

Software manual

MTB Application Kit for Techman Robot

SCHUNK software module for TMflow

Superior Clamping and Gripping



Imprint

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Dear Customer,

thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

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Please read the operating manual in full and keep it close to the product.

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1 General

1.1 About this manual

This manual contains information on software modules – hereinafter referred to as "components" – and their use in "TMflow".

The components are used to easily integrate and control the following products in Techman applications:

The components are used to easily integrate and control the following products in OMRON applications:

- MTB Application Kit SG-JGP-P
- MTB Applikations-Kit DG-JGP-P
- MTB Application Kit KS-PGS3

This manual describes the software environment for a Techman robot.

This manual describes the software environment for an OMRON robot.

The components were tested with TMflow version 1.82.51. Before installing, check whether a more recent version of the PlugIn is available at schunk.com/mtb-downloads.

NOTE: The illustrations in this manual are intended to provide a basic understanding and may deviate from the actual version.

In addition to these instructions, the documents listed under ▶ [1.4 \[4 5\]](#) are applicable.

1.2 Symbol definition

The following symbols are used in this manual:

- Prerequisite for an action

1. Action 1
2. Action 2

- ✓ Intermediate results

- ✓ Final results

- ▶ [1.2 \[4 4\]](#): chapter number and [page number] in hyperlinks

1.3 Presentation of Warning Labels

To make risks clear, the following signal words and symbols are used for safety notes.



⚠ DANGER

Danger for persons!

Non-observance will inevitably cause irreversible injury or death.



⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.



⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

CAUTION

Material damage!

Information about avoiding material damage.

1.4 Applicable documents

- Assembly and operating manual for the product:
 - MTB application kit SG-JGP-P **
 - MTB Application Kit DG-JGP-P **
 - MTB Application Kit KS-PGS3 **
- Assembly and operating manual of the sensor MMS 22-PI2 *
- Operating manual for the Techman robot
- Operating manual for the OMRON robot

The documents labeled with an asterisk (*) can be downloaded from [schunk.com](https://www.schunk.com).

The documents labeled with an asterisk (**) can be downloaded from [schunk.com/mtb-downloads](https://www.schunk.com/mtb-downloads).

2 Description of function

The following components are provided:

"JGPClose" component

When closing, the digital output *MTB_Control* is set to low. If the gripper is not activated, the digital output *MTB_Enable* is also set to high. After a fixed time of 120 ms the function is finished.

"JGPOpen" component

When opening, the digital output *MTB_Control* is set to high. If the gripper is not activated, the digital output *MTB_Enable* is also set to high. After a fixed time of 120 ms the function is finished.

"JGPBlowoff" component

Activates or deactivates the blow-off nozzle via the digital output *MTB_Control_N*. Optionally, a specific activation period can be specified.

"JGPTeach" component

This component is required for teaching the two sensor positions. The teach-in process starts when the digital output *MTB_Teach* is set to high.

"ViseOpen" component

When opening, the digital output *MTB_Control_Vise* is set to high in order to open the clamping force block. If the clamping force block is not activated, the digital output *MTB_Enable_Vise* is also set to high. After a fixed time of 120 ms the function is finished.

"ViseClose" component

When closing, the digital output *MTB_Control_Vise* is set to low in order to close the clamping force block. If the clamping force block is not activated, the digital output *MTB_Enable_Vise* is also set to high. After a fixed time of 120 ms the function is finished.

3 Installing components

CAUTION

Damage to the product possible!

The product or the robot may get damaged if electrical cables are connected or disconnected during operation.

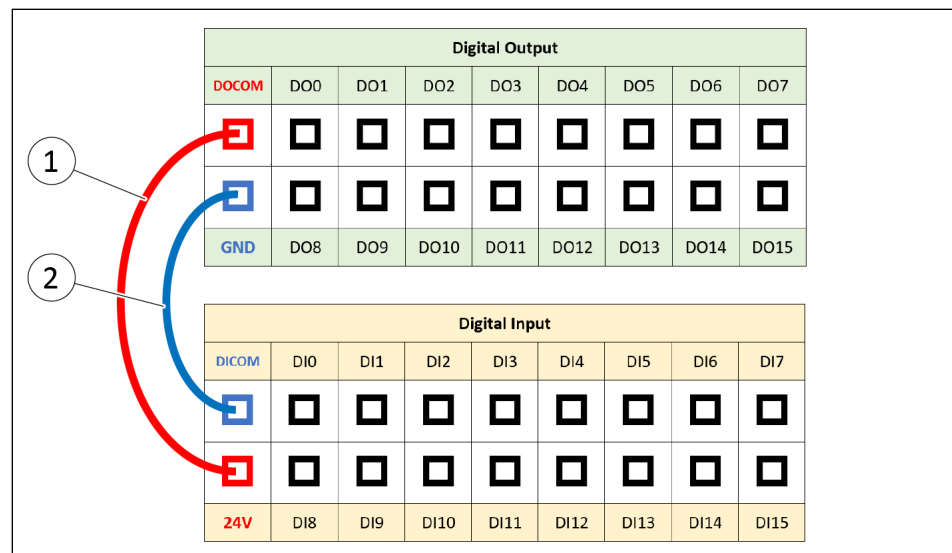
- Connect or disconnect electrical connections only when the device is switched off.

3.1 Switching ports to PNP

NOTE

- In the standard configuration, NPN is the connection (bridge) between GND and 24 V. For the switch to PNP, the bridge (1) between 24 V and DOCOM must be connected.
- This change applies to all 16 ports on the control box. That is why only PNP-wired devices work on the control box.
- For more information, see the operating manual for the robot.

1. **IMPORTANT! Material damage due to short circuit! Do not connect GND to 24 V.** Connect the DOCOM connection (1) to the positive terminal of the current supply (24 V).
2. To connect the sensors, switch inputs to PNP. For this, connect DICOM connection (2) to GND.



