

# **R1C**



## **R1C / R1C-4 Control Unit**

**PickAPP application**



CR00758136\_en-02/2017.11

**Instruction Handbook**

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# PREFACE

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- [Symbols used in the manual](#)
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## Symbols used in the manual

The symbols for **WARNING**, **CAUTION** and **NOTES** are indicated below together with their significance.



This symbol indicates operating procedures, technical information and precautions that if ignored and/or are not performed correctly could cause injuries.



This symbol indicates operating procedures, technical information and precautions that if ignored and/or are not performed correctly could cause damage to the equipment.



This symbol indicates operating procedures, technical information and precautions that it are important to highlight.

## Reference documents

This document refers to **PickAPP** software application for **R1C/R1C-4** Control Unit.

In addition to the current manual, the complete manuals set for **R1C/R1C-4** consists of:

Comau	Control Unit	<ul style="list-style-type: none"><li>– Technical Specifications</li><li>– Transport and installation</li><li>– Control Unit Use.</li></ul>
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These manuals are to be integrated with the following documents:

Comau	Robot	<ul style="list-style-type: none"><li>– Technical Specifications</li><li>– Transport and installation</li><li>– Maintenance</li></ul>
	Programming	<ul style="list-style-type: none"><li>– Motion programming</li></ul>
	Applications	<ul style="list-style-type: none"><li>– According to the required type of application.</li></ul>

## Modification History

In the current manual version 02/2017.11, compared to previous version, the following important modifications have been made:

- description of [Integrated Vision System \(optional feature\)](#).

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# 1. GENERAL SAFETY REQUIREMENTS



This chapter deals with general specifications that apply to the whole Robot System. Considering its significance, this chapter is referred unreservedly in each system instructions handbook.

This chapter deals with the following topics:

- [Responsibilities](#)
- [Safety Requirements](#).

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## 1.1 Responsibilities

- The system integrator is responsible for ensuring that the [Robotic System \(Robot and Control Unit\)](#) is installed and handled in accordance with the Safety Standards in in the country where the installation takes place. The application and use of the necessary protection and safety devices, the issuing of declaration of conformity and any EC marking of the system are the responsibility of the Integrator.
- COMAU refuses any responsibility for accidents caused by incorrect or improper use of the [Robotic System \(Robot and Control Unit\)](#), by tampering with circuits, components, software and with the use of spare parts that are not included in the spare parts list.
- The application of these Safety Requirements is the responsibility of the persons assigned to direct / supervise the activities indicated in the section [Applicability](#), which should make sure that the [Authorised Personnel](#) is aware of and scrupulously follow the requirements contained in this document in addition to the general Safety Standards applicable to [Robotic System \(Robot and Control Unit\)](#) in in the Country where the system is installed.
- The non-observance of the Safety Standards may cause to the operators permanent injuries or death and can damage the [Robotic System \(Robot and Control Unit\)](#).



The installation shall be carried out by qualified Personnel and must conform to all National and Local standards.



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### 1.1.1 Safety Fundamental Requirements Applied and Respected

The robotic system is composed of Control Unit and Robot series SMART 5 considers as applied and respected the following Safety Fundamental Requirements, Annex 1 of Directive on Machinery 2006/42/CE: 1.1.3 – 1.1.5 – 1.2.1 – 1.2.2 – 1.2.3 – 1.2.4.3 – 1.2.5 – 1.2.6 – 1.3.2 – 1.3.4 – 1.3.8.1 – 1.5.1 – 1.5.2 – 1.5.4 – 1.5.6 – 1.5.8 – 1.5.9 – 1.5.10 – 1.5.11 – 1.5.13 – 1.6.3 – 1.6.4 – 1.6.5 – 1.7.1 – 1.7.1.1 – 1.7.2 – 1.7.4.

In case it is provided only the Robot series SMART 5 are to be considered as applied the following requirements: 1.1.3 – 1.1.5 – 1.3.2 – 1.3.4 – 1.3.8.1 – 1.5.1 – 1.5.2 – 1.5.4 – 1.5.6 – 1.5.8 – 1.5.9 – 1.5.10 – 1.5.11 – 1.5.13 – 1.6.4 – 1.6.5 – 1.7.1 – 1.7.1.1 – 1.7.2 – 1.7.4.

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## 1.2 Safety Requirements

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### 1.2.1 Purpose

These safety requirements are aimed to define the behaviour and obligations to be observed when performing the activities listed in the [Applicability](#) section.

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### 1.2.2 Definitions

#### **Robotic System (Robot and Control Unit)**

Robotic system is the workable assembly composed of: Robot, Control Unit, Teach Pendant and other possible options.

#### **Protected Area**

The protected area is the zone confined by the protection barriers and intended to be used for the installation and operation of the Robot.

#### **Authorised Personnel**

Authorised personnel defines the group of persons who have been appropriately trained and assigned to carry out the activities listed in the section [Applicability](#).

#### **Staff in Charge**

The staff in charge defines the personnel who manage or supervise the activities of the employed persons defined in the preceding point.

#### **Installation and Startup**

The installation is intended as the mechanical, electrical and software integration of the Robot and Control System in any environment that requires controlled movement of Robot axes, in compliance with the safety requirements of the Country where the System is installed.

#### **Functioning in Programming Mode**

Operating mode under the control of the operator, that excludes automatic operation and allows the following activities: manual movement of Robot axes and programming of work cycles at low speed, programmed cycle testing at low speed and, when allowed,

at working speed.

**Functioning in Auto / Remote Mode**

Operating mode in which the Robot autonomously executes the programmed cycle at work speed, with the operators outside the protected area, with the protection barriers closed and included in the safety circuit, with local (located outside the protected area) or remote start/stop.

**Maintenance and Repair**

Maintenance and repair are activities that involve periodical checking and / or replacement of Robot and Control System (mechanical, electrical, software) parts or components, and trouble shooting, that ends when the Robot and Control System has been reset to its original project functional conditions.

**Decommissioning and Dismantling**

Decommissioning defines the activities involved in the mechanical and electrical removal of the Robot and Control System from a production unit or from an environment in which it was under study.

Dismantling consists of the demolition and dismantling of the components that make up the Robot and Control System.

