltage category II)

Operating voltage (Pollution degree)	1,800 V DC
---	------------

Mechanical	
Touch protection	IP2X for both sides
Crimp for	Class 5 and 6 cable

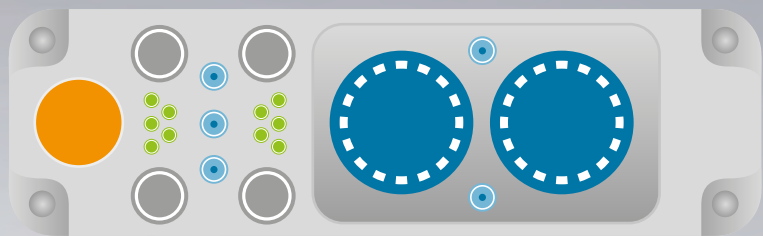
Description	12-Flex	4-Flex
Insulator socket	637.104.022.923.001	on request
Insulator pin	638.104.022.923.001	on request

Contact	Part number	Width of busbar	Conductor cross-section mm ²	Cross-section busbar in mm ² / Number of contacts	Nominal current ⁴ Single contact A	Max. continuous current ¹ Single contact A	Contact resistance in mΩ
Pin	181.770.000.201.000	—	50	—	180	275	0.05
Socket	178.770.140.249.000	—	50	—	180	275	
Pin	181.771.000.201.000	—	70	—	210	320	
Socket	178.771.140.249.000	—	70	—	210	320	
Pin	181.772.000.201.000	—	95	—	240	360	
Socket	178.772.140.249.000	—	95	—	240	360	
Pin	181.773.000.201.000	—	120	—	264	380	
Socket	178.773.140.249.000	—	120	—	264	380	
Pin	181.779.000.201.000	max. 25 mm	M10	200 / 1	350	520	
				280 / 1	400	600	
Socket	178.779.140.249.000			420 / 2 ⁵	600	870	

Crimping tool	Crimp insert	Conductor cross section mm ²
080.000.064.000.000	080.000.064.150.001	50
	080.000.064.170.001	70
	080.000.064.195.001	95

¹ For a definition of max. continuous current, see page 71 ² IEC 60664-1:2020 (VDE 0110-1:2022-07) see page 59 ³ see page 62

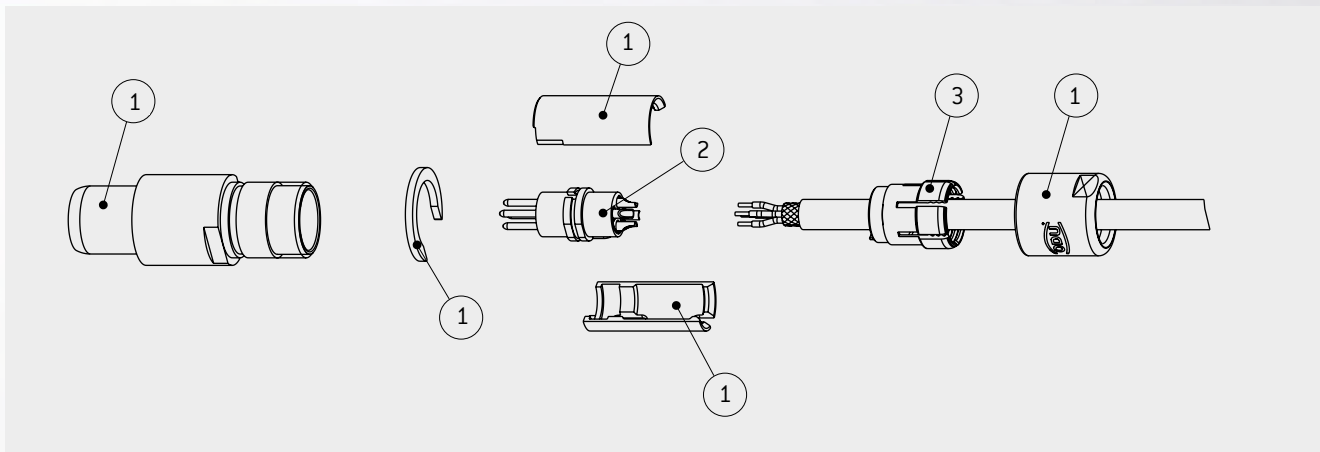
⁴ Determined according to IEC 60512-5-2:2002 at increased temperature 45 K ⁵ Contact bridge necessary



-  see 16 mm contacts from page [32](#)
-  see 2 mm contacts from page [35](#)
-  see fluid or liquid plug sleeves and couplings from page [35](#)
-  see 1.3 mm contacts from page [35](#)
-  see shielded feed-through / high-speed connector size 1 on page [33 - 34](#)

Shielded feed-through / High-speed connector Size 1

HOW TO CONFIGURE



ASSEMBLY SET

Order	Base parts	Part number
1	Socket housing complete	653.002.001.304.000
1	Plug housing complete	653.002.002.304.000
–	Dummy contact	021.341.186.300.000
2	Insert complete solder contacts ¹	see page 34
3	Assembly set	see table on the right

Cable Ø mm	Part number
1.5 to 2.1	751.020.188.304.022
2 to 3.2	751.020.188.304.032
3 to 4.2	751.020.188.304.042
4 to 5.2	751.020.188.304.052
5 to 6.2	751.020.188.304.062
6 to 7.2	751.020.188.304.072
7 to 7.7	751.020.188.304.077 ²

¹ Available with crimp contact upon request. ² It's possible that the cable collet cannot be covered completely over the cable.

Module for multi-position



2 contacts



3 contacts



4 contacts

CAT 5, USB® 2.0⁵



5 contacts



6 contacts



7 contacts



8 contacts



8 contacts

CAT 5



10 contacts

USB® 3.2 Gen 1x1⁵



14 contacts

Number of contacts	Contact diameter mm	Termination cross-section AWG	Model	Category ¹	Insert complete ² Part number
--------------------	---------------------	-------------------------------	-------	-----------------------	--

INSERT WITH ODU TURNTAC® (MATING CYCLES MINIMUM 10,000)

2	1.3	20	Pin	—	701.844.724.002.200
			Socket		701.744.724.002.200
2	0.7	22	Pin	SPE 1000 BASE-T1	701.848.724.002.000
			Socket		701.748.724.002.000
3	1.3	20	Pin	—	701.844.724.003.200
			Socket		701.744.724.003.200
4	0.9	22	Pin	CAT 5 up to 100 Mbit/s	701.849.724.004.200
			Socket		701.749.724.004.200
4	0.9	22	Pin	USB® 2.0	701.849.724.004.000
			Socket		701.749.724.004.000
5	0.9	22	Pin	—	701.849.724.005.200
			Socket		701.749.724.005.200
6	0.7	22	Pin	—	701.848.724.406.200
			Socket		701.748.724.406.200
7	0.7	22	Pin	—	701.848.724.407.200
			Socket		701.748.724.407.200
8	0.7	22	Pin	—	701.848.724.408.200
			Socket		701.748.724.408.200
8	0.5	26	Pin	CAT 5 up to 1 Gbit/s	701.841.724.408.000
			Socket		701.741.724.408.000
10	0.5	28	Pin	—	701.841.724.010.400
			Socket		701.741.724.010.200
10	6 x 0.3 4 x 0.5	28 24	Pin	USB® 3.2 Gen 1x1	701.831.724.410.000
			Socket		701.731.724.410.000
14	0.5	28	Pin	—	701.841.724.014.400
			Socket		701.741.724.014.200

INSERT WITH ODU SPRINGTAC® (MATING CYCLES MINIMUM 60,000)

4	0.76	22	Pin	CAT 5 up to 100 Mbit/s	701.842.724.004.700
			Socket		701.742.724.004.700
5	0.76	22	Pin	—	701.842.724.005.700
			Socket		701.742.724.005.700

¹ Classification acc. to ISO/IEC 11801-1:2017-1. ² Several inserts in crimp model on request.

For more information see [ODU-MAC® White-Line catalog](#) on page 146 – 147.

Contacts 2 and 1.3 mm

2 mm CONTACTS

Contact	Part number	Conductor cross-section mm ²	Termination AWG
Pin short	185.437.000.270.000	1.00–1.50	16–18
Pin long	185.436.000.270.000		
Socket	175.567.000.270.000		
Pin short	185.441.000.270.000	2.50	14
Pin long	185.440.000.270.000		
Socket	175.570.000.270.000		
Contact removal tool	087.7CC.200.003.000		

For more information see [ODU-MAC Blue-Line® catalog](#) on page 100.

1.3 mm CONTACTS

Contact	Part number	Conductor cross-section mm ²	Termination AWG
Pin short	185.432.000.270.000	0.50 – 1.00	18 – 20
Pin long	185.424.000.270.000		
Socket	175.535.000.270.000		
Pin short	185.714.000.270.000	0.14 – 0.38	22 – 26
Pin long	185.713.000.270.000		
Socket	175.A42.000.270.000		
Contact removal tool	087.7CC.130.004.000		

For more information see [ODU-MAC Blue-Line® catalog](#) on page 98.

Compressed air and fluid

COMPRESSED AIR COUPLING

Description	Part number	Termination diameter
Plug sleeve (non shut-off)	196.023.001.300.000	3
Plug sleeve (non shut-off)	196.024.001.300.000	4
Coupling (non shut-off)	196.023.003.300.000	3
Coupling (non shut-off)	196.024.003.300.000	4
Plug sleeve (shut-off) ^{1,2}	196.025.014.300.000	M5
Coupling (shut-off)	196.023.002.300.000	3
Coupling (shut-off)	196.024.002.300.000	4
Coupling (shut-off) ³	196.025.012.300.000	M5

¹ Only pluggable on coupling 196.025.012.300.000

² Sealing material: FKM ³ Not suitable for mixtures with over 25% oxygen content or explosive gases

Dummy contact 021.341.205.946.000

For more information see [ODU-MAC Blue-Line® catalog](#) on page 116.

FLUID COUPLING

Description	Part number	Termination
Plug sleeve (shut-off)	196.025.015.388.000	M5
Coupling (shut-off)	196.025.016.338.000	M5

For more information see [ODU-MAC Blue-Line® catalog](#) on page 118.

Receiver

12-FLEX FOUR A



Technical data

Supply voltage ¹	24 V / DC
Current- / power input	2 A
Operating temperature	0 to +55 °C
Protection class	IP20 (in mated condition)
Air moisture	0 to 95 % non-condensing
Locking principle	Electromechanical engagement

¹ Return-proof power supply with a minimum capacity (in the power supply or externally of 6.600 µF (class 2 at UL)

Mechanical

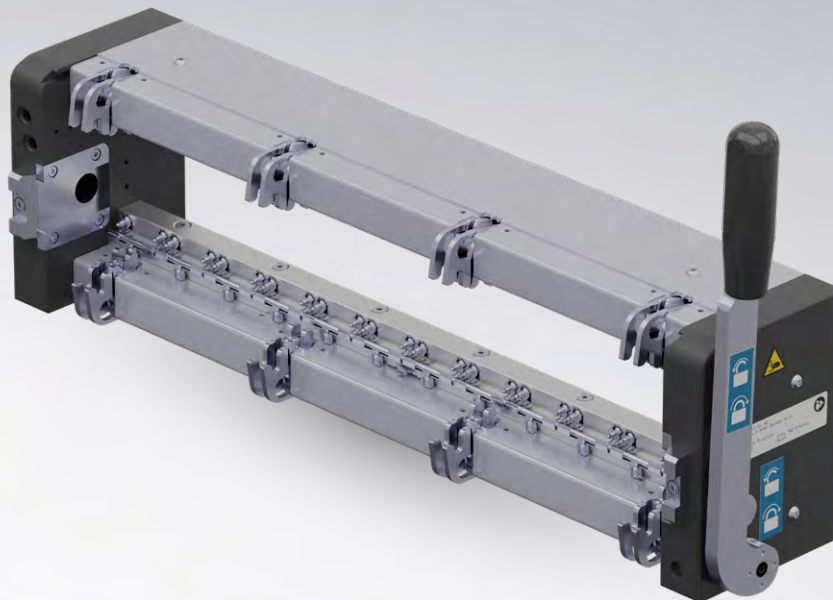
Max. cable length	3 m
Weight	7,400 g
Number of connectors	max. 12 ODU-MAC® Frame size 4
Mating cycles	20,000

RECEIVER VARIANTS

Part number	Inclusive condition monitoring	Inclusive resistance coding
637.011.412.000.001	—	—
637.011.412.001.001	•	—
637.011.412.003.001	•	•
637.011.412.002.001	—	•

Receiver

12-FLEX TWO M



Technical data

Operating temperature	0 to +55 °C
Protection class	IP20 (in mated condition)
Air moisture	0 to 95 % non-condensing
Locking principle	Handle lever engagement

