Product Description

Tool changers Moduflex-series

M0723-1

Tool changers | Swivels | Swivels with 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 changers

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 cavities. In consequence, substantially larger positional tolerances are accepted during docking. A built-in spring ensures that the tool remains in place in the tool changer even if the air pressure drops.

1.2 Documents

This document, *Product Description*, contains product information, drawings, data, electrical and pneumatic diagrams, required safety software functions and lists of spare parts. In the document *Installation and Maintenance* (M0720-1) procedures for mounting, installation, replacement of equipment is described together with instructions related to maintenance activities and 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:

- Water/air couplings
- Signal pins
- Servo power pins and sockets
- Weld power pins and sockets
- Guide pins and bushings
- o Air sealings
- O-rings

1.4 Complementary equipment from RSP

Complementary equipment is described in separate documents.

Article	Note
External valve units	Mounted at the rear of the upper arm. Shuts off air automatically during tool change.
Cable and hose packages	Complete packages for most robots on the market ready to be mounted without any modifications.
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 X_T-format.

2 TECHNICAL SPECIFICATIONS

2.1 Description of tool changers and tool attachments

This document presents the RSP product family Moduflex, which is designed for maximum flexibility. It can be used for various applications combining a large number of options in different configurations which are generally useable within the entire product family. This document presents:

- The Robot System Products TC240, TC480, TC720 and TC960 tool changers including tool attachments.
- Options to configure tool changers and tool attachments. These options can, as well, be ordered as accessories for retrofitting.
- Connection kits to facilitate electrical installation.

An adaptation plate between the tool changer and the turning disc on the robot may be needed, depending on the robot model. Such adaptation plates are available from RSP.

Dependent on model two or three guide pins are mounted in order to precisely align the tool attachment with the tool changer before the electrical connectors are connected at a tool change operation, this extends the lifetime for not spring-mounted signal pins.

The figure below is an example that shows a configuration for spot welding.



TC720-SWS

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 maximum tool load can, in accordance with the co-ordinate systems shown below, be found in the technical specification tables of the tool changers.





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 TC240-1, basic unit. Article: P6701A



The tool changer P6701A transfers 1 pneumatic channel to the tool attachment, has separate inlets for Open TC and Close TC, 5 positions for options and 1 for magnetic sensors. To be used together with tool attachment P6702.

Tec	hnical	data

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 125-6-M10
Maximum tool load	Fz (static)	±2 400 N
	Mx/My (dynamic)	±2 000 Nm
	Mz (dynamic)	±1 250 Nm
Weight and centre of	gravity (Z)	
P6701A		8.2 kg / 38 mm
P6701A with P6702		13.5 kg / 55 mm
Air channels	Pneumatic diagram	Pne0230-008 (section 2.1.14)
	User channels, robot side	1 x G ½" (2 000 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 25um particle content

2.1.3 Tool attachment TA240-1, basic unit. Article: P6702



The tool attachment TA240-1 transfers 1 pneumatic channel to the tool and has 5 positions for options. To be used together with tool changer P6701A.

Technical data

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 125-6-M10
Weight		5.1 kg
Maximum tool load	Fz (static)	±2 400 N
(M10 screws)	Mx/My (dynamic)	±2 000 Nm
	Mz (dynamic)	±1 250 Nm
Maximum tool load	Fz (static)	±2 400 N
(M8 screws)	Mx/My (dynamic)	±2 000 Nm
	Mz (dynamic)	±750 Nm
Air channels	Connection, tool side	1 x G ½"



NOTE! Tools can be mounted to the tool attachment using six M10 screws, alternatively the tool attachment can be mounted to the tool using six M8 screws.

2.1.4 Tool changer TC480-1, basic units. Article: P6801A



The tool changer P6801A transfers 1 pneumatic channel to the tool attachment, has separate inlets for Open TC and Close TC, 5 positions for options and 1 for magnetic sensors. To be used together with tool attachment P6802 or P6872.

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 160-10-M12
Maximum tool load	Fz (static)	±5000 N
	Mx/My (dynamic)	±5000 Nm
	Mz (dynamic)	±3500 Nm
Weight and centre of	gravity (Z)	
P6801A		13.1 kg / 39 mm
P6801A with P6802/P6	872	20.8 kg / 55 mm
Air channels	Pneumatic diagram	Pne0230-008 (<u>section 2.1.14</u>)
	User channels, robot side	1 x G ½" (2 000 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

2.1.5 Tool attachment TA480-1, basic unit. Article: P6802



A-A

The tool attachment P6802 transfers 1 pneumatic channel to the tool and has 5 positions for options. To be used together with tool changer P6801A or P6851A.

Technical data

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 160-10-M12
Weight		7.7 kg
Maximum tool load	Fz (static)	±5000 N
(M12-screws)	Mx/My (dynamic)	±5000 Nm
	Mz (dynamic)	±3500 Nm
Maximum tool load	Fz (static)	±5000 N
(M10-screws)	Mx/My (dynamic)	±5000 Nm
	Mz (dynamic)	±2500 Nm
Air channels	Connection, tool side	1 x G ½"



NOTE! Tools can be mounted to the tool attachment using ten M12 screws, alternatively the tool attachment can be mounted to the tool using ten M10 screws.

2.1.6 Tool changer TC480-1, basic units. Article: P6851A



The tool changer P6851A transfers 1 pneumatic channel to the tool attachment, has separate inlets for Open TC and Close TC, 5 positions for options and 1 for magnetic sensors. To be used together with tool attachment P6802 or P6872.

