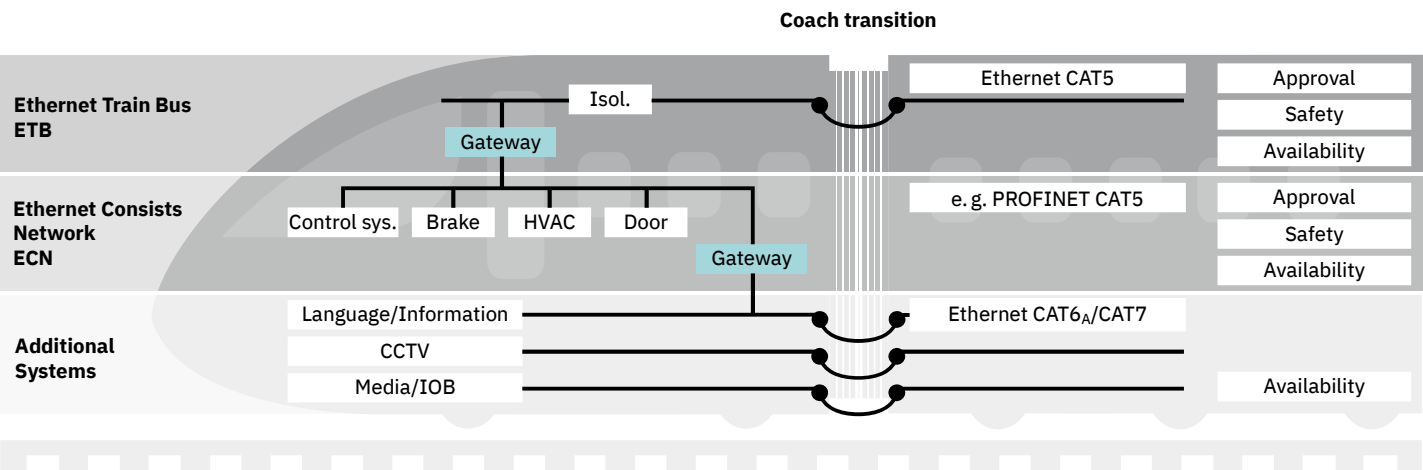


M12 connectors

Molded connectors from the M12 RAIL series provide a reliable cabling system for all control levels in the train. They meet the fire protection requirements of DIN EN 45545-2 and are fully electrically tested. The portfolio also includes connectors designed for assembly for individually adjustable cable lengths. Our push-pull system enables quick, tool-free mounting. All connectors are available in shielded versions, an important criterion in light of high EMC exposure in rail traffic.



Reliable cabling of communication networks in rolling stock



The TCN (Train Communication Network) train control system is often set up in a hierarchy. It consists of multiple control levels with different functions and requirements:

Train bus ETB (Ethernet Train Bus)

The train bus ETB (Ethernet Train Bus) is the control level. Relevant for safety and approval, its availability must be constantly ensured. That is why high demands are placed on the cabling and other infrastructure components. Communication takes place via category CAT5 Ethernet.

Vehicle bus ECN (Ethernet Consist Network)

The vehicle bus ECN (Ethernet Consist Network) is subordinate to the train bus. On this level, the communication for controlling the train function and the safety-related monitoring of brakes, doors, and air conditioning are performed. The requirements on this level are equal to those of the train bus. Here, communication is via PROFINET CAT5, for example.

Auxiliary systems

There are also other systems in trains that are not relevant to safety or approval. Availability and demand for higher data rates are key here. Systems increasingly communicate via 10 Gb Cat. 6A Ethernet. This covers tasks such as language and information (on-board radio), monitoring (cameras), and on-board media (Internet).