Switching ports to PNP

3.2 Connecting the product to the robot control system

Before connecting or commissioning the product, read the operating manual of the robot and observe the instructions in this manual!



⚠ WARNING

Risk of injury due to unexpected movements!

If the power supply is switched on or residual energy remains in the system, components can move unexpectedly and cause serious injuries.

- Before starting any work on the product: Switch off the power supply and secure against restarting.
- Make sure, that no residual energy remains in the system.



⚠ CAUTION

Risk of injury from electric shock due to contact with live parts!

- Follow the operating manual for the robot.
- Before starting any work on the product: Switch off the energy supply and secure against re-connection.

NOTE

Safety-relevant signals (e.g. emergency stop) must be wired externally, e.g. via safety relays, thus completely disconnecting the product from the power supply.

- Perform a risk assessment for the entire robotic application based on legal requirements to evaluate all safety-related aspects of the application.

- There is no power or compressed air supply on.
 - Product is mounted on the robot. Compressed air hose and cable are connected to the product, see product assembly and operating manual.
1. Connect the wire strands of the M12 cable to the terminals of the control unit. For connection assignment, see the following table.
 2. Connect logic and power supply.
 - ✓ LED "Power" lights up green.

Connection assignment MTB

Pin	Wire strand	Signal (Variable)	Robot interface	
			Register	Assignment *
1	Brown	+24 VDC	Power or Digital Inputs	24V
2	Blue	GND	Power or Digital Outputs	0V
3	White	Sensor Gripper 1, Position A (MTB_Pos_P1_G1)	Digital inputs	DI0
4	Green	Sensor Gripper 1, Position B (MTB_Pos_P2_G1)	Digital inputs	DI1
5	Pink	Sensor Gripper 2, Position A (MTB_Pos_P1_G2)	Digital inputs	DI2
6	Yellow	Sensor Gripper 2, Position B (MTB_Pos_P2_G2)	Digital inputs	DI3
7	Black	Teach function, Sensor Gripper 1 (MTB_Teach_G1)	Digital Outputs	DO4
8	Grey	Teach function, Sensor Gripper 2 (MTB_Teach_G2)	Digital Outputs	DO5
9	Red	Switch Gripper 1 (MTB_Control_G1)	Digital Outputs	DO1
		Switch clamping force block (MTB_Control_Vise)	Digital Outputs	DO7
10	Violet	Switch Gripper 2 (MTB_Control_G2)	Digital Outputs	DO2
11	Grey/ Pink	Release signal (MTB_Enable)	Digital Outputs	DO0
		Release signal clamping force block (MTB_Enable_Vise)	Digital Outputs	DO6
12	Red/ Blue	Switch blow-off nozzle (MTB_Control_N)	Digital Outputs	DO3

- Besides the voltage supply, the connections for *MTB_Enable* and *MTB_Control_G1* or *MTB_Control_G2* must be connected to two or three output ports of the control box.
- To use the blow-off nozzle, the connector *MTB_Control_N* must be connected to an output port.
- The connections for the clamping force block *MTB_Enable_Vise* and *MTB_Control_Vise* must be connected to two free output ports of the control box.
- The cables for teaching (*MTB_Teach1_G1*, *MTB_Teach2_G2*) must be connected to two free output ports and the sensor system (*MTB_Pos_P1_G1*, *MTB_Pos_P2_G1*, *MTB_Pos_P2_G2*, *MTB_Pos_P2_G2*) to four free input ports of the control box.
- All ports are freely selectable and can be configured later in the program by the user. A standard assignment for a double gripper with clamping force block is included in the PlugIn.

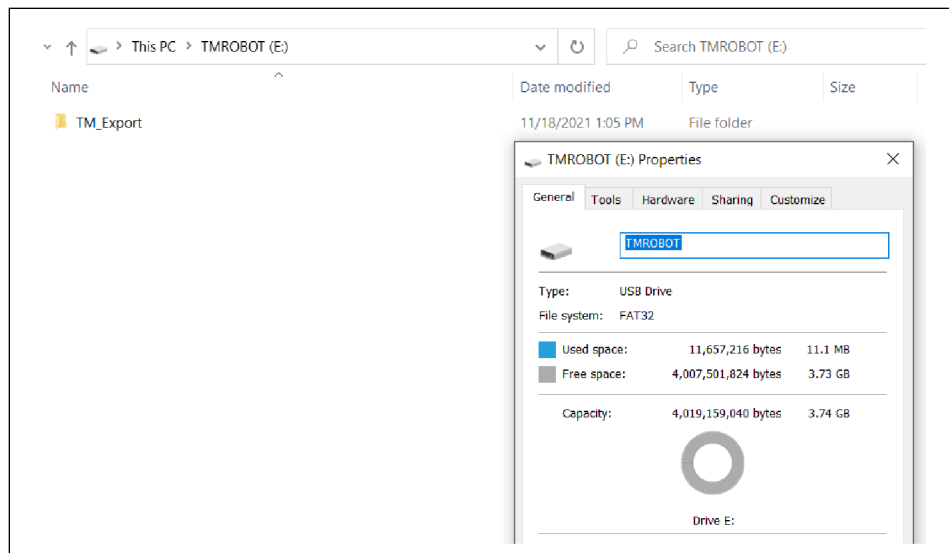
3.3 Preparing the USB stick

NOTE

To install the software, SCHUNK recommends using the enclosed USB stick.

The USB stick must meet the following requirements:

- Formatted in FAT32 format
- Designation of the removable drive: "TMROBOT".