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 160-10-M10
Maximum tool load	Fz (static)	±5000 N
	Mx/My (dynamic)	±5000 Nm
	Mz (dynamic)	±2500 Nm
Weight and centre of	gravity (Z)	
P6851A		13.1 kg / 39 mm
P6851A with P6802/P6	872	20.8 kg / 55 mm
Air channels	Pneumatic diagram	Pne0230-008 (<u>section 2.1.14</u>)
	User channels, robot side	1 x G ½" (2 000 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

2.1.7 Tool attachment TA480-1, basic unit. Article: P6872



A-A

The tool attachment P6872 transfers 1 pneumatic channel to the tool and has 5 positions for options. To be used together with tool changer P6801A or P6851A.

Technical data

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 160-10-M10
Weight		7.7 kg
Maximum tool load	Fz (static)	±5000 N
(M10-screws,	Mx/My (dynamic)	±5000 Nm
screw class 8.8)	Mz (dynamic)	±2500 Nm
Maximum tool load	Fz (static)	±5000 N
(M8-screws,	Mx/My (dynamic)	±5000 Nm
screw class 12.9)	Mz (dynamic)	±2500 Nm
Air channels	Connection, tool side	1 x G ½"



NOTE! Tools can be mounted to the tool attachment using ten M10 screws, alternatively the tool attachment can be mounted to the tool using ten M8 screws.

2.1.8 Tool changer TC720-1, basic unit. Article: P6901A



The tool changer P6901A transfers 1 pneumatic channel to the tool attachment, has separate inlets for Open TC and Close TC, 5 positions for options and 1 for magnetic sensors. To be used together with tool attachment P6902A.

Тес	hni	cal	data

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 200-12-M16
Maximum tool load	Fz (static)	±10 000 N
	Mx/My (dynamic)	±10 000 Nm
	Mz (dynamic)	±10 000 Nm
Weight and centre of	gravity (Z)	
P6901A		20,4 kg / 45 mm
P6901A with P6902A		30.6 kg / 61 mm
Air channels	Pneumatic diagram	Pne0230-011 (section 2.1.15)
	User channels, robot side	1 x G ½" (2 000 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

2.1.9 Tool attachment TA720-1, basic unit. Article: P6902A



The tool attachment P6902A transfers 1 pneumatic channel to the tool and has 5 positions for options. To be used together with tool changer P6901A.

Technical data

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 200-12-M16
Weight		10.2 kg
Maximum tool load	Fz (static)	±10 000 N
(M16 screws)	Mx/My (dynamic)	±10 000 Nm
	Mz (dynamic)	±10 000 Nm
Maximum tool load	Fz (static)	±10 000 N
(M14 screws)	Mx/My (dynamic)	±10 000 Nm
	Mz (dynamic)	±7 500 Nm
Air channels	Connection, tool side	1 x G ½"



NOTE! Tools can be mounted to the tool attachment using twelve M16 screws, alternatively the tool attachment can be mounted to the tool using twelve M14 screws.

2.1.10 Tool changer TC720-1, basic unit. Article: P6947



The tool changer P6947 transfers 1 pneumatic channel to the tool attachment, has separate inlets for Open TC and Close TC, 5 positions for options and 1 for magnetic sensors. To be used together with tool attachment P6948.

Working temperature		+10°C-+50°C
Bolt pattern		ISO 9409-1 200-16-M16
Maximum tool load	Fz (static)	±10 000 N
	Mx/My (dynamic)	±10 000 Nm
	Mz (dynamic)	±10 000 Nm
Weight and centre of	gravity (Z)	
P6947		20,4 kg / 45 mm
P6901A with P6948		30.6 kg / 61 mm
Air channels	Pneumatic diagram User channels, robot side Dedicated channels, G 1/8" Air quality	Pne0230-011 (section 2.1.15) 1 x G $\frac{1}{2}$ " (2 000 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

2.1.11 Tool attachment TA720-1, basic unit. Article: P6948



The tool attachment P6948 transfers 1 pneumatic channel to the tool and has 5 positions for options. To be used together with tool changer P6947.

Technical data

Working temperature		+10°C-+50°C	
Bolt pattern		ISO 9409-1 200-18-M16	
Weight		10.2 kg	
Maximum tool load	Fz (static)	±10 000 N	
	Mx/My (dynamic)	±10 000 Nm	
	Mz (dynamic)	±10 000 Nm	
Air channels	Connection, tool side	1 x G ½"	



NOTE! Tools can be mounted to the tool attachment using eighteen M16 screws, alternatively the tool attachment can be mounted to the tool using eighteen M14 screws.

2.1.12 Tool changer TC960-1, basic unit. Articles: P7901A and P7901A-1



The tool changer P7901A (265-12-M16) and P7901A-1 (250-10-M12) transfers 1 pneumatic channel to the tool attachment, has separate inlets for Open TC and Close TC, 5 positions for options and 1 for magnetic sensors. To be used together with tool attachment P7902A.

Working temperature		+10°C-+50°C
Bolt patterns		265-12-M16
		250-10-M12
Maximum tool load	Fz (static)	±15 000 N
(P7901A)	Mx/My (dynamic)	±15 000 Nm
	Mz (dynamic)	±12 500 Nm
Maximum tool load	Fz (static)	±15 000 N
(P7901A-1,	Mx/My (dynamic)	±10 000 Nm
screw class 12.9)	Mz (dynamic)	±9 000 Nm
Weight and centre of	gravity (Z)	
P7901A/ P7901A-1		27,7 kg / 46 mm
P7901A/ P7901A-1 wit	h P7902A	43.6 kg / 61 mm
Air channels	Pneumatic diagram	Pne0230-011 (section 2.1.15)
	User channels, robot side	1 x G ½" (2 000 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

2.1.13 Tool attachment TA960-1, basic unit. Article: P7902A



The tool attachment TA960-1 transfers 1 pneumatic channel and to the tool and has 5 positions for options. To be used together with tool changer P7901A.

