

Technical Description

Tool changer TC20

M0117-1

Tool changers | Swivels | Swivel tool changers | Grippers | Hose packages | Valve units | Tool systems



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1 INTRODUCTION

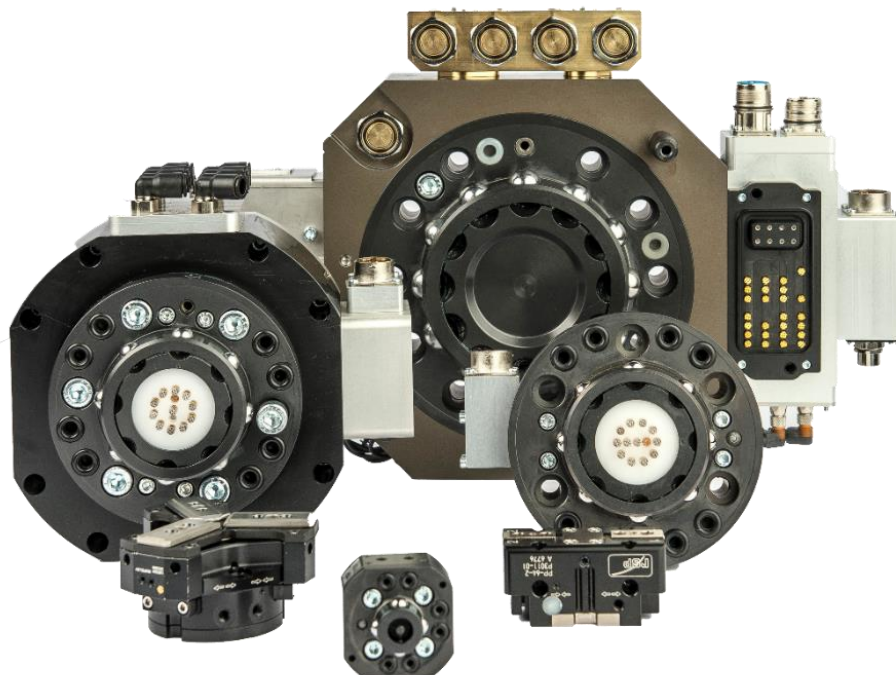
Robot System Products is a front-rank provider of peripheral products for high performance robot applications. We provide complete system solutions for your robot installations, aiming to improve your productivity with the most reliable and cost-effective tooling on the market. Continuously we explore emerging technologies, working with leading edge design.

Robot System Products has a wide range of standard robot peripheral products:

- Tool changers
- Swivels
- Swivel tool changers
- CiRo
- Grippers
- Hose Packages
- Valve units
- Tool systems
- Tool parking systems

Robot System Products' tool changers are constructed to maximize the flexibility and reliability of your robot fleet. Through our patented locking device TrueConnect™ robustness and high safety are combined with low weight and compactness. With our swivels compressed air, water, electrical and data signals as well as weld and servo power are transferred to your tools with robot motion capabilities fully maintained. Our swivel tool changers unite the TrueConnect™ mechanism with our swivel technology, combining the best out of the two technologies. With RSP's cost-effective CiRo, cables and hoses can be freely selected with high robot flexibility maintained, and space requirements reduced. Our integrated tool systems are delivered as complete plug-and-play solutions designed for quick and simple installation.

Robot System Products' product lines are available for all major robot brands and come with complete documentation. 3D-models for simulation are available for download at: www.rsp.eu.com.



1.1 RSP tool changer

The Robot System Products' tool changers enable robots to handle and switch between multiple tools. They are built to ensure reliable and smooth operation, being compact with low weight and robust design and incorporating many safety features. Depending on model and options, electrical signals, weld and servo power, data, water and compressed air are transferred from the robot side to the tool.

The patented locking device TrueConnect™ has a minimum of play and gives a practically, through the lifespan, absolute positioning repeatability. The principle behind the locking mechanism is the uniform distribution of load obtained by pressing locking balls into spherical grooves. In consequence, substantially larger positional tolerances are accepted during docking.

1.2 Documents

This *Technical Description* contains product information and data, drawings, circuit and pneumatic diagrams and lists of spare parts. In the document *Installation and Maintenance* (M0119-1) procedures for mounting, installation and replacement of equipment are described together with descriptions of inspection, cleaning and lubrication activities including recommended maintenance intervals.

1.3 Wear parts

Wear parts should be replaced before considerable damage occurs. The interval depends on the number of tool changes and its working environment. Generally, the more contaminated environment, the closer maintenance intervals.

The following parts are considered as wear parts:

- Signal pins
- Air sealings
- O-rings

1.4 Complementary equipment

Complementary equipment is described in separate documents.

Article	Note
External valve units	Mounted at the rear of the upper arm. Shuts off the air automatically during tool changing.
Tool parking systems	RSP tool parking systems give rigid installations for easy tool changing.
Connection kits	Connection kits for tool changers and tool attachments simplifying electrical installations.
3D-models	Available in Solid Works®, STEP and Parasolid format.

2 TECHNICAL SPECIFICATIONS

2.1 Description of tool changers and tool attachments

This document presents the Robot System Products TC20-4 tool changers, including tool attachments, dedicated for material handling. Likewise presented are adaptation kits, connection kits to facilitate electrical installation and a tool stand kit.

The tool changer TC20-4 transfers compressed air to the tool. It can be equipped with transfer of electrical signals, via spring loaded signal pins, to the tool attachment. The electrical version is designated 'E'. The tool changers TC20-4 ID and TC20-4E ID are dedicated for the use on robots with integrated dressing. This series of TC20 tool changers cannot transport fluids.

The contact surface of the tool attachment and the signal pins are not in connection until at the very end of the docking cycle when the tool attachment is already properly aligned. This guarantees a minimum of wear of the contact surfaces.

The electrical unit is primarily intended for transfer of sensor signals from grippers. In addition, it can be used for checking the presence and identifying tools by using signal jumpers and binary coding of signals on the tool attachment.

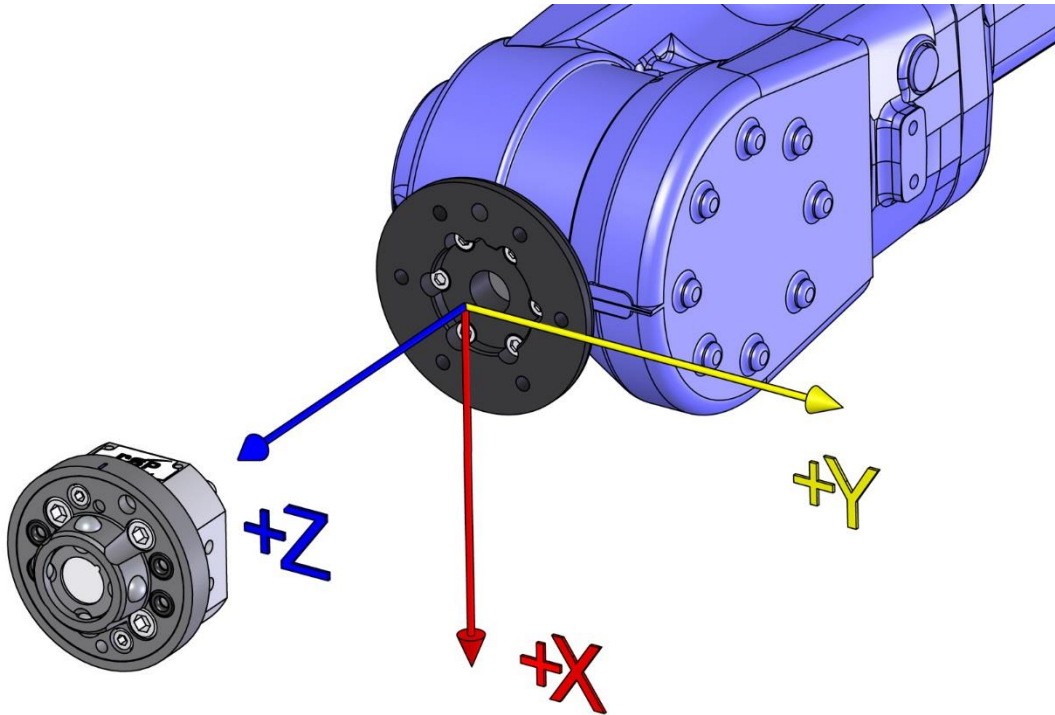
For other bolt circles adaptation plates between the tool changer and the turning disc on the robot may be needed. Such adaptation plates are available from RSP.



TC20-4E

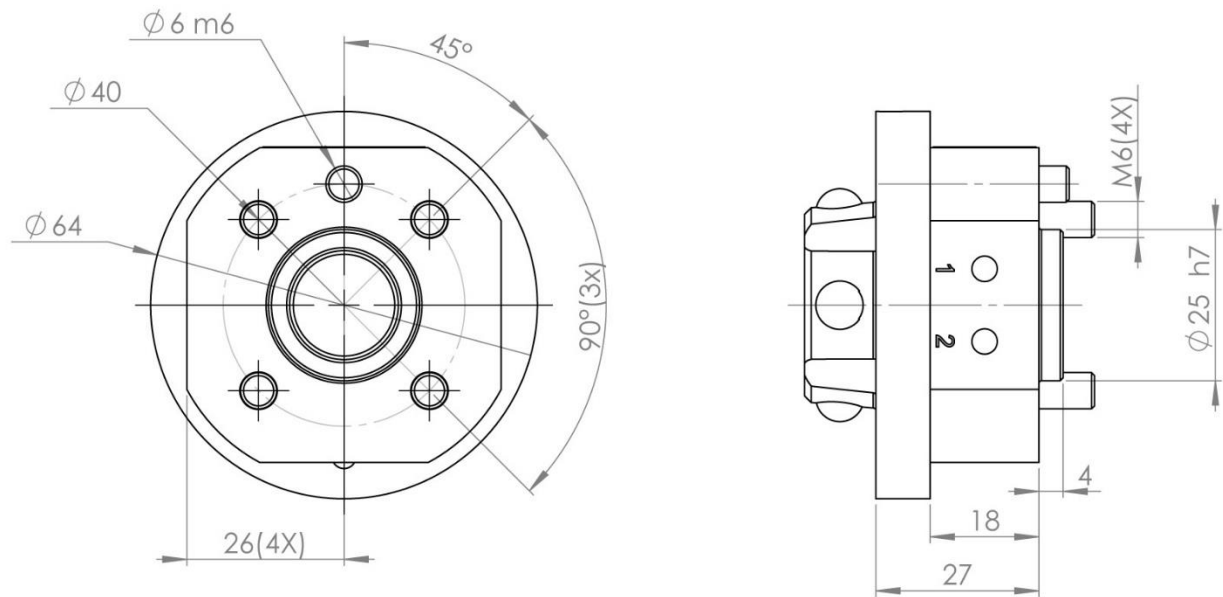
2.1.1 Coordinate System Definition

A tool changer adds load to the robot. If the arm and tool loads are not stated correctly during programming the behaviour of the robot and the wear of the equipment will be affected. Information about weight and centre of gravity can, in accordance with the co-ordinate system stated below, be found in the technical specification tables of the tool changer.



NOTE! For the tool changer and tool changer with tool attachment, the origo of the co-ordinate system is situated in the centre of the robot mounting flange.

