

# Technical Description

## Tool changer TC5

M0118-1

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





The information in this document is subject to change without prior notice and should not be regarded as an undertaking from Robot System Products AB. Robot System Products AB assumes no responsibility for errors that may occur in this document.

Robot System Products AB bears no responsibility for damage that is incurred by the use of this document, or the software or hardware described in this document.

The document, or parts of it, may not be reproduced or copied without prior permission from Robot System Products AB. It may neither be imparted to a third party, nor otherwise be used without authorization. Infringement hereof will be subject to action in accordance with the applicable laws.

Further copies of this document can be obtained from Robot System Products AB at current prices.

© Robot System Products AB

Robot Systems Products AB  
Isolatorvägen 4  
SE-721 37 Västerås  
Sweden

# CONTENTS

<b>1 INTRODUCTION .....</b>	<b>5</b>
1.1 RSP tool changer .....	6
1.2 Documents .....	6
1.3 Wear parts.....	6
1.4 Complementary equipment .....	6
<b>2 TECHNICAL SPECIFICATIONS.....</b>	<b>7</b>
2.1 Description of tool changers and tool attachments .....	7
2.1.1 Coordinate System Definition.....	8
2.1.2 Tool changer with air, TC5-6. Article: P1001 .....	9
2.1.3 Tool attachment TA5-6, Article: P1002 .....	10
2.1.4 Tool changer with air and electric signals, TC5-4E. Article: P1003 .....	11
2.1.5 Tool attachment TA5-4E, Article: P1004.....	12
2.1.6 Pneumatic diagram for TC5 and TA5.....	13
2.1.7 Circuit diagram E0211-006 for TC5-4E .....	14
2.1.8 Circuit diagram E0211-007 for TA5-4E .....	15
2.2 Options for tool changer .....	16
2.2.1 Robot adaptation kits.....	16
2.2.2 Tool Identification .....	16
2.2.3 Limitation of Robot movements.....	16
2.2.4 Signal interface, 8 signals, robot side. Article: P1013.....	17
2.2.5 Signal interface, 8 signals, tool side. Article: P1014 .....	17
2.2.6 TC5 Air module 2x M5, robot side. Article: P1029 .....	18
2.2.7 TA5 Air module 2x M5, tool side. Article: P1030.....	18
2.2.8 Tool stand kit. Article: P1005.....	19
<b>3 SPARE PARTS .....</b>	<b>20</b>
3.1 Part list for tool changer P1001 and P1003 .....	20
3.2 Part list for air module, P1029 .....	21
3.3 Part list for air module P1030 .....	21

# 1 INTRODUCTION

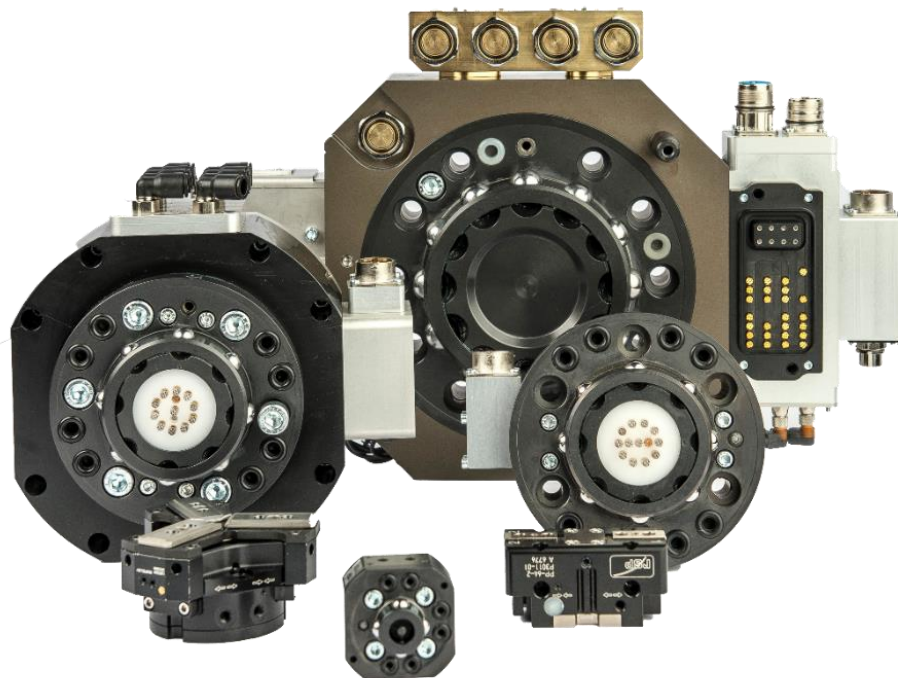
**Robot System Products** is a front-rank provider of peripheral products for high performance robot applications. We provide complete system solutions for your robot installations, aiming to improve your productivity with the most reliable and cost-effective tooling on the market. Continuously we explore 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: [robotsystemproducts.com](http://robotsystemproducts.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' TC5-6 and TC5-4E 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 TC5-6 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 TC5-6 and TC5-4E 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.

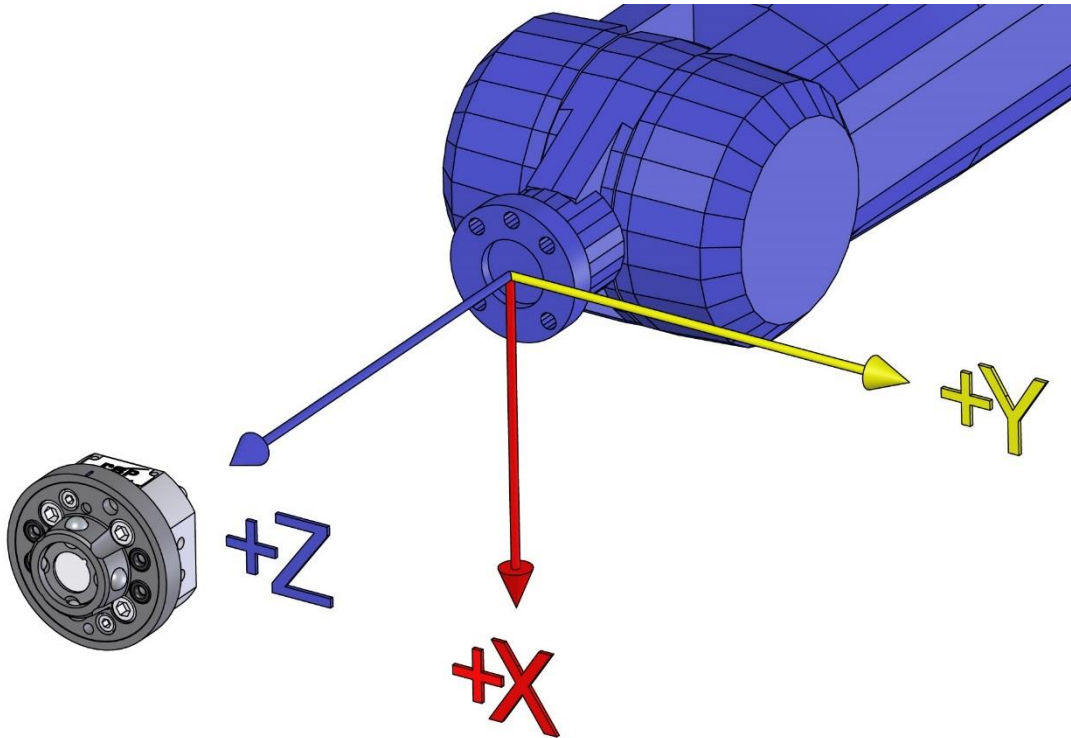
For other bolt circles adaptation plates between the tool changer and the turning disc on the robot may be needed. Such adaptation plates are available from RSP.