Designation USB stick

Storage location for components

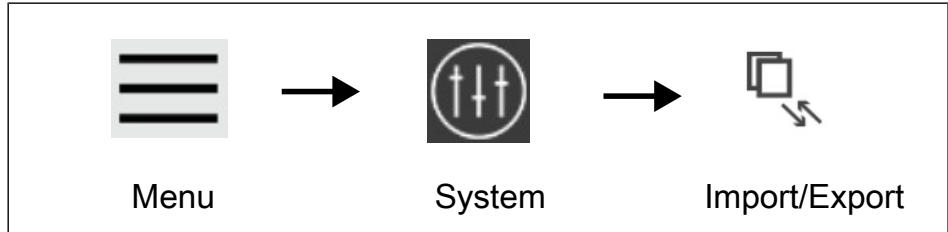
1. Download the latest version of the software module at [schunk.com/mtb-downloads](https://www.schunk.com/mtb-downloads).
2. Save components in a directory "*TM_Export\Schunk\ComponentObject*" on the USB stick.

Storage location for variables and TCP (Tool Center Point)

- Save components in a directory "*TM_Export\Schunk*" on the USB stick.

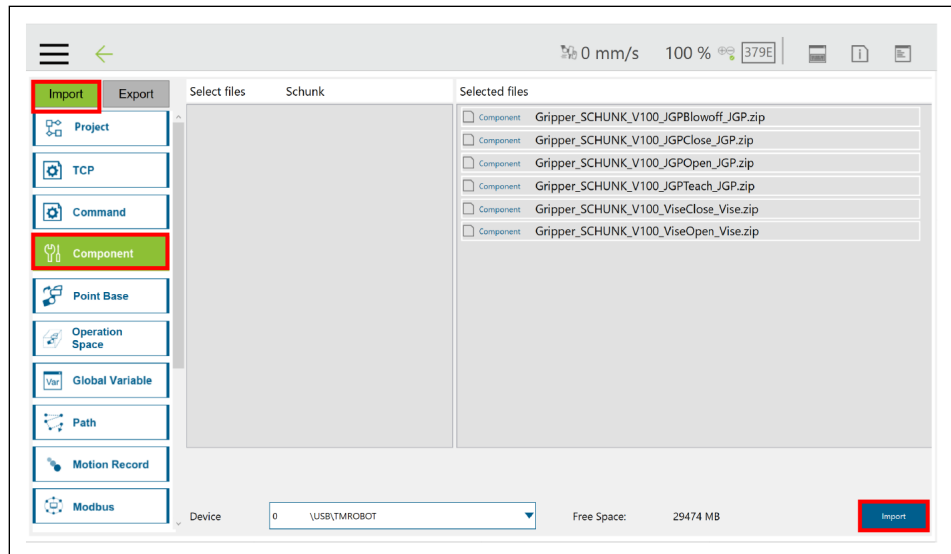
3.4 Importing components

1. Insert the USB stick into an available USB slot in the control box.
2. Select *Menu – System – Import/Export*.



Calling up the "Import/Export" window

3. Press the "Import" button.
 - ✓ The "Robot List" window opens.
4. Select "SCHUNK" and confirm with "OK".
5. **Installing components:** Select "Component" menu. Select the components to be imported and click the "Import" button.
6. **Install variables:** Select "Global Variable" menu. Select the variables to be imported and click the "Import" button.

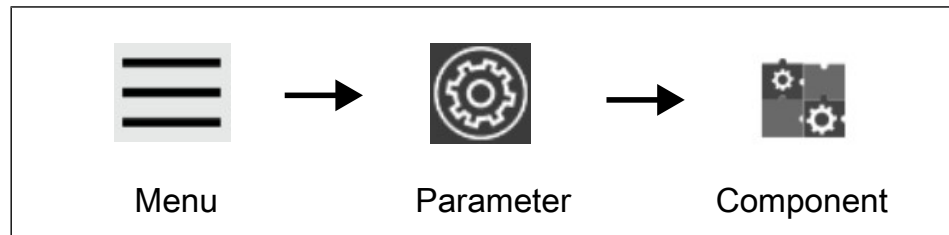


"Import/Export" window - Importing components, variables and TCP

- ✓ Components and variables are imported.

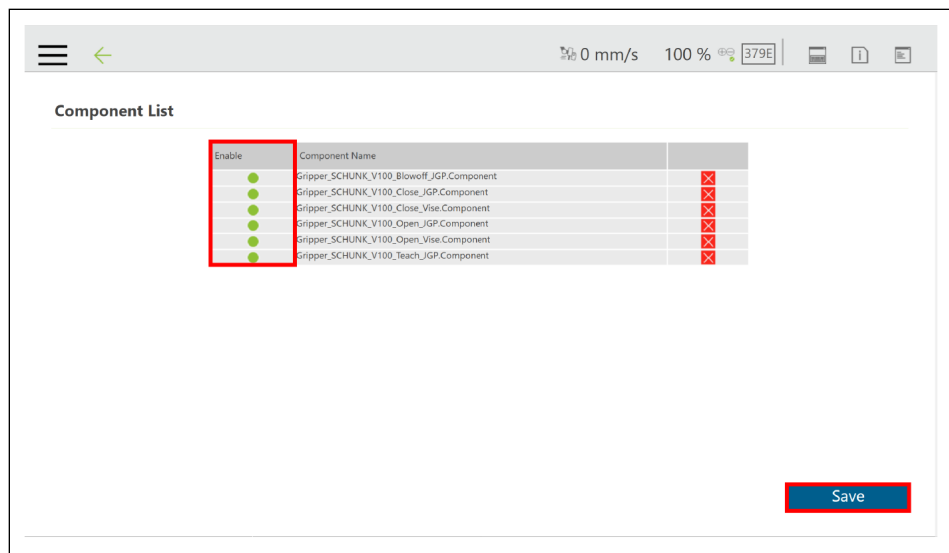
3.5 Activating components

1. Select *Menu – Parameter – Components*.




Call up the "Component" window

2. Activate the desired component in the "Enable" column.
3. Select the "Save" button.
 - ✓ The selection box lights up green when the component is activated.