A-coded for signals
ETB train bus



D-coded for data
ECN vehicle bus

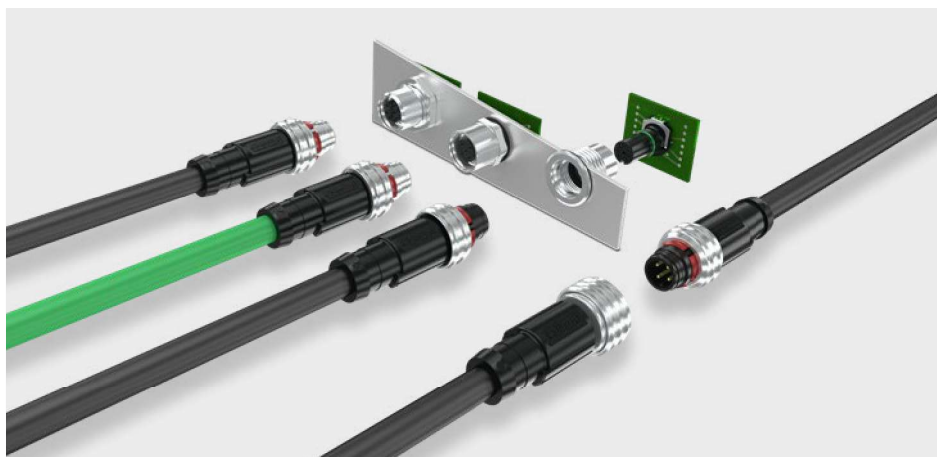


X-coded for large amounts of data
Auxiliary systems

M12 push-pull connectors in detail

The new standard for railway technology

The M12 connectors with a push-pull fast locking system guarantee easy cabling and space-saving device connection. They provide significant mounting advantages, in particular in tight spaces and with high cabling densities, allowing fast component plugging and unplugging. M12 push-pull connectors are robust and reliable. They enable a secure, durable connection under extreme conditions.



Plug and Produce

With the cross-manufacturer push-pull locking system, you plug in securely and save up to 80% installation time.



Greater flexibility

The M12 DUO contour enables flexible field wiring with M12 screw connectors or push-pull connection technology.



More compact designs

With recessed M12 ports, you can achieve more compact device designs and flush integration into the housing.



Flying leads

With connectors that have push-pull internal and external locking, you can realize flying leads.



Individual cabling

With M12 push-pull connectors designed for assembly, you can determine flexible cable lengths and connect them tool-free.



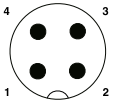
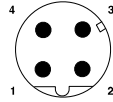
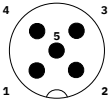
Highly future-proof

The push-pull product range is cross-manufacturer compatible with IEC 61076-2-010 standardization.

Product list M12 push-pull connectors

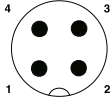
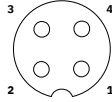
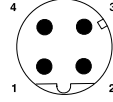
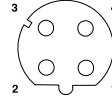
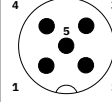
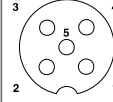
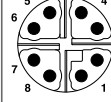
EN 61373, unclassified mass in accordance with EN 45545-2:

 <10 g  <100 g

M12 push-pull device connectors		4-position		5-position
 Lead-free alternative items available	Coding	A	D	A
	Pin assignment	Male	Male	Male
				
Zinc die-cast housing, with litz wires, for screw fastening				
	Front mounting, M16 x 1.5	1108117	1027688	1027694
	Rear mounting, M16 x 1.5	1108128	1027691	1027697

Housing screw connections, two-piece			
	Pin assignment	Male	Female
Housing for THR and wave soldering contact carriers			
	Front mounting, female, M14 x 1		1249211
	Front mounting, recessed female, M16 x 1, flat gasket		1233777
	Rear mounting, male M15 x 1, female M16 x 1	1027661	1249212
Housing for SMD contact carriers			
	Front mounting, male M14 x 1	1107999	
	Rear mounting, male M15 x 1	1107993	

EN 61373, EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

M12 push-pull cable connectors		4-position				5-position		8-position
 Lead-free alternative items available	Coding	A		D		A		X
	Pin assignment	Male	Female	Male	Female	Male	Female	
								
	Even	1438165	1438169	1438182	1438183	1438175	1438180	1489580
	Angled	1438168	1438172	1438184	1438185	1438179	1438181	1489579

M12 cable connectors in detail

On this page and the next double page, you will find our products for the cable side of an M12 connector. This includes both connectors designed for assembly and pre-assembled cables. The M12 RAIL series features sensor/actuator cabling with A-coding, Ethernet and PROFINET cabling in a D-coded design, and X-coded cables for high data rates (10 Gbps). These materials can be used without any problems in a rail vehicle because they satisfy the fire protection requirements of DIN EN 45545-2.