***TC5-4E***

### 2.1.1 Coordinate System Definition

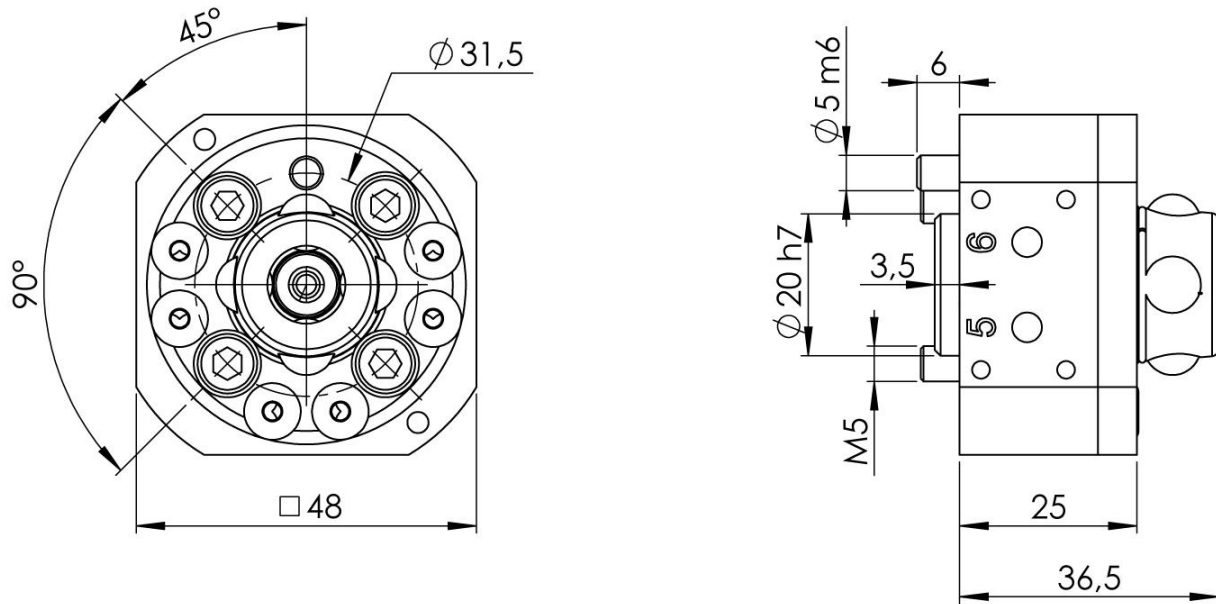
A tool changer adds load to the robot. If the arm and tool loads are not stated correctly during programming the behaviour of the robot and the wear of the equipment will be affected. Information about weight and centre of gravity can, in accordance with the co-ordinate system stated below, be found 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, TC5-6. Article: P1001

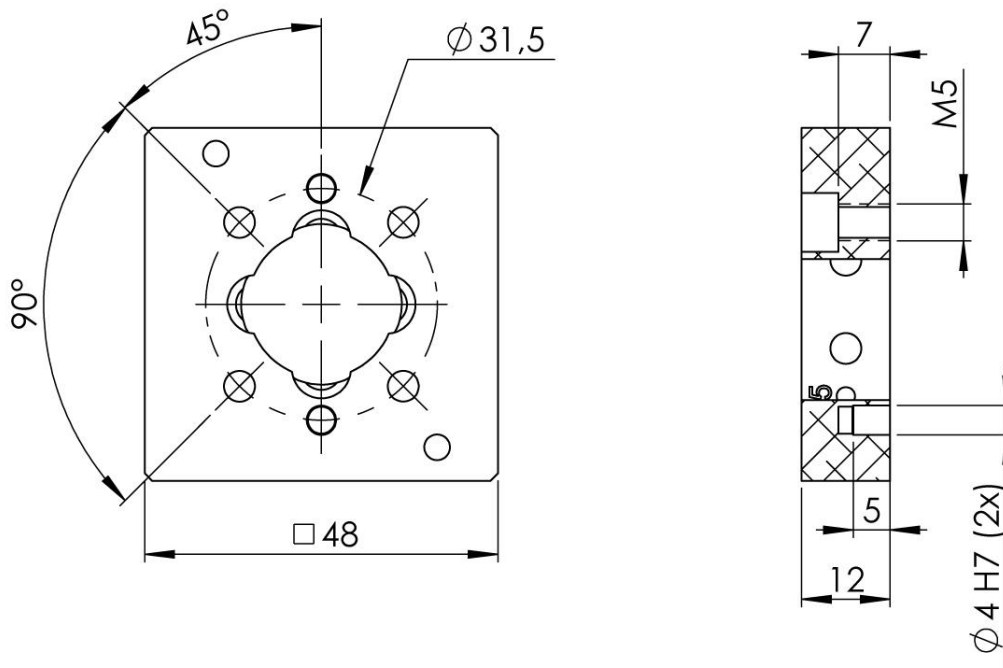


Tool changer TC5-6 transfers 6 pneumatic channels to the tool attachment and has separate inlets for Open TC and Close TC. To be used together with tool attachment P1003.

#### Technical data

<b>Working temperature</b>		+10°C – +50°C
<b>Bolt pattern</b>		ISO 9409-1 31.5-4-M5
<b>IP classification</b>		IP 54
<b>Maximum tool load</b>	Fz (static)	±50 N
	Mx/My (dynamic)	±50 Nm
	Mz (dynamic)	±50 Nm
<b>Weight and centre of gravity (Z)</b>		
P1001		0.23 kg / 16 mm
P1001+P1002		0,28 / 19 mm
<b>Air channels</b>	Pneumatic diagram	See <a href="#">section 2.1.6</a>
	User channels, robot side	6 x M5 (100 l/min, max 10 bar)
	Dedicated channels, G 1/8"	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

### 2.1.3 Tool attachment TA5-6, Article: P1002



Tool attachment TA5-6 transfers 6 pneumatic channels to the tool. To be used together with tool changer P1001.