**Integrator**

The integrator is the professional expert responsible for the Robot and Control System installation and startup.

**Misuse**

Misuse is defined as the use of the system outside the limits specified in the Technical Documentation.

**Action Area**

The Robot action area is the enveloping volume of the area occupied by the Robot and its equipment during movement in the area.

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### 1.2.3 Applicability

These requirements must be applied when carrying out the following activities:

- [Installation and Startup](#)
- [Functioning in Programming Mode](#)
- [Functioning in Auto / Remote Mode](#)
- [Robot Axes Brake Release \(if present\)](#)
- [Maintenance and Repair](#)
- [Decommissioning and Dismantling.](#)

## 1.2.4 Operating Modes

### Installation and Startup

- The startup is only possible when the Robot and Control System has been correctly and completely installed.
- The system installation and startup is exclusively the task of the authorised personnel.
- The system installation and startup is only permitted exclusively inside a protected area of an adequate size to house the Robot and the equipment it is outfitted with, without passing beyond the protection barriers. It is also necessary to check that in normal Robot movement conditions there is no collision with parts inside the protected area ( e.g structural columns, power supply lines, etc.) or with the barriers. If necessary, limit the Robot work area using mechanical hard stop (see optional units).
- Any fixed Robot control stations must be located outside the protected area and in a point such as to permit a full view of the Robot movements.
- The Robot installation area must be as free as possible from materials that could impede or limit the visibility.
- During installation the Robot and the Control Unit must be handled as described in the product Technical Documentation; if lifting is necessary, check that the eye-bolts are fixed securely and use only adequate slings and equipment.
- Fix the Robot to mount holder, with all the provided bolts and pins, tightened to the tightening torque indicated in the product Technical Documentation.
- If present, remove the fixing brackets of the axes and verify the proper fixing of the equipment the Robot is outfitted with.
- Check that the Robot guards are correctly fixed and that there are no moving or loose parts. Check that the Control Unit components are intact.
- Install the Control Unit outside the protected area: the Control Unit should not be used as part of the fencing.
- Check that the voltage value of the power mains is consistent with that indicated on the nameplate of the Control Unit.
- Before electrically connect the Control Unit, check that the circuit breaker on the power mains is locked in open position.
- Connection between the Control Unit and the supply mains at the works, is to be with a cable dimensioned appropriately for the power installed on the Control Unit (for further details see the Control Unit “Transport and Installation” manual).
- Connect the ground cable (PE) then connect the power conductors to the main switch.
- Connect the power supply cable, first connecting the ground cable to the circuit breaker on the power mains line, after checking with a tester that the circuit breaker terminals are not powered. It is recommended to connect the cable armouring to the earth.
- Connect the signals and power cables between the Control Unit and the Robot.

- Connect the Robot to earth through the Control Unit or by means of specific ground terminal blocks, depending on the predispositions available on the Robot and/or on the Control Unit.
- If present, check that the Control Unit door (or doors) is/are locked with the key.
- A wrong connection of the connectors may cause permanent damage to the Control Unit components.
- The Control Unit manages internally the main safety interlocks (gates, enabling pushbuttons, etc.). Connect the Control Unit safety interlocks to the line safety circuits, taking care to connect them as required by the Safety standards. The safety of the interlock signals coming from the transfer line (emergency stop, gates safety devices etc.) i.e. the realisation of correct and safe circuits, is the responsibility of the Robot and Control System integrator.



In the cell/line emergency stop circuit it is necessary to include the contacts of the Control Unit emergency stop push-buttons, available on X30. The push-buttons are not interlocked inside the emergency stop circuit of the Control Unit.

- The safety of the system cannot be guaranteed in case of interlocks erroneous, incomplete or missing execution.
- The safety circuit executes a controlled stop (IEC 60204-1 , class 1 stop) for the safety inputs Auto Stop/ General Stop and Emergency Stop. The controlled stop is only active in Automatic mode; in Programming mode the power is disabled immediately.
- When preparing protection barriers, especially light curtains and access doors, take into consideration the Robot stopping times and distances according to the stop category (0 or 1) and the weight of the Robot.



If present, on the Control Unit, make sure that the setting of the stop circuit timer is consistent with the type of Robot connected (for further details see the Control Unit “Transport and Installation” manual)

- Check that the environmental and operating conditions do not exceed the limits specified in the Technical Documentation of the specific product.
- The calibration operations must be carried out with great care, as indicated in the Technical Documentation of the specific product, and should be concluded by checking the correct position of the machine.

GENERAL SAFETY REQUIREMENTS

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- To load or update the system software (for example after boards replacing), use only the original software handed over by COMAU. Scrupulously follow the system software loading procedure described in the Technical Documentation supplied with the specific product. After loading, always make some Robot moving tests at low speed remaining outside the protected area.
- Check that the barriers of the protected area are correctly positioned.

**Functioning in Programming Mode**

- The programming of the Robot is exclusively the task of the authorized personnel.
- Before starting to program, the operator must check the [Robotic System \(Robot and Control Unit\)](#) to make sure that there are no potentially dangerous irregular conditions, and that there is nobody inside the protected area.
- The programming should be controlled from outside the protected area whenever possible.
- Before operating inside the [Protected Area](#), the operator must make sure from outside that all the necessary protections and safety devices are present and in working order, and especially that the Teach Pendant is working properly (low speed, emergency stop device, enabling device, etc.).
- During the programming phases, only the operator with the Teach Pendant is allowed inside the [Protected Area](#).
- If the presence of a second operator in the working area is necessary when checking the program, this person must have an enabling device interlocked with the safety devices.
- Activation of the motors (DRIVE ON) always must be controlled from a position outside the operating range of the Robot, after checking that there is nobody in the area involved. The Drive On operation is considered complete when the relevant machine status indication is shown.
- When programming, the operator must remain at an appropriate distance from the Robot to be able to avoid any irregular machine movements, and in any case in a suitable position to avoid the risk of being trapped between the Robot and structural parts (columns, barriers, etc.), or between movable parts of the Robot.
- When programming, the operator must avoid to remain in a position where parts of the Robot, pulled by gravity, could move downwards, upwards or sideways (when installed on a inclined plane).
- Testing a programmed cycle at working speed with the operator inside the protected area, in some situations where a close visual check is necessary, is only to be carried out after a complete test cycle at low speed has been carried out. The test must be controlled from a safe distance.
- Special attention is to be paid when programming using the Teach Pendant: in this situation, although all the hardware and software safety devices are active, the Robot movement depends on the operator.
- During the first running of a new program, the Robot may move along a path that is not the one expected.
- The modification of program steps (such as moving by a step from one point to another of the flow, wrong recording of a step, modification of the Robot position out of the path that links two steps of the program), could give rise to movements not envisaged by the operator when testing the program.