Assembled cables

Choose from assembled sensor/actuator cables, as well as data cables for communication networks and passenger information systems.



Connectors designed for assembly

With our M12 connectors designed for assembly, you can adapt the cabling flexibly to your requirements.



Totally protected shielding

The 360° shield connection with Advanced Shielding Technology ensures approved EMC protection, robustness, and improved performance.



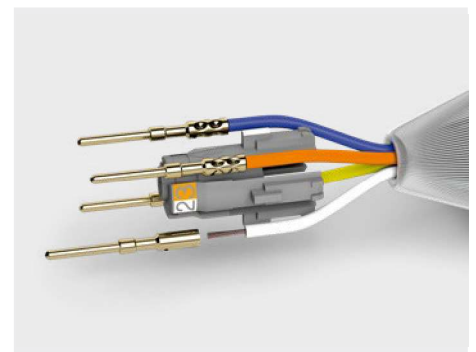
Push-Lock connection

Tool-free wiring of all conductor types with direct insertion. Color-coded lever for reliable assembly.



IDC insulation displacement connection

QUICKON provides a fast connection for M12 connectors. The insulation displacement contact makes a vibration resistant and gas-tight contact.



Crimp connection

Connection can be automated for high production volumes. The extremely compact connector is suitable for railway applications.

Product list M12 cable connectors

SIGNAL

EN 61373 and EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

M12 cable connectors, designed for assembly			4-position		5-position	
	Coding	Design	Male	Female	Male	Female
Push-Lock connection, conductor cross-section: 0.14 mm² ... 0.75 mm², shielded						
	A	Even	1424666	1424668	1424658	1424660
		Angled	1424667	1424669	1424659	1424661
Crimp connection, conductor cross-section 0.14 mm² ... 0.75 mm², shielded						
	A	Even			1422850	1422852
		Angled			1422851	1422853
IDC connection, conductor cross-section 0.14 mm² ... 0.75 mm², shielded						
	A	Even	1413993	1413994	1413991	1413992

DATA

EN 61373 and EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

M12 cable connectors, designed for assembly				4-position		8-position	
	Fieldbuses/ networks	Coding	Design	Male	Female	Male	Female
Push-Lock connection, conductor cross-section: 0.14 mm² ... 0.75 mm², shielded							
	PROFINET	D	Even	1424682	1424683		
			Angled	1424684	1424685		
Crimp connection, conductor cross-section 0.14 mm² ... 1 mm², shielded							
	PROFINET	D	Even	1150634/ 1422846	1422848		
			Angled	1422847	1422849		
	Ethernet	X	Even			1422844	
			Angled			1422845	
IDC connection, conductor cross-section 0.14 mm² ... 0.5 mm², shielded							
	Ethernet	D	Even	1411066	1411069		
	PROFINET	D	Even	1411068	1411071		
	Ethernet	X	Even			1411043	1414586
	PROFINET	X	Even			1411044	1414587

Product list M12 cable connectors

SIGNAL and DATA

EN 61373 and EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

Assembled network cables with M12 cable connectors, railway approved						
						
Cable length	PROFINET D-coded	Signal, 2-position A-coded	Signal, 3-position A-coded	Signal, 4-position A-coded	Signal, 5-position A-coded	Ethernet X-coded
Straight male, free cable end						
2 m	1407339		1407296	1407311	1407325	1415599
5 m	1407340			1407312	1407326	1415600
10 m	1407341		1407298	1407313	1407327	1415601
Variable	1412178	1412159		1412169		
Straight female, free cable end						
2 m			1407303	1407317	1407331	
5 m			1407304	1407318	1407332	
10 m			1407305	1407319	1407333	
Variable	1412181	1412157		1412167	1412172	
Angled female, free cable end						
2 m			1407306	1407320	1407334	
5 m			1407307	1407321	1407335	
10 m				1407322	1407336	
Variable				1412168	1412173	
Angled male, free cable end						
2 m				1407314	1407328	
5 m			1407300	1407315	1407329	
10 m				1407316	1407330	
Variable	1412179	1412160			1412175	
Straight male, straight male						
2 m	1407342				1407337	1415595
5 m	1407343				1407338	1415598
10 m						1431616
Variable	1412177					
Straight male, straight female						
2 m			1407309	1407323		
5 m				1407324		
10 m						
Variable				1412171	1412176	

