Product manual

FlexGripper-Vacuum

IRB 660

ABB

Product manual

FlexGripper-Vacuum

Table of Contents

Overview

About this manual

This manual provides instructions for the FlexGripper-Vacuum. Each chapter concerning the FlexGripper-Vacuum contains information on:

- mechanical structure & working principle
- mechanical /electrical installation
- maintenance
- repair
- trouble shooting
- spare parts

Read through this document carefully, especially the sections about safety, before you start to unpack, install and use the FlexGripper-Vacuum.

Usage

This manual should be used during:

- installation
- operation
- maintenance work
- repair work

Who Should Read This Manual?

This manual is intended for:

- operators
- installation personnel
- repair and maintenance personnel

Prerequisites

The reader should be:

- familiar with industrial robots and the relevant terminology
- familiar with the equipment
- skilled in mechanical & electrical installation/maintenance/repairs

Oganization of Chapter

The manual is organized in to the following chapters:

Chapter	Contents
1.	Safety
2.	FlexGripper-Vacuum
3.	FlexGripper UI

Continued

Reference

Reference	Document ID
Product manual - IRB 660	3HAC025755-001
Product manual - IRC5 Robot Controller	3HAC021313-001

Revision

Revision	Description
-	First edition

1 Safety

1.1. Introduction

Overview

The safety information in this manual is divided into two categories:

- General safety aspects, important to attend to before performing any service work on the FlexGripper. These are applicable for all service work and are found in *General safety information on page 8*.

- Specific safety information, pointed out in the procedure when the danger is imminent. How to avoid and eliminate the danger is either detailed directly in the procedure, or further detailed in separate instructions, found in *Safety related instructions on page 17*.

NOTE!

This manual includes only the safety information related to this product.

The FlexGripper can be used together with IRB660. Please refer the Robot and IRC5 Controller manuals for more details on safety.

1.2 General safety information

1.2.1. Safety in the manipulator system

Validity and responsibility

The information does not cover how to design, install and operate a complete system, nor does it cover all peripheral equipment, which can influence the safety of the total system. To protect personnel, the complete system must be designed and installed in accordance with the safety requirements set forth in the standards and regulations of the country where the manipulator is installed.

The users of ABB products are responsible for ensuring that the applicable safety laws and regulations in the country concerned are observed, and that the safety devices necessary to protect people working with the system are designed and installed correctly.

Personnel working with manipulators must be familiar with the operation and handling of the industrial manipulator, as described in the following documents:

- Operating Manual - IRC5 with FlexPendant (M2004)
- Product Manual

Connection of external safety devices

Apart from the built-in safety functions, the manipulator is also supplied with an interface for the connection of external safety devices. Via this interface, an external safety function can interact with other machines and peripheral equipment. This means that control signals can act on safety signals received from the peripheral equipment as well as from the manipulator.

Limitation of liability

Any information given in this manual regarding safety must not be construed as a guarantee by ABB that the industrial manipulator will not cause injury or damage, even if all safety instructions are complied with.

Related information

Type of information	Detailed in document	Section
Installation of safety devices	Product manual for the manipulator	Installation and commissioning
Changing operating modes	Operating manual - IRC5 with FlexPendant	Operating modes
Restricting the working space	Product manual for the manipulator	Installation and commissioning

1.2.2. Safety risks

1.2.2.1. Safety risks during installation and service work on the FlexGripper

Overview

This section includes information on general safety risks to be considered when performing installation and service work on the FlexGripper.

General risks during installation and service

- The instructions in the Product manual in the section *Installation and commissioning on page 28* must always be followed.
- Emergency stop buttons must be positioned in easily accessible places so that the manipulator can be stopped quickly.
- Those in charge of operations must make sure that safety instructions are available for the installation in question.
- Those who install the FlexGripper must have the appropriate training for the manipulator system in question and in any safety matters associated with it.

Nation/region specific regulations

To prevent injuries and damage during the installation of the manipulator system, the regulations applicable in the country concerned and the instructions of ABB manipulatorics must be complied with.

1.2.2.2. Safety risks related to tools/workpieces

Safe handling

It must be possible to safely turn off tools, such as milling cutters. Make sure that guards remain closed until the cutters stop rotating. It should be possible to release parts manually (valves).

Safe design

FlexGrippers are designed so that they retain workpieces in the event of a power failure or a disturbance to the controller.

1.2.2.3. Safety risks related to high speed

WARNING!

Particular care must be taken with the FlexGripper-Vacuum.

Risk of gripped workpiece uncontrolled gravity drop during high speed movement.

1.2.2.4. Safety risks during operational disturbances

General

- The industrial manipulator is a flexible tool that can be used in many different industrial applications.
- All work must be carried out professionally and in accordance with the applicable safety regulations.
- Care must be taken at all times.

Qualified personnel

- Corrective maintenance must only be carried out by qualified personnel who are familiar with the entire installation as well as the special risks associated with its different parts.

Extraordinary risks

If the working process is interrupted, extra care must be taken due to risks other than those associated with regular operation. Such an interruption may have to be rectified manually.

1.2.2.5. Risks associated with live electric parts

Voltage related risks, general

- Although trouble shooting may, on occasion, have to be carried out while the power supply is turned on, the manipulator must be turne off(by setting the main switch to OFF)when repairing faults, disconnecting electric leads and disconnecting or connecting units.

- The main supply to the manipulator must be connected in such a way that it can be turned off outside the manipulator's working space.

Voltage related risks, controller IRC5

A danger of high voltage is associated with the following parts:

- The mains supply/mains switch
- The transformers
- The power unit
- The control power supply (230 VAC)
- The rectifier unit (400-480 VAC and 700 VDC. Note: Capacitors!)
- The drive unit (700 VDC)
- The drive system power supply (230 VAC)
- The service outlets (115/230 VAC)
- The customer power supply (230 VAC).
- The power supply unit for tools, or special power supply units for the machining process.
- The external voltage connected to the control cabinet remains live even when the manipulator is disconnected from the mains.
- Additional connections
- Be aware of stored electrical energy (DC link, Ultra Cap unit) in the controller.
- Units inside the controller, for example I/O modules, can be supplied with power from an external source.

Voltage related risks, manipulator

A danger of high voltage is associated with the manipulator in:

- The power supply for the motors (up to 800 VDC)
- The user connections for tools or other parts of the installation (max.230 VAC, see chapter Installation and commissioning in the Product manual).

Voltage related risks, tools, material handling devices and so on

Tools, material handling devices and so on may be live even if the manipulator system is in the OFF position. Power supply cables which are in motion during the working process may be damaged.

1.2.3. Safety actions

1.2.3.1. Safety fence dimensions

General

Install a safety cell around the manipulator and the FlexGripper to ensure safe FlexGripper installation and operation.

Dimensioning

Dimension the fence or enclosure to enable it to withstand the force created if the load being handled by the FlexGripper is dropped or released at maximum speed.

1.2.3.2. Fire extinguishing

NOTE!

Use a CARBON DIOXIDE (CO2) extinguisher in the event of a fire in the manipulator system (manipulatoror controller)!

1.2.3.3. Safe use of the FlexPendant

NOTE!

The enabling device is a push-button located on the side of the FlexPendant which, when pressed half way in, takes the system to MOTORS ON. When the enabling device is released or pushed all the way in, the manipulator is taken to the MOTORS OFF state.

To ensure safe use of the FlexPendant, the following must be implemented:

- The enabling device must never be rendered inoperative in any way. During programming and testing, the enabling device must be released as soon as there is no need for the manipulator to move. The programmer must always bring the FlexPendant with them, when entering the manipulator's working space. This is to prevent anyone else taking control of the manipulator without the programmer being aware of it.

Enabling device

The enabling device is a manually operated constant pressure push-button which, when continuously activated in one position only, allows potentially hazardous functions but does not initiate them. In any other position, hazardous functions are stopped safely. The enabling device is of a specific type where you must press the push-button only half-way to activate it. In the fully in and fully out positions, manipulator operation is impossible.

Hold-to-run function

The hold-to-run function allows movement when a button connected to the function is actuated manually, and immediately stops any movement when released. The hold-to-run function can only be used in manual mode. How to operate the hold-to-run function is detailed in the Operating manual - IRC5 with FlexPendant.

1.3 Safety related instructions

1.3.1. Safety signals, general

General

This section specifies all the dangers that may arise from performing the work detailed in the manual. Each danger is detailed in its own section consisting of:

- A caption specifying the danger level (DANGER, WARNING or CAUTION) and the type of danger.
- A brief description of what will happen if the operator/service personnel do not eliminate the danger.
- An instruction of how to eliminate the danger to facilitate performing the activity at hand.

Danger levels

The table below defines the captions specifying the danger levels used throughout this manual.

Symbol	Designation	Signification
	DANGER	Warns that an accident will occur if the instructions are not followed, resulting in a serious or fatal injury and/or severe damage to the product. It applies to warnings that apply to danger with, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height, etc.
\nen1011002	WARNING	Warns that an accident may occur if the instructions are not followed, that can lead to serious injury, possibly fatal, and/or great damage to the product. It applies to warnings that apply to danger, for example, contact with high voltage electrical units, explosion or fire risk, risk of poisonous gases, risk of crushing, impact, fall from height and so on.
\nen1011003	ELECTRIC SHOCK	The electrocution or electrical shock symbol indicates electrical hazards which could result in severe personal injury or death.

Continues on next page

1 Safety

Continued

Symbol	Designation	Signification
en1011004	CAUTION	Warns that an accident may occur if the instructions are not followed that can result in injury and/or damage to the product. It also applies to warnings of risks that include burns, eye injury, skin injury, hearing damage, crushing or slipping, tripping, impact, fall from height, etc. Furthermore, it applies to warnings that include function requirements when fitting and removing equipment, where there is a risk of damaging the product or causing a breakdown.
en1011005	ELECTROSTATIC DIS-CHARGE(ESD)	The electrostatic discharge (ESD) symbol indicates electrostatic hazards whichcould result in severe damage to the product.
en1011006	NOTE	Note symbols alert you to important facts and conditions.
en1011008	TIP	Tip symbols direct you to specific instructions, where to find additional information or how to perform a certain operation in an easier way.

1.3.2. Safety symbols on the FlexGripper labels

Introduction to labels

This section describes safety symbols used on labels (stickers) on the FlexGripper. Symbols are used in combinations on the labels, describing each specific warning. The descriptions in this section are generic, the labels can contain additional information such as values.

Types of labels

Both the manipulator and the FlexGripper are marked with several safety and information labels, containing important information about the product. The information is useful for all personnel handling the FlexGripper system, for example during installation, service, or operation.The safety labels are language independent, they only use graphics.

Symbols on safety labels

Symbol	Description
 en1015001	Heat Risk of heat that can cause burns.

1.3.3. Safety guidelines

Safety guidelines while working with FlexGripper

- See the IRB 660 Product manual for information on safety.

- All persons working in the system must be sufficiently trained. Incorrect installation and/or use can cause injuries to persons and/or damage to equipment.

- Damaged or broken equipment can result in a risk to safety.

- Do not continue to work with the FlexGripper if you find any fault in any parts of it.

- Do not over power the pneumatic devices.

- Use pressure relief valves.

- Repair any air leaks immediately.

- Wear safety glasses when working with pneumatic cylinders. Maintenance, assembling, adjustments and other works on the FlexGripper, such as: replacement of pneumatic cylinders , should only be implemented by skilled and qualified workers, when the FlexGripper is not under air-pressure.

- It should be possible to release parts by manual operation (valves).

- Do not touch the FlexGripper while it is connected to air pressure.

- While assembling, adjusting and working on the FlexGripper, it is mandatory to implement safety regulations so that no fingers or other body parts are in proximity to the moving parts of the FlexGripper. There is risk and danger of injury.

- Do not use temporary arrangements to make the FlexGripper work. This may lead to severe damage.

- Ensure all the bolts have been tightened before starting any operation after maintenance work.

- Ensure no foreign material is lying on the FlexGripper before starting any operation.

- During operation the FlexGripper must be protected by fixed or interlocking guards according to the safety laws and regulations in the country concerned.

- It should not be possible to reach any moving parts when the Flexgripper is operating and the safety guards are fenced and interlocked.

2 FlexGripper-Vacuum

2.1. Specification

The products to be lifted with the FlexGripper-Vacuum must have a dense and smooth surface and a rigid structure (for example a cardboard case) on which the vacuum cups can grip.

Storage conditions

The table below shows the allowed storage conditions for the FlexGripper-Vacuum:

Parameter	Value
Min ambient temperature	0° C
Max ambient temperature	+55° C
Max ambient humidity	Max. 90% at constant temperature
Explosive environments	Not permitted

Operating conditions

The table below shows the allowed operating conditions for the FlexGripper-Vacuum:

Parameter	Value
Min ambient temperature	+5° C
Max ambient temperature	+50° C
Max ambient humidity	Max. 90% at constant temperature
Explosive environments	Not permitted

FlexGripper-Vacuum weight

The table below shows the weights of the different variants :

FlexGripper-Vacuum		Variants	Weight
10 Zones	Basic	2 X 20	65 kg
	+Pallet Picker	2 X 2	75 kg

FlexGripper-Vacuum size
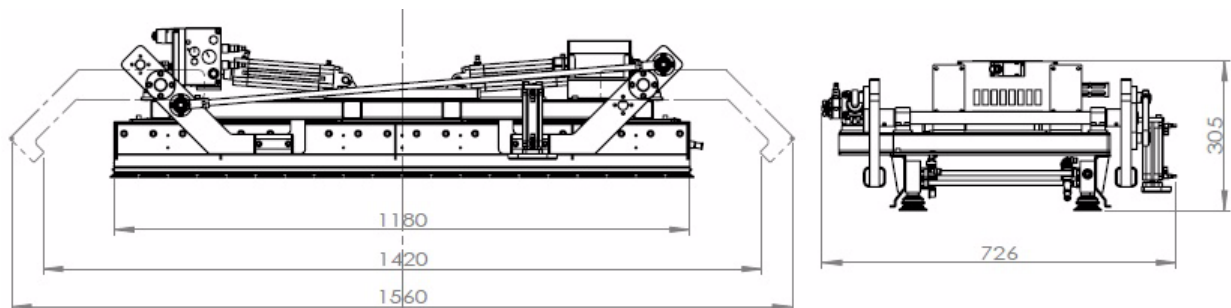
en100

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2.1. Specification

Continued

Product specification

Product capacity	Product quantity	Product size limit (LxMxH)
Max. 40 kg per lift	1-5	Min: 240 X 240 X100mm
		Max: 1200 X 500 X 300mm

NOTE!

Due to variations in size, weight, design, surface, rigidity, porosity and centre of gravity, please judge if your products can be lifted by ABB FlexGrippers according to the above FlexGripper parameters and product specifications.

2.2 Mechanical structure & working principle

2.2.1. General

The FlexGripper-Vacuum (see Figure 2.1) consists of two main components: the vacuum rails and the pallet hook. The vacuum rails are for picking up products and the pallet hook is used for lifting pallets.

The whole FlexGripper is connected to the robot manipulator by a flange.
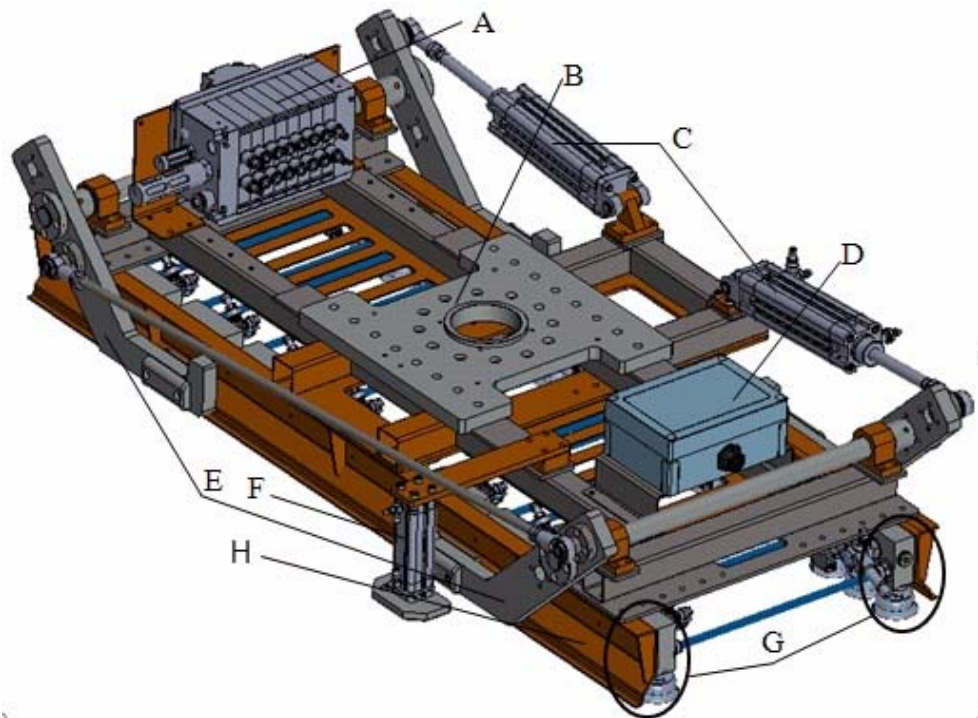
en1011008

Figure 2.1 FlexGripper-Vacuum

Pos	Part	Description
A	Valve unit	The compressed air inlet and outlet, controlling the air to the vacuum unit on the FlexGripper.
B	Flange	Connects the FlexGripper to the robot wrist.
C	Cylinders of hook	
D	Terminal box	Signals connections for the FlexGripper.
E	Pallet hook	Lifts the pallets
F	Search cylinder	
G	Vacuum rails	Picks up the products
H	Beam plate	Two plates, close to the vacuum cups

2.2.2. Vacuum rails

The two rails, which measure 1200 mm, consist of two beam plates mounted with vacuum units and photoelectric sensors (see figure 2.2). Each beam plate is e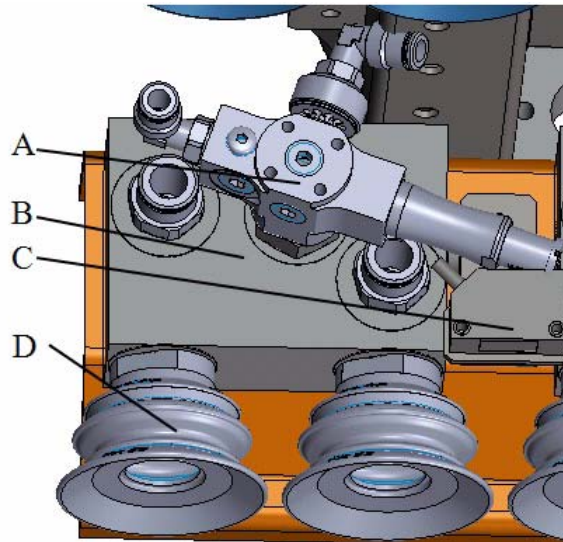quipped with ten vacuum units, which support two vacuum cups with a pitch of 60 mm each which generate the vacuum. Photoelectric sensors are installed to detect if the products lift correctly.