- In both cases operate cautiously, always remaining out of the Robot range of action and test the cycle at low speed.

### Functioning in Auto / Remote Mode

- The activation of the automatic operation (AUTO and REMOTE states) is permitted only with the [Robotic System \(Robot and Control Unit\)](#) integrated inside an area with protection barriers properly interlocked, as required by the Safety Standards currently in place in the Country where the installation takes place.
- Before starting the automatic mode the operator must check the Robot and Control System and the protected area to make sure there are no potentially dangerous irregular conditions.
- The operator can activate automatic operation only after having checked:
  - that the Robot and Control System is not in maintenance or repair status;
  - that the protection barriers are correctly positioned;
  - that there is nobody inside the protected area;
  - that the Control Unit doors are closed and locked with the appropriate key;
  - that the safety devices (emergency stop, protection barrier safety devices) are functioning;
- Special attention is to be paid when selecting the remote mode, in which the line PLC can perform automatic operations of motors power up and program starting.

### Robot Axes Brake Release (if present)

- In the absence of motive power, the Robot axes repositioning is possible by means of optional brake release devices and suitable lifting devices. Such devices only allow the brake deactivation of each axis. In this case, all the system safety devices (including the emergency stop and the enabling push-button) are disabled; also the Robot axes can move upwards or downwards because of the forces generated by the balancing system or by the gravity.



Before using the manual brake release devices, it is recommended to sling the Robot, or hook it to an overhead travelling crane.

- The use of brake releasing device may cause the axes falling due to gravity, as well as possible impacts due to an incorrect reset, after applying the brake releasing module. The procedure for the correct usage of the brake releasing device (both for the integrated one and module one) is to be found in the maintenance handbooks.

## GENERAL SAFETY REQUIREMENTS

- When after the interruption of an unfinished MOVE the motion is enabled again, the typical function of trajectory recuperation may generate unpredictable paths that may imply the risk of impact. This same condition arises at the next restart of the automatic cycle. Avoid moving the Robot in positions that are distant from the ones required for the motion restarting; alternatively disable the outstanding MOVE programmes and/or instructions.

**Maintenance and Repair**

- When assembled in COMAU the Robot is supplied with lubricants that do not contain any harmful to health substances, however, in some cases, repeated and prolonged exposure to the product may cause skin irritation, or if swallowed, sickness.

**First Aid Measures.** In case of contact with the eyes or skin: rinse the affected areas with copious amounts of water; should irritation persist, seek medical advice. If swallowed, do not induce vomiting or administer anything by mouth; consult a doctor as soon as possible.

- Maintenance, trouble-shooting and repair are only to be carried out by authorised personnel.
- When carrying out maintenance and repair operations, the specific warning sign stating the maintenance status must be placed on the control panel of the Control Unit, until the end of the operation, even if it should be temporarily suspended.
- Maintenance and components or Control Unit replacement operations must be carried out with the main switch in open position and locked with a padlock.
- Even if the Control Unit is not powered (main switch open), there may be interconnected voltages deriving from connection to peripheral units or external power sources (e.g. 24 Vdc input/output). Power off the external sources when operating on involved system parts.
- Removal of panels, protection shields, grids, etc. is only allowed with the main switch open and padlocked.
- Defective components must be replaced with others having the same Part Number, or equivalent components defined by COMAU.



If present, the safety components, in case of replacement, must be configured using the same parameters of the components just removed.

- Trouble-shooting and maintenance activities must be carried out, whenever possible, outside the protected area.
- Trouble-shooting executed on the control is to be carried out, whenever possible without power supply.
- Should it be necessary, during trouble-shooting, to intervene with the Control Unit powered, all the precautions specified by Safety Standards must be observed when operating in presence of dangerous voltages.
- Trouble-shooting on the Robot must be carried out with the power supply turned off (DRIVE OFF).
- At the end of the maintenance and trouble-shooting operations, all the deactivated safeties must be reset (panels, protection shields, interlocks, etc.).

- Maintenance, repair and trouble-shooting operations must be concluded with the check of the correct functioning of the **Robotic System (Robot and Control Unit)** and all the safety devices, executed from outside the protected area.
- During the software loading phases (for example after replacement of electronic boards) use only the original software handed over by COMAU. Scrupulously follow the system software loading procedure described in the specific product Technical Documentation; after loading, to be sure, always run a test cycle, remaining outside the protected area
- Disassembly of Robot components (e.g. motors, balancing cylinders, etc.) may cause uncontrolled movements of the axes in any direction: before starting a disassembly procedure, consult the warning plates applied on the Robot and the Technical Documentation supplied.
- If present, always restore the protective covering where previously installed.

### Decommissioning and Dismantling

- The decommissioning and removal of the Robot and Control System is exclusively the task of **Authorised Personnel**.
- Move the Robot in transport position and assemble the axes locking brackets (when required) following the instructions on the plate on the Robot and its Technical Documents.
- Before decommissioning initiation, the mains voltage at the Control Unit inlet must be powered off (switch off the circuit breaker on the power mains and lock it in open position).
- After using the specific instrument to check there is no voltage on the terminals, disconnect the power supply cable from the circuit breaker on the power mains, first disconnecting the power conductors, then the earth one. Disconnect the power supply cable from the Control Unit and remove it.
- First disconnect the connection cables between the Robot and the Control Unit, then the ground cable.
- If present, disconnect the Robot pneumatic system from the air distribution mains.
- Check that the Robot is properly balanced and if necessary sling it correctly, then remove the Robot securing bolts from the mount holder.
- Remove the Robot and Control Unit from the work area, following all the requirements indicated in the products Technical Documents; if lifting is necessary, check the eyebolts proper fixing and use only suitable slinging devices and equipment.
- Before starting dismantling operations (disassembly, demolition and disposal) of the Robot and Control System components, contact COMAU, or one of its branches, who will indicate, according to the type of Robot and Control Unit, the operating methods in accordance with safety principles and environment safeguarding.