2.1.2 Tool changer with air, TC20-4. Article: P0101

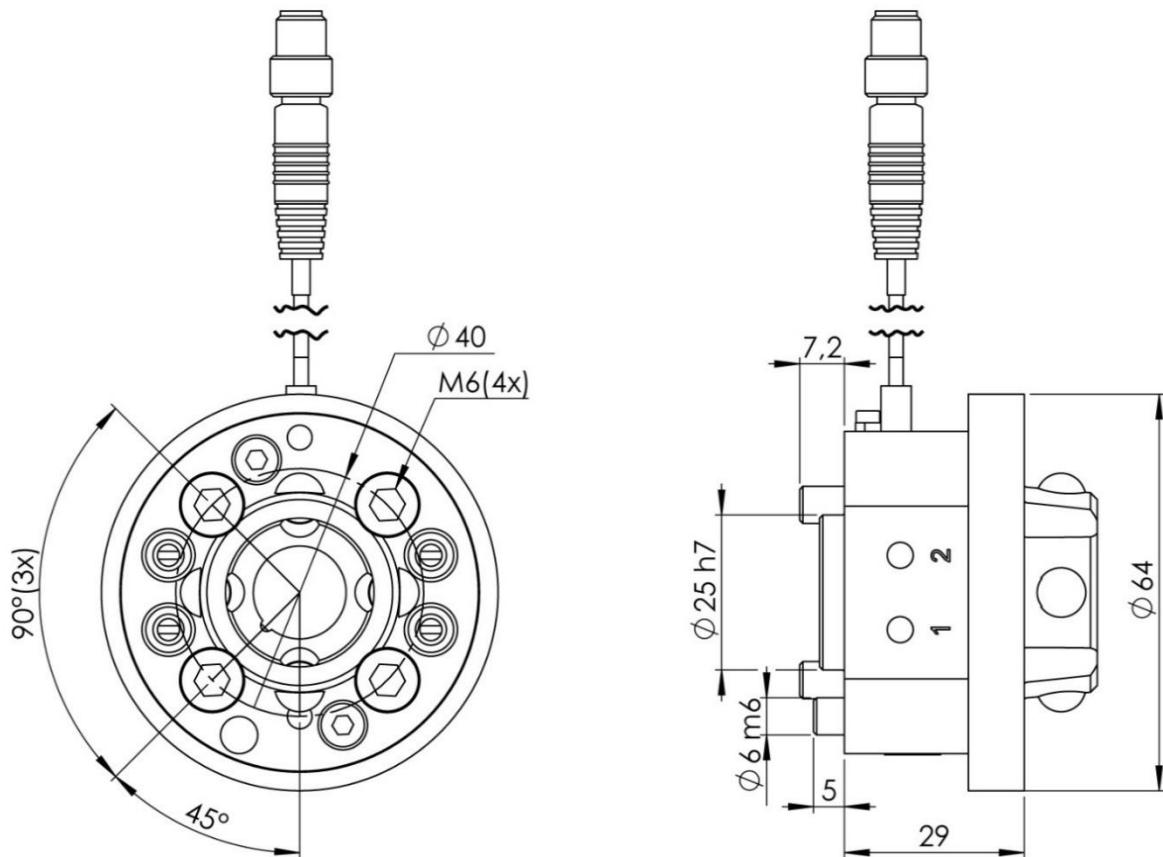


Tool changer TC20-4 transfers 4 pneumatic channels to the tool attachment and has separate inlets for Open TC and Close TC. To be used together with tool attachments P0102 or P0123.

Technical data

Working temperature		+10°C – +50°C
Bolt pattern		ISO 9409-1-40-4-M6
IP classification		IP 54
Maximum tool load	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±100 Nm
Weight and centre of gravity (Z)		
TX (P0101)		0.4 kg / 18 mm
TC + (TA) P0102		0,5 kg / 22 mm
TC + (TA) P0123		0.7 kg / 26 mm
Air channels	Pneumatic diagram	See section 2.1.13
	User channels, robot side	4 x M5 (150 l/min, max 10 bar)
	Dedicated channels, G 1/8"	Open TC marked Open (6-10 bar) Close TC marked Close (6-10 bar)
	Air quality	Oil-clean and waterless filtered air, with max 25µm particle content

2.1.3 Tool changer with TC Opened sensor, TC20-4. Article: P1140

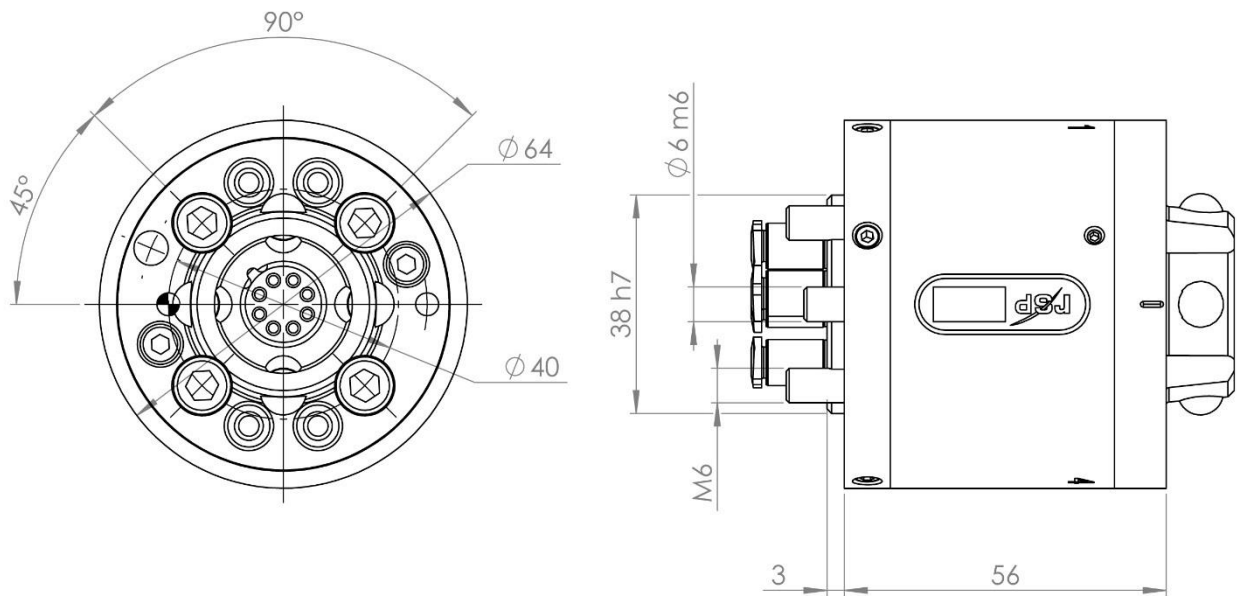


Tool changer TC20-4 transfers 4 pneumatic channels and has a magnetic sensor for TC Opened. To be used together with tool attachments P0102 or P0123.

Technical data

Working temperature		+10°C – +50°C
Bolt pattern		ISO 9409-1-40-4-M6
IP classification		IP 54
Maximum tool load	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±100 Nm
Weight and centre of gravity (Z)		
TC (P1140)		0.4 kg / 18 mm
TC + (TA) P0102		0,5 kg / 22 mm
TC + (TA) P0123		0.7 kg / 26 mm
Air channels	Pneumatic diagram	See section 2.1.13
	User channels, robot side Dedicated channels, G 1/8"	4 x M5 (150 l/min, max 10 bar) Open TC marked Open (6-10 bar) Close TC marked Close (6-10 bar)
Air quality		Oil-clean and waterless filtered air, with max 25µm particle content
Electrical signals	Circuit diagram	E0185-029 (section 2.1.14)
	Dedicated signal	TC Opened
	Connection, robot side	M8 3p

2.1.4 Tool changer ID with air, TC20-4 ID. Article no: P0139

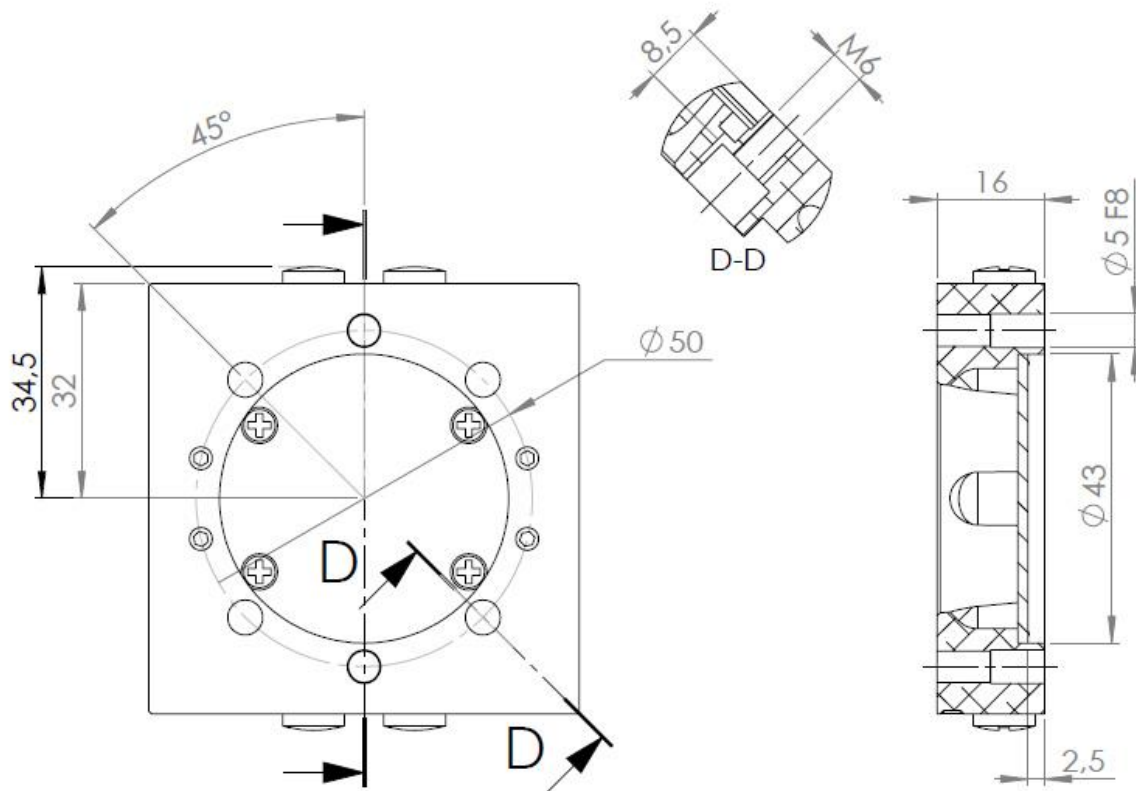


Tool changer TC20-4 ID transfers 4 pneumatic channels to the tool attachment and has inlets for Open TC and Close TC. To be used together with tool attachments P0102 or P0123.

Technical data

Working temperature		+10°C–+60°C
Bolt pattern		ISO 9409-1-40-4-M6
Maximum tool load	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±100 Nm
Weight and centre of gravity (Z)		
TC (P0139)		0.7 kg / 34 mm
TC + TA (P0102)		0,8 kg / 38 mm
TC + TA (P0123)		1,0 kg / 42 mm
Air ducts	Pneumatic diagram	See section 2.1.13
	User channels, robot side	4 x 4 mm (100 l/min, max 10 bar)
	Dedicated channels, 2 x 4 mm	Open TC marked O (6-10 bar) Close TC marked C (6-10 bar)
Air quality		Oil-clean and waterless filtered air, with max 25µm particle content

2.1.5 Tool attachment TA20-4, Article: P0102



Tool attachment TA20-4 transfers 4 pneumatic channels to the tool. To be used together with P0101 or P0139.