The FlexGripper-Vacuum picks up the products using vacuum cups. The compressed air (4-6 bar) is fed into a valve unit from the main inlet air cable. The 20 vacuum units are then connected to the valve unit with 10 air cables.

The net height of the vacuum cups is designed to be higher than the beam plates. The vacuum cups lift the products up until the upper-surface of the products touch with the plates. In this way, the beam plates along with suction cups on the FlexGripper significantly reduce the tendency of pendulum effects.

en1011009

Figure 2.2 Vacuum rails

Pos	Part	Description
A	Vacuum generators	2 x 10
B	Vacuum units	
C	Photoelectric sensor	Totally five sensors are installed on the FlexGripper by default. You can choose the mounting location according to the size of the products.
D	Suction cups	4 x 10

Individually controlled zones

The vacuum rails are divided into ten separate controlled zones (see figure 2.3).
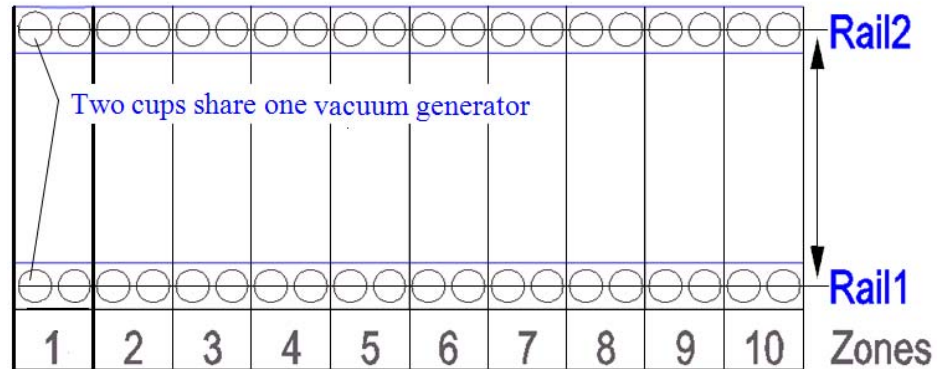
en1011010

Figure 2.3 Vacuum cup and zone configration

Each zone contains two vacuum units with four cups. On different rails, every two cups in the same zone share one vacuum generator, and every two vacuum generators in the same zone are controlled by one signal. So there are four vacuum cups in one zone that are controlled simultaneously, which also have integrated valves enabling individual control of different zones.

Adjustable rails

The width between two rails can be adjusted from 210 to 360 mm measured from the center of both rails, vacuum cups, center.
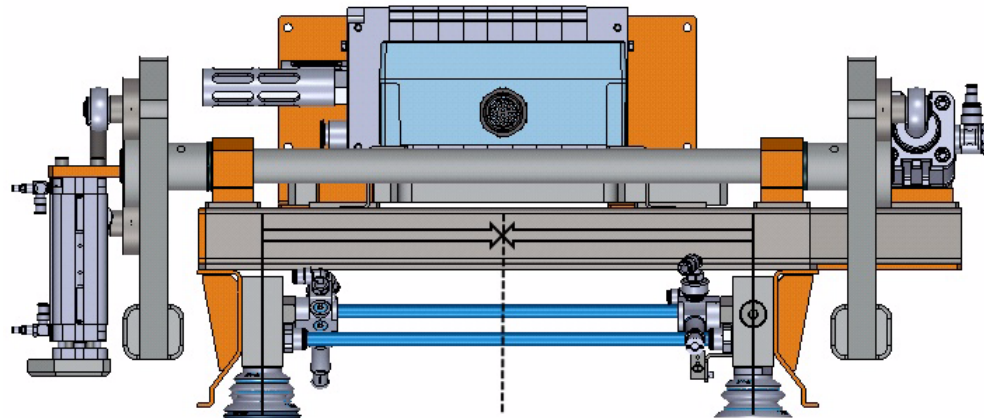
en1011012

Figure 2.4 Adjustment between the two rails

Adjustable widths(mm)	210	240	270	300	330	360

NOTE!

The distance from the center of the suction cup to the center of the FlexGripper should be equal.

2.2.3. Pallet hook

The pallet hook is used for lifting the pallet that is associated with the handling product. It includes two parts: a pneumatic search cylinder and two pairs of lifting fingers.

Pneumatic search cylinder

The pneumatic search cylinder on the FlexGripper (see figure 2.5) allows the robot to locate the top of the pallet stack, eliminating the need for external sensing to determine the exact height of the stack.

As pallets are picked, the system keeps track of the theoretical top level of the pallet. If the process is interrupted, for example if the cell is accessed by an operator, the robot will start to seek from the absolute top level again to find the top surface of the pallet.
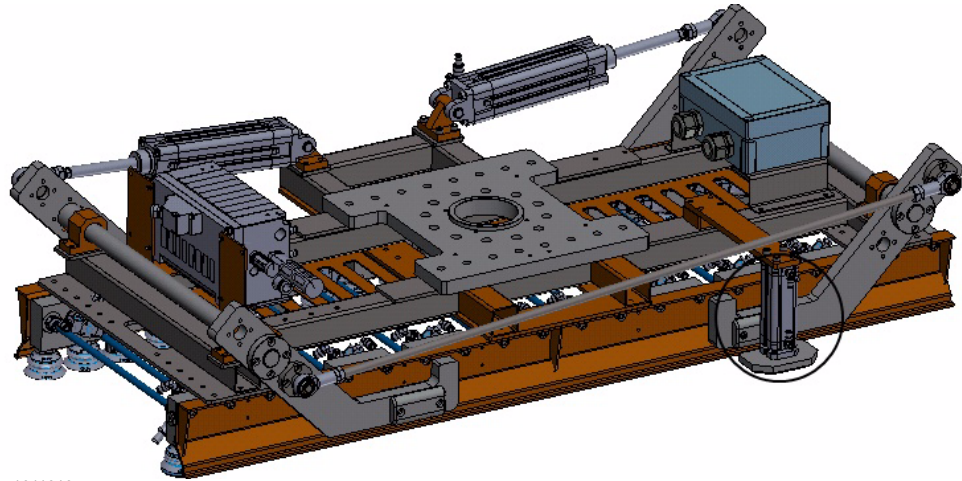
en1011013

Figure 2.5 Pneumatic search cylinder

Lifting fingers

Two pneumatic cylinders each control and adjust the tilting angle of the two pairs of fingers (see figure 2.6). With one synchronous lever, the two pairs of fingers can be operated at the same time.
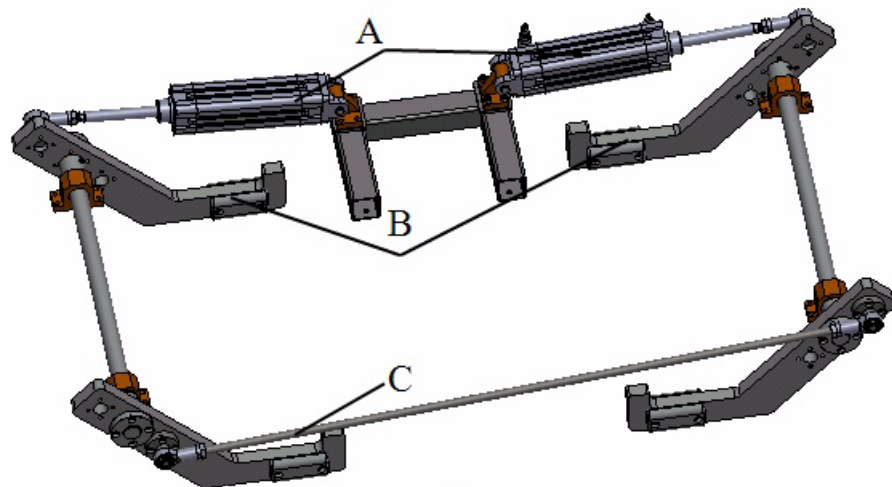
en1011014

Figure 2.6 Pallet picker assembly details

Continues on next page

Pos	Part	Description
A	Pneumatic cylinders	Drive the hook to clamp the pallet.
B	Lifting fingers	2x2
C	Synchronous lever	Operates the fingers synchronously

Pallet size

Different types of pallets are supported by the pallet hook as shown below. It is not required to make any change in the FlexGripper for working with these types of pallets.

Pallet type	Length x Width x Height	MM/Inch
EUR pallet	1200 x 800 x 144 mm	MM
GMA pallet	40" x 48" x 5.5"(1016*1219.2*139.7)	Inch/(MM)
AUS pallet	1165 x 1165 x 150 mm	MM
ISO pallet	1200 x 1000 x 144 mm	MM

2.3 Installation and commissioning

2.3.1. Overview

This instruction is primarily intended for use when unpacking and installing the grippr for the first time. It also contains information useful during later installation of the FlexGripper.

The FlexGripper was packed by the standard of sea transportation, land transportation and air transportation on delivery.

NOTE!

Lifting should be done by four people or by a crane.

Do not hold the solenoid valves, terminal box or connectors when lifting the gripper.

2.3.2. Unpacking

Inspection

The FlexGripper-Vacuum is wrapped in packing plastic foam loaded in a wooden package. Keep the package upwards. Unpack the package to check for any visible transport damage. If the FlexGripper-Vacuum is damaged, contact ABB.

NOTE!

Only 24V power is used in FlexGripper.

Short circuit protection should be implemented by a fuse in the control cabinet by the customer.

NOTE!

If the FlexGripper is not to be installed directly, it must be stored. Refer to the specified *Storage conditions on page 21*.

Contents

As standard the FlexGripper-Vacuum includes the following on delivery.

No.	Item	Description
A	Flange	
B	Connecting screws	For IRB660: 11x M12 screws and 16x M6 screws.
C	Cable bracket	Fixes the cables on the flange
D	Preassembled FlexGripper	
E	Cables	Compressed air hose in blue
		Power & signal cable in green
		Plastic corrugated pipe in black
F	CD	Includes one product manual

Pre-requisites for mounting

The checklist below details what must be observed before proceeding with the actual installation of the FlexGripper.

1. Visually inspect the FlexGripper to make sure it is not damaged.

2. Make sure the operating environment for the FlexGripper conforms to the specifications, as described in *Operating conditions on page 21*.

3. Make sure that there is enough space around the robot wrist working range. Anything that would hinder the installation of the FlexGripper or be dangerous to the operator must be cleared away.

4. On delivery, the width is set wide enough to make mounting of the FlexGripper possible without the need to separate the vacuum rails and the pallet FlexGripper. If needed, refer to *Adjustment on page 31* to adjust the width between the two rails according to the size of the product.

2.3.2. Unpacking

Continued

Recommended standard tightening torque

For the torque values needed during installation, please see the following. The table below specifies the recommended standard tightening torque for oil-lubricated allen head screws (recommended class 12.9).

Dimension	Tightening torque(Nm) /Class 12.9, oil-lubricated
M5	6
M6	10
M8	24
M10	47
M12	82
M16	200

2.3.3. Adjustment

On delivery, the width is set wide enough to make mounting of the FlexGripper possible without the need to separate the vacuum rails and the pallet hook.

The width between the two rails can be adjusted to fit different sized work pieces. If needed, please refer to the following instructions to adjust the width between the two rails according to the size of the product.

Adjustment instructions

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

No	Action	Info/Illustration
1.	Release the air pipe from the compressed air hose.	en1917001
2.	Loosen the screws holding the rails, the width between the two rails can be adjusted depending on the size of the products.	en1011011
3.	Adjust the length of the air pipe and reconnect them with the compressed air hose.	

2.3.4. Mounting the FlexGripper-Vacuum
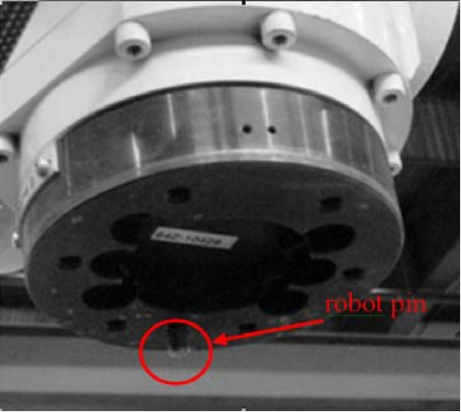
DANGER!
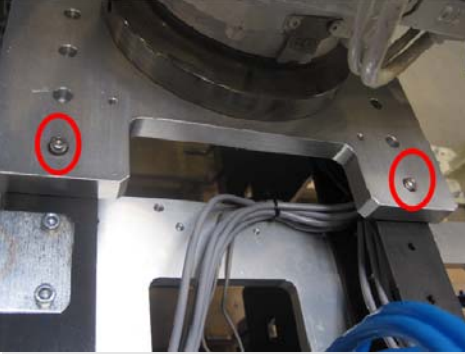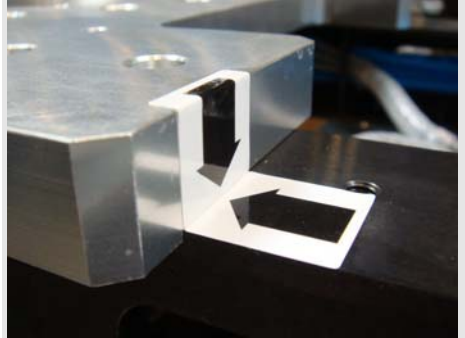
Before any service work is started, make sure all the safety guidelines have been strictly observed!

Make sure that the power is off before starting any work.

Mounting the FlexGripper-Vacuum on the robot

No	Action	Info/Illustration
1.	Place the wooden package so that the robot can reach it. Jog the robot wrist to the correct working height for the operators.	
2.	Insert the robot pin in the non-threaded hole on the robot wrist.(seeFigure).	 en1011031
3.	Mount the flange on the robot wrist using the 6 supplied M10 screws Moment 47 Nm (or 11x M12 Moment 80 Nm) from below upward. **NOTE!** Locate the previously inserted robot pin in to the non-threaded hole in the flange plate to guarantee the FlexGripper's orientation.	 en1011015.
4.	Jog robot to find the location of the FlexGripper. Set the robot wrist to a low position (see Robot User's Guide).	
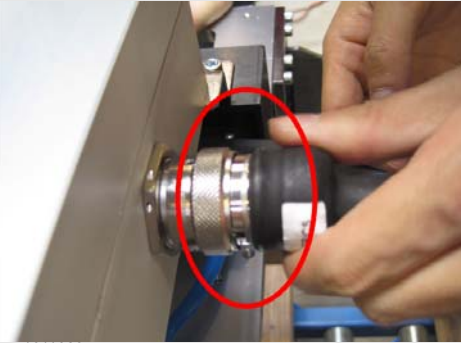
Continued

No	Action	Info/Illustration
5.	Mount the flange to the FlexGripper beam using the supplied 16×M6 bolts Moment 10Nm from above downward. **ℹ️ NOTE!** The labels on the flange and the FlexGripper indicate the directions of mounting. Make sure the locking groove on the flange engages with the frame of the FlexGripper.	 en1011016 en1011017
6.	Attach the cable bracket on the flange and the cable routing to the robot wrist. **ℹ️ NOTE!** Pass the cables through the plastic corrugated pipe which is used as the cable protection.	 en1011018 en1011019

Continues on next page

2.3.4. Mounting the FlexGripper-Vacuum

Continued

No	Action	Info/Illustration
7.	Connect the power and air cables to the manipulator wrist.	 en1011020
8.	Connect the compressed air supply cable to the vavle unit and the power & signal cable to the terminal box.	 en1011023
9.	Jog the robot wrist to lift the FlexGripper package, then pull down the wooden box and separate it from the FlexGripper.	
10.	Set axis 4 to zero angle position. Manipulate the robot to check if axis 4 can rotate to the position of angle 180 clockwise and anticlockwise without tensioning of the cables and distortion of the corrugated pipe.	

NOTE!

Make sure that the standard tool kit and attached screws, washers and dowels be used during the mounting.

2.3.5. Commissioning

NOTE!

ABB recommend that air connected to the FlexGripper should be: 4-6 bar, filtered (5ym), 1600 L/min and non-lubricated.

After the electrical and pneumatic connection of the FlexGripper, commissioning must be done to test if the FlexGripper operates correctly.

NOTE!

Only 24V power is used in FlexGripper.

Short circuit protection should be implemented by a fuse in the control cabinet by the customer.

CAUTION!

Hot parts may cause burns!

Mechanical commissioning

1. Manually test ten zones separately to check that each zone works individually. If not, check the connection of the air cables..

2. Operate the pallet hook manually to check the lifting fingers move smoothly and reach the predetermined position. If not, adjust the fixing location of the cylinder rod.

Rapid routines

Routines	Description
Init_Interrupt()	This routine is called to initialize the interrupt program. According to your using of the sensors, Please modify this routine. Totally five sensors are installed on the FlexGripper-Vacuum by default.
PFPS_MainEntry()	This routine is the main entry of the 'Test run' process. It can not be renamed, modified or deleted.
PFPS_PalletPicker()	This routine is called when the pallet hook is set to be open or close.
PFPS_PalletSeacher()	This routine is called when the search cylinder goes forward and backward to search the pallet.
PFPS_PickUpBox()	This routine is called when the robot goes to pick up boxes.
PFPS_PlaceDownBox()	This routine is called when the robot goes to place down boxes.
exePickPlace()	This routine is called when the robot goes to pick up and place down boxes. The two routines 'PFPS_PickUpBox()' and 'PFPS_PlaceDownBox()' are called during the process.
exePallet()	This routine is called when the robot picks up the pallet for testing the vacuum hook.

Continues on next page

2.3.5. Commissioning

Continued

NOTE!

The hook is open, when 'DO10_02_PalletPicker_Close' is 0 and 'DO10_01_PalletPicker_Open' is 1. While the hook is close, when 'DO10_02_PalletPicker_Close' is 1 and 'DO10_01_PalletPicker_Open' is 0.