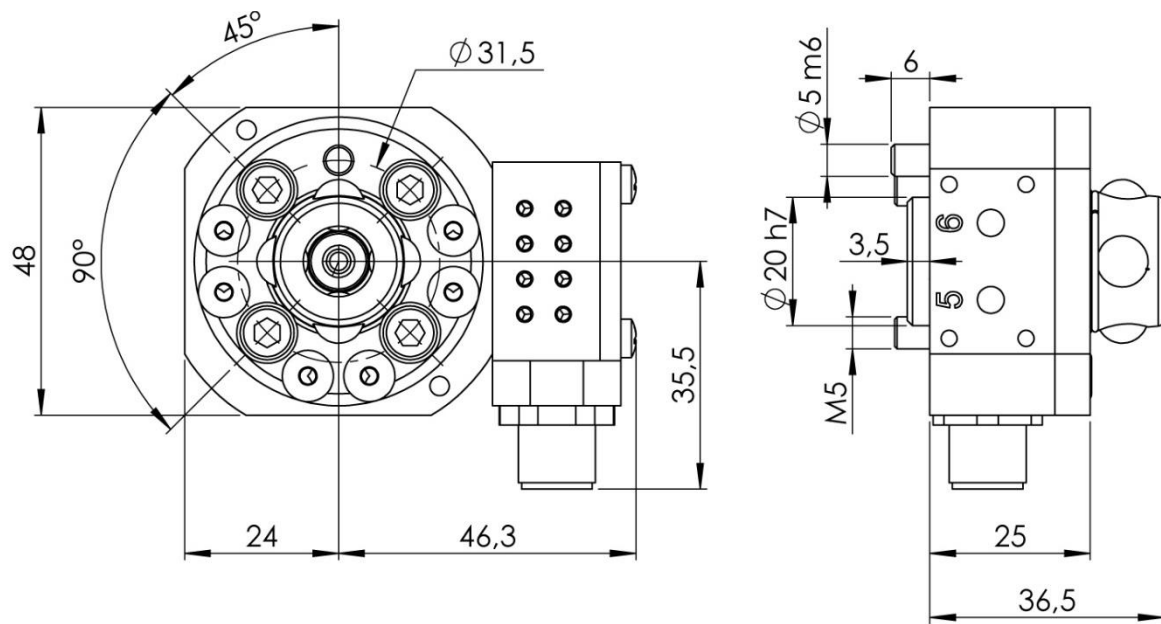
#### Technical data

<b>Working temperature</b>		+10°C – +50°C
<b>Bolt pattern</b>		ISO 9409-1 31.5-4-M5
<b>Weight</b>		0.06 kg
<b>Maximum tool load</b> (M5-screws)	Fz (static)	±50 N
	Mx/My (dynamic)	±50 Nm
	Mz (dynamic)	±50 Nm
<b>Maximum tool load</b> (M4-screws)	Fz (static)	±50 N
	Mx/My (dynamic)	±50 Nm
	Mz (dynamic)	±30 Nm
<b>Air channels</b>	Connections, tool side	6 x M5



**NOTE!** Tools can be mounted to the tool attachment using four M5-screws, alternatively the tool attachment can be mounted to the tool using four M4-screws

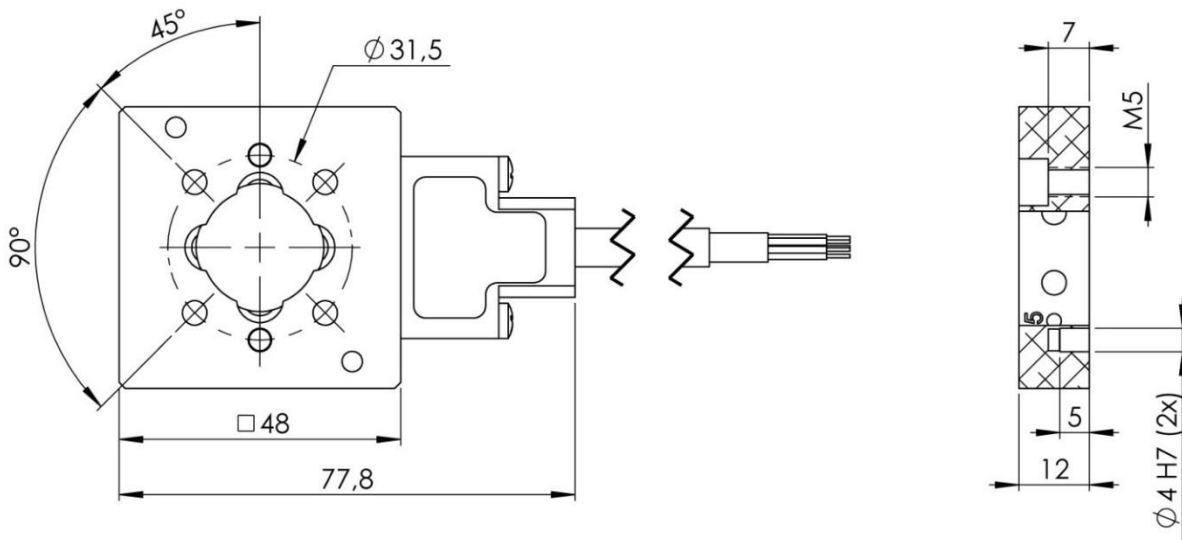
#### 2.1.4 Tool changer with air and electric signals, TC5-4E. Article: P1003



Tool changer TC5-4E 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 attachment P1004.

<b>Working temperature</b>		+10°C – +50°C
<b>Bolt pattern</b>		ISO 9409-1 31.5-4-M5
<b>IP classification</b>		IP 54
<b>Maximum tool load</b>	Fz (static)	±50 N
	Mx/My (dynamic)	±50 Nm
	Mz (dynamic)	±50 Nm
<b>Weight and centre of gravity (Z)</b>		
P1003		0.26 kg / 16 mm
P1001+P1003		0,34 / 19 mm
<b>Air channels</b>	Pneumatic diagram	See <a href="#">section 2.1.6</a>
	User channels, robot side Dedicated channels, G 1/8"	4 x M5 (100 l/min, max 10 bar) 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
<b>Electrical signals</b>	Circuit diagram	E0211-006 (see <a href="#">section 2.1.7</a> )
	Total signals	8 x (1A, 30V)
	Dedicated signals	-
	Connection, robot side	M12 8p, A-coded PM
<b>Connection kits (optional)</b>	P0025 (cable kit)	M12 8P–M12 8S, 2-meter cable (0,25 mm²)
	P0025-30 (cable kit)	M12 8P–M12 8S, 3-meter cable (0,25 mm²)

## 2.1.5 Tool attachment TA5-4E, Article: P1004



Tool attachment TA20-4 transfers 4 pneumatic channels and 8 electrical signals to the tool. To be used together with tool changer P1003.