Disposal operations must be carried out in accordance with the legislation of the country where the Robot System is installed; dispose the batteries, oils and other chemical liquids respecting the environment and in accordance with the legislative standards in , transferring them to the appropriate waste collection sites.

GENERAL SAFETY REQUIREMENTS

- The waste disposal operations are to be carried out complying with the legislation of the country where the Robot and Control System is installed.

## 2. GENERAL DESCRIPTION

### 2.1 Introduction

Current manual describes the use of Comau **PickAPP** application software, available on a mobile device which is an Android Tablet.

It allows moving a robot in order to implement a **Pick and Place** process without knowing the robot programming language.

The following topics are dealt with:

- Basic System
- Basic Functions.

### 2.2 Basic System

The basic system consists of the following basic components (see the figure below):

- **R1C / R1C-4** Control Unit (1)
- Bypass circuit to be inserted in the **X124** connector (2)
- **Racer3**, **Racer5** or **Rebel** families robot (3)
- Tablet (minimum size 8", maximum size 10.1") based on *Android* OS (minimum required version is *Lollipop* 5.1 and above) (4)
- Access point Wi-Fi (5)
- System software - version 1.11.008 installed on **R1C / R1C-4** Control Unit
- Software option **CR17926410** - "**PickAPP** Android application"
- **PickAPP** application manual.





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### 2.2.1 Options

The currently available options are as follows:

- **Cognex Vision System - IN-SIGHT MICRO 8402** - integrated vision system for Comau system, supporting all models compatible with **Cognex** identification algorithm. The used smart camera is shown in the figure below.



Refer to [Chap.5. - Integrated Vision System \(optional feature\) on page 61](#) for a detailed description.

---

## 2.3 Basic Functions

A **Graphical User Interface** is provided composed of dedicated environments allowing the use of the following functions:

- connecting the tablet to **R1C / R1C-4** Control Unit
- jogging the robot, teaching the wished positions, showing the trajectory path, modifying the robot movements characteristics
- turning on/off motors (DRIVE ON/OFF), starting/pausing/stopping programs
- modifying the positions setup
- navigation menu to handle
  - programs
  - robot speed
  - system states
  - grippers
  - reference frames
  - input signals
  - Vision System (optional).

## 3. INSTALLATION AND ACTIVATION

- Safety issues
- Bypass circuit
- Installation
- Activation

### 3.1 Safety issues

Since in the **PickAPP** application scenario (refer to [par. 2.2 Basic System on page 19](#)) a mobile device is meant to substitute the Teach Pendant on Pick and Place processes programming and configuration, the related security issues are transferred at the cell level, due to the fact that commercial tablets do not contain neither the Emergency Stop button nor the Enabling Device.

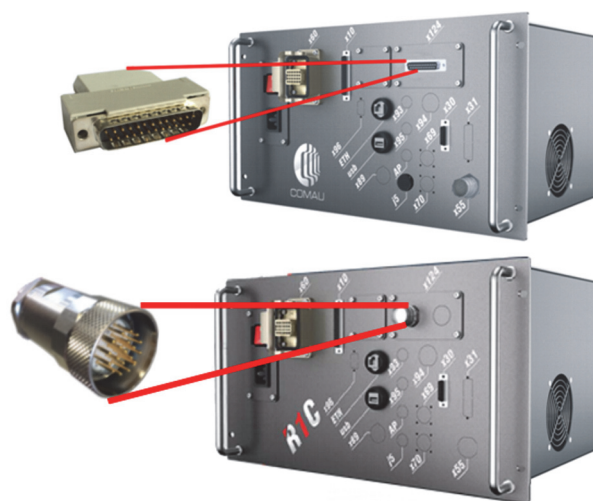


For the described above reasons, in order to guarantee the operator's safety, robot manual movements (JOG), motors power on, START/STOP cycle commands, may come from **the tablet** but will take effect only if the cell gates are CLOSED; furthermore, the Emergency Stop button must be available at cell level.



For further details about the safety issues, refer to [Chap.6 - Virtual TP5 Teach Pendant in R1C - R1C-4 Control Unit Use manual](#).

### 3.2 Bypass circuit



- Basic issues
- Insertion procedure.

---

### 3.2.1 Basic issues

To obtain a system configuration without any Teach Pendant devices (e.g. with a mobile device), for Pick & Place processes, it is needed to insert a hardware circuit called the **bypass circuit** (see the previous figure) which performs the following operations:

- bypass the Emergency Stop button contacts
- bypass the Enabling Device contacts
- set the modal selector switch status to **AUTO-REMOTE**.

Irrespective of whether **R1C** or **R1C-4**, the bypass circuit must be inserted into the **X124** connector, according to the following [Insertion procedure](#).

---

### 3.2.2 Insertion procedure

To insert the bypass circuit into the **X124** connector (see the previous figure) and then to control **R1C** / **R1C-4** Control Unit by means of the tablet, the following operations are needed:

- a. switch OFF **R1C** / **R1C-4** Control Unit
- b. disconnect **TP5** Teach Pendant, if any
- c. insert the bypass circuit into the **X124** connector (which bypasses both Emergency Stop and Enabling Device contacts of the Teach Pendant)
- d. switch **R1C** / **R1C-4** Control Unit ON again.

It is now able to accept the connection with the tablet, when required.



#### CAUTION!!

Remember that in this configuration the Emergency Stop button, available on the disconnected Teach Pendant, DOES NOT work, neither do the Enabling Device buttons.

Therefore, in order not to meet with potentially dangerous situations, it is strongly recommended to remove (hide) any existing physical Teach Pendants, from the Control Unit and the cell proximity.