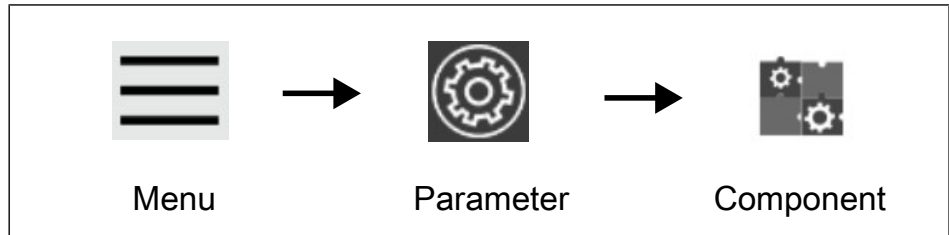


Activating components

- ✓ All activated components are displayed in the "Project"  window below.

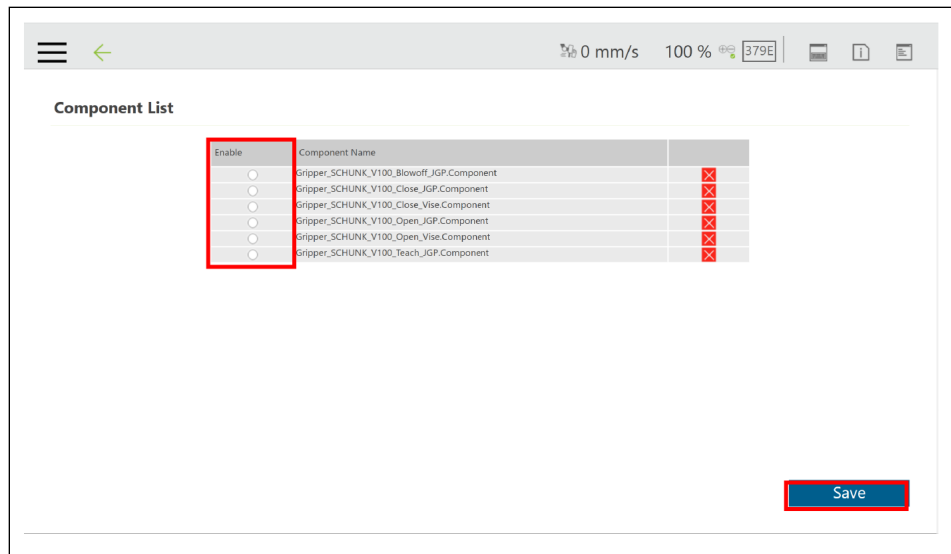
3.6 Deactivating components

1. Select *Menu – Parameter – Components*.



Call up the "Component" window

2. Deactivate the desired component in the "Enable" column.
3. Select the "Save" button.



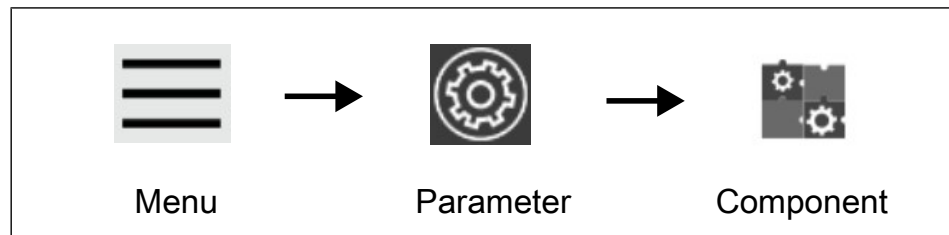
Deactivating components

- ✓ Components are deactivated.

4 Uninstalling components

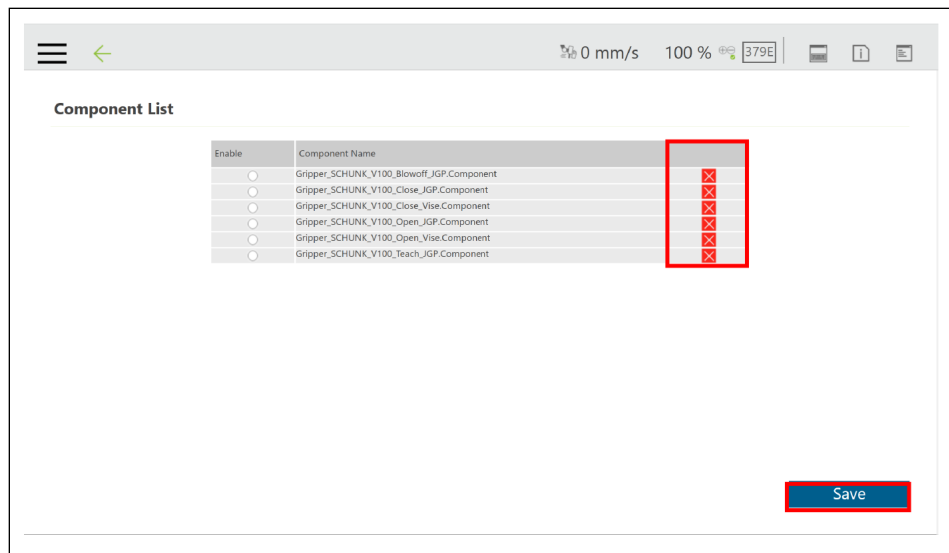
Components can be permanently removed from the program.

1. Select *Menu – Parameter – Components*.



Call up the "Component" window

2. Select the desired component in the right column.
3. Select the "Save" button.
4. Repeat the procedure for other components.



Removing components

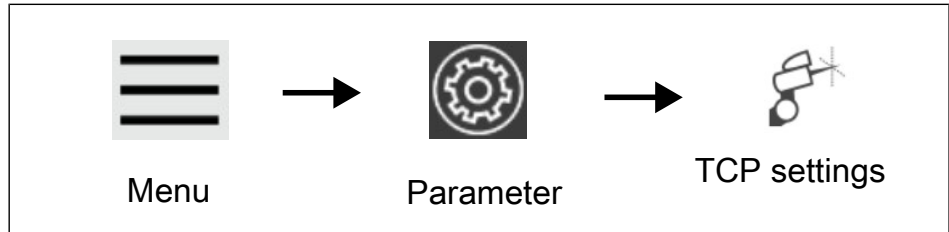
- ✓ Components are removed permanently.