Cable types for rolling stock

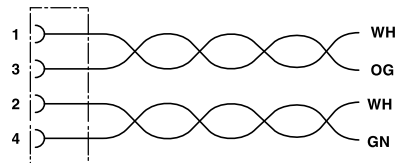
A

A-coded



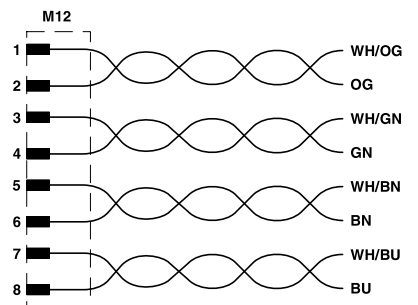
D

D-coded



X

X-coded



Conformity with typical railway requirements

Phoenix Contact has a wide portfolio of M12 push-pull, cable, and device connectors as well as assembled network cables for rolling stock. An important feature of these products is that they meet the requirements for fire protection (EN 45545-2) and shock and vibration (EN 61373) relevant to railway applications, which are specified with the respective tables.

“EN 61373” stands for the shock and vibration requirements in accordance with category 1 class B. This is the typical requirement for electrical equipment.

The majority of the items meet the fire protection requirements of EN 45545-2 via the requirement sets R22, R23, and R24 up to the highest hazard level HL 3. Alternatively, the mass of the unclassified material is specified. Conformity to the requirements is then achieved via the so-called grouping rules.

For more information on fire protection, please refer to the Railway Guide:

phoenixcontact.com/railway_guide



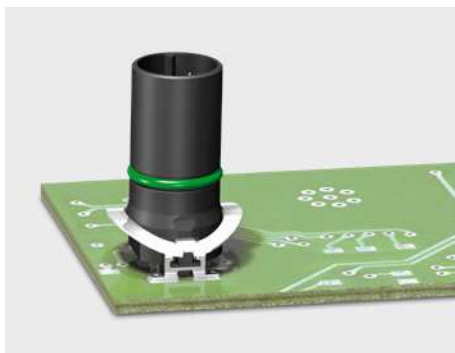
M12 device connectors in detail

On this and the next double page you will find our products for the device side of an M12 connector. This includes device connectors with assembled conductors as well as products for printed circuit board direct mounting.



Through-hole reflow soldering

The THR soldering process applies the process steps of SMT manufacturing to a PCB with through-contacted holes.



Surface mount technology

SMD is the basis for modern assembly manufacturing and optimizes the assembly manufacturing process.



Wide range of device port solutions

Use of housing screw connections with threaded fastening, press-in contour, or for direct integration into the front panel.



Connectors with litz wire connection

Connectors with preassembled litz wires for immediate use. They are molded on the cable side for optimum seal tightness.



Connectors with cable connection

Cable designs with optimum tightness due to cable-side potting for all common networks and fieldbuses.



For wave soldering processes

Connectors for use in wave soldering processes feature simple PCB mounting.

