

WINGMAN

THE COBOT TOOL CHANGER SYSTEM













PLUG AND PLAY
AUTOMATIC & MANUAL TOOL CHANGE
FOR COBOTS

DATASHEETS

Version 1.10

SPECIFICATIONS

-  **AUTOMATIC & MANUAL** change in one device
-  Integrates with **most** cobots and tools
-  Rated payload **33 kg / 73 lbs**
-  Weight on cobot **260 g / 0.57 lbs**
-  Combined height **30 mm / 0.18 in**
-  Repeatability **+/-0,03 mm / +/-0.0012 in**
-  Automatic tool change setup in **1 minutes**
-  Pass-through **adaptability**
-  All highly **durable** metal alloys
-  Cobot safe (**ISO/TS 15066**)



PLUG AND PLAY

Installed in few minutes out-of-the-box.
Automatic tool change setup in 1 minute.



ONE FITS ALL

Automatic and manual tool change in one.
Standard ISO flange – Strong and light.



COBOT SAFE

Designed & tested for ISO/TS 15066
compliance and with redundant safety lock.

THE TOOL CHANGER

The WINGMAN is suitable for use on cobots of all sizes and will fit in applications with only little space.

Combined height	30 mm / 0.18 in
Combined weight	260 g / 0.57 lbs
Rated payload	33 kg / 73 lbs
Repeatability	+/-0,03 mm / 0.0012 in

THE TOOL HOLDER

The holder provides a standard solution to store end-effectors and the holder is part of the automatic tool change mechanism.

Holder's maximum payload	5 kg / 11 lbs
Maximum tool imbalance	1 Nm
Material	Stainless steel



THE HIGH FLOW PASS-THROUGH MODULES

The modules click on the WINGMAN's housing without use of tools. The WINGMAN can hold three sets of modules.

Maximum pressure	10 bar
Push-in fittings	2 x Ø6 mm hoses
Pass-through clearance	Ø4 mm



ELECTRICAL PASS-THROUGH MODULES

The modules click on the WINGMAN's housing without use of tools. There is room for three sets of module, which allow for three different sources of electrical power/control.

Connectors	Std. cobot M8 / 8 pin
Rated voltage/amps	30 ACDC / 1,5 A
IP classification	IP54