Mechanical

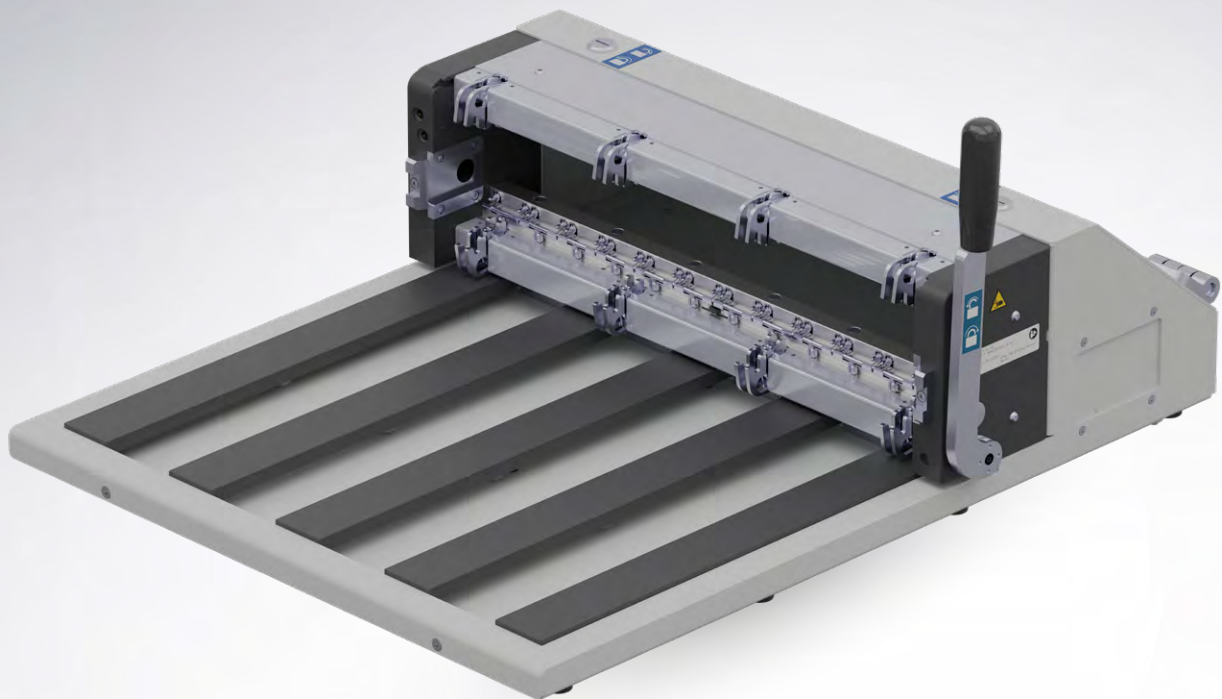
Weight	4,860 g
Number of connectors	max. 12 ODU-MAC® Frame size 2
Mating cycles	20,000

RECEIVER VARIANTS

Part number	Inclusive condition monitoring	Inclusive resistance coding
637.012.212.000.001	—	—
637.012.212.001.001	•	—
637.012.212.003.001	•	•
637.012.212.002.001	—	•

Receiver

12-FLEX TWO M Tabletop



Technical data	
Operating temperature	0 to +55 °C
Protection class	IP20 (in mated condition)
Air moisture	0 to 95 % non-condensing
Locking principle	Handlever engagement

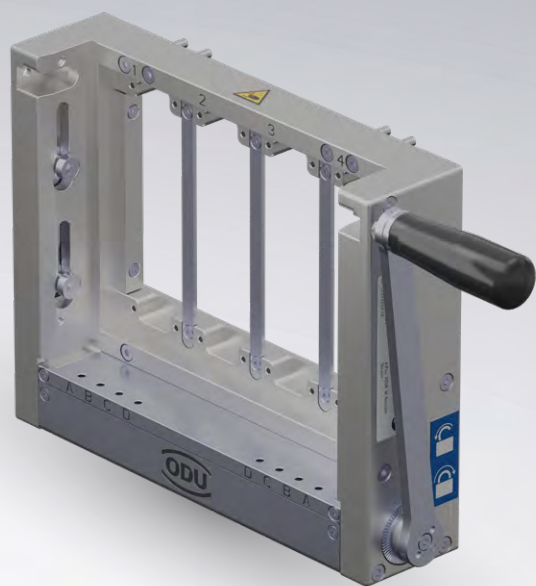
Mechanical	
Weight receiver	4,770 g
Weight complete assembly	13,180 g
Number of connectors	max. 12 ODU-MAC® Frame size 2
Mating cycles	20,000

RECEIVER VARIANTS

Part number	Inclusive condition monitoring	Inclusive resistance coding
637.032.212.000.002	—	—
637.032.212.001.002	•	—
637.032.212.003.002	•	•
637.032.212.002.002	—	•

Receiver

4-FLEX FOUR M

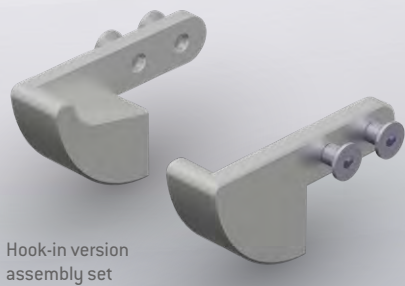


Technical data	
Operating temperature	0 to +55 °C
Protection class	IP20 (in mated condition)
Air moisture	0 to 95 % non-condensing
Locking principle	Handlever engagement

Mechanical	
Weight	4,860 g
Number of connectors	max. 4 ODU-MAC® Frame size 4
Mating cycles	20,000

RECEIVER VARIANTS

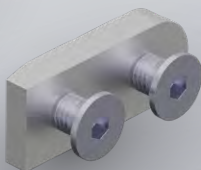
Part number	Description
637.012.404.001.001	4-Flex FOUR M Receiver standard
on request	4-Flex FOUR M Receiver with locking option
637.050.000.000.004	Hook-in version assembly set
637.050.000.000.005	Platform version assembly set
637.050.000.000.007	Coding set receiver



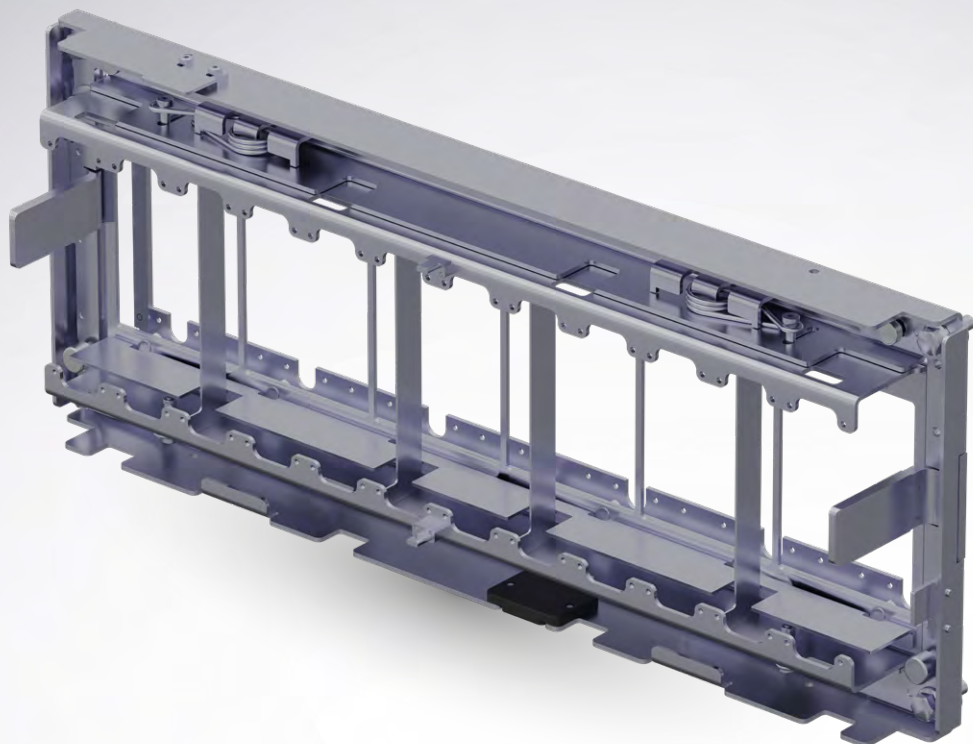
Hook-in version assembly set



Platform version assembly set



ITA
12-FLEX FOUR A

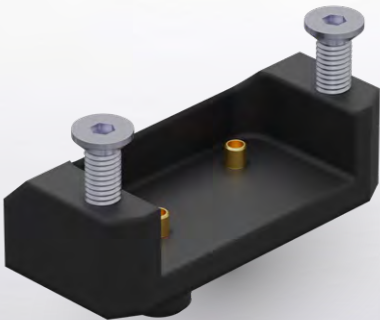


Technical data	
Operating temperature	0 to +55 °C
Protection class	IP20 (in mated condition)
Air moisture	0 to 95% non-condensing

Mechanical	
Weight receiver	3,600 g
Number of connectors	max. 12 ODU-MAC® frame size 4
Mating cycles	20,000

ITA VARIANTS

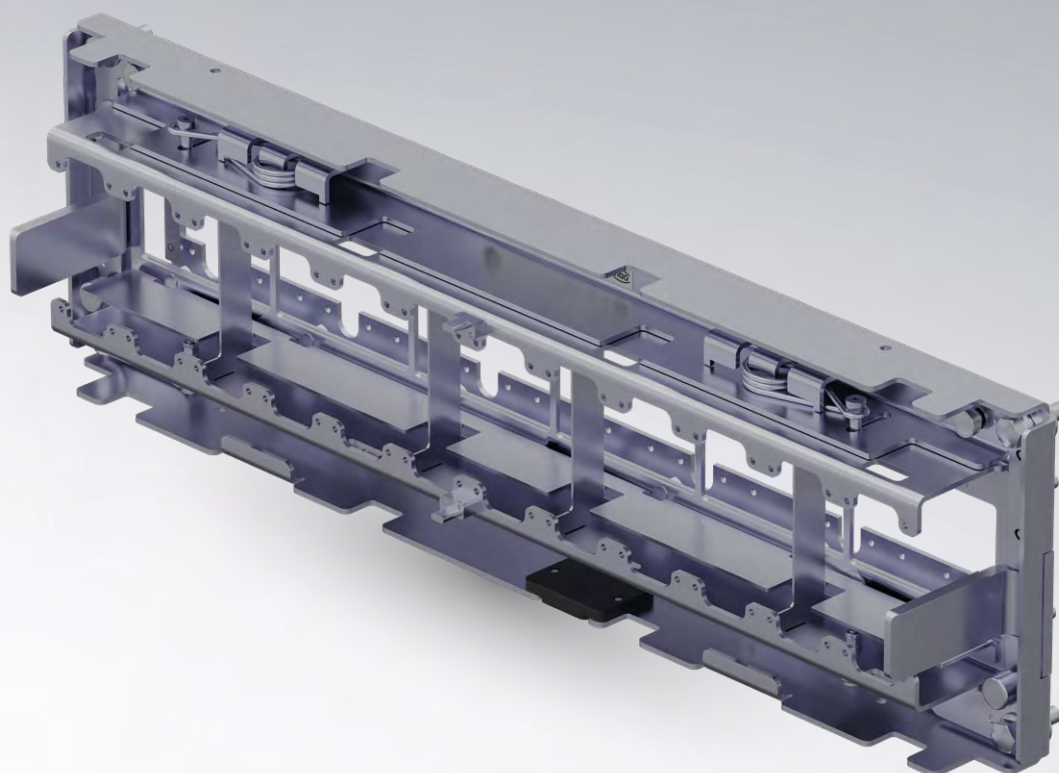
Part number	Description
638.021.412.100.001	12-Flex FOUR A (ITA)
638.050.000.000.001 (Same number for both ITA sizes)	Adapter kit resistance coding



Adapter kit resistance coding

ITA

12-FLEX TWO M



Technical data

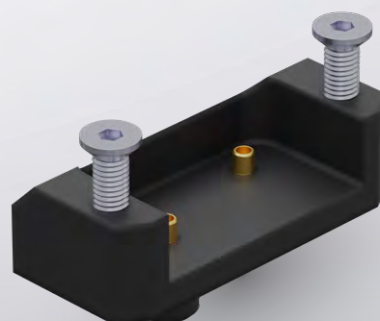
Operating temperature	0 to +55 °C
Protection class	IP20 (in mated condition)
Air moisture	0 to 95 % non-condensing

Mechanical

Weight	3,400 g
Number of connectors	max. 12 ODU-MAC® frame size 2
Mating cycles	20,000

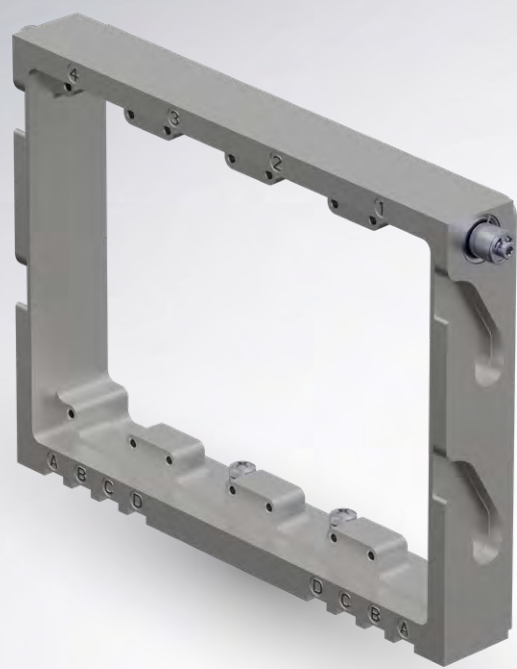
ITA VARIANTS

Part number	Description
638.022.212.100.001	12-Flex TWO M (ITA)
638.050.000.000.001 (Same number for both ITA sizes)	Adapter kit resistance coding