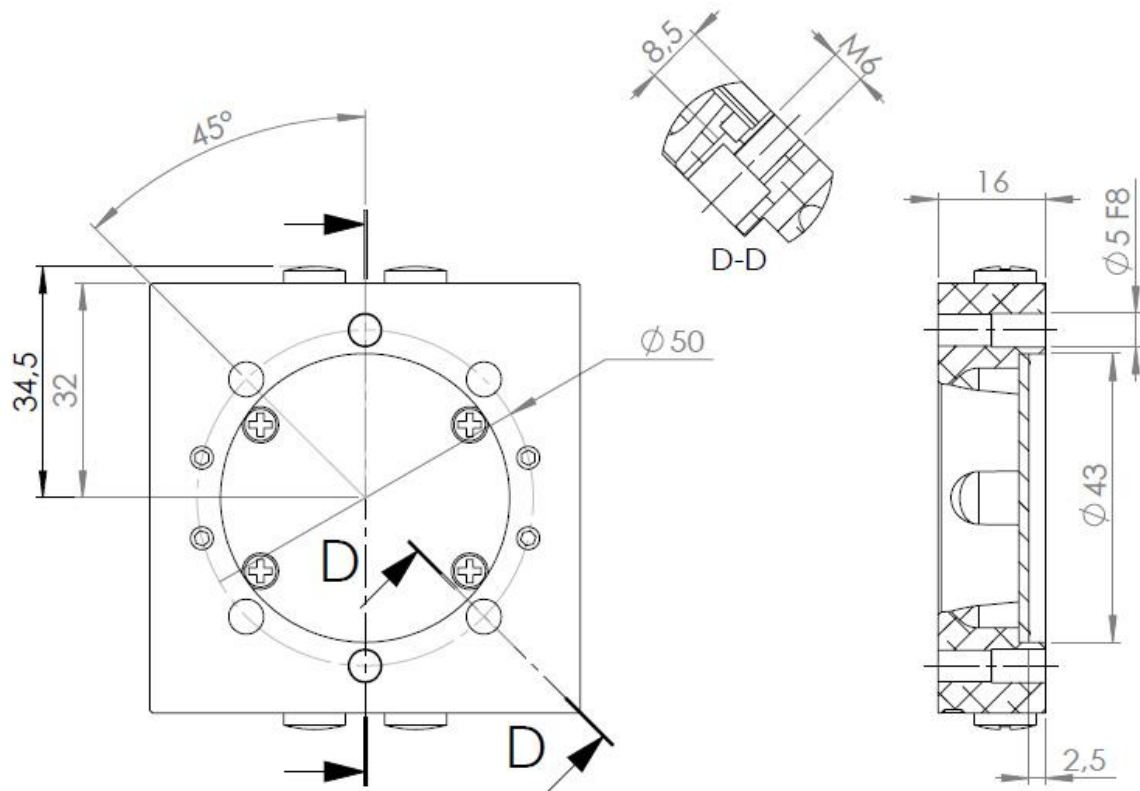
Technical data

Working temperature		+10°C – +50°C
Bolt pattern		ISO 9409-1-50-4-M6
Weight		0.1 kg
Maximum tool load (M6-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±100 Nm
Maximum tool load (M5-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±75 Nm
Air channels		Connections, tool side 4 x M5



NOTE! Tools can be mounted to the tool attachment using four M6-screws, alternatively the tool attachment can be mounted to the tool using four M5-screws.

2.1.6 Tool attachment TA20-4 steel, Article: P0123



Tool attachment TA20-4 transfers 4 pneumatic channels to the tool. To be used together with P0101 or P0139.

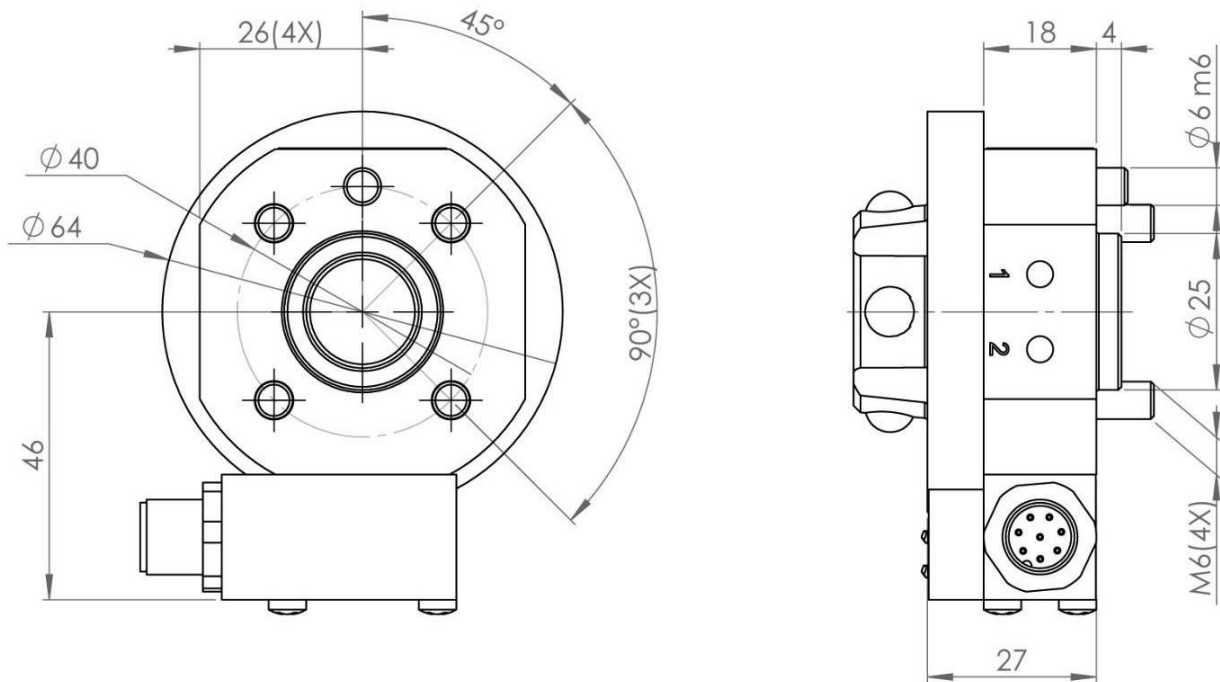
Technical data

Working temperature		+10°C – +50°C
Bolt pattern		ISO 9409-1-50-4-M6
Weight		0.3 kg
Maximum tool load (M6-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±100 Nm
Maximum tool load (M5-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±75 Nm
Air channels	Connections, tool side	4 x M5



NOTE! Tools can be mounted to the tool attachment using four M6-screws, alternatively the tool attachment can be mounted to the tool using four M5-screws.

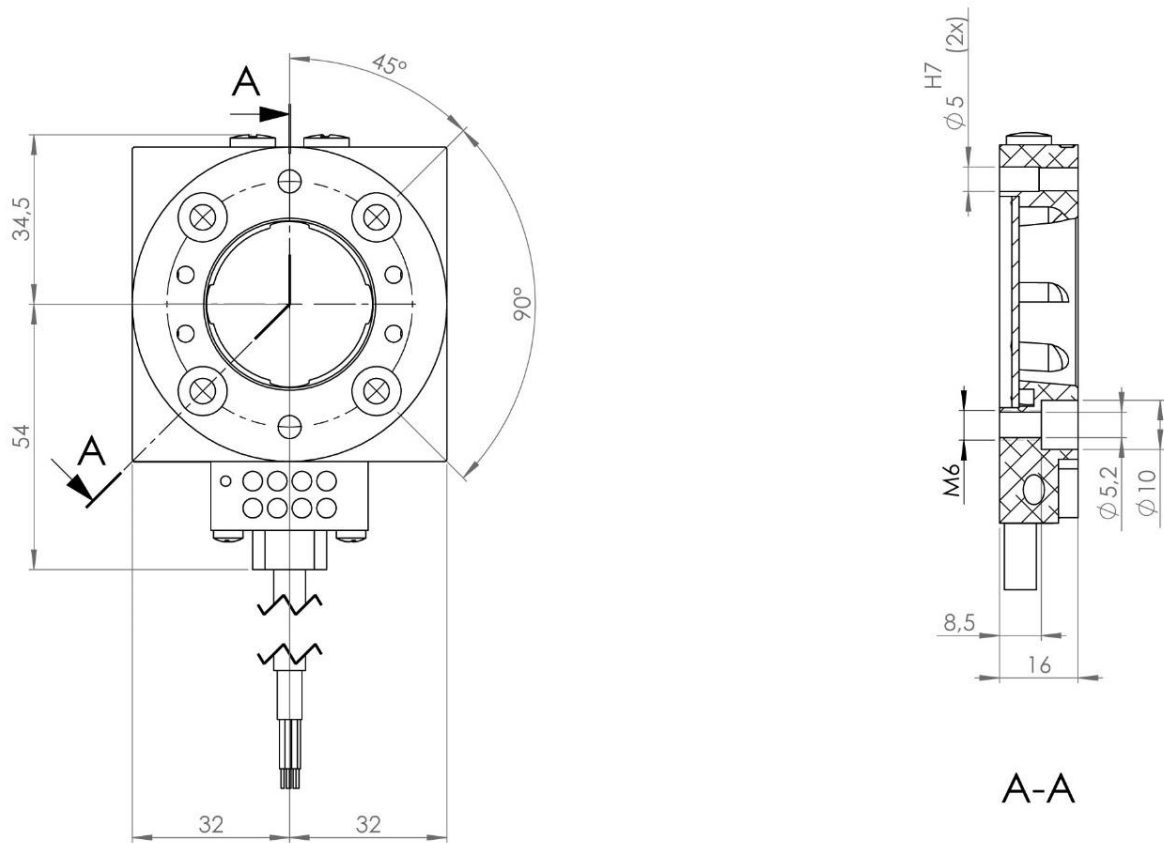
2.1.7 Tool changer with air and electric signals TC20-4E. Article: P0103



Tool changer TC20-4E transfers 4 pneumatic channels and 8 electrical signals to the tool attachment and has separate inlets for Open TC and Close TC. To be used together with tool attachments P0104 or P0124.

Working temperature		+10°C – +50°C
Bolt pattern		ISO 9409-1-40-4-M6
IP classification		IP 54
Maximum tool load	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±100 Nm
Weight and centre of gravity (Z)		
TC (P0103)		0.4 kg / 18 mm
TC + (TA) P0104		0,5 kg / 22 mm
TC + (TA) P0124		0.7 kg / 26 mm
Air channels	Pneumatic diagram	See section 2.1.13
	User channels, robot side	4 x M5 (150 l/min, max 10 bar)
	Dedicated channels, 2 x M5	Open TC marked 6 (6-10 bar)
		Close TC marked 5 (6-10 bar)
	Air quality	Oil-clean and waterless filtered air, with max 25µm particle content,
Electrical signals	Circuit diagram	E0185-001 (section 2.1.15)
	M12 8P, A-coded PM	8 x (1A, 30V)
Connection kits (optional)	P0025 (cable kit)	M12 8S–M12 8P, 2-meter cable (0,25 mm²)
	P0025-30 (cable kit)	M12 8S–M12 8P, 3-meter cable (0,25 mm²)

2.1.8 Tool attachment TA20-4E, Article: P0104



Tool attachment TA20-4E transfers 4 pneumatic channels and 8 electrical signals to the tool. To be used together with P0103.