BUILT-IN AIR PASS-THROUGH

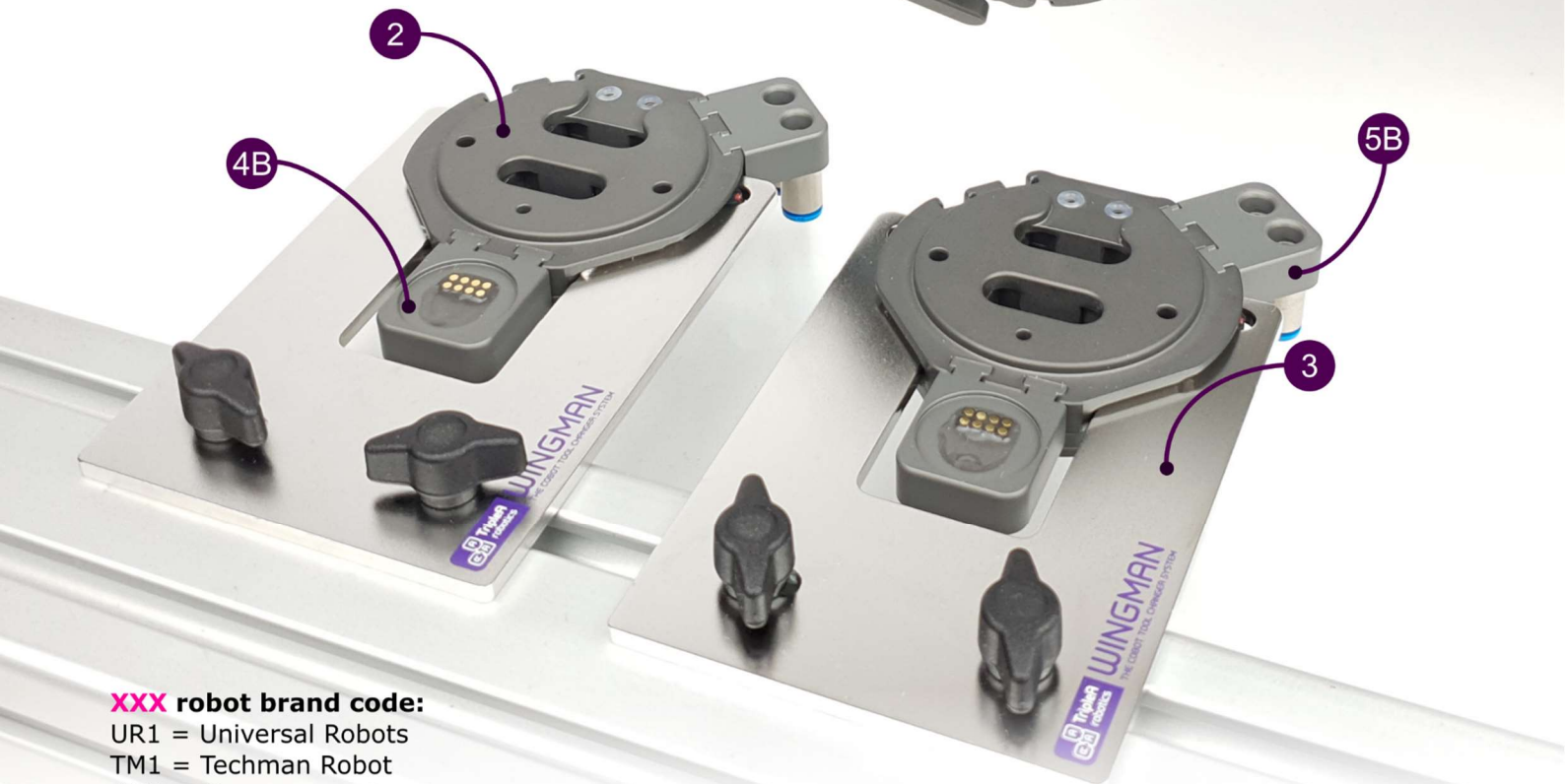
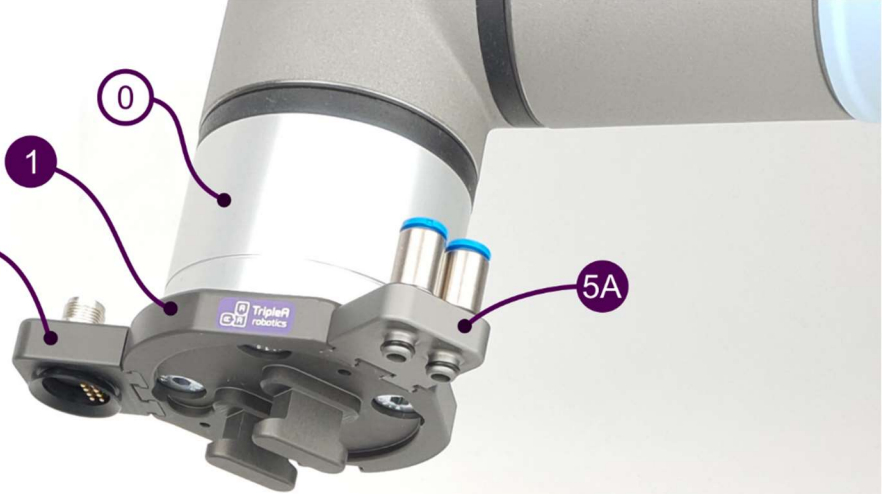
The WINGMAN Tool Changer housings feature built-in channels for pneumatic pass-through.

Maximum pressure	10 bar
Channels for fittings	2 x Ø4 mm hoses
Pass-through clearance	Ø2,7 mm

HIGH QUALITY

The WINGMAN Tool Changer System is made of precision machined metal parts.

Manufacturing country	DENMARK
Material	High grade aluminium
Surface treatment	Special



XXX robot brand code:

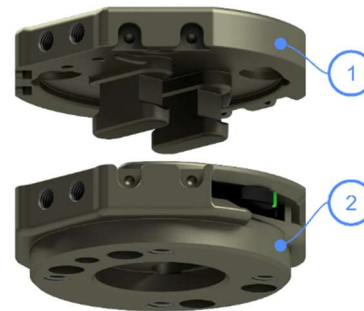
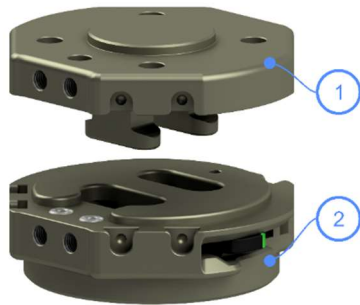
- UR1 = Universal Robots
- TM1 = Techman Robot
- OM1 = Omron
- DR1 = Doosan Robotics
- FA1 = Fanuc CRX

INTERFACE OVERVIEW

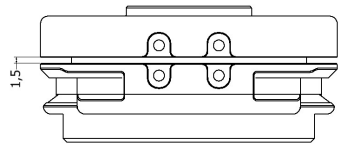
Pos.:	Part number:	Description:	Interfaces with:
0		Robot / Cobot	1 6A 6B
1	WM1-P-01-01- XXX	Robot Part	0 2 4A 5A 7A 7B
2	WM1-P-02-01	Tool Part	1 3 4B 5B 7A 7B
3	WM1-P-03-01	Tool Part Holder	2
4A	WM1-A-01-01- XXX	El pass-through module for Robot Part	1 4B
4B	WM1-A-01-02- XXX	El pass-through module for Tool Part	2 4A
5A	WM1-A-03-01	Air pass-through module for Robot Part	1 5B
5B	WM1-A-03-02	Air pass-through module for Tool Part	2 5A
6A	WM1-A-02-01- XXX	Cable for robot tool flange connector	0 4A
6B	WM1-A-02-03	Cable for robot controller	0 4A
7A	WM1-A-06-01	Fittings straight for built-in air pass-through	1 2
7B	WM1-A-06-02	Fittings angled for built-in air pass-through	1 2