PFPS_PalletPicker()

```
PROC PFPS_PalletPicker()
 IF Present (Open) THEN
   SetDO DO10_02_PalletPicker_Close,0;
   SetDO DO10_01_PalletPicker_Open,1;
  ENDIF
 IF Present (Close) THEN
   SetDO DO10_01_PalletPicker_Open,0;
   SetDO DO10_02_PalletPicker_Close,1;
  ENDIF
ENDPROC
```

NOTE!

The pneumatic search cylinder is forward when 'DO10_14_PostionSeacher_Backward' is 0 and 'DO10_13_PostionSeacher_Forward' is 1. The pneumatic search cylinder is backward when 'DO10_14_PostionSeacher_Backward' is 1 and 'DO10_13_PostionSeacher_Forward'

Continued

is 0. While 'DO10_14_PostionSeacher_Backward' is 0 and
'DO10_13_PostionSeacher_Forward' is also 0, there is no pressure in the cylinder which
means a pallet is searched.

PFPS_PalletSeacher()

```
PROC PFPS_PalletSeacher()
 IF Present (Forward) THEN
   SetDO DO10_14_PostionSeacher_Backward, 0;
   SetDO DO10_13_PostionSeacher_Forward, 1;
   WaitDI DI10_03_PostionSeacher_Searched, 1;
 ENDIF
 IF Present (Back) THEN
   SetDO DO10_13_PostionSeacher_Forward, 0;
   SetDO DO10_14_PostionSeacher_Backward, 1;
   WaitDI DI10_04_PostionSeacher_Backed, 1;
 ENDIF
 IF Present (Search) THEN
   SetDO DO10_14_PostionSeacher_Backward, 0;
   SetDO DO10_13_PostionSeacher_Forward, 1;
   WaitDI DI10_03_PostionSeacher_Searched, 1;
   SetDO DO10_13_PostionSeacher_Forward, 0;
   WaitDI DI10_03_PostionSeacher_Searched, 1;
 ENDIF
ENDPROC
```

2.3.5. Commissioning

Continued

NOTE!

The target points 'pHome', 'pPick' and its offsets must be defined and taught firstly.

PFPS_PickUpBox()

```
PROC PFPS_PickUpBox()
 MoveJ pHome, v100, fine, tPFPSVacGrip\WObj:=wobj0;
 TPWrite " Robot move to pick postion!  ";
 MoveL Offs(pPick,-10,0,100), v100, z20, tPFPSVacGrip\WObj:=wobj0;
 TriggIO tTrigger1, 20\GOp:=GoVacuume, 0;
 TriggL pPick, v100, tTrigger1, fine, tPFPSVacGrip;
 IWatch PFPSVacuumMonitor1;
 IWatch PFPSVacuumMonitor2;
 IWatch PFPSVacuumMonitor3;
 IWatch PFPSVacuumMonitor4;
 bPartPicked:=TRUE;
 TPWrite " Robot start to pick up box!  ";
 MoveL Offs(pPick,0,0,50), v50, z10, tPFPSVacGrip\WObj:=wobj0;
 WaitTime\InPos, 0;
 MoveJ pHome, v100, fine, tPFPSVacGrip\WObj:=wobj0;
ENDPROC
```

NOTE!

The target points 'pHome', 'pPlace' and its offsets must be defined and taught firstly.

PFPS_PlaceDownBox()

```
PROC PFPS_PlaceDownBox()
 TPWrite "  Robot move to place postion!   ";
 MoveL Offs(pPlace,-10,0,100), v100, z20, tPFPSVacGrip\WObj:=wobj0;
 ISleep PFPSVacuumMonitor1;
 ISleep PFPSVacuumMonitor2;
 TriggIO tTrigger2, 0\GOp:=GoVacuume, 992;
 TriggL pPlace, v50, tTrigger2, fine, tPFPSVacGrip\WObj:=wobj0;
 WaitTime\InPos, 0.2;
 WaitTime\InPos, 2.0;
 ISleep PFPSVacuumMonitor3;
 ISleep PFPSVacuumMonitor4;
 TriggIO tTrigger2, 0\GOp:=GoVacuume, 1023;
 TriggL pPlace, v50, tTrigger2, fine, tPFPSVacGrip\WObj:=wobj0;  bPartPicked:=FALSE;
 WaitTime\InPos, 0.2;
 TPWrite "  Robot finish to place box!   ";
 MoveL Offs(pPlace,-10,0,100), v100, z20, tPFPSVacGrip\WObj:=wobj0;
 TPWrite "  Robot move to home postion!   ";
 MoveJ pHome, v100, fine, tPFPSVacGrip\WObj:=wobj0;
ENDPROC
```

2.3.5. Commissioning

Continued

NOTE!

The target points 'pSearch' and its offsets, 'pPickPallet' and its offsets, 'pHome', 'pPlace' and its offsets, 'pPick' and its offsets must be defined and taught firstly.

exePallet()

During the process, first the robot with the FlexGripper-Vacuum goes to search the pallet, then pick up the pallet, finally place down the pallet.

```
PROC exePallet()
    TPWrite " Robot move to test vacuum postion!  ";
    MoveJ pSearch, v100, fine, tPFPSVacGrip\WObj:=wobj0;
    TPWrite " Robot ready to search pallet!  ";
    PFPS_PalletPicker \Open;
    PFPS_PalletSeacher \Search;
    IWatch PFPSPosSeachMonitor;
    MoveL Offs(pSearch,0,0,-480), v100, fine, tPFPSVacGrip\WObj:=wobj0;
    ISleep PFPSPosSeachMonitor;
    PFPS_PalletSeacher \Search;
    TPWrite " Robot start to search pallet!  ";
    SearchL\Stop, DI10_03_PostionSeacher_Searched\Flanks, pPickPallet, pSearchEnd,
v10, tPFPSVacGrip\WObj:=wobj0;
    PFPS_PalletSeacher \Back;
    MoveL Offs(pPickPallet,0,0,-13), v30, fine, tPFPSVacGrip\WObj:=wobj0;
    WaitTime\InPos, 0.2;
    TPWrite " Robot start to pick up pallet!  ";
    PFPS_PalletPicker \Close;
    MoveL Offs(pSearch,0,0,-480), v30, fine, tPFPSVacGrip\WObj:=wobj0;
    MoveJ pSearch, v100, fine, tPFPSVacGrip\WObj:=wobj0;
    WaitTime\InPos, 2;
    TPWrite " Robot start to place down pallet!  ";
    MoveL Offs(pSearch,0,0,-480), v100, fine, tPFPSVacGrip\WObj:=wobj0;
    MoveL Offs(pPickPallet,0,0,-18), v30, fine, tPFPSVacGrip\WObj:=wobj0;
    PFPS_PalletPicker \Open;
    MoveL Offs(pPickPallet,0,0,-480), v30, fine, tPFPSVacGrip\WObj:=wobj0;
    MoveJ pSearch, v100, fine, tPFPSVacGrip\WObj:=wobj0;
    TPWrite " Robot finish pick pallet test!  ";
    WaitTime\InPos, 2;
    PFPS_PalletPicker\Close;
    ERROR
    IF ERRNO=ERR_WHLSEARCH THEN
     TPErase;
     TPWrite " Warning!the pallet's position or the Forward sensor of  ";
```

TPWrite " pallet picker may be wrong !   ";

TPWrite " ";

TPWrite " Robot stop to test,and need checking parts or sensor!   ";

StopMove;

WaitTime 0.2;

ENDIF

ENDPROC

Reference Rapid codes

Gripper function is checked with the following rapid codes. Please modify the data in rapid codes as needed before using it. The rapid codes are as follows:

```
MODULE MainModule
 Local PERS robtarget
 pPick:=[[1908.03,-446.57,1007.54],[1.72802E-06,0.0867458,-0.996231,-5.63714E-07],[-1,0,-1,0],[9E+09,9E+09,9E+09,9E+09,9E+09,9E+09]];
 PERS tooldata
 tPFPSVacGrip:=[TRUE,[[0,0,439],[1,0,0,0]],[80,[0,0,200],[1,0,0,0],0,0,4.097]];
 PERS Loaddata PFPSLoadEmpty:=[0.001,[0,0,0.001],[1,0,0,0],0,0,0];
 PERS num cycletime:=3.111;
 PERS num pace:=0;


 PROC main()
 var clock MyClock;
 MoveJ pPick, vmax, fine,tPFPSVacGrip\WObj:=wobj0;
 ConfJ \off;
 confl \off;
 pace:=0;
 clkreset MyClock;
 clkstart MyClock;
 for i from 1 to 5 do
    StartVaccum 1, \ZoneNo2:=2, \ZoneNo3:=3, \ZoneNo4:=4, \ZoneNo5:=5, \ZoneNo6:=6, \ZoneNo7:=7, \ZoneNo8:=8, \ZoneNo9:=9, \ZoneNo10:=10;
    WaitTime 0.2;
    GripLoad  PFPSLoadFull;
    MoveL Offs(pPick,0,0,400),vmax,z200, tPFPSVacGrip\WObj:=wobj0;
    MoveL Offs(pPick,0,2000,400), vmax, z200, tPFPSVacGrip\WObj:=wobj0;
    MoveL Offs(pPick,0,2000,0), vmax, fine, tPFPSVacGrip\WObj:=wobj0;
 StopVaccum 1, \ZoneNo2:=2, \ZoneNo3:=3, \ZoneNo4:=4, \ZoneNo5:=5, \ZoneNo6:=6, \ZoneNo7:=7, \ZoneNo8:=8, \ZoneNo9:=9, \ZoneNo10:=10;
    WaitTime 0.1;
    GripLoad  PFPSLoadEmpty;
    !Gripper start to back!
    MoveL Offs(pPick,0,2000,400), vmax, z200, tPFPSVacGrip\WObj:=wobj0;
    MoveL Offs(pPick,0,0,400),vmax,z200,tPFPSVacGrip\WObj:=wobj0;
    MoveL pPick,vmax,fine, tPFPSVacGrip\WObj:=wobj0;
 endfor
 waituntil\inpos,true;
 clkStop MyClock;
```

Continued

```
cycletime:=clkRead(MyClock)/5;
pace:=3600/cycletime;
ENDPROC


PROC StartVaccum(num ZoneNo1, \num ZoneNo2, \num ZoneNo3, \num ZoneNo4, \num
ZoneNo5, \num ZoneNo6, \num ZoneNo7, \num ZoneNo8, \num ZoneNo9, \num
ZoneNo10)
  SetZone(ZoneNo1);
  if Present(ZoneNo2) then
    SetZone(ZoneNo2);
  endif
  if Present(ZoneNo3) then
    SetZone(ZoneNo3);
  endif
  if Present(ZoneNo4) then
    SetZone(ZoneNo4);
  endif
  if Present(ZoneNo5) then
    SetZone(ZoneNo5);
  endif
  if Present(ZoneNo6) then
    SetZone(ZoneNo6);
  endif
  if Present(ZoneNo7) then
    SetZone(ZoneNo7);
  endif
  if Present(ZoneNo8) then
    SetZone(ZoneNo8);
  endif
  if Present(ZoneNo9) then
    SetZone(ZoneNo9);
  endif
  if Present(ZoneNo10) then
    SetZone(ZoneNo10);
  endif
ENDPROC
PROC StopVaccum(num ZoneNo1, \num ZoneNo2, \num ZoneNo3, \num ZoneNo4, \num
ZoneNo5, \num ZoneNo6, \num ZoneNo7, \num ZoneNo8, \num ZoneNo9, \num
ZoneNo10)
  ResetZone(ZoneNo1);
```

Continues on next page

2.3.5. Commissioning

Continued

```
if Present(ZoneNo2) then
  ResetZone(ZoneNo2);
endif
if Present(ZoneNo3) then
  ResetZone(ZoneNo3);
endif
if Present(ZoneNo4) then
  ResetZone(ZoneNo4);
endif
if Present(ZoneNo5) then
  ResetZone(ZoneNo5);
endif
if Present(ZoneNo6) then
  ResetZone(ZoneNo6);
endif
if Present(ZoneNo7) then
  ResetZone(ZoneNo7);
endif
if Present(ZoneNo8) then
  ResetZone(ZoneNo8);
endif
if Present(ZoneNo9) then
  ResetZone(ZoneNo9);
endif
if Present(ZoneNo10) then
  ResetZone(ZoneNo10);
endif
ENDPROC
PROC SetZone(num zone)
  TEST zone
CASE 1:Set DO10_03_Zone1;
CASE 2:Set DO10_04_Zone2;
CASE 3:Set DO10_05_Zone3;
CASE 4:Set DO10_06_Zone4;
CASE 5:Set DO10_07_Zone5;
CASE 6:Set DO10_08_Zone6;
CASE 7:Set DO10_09_Zone7;
CASE 8:Set DO10_10_Zone8;
CASE 9:Set DO10_11_Zone9;
```

```
CASE 10:Set DO10_12_Zone10;
 ENDTEST
ENDPROC
PROC ResetZone(num zone)
 TEST zone
CASE 1:Reset DO10_03_Zone1;
CASE 2:Reset DO10_04_Zone2;
CASE 3:Reset DO10_05_Zone3;
CASE 4:Reset DO10_06_Zone4;
CASE 5:Reset DO10_07_Zone5;
CASE 6:Reset DO10_08_Zone6;
CASE 7:Reset DO10_09_Zone7;
CASE 8:   Reset DO10_10_Zone8;
CASE 9:Reset DO10_11_Zone9;
CASE 10:Reset DO10_12_Zone10;
 ENDTEST
ENDPROC
PROC PFPS_PalletPicker(\switch Open | switch Close)
 IF Present (Open) THEN
  SetDO DO10_02_PalletPicker_Close,0;
  SetDO DO10_01_PalletPicker_Open,1;
 ENDIF
 IF Present (Close) THEN
  SetDO DO10_01_PalletPicker_Open,0;
  SetDO DO10_02_PalletPicker_Close,1;
 ENDIF
ENDPROC
PROC PFPS_PalletSeacher(\switch Forward | switch Back | switch Search)
 IF Present (Forward) THEN
  SetDO DO10_14_PostionSeacher_Backward, 0;
  SetDO DO10_13_PostionSeacher_Forward, 1;
  WaitDI DI10_03_PostionSeacher_Searched, 1;
 ENDIF
 IF Present (Back) THEN
  SetDO DO10_13_PostionSeacher_Forward, 0;
  SetDO DO10_14_PostionSeacher_Backward, 1;
  WaitDI DI10_04_PostionSeacher_Backed, 1;
 ENDIF
 IF Present (Search) THEN
```

2.3.5. Commissioning

Continued

> SetDO DO10_14_PostionSeacher_Backward, 0;
>
> SetDO DO10_13_PostionSeacher_Forward, 1;
>
> WaitDI DI10_03_PostionSeacher_Searched, 1;
>
> SetDO DO10_13_PostionSeacher_Forward, 0;
>
> WaitDI DI10_03_PostionSeacher_Searched, 1;
>
> ENDIF
>
> ENDPROC
>
> ENDMODULE

Software commissioning

For the detailed software commissioning procedure, see *FlexGripper-Vacuum function test on page 93*.

2.4 Maintenance

2.4.1. General

This chapter details all the maintenance activities recommended for the FlexGripper. It contains two types of maintenance: regular maintenance activities and changing activities. The procedures are gathered in different sections and divided according to the maintenance activity.

WARNING!

During maintenance, disconnect the mains voltage before work on the equipment is started. Even if the voltage is switched off there still remains a safety risk. Pneumatic and Electric connection should be disconnected before performing any maintenance activity in the FlexGripper.

Safety information

Before any service work is started, it is extremely important that all safety information is observed! There are general safety aspects that must be read through, as well as more specific safety information that describes danger and safety risks when performing the procedures. Read the chapter *Safety on page 7* before performing any service work.

2.4.2. Regular maintenance activities

To help prevent accidents, the pneumatic system must be regularly inspected. Regular visual inspections must be carried out before operating the FlexGripper.

The main parts to be inspected at regular intervals are:

Maintenance activity	Equipment	Action
Inspection	Fastener	Check that the fastener is not loose.
	Rubber pad	Check the wear extent of the rubber pad.
	Pneumatic cylinders	Regularly check that the piston rods of cylinders are free from dust particles and that there is no air leakage.
	Vacuum generators	Check for air leakage.
	Suction cups	Regularly check that the suction cups are undamaged and free from dirt and other particles (at least one time per month)
	Valve unit	Ensure all the connectors are tightened properly.
Cleaning	Suction cups	Clean the cups with soap and water.

2.4.3. Changing/Replacement activities

In any of the following situations, the corresponding component should be replaced:

- The valve unit/vacuum generator is distorted
- The congressed pipe is worn out
- Pins in the FlexGripper-Vacuum are worn out
- The vacuum rails are distorted
- Any component that has exceeded it's lifetime

See the expected component life time in the table below:

Maintenance activity	Equipment	Expected life
Changing	Complete suction cups	6 months

2.5 Repair

2.5.1. Instruction

This chapter details all the repair activities recommended for the FlexGripper-Vacuum.

Safety information

Before any service work is started, it is extremely important that all safety information is observed! There are general safety aspects that must be read through, as well as more specific safety information that describes danger and safety risks when performing the procedures. Read the chapter *Safety on page 7* before performing any service work.
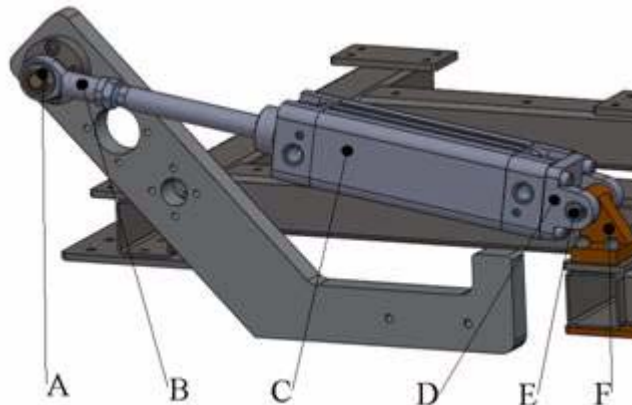
NOTE!

Make sure that the power is off before starting any work.