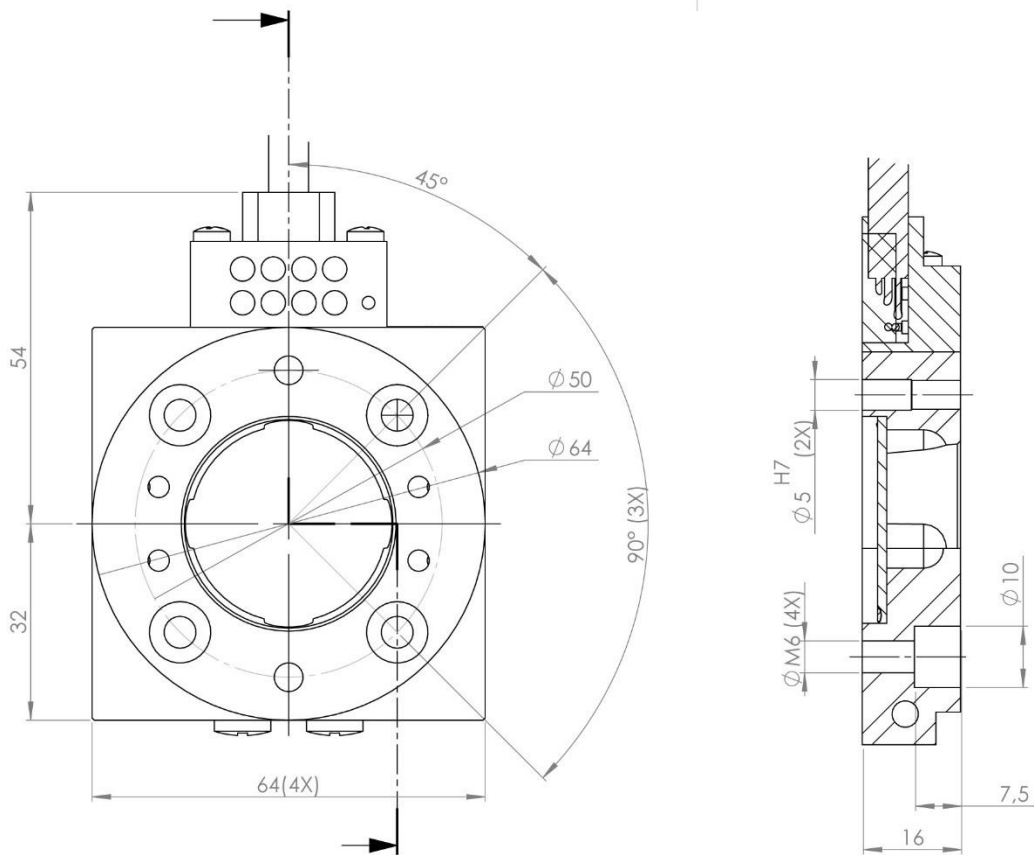
Technical data

Working temperature		+10°C – +50°C
Bolt pattern		ISO 9409-1-50-4-M6
Weight		0.1 kg
Maximum tool load (M6-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±100 Nm
Maximum tool load (M5-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±75 Nm
Air channels	Connections, tool side	4 x M5
Electrical signals	Circuit diagram	E0185-001 (section 2.1.15)
	Total number of signals	8
	Connection, tool side	0.5 m cable (0.25 mm²), open end



NOTE! Tools can be mounted to the tool attachment using four M6-screws, alternatively the tool attachment can be mounted to the tool using four M5-screws.

2.1.9 Tool attachment TA20-4E steel, Article: P0124



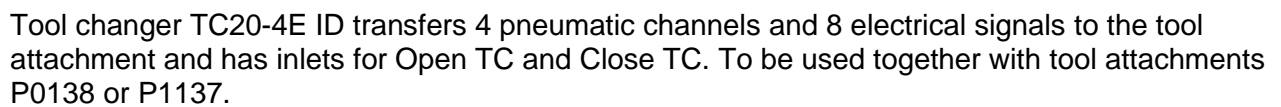
Tool attachment TA20-4E transfers 4 pneumatic channels and 8 electrical signals to the tool. To be used together with P0103.

Technical data

Working temperature		+10°C – +50°C
Bolt pattern		ISO 9409-1-50-4-M6
Weight		0.1 kg
Maximum tool load (M6-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±100 Nm
Maximum tool load (M5-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±200 Nm
	Mz (dynamic)	±75 Nm
Air ducts	Connections, tool side	4 x M5
Electrical signals	Circuit diagram	E0185-001 (section 2.1.15)
	Total number of signals	8
	Connection, tool side	0.5 m cable (0.25 mm²), open end

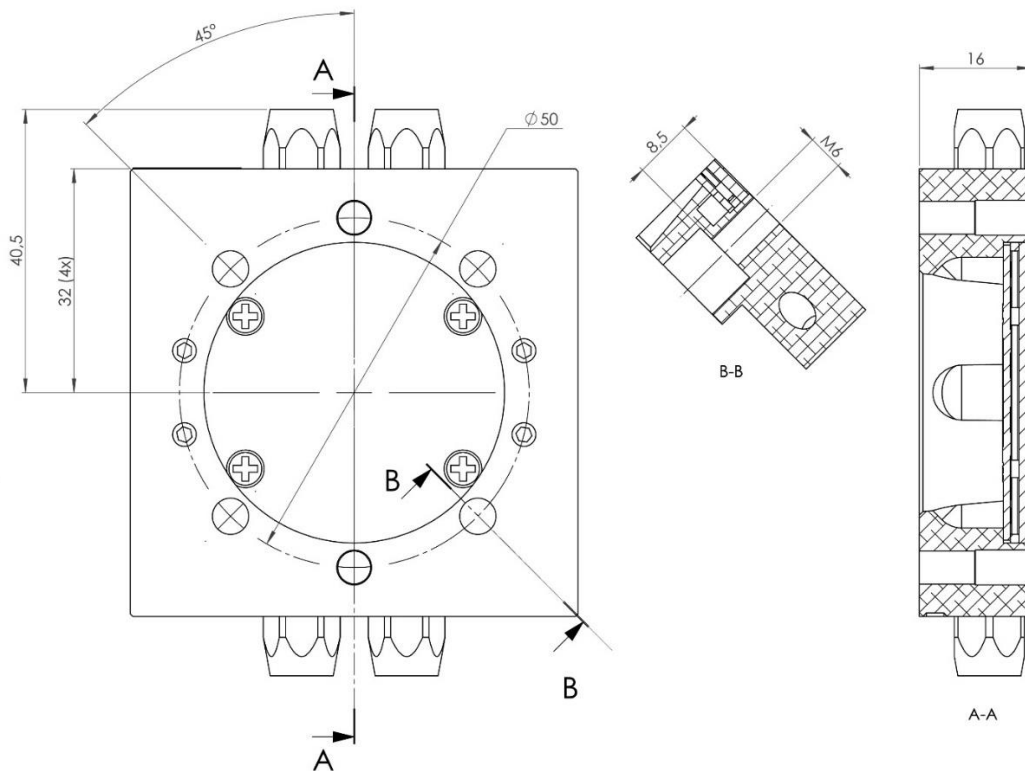


Note! Tools can be mounted to the tool attachment using four M6-screws, alternatively the tool attachment can be mounted to the tool using four M5-screws.

Article: P0133

Working temperature		+10°C–+60°C
Bolt pattern		ISO 9409-1-40-4-M6
Maximum tool load	Fz (static) Mx/My (dynamic) Mz (dynamic)	±200 N ±200 Nm ±100 Nm
Weight and centre of gravity (Z)		
TC (P0133)		0.7 kg / 34 mm
TC + TA (P0138)		0.8 kg / 40 mm
TC + TA (P1137)		1.0 kg / 44 mm
Air ducts	Pneumatic diagram User channels, robot side Dedicated channels, 2 x 4 mm Air quality	See section 2.1.13 4 x 4 mm (100 l/min, max 10 bar) Open TC marked O (6-10 bar) Close TC marked C (6-10 bar) Oil-clean and waterless filtered air, with max 25µm particle content
Electrical signals	Circuit diagram Mini-snap connector (I0925) ODU GH1LOC-P08PFG0-0000	E0185-013 (see section 2.1.16) 8 x (0.5A, 60V)
Connection kits (optional)	P8153-12/15/18/20 (Cable kit for connection box)	ODU 8S – M12 8P, 1.2/1.5/1.8/2.0-meter cable (0,25 mm²)

2.1.11 Tool attachment TA20-4E, Article no: P0138



Tool attachment TA20-4E transfers 4 pneumatic channels and 13 electrical signals to the tool. To be used together with P0133.

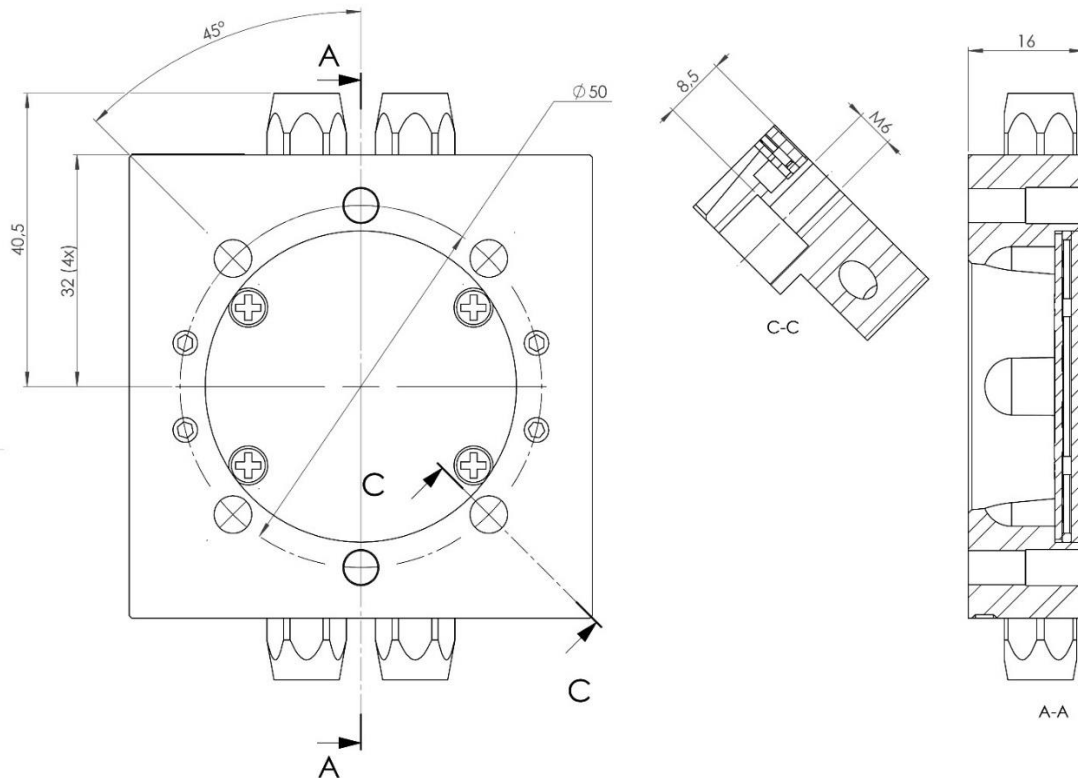
Technical data

Working temperature		+10°C–+60°C
Bolt pattern		ISO 9409-1-50-4-M6
Weight		0.1 kg
Maximum tool load M6-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±100 Nm
Maximum tool load (M5-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±75 Nm
Air channels	Connections, tool side	4 x M5
Electrical signals	Circuit diagram	E0208-001 (see section 2.1.17)
	Connection tool side	1 x M8 4S (2 x signal, 24V, 0V) 3 x M8 3S (signal, 24V, 0V)



Note! Tools can be mounted to the tool attachment using four M6-screws, alternatively the tool attachment can be mounted to the tool using four M5-screws.

2.1.12 Tool attachment TA20-4E steel, Article no: P1137



Tool attachment TA20-4E transfers 4 pneumatic channels and 13 electrical signals to the tool. To be used together with P0133.