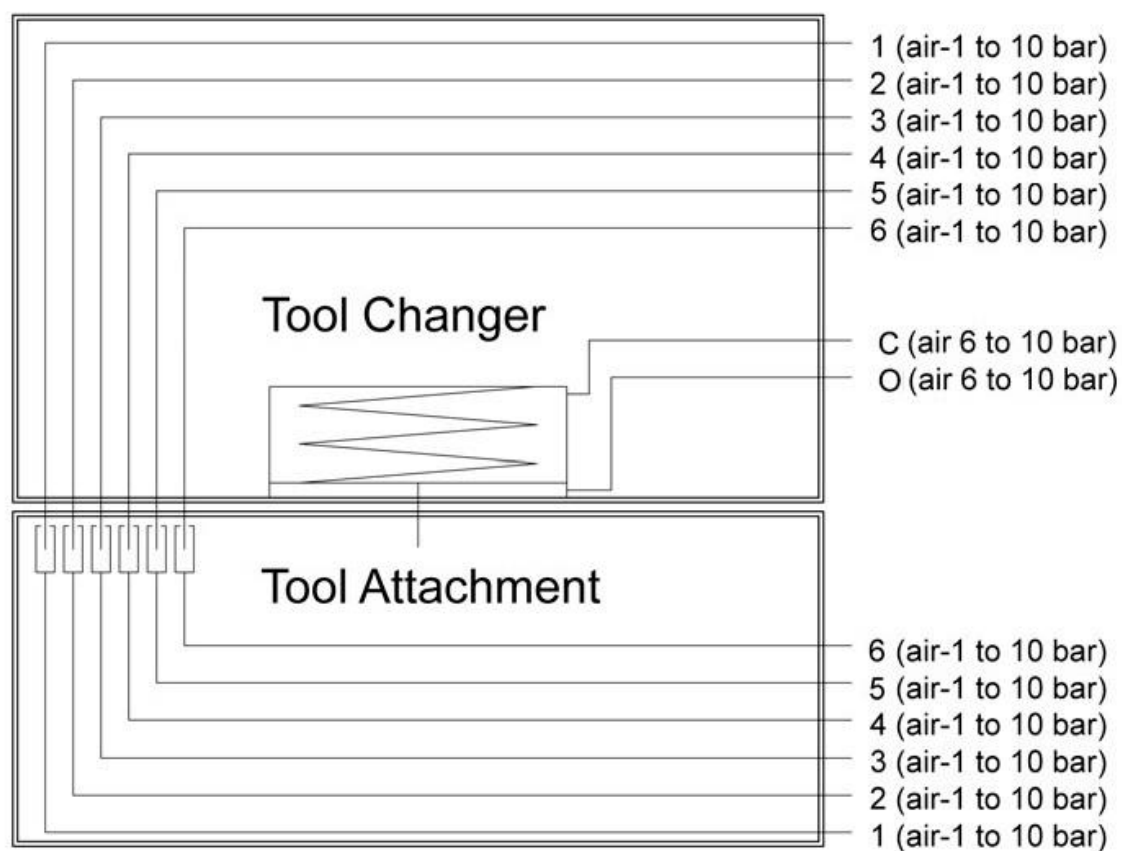
### Technical data

<b>Working temperature</b>		+10°C – +50°C
<b>Bolt pattern</b>		ISO 9409-1 31.5-4-M5
<b>Weight</b>		0.08 kg
<b>Maximum tool load</b> (M5-screws)	Fz (static)	±50 N
	Mx/My (dynamic)	±50 Nm
	Mz (dynamic)	±50 Nm
<b>Maximum tool load</b> (M4-screws)	Fz (static)	±50 N
	Mx/My (dynamic)	±50 Nm
	Mz (dynamic)	±30 Nm
<b>Air channels</b>	Connections, tool side	4 x M5
<b>Electrical signals</b>	Circuit diagram	E0211-007 (see <a href="#">section 2.1.8</a> )
	Total number of signals	8
	Connection, tool side	0.8 m cable (0.25 mm²), open end



**NOTE!** Tools can be mounted to the tool attachment using four M5-screws, alternatively the tool attachment can be mounted to the tool using four M4-screws.

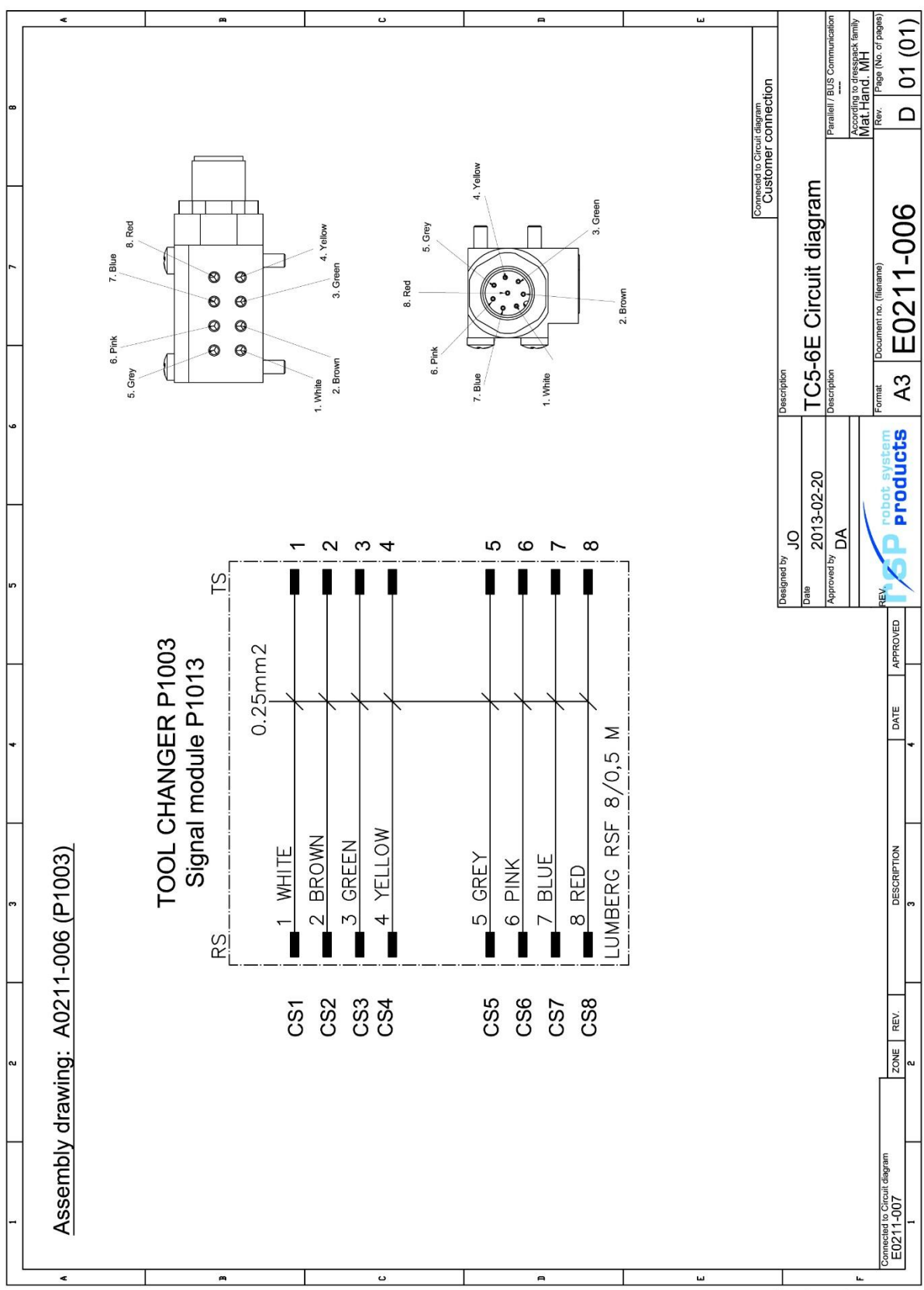
## 2.1.6 Pneumatic diagram for TC5 and TA5