Working temperature		+10°C-+50°C
Bolt patterns		265-12-M16
		250-10-M12
Weight		15.9 kg
Maximum tool load	Fz (static)	±15 000 N
(265-12-M16 with M16	Mx/My (dynamic)	±15 000 Nm
screws)	Mz (dynamic)	±12 500 Nm
Maximum tool load	Fz (static)	±15 000 N
(265-12-M16 with M14	Mx/My (dynamic)	±15 000 Nm
screws)	Mz (dynamic)	±10 000 Nm
Maximum tool load	Fz (static)	±15 000 N
(250-10-M12 with M12,	Mx/My (dynamic)	±10 000 Nm
screw class 12.9)	Mz (dynamic)	±9 000 Nm
Maximum tool load	Fz (static)	±15 000 N
(250-10-M12 with M10,	Mx/My (dynamic)	±7 000 Nm
screw class 12.9)	Mz (dynamic)	±6 000 Nm
Air channels	Connection, tool side	1 x G ½"

Technical data



NOTE! Tools can be mounted to the tool attachment using twelve M16 screws or ten M12 screws, alternatively the tool attachment can be mounted to the tool using twelve M14 screws or ten M10 screws.







2.1.15 Pneumatic diagram Pne0230-011 for TC720-1 and TC960-1

2.2 Options for tool changers and tool attachments

2.2.1 Integrated valve, TC Open/Close for TC240 and TC480. Article: P6718



Includes two integrated valves. The TC Close valve is in passive position open, which is locking the tool changer. The TC Open valve is in passive position evacuating the air from the unlocking side of the piston inside the tool changer, which is allowing the tool to be locked.

In order to Open (unlock) the tool changer, the signals "doOpen TC 1" and "doOpen TC 2" shall both be set to +24V DC. If one or both of the electrical signals disappear the tool changer will go to closed (locked) position. Air is supplied via Air in on the tool changer.

To be mounted at one dedicated position on the tool changers P6701A (TC240) or P6801A and P6851 (TC480).



NOTE!

Are prepared for options P6738-1, P7224, P6778 or P6780.

	Tech	nical	data
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Weight		0.5 kg
Electrical signals	Circuit diagram	See respective signal module.
	Dedicated signals	doOpen TC 1 (24V DC)
		doOpen TC 2 (24V DC)
		0V DC
	Connection	М8 Зр
Air channels	Pneumatic diagram	Pne0230-008 (<u>section 2.1.14</u>)
	Air supply	Air in marked "AIR" on TC (6-10 bar)
	Air quality	Oil-clean and waterless filtered air, with max
		25µm particle content

2.2.2 Integrated valve, TC Open/Close for TC720 and TC960. Article: P7710



Includes two integrated valves. The TC Close valve is in passive position open, which is locking the tool changer. The TC Open valve is in passive position evacuating the air from the unlocking side of the piston inside the tool changer, which is allowing the tool to be locked.

In order to Open (unlock) the tool changer, the signals "doOpen TC 1" and "doOpen TC 2" shall both be set to +24V DC. If one or both of the electrical signals disappear the tool changer will go to closed (locked) position. Air is supplied via Air in on the tool changer.

To be mounted at one dedicated position on the tool changer P6901A (TC720) or P7901A (TC960).



NOTE!

Are prepared for options P6738-1, P7224, P6778 or P6780.

Weight		0.3 kg
Electrical signals	Circuit diagram	See respective signal module.
	Dedicated signals	doOpen TC 1 (24V DC)
		doOpen TC 2 (24V DC)
		0V DC
	Connection	М8 Зр
Air channels	Pneumatic diagram	Pne0230-011 (<u>section 2.1.15</u>)
	Air supply	Air in marked "AIR" on TC (6-10 bar)
	Air quality	Oil-clean and waterless filtered air, with max
		25µm particle content

2.2.3 Valve adapter (external valve). Article: P7084



To be used for connecting external valves to tool changer. Includes blind plugs for covering connections to the integrated valve and sensors on the tool changer when they are not in use.

To be mounted at one dedicated position on the tool changers P6901A (TC720-1) or P7901A (TC960-1).



NOTE!

To be mounted when option P7710 Integrated valve is not used.

Weight		0.1 kg
Air channels	Pneumatic diagram	Pne0230-011 (<u>section 2.1.15</u>)
	Dedicated channels, 8 mm hose	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

2.2.4 Magnetic sensors TC Opened/TC Closed. Articles: P6789, P6873-2, P7174 and P7175



One magnetic sensor which gives +24V signal "TC Opened" when tool changer is unlocked and one magnetic sensor which gives +24V signal "TC Closed" when tool changer is locked. To be mounted at one dedicated position on the tool changer.



NOTE!

Are prepared for options P6738-1, P7224, P6778 or P6780.



NOTE!

The magnetic sensors are each dedicated for a specific tool changer (see below).

Weight		0.05 kg
Electrical signals	Circuit diagram	See respective signal module.
	Dedicated signals	0V DC, 24V DC
		TC Closed (24V DC), TC Opened (24V DC)
	Connections	2 x M8 3P

Magnetic sensor	Tool changers
P6789	P6701A (TC240-1)
P6873-2	P6801A and P6851A (TC480-1)
P7174	P6901A (TC720-1)
P7175	P7901A (TC960-1)

2.2.5 Signal interface Souriau, robot side. Article: P6738-1



Transfers 16 electrical signals to the tool attachment. Can be mounted at 4 different positions on tool changer TC240 and TC 480 and 3 different positions on TC720 and TC960. To be used together with option P6739 attached to the tool attachment.