Adapter kit resistance coding

ITA
4-FLEX FOUR M

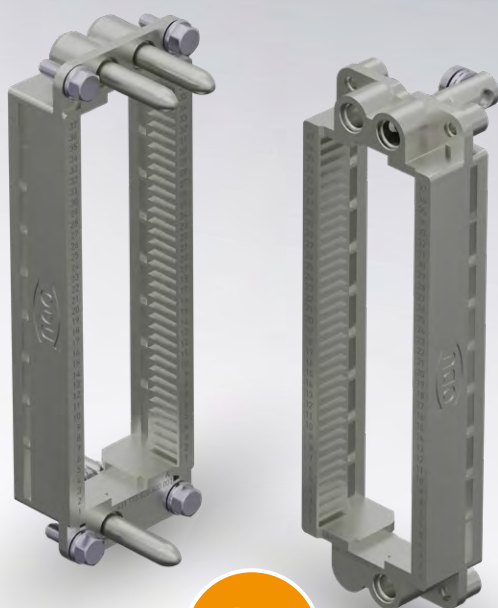


ITA VARIANTS

Part number	Description
638.022.404.001.001	4-Flex FOUR M (ITA)
638.050.000.000.009	Coding set adapter
638.050.000.000.013	Floating set short (2.0 mm – 3.5mm wall thickness) <i>Available from June 2026</i>
638.050.000.000.012	Floating set long (4.0 mm – 5.5 mm wall thickness) <i>Available from June 2026</i>

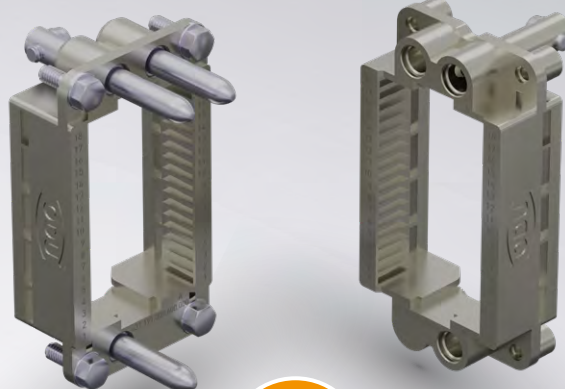
FRAMES

Size 4



37
units

Size 2



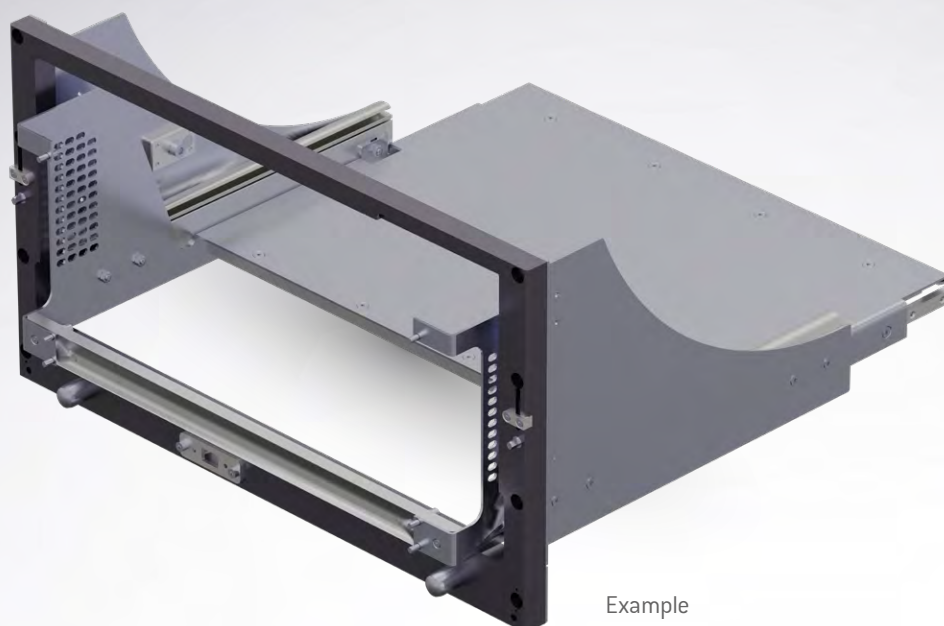
18
units

FRAME VARIANTS

	12-Flex FOUR A	12-Flex TWO M (Rack & tabletop)	4-Flex FOUR M
Receiver side	630.193.000.600.001	630.191.000.600.001	630.193.000.600.000
ITA side	631.193.020.600.001	631.191.020.600.001	631.193.020.600.001

The frames used for the ODU-MAC® Black-Line portfolio are out of the ODU-MAC® Blue-Line product range. Therefore the technical specifications can be found in the [ODU-MAC® Blue-Line catalog](#).

SLIDE MOUNT



Example

Technical data

Maximal expansion length	approx. 340 mm
Maximal carry capacity	Receiver including equipment

SLIDE MOUNT VARIANTS

Part number	Description	Weight	Max. loading capacity of the supporting surface
637.040.412.000.001	12-Flex FOUR A slide mount with platform option	8,160 g	15 kg
637.040.412.000.002	12-Flex FOUR A slide mount without platform option	7,230 g	15 kg
637.040.212.000.001	12-Flex TWO M slide mount with platform option	7,870 g	15 kg
637.040.212.000.002	12-Flex TWO M slide mount without platform option	6,870 g	15 kg
637.040.012.000.001	200 mm platform extension for slide mount	1,620 g	15 kg

MOUNTING FRAMES FOR RECEIVERS



MOUNTING FRAME VARIANTS

Part number	Description	Weight
637.040.412.000.006	12-Flex Four A Receiver mounting frame with platform option	1,980 g
637.040.412.000.005	12-Flex Four A Receiver mounting frame without platform option	1,820 g
637.040.212.000.006	12-Flex TWO M Receiver mounting frame with platform option	1,930 g
637.040.212.000.005	12-Flex TWO M Receiver mounting frame without platform option	1,770 g
637.040.404.000.001	4-Flex FOUR M Receiver mounting frame with platform option	2,620 g
637.040.404.000.002	4-Flex FOUR M Receiver mounting frame without platform option	1,920 g

PLATFORM

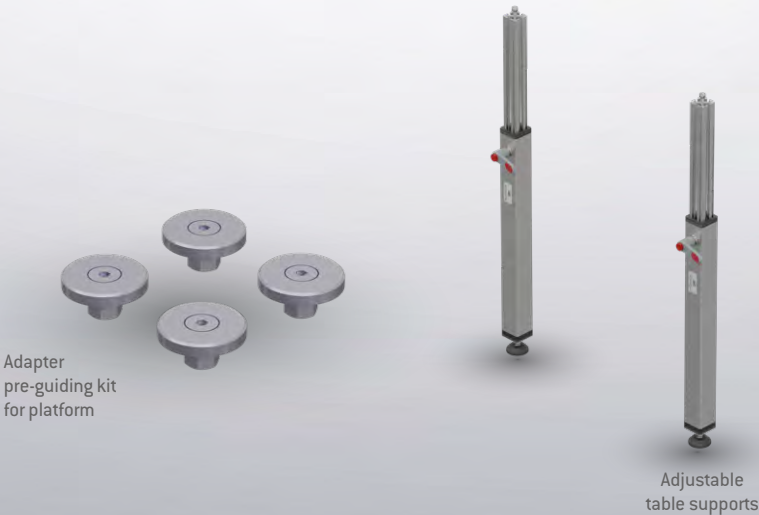


Example

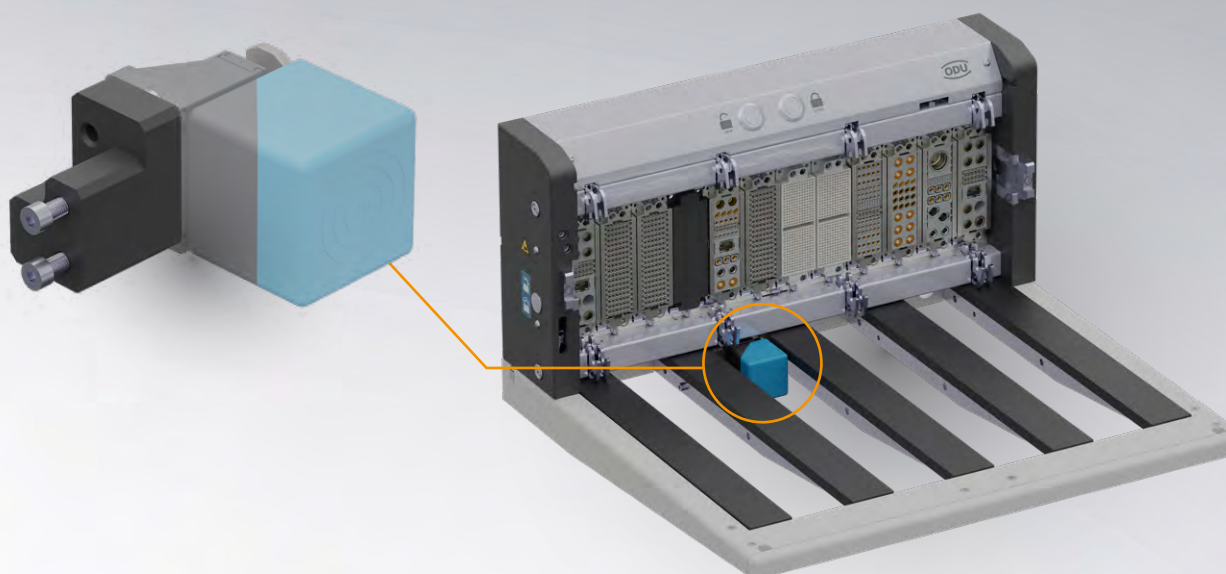
Technical data		
	15"	20"
Weight	7,500 g	8,100 g
Maximal load without adjustable table supports	30 kg	–
Maximal load with adjustable table supports	85 kg	85 kg

PLATFORM VARIANTS

Part number	Description
637.040.012.000.006	Platform 9" Available from June 2026
637.040.012.000.002	Platform 15"
637.040.012.000.004	Platform 20"
638.050.000.000.003	Adapter pre-guiding kit for platform
637.040.000.000.001	Adjustable table support



RFID (Holder for reader)



HOLDER VARIANTS

Part numbers for 15" and 20" platform	Part numbers for 9" platform Available from June 2026	Description
638.050.000.000.007	638.050.000.000.010	Holder for SICK reader
638.050.000.000.008	638.050.000.000.011	Holder for IFM reader

SICK Reader Type: RFH515-1004301

IFM Reader Type: Type: ANT515

Please note: The reader is not included in the delivery of the holders.