2.5.2. Cylinder

2.5.2.1. Replacing the cylinder of the pallet picker unit

The cylinder is located as shown in the figure below.
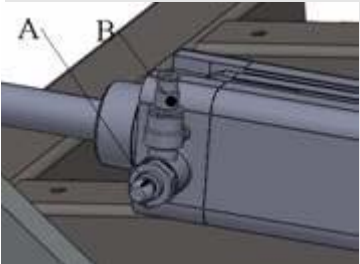

en1012001

Position	Part
A	Spring hoop
B	Spherical hinge
C	Pneumatic cylinder
D	Bracket
E	Pin
F	Bracket

Use this procedure to remove the cylinder.

DANGER!

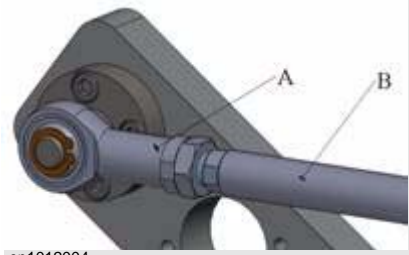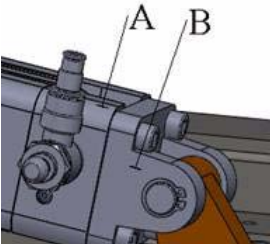Turn off all electric power and pneumatic pressure supplies to the gripper!

|	Action	Note
1.	Drain the air from the cylinder.	Disconnect the air cable on the cylinder.
2.	Remove the air control valve and joint.	en1012002 Parts: A: air control valve, B: joint

Continues on next page

2.5.2.1. Replacing the cylinder of the pallet picker unit

Continued

	Action	Note
3.	Remove the sensors from the cylinder.	en1012003 Parts: A: sensor
4.	Remove the joint from the piston rod of the cylinder.	en1012004 Parts: A: joint, B: piston rob
5.	Remove the bracket from the cylinder.	en1012005 Parts: A: cylinder, B: bracket
6.	Remove the cylinder.	

2.5.2.2. Replacing the cylinder on the pallet searcher

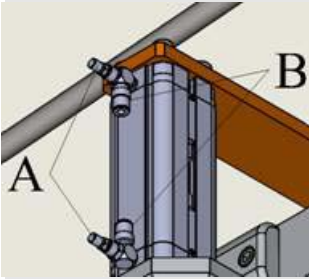The cylinder is located as shown in the figure below.
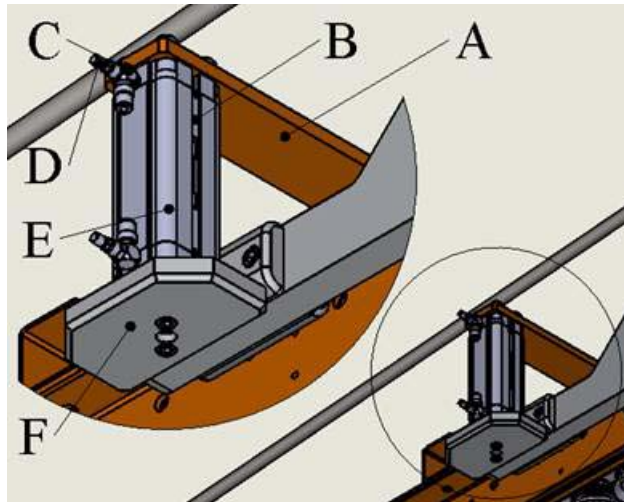
en1012006

Position	Part
A	Cylinder connect plate
B	Magnetic proximity switch
C	Quick connector
D	Flow valve

Use this procedure to remove the cylinder.

DANGER!

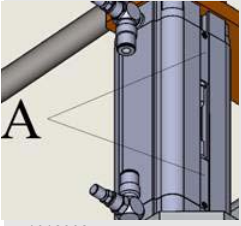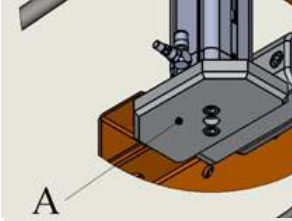Turn off all electric power and pneumatic pressure supplies to the gripper!

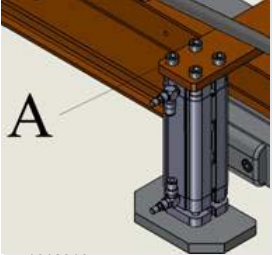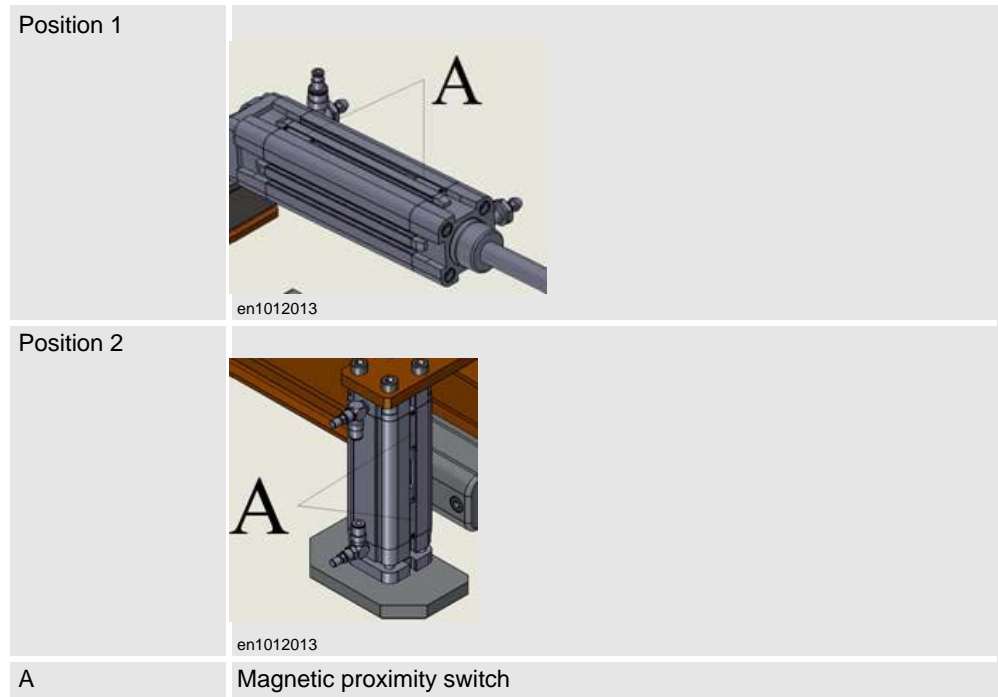|	Action	Note
1.	Drain the air from the cylinder.	Disconnect the air cable on the cylinder.
2.	Remove the flow valve and quick connector.	en1012007 Parts: A: Flow valve, B: Quick connector

Continues on next page

2.5.2.2. Replacing the cylinder on the pallet searcher

Continued

	Action	Note
3.	Remove the magnetic proximity switch from the pneumaticcylinder.	 en1012008 Parts: A: Magnetic proximity switch
4.	Remove the press plate from the pneumatic cylinder.	 en1012009 Parts: A: Press plate
5.	Loosen the bolts on the cylinder connect plate.	 en1012010 Parts: A: Bolt
6.	Remove the pneumatic cylinder.	

2.5.3. Magnetic proximity switch

The magnetic proximity switch is located as shown in the figure below.

Position 1	
	en1012013
Position 2	
	en1012013
A	Magnetic proximity switch

Position 1

Use this procedure to remove the magnetic proximity switch.

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	Note
1.	Loosen the small bolt.	 en1012015 Parts: A: Small bolt
2.	Open the terminal box and remove the cable.	See the circuit diagram for details.
3.	Remove the magnetic proximity switch.	

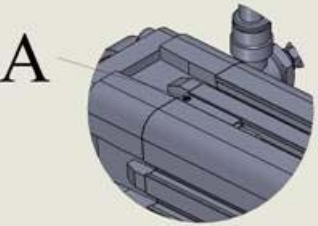2.5.3. Magnetic proximity switch

Continued

Position 2

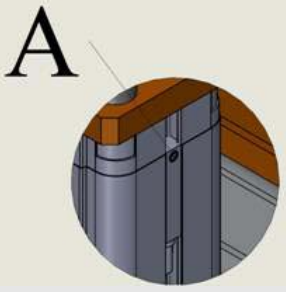Use this procedure to remove the magnetic proximity switch.

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	**Note**
1.	Loosen the small bolt.	en1012016 Parts: A: Small bolt
2.	Open the terminal box and remove the cable.	See the circuit diagram for details.
3.	Remove the magnetic proximity switch.	

2.5.4. Sensors

The sensor is located as shown in the figure below. (There are 5 sensors mounted on the gripper.)
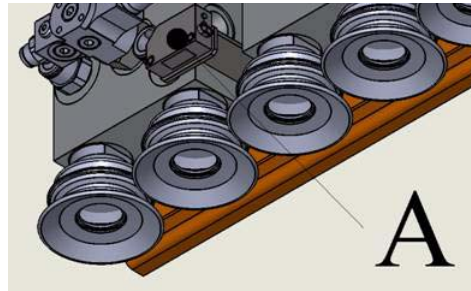
en1012017

Position	Part
A	Sensor

2.5.4. Sensors

Continued
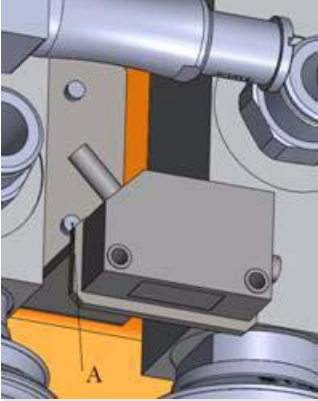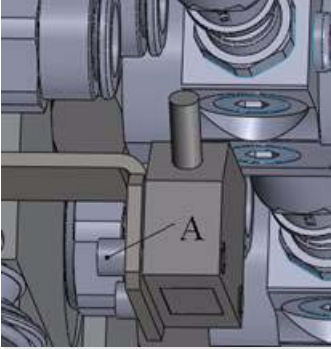
Removing the sensor

Use this procedure to remove the sensor.

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	Note
1.	Loosen the small bolt.	 en1012018 Parts: A: Small bolt
2.	Loosen the small bolt.	 en1012018 Parts: A: Small bolt
3.	Open the terminal box and remove the cable.	See the circuit diagram for details.
4.	Remove the sensor.	

2.5.5. Pneumatic unit

The pneumatic units are located as shown in the figure below.
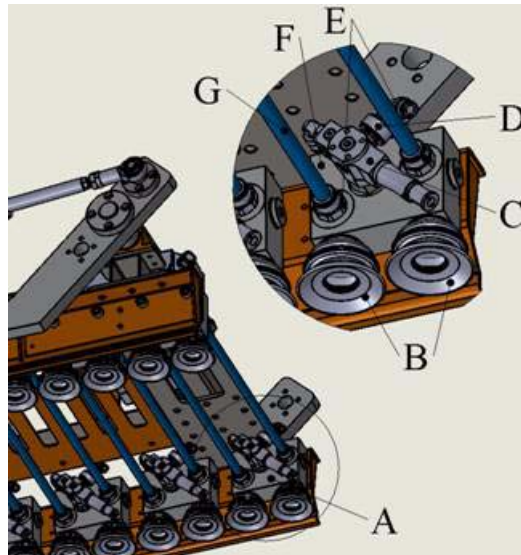
en1012019

Position	Part
A	Pneumatic unit
B	Pneumatic cup
C	Vacuum ejector
D	One way valve
E	Quick connector
F	Pneumatic block
G	Compressed air hose

Removing the pneumatic cup lip

Use this procedure to remove the pneumatic cup lip.

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	Note
1.	Remove the cup lip using your hands.	en1012018 Parts: A: Cup lip

Continues on next page

2.5.5. Pneumatic unit

Continued

Removing the pneumatic cup lip

Use this procedure to remove the whole pneumatic cuplip.

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	Note
1.	Loosen the bolts.	 en1012018 Parts: A: Bolt
2.	Remove the cup.	

Removing the vacuum ejector
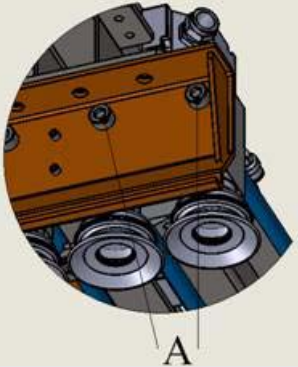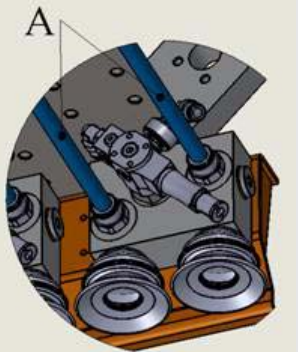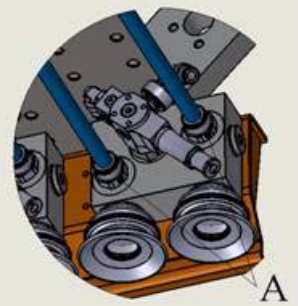
Use this procedure to remove the vacuum ejector.

⚠️ **DANGER!**

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	Note
1.	Loosen the bolts.	 en1012018 Parts: A: Bolt
2.	Remove the compressed air hose.	 en1012018 Parts: A: Compressed air hose
3.	Remove the quick connector.	 en1012018 Parts: A: Quick connector
4.	Remove the vacuum ejector.	

2.5.6. Valve base

The valve base is located as shown in the figure below.
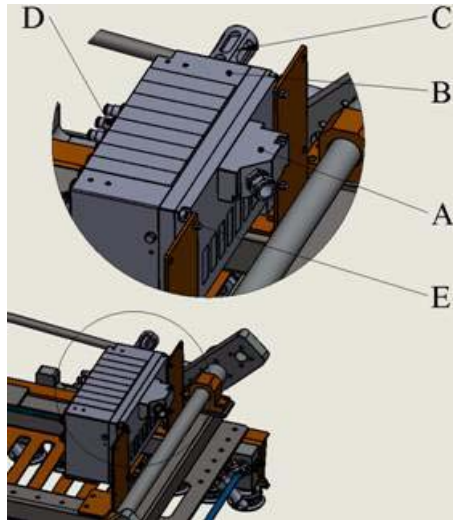
en1012017

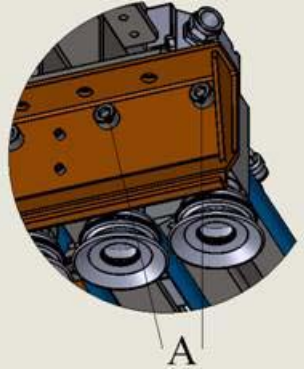| Position	Part
A	Power supply
B	Valve base
C	Muffler
D	Quick connector

Removing the pneumatic cup lip
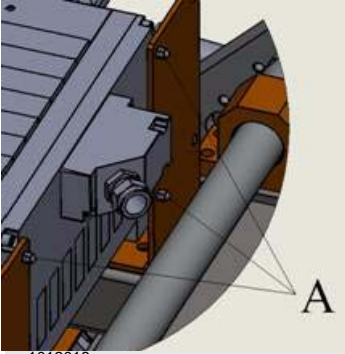
Use this procedure to remove the pneumatic cup lip.

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	Note
1.	Drain the air from the gripper.	Disconnect the air cable.
2.	Remove the power supply.	
3.	Disconnect the air cable.	
4.	Remove the quick connector.	
5.	Remove the muffler.	

Continues on next page

Continued

	Action	Note
6.	Loosen the bolts.	en1012018 Parts: A: Bolt
7.	Remove the valve base.	

2.5.7. Dress cable

The dress cable is located as shown in the figure below.
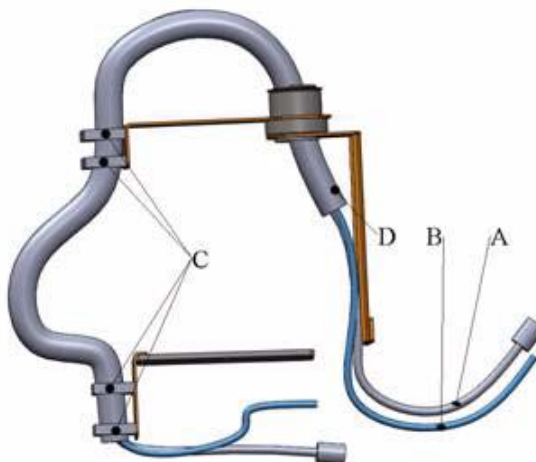
en1012020

Position	Part
A	Electrical cable
B	Main compressed air hose
C	Corrugated pipe clip
D	Dress cable

Use this procedure to remove the dress cable magnetic proximity switch.

DANGER!

Turn off all electric power and pneumatic pressure supplies to the gripper!

	Action	Note
1.	Drain the air from the cylinder.	Disconnect the air cable
2.	Pull out the main compressed air hose from the two sidequick connectors.	
3.	Pull out the electrical cable from both side(one side-Gripper terminal box, the other side-Robot axis 6).	
4.	Open the corrugated pipe clip.	
5.	Remove the dress cable.	

2.6 Trouble shooting

2.6.1. Start-up failures

Consequences

Problem starting the system

Symptoms and causes

- LEDs not lit on the sensors.
- Air hose hangs loosely on the gripper.

Recommended actions

	Action	Info/illustration
1.	Make sure the robot system has started up and is correctly connected.	
2.	Make sure the air source is open.	
3.	Make sure the gripper cable and air hose are correctly connected to the dress cable.	
4.	Make sure the gripper cable is correctly connected to the terminal box on the gripper.	

2.6.2. Gripper not responding

Consequences

The gripper cannot be operated using the FlexPendant.

Recommended actions

	Action	Info/illustration
1.	Make sure the gripper system has started up.	
2.	Make sure the connection to the I/O board is correct.	
3.	Make sure that there is no air leakage.	

2.6.3. Wrong movement

Consequences

The fault can cause severe injuries or death to personnel in the area or severe damage to the manipulator and/or surrounding equipment.

Symptoms and causes

The movement of the gripper part is not as expected during commissioning.

Recommended actions

	Action	Info/illustration
1.	Make sure the connection to the I/O board is correct.	
2.	Check the connection in the terminal box.	

2.6.4. Low performance

Consequences

Clamp or hook movement is sluggish and sometimes stalls.

Symptoms and causes

- Connection error
- Low air pressure
- Excessive friction

Recommended actions

	Action	Info/illustration
1.	Make sure the electrical and air connections are correctly and firmly connected.	
2.	Make sure the air pressure is between 4 bar and 6 bar.	
3.	Make sure there is not excessive friction between moving parts (See section Mechanical noise).	