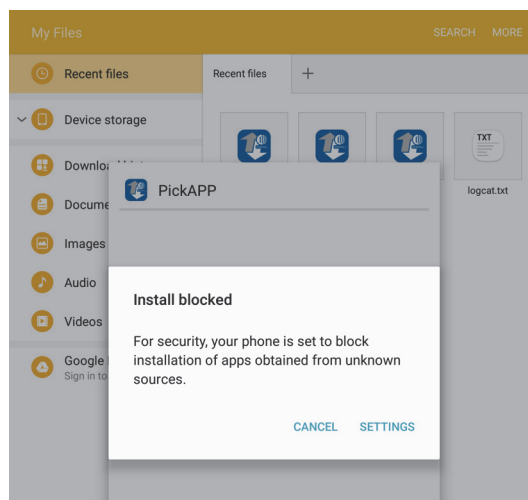
### 3.3 Installation

The application software is provided by COMAU web site:

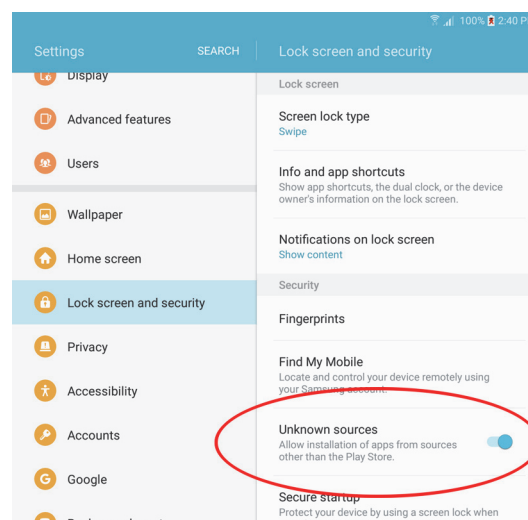
<http://comau.com/en/our-competences/robotics/software/pickapp> .

In order to install it into the mobile device, the following steps are to be executed:

- a. copy the application software to the mobile device (tablet) in the wished folder (e.g. **Download** folder);
  - b. in the folder where the application has been copied, touch the application icon to start its installation.
- a. Two scenarios may occur:
    - a.1 the **Unknown sources** flag is **NOT** enabled in the tablet settings.

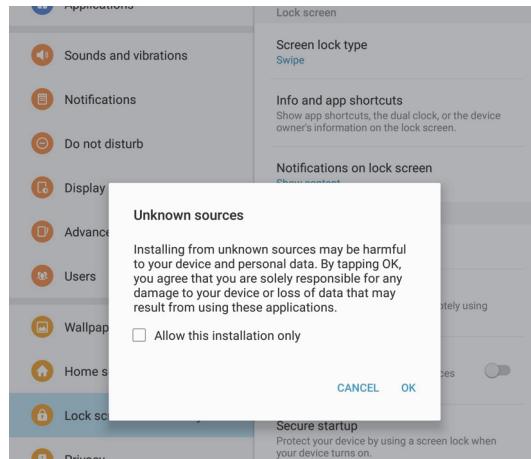


- a.2 Choose **SETTINGS**

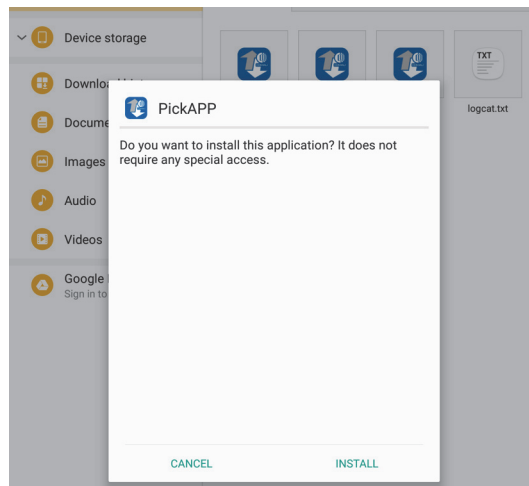


- a.3 enable the **Unknown sources** flag (as shown in the figure above)

## INSTALLATION AND ACTIVATION



- a.4 touch **OK** to confirm the operation
- b. the **Unknown sources** flag is enabled. In the displayed window, choose **INSTALL** to actually start the application installation



NOTE that whenever the **Unknown sources** flag is enabled, the only required step after touching twice on the filename, is **b.**



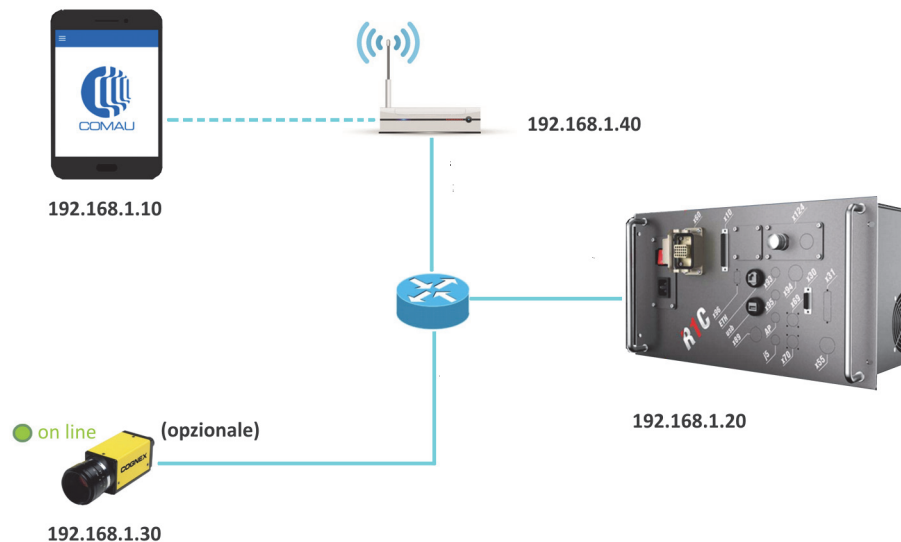
### 3.4 Activation



#### WARNING!

All the involved devices (Tablet, Access Point, Control Unit, optional Vision System Camera) must be configured and connected to the same network.

The figure below shows an example of connections and IP addresses.