Recommended RFID TAG: TURCK: TW-R20-B128

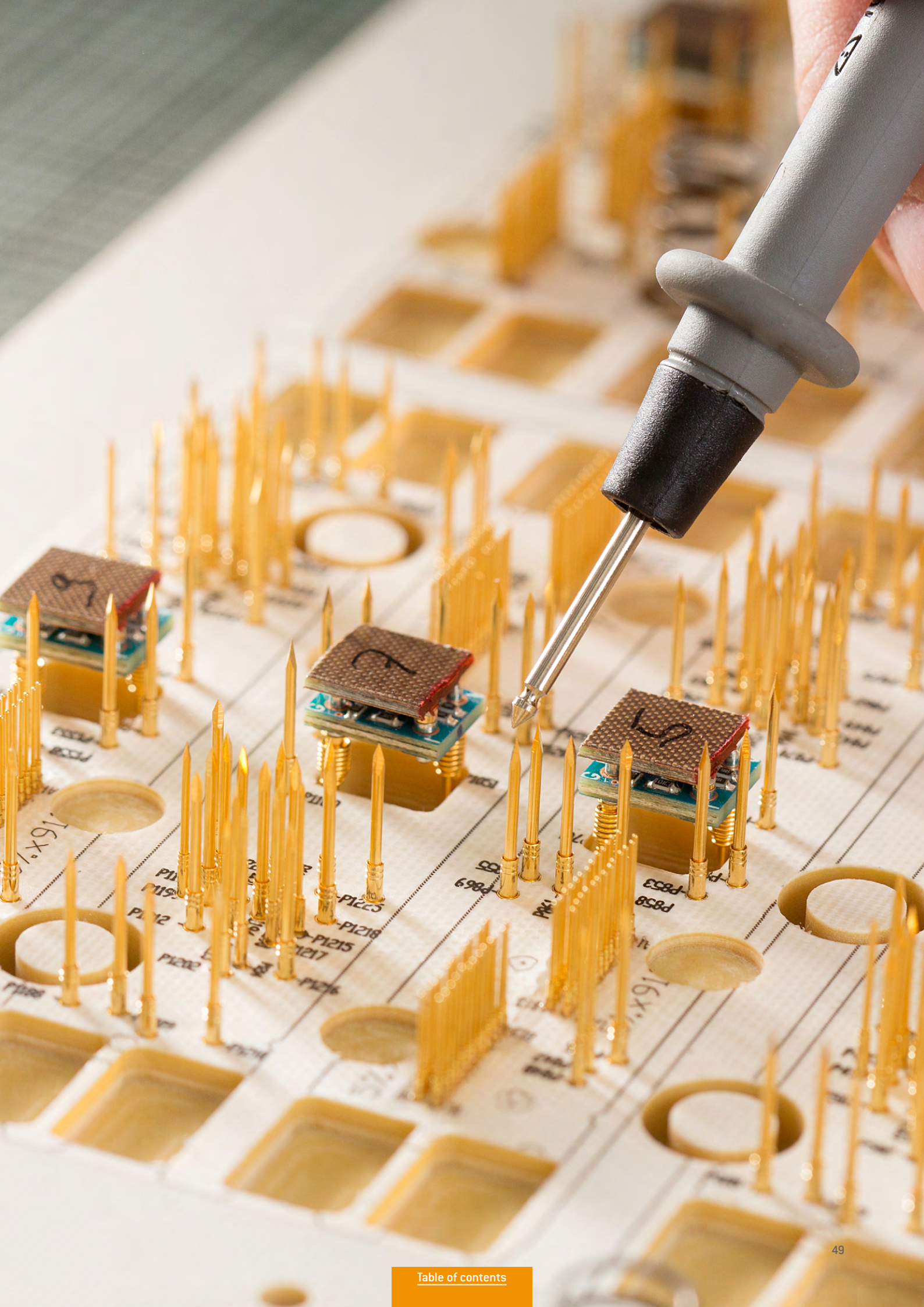
Please note: The reader is not included in the delivery of the holders or ITA. The recommended TAG will work for both readers and is easily mountable on our ITA. Other TAGs may work but the customer needs to test it and take care of mounting on the ITA frame.

4-FLEX FOUR M

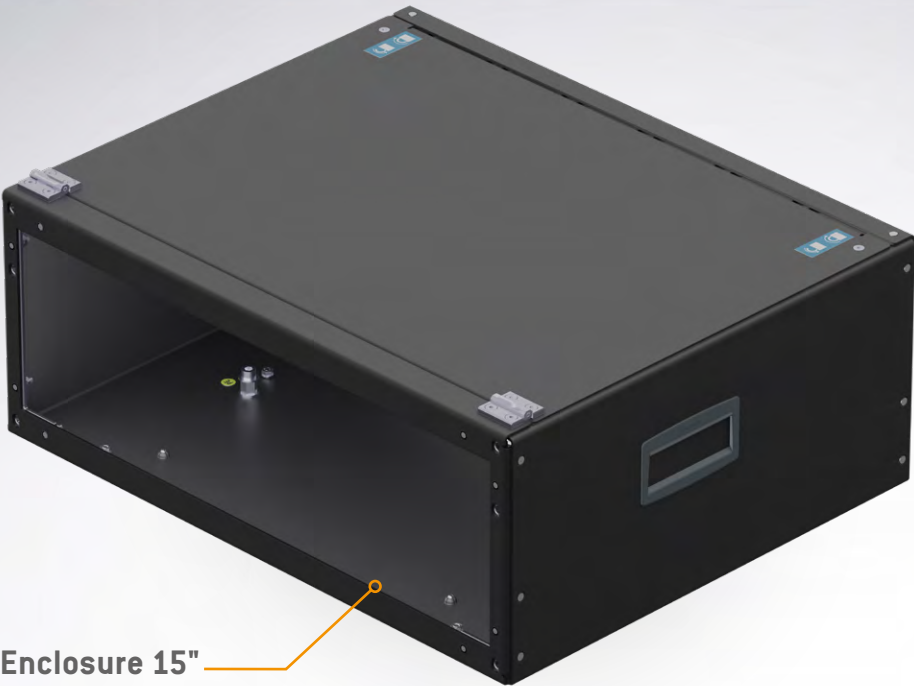
Housing version



Part number	Description
638.052.404.000.005	4-Flex FOUR M housing set
638.052.404.000.001	Strain relief set
638.052.404.000.003	Cover (included in the strain relief set)
638.052.404.000.004	Cover for customer solution



ENCLOSURE



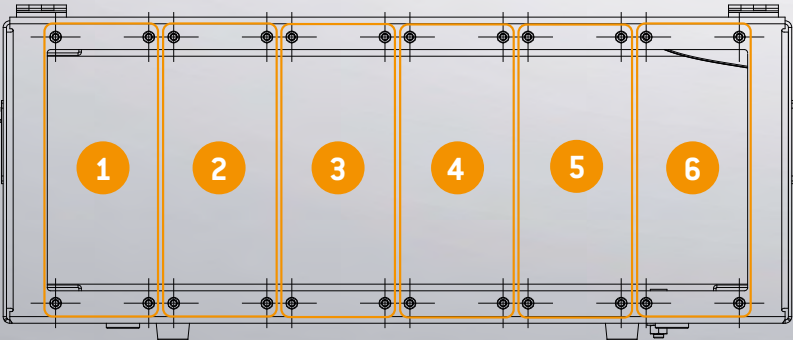
Enclosure 15"

Technical data	
Material	Aluminium
Surface	Black powder coated polyamid PA

ENCLOSURE VARIANTS

Part number	Description
638.040.412.000.001	Enclosure 15" for 12-FLEX FOUR ITA
638.040.412.000.002	Enclosure 9" for 12-FLEX FOUR ITA
638.040.412.000.004	Enclosure 15" for 12-FLEX TWO ITA (Adapter plate need to be ordered separately: See below)
638.040.412.000.003	Enclosure 9" for 12-FLEX TWO ITA (Adapter plate need to be ordered separately: See below)
638.040.212.000.017	Adapter plate for 12-FLEX TWO ITA

ENCLOSURE BACKSIDE

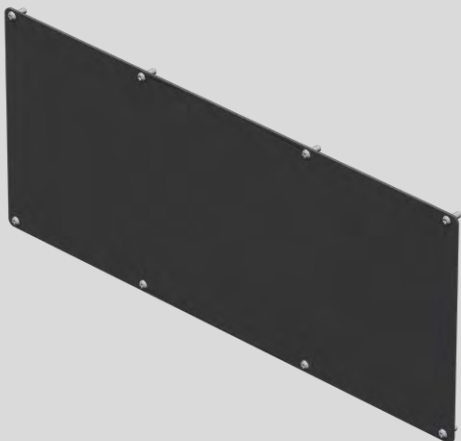


FLANGE PLATES FOR ENCLOSURE

Technical data	
Material	Aluminium
Surface	Black powder coated

ENCLOSURE VARIANTS

ODU Bulkhead housing 1 slot	ODU Rapid housing 1 slot	Feedthroughs 1 slot	Closed 1 slot
			
638.040.212.000.006	638.040.212.000.008	638.040.212.000.010	638.040.212.000.012

D SUB connectors 1 Slot	Closed 2 slots	Closed 6 slots
		
638.040.212.000.014	638.040.212.000.016	638.208.902.000.026

ACCESSORIES

MISCELLANEOUS

Part number	Description
098.637.000.000.001	Socket wrench SW8 for emergency release
098.637.000.000.002	Socket wrench for service access
637.052.000.000.002	Receiver hand lever extension 30 mm
637.052.000.000.001	Receiver hand lever extension 100 mm
637.050.000.000.003	4-Flex FOUR M hand lever extension 120 mm
637.050.000.000.008	4-Flex FOUR M hand lever extension 40 mm Available from June 2026

BLIND COVER (SLOT)

Part number	12-Flex FOUR A receiver	12-Flex FOUR A ITA	12-Flex TWO M receiver	12-Flex TWO M ITA	4-Flex FOUR M receiver	4-Flex FOUR M ITA
637.154.000.921.001	•	—	—	—	—	—
638.154.000.921.001	—	•	—	—	—	•
637.152.000.921.001	—	—	•	—	—	—
638.152.000.921.001	—	—	—	•	—	—
637.154.000.921.002	—	—	—	—	•	—

PROTECTIVE COVER (INTERFACE)

Part number	Description
637.060.412.000.001	12-Flex FOUR receiver protective cover
638.060.412.000.002	12-Flex FOUR adapter protective cover
637.060.212.000.001	12-Flex TWO receiver protective cover
638.060.212.000.002	12-Flex TWO adapter protective cover
637.206.902.000.003	4-Flex FOUR receiver protective cover Available from June 2026
638.060.404.000.001	4-Flex FOUR adapter protective cover Available from June 2026

STRAIN RELIEF OPTIONS

STRAIN RELIEF

12-FLEX FOUR A / 12-FLEX TWO M

Part number	Receiver				ITA / Adapter			
	ODU-MAC® Blue-Line frames		Signal Block		ODU-MAC® Blue-Line frames		Signal Block	
	Size 2	Size 4	Size 2	Size 4	Size 2	Size 4	Size 2	Size 4
637.050.200.000.001	•	—	•	—	—	—	—	—
637.050.400.000.002	—	•	—	•	—	—	—	—
638.050.200.000.004	—	—	—	—	•	—	•	—
638.050.400.000.003	—	—	—	—	—	•	—	•
631.000.002.902.191	•	—	—	—	•	—	—	—
631.000.002.902.193	—	•	—	—	—	•	—	—
631.000.001.902.191	•	—	—	—	—	—	—	—
631.000.001.902.193	—	•	—	—	—	—	—	—

4-FLEX FOUR M

Part number	Receiver		ITA / Adapter	
	ODU-MAC® Blue-Line frames	Signal Block	ODU-MAC® Blue-Line frames	Signal Block
	Size 4	Size 4	Size 4	Size 4
637.050.000.000.006	•	•	•	•
631.000.002.902.193	•	—	•	—
631.000.001.902.193	•	—	•	—
630.000.001.902.193	—	•	—	—
631.000.006.902.193	—	—	—	•

ODU-MAC[®] Black-Line[®]

Configurator

The ODU Mass Interconnect Solution – a modular interface for test systems

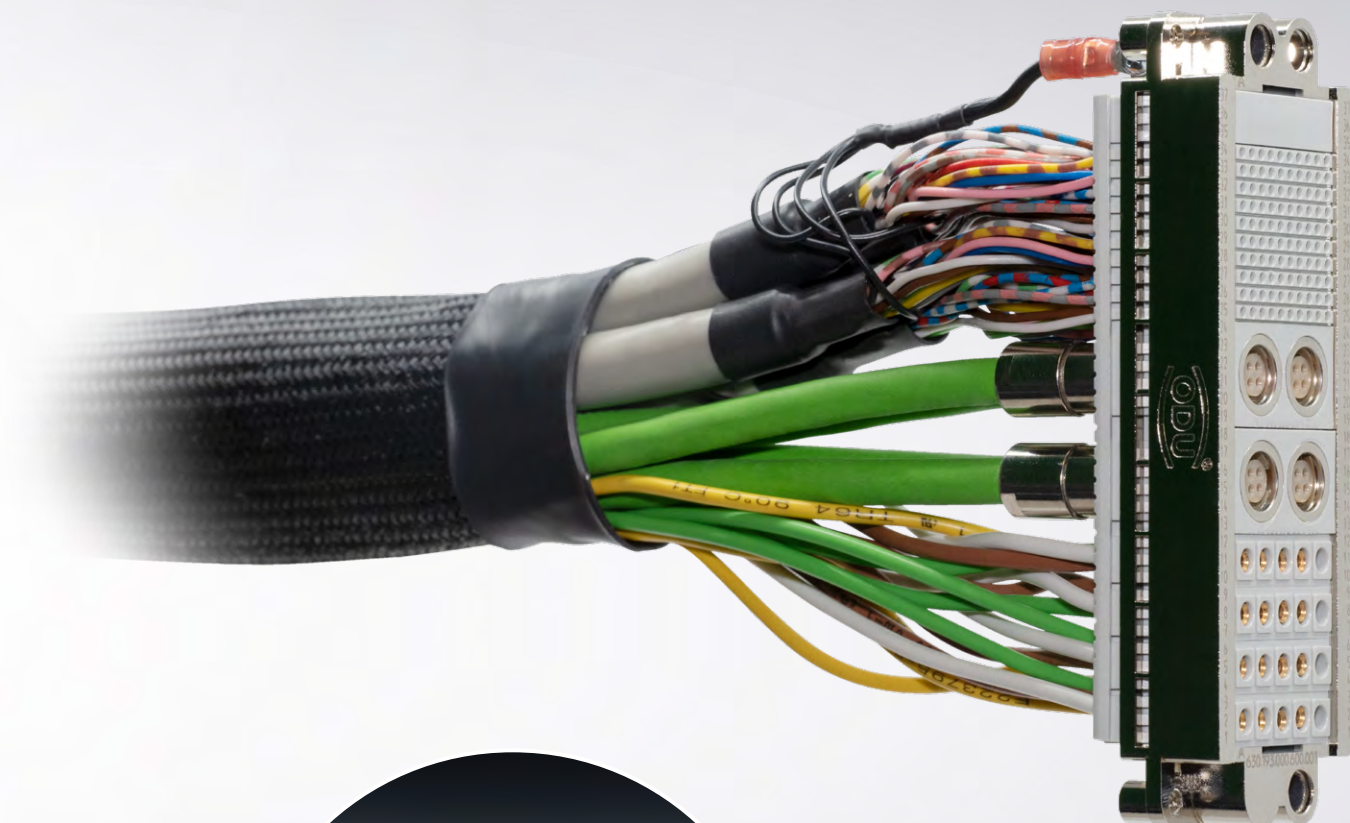
Use this configurator for your existing ODU-MAC[®] Black-Line[®] products.