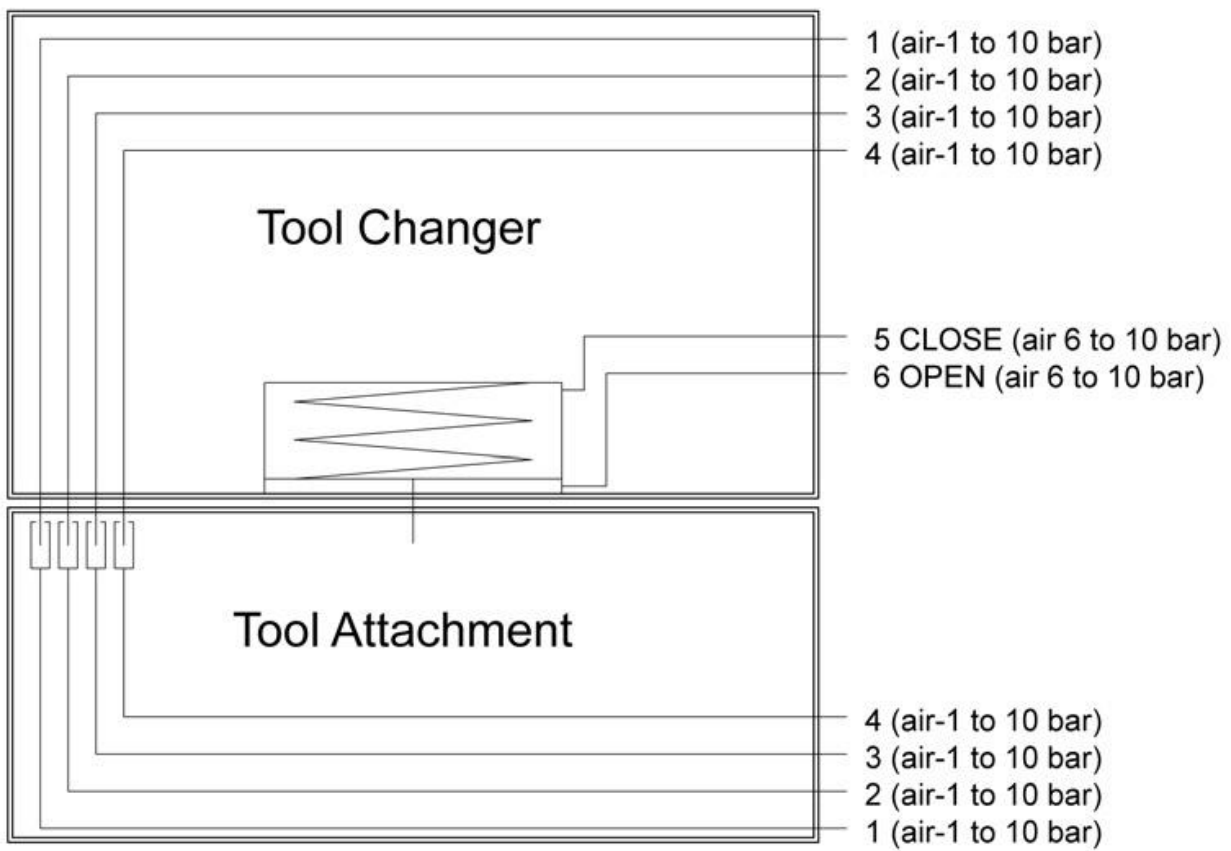
Technical data

Working temperature		+10°C–+60°C
Bolt pattern		ISO 9409-1-50-4-M6
Weight		0.3 kg
Maximum tool load (M6-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±100 Nm
Maximum tool load (M5-screws)	Fz (static)	±200 N
	Mx/My (dynamic)	±100 Nm
	Mz (dynamic)	±75 Nm
Air channels	Connections, tool side	4 x M5
Electrical signals	Circuit diagram	E0208-001 (see section 2.1.17)
	Connection tool side	1 x M8 4S (2 x signal, 24V, 0V) 3 x M8 3S (signal, 24V, 0V)

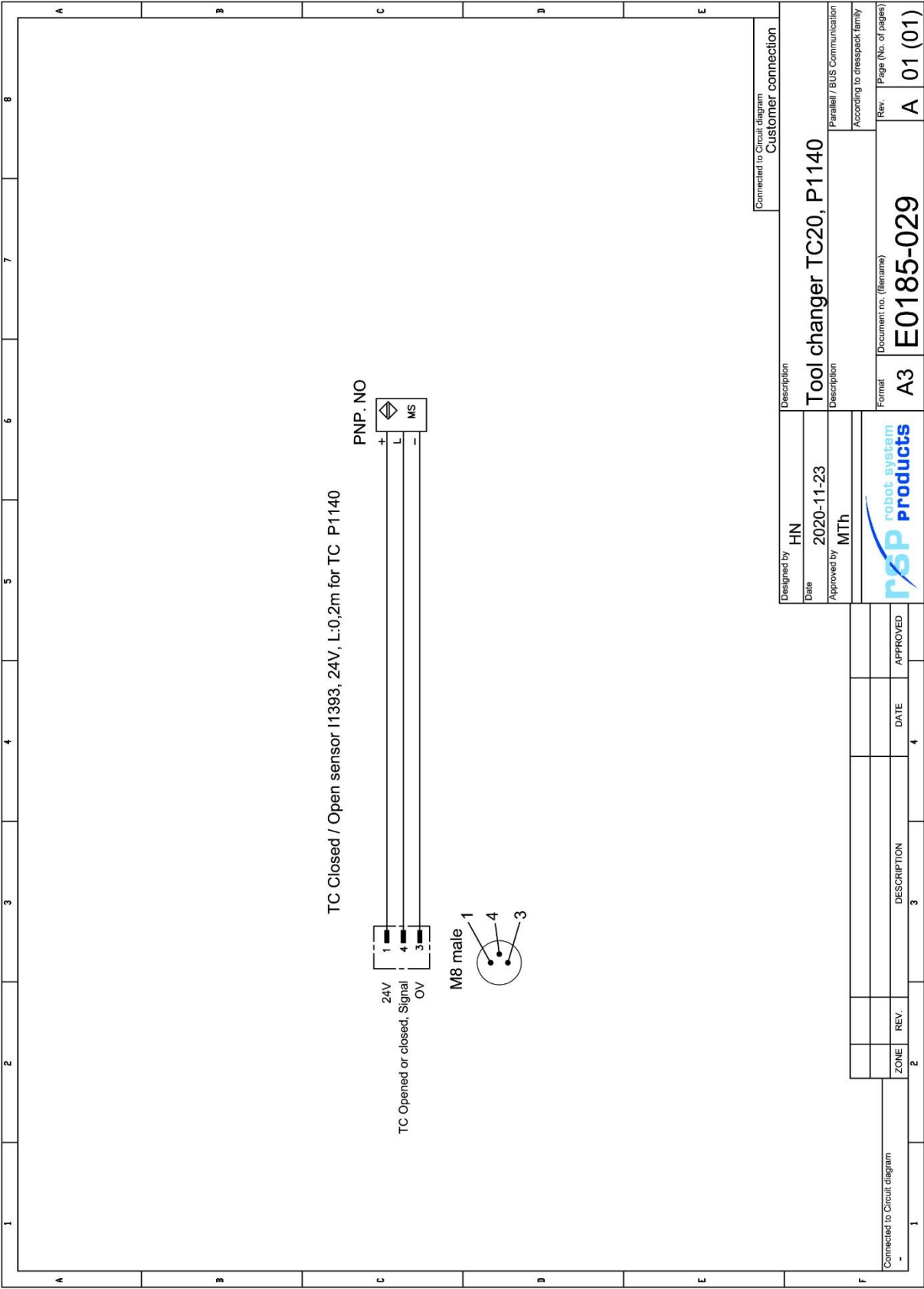


Note! Tools can be mounted to the tool attachment using four M6-screws, alternatively the tool attachment can be mounted to the tool using four M5-screws.

2.1.13 Pneumatic diagram for TC20, TC20 ID and TA20

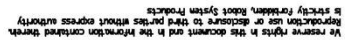


2.1.14 Circuit diagram E0185-029 for P1140

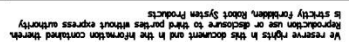


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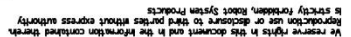
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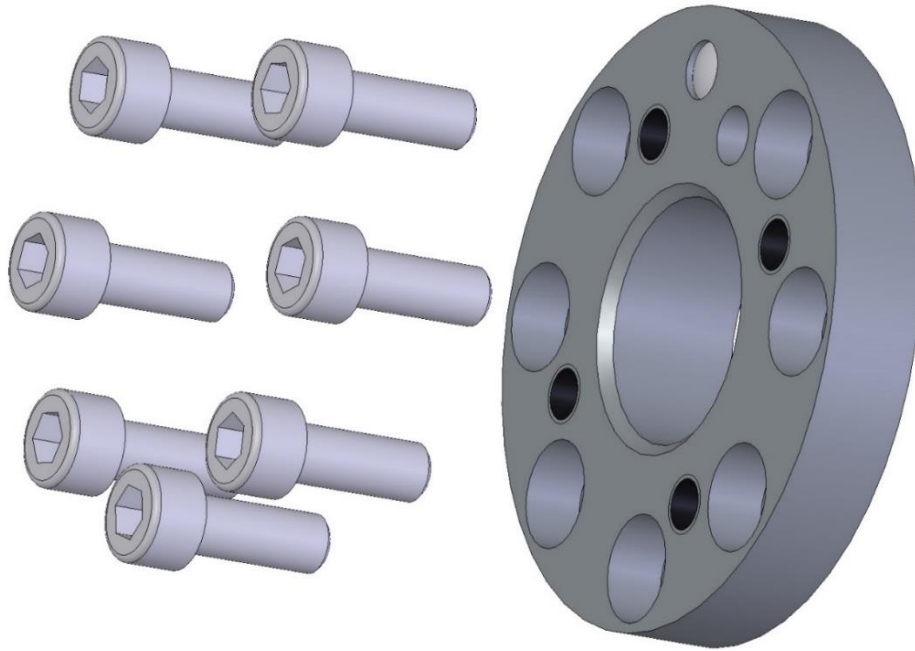
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2.2 Options for tool changer

2.2.1 Robot adaptation kits

Robot adaptation kits are required for mounting on robot flanges using alternative bolt patterns and consist of an adaptation plate including mounting screws. Robot adaptation kits for various robot models are available from RSP.



Example of adaptation plate with mounting screws

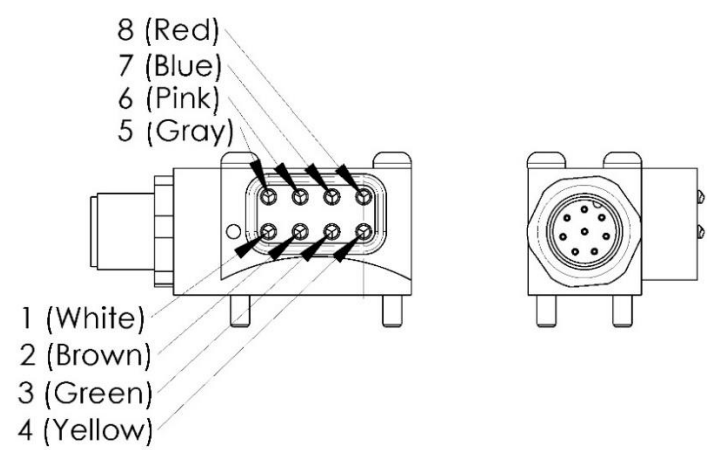
2.2.2 Tool Identification

Jumpers on signals at the tool attachment can be used to give information about which tool attachment that is docked in the tool changer.

2.2.3 Limitation of Robot movements

There can be some limitations on the movement of axis 5 for some robot models. Contact Robot System Products for more information.

2.2.4 Signal interface, 8 signals, robot side. Article: P1113



Transfers 8 electrical signals to the tool attachment. Can be mounted at two different positions on the tool changer. To be used with option P1114 on the tool attachment.

Technical data

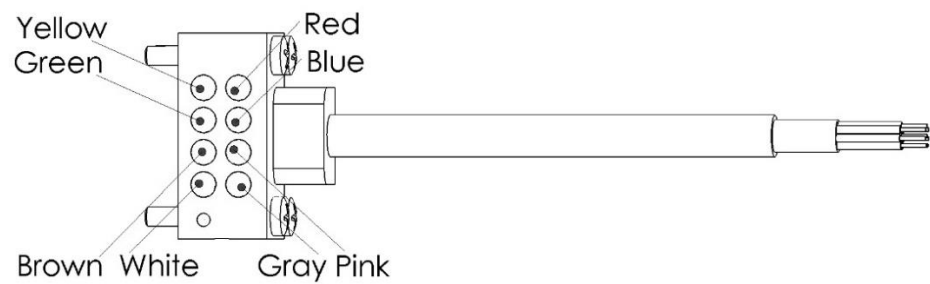
Weight	0.05 kg	
Electrical signals	Circuit diagram	E0185-001 (section 2.1.15)
	Total signals	8 x (1A, 30V)
	Connection, robot side	M12 8p, A-coded PM



NOTE! One P1113 is included in tool changer P0103. An additional P1113 can be mounted on P0103, making totally 16 electrical signals transferable. Can not be mounted on TC20-4 ID P0139 or P0133).