The following steps are needed to activate **PickAPP** application:

- touch **PickAPP** icon on the tablet desktop




PickAPP



IP address

192.168.1.20



NEXT >

- in the displayed Connection Page (figure above), the user is asked to insert the Control Unit IP address. It can be either directly typed in or inserted by means of the Control Unit **QR code**.



#### WARNING

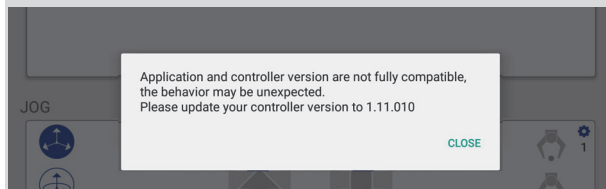
Wait at least 5 seconds between a disconnection and the subsequent connection.

## INSTALLATION AND ACTIVATION

- c. Touch **Next** command.



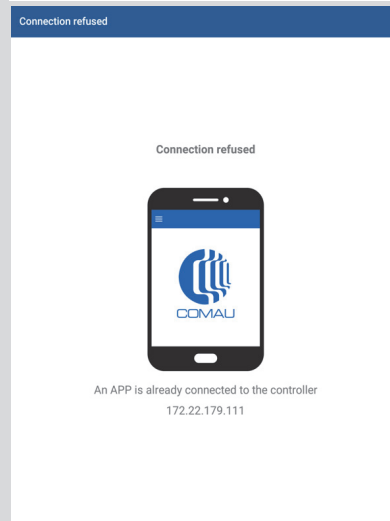
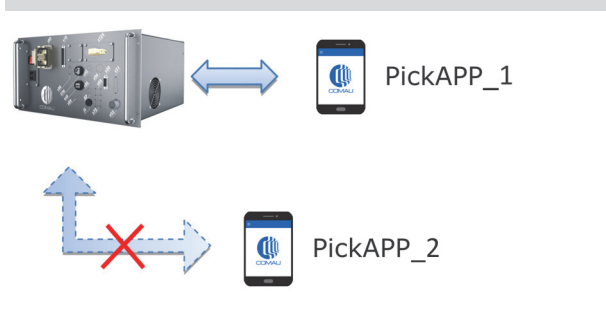
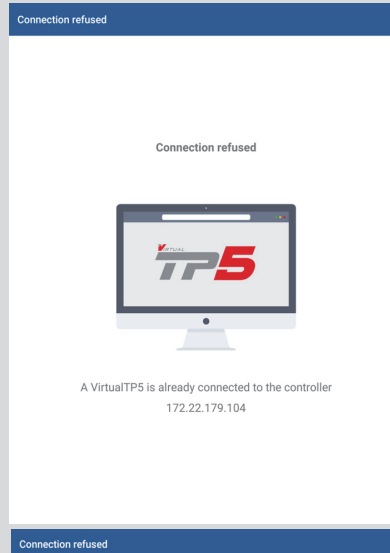
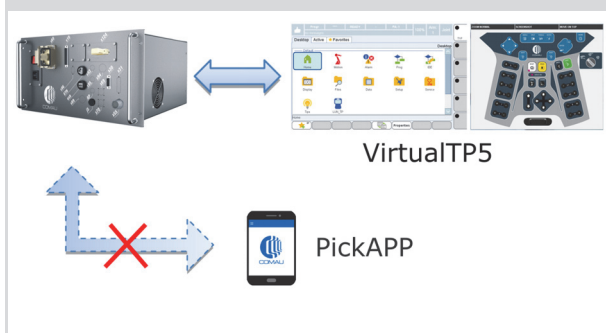
**NOTE** that if the Control Unit software version is not fully compatible, an alarm message occurs at the application startup, informing the user that the application behavior can be unexpected and therefore it is recommended to update the Control Unit software version to the specified one.



As far as already connected applications, the following conflict scenarios may occur:

- **VirtualTP5** currently connected,
- **PickAPP** currently connected.

In both scenarios (see figures below), an informational page is displayed and the connection attempt is refused by the Control Unit.



- d. If no conflicts occur, the wireless connection between **PickAPP** and Control Unit is established and the application is active and ready to be used.



The system status is automatically switched to **AUTO-REMOTE**. Since then, the user is allowed to change the system state as wished.

Upon a disconnection, the system state is forced to **AUTO-REMOTE** again.

The only exception is the case in which the previous state was **AUTO-LOCAL** and **DRIVEs** were **ON**. In such a way, the running program continues to run.

## 4. USAGE AND PROCEDURES

### 4.1 Introduction

Upon the application activation, the system status is set to **AUTO-REMOTE** and the application **Main Page** is displayed on the tablet.



**NOTE** - Upon a disconnection, the system state is forced to **AUTO-REMOTE** again. The only exception is the case in which the previous state was **AUTO-LOCAL** and **DRIVES** were **ON**.

The purpose of the **PickAPP** application is to create/modify/run programs to execute Pick and Place processes.

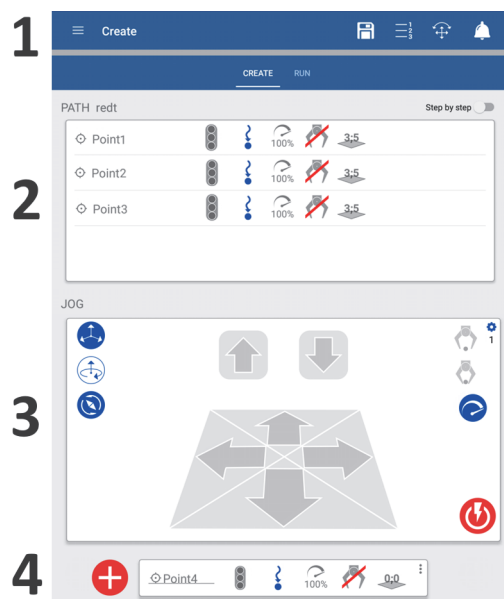
- [Main Page](#)
- [Navigation Menu](#)
- [Alarm Page](#)
- [Usage procedures.](#)

### 4.2 Main Page

In the Main Page, two subpages are available:

- [Create](#)
- [Run.](#)

#### 4.2.1 Create



This environment allows the user to handle programs: create, modify and save them. The core of Pick and Place processes is the **path**, which means a sequence of robot positions (referred to as **points**) chosen by the user. So the main goal of **PickAPP** is to setup the robot position features, move the robot to the wished position and then teach it in order to insert a new **point** into the current **path**.