2.6.5. Problem jogging the gripper

Consequences

Gripper can not reach the rotation range.

Symptoms and causes

Cable or air hose routing.

Recommended actions

	Action	Info/illustration
1.	Make sure the cable and air hose are correctly routed.	

2.6.6. Mechanical noise

Consequences

- Failing bearings cause the palletizing accuracy, and in severe cases, the workpiece may fall down uncontrolly
- The gripper part or workpiece may fall down

Symptoms and causes

- Loose bolts

Recommended actions

	Action	Info/illustration
1.	Determine which bearing is emitting the noise.	
2.	Make sure the bearing has sufficient lubrication.	
3.	Replace the bearing with a new one.	

	Action	Info/illustration
1.	Determine which bearing is emitting the noise.	
2.	Tighten the bolts to the recommended torque.	

2.6.7. Workpiece drop on power down

Consequences

The fault can cause severe injuries or death to personnel in the area or severe damage to the manipulator and/or surrounding equipment.

Symptoms and causes

- Faulty valve
- Faulty air connection or air leakage

Recommended actions

	Action	Info/illustration
1.	Determine which valve causes the workpiece to drop.	
2.	Check the air hose connection.	

2.6.8. No Input signal detected

Consequences

Can not run work program.

Symptoms and causes

- No signal detected in UI. LEDs not lit on the I/O board.
- Faulty connection.

Recommended actions

	Action	Info/illustration
1.	Make sure the LED sensors are lit and all the connections are firmly connected.	
2.	Check the connection on the I/O board.	

2.6.9. No Vacuum created

Consequences

Can not use vacuum gripper.

Symptoms and causes

- Wrong voltage levelAir leakage
- Faulty vacuum pump or terminal valve

Recommended actions

Action	Info/illustration
1. Make sure low level is used to activate the vacuum.	
2. Make sure there is no air leakage or air connection error.	
3. Replace the faulty vacuum pump or the terminal valve.	

2.7 Decommissioning

2.7.1. Introduction

Introduction

This section contains information to consider when taking a product, FlexGripper, out of operation. It deals with how to handle potentially dangerous components and potentially hazardous materials.

General

All used grease, oils and dead batteries must be disposed of in accordance with the current legislation of the country in which the FlexGripper units are installed. If the FlexGripper units are partially or completely disposed of, the various parts must be grouped together according to their nature (that is, all iron together and all plastic together), and disposed of accordingly. These parts must also be disposed of in accordance with the current legislation of the country in which the FlexGripper units are installed.

2.7.2. Environmental information

Hazardous material

The table specifies some of the materials in the FlexGripper and their respective use throughout the product.

Dispose of the components properly to prevent health or environmental hazards.

Material	Example application
Copper	Cables
Steel	Screws, base-frame, and so on
Plastic/rubber (PVC)	Cables, connectors, and so on
Oil, grease	Gear boxes
Aluminium	Flange

Oil and grease

Where possible, arrange for the oil and grease to be recycled. Dispose of via an authorized person/contractor in accordance with local regulations. Do not dispose of oil and grease near lakes, ponds, ditches, down drains or onto soil. Incineration must be carried out under controlled conditions in accordance with local regulations.

Also note that:

- Spills may form a film on water surfaces causing damage to organisms. Oxygen transfer could also be impaired. Spillage may penetrate the soil causing ground water contamination.

2.8. Wear parts

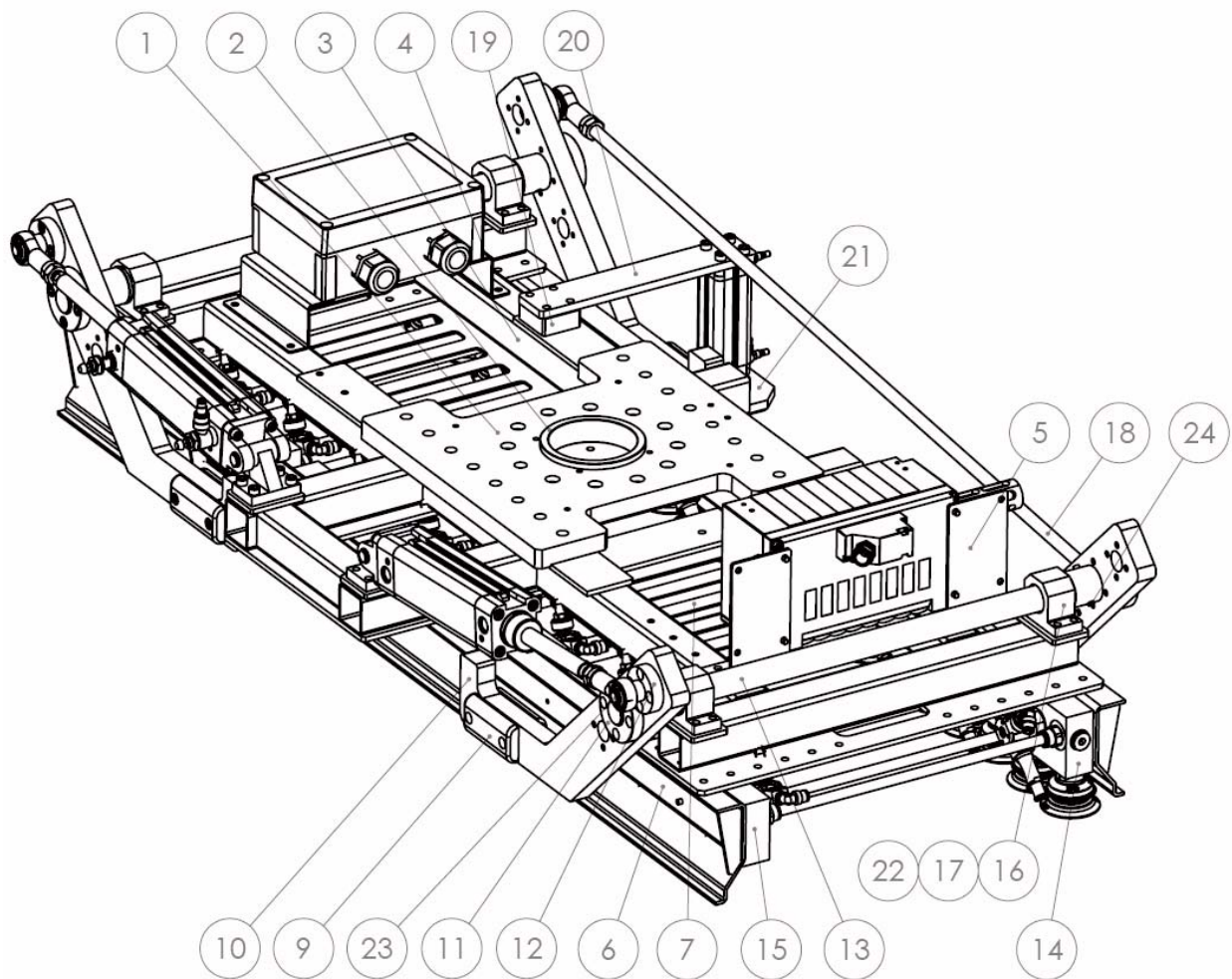| Part No.	Description
3HAC040869-001	Vacuum cup

2.9. Spare parts

Mechanical parts

en1016001

2.9. Spare parts

Continued

Pneumatic & electric parts

en1016001

Spare parts list

Pos	Part No.	Description	Qty	Note / Dimension
1	3HAC040417-001	Flange plate for 660	1	
2	3HAC040418-001	Shaft fitting for 660	1	
3	3HAC040469-001	frame machining	1	
4	3HAC040472-001	electric box bracket	2	
5	3HAC040588-001	valve bracket A	2	
6	3HAC040474-001	beam welding1	2	
7	3HAC040526-001	cable protect plate	2	
8	3HAC040527-001	sensor bracket	5	
9	3HAC040528-001	hook block	8	
10	3HAC040529-001	hook	4	
11	3HAC040533-001	cylinder pin	4	
12	3HAC040535-001	hollow shaft pin	4	
13	3HAC040536-001	shaft	2	
14	3HAC040538-001	pneumatic block left	10	
15	3HAC040589-001	pneumatic block right	10	
16	3HAC040539-001	bearing house	4	
17	3HAC040540-001	plastic sleeve	4	
18	3HAC040542-001	synchronize rod	1	
19	3HAC040543-001	cylinder washer	1	
20	3HAC040544-001	cylinder connect plate	1	
21	3HAC040545-001	press plate	1	
22	3HAC040698-001	Wafer for hook	4	
23	9ABA135-10	spring ring	4	
24	9ABA142-62	pin	4	
25	3HAC040844-001	Valve base	1	
26	3HAC040851-001	fitting	8	
27	3HAC040854-001	Cylinder	1	
28	3HAC040855-001	Flow contral valve	2	
29	3HAC040856-001	fitting	2	
30	3HAC040857-001	Accessory of cylinder	2	
31	3HAC040858-001	Pin	2	
32	3HAC040859-001	cylinder	2	
33	3HAC040860-001	Accessory of cylinder	2	
34	3HAC040800-001	spherical hinge	4	
35	3HAC040861-001	Flow vavle	4	
36	3HAC040862-001	fitting	4	
37	3HAC040867-001	Vacuum ejector	20	
37	3HAC040868-001	One way valve	20	
40	3HAC040872-001	photoelectric sensor	5	

en1016001

2.10.1. Electrical circuit

2.10 Circuit diagram

2.10.1. Electrical circuit

Power supply circuit

3HAC040149-003-7

Continues on next page

DRESSPACK IRB660

3HAC040149-003-17

2 FlexGripper-Vacuum

2.10.1. Electrical circuit

Continued

FlexGripper-Vacuum DO

3HAC040149-003-15

Continues on next page

FlexGripper-Vacuum DI

3HAC040149-003-16

Continues on next page

2 FlexGripper-Vacuum

2.10.1. Electrical circuit

Continued

FlexGripper-Vacuum terminal connection

Prepared by, date: CNYAWU2	Approved by, date:	
Latest revision:		

ABB

Lab/Office:

TERMINAL CONN. VACUUM
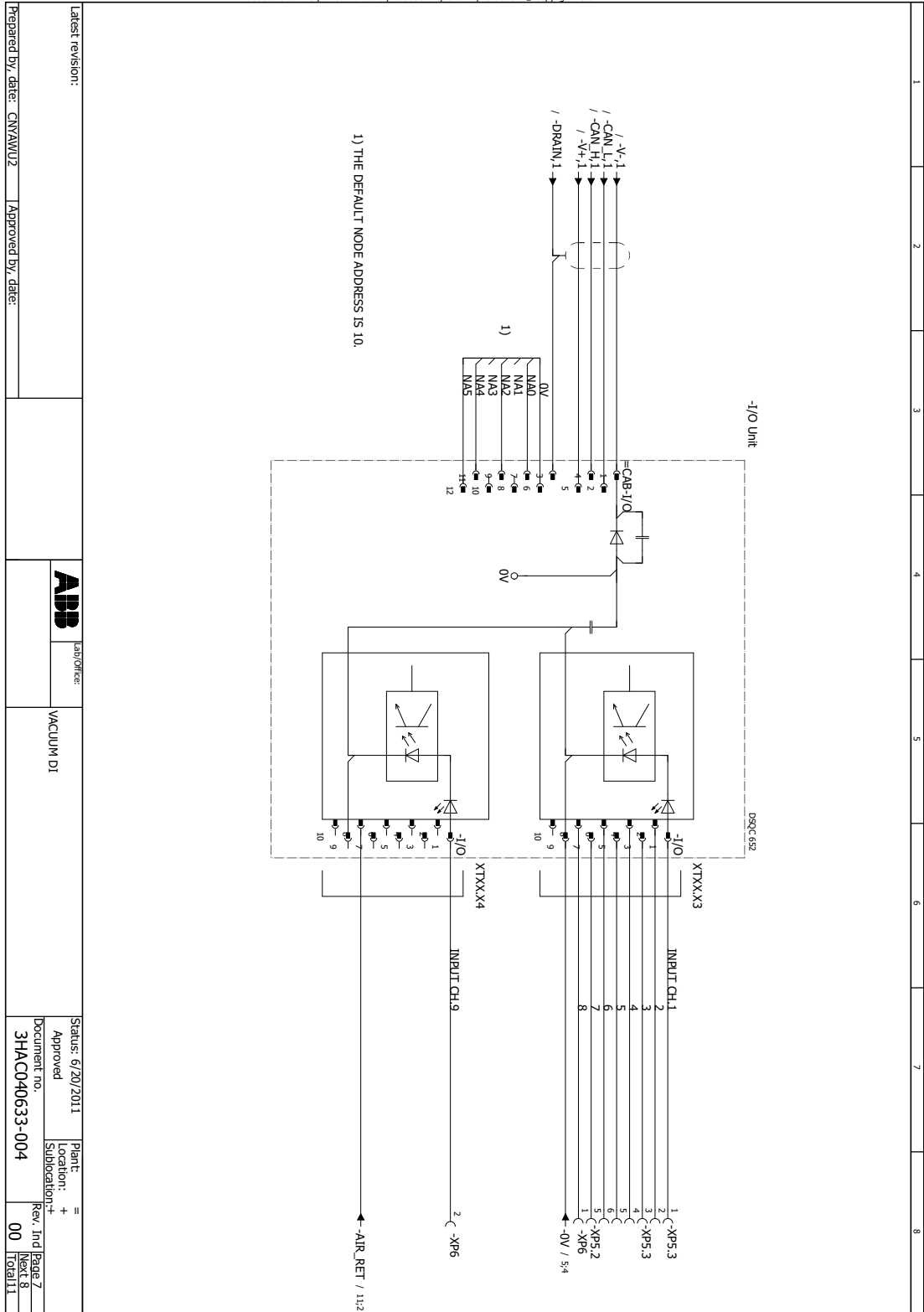
Status: 6/20/2011	Plant: =
Approved	Location: +
Document no.	Sublocation:+
3HAC040633-004	Rev. Ind	Page 9
	00	Next 10
		Total 11

-G.CP/CS

Terminal	Wire color	Signal
A / 1	WH	-DO_PALLET_OPEN / 11:7
B / 2	GN	-DO_PALLET_CLOSE / 11:8
C / 3	YE	-DO_POS_F / 11:2
D / 4	GY	-DO_POS_B / 11:2
H / 5	PK	-ZONE1 / 11:3
J / 6	BU	-ZONE2 / 11:3
K / 7	RD	-ZONE3 / 11:4
L / 8	VT	-ZONE4 / 11:4
M / 9	GY/PK	-ZONE5 / 11:5
N / 10	RD/BU	-ZONE6 / 11:5
P / 11	WH/GN	-ZONE7 / 11:5
R / 12	BN/GN	-ZONE8 / 11:6
S / 13	WH/YE	-ZONE9 / 11:6
T / 14	YE/BN	-ZONE10 / 11:7
U / 15		-DI_PALLET_OPEN / 10:3
X / 16		-DI_PALLET_CLOSE / 10:3
Y / 17		-DI_POS_F / 10:4
Z / 18		-DI_POS_B / 10:4
a / 19		-VACUUM_DET1 / 10:6
b / 20		-VACUUM_DET2 / 10:6
c / 21		-VACUUM_DET3 / 10:7
E / 22		-VACUUM_DET4 / 10:7 10:8
F / 23		-VACUUM_AIR_RETURN /
V / 25	24V	-VACUUM_AIR /
/ 27		-VACUUM_24V_3 / 10:1
/ 29		-VACUUM_24V_4 / 10:1
/ 31		-VACUUM_24V_5 / 10:1
/ 33		-VACUUM_24V_6 / 10:1
/ 35		-VACUUM_24V_7 / 10:1
/ 37		-VACUUM_24V_8 / 10:1
/ 39		-VACUUM_24V_2 / 11:8 11:8 11:8
W / 26	0V	-VACUUM_0V_2 / 10:2
/ 28		-VACUUM_0V_3 / 10:2
/ 30		-VACUUM_0V_4 / 10:2
/ 32		-VACUUM_0V_5 / 10:2
/ 34		-VACUUM_0V_6 / 10:2
/ 36		-VACUUM_0V_7 / 10:2
/ 38		-VACUUM_0V_8 / 10:2
/ 40		

3HAC040149-003-29

Continues on next page

FlexGripper-Vacuum sensor connection

3HAC040149-003-30

2.10.2. Pneumatic circuit

FlexGripper-Vacuum pneumatic circuit
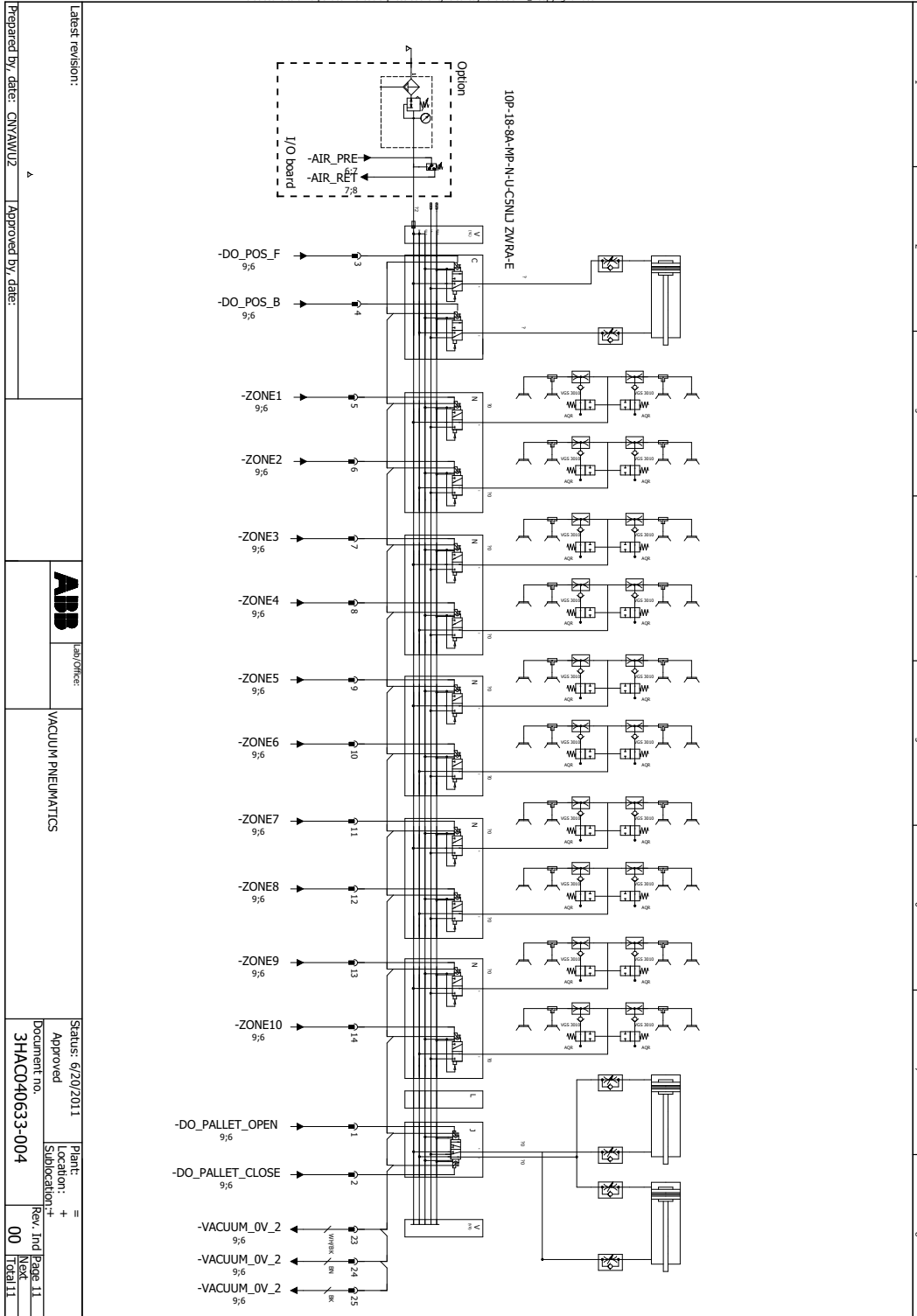
3HAC040149-003-31

3 FlexGripper UI

3.1 Software installation

3.1.1. Installing FlexGripper UI FlexPendant application

NOTE!