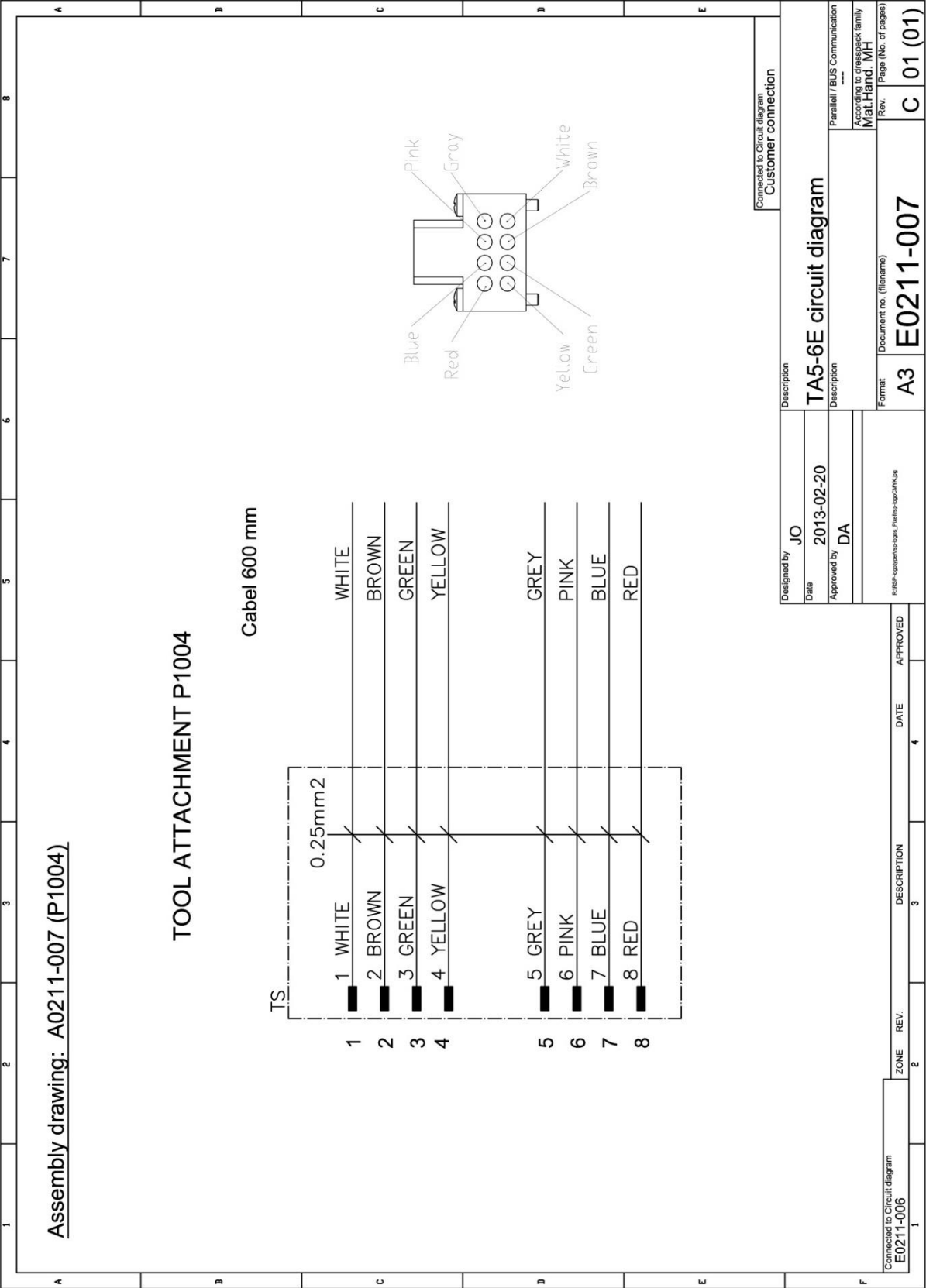
### NOTE!

Channels 1 and 2 are not available for TC5-4E and TA5-4E!