On the housing 3 separate M8-contacts for connecting integrated valve and magnetic sensors are mounted, which can be used for sensor-options P6789, P6873-2, P7174 or P7175 and valve-options P6718 or P7710.

Weight		0.2 kg
Electrical	Circuit diagram	E0178-246 (<u>section 2.2.7</u>)
signals	Souriau 23P (UT001823PH)	16 x (2A, 60V) + PE
	Dedicated signals, 3 x M8 3S	24V (for sensors)
		0V (for valves and sensors)
		TC Opened (sensor)
		TC Closed (sensor)
		doOpen TC 1 (valve)
		doOpen TC 2 (valve)
Connection kits	P8002 (connector)	Souriau 23S (straight)
(optional)	P8002-1 (connector)	Souriau 23S (angled)

2.2.6 Signal interface Souriau, tool side, Article: P6739



Transfers 16 electrical signals to the tool. To be mounted at the tool attachment and used together with option P6738-1 attached to the tool changer.

Weight		0.2 kg
Electrical signals	Circuit diagram	E0178-247 (<u>section 2.2.8</u>)
	Souriau 19S (UT001619SH)	16 signals + PE
Connection kits	P8003 (connector)	Souriau 19P (straight)
(optional)	P8003-1 (connector)	Souriau 19P (angled)



2.2.7 Circuit diagram E0178-246 for P6738-1



2.2.8 Circuit diagram E0178-247 for P6739

2.2.9 Signal interface Souriau, robot side. Article: P7224



Transfers 19 electrical signals to the tool attachment. Can be mounted at 4 different positions on tool changer TC240 and TC 480 and 3 different positions on TC720 and TC960. To be used together with option P7225 attached to the tool attachment.

On the housing 3 separate M8-contacts for connecting integrated valve and magnetic sensors are mounted, which can be used for sensor-options P6789, P6873-2, P7174 or P7175 and valve-options P6718 or P7710.

Weight		0.2 kg
Electrical		E0178-764 (<u>section 2.2.11</u>)
Signals	Souriau 26P (UT001626PH)	$19 \times (2A, 60V) + PE$
	Dedicated signals, 3 x M8 35	24V (for tool attachment) 24V (for sensors) 0V (for valves and sensors) TC Opened (sensor) TC Closed (sensor) doOpen TC 1 (valve) doOpen TC 2 (valve)
Connection kits (optional)	P8025 (connector)	Compact Souriau 26S (straight)

2.2.10 Signal interface Souriau, tool side, Article: P7225



Transfers 19 electrical signals to the tool. To be mounted at the tool attachment and used together with option P7224 attached to the tool changer.

Weight		0.2 kg
Electrical signals	Circuit diagram	E0178-765 (section 2.2.12)
	Souriau 26S (UT001626SH)	19 signals + PE
Connection kits	P8012 (connector)	Souriau 26P (straight)
(optional)	P8012-1 (connector)	Souriau 26P (angled)



2.2.11 Circuit diagram E0178-764 for P7224



2.2.12 Circuit diagram E0178-765 for P7225
2.2.13 Signal interface Souriau, robot side. Article: P6711



Transfers 23 electrical signals to the tool attachment. Can be mounted at 4 different positions on tool changer TC240 and TC 480 and 3 different positions on TC720 and TC960. To be used together with option P6721 attached to the tool attachment.

Weight		0.2 kg
Electrical signals	Circuit diagram	E0178-207 (<u>section 2.2.15</u>)
	Souriau 23P (UT001823PH)	23 x (2A, 60V)
Connection kits	P8002 (connector)	Souriau 23S (straight)
(optional)	P8002-1 (connector)	Souriau 23S (angled)

2.2.14 Signal interface Souriau, tool side, Article: P6721



Transfers 23 electrical signals to the tool. To be mounted at the tool attachment and used together with option P6721 attached to the tool changer.

Weight		0.2 kg
Electrical signals	Circuit diagram	E0178-208 (section 2.2.16)
	Souriau 23S (UT001823SH)	23 signals
Connection kits	P8001 (connector)	Souriau 23P (straight)
(optional)	P8001-1 (connector)	Souriau 23P (angled)



2.2.15 Circuit diagram E0178-207 for P6711



2.2.16 Circuit diagram E0178-208 for P6721

2.2.17 Servo interface M23, robot side. Article: P6768-2



Transfers 8 servo power signals to the tool attachment. Can be mounted at 4 different positions on tool changer TC240 and TC 480 and 3 different positions on TC720 and TC960. To be used together with option P6772 attached to the tool attachment.

Weight		0.2 kg
Servo power	Circuit diagram	E0178-314 (<u>section 2.2.19</u>)
	M23 8P (Hummel 7.601.000.000, insert 7.084.943.121)	4 x (5A, 300V) + 3 x (15A, 600V) + PE
Connection kits	P8030 (Connector)	M23 8S (straight)
(optional)	P8030-1 (Connector)	M23 8S (angled)

2.2.18 Servo interface M23, tool side, Article: P6772-2



Transfers 8 servo power signals to the tool. To be mounted at the tool attachment and used together with option P6768 attached to the tool changer.

Weight		0.2 kg
Servo power	Circuit diagram	E0178-321 (section 2.2.20)
	M23 8S (Hummel 7.641.000.000, insert 7.084.943.102)	8 power signals
Connection kits (optional)	P8032 (Connector)	M23 8P (straight)



2.2.19 Circuit diagram E0178-314 for P6768-2



2.2.20 Circuit diagram E0178-321 for P6772-2

2.2.21 Field bus interface Profinet, robot side. Article: P6771



Transfers 4 field bus signals to the tool attachment. Can be mounted at 4 different positions on tool changer TC240 and TC 480 and 3 different positions on TC720 and TC960. To be used together with option P6775 attached to the tool attachment.