Datasheet - TOOL CHANGER

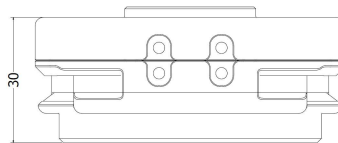
PICTURES AND DRAWINGS



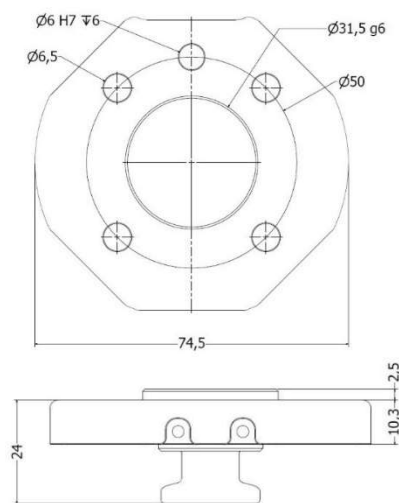
Maximum couple distance in automatic use



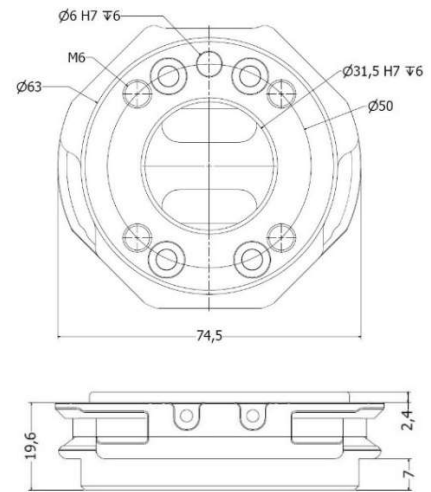
Assembled height



Robot part WM1-P-01-01



Tool part WM1-P-02-01



PART NUMBERS

Pos.:	Part no.:	Description:	Interfaces with:
1	WM1-P-01-01	Robot part including: 4 pcs. screws M6x12mm ISO 10642 1 pcs. positioning pin 6mmH6	Pos.: 2, 4A, 5A, 6A
2	WM1-P-02-01	Tool part	Pos.: 1, 3, 4B, 5B, 6B
	WM1-S-01-01	Spare part kit for Tool part WM1-P-02-01 including 2 pcs. levers, 4 pcs. bearings, 4 pcs. Springs and 4 pcs. pins.	Pos.: 2

TECHNICAL DATA

Weight, tool changer assembled:	260 g
Rated payload* (Maximum payload):	33 kg (100kg)
Tool changer assembly height:	30 mm
Repeatability:	+0,03 mm
Pass-through, pneumatic build in and suggested push-in fittings (not included):	2 x M5 pneumatic (max 10 bar) Festo 133004 or Festo 153333
Pass-through, modules:	3 sets can be fitted
Material:	Surface treated aluminum
Interface flanges on robot part and tool part:	ISO 9409-1-50-4-M6

* The rated payload is based on the payload's center of gravity being 100 mm from the center of the tool changer, a dynamic force of maximum 2G and a safety factor of 5. Maximum allowed payload must always be calculated for the application.

Tool Changer



Part no.: WM1-P-01-01



Part no.: WM1-P-01-02



STATIC LOAD LIMITS

The WINGMAN Tool Changer has a proven *breaking load* at 20.770 N (2.150 kg) and a *yield load* at approx. 14.000 N (1.425 kg) in direction, F.

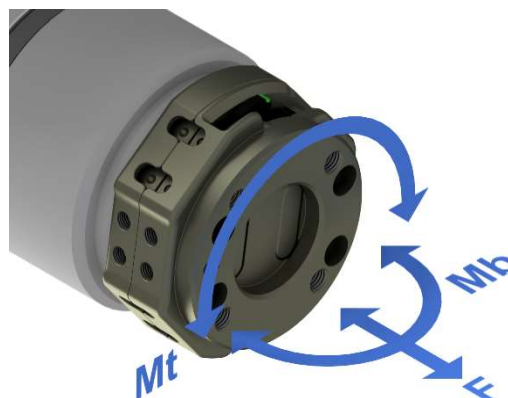
The WINGMAN's **maximum static payload and torques of F,max = 100kg, Mb,max = 80 Nm, Mt,max = 80 Nm** are calculated based on a very conservative theoretical *minimum yield load* of 5.000 N and with a safety factor of 5 which results in the given payload and torques.