2.2.5 Signal interface, 8 signals, tool side. Article: P1114

Transfers 8 electrical signals to the tool. Can be mounted at two different positions on the tool attachment. To be used with option P1113 on the tool changer.



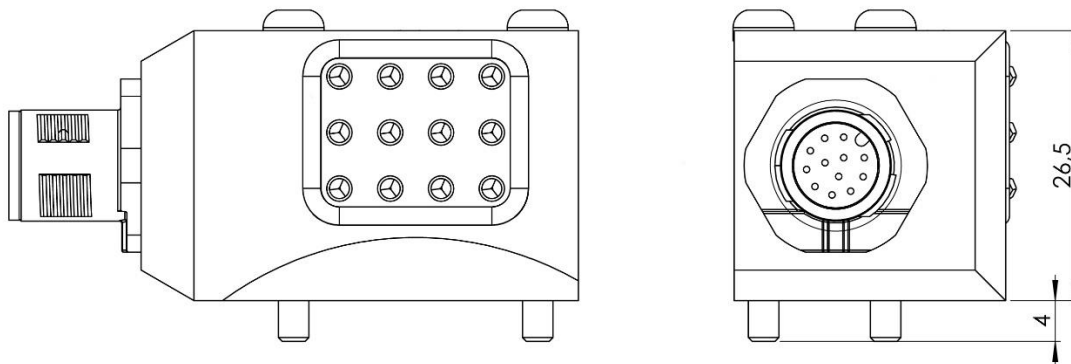
Technical data

Weight	0.05 kg	
Electrical signals	Circuit diagram	E0185-001 (section 2.1.15)
	Connection, tool side	0.5 m cable (0.25 mm²), open end



NOTE! One P1114 is included in tool attachments P0104 and P0124. An additional P1114 can be mounted on P0104 and P0124.

2.2.6 Signal interface, 12 signals, robot side. Article: P1131



Transfers 12 electrical signals to the tool attachment. Can be mounted at two different positions on the TC20 tool changers. To be used with option P1132 on the tool attachment.

Technical data

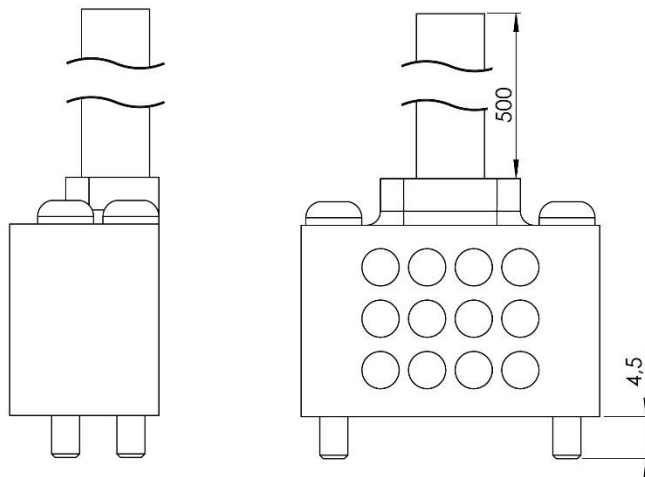
Weight		0.05 kg
Electrical signals	Circuit diagram	E0208-044 (section 2.2.8)
	Total signals	12 x (1A, 30V)
	Connection, robot side	M12 12P, A-coded PM



NOTE! Can not be mounted on TC20-4 ID P0139 or P0133.

2.2.7 Signal interface, 12 signals, tool side. Article: P1132

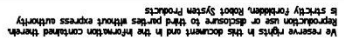
Transfers 12 electrical signals to the tool. Can be mounted at two different positions on the tool attachment. To be used with option P1131 on the tool changer.



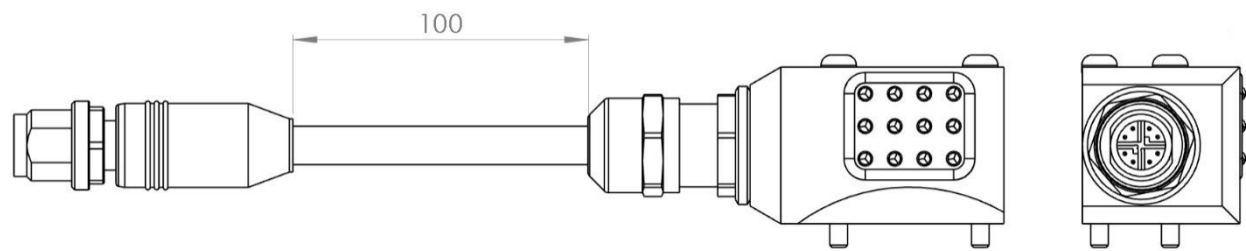
Technical data

Weight		0.05 kg
Electrical signals	Circuit diagram	E0208-044 (section 2.2.8)
	Connection, tool side	0.5 m cable (0.25 mm ²), open end

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2.2.9 Signal interface, M12 X-coded, robot side. Article: P1163



Transfers 8 Ethernet signals to the tool attachment. Can be mounted at two different positions on the tool changer. To be used with option P1164 on the tool attachment.

Technical data

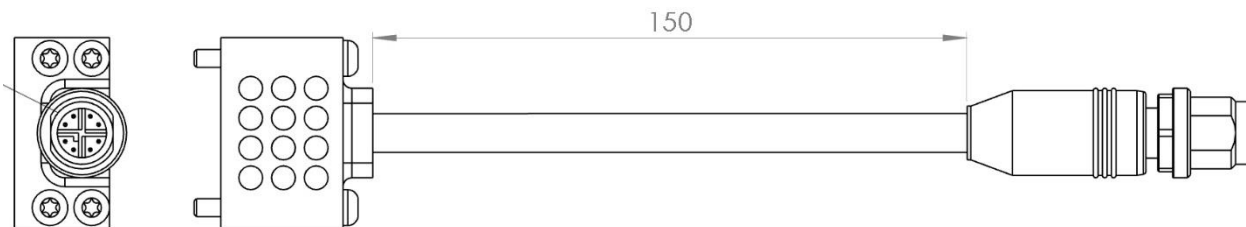
Weight		0.06 kg
Electrical signals	Circuit diagram	E0208-077 (section 2.2.11)
	Total signals	8 x Ethernet
	Connection, robot side	100 mm cable, M12 8P, X-coded



NOTE! Can not be mounted on TC20-4 ID P0139 or P0133.

2.2.10 Signal interface, M12 X-coded, tool side. Article: P1164

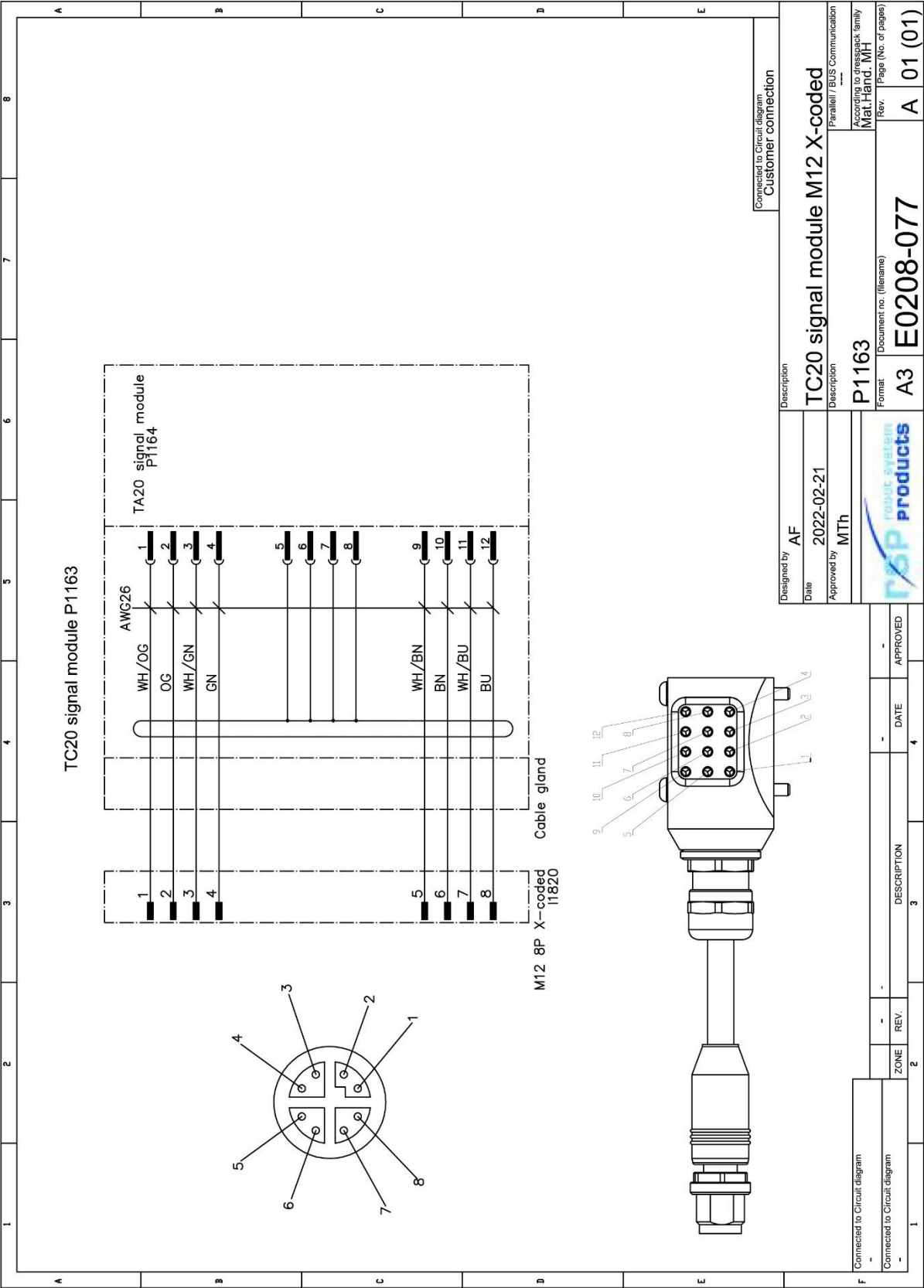
Transfers 8 Ethernet signals to the tool. Can be mounted at two different positions on the tool attachment. To be used with option P1163 on the tool changer.