Weight		0.2 kg
Field bus	Field bus type	Profinet, Ethernet, EtherCAT
	Circuit diagram	E0178-317 (<u>section 2.2.23</u>)
	M12 4S D-code	4 field bus channels
Connection kits (optional)	I1175 (field bus)	M12 4P D-code



2.2.22 Field bus interface Profinet, tool side, Article: P6775

Transfers 4 field bus signals to the tool. To be mounted at the tool attachment and used together with option P6771 attached to the tool changer.

Weight		0.2 kg
Field bus	Circuit diagram	E0178-320 (<u>section 2.2.24</u>)
	M12 4P D-code	4 field bus channels
Connection kits (optional)	I1257 (field bus)	M12 4S D-code



2.2.23 Circuit diagram E0178-317 for P6771



2.2.24 Circuit diagram E0178-320 for P6775

2.2.25 Signal and servo interface, robot side. Article: P6778



Transfers 19 electrical signals, 7 servo power signals and 4 field bus signals to the tool attachment. To be mounted at one dedicated position on the tool changer and used together with option P6779 at the TA.

On the housing 3 separate M8-contacts for connecting integrated valve and magnetic sensors are mounted, which can be used for sensor-options P6789, P6873-2, P7174 or P7175 and valve-options P6718 or P7710.

Weight		1.1 kg
Electrical	Circuit diagram	E0230-290 (<u>section 2.2.27</u>)
signals	Compact Souriau 26P (UT0W01626PH)	19 x (2A, 30V) + PE
	Dedicated signals, 3 x M8 3S	24V (for sensors)
		0V (for valves and sensors)
		TC Opened (sensor)
		TC Closed (sensor)
		doOpen TC 1 (valve)
		doOpen TC 2 (valve)
	M23 17P (7410 000 000, 7003 917 101)	6 x (2A, 60V)
Servo	M23 8P (7601 000 000, 7084 943 101)	4 x (5A, 300V) + 3 x (15A, 600V) + PE
power		
Field bus	Field bus type	Profinet, Ethernet, EtherCAT
	M12 4S D-code, socket	4 (2 pairs) field bus channels, 100 Mbit/s
Connection	P8025 (signals)	Compact Souriau 26S (straight)
kits	P8029 (signals)	M23 17S (straight)
(optional)	P8030 (servo)	M23 8S (straight)
	I1175 (field bus)	M12 4P D-code, pin

2.2.26 Signal and servo interface, tool side. Article: P6779



Transfers 19 electrical signals, 7 servo power signals and 4 field bus signals to the tool. To be mounted at the tool attachment and used together with option P6778 attached to the tool changer.

Weight		1.1 kg
Electrical	Circuit diagram	E0230-291 (see section 2.2.28)
signals	Compact Souriau 26S (UT0W61626SH)	13 + PE
	M23 17S (7440 000 000, 7003 917 102)	6
Servo power	M23 8S (7641 000 000, 7084 943 102)	7 + PE
Field bus	Field bus type	Profinet, Ethernet, EtherCAT
	M12 4P D-code, pin	4 (2 pairs) field bus channels
Connection kits	P8022 (signals)	Compact Souriau 26P (straight)
(optional)	P8031 (signals)	M23 17P (straight)
	P8032 (servo)	M23 8P (straight)
	I1257 (field bus)	M12 4S D-code, socket



2.2.27 Circuit diagram E0230-290 for P6778





2.2.28 Circuit diagram E0230-291 for P6779

2.2.29 Signal and field bus interface, robot side. Article: P6780



Transfers 9 electrical signals and 4 field bus signals to the tool attachment. To be mounted at one dedicated position on the tool changer and used together with option P6781 attached to the tool attachment.

On the housing 3 separate M8-contacts for connecting integrated valve and magnetic sensors are mounted, which can be used for sensor-options P6789, P6873-2, P7174 or P7175 and valve-options P6718 or P7710.

Weight		1.1 kg
Electrical	Circuit diagram	E0230-292 (<u>section 2.2.31</u>)
signals	Compact Souriau 26P (UT0W01626PH)	9 x (2A, 30V) + PE
	Dedicated signals, 3 x M8 3S	24V (for sensors)
		0V (for valves and sensors)
		TC Opened (sensor)
		TC Closed (sensor)
		doOpen TC 1 (valve)
		doOpen TC 2 (valve)
Field bus	Field bus type	Profinet, Ethernet, EtherCAT
	M12 4S D-code	4 (2 pairs) field bus channels, 100 Mbit/s
Connection	P8025 (signals)	Compact Souriau 26S (straight)
kits (opt.)	I1175 (field bus)	M12 4P D-code



2.2.30 Signal and field bus interface, tool side. Article: P6781

Transfers 9 electrical signals and 4 field bus signals to the tool. To be mounted at the tool attachment and used together with option P6780 attached to the tool changer.

Tec	hnical	data

Weight		1.0 kg
Electrical signals	Circuit diagram	E0230-293 (<u>section 2.2.32</u>)
	Compact Souriau 26S (UT0W61626SH)	9 + PE
Field bus	Field bus type	Profinet, Ethernet, EtherCAT
	M12 4P D-code	4 (2 pairs) field bus channels
Connection kits	P8022 (connector)	Compact Souriau 26P (straight)
(optional)	I1257 (field bus)	M12 4S D-code



2.2.31 Circuit diagram E0230-292 for P6780





2.2.32 Circuit diagram E0230-293 for P6781

2.2.33 Water/air coupling, 1-4 channels, robot side. Article: P6715A



Transfers 1–4 water/air channels, with non-return valves, to the tool attachment. Can be mounted at 2 different positions on the tool changer. To be used together with option P6725A attached to the tool attachment.