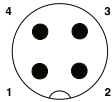
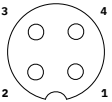
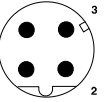
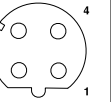
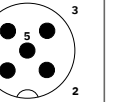
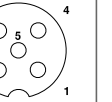
Product list M12 device connectors

SIGNAL and DATA

EN 61373, unclassified mass in accordance with EN 45545-2:

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 <100 g

M12 device connectors		4-position				5-position	
 Lead-free alternative items available	Coding	A		D		A	
	Pin assignment	Male	Female	Male	Female	Male	Female
							
Screw fastening, front mounting							
	Zinc die-cast housing with litz wire, M16 x 1.5	1523450	1523434	1551558	1535202	1520055	1520039
	Stainless steel housing with litz wire, M16 x 1.5	1405233	1458855			1458868	1458871
Screw fastening, rear mounting							
	Zinc die-cast housing with litz wire, M16 x 1.5	1419629	1419632	1419603	1419616	1419645	1419658
	Zinc die-cast housing with cable, M16 x 1.5, cable length 1 m, PUR black	1419399	1419302			1419409	1419328
Solder connection for reflow and wave soldering processes, two-piece							
	Straight, shielded, THR, tape-on-reel	1457500	1457623	1457513	1457636	1457539	1457652
	Straight, THR, tape-on-reel	1457490	1457610			1457526	1457649
	Angled, shielded, wave soldering, blister packaging	1439887	1432444	1436673	1432457	1439890	1432431
Solder connection for reflow processes, two-piece, SMD contact carrier							
	Straight, shielded, SMD, tape-on-reel, additional gasket for the device when not plugged in	1412010	1412004	1412011	1412005	1412012	1412006

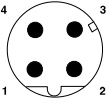
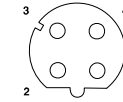
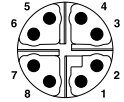
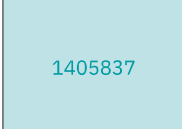
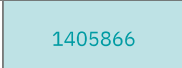
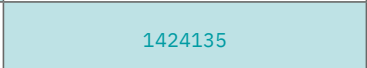
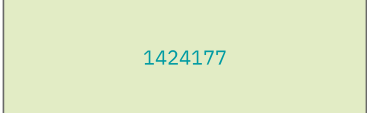
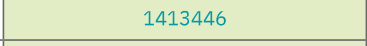
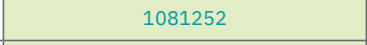
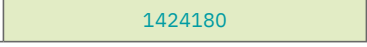
Product list M12 device connectors

DATA

EN 61373, unclassified mass in accordance with EN 45545-2:

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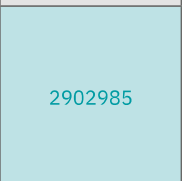
 <100 g

M12 device connectors for networks		4-position		8-position
 Lead-free alternative items available	Coding	D		X (CAT6 _A)
	Pin assignment	Male	Female	Female
				
Front mounting, with assembled cable, Ethernet				
	M16 x 1.5, can be positioned, water blue, cable type 93E, cable length: 2 m			
Rear mounting, with assembled cable, Ethernet				
	M16 x 1.5, water blue, cable type 93E, cable length: 2 m			
	M16 x 1.5, water blue, cable type 94F, cable length: 0.5 m			
Rear mounting, with assembled cable, PROFINET				
	Pg9, green, cable type 93B, cable length: 0.5 m			
Rear mounting, for wave soldering processes, Ethernet hybrid				
	M16 x 1.5, one-piece, wave soldering			
Contact carrier for wave and reflow soldering processes, Ethernet two-piece				
	Straight, shielded, THR, tape-on-reel			
	Straight, shielded, SMD, tape-on-reel			
	Angled, shielded, wave soldering			

DATA

EN 50155, EN 61373, unclassified mass in accordance with EN 45545-2:

 <100 g

Network isolator for electrical isolation					
	Connection method	Transmission rate	Interfaces	Type	Item no.
	M12 D-coded, female	10/100 Mbps	Ethernet PROFINET	FL ISOLATOR 100-M12	

Reliable data cabling

The portfolio for control level cabling systems in the rail vehicle can be found here in a list:

phoenixcontact.com/railway-data-cabling



M12 push-pull cable connectors

Access the product list online for M12 push-pull cable connectors suitable for use in railway vehicles:

phoenixcontact.com/railway-field-connector



M12 push-pull device connectors

Gain an overview of the portfolio of M12 connectors for installation in devices here:

phoenixcontact.com/railway-device-connector