The WINGMAN's **Rated Payload of 33kg** is based on the *maximum static payload and torque* and a typical application with a maximum of 2G acceleration/deacceleration and a distance from the WINGMAN to the payload's center of 100 mm.

How to calculate if the WINGMAN's maximum allowed static payload & torque limits are within those present in your application:

1. Calculate the forces (F , Mb , Mt), which the WINGMAN will be exposed to in your application considering the cobots worst-case acceleration/deacceleration of the payload and the payloads interaction with other objects.

3. Now compare the calculated worst-case forces present in your application with the WINGMAN's maximum allowed static payload & torque limits (F,max , Mb,max , Mt,max).



THE WINGMAN'S MAXIMUM ALLOWED STATIC LOAD & TORQUE

Rated Payload	33 kg.
F,max: (Maximum static payload)	1000 N (100 kg)
Mb,max: (Maximum static torque)	80 Nm
Mt,max: (Maximum static torque)	80 Nm

MAXIMUM ALLOWED APPLICATION PAYLOAD CALCULATION

To calculating the **maximum application payload** for your application, determine the:

- G,max => Maximum *dynamic forces*.
To determine the *dynamic forces*(G,max), consult your cobot's documentation to find out the maximum acceleration / deacceleration for your cobot.
- Dmb => Distance (Dmb) from the *tool part* center to the payloads Center of Gravity in meters that causes Mb type torque.
- Dmt => Distance (Dmt) from the *tool part* center to the payloads Center of Gravity in meters that causes Mt type torque.

	F	Mb	Mt
<i>Maximum allowed application payload</i> =	$F_{max} / G_{max} / 9,82$	$Mb_{max} / G_{max} / Dmb / 9,82$	$Mt_{max} / G_{max} / Dmt / 9,82$
<i>Maximum allowed application payload</i> EXAMPLE cal.=	<ul style="list-style-type: none"> • F,Max = 1000 N • Mb,max = 80 Nm • Mt,max = 80 Nm • Maximum dynamic force, G,max = 2. • Distance, Dmt = 0,1 m. • Distance, Dmb = 0,12 m. $1000 \text{ N} / 2 / 9,82 = 50 \text{ Kg}$	$80 \text{ Nm} / 2 / 0,12 \text{ m} / 9,82 = 33 \text{ Kg}$	$80 \text{ Nm} / 2 / 0,10 / 9,82 = 40 \text{ kg}$

Maximum application payload EXAMPLE cal. RESULT =

The **lowest** relevant calculated value for F, Mb and Mt determines the *maximum application payload*.

In case that the cobot movement result in only F type force on the tool changer:

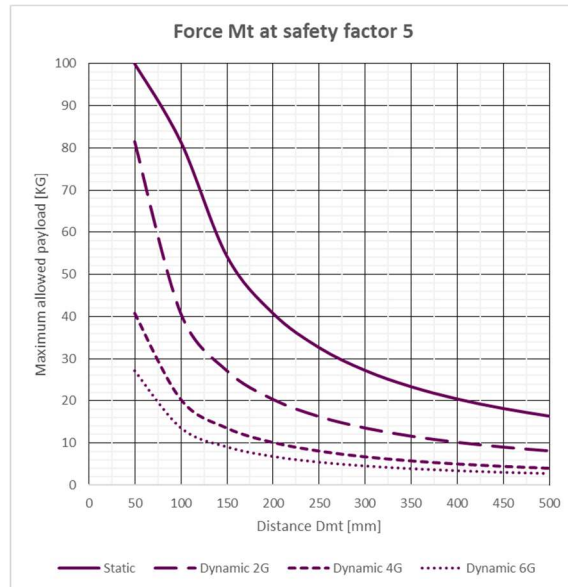
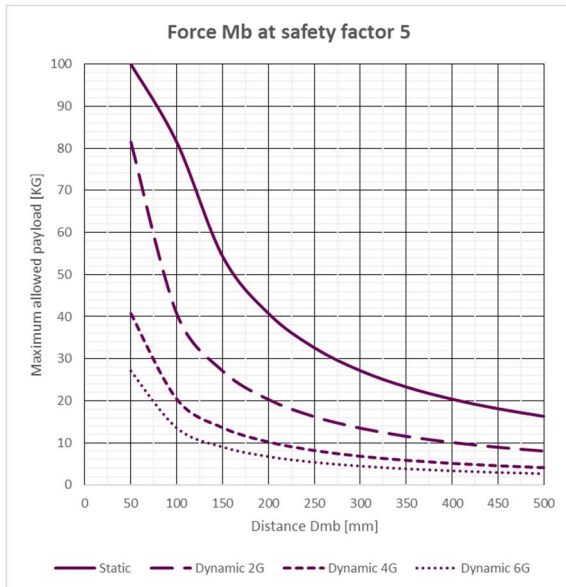
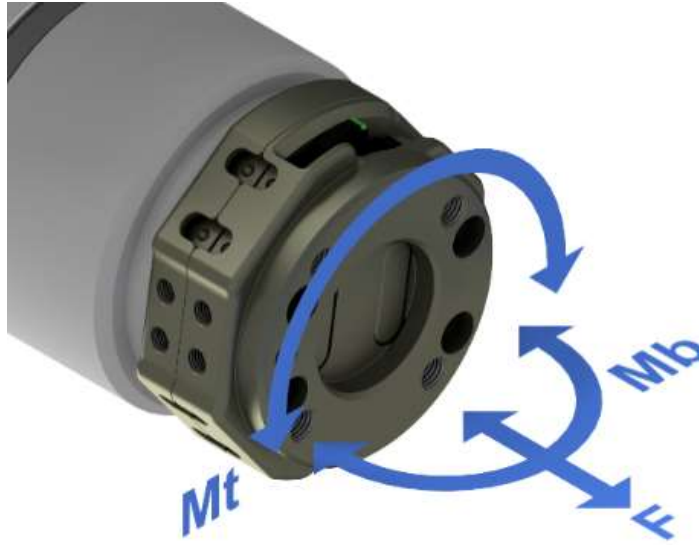
Maximum allowed application payload = 50 kg.