2.1.7 Circuit diagram E0211-006 for TC5-4E



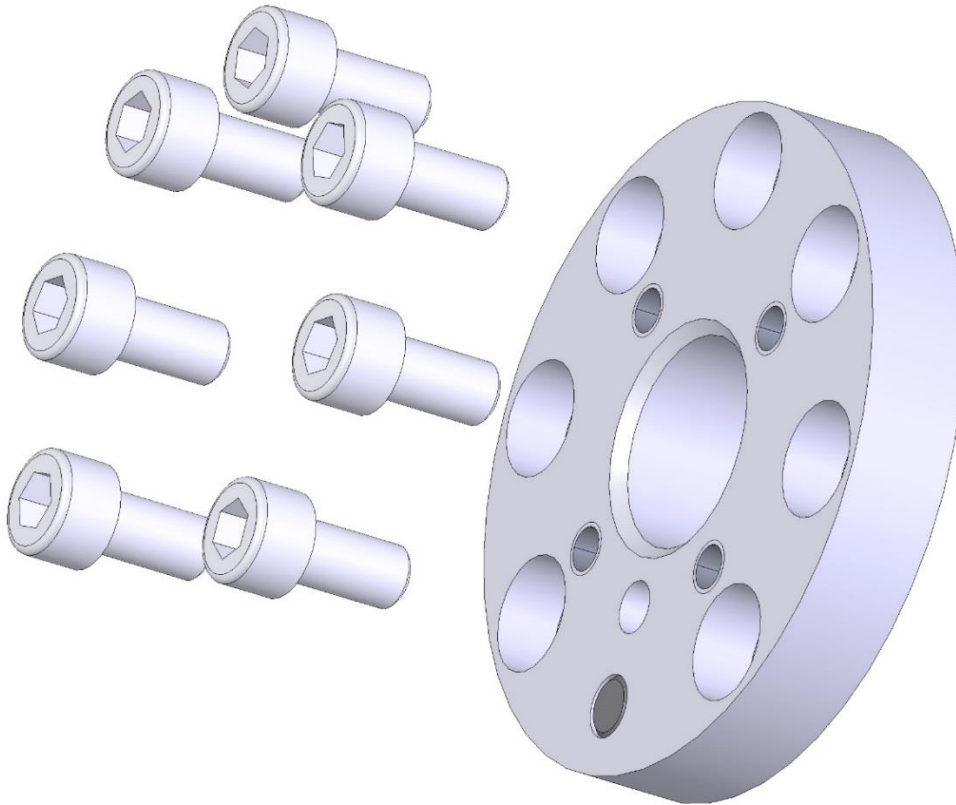
2.1.8 Circuit diagram E0211-007 for TA5-4E



## **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**

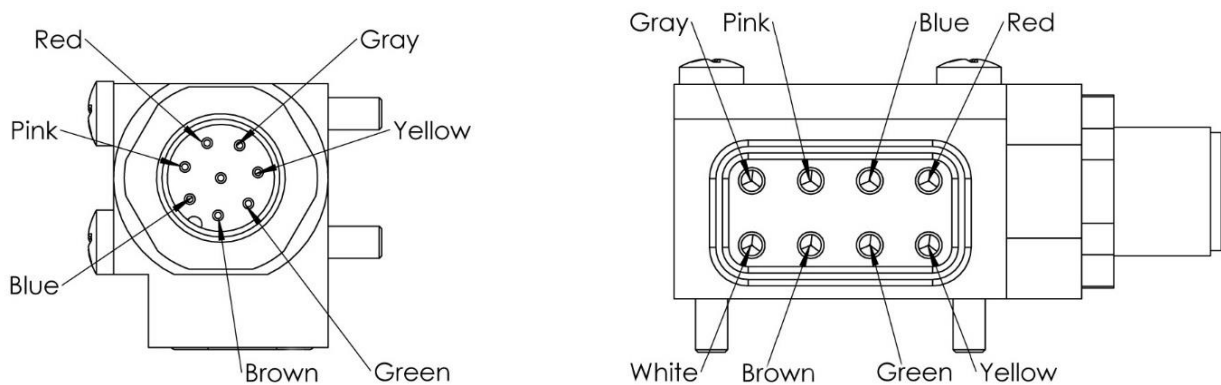
Jumpers on signals at the tool attachment can be used to give information about which tool attachment that is docked in the tool changer.

### **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: P1013



Transfers 8 electrical signal to the tool attachment. Can be mounted at two different positions on the tool changer. To be used with option P1014 on the tool attachment.

### Technical data

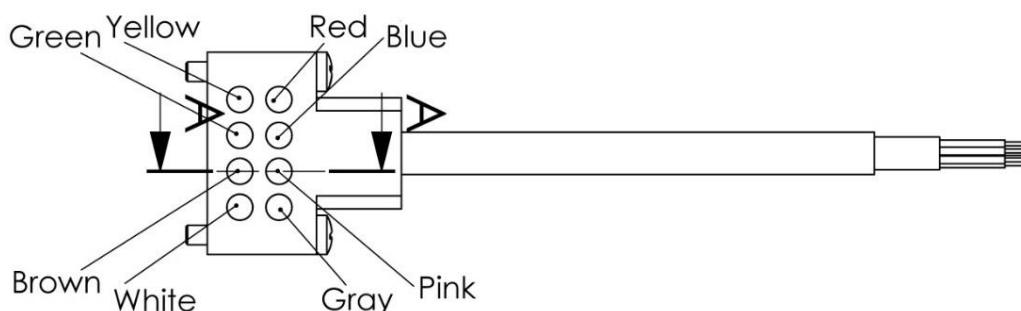
<b>Weight</b>		0.05 kg
<b>Electrical signals</b>	Circuit diagram	E0211-006 (see <a href="#">section 2.1.7</a> )
	Total signals	8 x (1A, 30V)
	Connection, robot side	M12 8p, A-coded PM



**NOTE!** P1013 is included in tool changer P1003. An additional P1013 can be mounted on P1003, making totally 16 electrical signals transferable but limiting the pneumatic channels to 4. including Open TC and Close TC.

## 2.2.5 Signal interface, 8 signals, tool side. Article: P1014

Transfers 8 electrical signal to the tool. Can be mounted at two different positions on the tool attachment. To be used with option P1013 on the tool changer.



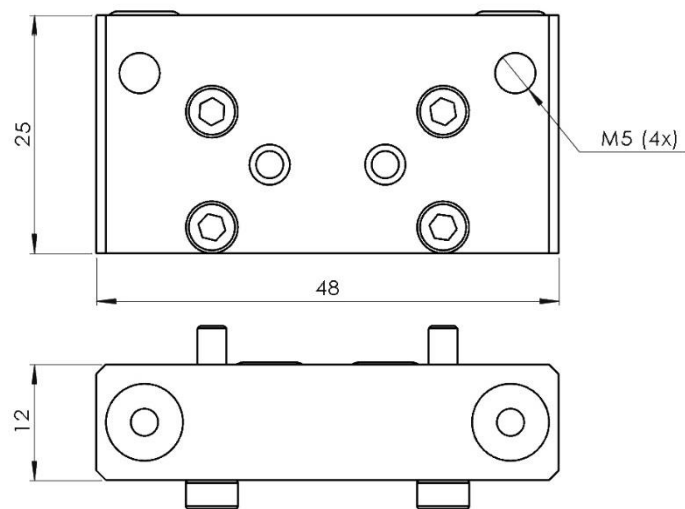
### Technical data

<b>Weight</b>		0.05 kg
<b>Electrical signals</b>	Circuit diagram	E0211-007 (see <a href="#">section 2.1.8</a> )
	Connection, tool side	0.8 m cable (0.25 mm²), open end