Тес	hnical	data

Weight		1.4-1.6 kg (depending on no. of ducts)
Water/air channels	Pneumatic diagram	Pne0230-011 (<u>section 2.1.15</u>)
	Water/air connections	1−4 x G½" (2000l/min air, max 10 bar)
	Water flow	20 l/min
	Water/air quality	Max 25µm particle content

Number of ducts	Article number
Water/air channels 1	P6715-1A
2	P6715-2A
3	P6715-3A
4	P6715-4A

2.2.34 Water/air coupling, 1-4 channels, tool side. Article: P6725A



Transfers 1–4 water/air-channels, with non-return valves, to the tool. To be mounted at the tool attachment and used together with option P6715A attached to the tool changer.

Weight		1.4-1.6 kg (depending on no. of ducts)
Water/air channels	Total number of ducts	1-4 (see article numbers. below)
	Water/air quality	Max 25µm particle content

Number of ducts	Article number
Water/air channels 1	P6725-1A
2	P6725-2A
3	P6725-3A
4	P6725-4A

2.2.35 Weld power connector M40, robot side. Article: P6716



Connects 3 weld power conductors to the tool attachment. Can be mounted at 2 different positions at the tool changer with the cable gland to the left or the right. To be used together with option P6726 attached to the tool attachment.

Weight		1.1 kg
Weld power	Total number of conductors	3 x (690V, 140A)
	Connection	Cable gland (M40x1.5) for a 3-conductor 19–28 mm cable

2.2.36 Weld power connector M50, robot side. Article: P6784



Connects 3 weld power conductors to the tool attachment Can be mounted at 2 different positions at the tool changer with the cable to the left or the right. To be used together with option P6726 attached to the tool attachment.

Weight		1.2 kg
Weld power	Total number of conductors	3 x (690V, 140A)
	Connection	Cable gland (M50 with insert grommet) for three
		15 mm separate cables

2.2.37 Weld power connector with MC connector, robot side. Article: P6717



Connects 3 weld power conductors to the tool attachment. Can be mounted at 2 different positions at the tool changer with the MC connector to the left or the right. To be used together with option P6726 attached to the tool attachment.

Weight		1.1 kg
Weld power	Total number of conductors	3 x (690V, 140A)
	Connection	Corresponds to MC TSB150

2.2.38 Weld power connector with RobiFix, robot side. Article: P6794



Connects 3 weld power conductors to the tool attachment. Can be mounted at one position at the tool changer with the RobiFix connector to the right. To be used together with option P6726 attached to the tool attachment.

Weight		1.1 kg
Weld power	Total number of conductors	3 x (690V, 140A)
	Connection	Corresponds to Robifix S35

2.2.39 Weld power with cable gland, tool side. Article: P6726



Connects 3 weld power conductors to the tool. Can be mounted at the tool attachment with cable gland to the left or the right. To be used together with option P6716, P6784 or P6794 attached to the tool changer.

Weight		1.1 kg
Weld power	Total number of conductors	3
	Connection	Cable gland for a 3-conductor 19–28 mm cable
Connection kits (optional)	P1521 (cable)	Power cable 1.5 m (3x25mm) with cable lugs

2.2.40 Weld power connector 2 x M40, robot side. Article: P6766



Connects 6 weld power conductors to the tool attachment Can be mounted at 2 different positions at the tool changer. To be used together with option P6767 attached to the tool attachment.

Weight		1.5 kg
Weld power	Total number of conductors	2 x 3 x (690V, 140A)
	Connection	2 x Cable glands (M40x1.5) for 3-conductor 19– 28 mm cables

2.2.41 Weld power with 2 x cable gland, tool side. Article: P6767



Connects 2 x 3 weld power conductors to the tool. To be mounted at the tool attachment and used together with option P6766 attached to the tool changer.

Weight		1.4 kg
Weld power	Total number of conductors Connection	2 x 3 2 x Cable glands for 3-conductor 19–28 mm cable
Connection kits (optional)	P1521 (cable)	Power cable 1.5 m (3x25mm) with cable lugs

2.2.42 Weld power contact cover, tool side. Article: P6742



To be used together with options P6716, P6717, P6794 P6766 when no power connector are used on tool attachment.

Technical data

Weight

0.2 kg

2.2.43 Air coupling, 8 channels, robot side. Article: P6847



Transfers 8 pneumatic channels to the tool attachment. Can be mounted at 2 different positions on the tool changer. To be used together with option P6848 attached to the tool attachment.

Weight		0.8 kg
Air channels	Total number of ducts	8 x G 1/4" (1000 l/min, max 10 bar)
		25µm particle content

2.2.44 Air coupling, 8 channels, tool side. Article: P6848



Transfers 8 pneumatic channels to the tool. To be mounted at the tool attachment and used together with option P6847 attached to the tool changer.

Weight		0.8 kg
Air channels	Total number of ducts	8 x G 1/4"
	Air quality	Oil-clean and waterless filtered air, with max
		25µm particle content

2.2.45 Programming tool for TC480. Article: P7160



To be used on TC-side for programming of docking of TA480 to TC480 together with the programming tool P7161 mounted on the TA.

Technical data

Weight 4.4 kg		<u></u>
	Weight	4.4 kg

2.2.46 Programming tool for TC480. Article: P7161



To be used on TA-side for programming of docking of TA480 to TC480 together with programming tool P7160 mounted on the TC.

Technical data

Weight	3.5 kg

M0723-1 version 3.8
2.2.47 TC ground socket. Article: P7239



To be mounted at the tool changers TC720-1 (P6901A) or TC960-1 (P7901A and P7901A-1) and used for ground connection between the tool changer, tool attachment and robot.