In case that the cobot movement result is both F, Mb and Mt type loads on the tool changer:

Maximum allowed application payload = 33 kg.

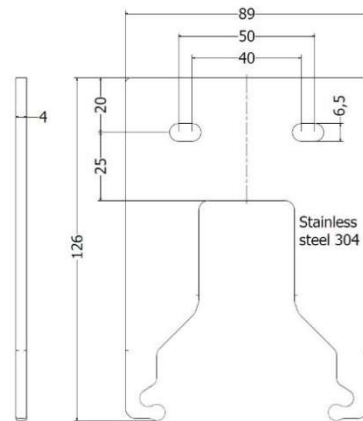
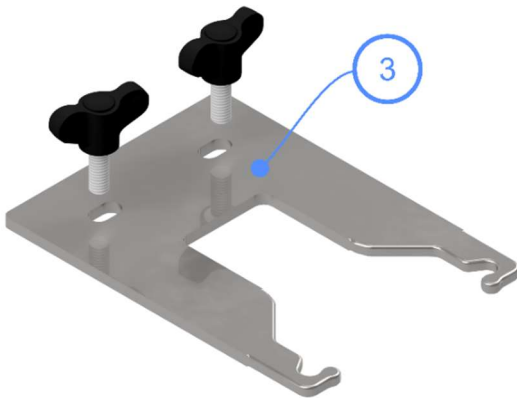
Alternatively, to calculating the *maximum allowed payloads* for a robot application, the *maximum allowed payloads* can be determined from the graphs on the next page.

MAXIMUM ALLOWED APPLICATION PAYLOAD GRAPHS



Datasheet - TOOL PART HOLDER

PICTURES AND DRAWINGS



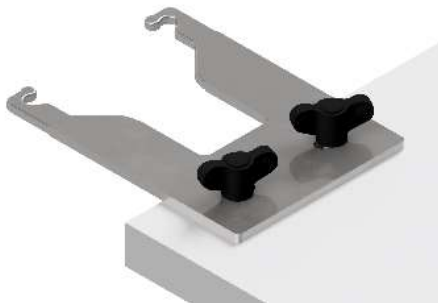
PART NUMBERS

Pos.:	Part no.:	Description:	Interfaces with:
3	WM1-P-03-01	Tool part holder including 2 pcs. finger screws.	Pos.: 2

TECHNICAL DATA

Material:	Electro polished stainless steel 304 (surface gloss may vary)
Rated couple payload / Rated couple torque (See USER GUIDE chapter 7.6 Installing the tool part holder)	5 kg / 1 Nm
Mounting means:	2 x M6 wing screws
Installation:	Horizontally on a rigid structure