5 Optional: Setting the Tool Center Point (TCP)

For proper use of the gripper on a robot, SCHUNK recommends storing the Tool Center Point (TCP) and the gripper weight in the robot settings.

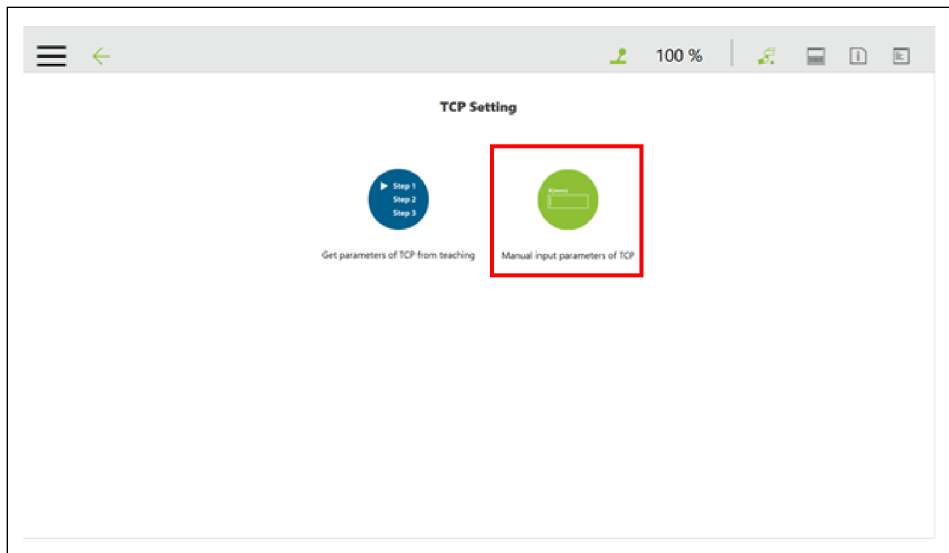
Calling up

1. Select *Menu – Parameter – TCP Settings*.



Call up the "TCP Settings" window

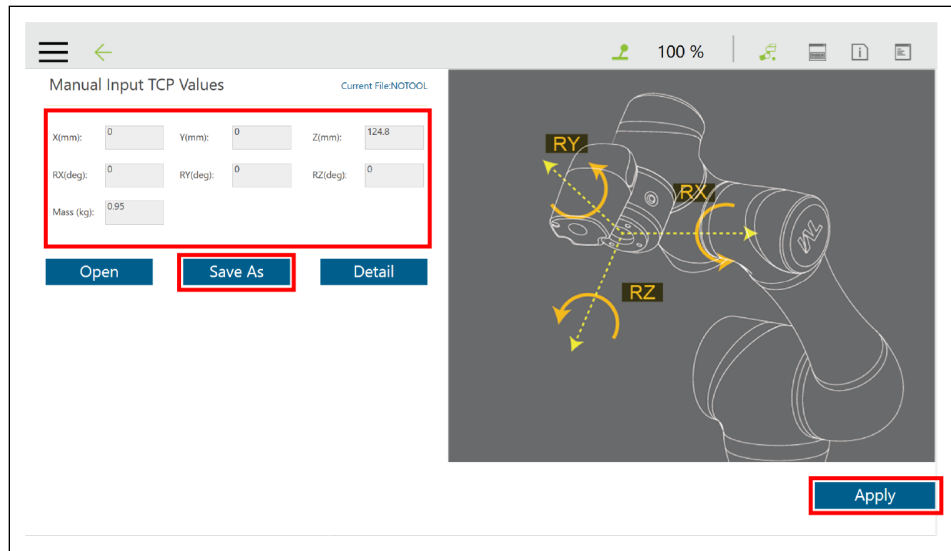
2. Select the button "Enter TCP parameters manually".



"TCP Settings" window - Parameters

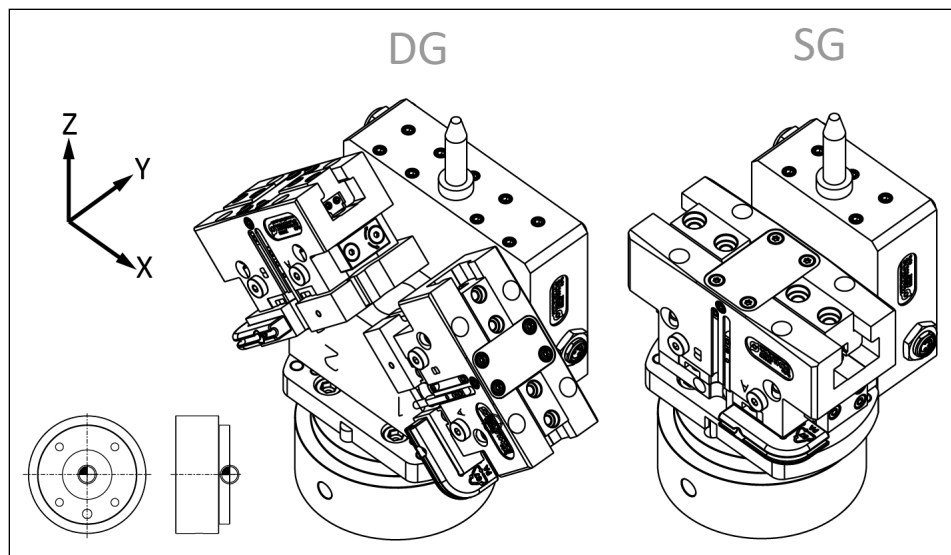
Enter values

1. Enter values adapted to the finger length in the input fields, see the following table.
2. Select the "Save as" button.
 - ✓ An input field opens.
3. Enter a description for the gripper, e.g. "SCHUNK_xxx".
4. Select the "Apply" button to confirm all entries.



TCP and weight input mask

- ✓ The Tool Center Point and the gripper weight have been saved in the robot settings.