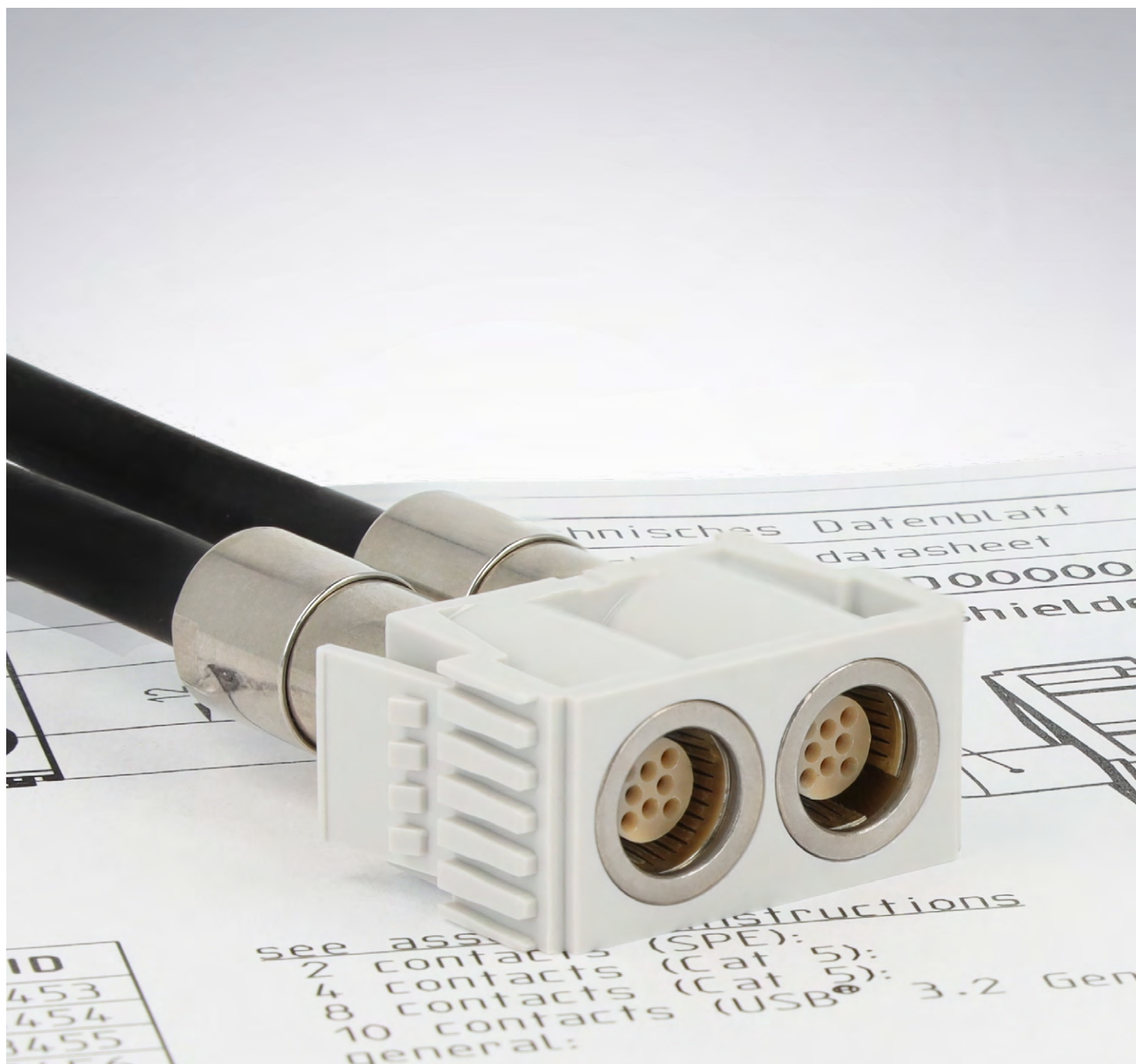
For a complete interface, please contact us at black-line@odu.de.



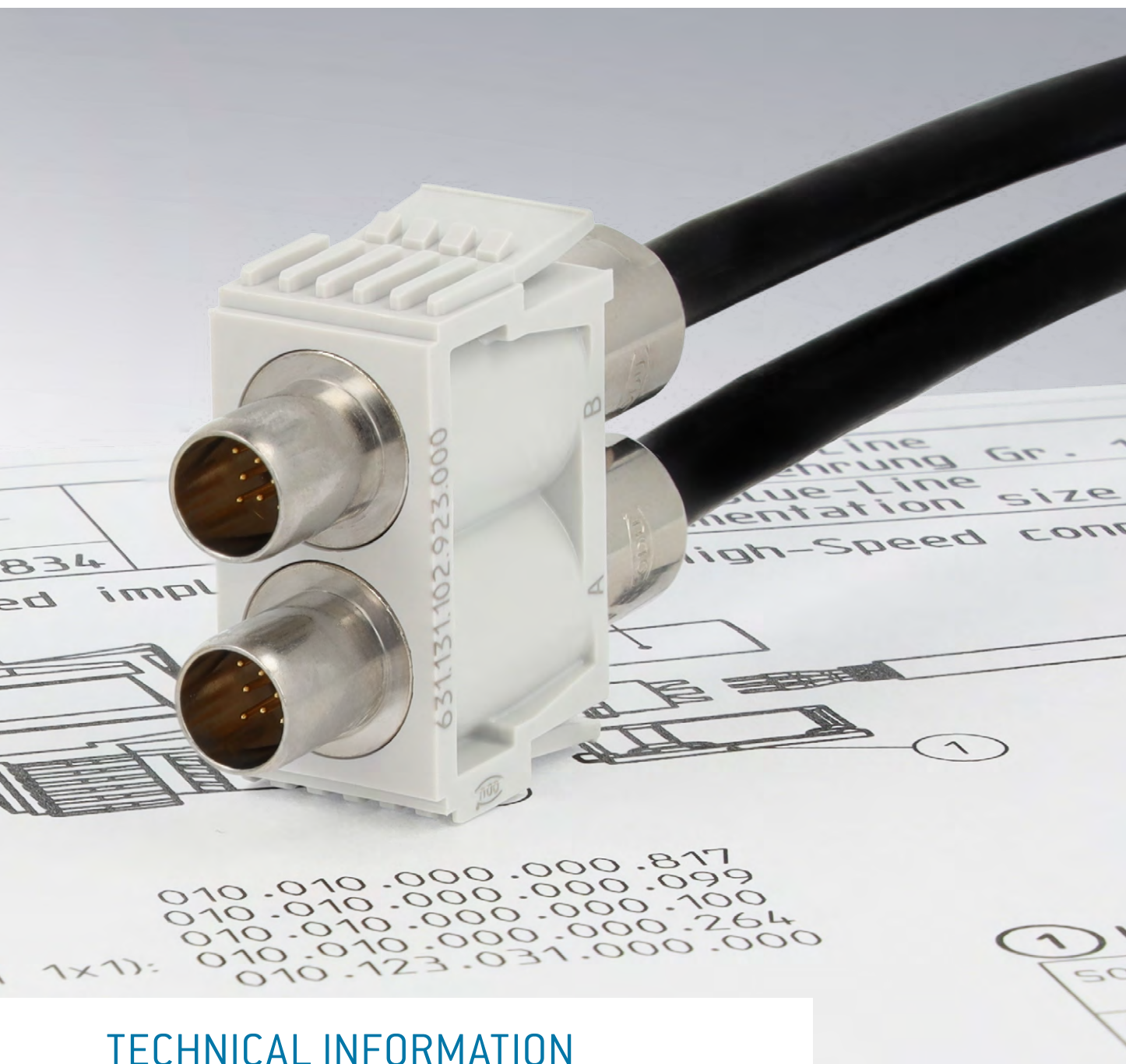
Cable assembly

In addition to high quality connectors, ODU also offers complete system solutions including cable assembly. The advantage is that you receive the cable harness in an all-in-one solution from a single source. This greatly minimizes effort and installation time.





ODU-MAC®



TECHNICAL INFORMATION

International Protection classes (IP) according to IEC 60529:1989 (VDE 0470-1:2014-09)	58
Explanations and details of safety requirements, inspections and voltage data	59
IEC 61010-1:2010 (VDE 0411-1:2020-03)	62
Voltage data according to "MIL"	63
Conversions / AWG	64
Basic principles of current-carrying capacity	65
Current load	66
Current-carrying capacity diagram	67
Nominal current load of lines	69
Technical terms	70

INTERNATIONAL PROTECTION CLASSES



According to IEC 60529:1989 (VDE 0470-1:2014-09)

Code letters (International Protection)		First code number (degrees of protection against access to hazardous parts or against solid foreign objects)		Second code number (degrees of protection against water)			
IP		6		5			
Code number	Protection against access to hazardous parts/ protection against ingress of solid foreign objects			Code number	Protection against harmful effects due to the ingress of water		
0	No protection		No protection against contact/no protection against solid foreign objects	0	No protection against water		No protection against water
1	Protection against large foreign objects		Protection against contact with the back of the hand/protection against solid foreign objects diameter ≥ 50 mm	1	Protection against dripping water		Protection against vertically falling water drops
2	Protection against medium-sized foreign objects		Protection against contact with the fingers/protection against solid foreign objects diameter ≥ 12.5 mm	2	Protection against water dripping at an angle		Protection against water drops falling at an angle (any angle up to 15° either side of the vertical)
3	Protection against small foreign objects		Protection against contact with tools/protection against solid foreign objects diameter ≥ 2.5 mm	3	Protection against spray water		Protection against spray water (any angle up to 60° either side of the vertical)
4	Protection against granular foreign objects		Protection against contact with a wire/protection against solid foreign objects diameter ≥ 1 mm	4	Protection against splashing water		Protection against splashing water from any direction
5	Dustproof		Protection against contact with a wire/protection against uncontrolled ingress of dust	5	Protection against water jet		Protection against water jet from any direction
6	Dustproof		Protection against contact with a wire/complete protection against ingress of dust	6	Protection against powerful water jet		Protection against powerful water jet from any direction
				7	Protection against the effects of temporary immersion in water		Protection against ingress of harmful quantities of water by temporary submersion into water
				8	Protection against the effects of continuous immersion in water		Protection against ingress of harmful quantities of water by continuous submersion into water
				9	Protection against high-pressure water jet featuring high temperatures		Protection against water from all directions characterized by high pressure and high temperatures



EXPLANATIONS AND DETAILS OF SAFETY REQUIREMENTS, INSPECTIONS, AND VOLTAGE DATA

GENERAL

All the technical information listed in this catalog and the data sheets has been determined by drawing on various standards. Unless otherwise stated, standard IEC 61984:2008 (VDE 0627:2009-11) "Connectors – Safety requirements and tests" has been used to dimension and determine the values provided.

This international standard applies to connectors (with rated voltages of 50 V to 1,000 V alternating and direct, and rated currents of up to 125 A per contact) which either have no type specification or which have a type specification whose safety requirements refer to this standard. The standard can be used as a guide for connectors with rated voltages up to 50 V. In cases such as this, IEC 60664-1:2020 (VDE 0110-1:2022-07) must be consulted when dimensioning the clearance and creepage distances. This standard can also serve as a guide for connectors with rated currents higher than 125 A per contact.

All shown connectors and cable assemblies are defined without breaking capacity (COC) according to IEC 61984:2008 (VDE 0627:2009-11).

All of the voltage data listed in this catalog refers to the use of insulators, which have been installed according to assembly regulations for the ODU-MAC® portfolio. Customer-specific attachments, which could reduce the clearance and creepage distances, have not been taken into account here.

The clearance and creepage distances are determined on the bases specified in IEC 60664-1:2020 (VDE 0110-1:2022-07).