Only 24V power is used in FlexGripper.

Short circuit protection should be implemented by a fuse in the control cabinet by the customer.

Robot controller configuration requirement

Hardware	DSQC 652 board
RobotWare	RobotWare 5.13.02, includes the following options: • 617-1 FlexPendant Interface

FlexGripper UI FlexPendant application installation

Use the following procedure:

NOTE!

Before installing FlexGripper UI FlexPendant application, make sure that you have RobotStudio installed on your laptop.

1. Copy the FlexGripperUI folder into the mediapool folder of your laptop. Copy the MULTIFLEXGRIPPERUI folder from the FlexGripperUI FlexPendant GUI installation CD to C:\Program Files\ABB Industrial IT\Robotics IT\Mediapool on your laptop (If the path to mediapool folder is not as above, find the mediapool folder on your PC).

2. Create a robot controller system for FlexGripperUI with RobotStudio.

- On the Online ribbon-tab of RobotStudio, click System Builder to bring up a dialog box.
- In the Actions group click Create New... to start the wizard.
- Follow the instructions on the wizard to enter a name and path of the system, then enter a controller key and a drive key for the system.
- In the Add Additional Options page, browse and select the FlexGripperUI option key from C:\Program Files\ABB Industrial IT\Robotics IT\Mediapool\MULTIFLEXGRIPPERUI\Internal_Use_Key. Then click the arrow to add the FlexGripperUI option key to the Added options list. Click Next to go to the next page.
- In the Modify Options page, make sure the following options are selected: a DeviceNet option (according to your hardware configuration), 616-1 PC Interface, 617-1 FlexPendant Interface and MULTIFLEXGRIPPERUI.
- Click Finish. The controller system is created. See Operating manual - RobotStudio for more detailed information.

3. Download the system to robot controller.

4. Warm start the controller.

The FlexGripperUI application icon is shown on the ABB main menu on the FlexPendant.

Note: For the FlexGripper UI option, Singleclamp option represents FlexGripper-Clamp 1, Twoclamp option represents FlexGripper-Clamp 2, Vacuum option represents FlexGripper-Vacuum, Claw option represents FlexGripper-Claw.
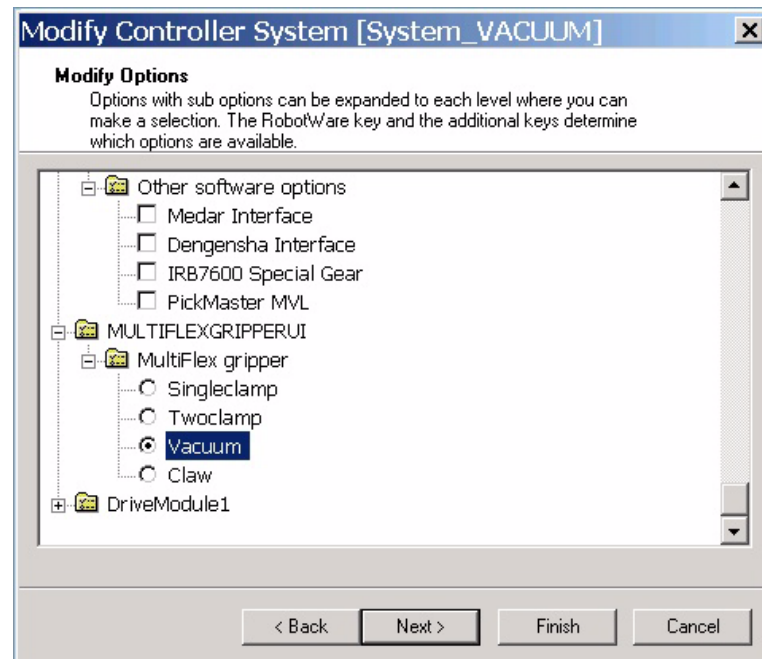
en1011047

3.1.2. I/O signal configuration

FlexGripper-Vacuum signal configration

I/O signal	I/O board	Controller	Electric box		
			Signal	24V	0V
DO1001(DO10_01_PalletPicker_Open)	DO1	XT5.1.1	1	-	28
DO1002(DO10_02_PalletPicker_Close)	DO2	XT5.1.2	2		
DO1003(DO10_03_Postion Seacher_Forward)	DO3	XT5.2.1	3		
DO1004(DO10_04_Postion Seacher_Backward)	DO4	XT5.2.2	4		
DO1005(DO10_05_Zone1)	DO5	XT5.2.3	5		
DO1006(DO10_06_Zone2)	DO6	XT5.2.4	6		
DO1007(DO10_07_Zone3)	DO7	XT5.1.9	7		
DO1008(DO10_08_Zone4)	DO8	XT5.1.10	8		
DO1009(DO10_09_Zone5)	DO9	XT5.1.11	9		
DO1010(DO10_10_Zone6)	DO10	XT5.1.12	10		
DO1011(DO10_11_Zone7)	DO11	XT5.1.3	11		
DO1012(DO10_12_Zone8)	DO12	XT5.1.4	12		
DO1013(DO10_13_Zone9)	DO13	XT5.1.5	13		
DO1014(DO10_14_Zone10)	DO14	XT5.1.6	14		
DI1001(DI10_01_PalletPicker1_Open)	DI1	XT5.3.1	15	29	30
DI1002(DI10_02_PalletPicker1_Close)	DI2	XT5.3.2	16	29	30
DI1003(DI10_03_PostionSeacher_Searched)	DI3	XT5.3.3	17	31	32
DI1004(DI10_04_PostionSeacher_Backed)	DI4	XT5.3.4	18	31	32
DI1005(DI10_05_PartCheck1), for photoelectrical sensor 1	DI5	XT5.3.5	19	33	34
DI1006(DI10_06_PartCheck2), for photoelectrical sensor 2	DI6	XT5.3.6	20	35	36
DI1007(DI10_07_PartCheck3), for photoelectrical sensor 3	DI7	XT5.2.5	21	37	38
DI1008(DI10_08_PartCheck4), for photoelectrical sensor 4 and 5	DI8	XP6.1	22	39	40
DI1009(DI10_09_AirPressure),for compressed air source pressure detection	DI9	XP6.2	23	25	
	24V	XP6.3			
	0V	XP6.4			

3.1.3. Back-up and I-Start

Back up the system

Use this procedure to back up your system:

NOTE!

We recommend performing a backup:

- Before installing a new RobotWare.

- Before making any major changes to instructions and/or parameters to make it possible to return to the previous settings.

- After making any major changes to instructions and/or parameters and testing the new settings to retain the new successful setting.

1. Tap the ABB menu and then tap Backup and Restore.

2. Tap Backup Current System....A page showing the selected path opens.

3. Specify a backup folder name and path.

4. Tap Backup.

A backup folder is created according to your settings.

Restart and return to default setting (I-start)

Use this procedure to make an I-start

NOTE!

After I-start, the system's state will be resumed but any changes done to system parameters and other settings will be lost. Instead, system parameters and other settings are read from the originally installed system on delivery. Therefore it is important to always make a back up before I-start.

1. Make a backup of the system.

2. On the ABB menu, tap Restart. The restart page is displayed.

3. Tap Advanced... to select restart method. The select restart method dialog is displayed.

4. Tap I-start, then tap OK.

5. Restore the backup system.

3.2 Operation

3.2.1. FlexGripper UI main interface

Enter FlexGripper UI
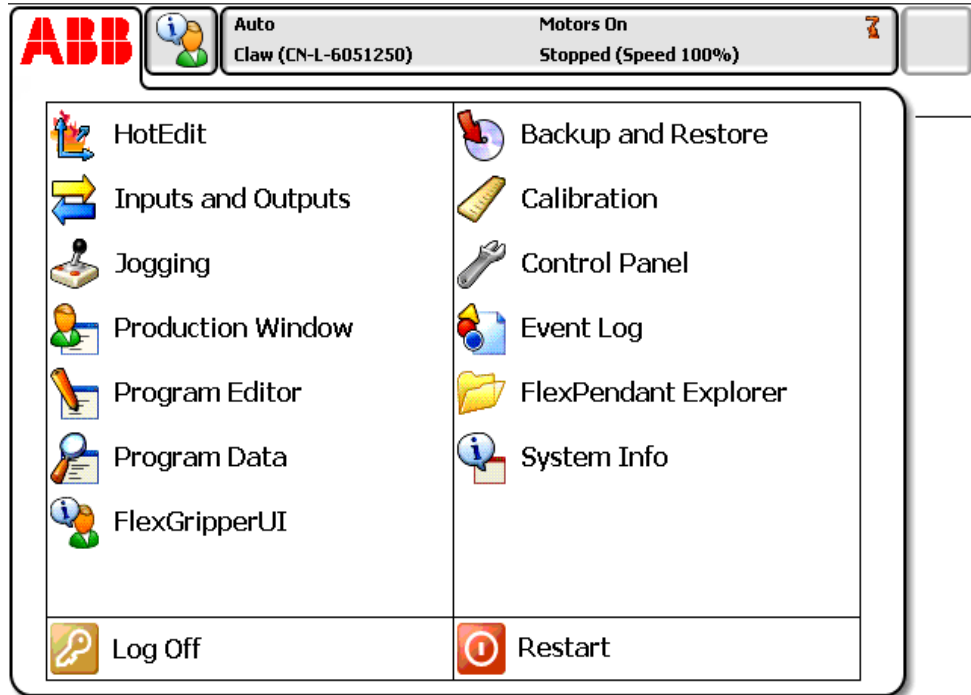
en1011048

The FlexGripper UI has three function blocks: Tool handle, TCP edit and Production which you can see after entering the main interface.

en1011049

3.2.2. Tool handle

3.2.2.1. FlexGripper function test

FlexGripper-Vacuum function test

Touch Tool handle button, the following interface would show up
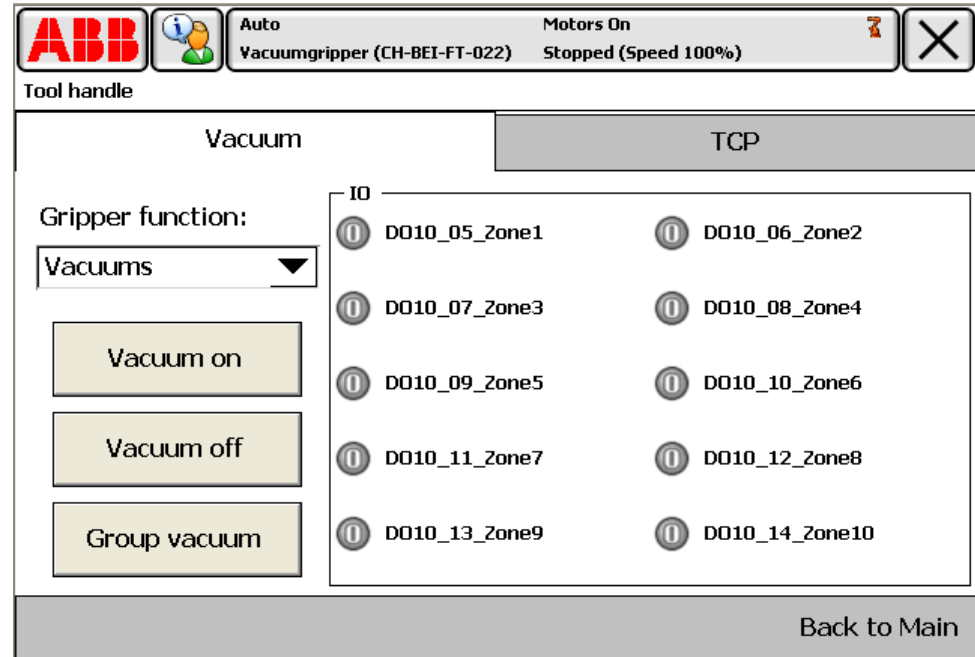
en1011050

3.2.2.1. FlexGripper function test

Continued

Users can operate functions displayed and check if the corresponding signals status right. By the FlexGripper function dropdown list, users can choose Vacuums, PalletPicker or PalletSearch to do the corresponding function test.

Function and signal status table (FlexGripper-Vacuum)

Function type	Function name	Action description	Signal status
Vacuums	Vacuum On	Turn on the vacuum source of all the vacuum cups at the same time.	DO10_05_Zone1 DO10_06_Zone2 DO10_07_Zone3 DO10_08_Zone4 DO10_09_Zone5 DO10_10_Zone6 DO10_11_Zone7 DO10_12_Zone8 DO10_13_Zone9 DO10_14_Zone10 all turn to 0 and extinguish
	Vacuum Off	Turn off the vacuum source of all the vacuum cups at the same time	DO10_05_Zone1 DO10_06_Zone2 DO10_07_Zone3 DO10_08_Zone4 DO10_09_Zone5 DO10_10_Zone6 DO10_11_Zone7 DO10_12_Zone8 DO10_13_Zone9 DO10_14_Zone10 all turn to 1 and light up
	Group Vacuum	Group vacuum cups into groups and on different vacuum rails	Refer to Group activity
PalletPicker	Close	Close pallet picker	DO10_02_PalletPicker1_Close turns to 1 and lights up
	Open	Open pallet picker	DO10_01_PalletPicker1_Open turns to 1 and lights up

Function type	Function name	Action description	Signal status
Palle-tSearch	Forward	Search cylinder move forward	DO10_03_PositionSearcher_Forward turns to 1 and lights up
	Backward	Search cylinder move backward	DO10_04_PositionSearcher_Backward turns to 1 and lights up
Product drop detection		To detect if the product drop down. When the product is gripped, the corresponding photoelectric sensor would keep light on.	If one of the products drops, the corresponding signal in DI10_05_PartCheck1 DI10_06_PartCheck2 DI10_07_PartCheck3 DI10_08_PartCheck4 would turn to 0 and turn off.

Group activity

Group function is used for build vacuum groups. Every two adjacent vacuum cups share a vacuum generator. Every vacuum cup pair and the opposite vacuum cup pair on the other vacuum rail form one control zone. There are totally ten vacuum zones which can be controlled separately.

Touch Group vacuum button, the following interface shows up:
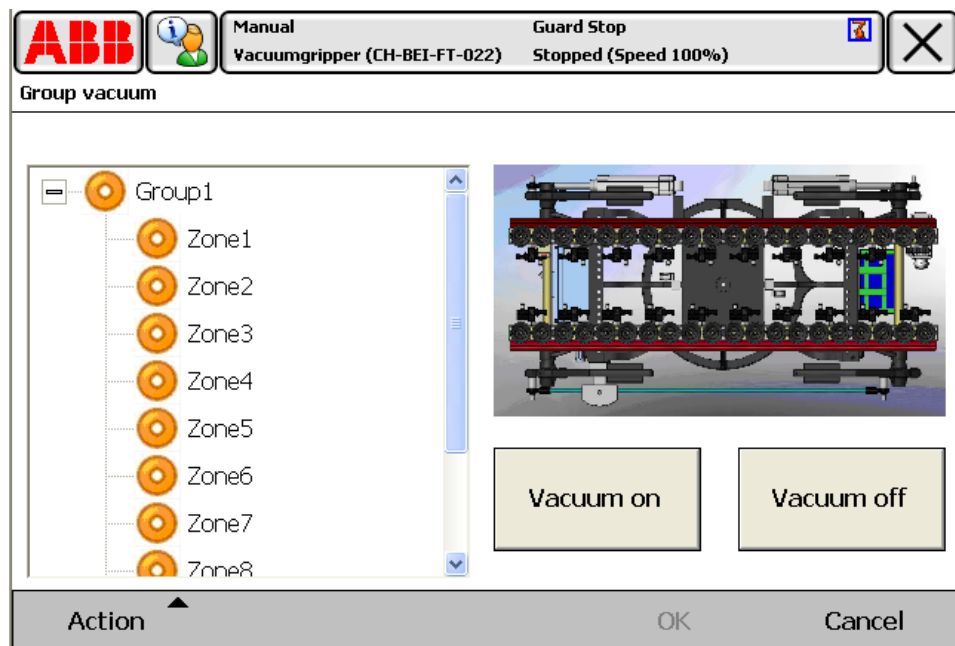
en1011051

3.2.2.1. FlexGripper function test

Continued

Select the desired group, tap Vacuum on or Vacuum off button, the vacuum source of selected vacuum groups would be turn on or shut down accordingly. Users can operate functions displayed and check if the corresponding signals status right. Function and signal status table for default vacuum group:

Group name	Button name	Action description	Signal status
Group 1	Vacuum On	Turn on the vacuum source of all vacuum cups in group 1 at the same time.	DO10_05_Zone1 DO10_06_Zone2 DO10_07_Zone3 DO10_08_Zone4 DO10_09_Zone5 DO10_10_Zone6 DO10_11_Zone7 DO10_12_Zone8 DO10_13_Zone9 DO10_14_Zone10 all turn to 0 and turn off
	Vacuum off	Cut off the vacuum source of all vacuum cups in group 1 at the same time.	DO10_05_Zone1 DO10_06_Zone2 DO10_07_Zone3 DO10_08_Zone4 DO10_09_Zone5 DO10_10_Zone6 DO10_11_Zone7 DO10_12_Zone8 DO10_13_Zone9 DO10_14_Zone10 all turn to 1 and light up

Users can edit the vacuum group. Following is the action list that could be executed when selecting a group:

Action	Description	Procedure
Add Group	Add new groups	Touch Action -> Add group, a soft keyboard would show up. Input the group name. The name can only contains numbers, letters and underline signals with name length no more than 25 characters.
Delete Group	Delete vacuum groups	Select the group to be deleted, touch Action -> Delete Group, A message window would pop up confirming the action. Click OK to confirm the deletion. Click Cancel to cancel the edition.
Zone edit	Add or delete a vacuum zone to the selected group	Select the group to which a vacuum zone would be added. A vacuum zone list would show up in the right in which selected cups would be marked with a tick and unselected cups would leave unmarked. Select or deselect the vacuum zone that to be added or deleted, and touch OK.Click Back to cancel the edition.