Tool Center Point, DG: double gripper, SG: single gripper

Optional: Setting the Tool Center Point (TCP)

Size	TCP				Center of gravity			Weight [kg]
	X [mm]	Y [mm]	Z [mm]	RY [deg]	CX [mm]	CY [mm]	CZ [mm]	
MTB DG-JGP-P 64 *	62.6	0	68.5	±45	-0.5	12.8	44.5	1.62
MTB DG-JGP-P 80 *	69.7	0	75.5	±45	-0.5	15.3	37.6	2.1
MTB SG-JGP-P 80	0	0	65.5	-	-0.5	10	49.3	0.99
MTB SG-JGP-P 100	0	0	71.5	-	-0.5	11.4	40.9	1.38

* For the double gripper: Note the angle of 45° when calculating the TCP values.

NOTE

The blow-off nozzle may protrude beyond the TCP, creating an interference contour. For dimensions, see catalog data sheet at schunk.com/mtb-downloads.

6 Using components in the program

6.1 Creating the robot program

After installation, the JGPOpen, JGPClose, JGPBlowoff, JGPTeach, ViseOpen and ViseClose components are displayed in TMflow and can be easily dragged and dropped into the program sequence. This creates a sequence plan that the robot processes sequentially. Additional parameters can be set for the JGPTeach and JGPBlowoff components. To do so, select the component and choose the "Edit" symbol.

Using components

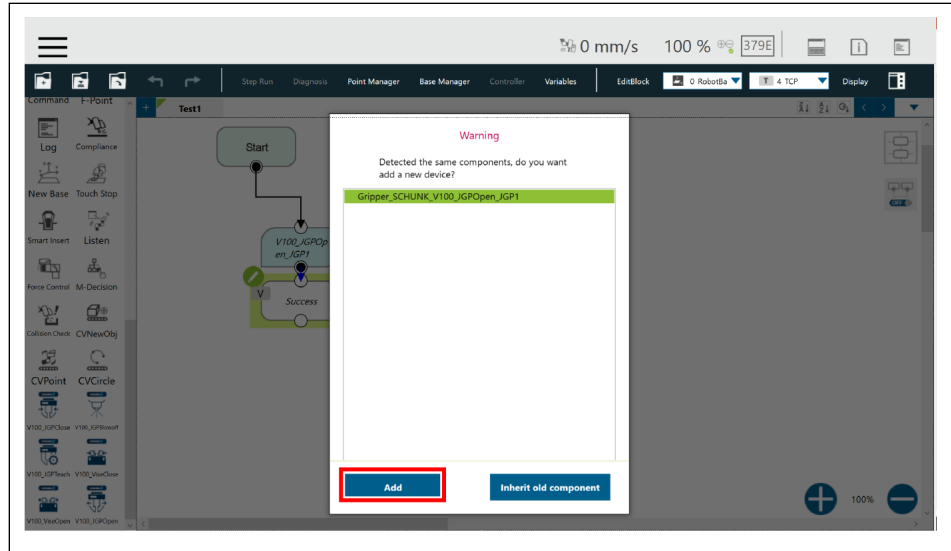
Examples of how to use the components can be found in the chapter [8 \[22\]](#).

The following components can be used with the parameters described in the table:

Component	Parameter	Value	Comment
JGPOpen	-	-	-
JGPClose	-	-	-
JGPBlowoff	Time_In_Seconds	Integers	Value in seconds for mode 2.
	Operation_Mode	0-2	Modes for operating the blow-off nozzle: 0: Deactivate blow-off nozzle 1: Activate blow-off nozzle 2: Activate blow-off nozzle for the time defined in the "Time_In_Seconds" variable.
JGPTeach	Position_Select	1-2	Selection of whether sensor position 1 or 2 is to be taught.
ViseOpen	-	-	-
ViseClose	-	-	-

6.2 Create robot program for a double gripper

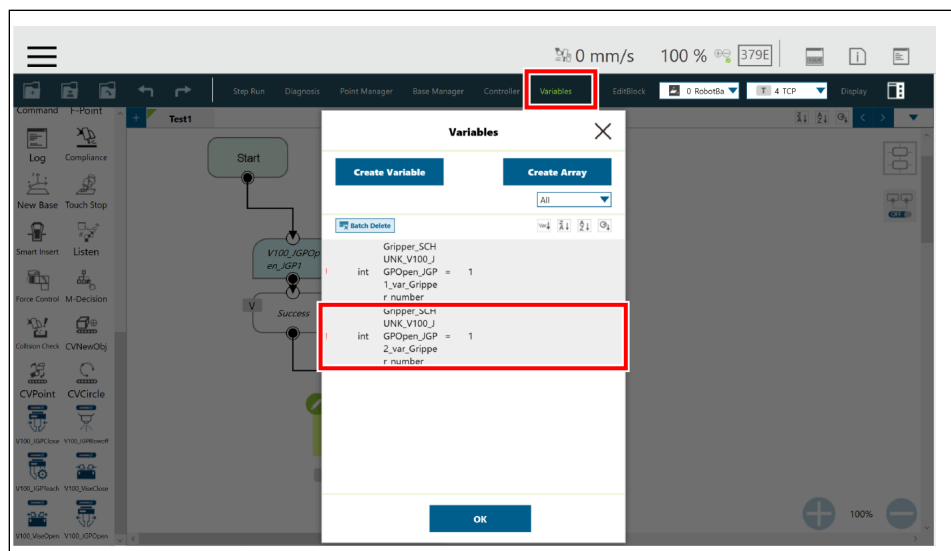
If the application kit has been configured as a double gripper, the same TMflow components can be used for both grippers. If a component is dragged into the program flowchart of which an instance already exists in the flowchart, the following dialog appears:



Add second gripper

The "Add" option is used to add a second component to the flowchart, which has a name different from the already existing component. For example, the name for the JGPOpen component changes from "Gripper_SCHUNK_V100_JGPOpen_JGP1" to "Gripper_SCHUNK_V100_JGPOpen_JGP2".