HORIZONTAL INSTALLATION FOR A RIGID INSTALLATION



Part no.: WM1-P-03-01



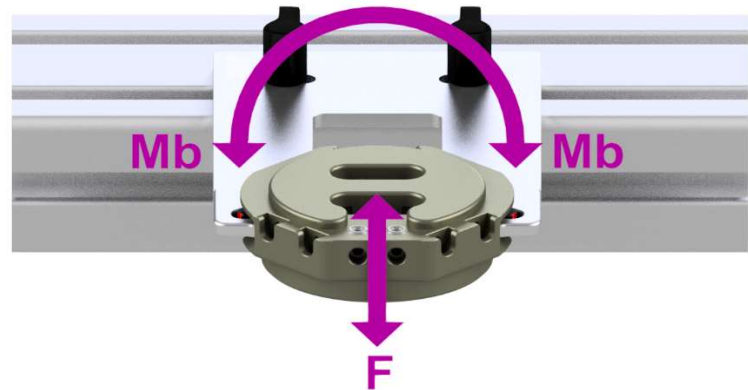
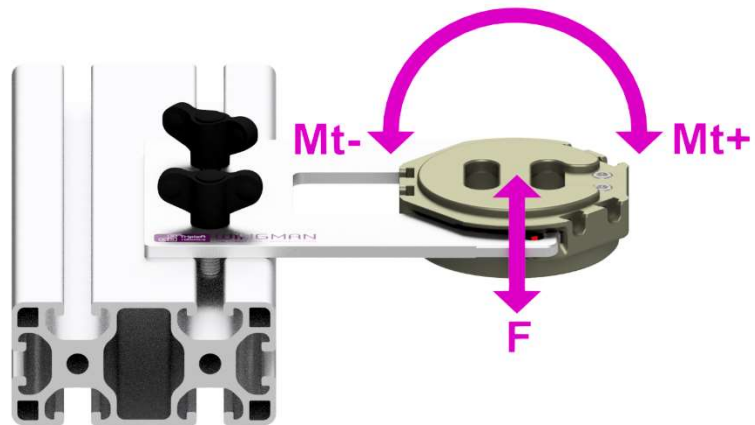
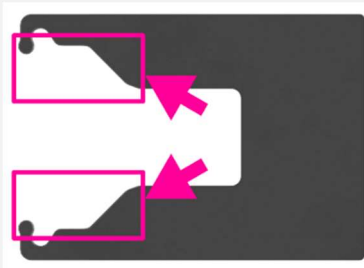
STATIC LOAD LIMITS FOR TOOL PART HOLDER

Automatic tool change with the WINGMAN Tool Changer System will work best and will provide the longest product life span when used within the limits for *rated couple payload* and *rated couple torque*.

The WINGMAN Tool Changer System will do automatic tool change even though the limits are exceeded however, use outside the limits is not recommended and will be on the *system integrators* (user) own risk.

Lubrication:

The tool part holder does not come pre-lubricated. Lubrication of the tool part holder is optional but will be necessary to achieve long life span and smooth tool change. For end-effector that result in a *rated couple payload*(F) > 1 kg and/or a *rated couple torque*($M+$ & Mb) > 0 Nm lubrication is mandatory. For lubrication is used a silicone based grease.

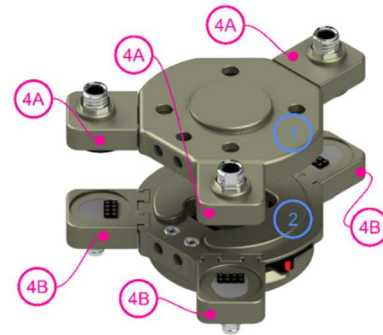
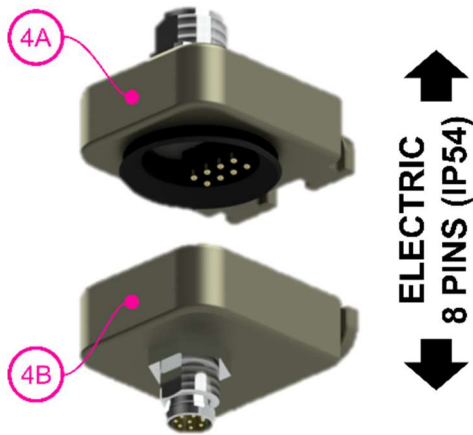


MAXIMUM ALLOWED STATIC LOAD

F_{max} (Rated couple payload):	50 N / 5 kg
$Mt+$, max (Rated couple torque):	1 Nm
$Mt-$, max (Rated couple torque):	0 Nm
Mb , max (Rated couple torque):	1 Nm

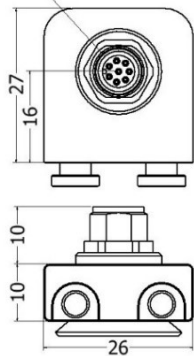
Datasheet - ELECTRIC PASS-THROUGH MODULE

PICTURES AND DRAWINGS



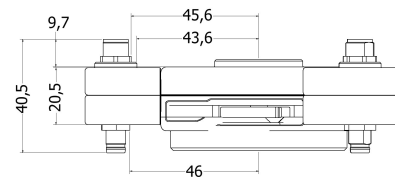
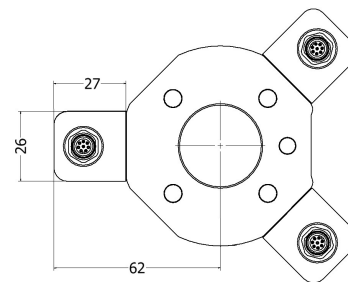
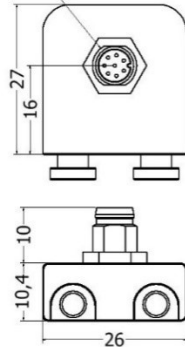
Part no.: WM- A-01-01