The **Create** Page is divided into four parts (see previous figure):

- **Top Menu (1)**
- **PATH (2)**
- **JOG (3)**
- **Function buttons (4).**

---

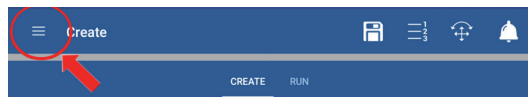
#### 4.2.1.1 Top Menu

- Open the Navigation Menu
- Current environment name
- Program Save
- Points commands
- Jog type command
- Alarm notification

---

##### 4.2.1.1.1 Open the Navigation Menu

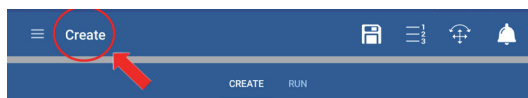
Touching the shown below symbol, causes the **Navigation Menu** to be open.



---

##### 4.2.1.1.2 Current environment name

The name of the current environment is displayed as shown in the figure below.

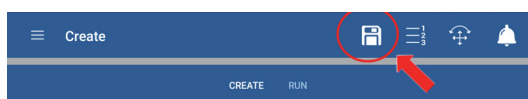


---

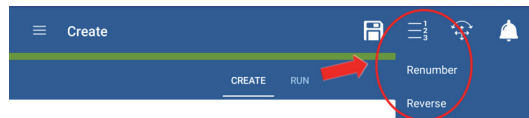
##### 4.2.1.1.3 Program Save

Touching the **Program Save** icon causes the current program to be saved with the same name.

If it was never saved before, it is added to the available programs list, with the name specified by the user.

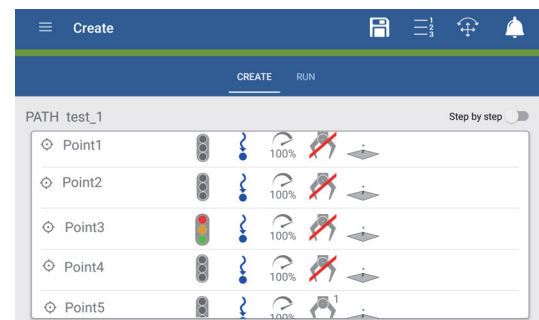
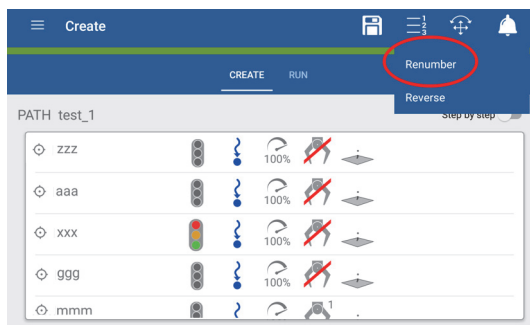


#### 4.2.1.1.4 Points commands

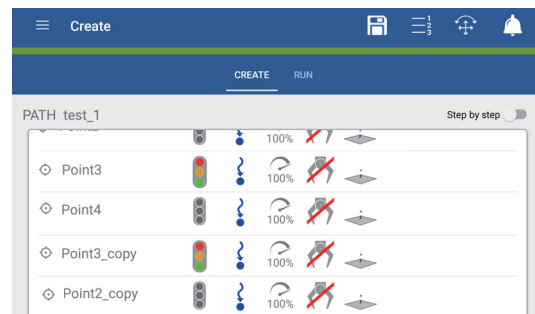
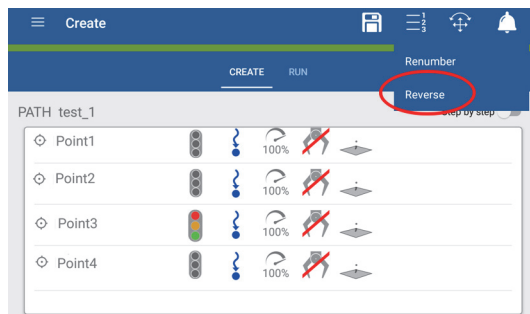


Touching this icon causes a menu to be displayed, providing the following commands related to the path points:

- **Renumber** - irrespective of their current naming and/or numbering, this command rennumbers the path points in ascending order, naming them **"Point"**. See the example shown in the following figures.

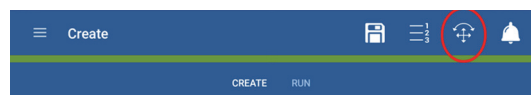


- **Reverse** - this command copies the existing points in reverse sequence, until the second one. This allows to move along the path backward, and restart the cycle from the beginning. See the example in the figures below.



#### 4.2.1.1.5 Jog type command

This icon activates the Jog type command, allowing to select the wished Jog type to be used while jogging in the **Create** environment.



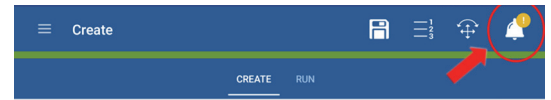
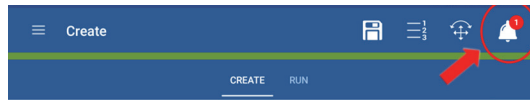
The available Jog types are:

- **Joint**
- **JPAD**
- **Cartesian.**

For further information see [par. 4.2.1.3 JOG on page 33](#).

#### 4.2.1.1.6 Alarm notification

The bell icon indicates whether or not an alarm occurred. The notification can be either red or yellow, depending on the severity. For further information see [Alarm Page](#).