The most important influence variables and the electrical parameters harmonized with these will be explained in more detail in the following. We would be happy to assist you with any further questions. The texts and tables given here are excerpts from the indicated standards. As a rule, product committees lay down application-specific safety requirements for various fields of use; these requirements also regulate the insulation coordination and inspection of connectors. In such cases, the "product standards" take precedence and must be observed instead of the "basic safety standards" stated here. However, since this catalog and the technical data sheets cannot take all product standards into consideration, we have restricted ourselves to the following standard in terms of voltage data:

IEC 60664-1:2020 (VDE 0110-1:2022-07) "INSULATION COORDINATION FOR EQUIPMENT WITHIN LOW-VOLTAGE SYSTEMS"

This is what is known as a **basic safety standard**, which regulates the minimum requirements for dimensioning clearance and creepage distances, as well as their inspection. The standard applies to equipment used up to an altitude of 2,000 m above sea level and with a rated alternating voltage of up to 1,000 V and a nominal frequency of up to 30 KHz or a rated direct voltage of up to 1,500 V. It applies in those cases where corresponding product standards do not define any values for clearance and creepage distances, nor lay down any requirements for solid insulation, or where no product standards are even available.

The permissible overvoltages and the rated voltages may be significantly influenced by the use of blank modules and varying positioning of the contacts in the insulators.

The following general specifications have been defined for dimensioning:

- **Insulation** between electrical circuits (functional insulation between the contacts) or between an electrical circuit and local ground (contact with grounded frame) has been dimensioned as **basic insulation**. If "**double insulation**" or "**reinforced insulation**" is required, the voltage data provided may no longer apply; insulating clearances may need to be extended.
- Unless otherwise stated, all voltages are given as rms voltage values.
- **Overvoltage category III** is used, along with the TT and TN system types, to dimension the rated surge voltage.
- Condition A is always used for the inhomogeneous field when dimensioning the clearance distances.
- The prescribed tests for solid insulation and for the airways (if necessary) shall be carried out in accordance to the tables shown in annex F.
- The clearance and creepage distances are determined on the bases specified in this standard.

OPERATING VOLTAGE / RATED VOLTAGE / NOMINAL VOLTAGE

The **max. operating voltage** (= rated voltage) is the value of a voltage that is specified by the manufacturer for a component, device, or item of equipment according to various applicable standards, and to which the operating and performance features relate. Some standards use the term "rated voltage" or



“working voltage” instead of “operating voltage”. In these explanations, the term “nominal voltage” is used for the value of the issued voltage indicated by the power supply company (PSC) or by the manufacturer of the voltage source for classification of the overvoltage category.

Equipment may have more than one value or one range for rated voltage.
(see Table F.5 in IEC 60664-1:2020 (VDE 0110-1:2022-07))

RATED SURGE VOLTAGE

Value of an impulse withstand voltage that is indicated by the manufacturer for equipment or a part thereof, and which indicates the defined endurance of its insulation against transient (brief, duration of a few milliseconds) overvoltages. The impulse withstand voltage is the highest value of the surge voltage of a defined form and polarity which will not result in the dielectric breakdown of the insulation under defined conditions.

Depending upon the indicated pollution degree, the rated surge voltage depends upon the clearance distance between the individual contacts (see Table F.2 in IEC 60664-1:2020 (VDE 0110-1:2022-07)).

According to this standard, the minimum clearance distances for equipment not connected directly to the low voltage mains should be measured according to the possible permanent voltages, the temporary overvoltages, or periodic peak voltages (see Table F.8 in IEC 60664-1:2020 (VDE 0110-1:2022-07)).

If a “periodic peak voltage” is present for a long time over the service life (more than approximately 60 minutes), this is not an overvoltage as regards insulation dimensioning under the terms of the standard, but must be considered a continuous voltage instead. In such cases, the “periodic peak voltage” must be used as the operating voltage.

POLLUTION DEGREE

Potentially occurring pollution combined with moisture can influence the insulation capacity on the surface of the connector. In order to define various rating parameters, a pollution degree according to the criteria listed below must be selected for the equipment.

In the case of a connector with a degree of protection of minimum IP54 IEC 60529:1989 (VDE 0470-1:2014-09), the insulating parts may be measured enclosed according to the standard for a low pollution degree. This also applies for mated connectors for which enclosure is ensured by the connector housing and which are only disconnected for testing and maintenance purposes.

Pollution degree 1

No or only dry, non-conductive pollution is present. The pollution has no influence. For example, computer systems and measuring instruments in clean, dry or air-conditioned rooms.

Pollution degree 2

Only non-conductive pollution is present. However, temporary conductivity due to condensation must be anticipated. For example, devices in laboratories, residential, sales, and other business areas.

Pollution degree 3

(= Standard, if no specific pollution degree is indicated)

Conductive pollution occurs or dry, non-conductive pollution that becomes conductive because of condensation must be expected. For example, devices in industrial, commercial, and agricultural operations, unheated storage areas and workshops.

Pollution degree 4

Permanent conductivity is present, caused by conductive dust, rain or moisture. For example, devices in the open air or outdoor facilities and construction machinery.

Depending upon the indicated pollution degree, the rated voltage is dependent upon the insulating material group of the connector and the respective creepage distances between the individual contacts.



CLEARANCE DISTANCE

The shortest distance in the air between two conductive parts.

CREEPAGE DISTANCE

The shortest distance between two conductive parts over the surface of an insulation material. The creepage distance is influenced by the pollution degree applied.

TEST VOLTAGES

The dielectric strength of the connector is confirmed according to the standard corresponding to the indicated rated surge voltage by applying the test voltage according to Table F.5 over a defined time range.

IEC 60664-1:2020 (VDE 0110-1:2022-07): Table F.6 – test voltages for testing clearance distances at different altitudes (the voltage levels are valid only to verify the clearance distances)

Rated surge voltage $\hat{u}$ kV	Test surge voltage at sea level $\hat{u}$ kV	Test surge voltage at 200 m elevation $\hat{u}$ kV	Test surge voltage at 500 m elevation $\hat{u}$ kV
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	4.923	4.874	4.675
6	7.385	7.236	7.013
8	9.847	9.648	9.350
12	14.770	14.471	14.025
15	18.464	18.091	17.533

IEC 61010-1:2010 (VDE 0411-1:2020-03)



“Safety requirements for electrical equipment for measurement, control, and laboratory use”

This is what is known as a type specification or product standard, which is universally applicable to all devices belonging to the application area covered by this standard. For particular types of device, these requirements are supplemented or modified by the specific requirements contained in one or more special additional parts of the standard (Part 2), which must be read in conjunction with the requirements contained in Part 1.

Devices belonging to the application area:

- Electrical test and measurement instruments: devices that test, measure, display or record electrical and/or physical variables (also applies to test instruments integrated in production processes)
- Electrical open and closed-loop control devices for industrial process control: devices that set one or more output variables to specific values
- Electrical laboratory equipment: devices that measure, display, monitor or analyze substances (may also be used outside of the laboratory)

Devices excluded from the application area:

- IEC 62368-1:2016 (Audio, video and similar electronic apparatus)
- IEC 60204-1:2016 (Electrical equipment of machines)
- IEC 60601-1:2005 (Medical electrical equipment)

This standard defines some special cases, unlike IEC 60664-1:2020 (VDE 0110-1:2022-07):

Limit values for accessible parts (Section 6.3¹):

The voltages listed below are classed as dangerous and active, if certain currents (0.5 mA AC; 2.0 mA DC) are exceeded at the same time:

- Alternating voltage (AC): $U_{rms} = 30 \text{ V}$ ($U_{peak} = 42.4 \text{ V}$)
- Direct voltage (DC): $U = 60 \text{ V}$
- Wet environment $U_{rms} = 16 \text{ V AC}$ ($U_{peak} = 22.6 \text{ V}$); $U = 35 \text{ V DC}$

A general distinction is made between the supply circuit (primary circuit) and the secondary circuit, which have different values for the clearance and creepage distances.

A partial discharge test is not compulsory at voltages $> 700 \text{ V}$ here either, it is merely recommended.

¹ See corresponding section in the IEC 61010-1:2010 (VDE 0411-1:2020-03) safety standard

VOLTAGE DATA ACCORDING TO “MIL”



EIA-364-20F:2019

“Withstanding Voltage – Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts”

The withstanding voltage values stated in this catalog were determined according to the method described in EIA-364-20F:2019 “Withstanding Voltage – Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts”. The inserts were tested while mated, and the test current was applied to the pin insert.

75 % of the calculated dielectric withstanding voltage is used as the test voltage for further calculations. The operating voltage is 1/3 of this value.

This standard refers to IEC 60512-4-1:2003 “Connectors for electronic equipment – Tests and measurements – Part 4-1: Voltage stress tests – Test 4a: Voltage proof”.

Test voltage: dielectric withstanding voltage $\times 0.75$

Operating voltage: dielectric withstanding voltage $\times 0.75 \times 0.33$

If there are any deviations, the derating factors are to be factored in according to the applicable standards. All tests were conducted at the prescribed indoor climate and apply up to an altitude of 2,000 m.

CONVERSIONS / AWG (AMERICAN WIRE GAUGE)



Circular wire					
AWG	Diameter		Cross-section mm ²	Weight kg/km	Max. resistance Ω/km
	Inch	mm			
4/0 [259/21]	0.6010	15.300	107.0	997.00	0.17
3/0 [259/22]	0.5360	13.600	85.0	793.00	0.22
2/0 [259/23]	0.4770	12.100	67.4	628.00	0.27
1/0 [259/24]	0.4240	10.800	53.5	497.00	0.34
1 [259/25]	0.3780	9.600	42.2	395.00	0.43
2 [259/26]	0.3350	8.500	33.6	312.00	0.55
4 [133/25]	0.2660	6.800	21.1	195.00	0.87
6 [133/27]	0.2100	5.300	13.3	122.00	1.38
8 [133/29]	0.1670	4.200	8.37	76.80	2.18
10 [1]	0.1019	2.590	5.26	46.77	3.45
10 [37/26]	0.1150	2.921	4.74	42.10	4.13
12 [1]	0.0808	2.050	3.31	29.41	5.45
12 [19/25]	0.0930	2.362	3.08	27.36	5.94
12 [37/28]	0.0910	2.311	2.97	26.45	6.36
14 [1]	0.0641	1.630	2.08	18.51	8.79
14 [19/27]	0.0730	1.854	1.94	17.23	9.94
16 [1]	0.0508	1.290	1.31	11.625	13.94
16 [19/29]	0.0590	1.499	1.23	10.928	15.70
18 [1]	0.0403	1.020	0.823	7.316	22.18
20 [1]	0.0320	0.813	0.519	4.613	35.10
20 [7/28]	0.0390	0.991	0.563	5.003	34.10
20 [19/32]	0.0420	1.067	0.616	5.473	32.00
22 [1]	0.0253	0.643	0.324	2.883	57.70
22 [19/34]	0.0330	0.838	0.382	3.395	51.80
24 [1]	0.0201	0.511	0.205	1.820	91.20
24 [7/32]	0.0250	0.635	0.227	2.016	86.00
24 [19/36]	0.0270	0.686	0.241	2.145	83.30
26 [1]	0.0159	0.404	0.128	1.139	147.00
26 [7/34]	0.0200	0.508	0.141	1.251	140.00
26 [19/38]	0.0220	0.559	0.154	1.370	131.00
28 [1]	0.0126	0.320	0.0804	0.715	231.00
28 [7/36]	0.0160	0.406	0.0889	0.790	224.00
28 [19/40]	0.0170	0.432	0.0925	0.823	207.00
30 [1]	0.0100	0.254	0.0507	0.450	374.00
30 [7/38]	0.0130	0.330	0.0568	0.505	354.00
32 [1]	0.0080	0.203	0.0324	0.288	561.00
32 [7/40]	0.0110	0.279	0.0341	0.303	597.10
34 [1]	0.0063	0.160	0.0201	0.179	951.00
34 [7/42]	0.0070	0.180	0.0222	0.197	1,491.00
36 [1]	0.0050	0.127	0.0127	0.1126	1,519.00
36 [7/44]	0.0060	0.150	0.0142	0.1263	1,322.00

The American Wire Gauge (AWG) is based on the principle that the crosssection of the wire changes by 26 % from one gauge number to the next. The AWG numbers decrease as the wire diameter increases, while the AWG numbers increase as the wire diameter decreases. This only applies to solid wire.

However, stranded wire is predominately used in practice. This has the advantage of a longer service life under bending and vibration as well as greater flexibility in comparison with solid wire.

Stranded wires are made of multiple, smaller-gauge wires (higher AWG number). The stranded wire then receives the AWG numbers of a solid wire with the next closest crosssection to that of the stranded wire. In this case, the crosssection of the stranded wire refers to the sum of the copper crosssections of the individual wires.

Accordingly, strands with the same AWG number but different numbers of wires differ in cross-section. For instance, an AWG 20 strand of 7 AWG 28 wires has a crosssection of 0.563 mm², while an AWG 20 strand of 19 AWG 32 wires has a cross-section of 0.616 mm².