ELECTRICAL CONNECTOR:
- Female 8 pin
- Internal threaded M8



Part no.: WM1-A-01-02

ELECTRICAL CONNECTOR:
- Male 8 pin
- External threaded M8



PART NUMBERS

Pos.:	Part no.:	Description:	Interfaces with:
4A	WM1 A-01-01	Pass-through module, electric for robot part, M8 8 positions.	Pos.: 1
4B	WM1-A-01-02- XXX	Pass-through module, electric for tool part, M8 8 positions.	Pos.: 2
	WM1 A-02-01- XXX	Electric cable 0,22 m for pass-through module, M8 8 pin, connector L shape.	Pos.: 4A
	WM1 A-02-02- XXX	Electric cable 5 m with M8 connector to open-end. For connection between pass-through module on tool part to end-effector.	Pos.: 4A
	WM1 A-02-03- XXX	Electric cable 5 m with M8 connector to open-end. For connection between pass-through module on robot part to robot controller cabinet.	Pos.: 4A

TECHNICAL DATA

Housing material:	Surface treated aluminum
Rated voltage (AC/DC):	30 V
Rated current at 40°C per pin (peak):	1,5 A (3,0 A)
Number of positions:	8
IP classification when connected:	IP54
Gold plated contacts:	10 μm
Connector type facing robot (4A)	M8, 8 pin connector - IEC 61076-2-104 (Female)
Connector type facing tool (4B)	M8, 8 pin connector - IEC 61076-2-104 (Female or male depending on robot brand/model)



WARNING Electricity to a pass-through module must be turned off and any residual electricity must be eliminated before tool change takes place. Failing in doing so will result in damage to the electric connectors and can result in injury.



Part no.: WM1-A-01-01

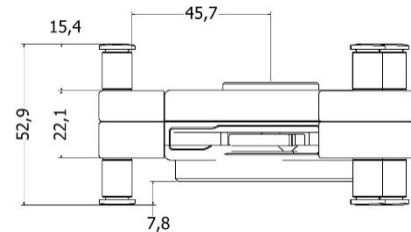
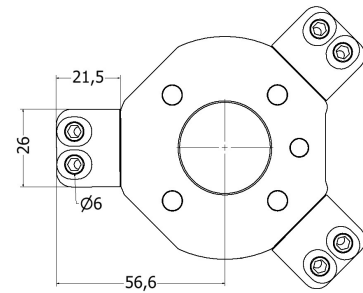
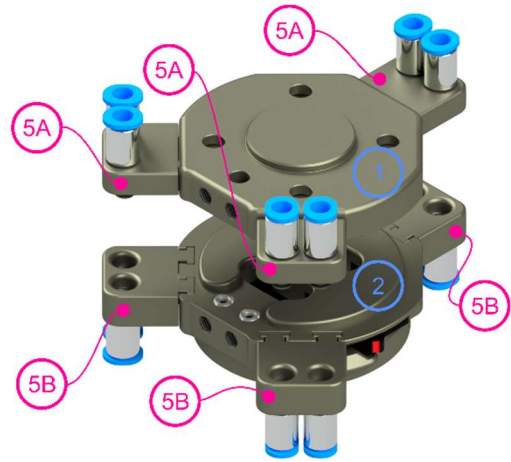
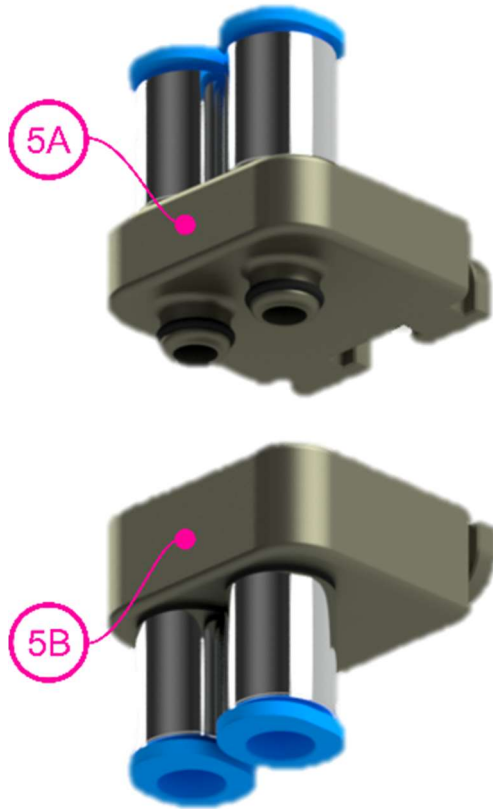


Part no.: WM1-A-01-02



Datasheet – HIGH FLOW PASS-THROUGH MODULE

PICTURES AND DRAWINGS



PART NUMBERS

Pos.:	Part no.:	Description:	Interfaces with:
5A	WM1-A-03-01	Pass-through module, High Flow for robot part , 2 x Ø6 mm hose fittings.	Pos.: 1
5B	WM1-A-03-02	Pass-through module, High Flow for tool part , 2 x Ø6 mm hose fittings.	Pos.: 2

TECHNICAL DATA

Material:	Surface treated aluminum
Maximum air pressure:	10 bar
Pass-through clearance diameter	Ø4 mm
Pass-through fittings (included):	PUSH-IN for Ø6 mm hose
O-ring sealing (wear part):	2 pcs. Ø6/Ø4 NBR shore 70



WARNING Energy (vacuum, air pressure) to a pass-through module must be turned off and any residual air pressure or vacuum in the system must be eliminated before tool change takes place. Failing in doing so can result in hardware damage and injury.