Continues on next page

Users can edit the vacuum zone. Following is the action list that could be executed when selecting a zone:

Action	Description	Procedure
Zone edit	Add or delete a vacuum zone to the selected group	Select the vacuum zone to be added or deleted. A vacuum zone list would show up in the right in which selected cups would be marked with a tick and unselected cups would leave unmarked. Select or deselect the vacuum zone that to be added or deleted, and touch OK. Click Back to cancel the edition.

NOTE!

After entering the main interface and touch any of the buttons, a warning message would show up prompting converting to the manual mode.

3.2.2.2. TCP edit

Note: The TCP configuration includes three elements: TASK, Storage type and Scope.

Their scopes are:

Task: T_ROB1

Storage type: Persistent and variable

Scope: Task, Global and Local

If the scope and storage type of the TCP is not correct it can not be monitored.

Touch TCP tab, the following interface would shows:
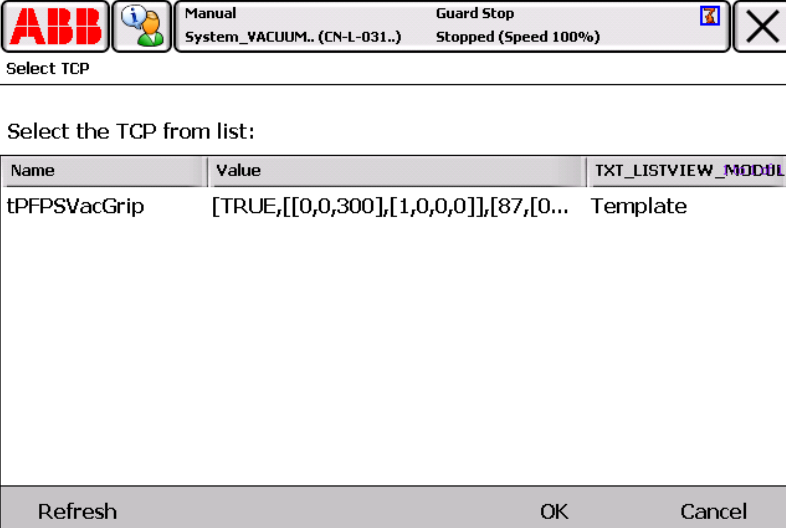
en1011057

The grey column indicates data columns are not editable. The white columns indicate they are in editable mode.

TCP operation

Action	Procedure
Select TCP	Touch Select TCP button, then the TCP list shows. en1011058 Select the TCP needed, and touch OK. The related parameters of the TCP are automatically loaded into the Tool field on the left and the Load field on the right.
Edit TCP	Choose the "Edit TCP" button, the column turns from grey to white indicating the content is editable. Choose one field, a soft keyboard shows which is used to input TCP data. en1011059 The soft keyboard consists of 0-9 numbers, positive/negative sign (+/-), decimal point, and an arrow left/right symbol used to move cursor left/right. The cross button has the function of backspace. For data description and valid data scope, see Table TCP Parameter description, After the editing, touch OK to confirm the editing. Then touch Apply, the editing is saved which is indicated by the data input columns turning grey.
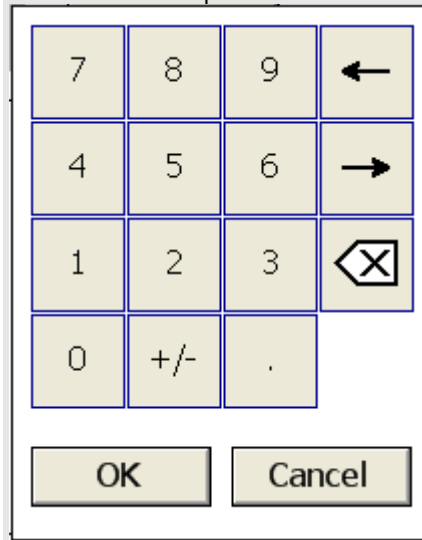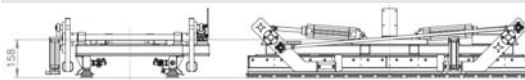
3.2.2.2. TCP edit

Continued

TCP Parameter description

Type	Parameter	Description
Tool	trans x	The X-value of TCP position in mm
	trans y	The Y-value of TCP position in mm
	trans z	The Z-value of TCP position in mm
	rot q1	The q1 value in the quaternion (q1, q2, q3, q4) of the orientation of the tool coordinate system
	rot q2	The q2 value in the quaternion (q1, q2, q3, q4) of the orientation of the tool coordinate system
	rot q3	The q3 value in the quaternion (q1, q2, q3, q4) of the orientation of the tool coordinate system
	rot q4	The q4 value in the quaternion (q1, q2, q3, q4) of the orientation of the tool coordinate system
Load	mass	The weight of the tool in kg.
	cog x	The X-value of the center of gravity of the tool load (x, y and z) in mm
	cog y	The Y-value of the center of gravity of the tool load (x, y and z) in mm
	cog z	The Z-value of the center of gravity of the tool load (x, y and z) in mm
	inertia x	The X-value of the moments of inertia of the tool relative to its center of mass around the tool load coordinate axes in kgm2
	inertia y	The Y-value of the moments of inertia of the tool relative to its center of mass around the tool load coordinate axes in kgm2
	inertia z	The Z-value of the moments of inertia of the tool relative to its center of mass around the tool load coordinate axes in kgm2

Default TCP of FlexGrippers

FlexGripper type	Default TCP value	Default TCP location illustration
FlexGripper-Vacuum	[TRUE, [[0,0,158], [1,0,0,0]], [64, [-10.5,12.8,59.8], [1,0,0,0],4.817,0,8.722]]	en1011081

NOTE!

The default TCP is only valid with no prodcut is gripped by the FlexGripper. After the product is gripped, the TCP location should be adjusted according to the new center of gravity.

If the user want to add TCP themselves, they can add TCP in the program. Then the newly added TCP can be shown in the TCP list when tapping Select TCP in the TCP interface.

3.2.3. Tune

3.2.3.1. Position Tune

The position tune function is used to fine tune the robot target location as the pick/place location and home location.

Note: The robot target configuration includes three elements: TASK, Storage type and Scope.
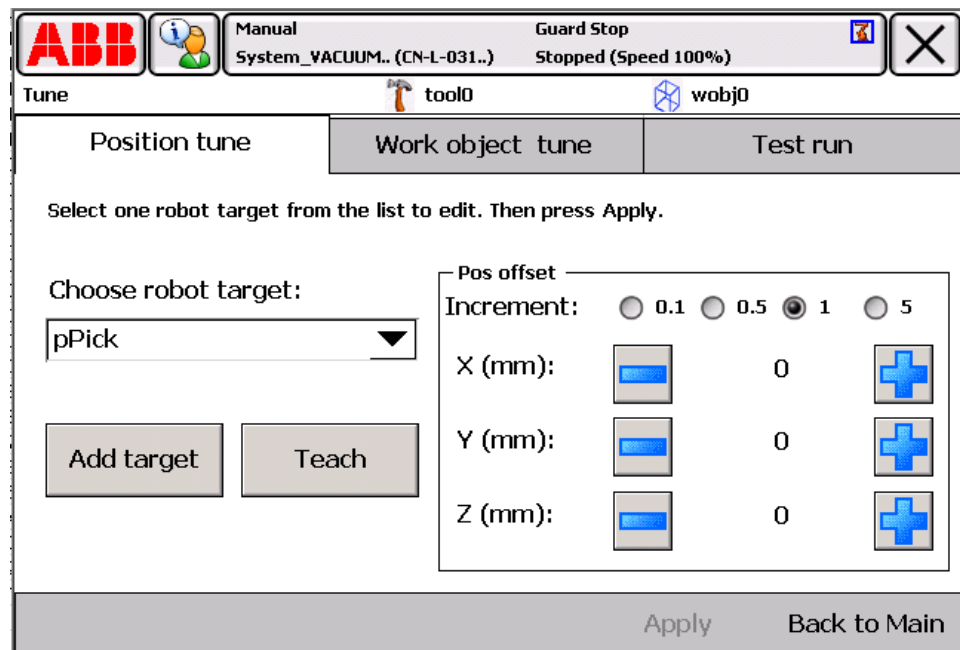
Their scopes are:

 Task: T_ROB1

Storage type: Persistent and variable

Scope: Task, Global and Local

If the scope and storage type of the robot target is not correct it can not be monitored.

Touch the Tune button in the FlexGripper UI main interface, and enter the Tune interface. By default, there are three robot targets listed: pPick, pPlace and pHome (For FlexGripper-Vacuum, there are three more targets: pPickPallet, pSearch and pSearchEnd).

en1011060
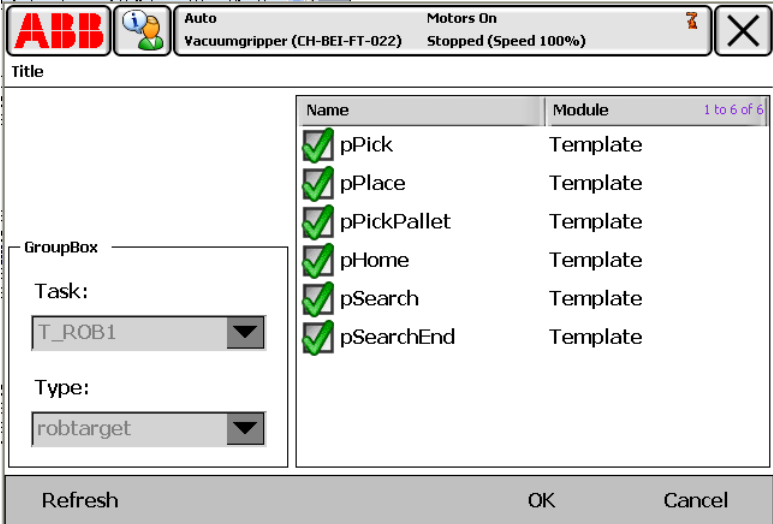
3.2.3.1. Position Tune

Continued

Robot target edit

Action	Procedure
Add target	Touch the Add target button, in the screen shown, the left side shows the target contribution, ie Task, Type, the right side shows the target list with the module described. Select the target needed, which is then ticked in the square before its name.

en1011061

The targets listed are selected by default. Touch the target to remove the tick and deselect a target. Select OK, the selected targets are added to the Choose robot target column.

Teach target	Touch the Teach button, the selected robot target position is taught. Meanwhile the corresponding parameters of the TCP are automatically loaded into the Pos offset column.
Target position offset	After target teach, if the robot doesn't reach the exact position, the offset function can be used to fine tune the robot target. In the Pos offset column, touching the plus sign increases the position in mm and the minus sign decreases it. The increment unit can be adjusted in 0.1mm, 0.5mm, 1mm or 5mm. After the offset, touch Apply, the offset target is saved.

3.2.3.2. Work object tune

A work object is a coordinate system used to describe the position of a work piece. The work object consists of two frames: a user frame and an object frame. All programmed positions will be related to the object frame. The object frame is related to the user frame and the user frame is related to the world coordinate system.

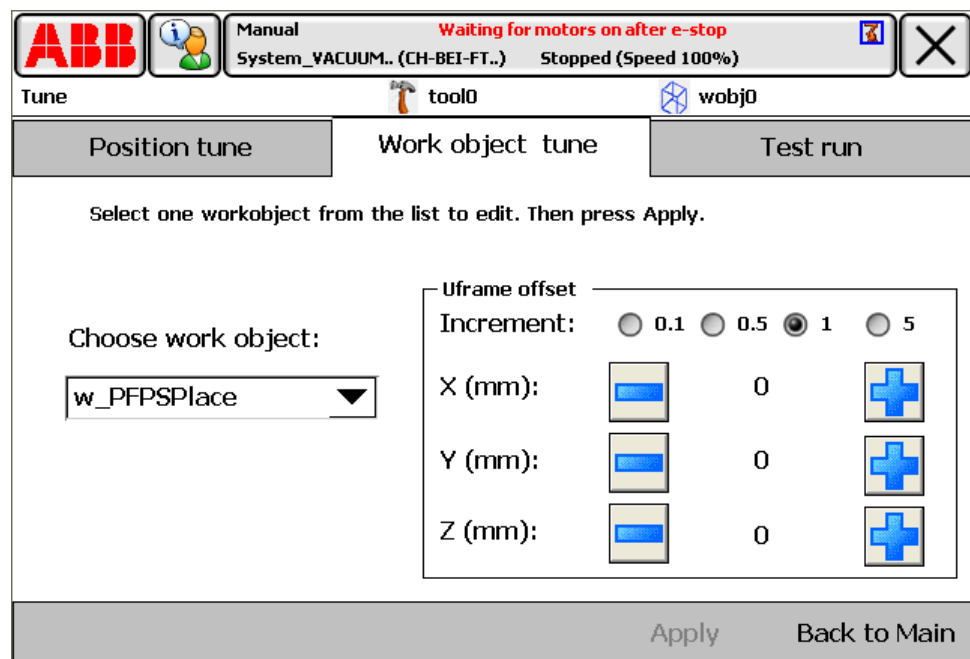Note: The work object configuration includs three elements: TASK, Storage type and Scope. Their scopes are:

Task: T_ROB1

Storage type: Persistent and variable

Scope: Task, Global

If the scope and storage type of the work object is not correct it can not be monitored.

Touch the Work object tune tab to enter the work object tune interface.

en1011062

Work object tune operation

Action	Procedure
Choose work target	Choose work object from the drop down list on the left. The work object (x, y, z) in mm shows up on the right.
Tune the work object	Touch the minus button to decrease the value and the plus button to increase the value. The tuning unit can be 0.1mm, 0.5mm, 1mm or 5 mm. After editing, touch Apply, the modification is saved.

3.2.3.3. Test run

After the TCP edit, Position tune and work object tune, the functions defined in the Template system module can be tested in Test run. For FlexGripper-Vacuum, after entering the Test run interface, the following interface shows:
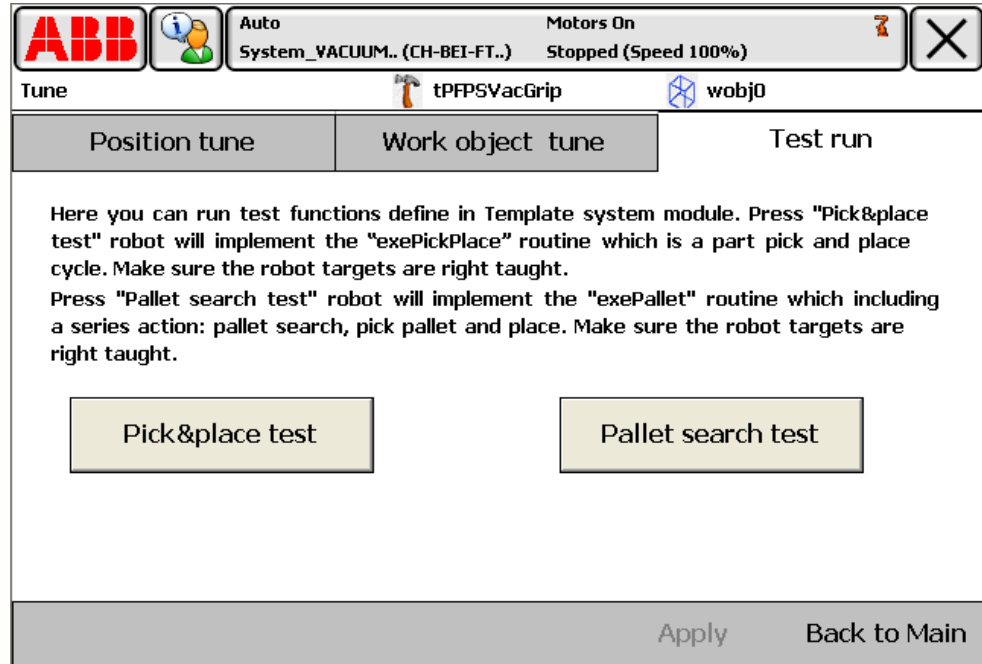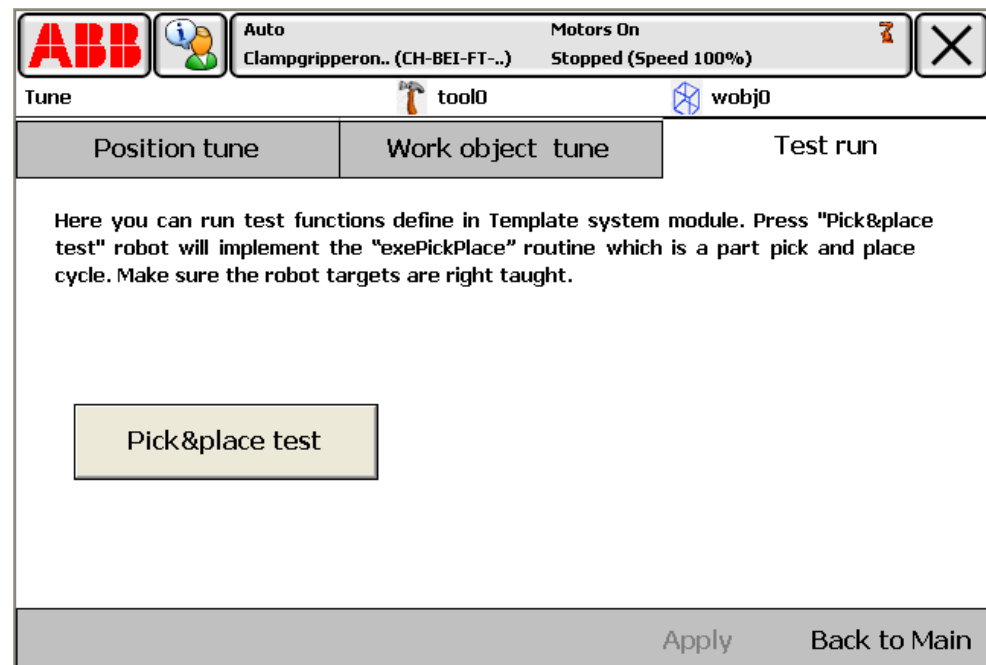

en1011065

Press the Product Pick&place button, the robot implements the exePickPlace routing which includes a part pick and place cycle. Press the Pallet pick&place button, the robot will implement the exePallet routing which includes a series action: pallet search, pick pallet and place.