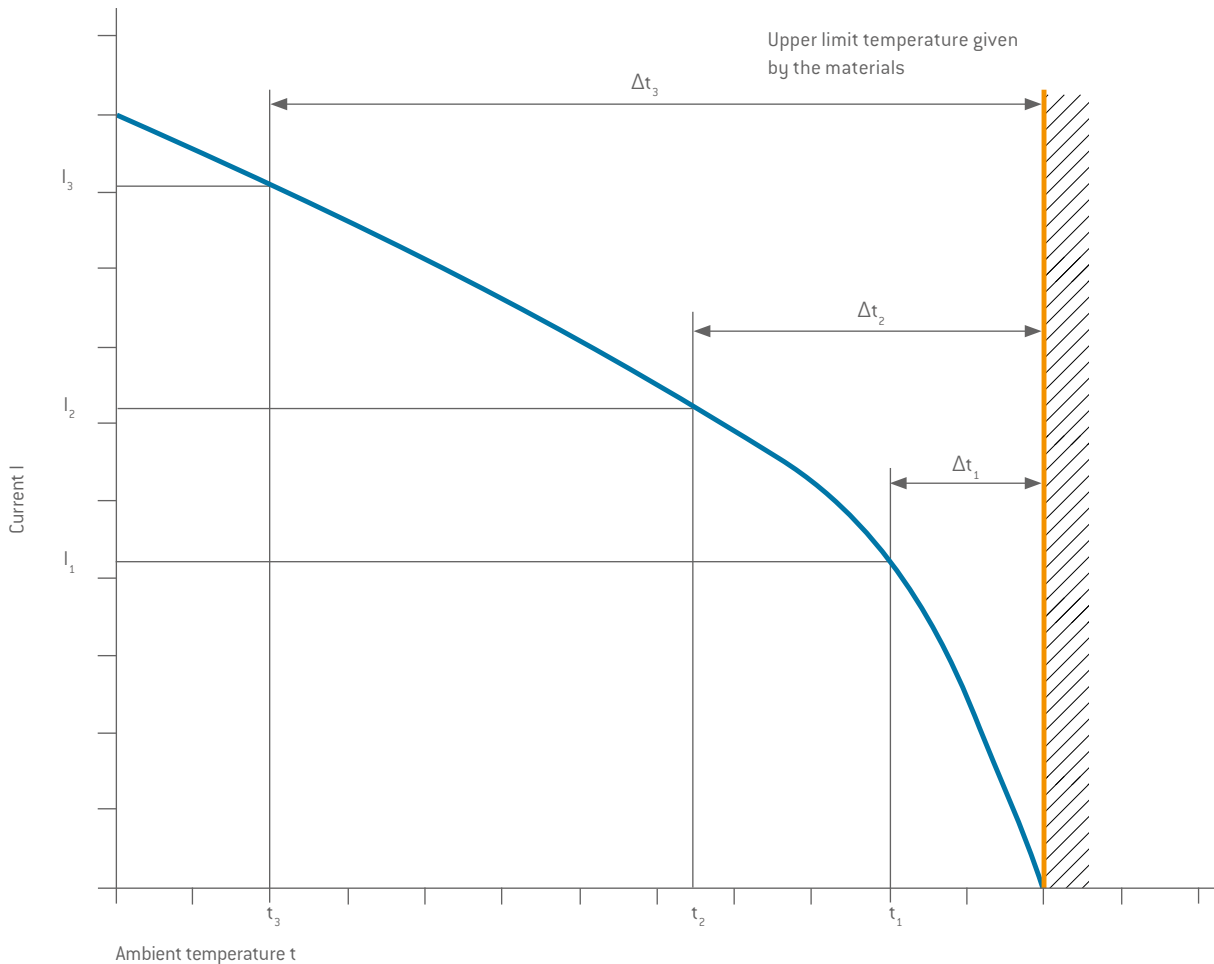
Source: ASTM

BASIC PRINCIPLES OF CURRENT-CARRYING CAPACITY

Derating measurement method IEC 60512-5-2:2002 (DIN EN 60512-5-2:2003-01)



STRUCTURE OF THE BASE CURRENT-CARRYING CAPACITY CURVE



The current-carrying capacity of a connector is determined by measurement. It is determined taking self-heating by current heat and the ambient temperature into account, and is limited by the thermal properties of the contact materials used. Their upper limit temperature must not be exceeded in the process.

The relationship between current, the resulting temperature increase, conditioned by the dissipation loss at the contact resistance, and the ambient temperature is represented in a curve. The curve is plotted in a linear coordinate system with current “I” as Y-axis and temperature “t” as X-axis. The upper limit temperature forms the limit of the diagram.

Over three measurements, the temperature rise due to current heat (Δt) is measured respectively for different currents

on minimum three connectors, and the resulting values are joined to produce the parabolic basic curve. The basic curve is then used to derive the corrected current-carrying capacity curve (**derating curve**). The safety factor ($0.8 \times I_n$) also makes allowance for factors such as manufacturing tolerances and uncertainties in temperature measurement or the measuring arrangement.

CURRENT LOAD



[In dependence on VDE 0276-1000:1995-06]

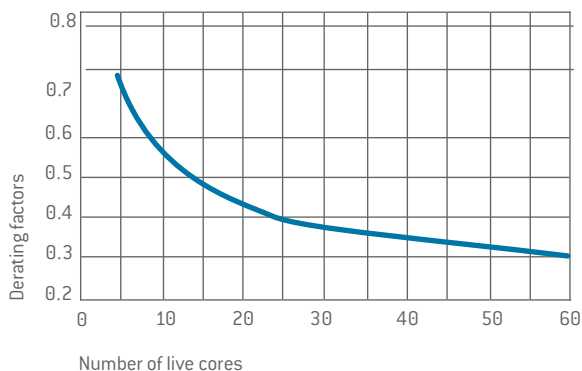
RATED CURRENT (NOMINAL CURRENT)

The metrologically determined current which is permitted to flow continuously through all contacts at the same time and will increase the contact temperature by 45 Kelvin. The amperage is determined according to the derating measurement method (DIN EN 60512-5-2:2003-01) and derived from the derating curve. The values specified in the catalog apply to either single contacts or completely assembled inserts/modules, as indicated.

DERATING FACTORS

In the case of multi-position connectors and cables, the heating is greater than it is with single contacts. It is therefore calculated with a derating factor.

There are no direct regulations for connectors in this context. The derating factors for multi-core cables pursuant to VDE 0298-4:2023-06 are applied. The derating factor assumes relevance as of 5 live cores or count the nominal current of the fully equipped modules. Dependent on the application and the cable-management.



Example:

VA cable with 24 cores is used (24 contacts). The nominal crosssection of a core is 6 mm². A derating factor of 0.4 (e.g., cable installed in the open air) is to be presumed for the load reduction depending upon the number of live cable cores. A 6 mm² Cu line (contact diameter 3.0 mm) can be used according to current-carrying capacity with 39 ampere.

The 24 contacts connector can thus be loaded with a max. of 15.6 A/contact (0.4 × 39 A).

MAX. CONTINUOUS CURRENT

The measured amperage at room temperature (approx. 20 °C) which increases the contact temperature to the limit temperature. The values specified in the catalog apply to either single contacts or completely assembled inserts / modules, as indicated.

Number of live cores or fully equipped module	Derating factor
5	0.75
7	0.65
10	0.55
14	0.5
19	0.45
24	0.4
40	0.35
61	0.3

Load and derating factors

Multi-core plastic cable with conductor crosssection of 1.5 to 10 mm² when installed in the open air

NOTE

Designs may differ depending upon the wiring of the modules and be verified with a heating test.

CURRENT-CARRYING CAPACITY DIAGRAM

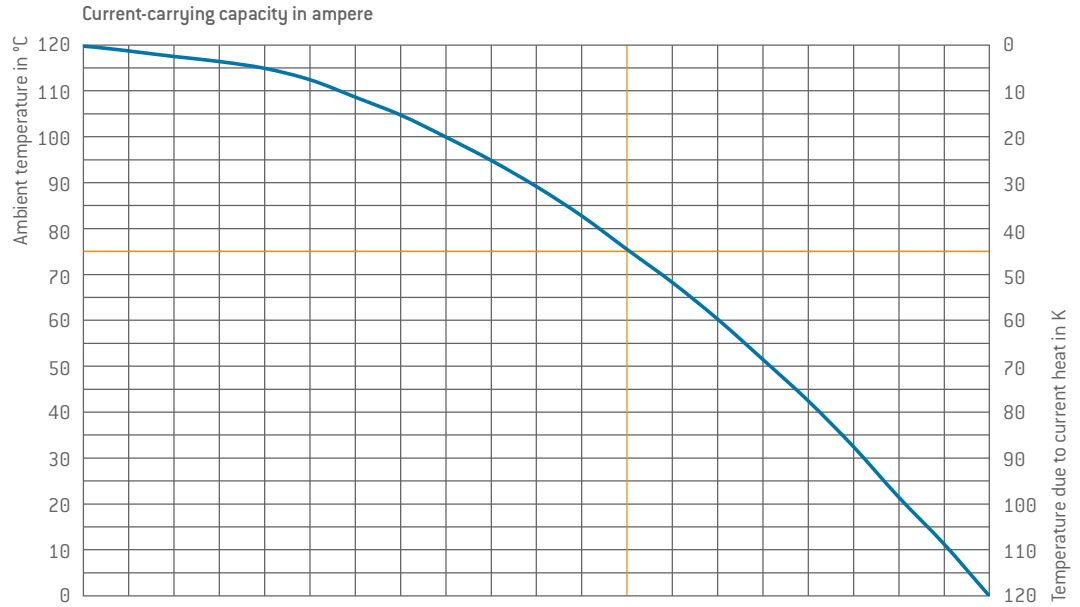


FOR SINGLE CONTACTS

Measurement made in acc.
with IEC 60512-5-2:2002
(derating curve shown =
 $0.8 \times$ base curve)

Upper limit temperature:
+120 °C

Termination with
nominal crosssection



Contact	Contact- Ø	Termination crosssection mm²	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
ODUTURNTAC®	0.7	0.14	0	I	1.1	I	2.1	I	3.2	I	4.3	I	5.4	I	6.5	I	7.6	I	8.7	I	9.8	I	10.9
		0.38	0	I	1	I	2.5	I	3.5	I	5	I	6	I	7	I	8.5	I	9.5	I	11	I	12
	1.3	0.38	0		1.5		3		4.5		6		7.5		9		11		12.5		14		15.5
		1	0	I	2	I	4	I	6.5	I	8.5	I	10.5	I	12.5	I	15	I	17	I	19.5	I	21.5
	2	1.5	0		3		6		9		12		15		18		21		24		27		30
		2.5	0	I	4	I	8	I	12	I	16	I	20	I	24	I	27	I	30	I	33	I	37
	3.5	2.5	0		4		8		12.5		16.5		20.5		25		29		33		37		41
		4	0	I	6.5	I	13	I	19.5	I	26	I	32.5	I	39	I	45	I	51.5	I	58	I	64
		6	0		6.5		13		19.5		26		32.5		39		45		51.5		58		64
ODU LAMTAC®	5	10	0	I	10	I	20	I	29	I	38	I	47	I	56	I	67	I	78	I	90	I	99
		16	0		11		22		33		44		56		68		81		94		108		119
	8	16	0	I	14	I	28	I	44	I	59	I	74	I	90	I	97	I	118	I	133	I	148
		25	0		17		34		51		68		85		105		119		136		154		170
	12	10	0		12		23.5		35.5		47		59		71		83		94.5		106		118
		16	0		16		32		48		64		80		96		112		128		144		160
		25	0		19		38		57		76		95		115		133		150		167		186
		35	0	I	22	I	44	I	66	I	88	I	111	I	135	I	156	I	176	I	195	I	217
		50	0		25		51		76		101		127		155		179		204		225		250

Nominal current

Max. continuous
current

CURRENT-CARRYING CAPACITY DIAGRAM

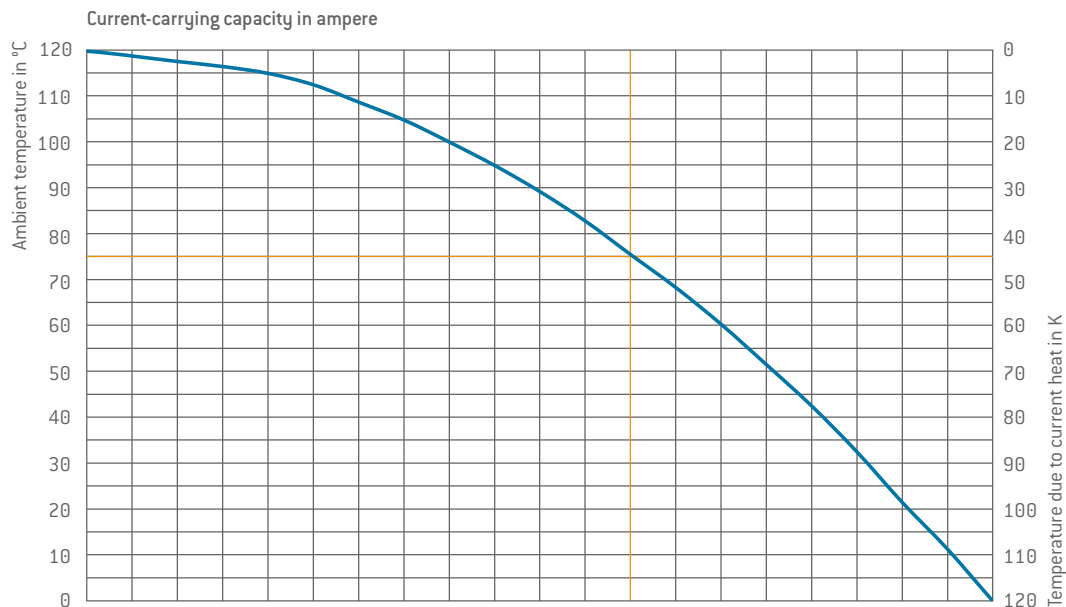


FOR FULLY EQUIPPED MODULES

Measurement made in acc. with IEC 60512-5-2:2002 (derating curve shown = $0.8 \times$ base curve)