The component "Gripper_SCHUNK_V100_JGPOpen_JGP2" must now be configured for the second gripper:



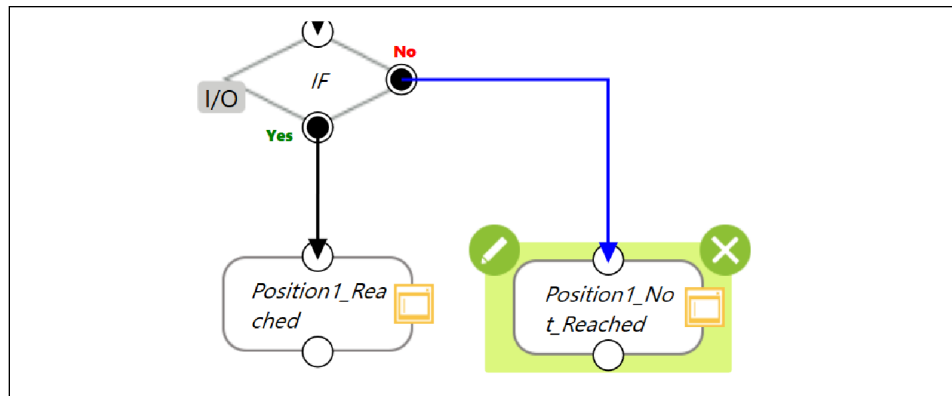
Assigning the gripper to the component

Set the variable

"Gripper_SCHUNK_V100_JGPOpen_JGP2_var_Gripper_number" to the value **2** to assign the component to the second gripper. This is possible for the JGPOpen, JGPClose and JGPTeach components.

7 Inserting sensor monitoring into the program code

The object detection sensors can be evaluated as follows:



Sensor monitoring

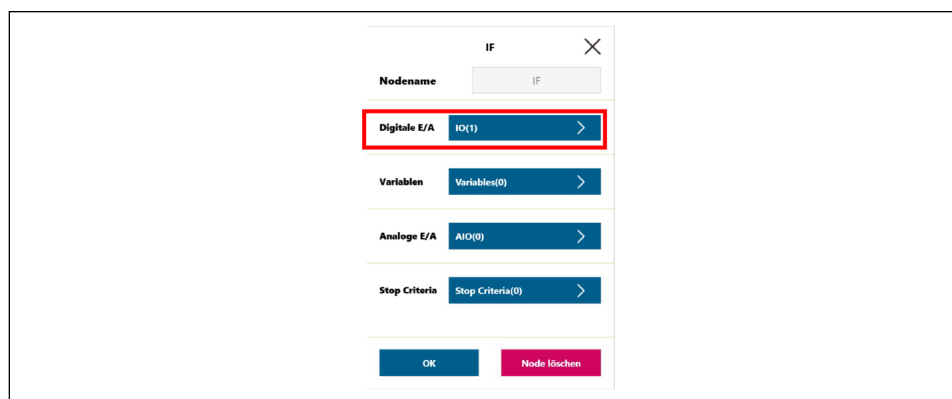
The following sensor behavior is monitored for the first gripper:

- The digital input *MTB_Pos_P1_G1* changes to high when the taught position 1 is reached.
- The digital input *MTB_Pos_P2_G1* changes to high when the taught position 2 is reached.

For the second gripper, the sample programs work identically with the digital inputs *MTB_Pos_P1_G2* and *MTB_Pos_P2_G2*. This behavior must be monitored via an IF node:

Configuring IF nodes

1. Open IF node and select IO (digital I/O).
2. For position 1, check the digital input of *MTB_Pos_P1_G1* to high. This is connected to "IO(0)" by default.
3. For position 2, check the digital input of *MTB_Pos_P2_G1* to high. This is connected to "IO(1)" by default.