Technical data

Weight	0.01 kg
Connection, ground	M5/M8 (screw holes on tool changer)
Max current	140A

2.2.48 TA ground socket. Article: P7147



To be mounted at the tool attachments TA720-1 (P6902A) or TA960-1 (P7902A) and used for ground connection between tool attachment, tool changer and tool.

Technical data

Weight	0.01 kg
Connection, ground	M5/M8 (screw holes on tool attachment)
Max current	140A

2.2.49 Forced opening kit. Article: P6910



To be mounted to dedicated connections at the tool changers TC240-1, TC480-1, TC720-1 or TC960-1 and used for manual unlocking by connecting to a grease gun.

Technical data

Weight	0.2 kg

2.2.50 Robot adaptation kits

The flange of the tool changers has fastening holes in accordance with ISO 9409. For other bolt circles adaptation plates, to be mounted between the tool changer and the robot flange, are available. The product numbers of the adaptation kits are depending on actual combination of robot and tool changer.

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.

3 TC OPERATION AND INTERFACE

3.1 Required software function

The risk assessment for this tool changer (locking control function and monitoring) requires that the software logic described below is adhered to by the system integrator installing the tool changer.



- The right valve, called TC Close, will in passive position allow the air pressure to move the piston in the direction locking the tool. In active position the air will be allowed to be evacuated from the cylinder without impacting the piston.
- The left valve, called TC Open, will in active position let the air pressure move the piston in the direction unlocking the tool. In passive position the air will be evacuated from this side of the cylinder, allowing the tool to be locked.
- As a consequence, both valves must be activated to open the tool changer.
- The "doOpen TC 2" signal shall be interlocked with both a tool attachment (TA) present jumper and a tool stand switch indicating the following safe conditions for opening the tool changer:
 - * When there is no tool attachment mounted, the tool changer can be opened.
 - * When there is a tool attachment mounted, it is only possible to open the tool changer when it is positioned in the tool stand.



There are two sensors built in into the main body supervising the location of the piston.

- Signal "TC Opened" is high when the piston is in open position.
- Signal "TC Closed" is high when the piston is in locked position.

Signal logic for picking up a tool

- Open the tool changer by setting signals "doOpen TC 1" and "doOpen TC 2" to high.
- When signal "TC Opened" becomes high the tool changer has been opened and is allowed to move to the tool attachment.
- When the tool changer is in position for picking up the tool attachment, the tool changer should be closed (set signals "doOpen TC 1" and "doOpen TC 2" low).
- When signal "TC Closed" is high, the tool changer has been closed and can start to move.
- When the closed tool changer has been lifted 10mm, the signal from the switch or sensor mounted at the tool stand should be checked to confirm that the tool remains in the tool changer.

Set "doOpen TC 1" and "doOpen TC 2" to high
Is "TC Opened" high and "TC Closed" low?
Move robot to tool stand
Is robot in position in tool stand?
Reset "doOpen TC 1" and "doOpen TC 2"
Is "TC Closed" high and "TC Opened" low?
Move robot up 10 mm
Is tool stand switch signals correct?
Continue work cycle



Signal logic for leaving a tool in the tool stand

- Opening of tool changer should only be possible when tool is positioned in tool stand. A switch or sensor mounted at the tool stand should give a signal that allows the tool changer to open.
- Set signals "doOpen TC 1" and "doOpen TC 2" high, when the tool attachment is positioned in the tool stand.
- When signal "TC Opened" is high, the tool changer is opened and can start to move.
- When the opened tool changer has been lifted 10mm, the signal from the switch or sensor mounted at the tool stand should be checked to confirm that the tool remains in the tool stand.

Wait

Wait

Wait

Stop

Move the robot to the tool stand position No Is robot in position in tool stand? Yes No Is "tool in stand" signal high? Yes. Set "doOpen TC 1" and "doOpen TC 2" to high No Is "TC Opened" high and "TC Closed" low"? Yes Move robot up 10 mm No Is tool stand switch signals correct? Yes Continue work cycle

Functional test

For controlling that the tool change valves and the integrated locking spring are functioning following tests should be made regularly:

- With the tool changer in opened position: Set "doOpen TC 2" to low and let "doOpen TC 1" remain high. The signal "TC Closed" will become high.
- With the tool changer in opened position: Let "doOpen TC 2" remain high and set "doOpen TC 1" to low. The signal "TC Closed" will become high.

Breaking conditions

- If signal "TC Closed" disappears when tool attachment is in tool changer, the robot should be stopped.
- If signal "TC Opened" disappears, when tool changer is going to pick up the tool attachment, the robot should be stopped.
- If signal "TC Opened" is high at the same time as "TC Closed" is high, the robot should be stopped.

3.2 Sparking



WARNING! Electrical and power signals must be switched off and disconnected when docking the tool attachment. This is to prevent sparking between signal pins and tool attachment.

3.3 Programming

The following will ensure a correct docking position.

	Action
1	Attach a spare tool attachment to the tool changer.
2	Position the spare tool attachment above the tool attachment that is mounted at the tool.
3	The correct position is found when the tool attachments are parallel, centered and the engraved arrows are on the same line.
4	Save the position. The robot can move to this position with high speed.
5	Dismount the spare tool attachment.
6	Go back to the saved position and move the tool changer (in axis 6 direction) the remaining distance to the tool attachment (mounted at the tool).
7	Save the position. The robot should move the final distance to this position with low speed.

3.4 Tool Stand



NOTE!

To guarantee reliability and a long service-life for the tool changer, the tool stand must be stable, both in terms of its design and attachment.



NOTE!

The tool stand must not be spring-loaded!

3.5 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.