NOTE!

when pressing any of the test buttons, a message shows prompting you to press the run button. Press the run button. Before the test, the TCP should be edited according to the real payload in testrun.

In the pick operation and place operation, the loads of the FlexGripper are different. So the user must set the new TCP, payload and work object according to the different load situation.

For FlexGripper-Clamp (FlexGripper-Clamp 1, FlexGripper-Clamp 2) and FlexGripper-Claw, after entering the Test run interface:

en1011066

Press the Pick&place test button, the robot implements the exePickPlace routing which includes a part pick and place cycle.

Note: when pressing any of the test buttons, a message shows prompting you to press the run button. Press the run button. Before the test, the TCP should be edited according to the real payload in test run, and all the robot target positions must be accurate.

In the pick operation and place operation, the loads of the FlexGripper are different. So the user must set the new TCP, payload and work object according to the different load situation.

3.2.4. Production

3.2.4.1. Production monitor

The production interface shows monitor signals on the left and monitor variables on the right. Users can monitor the production by the status of signals and variables. Users can check if the signal status or variable status is correct. If it is not in the right condition, check the corresponding equipment.
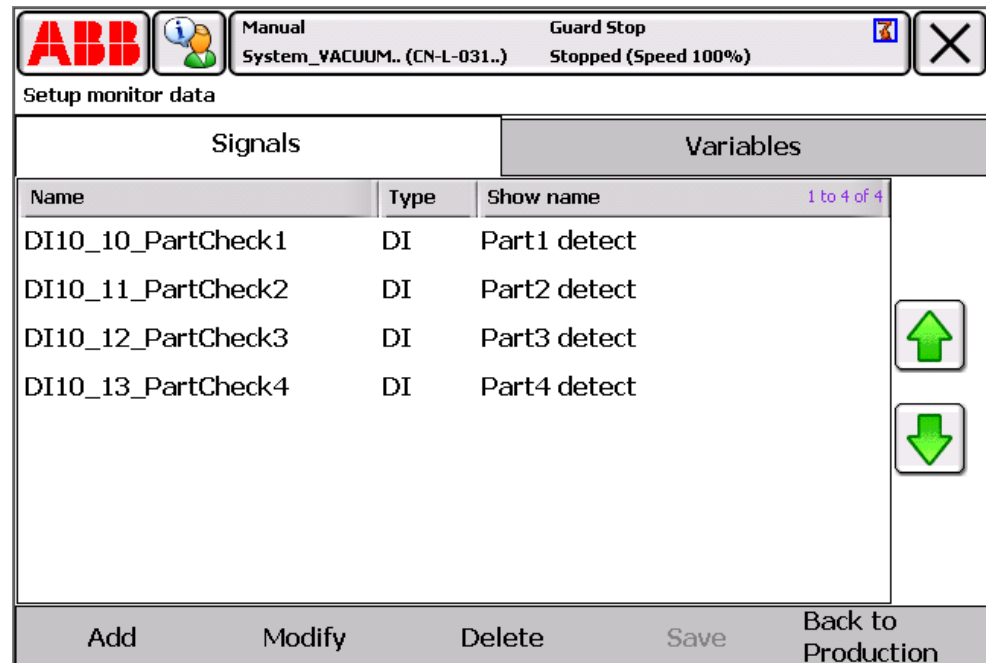
3.2.4.2. Setup

The production interface shows monitor signals on the left and monitor variables on the right. The monitoring signals and variables shown can be set by the Setup function.
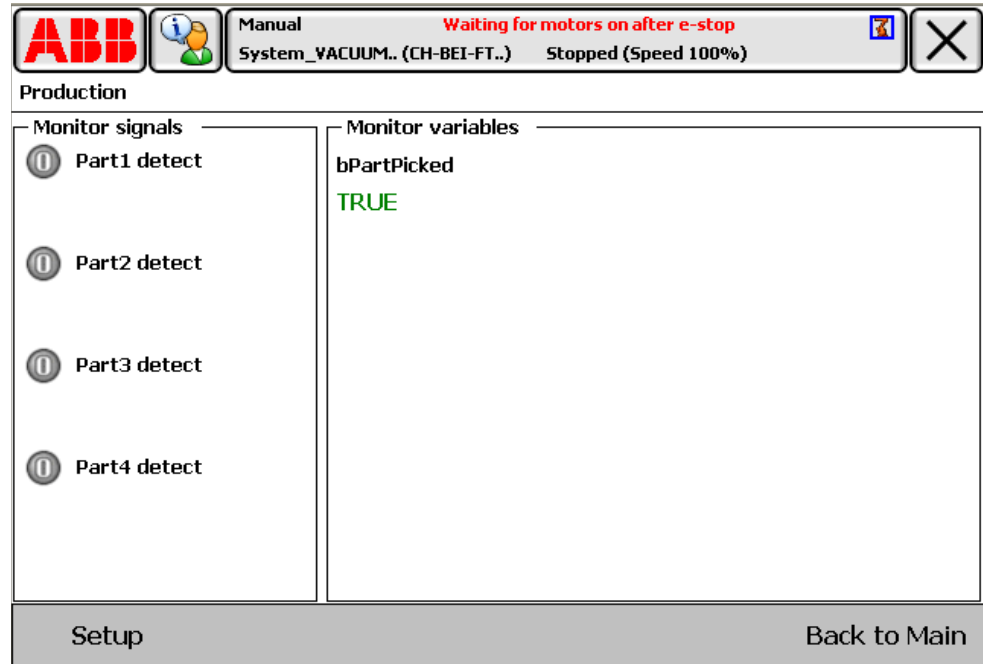
en1011067

Touch the Setup button, the following interface with signal list shows.
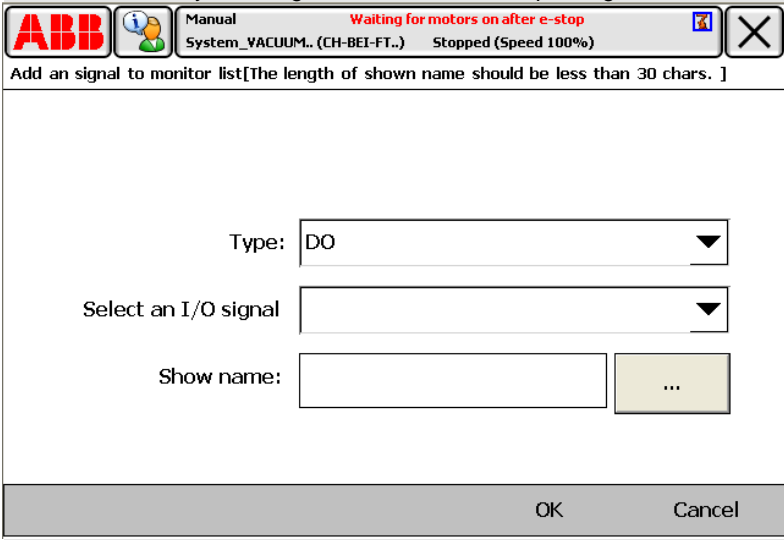

en1011068

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3.2.4.2. Setup

Continued

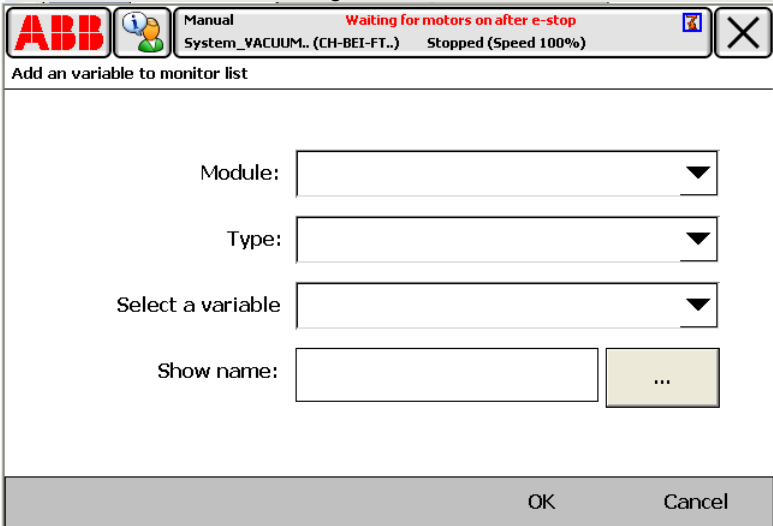After selecting one of the signals, using the two arrows buttons (see picture above) on the right to choose former signals or signals below.

Use the yellow double triangle/single triangle buttons to go to the first/last page or to move the page up/down.

Signal edit

Action	Procedure
Add signal	Touch Add button, then choose signal type, the signal to be added and edit its shown name by touching the button with an ellipsis sign. en1011073 A soft keyboard shows. Choose signal type for the signal to be added, edit its name by touching the button with an ellipsis. Type in the signal name. The signal name should be no longer than 25 characters which can only include numbers, letters and underline sign. Note: No more than 12 signals can be added.
Modify signal	Select the signal to be modified and press the Modify button. You can then modify its type, signal and name in the dropdown list or the soft keyboard. Press cancel if no modification is needed.
Delete signal	Select the signal to be deleted and press delete. The signal is then deleted from the monitor signal list.

Variable edit

Action	Procedure
Add variable	Touch Add button, the following interface shows: en1011074 Choose the module followed by the variable type to be added from the dropdown list. You can edit its name by selecting the button with the ellipsis. A soft keyboard shows with which you can enter the variable name. Note: The variable shown name should be no longer than 25 characters which can include numbers, letters and the underline sign. Note: No more than 12 variables can be added.
Modify variable	Select the variable to be modified and press the modify button. The variable, its module, type and name can be modified in the drop dropdown list or by using the soft keyboard. Select cancel if no modification is needed.
Delete variable	Select the variable to be deleted and press delete. The variable is deleted from the monitor variable list.

When you have finished editing, select Save to save any changes. Press the Back to Production button to return to the Production main interface.

NOTE!

The variable configuration includes three elements: TASK, Storage type and Scope.

Their scopes are:

 Task: T_ROB1;

Scope: Global, Task and local

Storage type: only Persistent

If the scope and storage type of the variable is not correct it can not be monitored.

3.3. Trouble shooting

Variable can not be monitored

Description	Can not monitor the variables
Possible reason	• The scope of variable is not correct • The storage type of variable is not correct
Solution	• Make sure the variable and the storage type are correct

The valid scope of variables is:

Task: T_ROB1;

Scope: Global, Task and local

Storage type: Persistent

TCP can not be edited

Description	Can not edit the TCP
Possible reason	• The scope of the TCP is not correct • The storage type of the TCP is not correct
Solution	• Make sure the scope and the storage type are correct

The valid scope of TCP is:

Task: T_ROB1;

Scope: Global, Task and local

Storage type: Persistent and Variable

Robot target can not be edited

Description	Can not edit the robot target
Possible reason	• The scope of the robot target is not correct • The storage type of the robot target is not correct
Solution	• Make sure the scope and the storage type are correct

The valid scope of robot target is:

Task: T_ROB1;

Scope: Global, Task and local

Storage type: Persistent and Variable

Work object can not be edited

Description	Can not edit the work object
Possible reason	• The scope of the work object is not correct • The storage type of the robot target is not correct
Solution	• Make sure the scope and the storage type are correct

Continues on next page

Continued
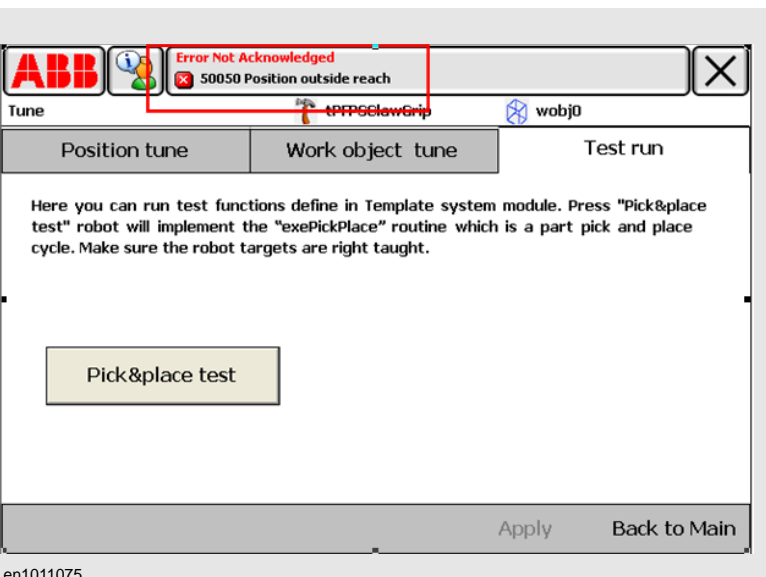
The valid scope of the work object is:

Task: T_ROB1;

Scope: Global, Task

Storage type: Persistent and Variable

FlexGripper UI icon can not be displayed on the ABB main menu of the FlexPendant

Description	Can not display FlexGripper UI icon on FlexPendant
Possible reason	• The FlexGripper UI FlexPendant application is installed incorrectly. • The FlexPendant Interface option is not selected when creating a robot system.
Solution	Check if the FlexGripper UI option is selected for the current system from ABB main menu->SystemInfo->SystemProperties->Additional Option on the FlexPendant. If the option is not displayed in the list, reinstall the TrueView application.

Position out of reach

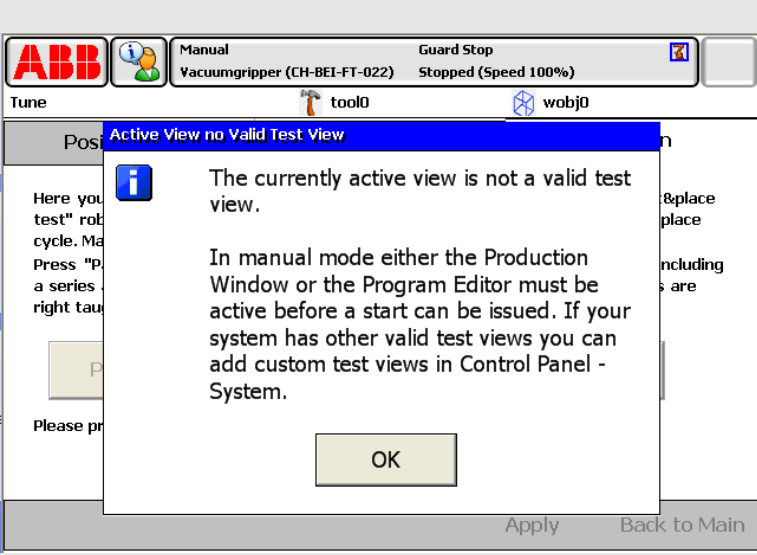|	
Description	en1011075
Possible reason	Robot target position is out of reach of the robot.
Solution	Check and change the robot target position to a valid scope.

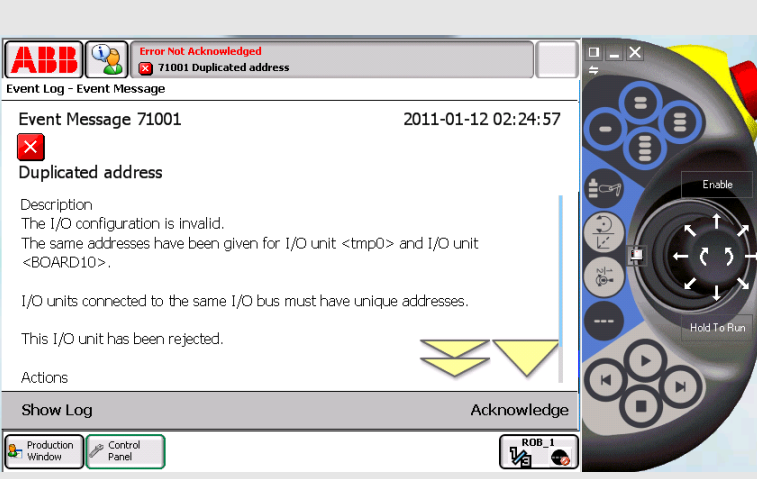*Continues on next page*

3.3. Trouble shooting

Continued

Active view no valid test view

Description	
	\nen1011075
Possible reason	The current test view is not a valid test view.
Solution	Enter Control panel->Flexpendant-> AdditionalTestView, check if the test view of the FlexGripper UI is selected.

Two many views

Description	When all the 6 places of the task bar are occupied by views, a warning message box will pop up when clicking on the GUI icon.
Possible reason	Too many views are opened at the same time.
Solution	Close one or more of the views not in use.

Duplicated adress

Description	
	\nen1011075
Possible reason	Two I/O units with the same addresses name'BOARD10'.

ABB

Continued

Solution	Enter Control panel->Configration-> Unit->BOARD10, edit the addresses name to BOARD11.
	Before software installation, edit the content 'DN_Address 10' to 'DN_Address 11' in EIO.cfg. For example, C:\Program Files\ABB Industrial IT\Robotics IT\MediaPool\FlexGripperUI\Syspar\Vacuum\EIO.cfg.

3.3. Trouble shooting