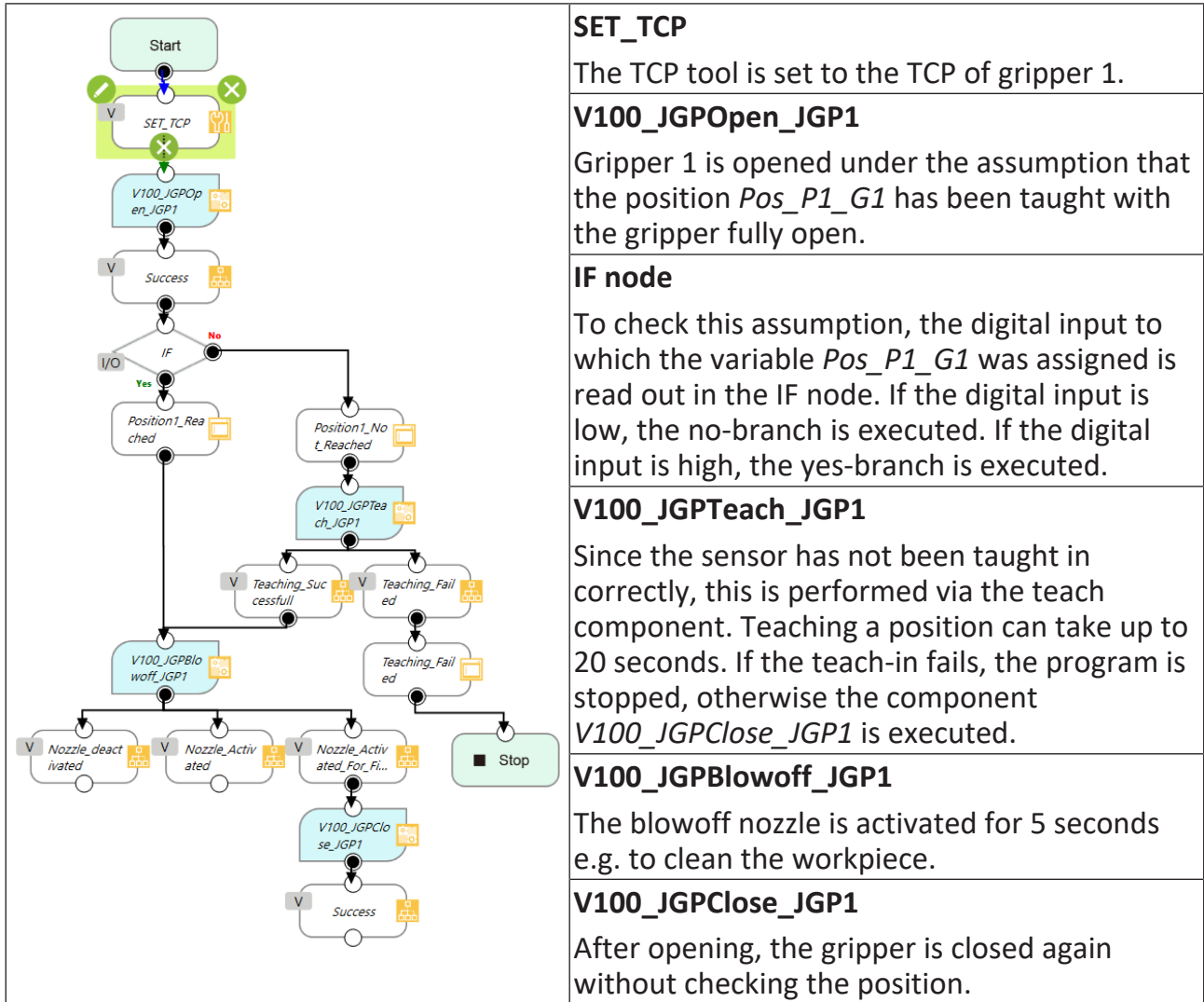


Configuring IF nodes

8 Example programs

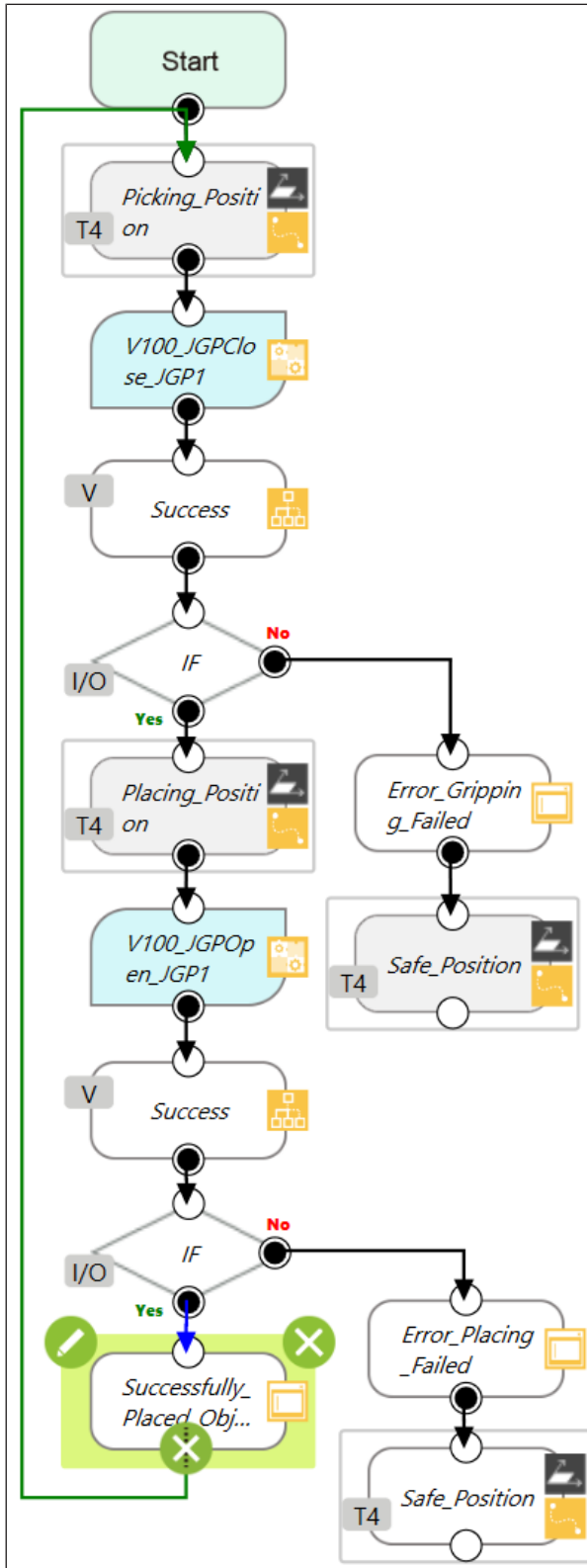
8.1 Open gripper and check position

This example shows the application of a gripper that releases a workpiece, activates the blow-off nozzle for a certain time and grips a workpiece.



8.2 Pick & Place application

This example shows the use of a gripper to pick up an object at a given position ("Picking_Position") and place it at a second position ("Placing_Position"). If the gripping or placing fails, the robot should move to a safe position ("Safe_Position").



Picking_Position

The robot moves to the previously defined position where the object is to be gripped. This position can be taught in via the Point Manager, for example.

V100_JGPClose_JGP1

Gripper 1 is closed to grip the object.

IF node

In the IF node, it is checked whether the gripper has reached its previously taught position and has thus gripped the object correctly. If the digital input to which the variable *Pos_P1_G1* is assigned is high (Yes branch), the object has been correctly gripped. The robot can move to the position for depositing the object.

If the digital input is low, the message "Error_Gripping_Failed" appears and the robot moves to the safe position. The program will be terminated.

Placing_Position

The robot moves to the previously defined position where the object is to be placed.

V100_JGPOpen_JGP1

Gripper 1 is opened to place the object.

IF node

As before, a check is made to see if the object has been placed correctly. If it has, the entire process is repeated for the next object.

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