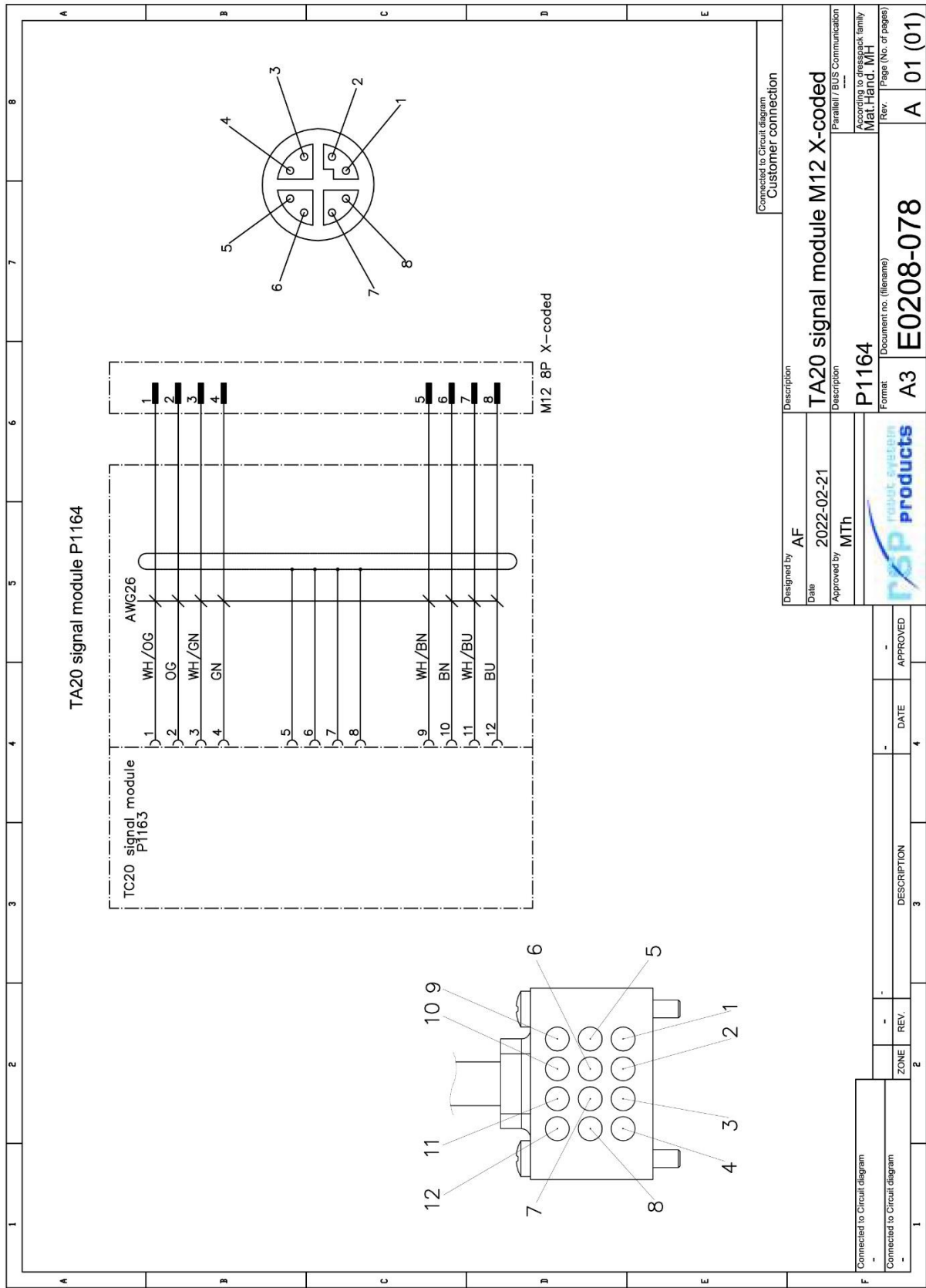
Technical data

Weight		0.03 kg
Electrical signals	Circuit diagram	E0208-078 (section 2.2.12)
	Connection, tool side	150 mm cable, M12 8P, X-coded

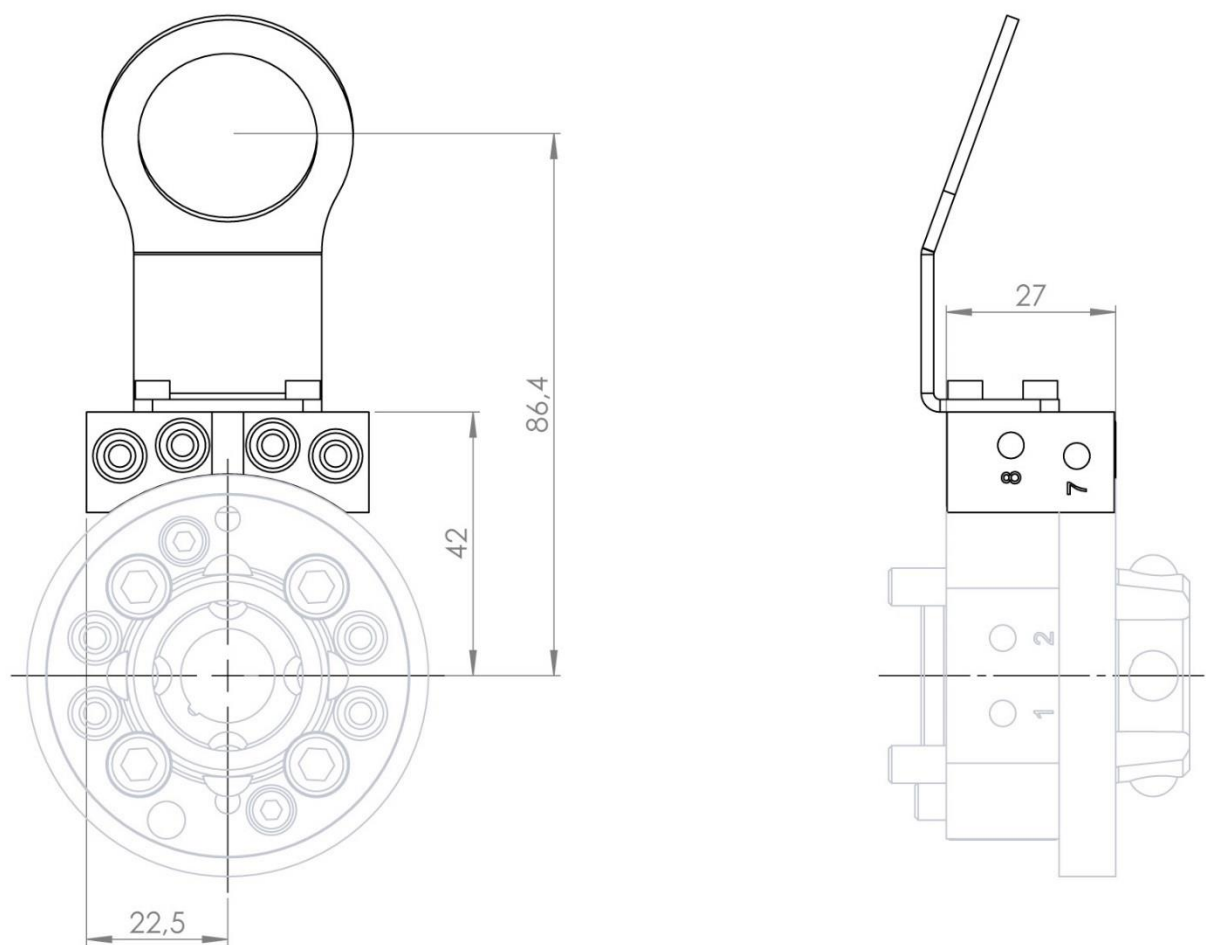
2.2.11 Circuit diagram E0208-077 for P1163



2.2.12 Circuit diagram E0208-078 for P1164



2.2.13 4x air coupling M5, robot side. Article: P1115



Transfers 4 additional pneumatic channels to the tool attachment. Can be mounted at two different positions at TC20-4 and one single position at TC20-4E. To be used together with option P1116 on the tool attachment.

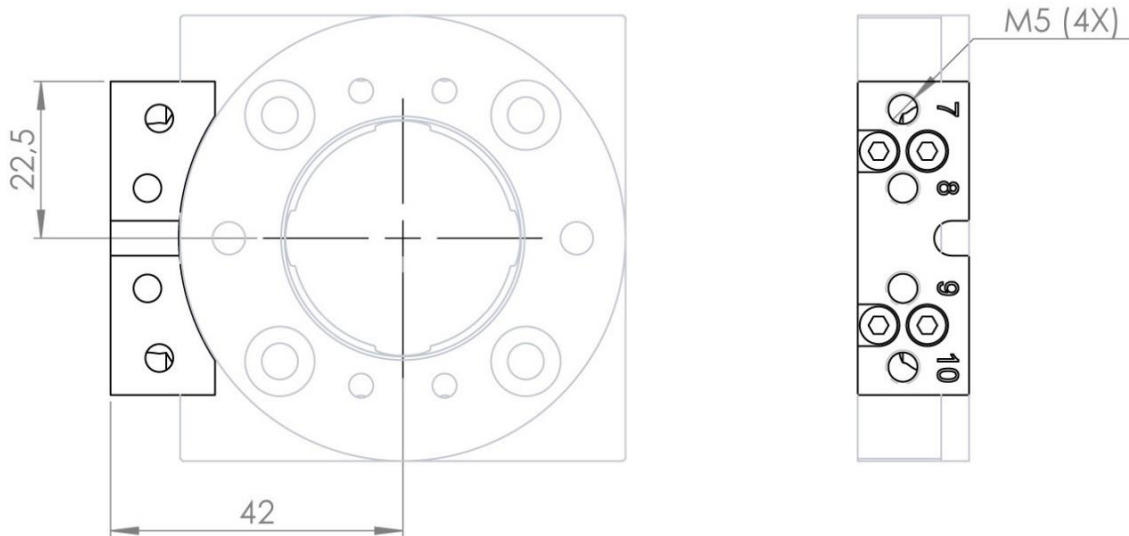
Technical data

Weight		0.1 kg
Air channels	User channels, robot side	4 x M5 (150 l/min, max 10 bar)
	Air quality	Oil-clean and waterless filtered air, with max 25µm particle content



NOTE! Can not be mounted on TC20-4 ID P0139 or P0133.

2.2.14 4x air coupling M5, tool side. Article: P1116

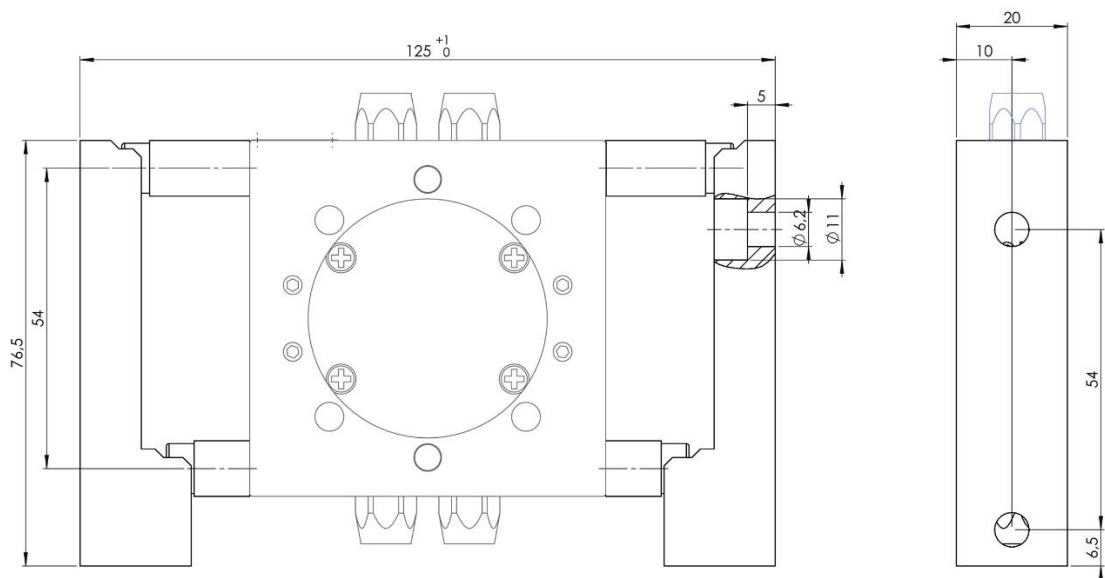


Transfers 4 pneumatic channels to the tool. Can be mounted at two different positions at TA20-4 and one single position at TA20-4E. To be used together with option P1115 on the tool changer.