4 SPARE PARTS

4.1 Tool changer

4.1.1 Parts list for TC240-1, P6701A



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M10x60	21212519-503		6
2	Damper	63550006-462	Х	4
3	Guide pin	P0230-175	Х	3
4	Water/air coupling	10203	Х	1

4.1.2 Parts list for TC480-1, P6801A and P6851A



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M12x60 (P6801A only)	21212519-544		10
1	Mounting screw, M10x60 (P6851A only)	21212519-503		10
2	Damper	63550006-462	Х	4
3	Circlip	10818		1
4	Guide pin	P0230-175	Х	3
5	Water/air coupling	10203	X	1

4.1.3 Parts list for TC720-1, P6901A and P6947



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M16x75 (P6901A only)	MC6S 16x75		12
1	Mounting screw, M16x75 (P6947 only)	MC6S 16x75		16
2	Damper	63550006-462	Х	3
3	Circlip	l1253		1
4	Guide pin	P0230-175	Х	2
5	Water/air coupling	10203	Х	1

4.1.4 Parts list for TC960-1, P7901A and P7901A-1



ltem	Description	Part number	Wear part	Pcs
1	Mounting screws M16x75 (12X) for P7901A (screw class 8.8)	P7914		1
1	Mounting screws M12x70 (10X) for P7901A-1 (screw class 12.9)	P7915		1
2	Damper	63550006-462	Х	3
3	Circlip	11320		1
4	Guide pin	P0230-175	Х	2
5	Water/air coupling	10203	Х	1

4.1.5 Parts list for integrated valve, P7710



ltem	Description	Part number	Wear part	Pcs
1	Valve	10449		1
2	Rear valve cover	P0178-324		1
3	M4x6 screw	9ADA618-31		2
4	Valve cover	P0178-323		1
5	Silencer	10903		2
6	Screw M4x8	21212711-287		4
7	Screw M6x6	MC6S 6x6		2

4.1.6 Parts list for Valve adapter, P7084



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M3x16	21212519-228		2
2	Air connection	10371		2
3	O-ring	10090		1
4	O-ring	10436		1
5	Blind plug	10093		2
6	Blind plug	10165		2

4.1.7 Parts list for magnetic sensors, P7172, P7173, P7174 and P7175



ltem	Description	Part number	Wear part	Pcs
1	Magnetic sensor	l1015		2
2	Nut	101469		4
3	Sensor cable M8	l1288		2

4	M4x8 screw	MC6S M4x8	2

4.1.8 Parts list for forced opening kit, P6910



ltem	Description	Part number	Wear part	Pcs
1	Nipple	I1335		1
2	Coupling extender	P0178-192		2

4.1.9 Parts list for signal interface, P6738-1, P7224, P6711 and P6771



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M6x60 and washer	21212519-382 and		3
		21512062-153		
2	Spring-loaded signal pin (P6738-1)	l1287	Х	17
2	Spring-loaded signal pin (P7224)	l1287	Х	21
2	Spring-loaded signal pin (P6711)	11287	Х	23

2	Spring-loaded signal pin (P6771)	l1287	Х	5

4.1.10 Parts list for servo interface M23, P6768-2



ltem	Description	Part number	Wear part	Pcs
1	Shoulder screw 8x50	M6-8x50		3

4.1.11 Parts list for signal interface, P6778 and P6780



Item	Description	Part number	Wear part	Pcs
1	Shoulder screw 8x60	H 8X60		4

2	Spring-loaded signal pin (P6778)	11287	Х	26
2	Spring-loaded signal pin (P6780)	l1287	Х	16

4.1.12 Parts list for weld power connector, P6716, P6784 and P6717



ltem	Description	Part number	Wear part	Pcs
1	Shoulder screw 10x80	M8-10x80		3
2	Weld power socket	11001	Х	3
3	O-ring	10160		3

4.1.13 Parts list for water/air coupling, P6715A



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M10x45	MC6S 10x45		2
2	Water/air coupling	10203	Х	1–4

4.1.14 Parts list for air coupling, P6847



ltem	Description	Part number	Wear part	Pcs
2	Mounting screw, M10x50	MC6S 10x50		2
1	Air sealing	63550006-462	Х	4

4.2 Tool attachment



4.2.1 Parts list for tool attachments, P6702, P6802 and P6872

ltem	Description	Part number	Wear part	Pcs
1	Water/air coupling	10202	Х	1
2	Guide bushing	P0178-064	Х	3

4.2.2 Parts list for tool attachments, P6902A, P7902A and P6948



ltem	Description	Part number	Wear part	Pcs
1	Water/air coupling	10202	Х	1
2	Guide bushing	P0178-064	Х	2



4.2.3 Parts list for signal interface, P6739, P7225, P6721 and P6775

ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M6x60 and	21212519-382 and		3
	washer	21512062-153		
2	O-ring	P0178-349	Х	1

4.2.4 Parts list for power interface M23, P6772-2



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M6x60 and	21212519-382 and		3
	washer	21512062-153		
2	O-ring	P0178-350	Х	1

4.2.5 Parts list for signal interface, P6779 and P6781



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M6x70 and	21212519-384 and		4
	washer	21512062-153		
2	O-ring	I1048	Х	1

4.2.6 Parts list for weld power connector, P6726



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M6x80	21212519-386		4
2	Weld power pin	P0230-105	Х	3
3	O-ring	10776		3

4.2.7 Parts list for water/air coupling, P6725A



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M10x45	MC6S 10x45		2
2	Water/air coupling	10202	Х	1–4

4.2.8 Parts list for air coupling, P6848



ltem	Description	Part number	Wear part	Pcs
1	Mounting screw, M10x50	MC6S 10x50		2
2	Air sealing	63550006-462	Х	4