**NOTE!** P1014 is included in tool attachment P1004. An additional P1014 can be mounted on P1004.

2.2.6 TC5 Air module 2x M5, robot side. Article: P1029

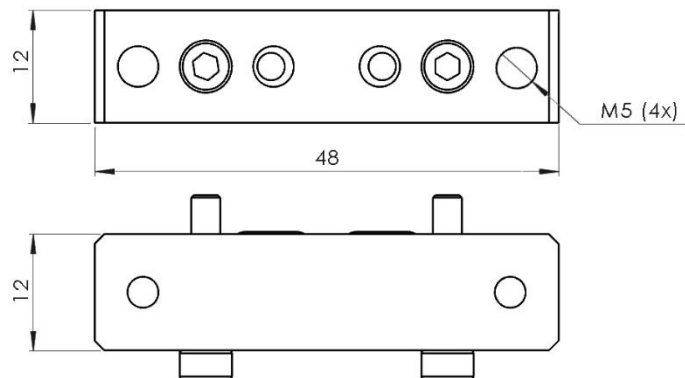


Transfers 2 additional pneumatic channels to the tool attachment. Can be mounted at three different positions at TC5-6 and two positions at TC5-4E. To be used together with option P1030 mounted on the tool attachment.

Technical data

Weight		0.04 kg
Air channels	User channels, robot side	2 x M5 (100 l/min, max 10 bar)
	Air quality	Oil-clean and waterless filtered air, with max 25µm particle content

2.2.7 TA5 Air module 2x M5, tool side. Article: P1030

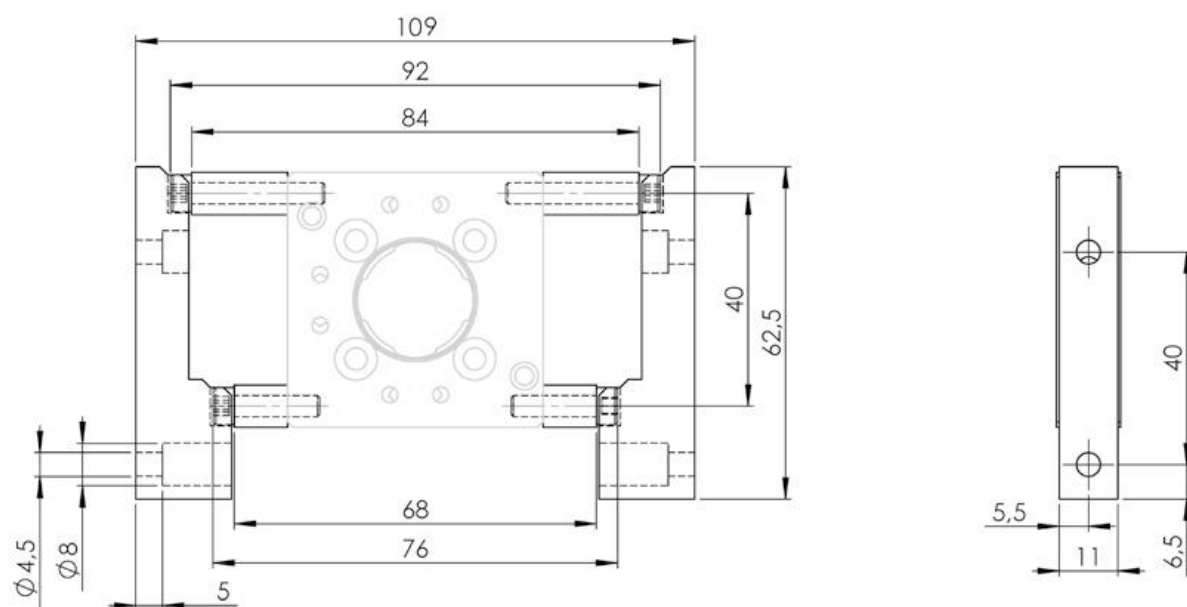


Transfers 2 additional pneumatic channels to the tool. Can be mounted at three different positions at TA5-6 and two positions at TA5-4E. To be used together with option P1029 mounted on the tool changer.

Technical data

Weight		0.02 kg
Air channels	Connections, tool side	2 x M5

## 2.2.8 Tool stand kit. Article: P1005



This tool stand kit gives, when the brackets are mounted on a stand, a robust tool stand for easy tool changing.



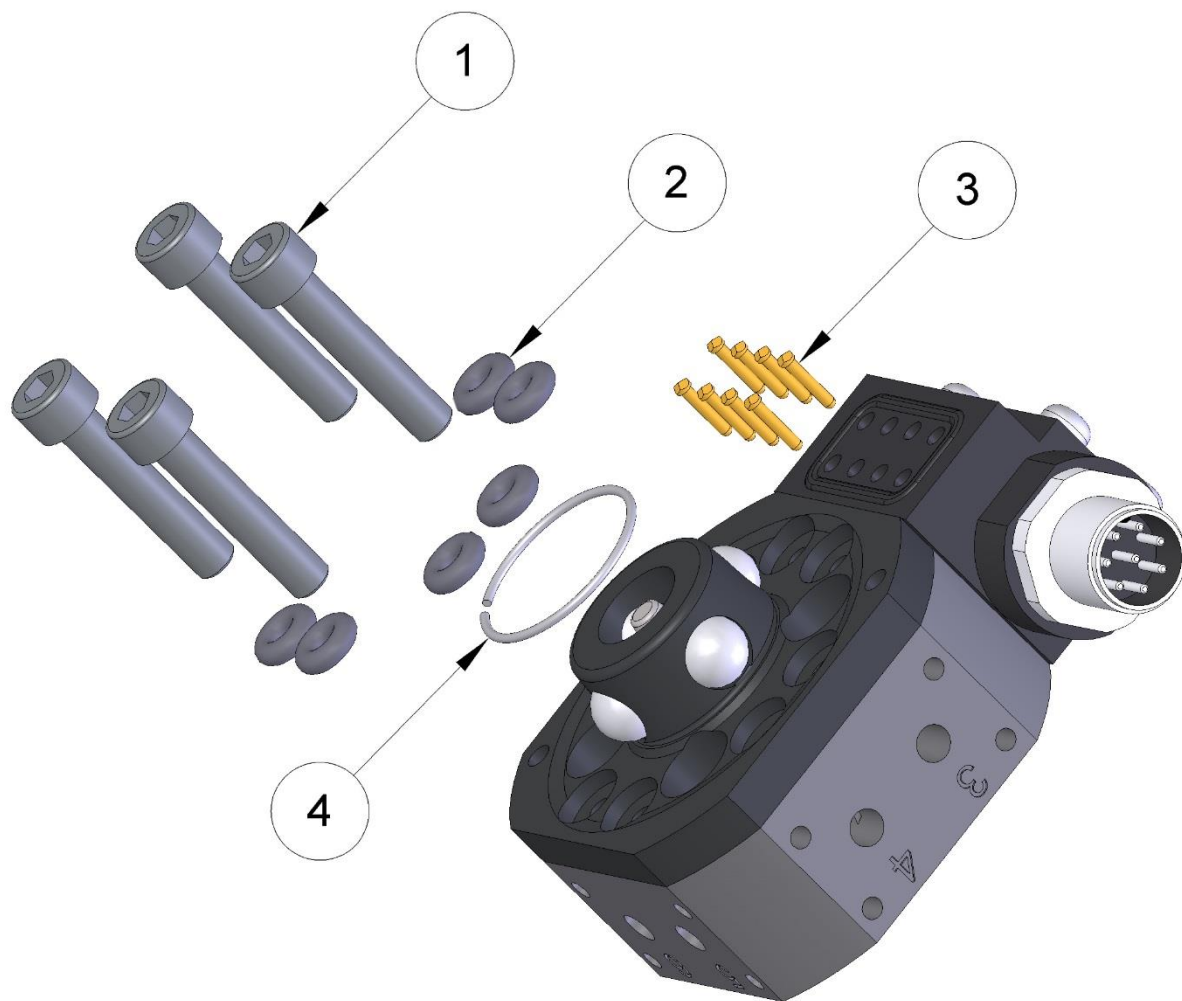
**NOTE!** The four enclosed screws and spacers shall be mounted on the tool attachments P1002 or P1004.