Technical data

Weight	0.02 kg
Air channels	Connections, tool side
	4 x M5

2.2.15 Tool stand kit 20. Article: P0142



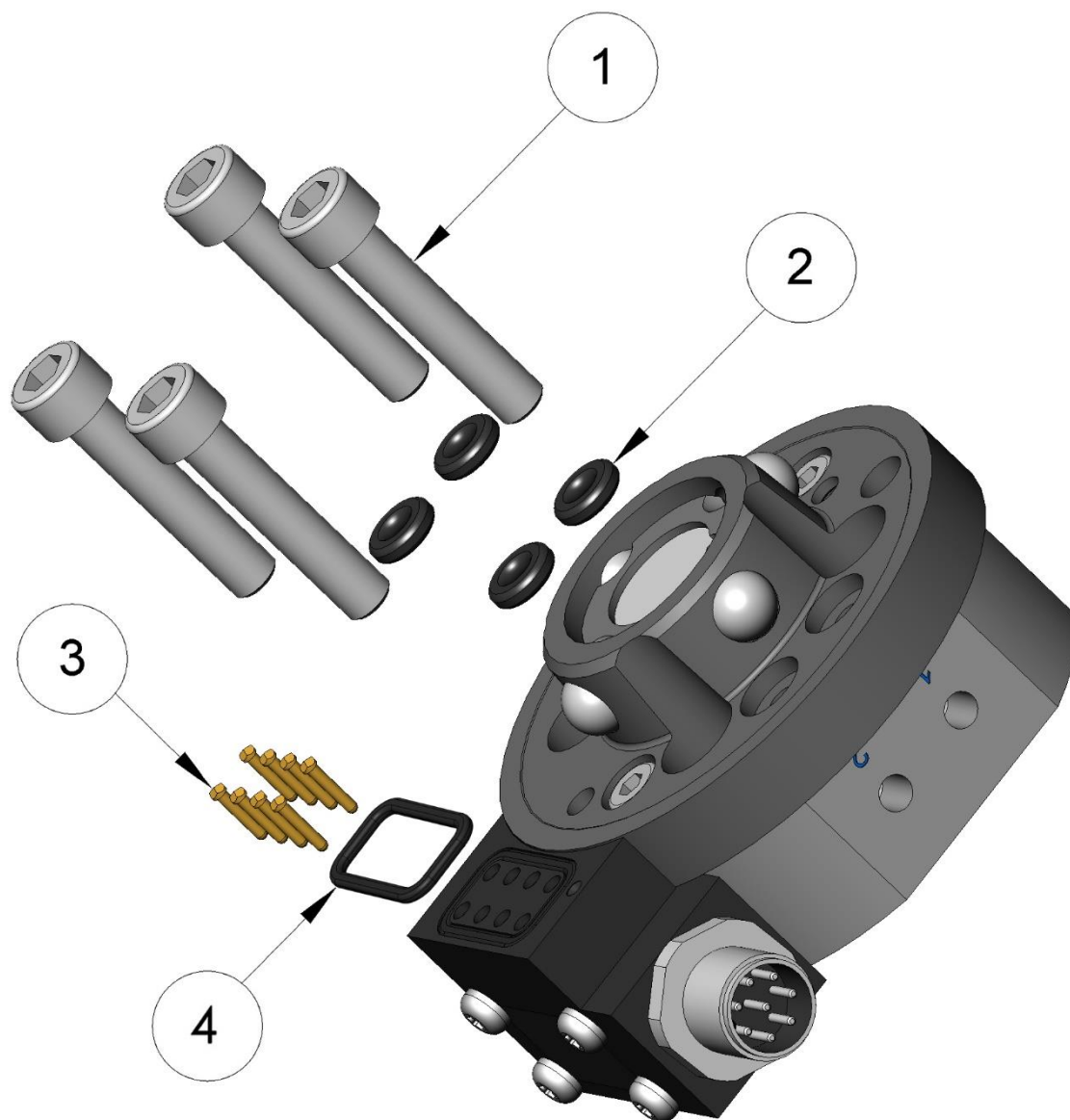
This tool stand kit gives, mounted on a stand, gives in combination with tool attachments P0102, P0104, P0123 or P0124 a robust tool stand for easy tool changing.

Technical data

Weight	0.3 kg
Maximum load	20 kg

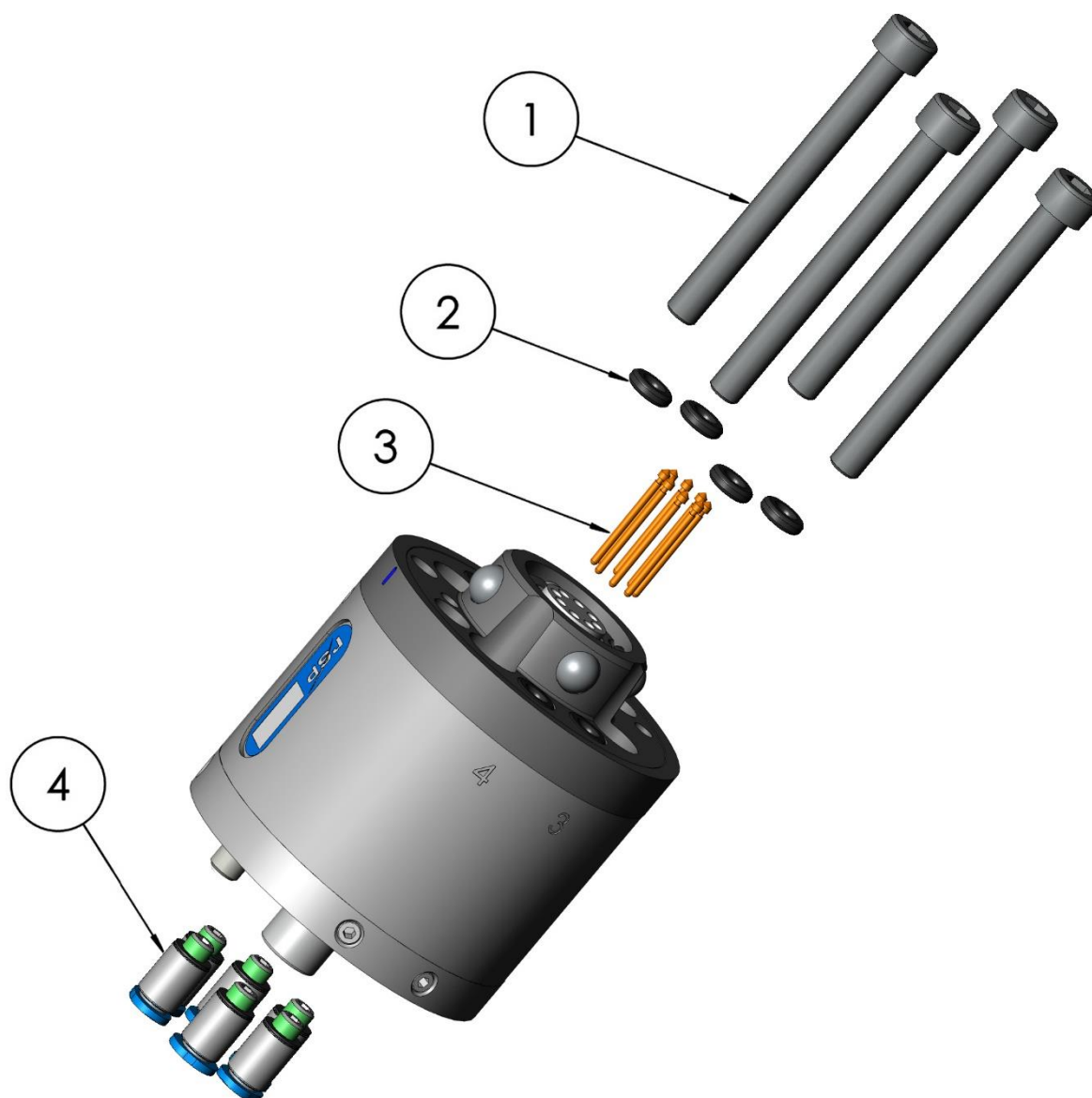
3 SPARE PARTS

3.1 Part list for tool changer P0101, P0103 and P1140



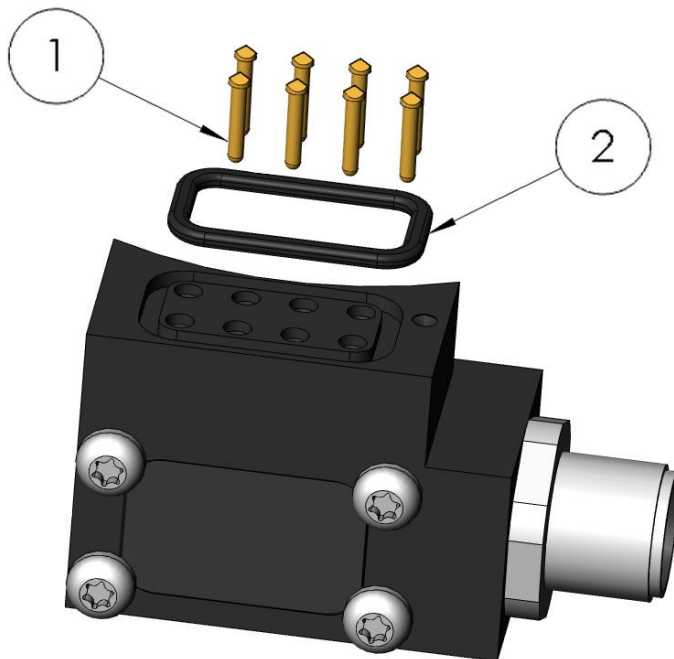
Item	Description	Part number	Wear part	Pcs
1	Fastening screws M6x30	21212519-374		4
2	Air sealings	I0158	X	4
3	Spring loaded signal pins (P0103 only)	I0154	X	8
4	O-ring	I1444	X	1

3.2 Part list for tool changer P0139 and P0133



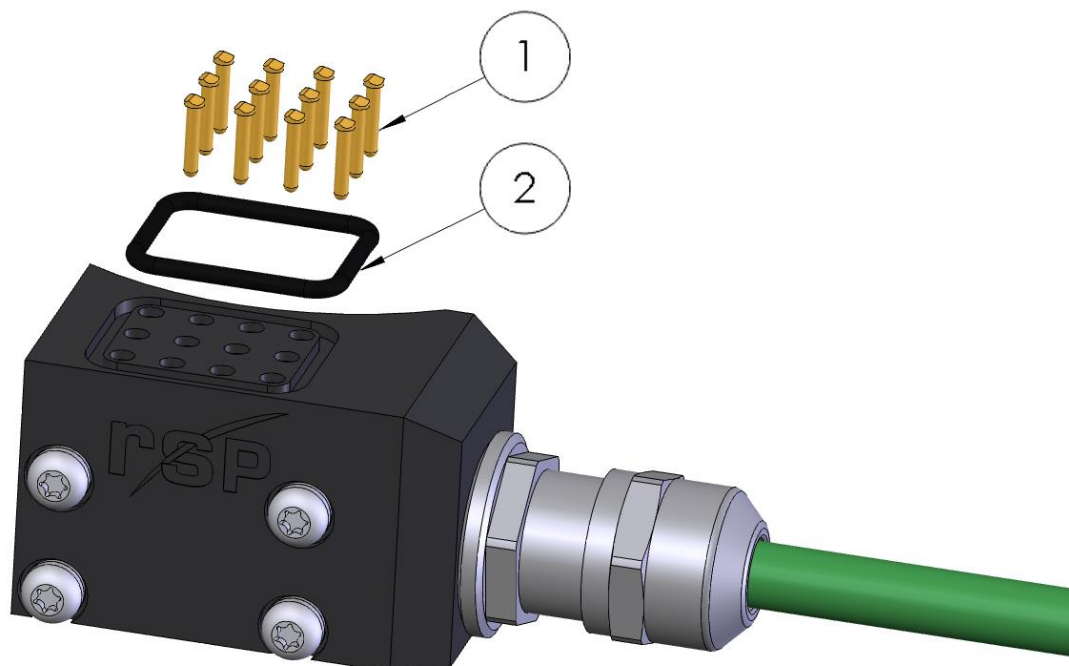
Item	Description	Part number	Wear part	Pcs
1	Fastening screws M16x30	21212519-382		4
2	Air sealings	I0158	X	4
3	Spring loaded signal pins (P0133 only)	I1783	X	8
4	Tube fittings	I0927		6

3.3 Part list for signal interface P1113



Item	Description	Part number	Wear part	Pcs
1	Spring loaded signal pins	I0154	X	8
2	O-ring	I1444	X	1

3.4 Part list for signal interface P1131 and P1163



Item	Description	Part number	Wear part	Pcs
1	Spring loaded signal pins	I0154	X	12
2	O-ring	I1467	X	1