Upper limit temperature: +120 °C

Termination with nominal crosssection



Contact	Contact- Ø	Termination crosssection mm ²																								
ODU TURNTAC®	0.7	0.14 (10 pos.)	0		0.8		1.6		2.4		3.3		4.1		4.9		5.7		6.6		7.4		8.2			
		0.14 (20 pos.)	0		0.5		1		1.6		2.1		2.6		3.2		3.7		4.2		4.7		5.2			
		0.38 (10 pos.)	0		1		2		3		4		5		5.5		6.5		7.5		8.5		9.5			
		0.38 (20 pos.)	0		1		2		3		4		5		5.5		6.5		7.5		8.5		9.5			
		PCB	0		1		1.5		2.5		3		4		4.5		5.5		6		7		7.5			
	1.3	0.38	0		1		2		3.5		4.5		5.5		7		8		9		10.5		11.5			
		1	0		1.5		3.5		5.5		7.5		9.5		11.5		14		16.5		19		20.5			
		PCB	0		1.5		2.5		4		5		6.5		8		9.5		11		12.5		14			
	2	1.5	0		2.5		5		7.5		10		12.5		15		17.5		20		22		24			
		2.5	0		3		6		9		12		15		19		22		25		28		31			
		PCB	0		3		5.5		8		11		13.5		16		19		22		25		27.5			
	3.5	2.5	0		3.5		7		10.5		14		17.5		21		24		27.5		31		34.5			
		4	0		5		10		15		20		25		30		34		39		44		49			
		6	0		5		10		15		20		25		30		34		39		44		49			
ODU LANTAC®	5	10	0		9		18		27		37		46		56		65		74		83		92			
		16	0		11		22		33		45		56		68		79		90		101		112			
	8	16	0		14		28		43		57		72		85		101		115		129		143			
		25	0		17		33		50		66		83		100		117		133		150		167			

Nominal current

Max. continuous
current

NOMINAL CURRENT LOAD OF LINES



The current-carrying capacity of the individual conductors is frequently lower than that of the single contacts used. When determining the maximum current-carrying capacity, the lowest value is always to be taken into account.

Laying procedure	Exposed in air	Or on surfaces		
	Single-wire lines PVC, PE, PUR, TPE heat-resistant	Multi-wire highly flexible lines For hand-held devices, core / sheath cold-resistant, PVC-insulated		Multi-wire movable lines PVC, PE, PUR, TPE standard program harmonized series
Number of live cores	1	2	3	4
Nominal crosssection copper conductor in mm ²	Nominal current load in A			
0.14 ¹	3	–	–	2
0.25 ¹	5	–	–	4
0.34 ¹	8	–	–	6
0.5 ¹	12	3	3	9
0.75	15	6	6	12
1	19	10	10	15
1.5	24	16	16	18
2.5	32	25	20	26
4	42	32	25	34
6	54	40	–	44
10	73	63	–	61
16	98	–	–	82
25	129	–	–	108
35	158	–	–	135
50	198	–	–	168
Nominal current load acc. to:	VDE 0298-4:2023-06 Table 11			

Nominal current load of lines with a nominal voltage of up to 1,000 V and of heat-resistant lines.

The specification of data does not release one from the need to conduct the test. The original standards remain authoritative for all of the listed technical specifications.

¹ DIN VDE 0891-1:1990-05

TECHNICAL TERMS

AMBIENT TEMPERATURE

Temperature of the air or other medium in which a connector or a corresponding cable assembly is intended to be used.

AWG

American Wire Gauge see page [64](#)

BASE CURVE

See page [65](#)

CHEMICAL RESISTANCE

Chemical resistance is the ability of a material to protect itself against chemical attack or solvent reaction. In contrast to corrosion, there is no material removal, which is particularly typical for plastics and elastomers.

Adhesives, cleaning agents or other chemicals are often used on our products within the scope of general deployment and further handling. Contact with unsuitable chemicals may have an adverse effect on the mechanical and electrical properties of the insulation and housing materials. The connector specifications may no longer be sustainable. Please observe our handling suggestions and technical instructions as given in this catalog or corresponding assembly instructions as well as the special information for the plastic housings.

CLEARANCE DISTANCE

The shortest distance by air between two conductive parts (according to IEC 60664-1:2020 (VDE 0110-1:2022-07)). The insulation coordination is explained in detail from page [59](#).

CODING (MECHANICAL)

Geometry detail that prevents interchangeability of otherwise identical connectors. This is useful when two or more identical connectors are attached to the same device.

CONNECTOR WITH BREAKING CAPACITY (CBC)

Connector that may be mated or unmated during intended use, live or under load (according to IEC 61984:2008 (VDE 0627:2009-11)).

CONNECTOR WITHOUT BREAKING CAPACITY (COC)

Connector which is not deemed to be engaged or disengaged in normal use when live under load (according to IEC 61984:2008 (VDE 0627:2009-11)).

CONNECTORS

An element which enables electrical conductors to be connected and is intended to create and / or separate connections with a suitable counterpart (according to IEC 61984:2008 (VDE 0627:2009-11)). If not otherwise specified, these are connectors without breaking capacity (COC).

CONTACT RESISTANCE

The contact resistance is the resistance at the contact zone of an electrical contact pair. The contact resistance is significantly lower than the total resistance (refer to total resistance). The specifications are average values.

CORES

Electrical conductor, solid wire or multi-wire strand, with insulation as well as any conductive layers. Cables or leads may have one or more cores.

CREEPAGE DISTANCE

The shortest distance between two conductive parts along the surface of a solid insulation material (according to IEC 60664-1:2020 (VDE 0110-1:2022-07)). This factors in all elevations and recesses in the insulator, as long as defined minimum dimensions are on hand. The insulation coordination is explained in detail from page [59](#).

CRIMP BARREL

A terminal sleeve which can accommodate one or more conductors and be crimped by a crimping tool.

CRIMP CONNECTION (CRIMP TERMINATION)

The permanent, non-detachable and solder-free mounting of a contact to a conductor via deforming or shaping under pressure to make a good electrical and mechanical connection. Executed with crimping tool, press or automatic crimping machine.

CRIMPING AREA

The specified area of the crimp barrel in which the crimp termination is executed by means of deforming or shaping the barrel under pressure around the conductor.

CURRENT-CARRYING CAPACITY (NOMINAL CURRENT AND MAXIMUM CONTINUOUS CURRENT)

The value is derived from an adequately dimensioned connection cable in accordance with IEC 60228:2023 (VDE 0295:2024-12); class 5, so that a significant temperature increase is

TECHNICAL TERMS



not incurred. The indicated temperature increase takes place through the contact. The specifications are average values.

DELIVERY FORM

The delivery of the connector is carried out in the form of individual parts.

DERATING CURVE

See page [66](#)

DERATING MEASUREMENT METHOD IN ACCORDANCE WITH IEC 60512-5-2:2002 (DIN EN 60512-5-2:2003-01)

See page [67](#)

INSERTION AND WITHDRAWAL FORCE

The force required to fully insert or withdraw pluggable elements without the influence of a coupling or locking device.

INSULATOR

Part of a connector or module that separates conductive parts with different potential, usually identical to the contact carrier.

LUBRICATION

All standard contacts are lubricated at the factory. We recommend using the ODU Electrical Contacts Service Kit.

MATING CYCLES

A mating cycle consists of one insertion and withdrawal action of both connector parts with each other. The given values are only valid under the following conditions: clean environment, adequate radial alignment, flawless counter contact pins.

MAX. CONTINUOUS CURRENT

The metrologically determined amperage at room temperature (approx. 20° C) which increases the contact temperature to the limit temperature. The values specified in the catalog apply to either individual contacts or completely assembled inserts / modules, as indicated. Refer to page [66](#) for the derating curve, if a different ambient temperature is valid.

NOMINAL CURRENT

See Rated current

NOMINAL SINGLE-CONTACT CURRENT LOAD

The current-carrying capacity which each individual contact can be loaded with on its own (see page [66](#).)

NOMINAL VOLTAGE

The nominal voltage of the power source for which the connector is being used. The nominal voltage may not be higher than the rated voltage of the connector.

OPERATING TEMPERATURE

Permissible temperature range between the uppermost and lowermost limits. This includes contact heating through current-carrying capacity.

OPERATING VOLTAGE

The operating voltage is the voltage supply at the device. The operating voltage may not be higher than the rated voltage of the connector.

PCB TERMINATION

A conductive connection between the PCB and an element in through-hole assembly, THT (through-hole technology).

POLLUTION DEGREE

Numerical value indicating the expected pollution of the micro-environment. The pollution levels 1-4 were defined. (Pollution: any deposit of solid, liquid or gaseous foreign matter that may reduce the electrical strength or surface resistance of the insulation; micro-environment: immediate vicinity of the insulation, which in particular influences the dimensioning of the creepage distances). See IEC 60664-1:2020 (VDE 0110-1:2022-07)) See from page [59](#).

PRINTED CIRCUIT BOARD (PCB)

A PCB is a carrier for electronic components. It serves the purposes of mechanical mounting and electrical connection.

RATED CURRENT (NOMINAL CURRENT)

The values specified in the catalog apply to individual contacts or to completely assembled inserts / modules, depending on the specification. See page [66](#)

TECHNICAL TERMS



RATED VOLTAGE

The rated voltage which the manufacturer specifies for a connector and which the operating and performance features relate to.

REDUCTION FACTOR

Based on VDE 0298-4:2023-06, connectors and cables with more than 5 contacts have a higher heating rate compared to individual contacts. For this reason, the aforementioned standard is calculated with a reduction. See page [65](#)

SLIDING FORCE

Please refer to Insertion and Withdrawal force.

The higher value of the insertion force is caused by the “attachment peak”. Subsequently, only the pure sliding force has an effect. In the case of lamella contacts, the data refers to contacts in the lubricated state (status at delivery) and after approx. 30 mating cycles. The forces are/may be higher in new condition (lubricated). In the case of springwire contacts, the data refers to contacts in new condition. The data represents average values with a potential fluctuation of $\pm 50\%$.

SOLDER CONNECTION (SOLDER TERMINATION)

Termination technology in which a molten additional metal (solder) with a lower melting point than the base materials to be connected is used to attach two metallic materials to one another.

SPINDLE LOCKING

Ergonomic locking of the housings with an easy-to-operate precision locking spindle. This spindle enables easy closing and opening of the housings with a single turning movement. The mating and sliding forces which are thereby overcome ease handling significantly. For relubrication, we recommend the ODU Electrical Contacts Service Kit.

STRANDED WIRE

The stranded wire is an electrical conductor consisting of thin individual wires and is therefore easy to bend.

TERMINATION CROSSSECTION

The specified cross-sections correspond to a “fine-wire” conductor structure (7/19 wire) according to : AWG (ASTM B258-14:2018) or to a “fine-wire” conductor structure pursuant to IEC 60228:2023 (VDE 0295:2024-12); class 5, borderline conductor structures require a separate review.

TERMINATION TECHNOLOGIES

Methods for connecting the leads to the electro-mechanical element, such as solder-free connections pursuant to IEC 60352-4:2020 (DIN EN 60352-2:2014-04): crimp, screw connection etc. or soldering connection.

TEST VOLTAGE

The test voltage which a connector or a corresponding cable assembly can withstand under defined conditions without dielectric breakdown or flashover.

TIGHTNESS IEC 60352-2:2006 (DIN EN 60352-2:2014-04)

See protection types on page [58](#)

TOTAL RESISTANCE

Total resistance value measured from terminal to terminal (e.g. without crimp resistance). The specifications are average values.

WIRE

Solid conductor



GENERAL NOTE

The connectors and cable assemblies listed in this catalog are generally designed as connectors without breaking capacity unless otherwise stated. The rated voltage specification given on the respective data sheet must be respected. Suitable precautionary measures must be taken to ensure that people do not come into contact with live conductors during installation and operation. All entries in this catalog were thoroughly reviewed before printing. ODU reserves the right to make changes based on the current status of knowledge without prior notice and without being obliged to provide replacement deliveries or refinements of older designs.



Printed on certified
recycled paper.

All dimensions are in mm.
Some figures are for illustrative purposes only. Subject to change
without notice. Errors and omissions excepted. We reserve the right to
change our products and their technical specifications at any time in
the interest of technical improvement. This publication supersedes all
prior publications.

ODU-MAC® Black-Line The Mass Interconnect Solution / C / 0326 / EN

This publication is also available as a PDF file that can be downloaded
from www.odu-connectors.com