### Technical data

Weight	0.02 kg
Maximum load	5 kg

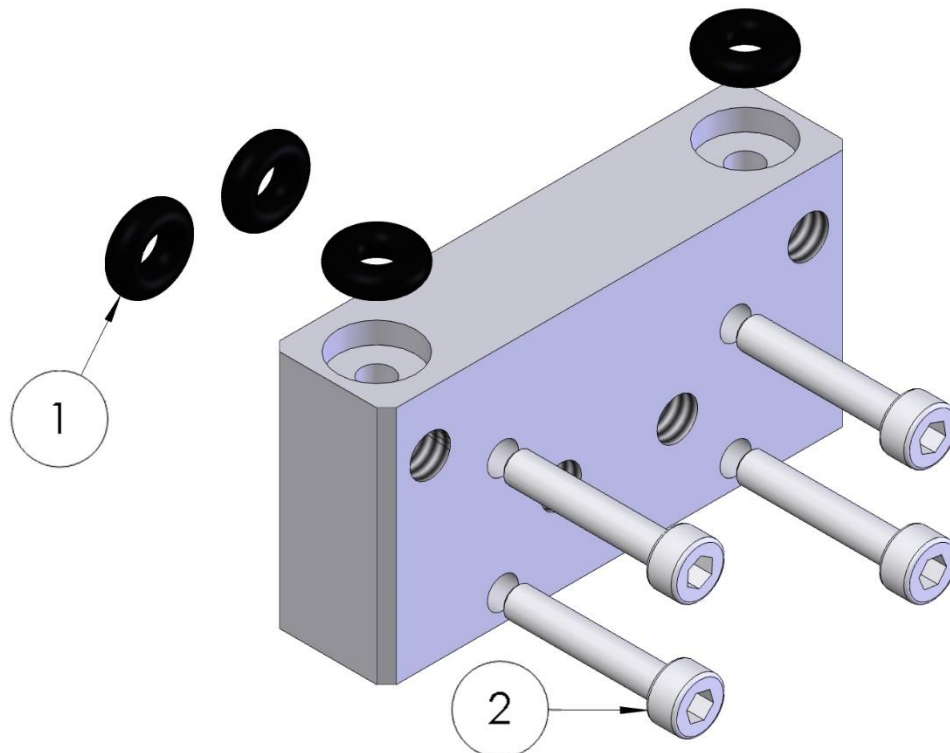
### 3 SPARE PARTS

#### 3.1 Part list for tool changer P1001 and P1003



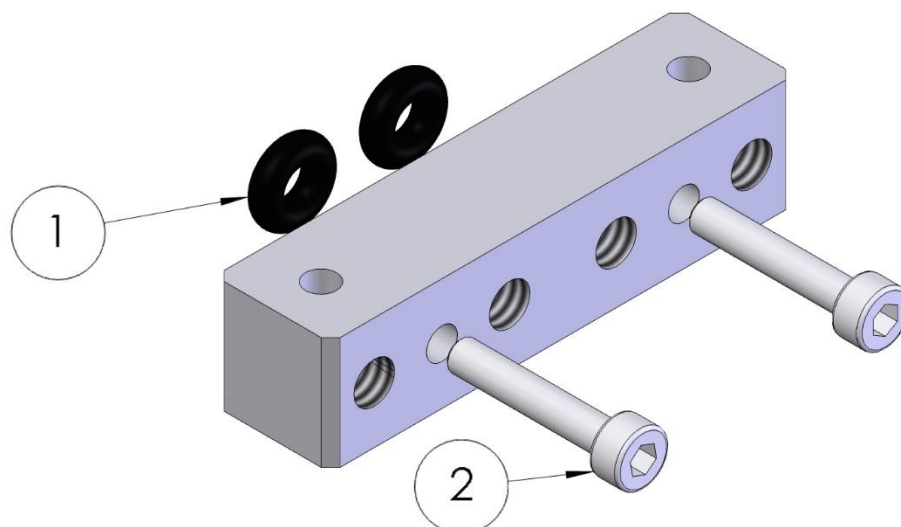
Item	Description	Part number	Wear part	Pcs
1	Fastening screws MC6S 5x25	21212519-333		4
2	Air sealings (O-ring 2,84x2,62)	I0812	X	6
3	Spring loaded signal pins (TC5-4E only)	I0154	X	8
4	Locking ring	I0815		1

### 3.2 Part list for TC5 air module, P1029



Item	Description	Part number	Wear part	Pcs
1	Air sealings (O-ring 2,84x2,62)	I0812	X	4
2	Fastening screw MC6S 3x16	21212519-228		4

### 3.3 Part list for TA5 air module, P1030



Item	Description	Part number	Wear part	Pcs
1	Air sealings (O-ring 2,84x2,62)	I0812	X	2
2	Fastening screw. MC6S 3x16	21212519-228		2