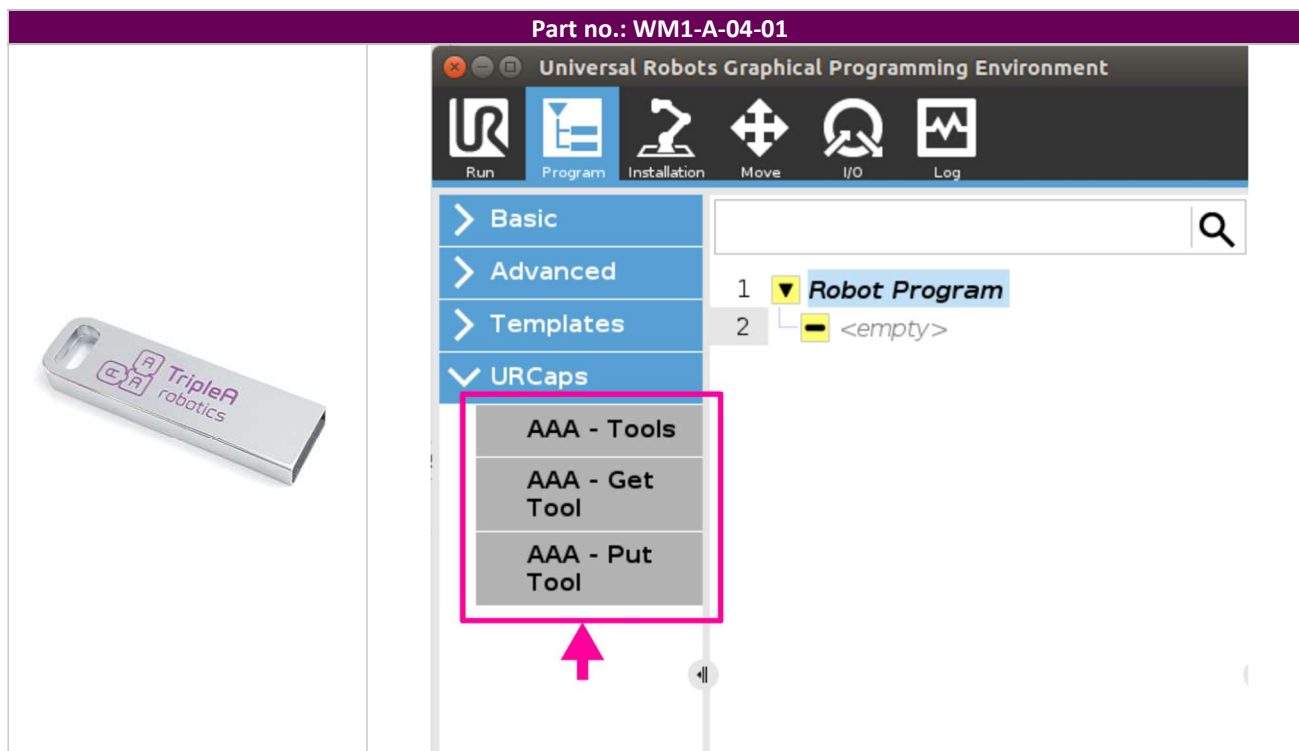
Part no.: WM1-A-03-01



Part no.: WM1-A-03-02



Datasheet – URcap software



PART NUMBERS

Pos.:	Part no.:	Description:	Interfaces with:
	WM1-A-04-01	UR cap software. License for use on one robot.	Universal robots

TECHNICAL DATA

For use on:	Universal Robots: CB3 series installed with Polyscope version 3.13 or later and e-series installed with Polyscope version 5.8 or later.
License:	License for use on one robot only.
Main features:	AAA – Tools > Add this node in top of your robot program and configure your end-effectors here. AAA – Get Tools > Add this node to you robot program when you want the robot to get an end-effector. AAA – Put Tool > Add this node to you robot program when you want the robot to put back an end-effector. <ol style="list-style-type: none"> 1. 1-minute tool change setup as only one waypoint must be teached per end-effector. 2. Store data in the robot program for all your favorite end-effectors. 3. Easy toggle of e.g. payload, TCP, COG and tool voltage in tool changes. 4. Optional exit and enter waypoints to ensure free passage to and from the tool area. 5. Adjustment of the tool changers orientation on the robot to allow odd orientation e.g. for use in double mount applications. 6. Several possibilities to optimize tool change waypoints. 7. Optimized to ensure no conflicts with other URcaps installed on the robot (e.g. no threads running in the background and no interference with Tool IO's).