#### 4.2.1.1.7 DRIVES status

A coloured bar shows the DRIVES current status see following figures):

- grey means DRIVE OFF
- green means DRIVE ON

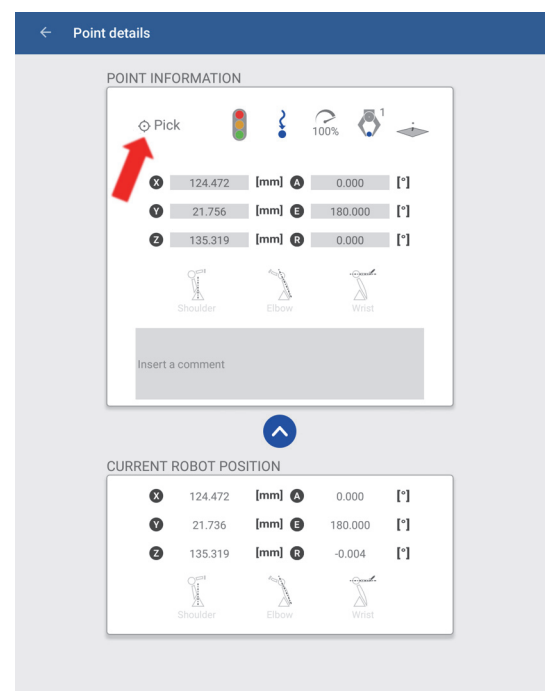


#### 4.2.1.2 PATH

- [Handling the PATH Points](#)
- [Step by step.](#)

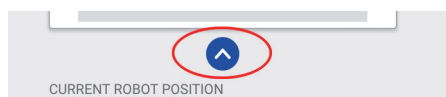
##### 4.2.1.2.1 Handling the PATH Points

This section displays the points belonging to the program. The user is allowed to edit them, if wished.



Touching a point causes its information to be displayed (previous figure, on the right); all the displayed data can be modified:

- **Point information**
  - *Point name* - this is the name of the point, chosen either by the user or automatically by the application. The name is preceded by a symbol meaning whether the point is **Fixed** or **Vision** type (par. [Select Fixed/Vision on page 41](#)). It is editable by touching it.
  - *Input signal* - a window is opened to allow selecting an input signal to be waiting for, associated to the current point
  - *Trajectory* - a window is opened to allow choosing a different trajectory for the current movement (Joint, Joint fly, Linear, Linear fly)
  - *Speed override* - a window is opened to allow modifying the speed, acceleration and deceleration override for the current movement
  - *Gripper action* - a window is opened to allow choosing a gripper and/or an action, associated to the current point
  - *Tool and Frame* - these are the tool and the frame associated to the current point
  - *Point coordinates* - these are the taught point coordinates.
- **Current robot position** - the coordinates of the current robot position are displayed. They can be associated to the current point, by simply touching the following symbol



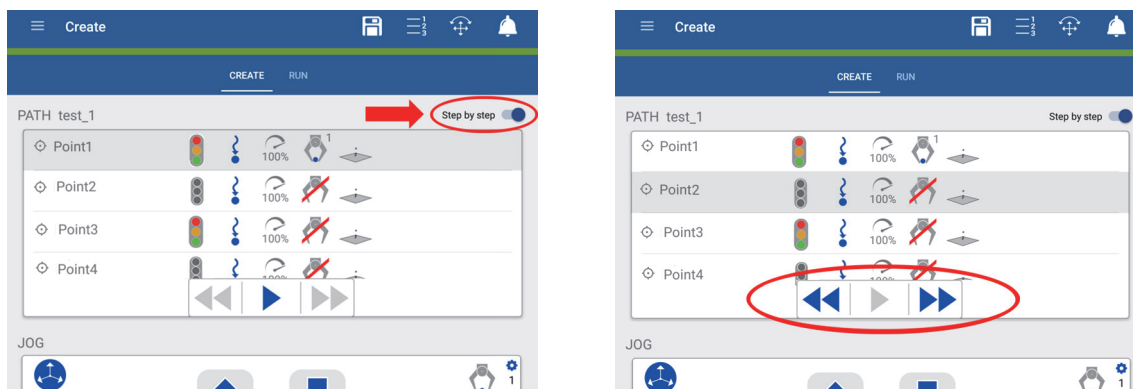
Long touching a point, a window is displayed providing some standard commands to handle it:

- **Rename** - change the point name
- **Move** - change its position in the path
- **Copy** - create a new point and copy the current one to it
- **Remove** - eliminate it.

#### 4.2.1.2.2 Step by step

This execution mode allows step by step checking the program, before executing it in automatic mode (par. [4.5.5 Running a program in automatic mode on page 59](#)).

It is activated by means of the switch highlighted in the left figure below.



When activated, **Play**, **Backward** and **Forward** buttons are displayed; the only available one is **Play**. In the next steps, depending on whether a subsequent and/or preceding point exists which can be executed, **Backward** and/or **Forward** buttons are made available too, as shown in the previous right figure.



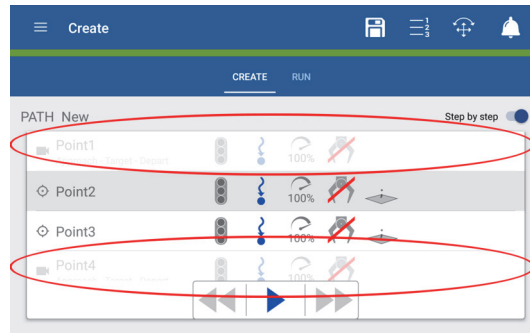


Note that the motors must be ON ([par. Turn motors ON/OFF on page 34](#)) to be able to start the execution!



#### WARNING

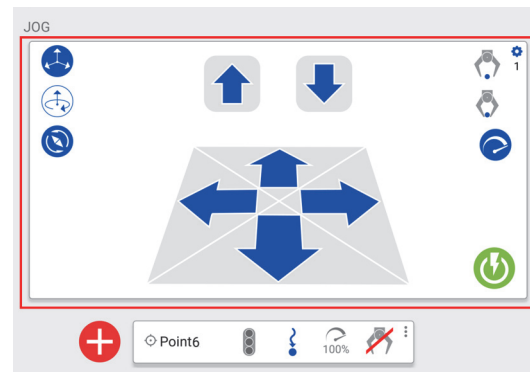
If the Vision System is integrated in the current system, any existing **Vision** points ([par. Select Fixed/Vision on page 41](#)) are NOT executed in this modality.



Refer to [par. 4.5.4 Step by step executing a program on page 58](#) for any further information.

### 4.2.1.3 JOG

This section displays all data related to set the robot movements and the gripper data, as well as the keys to jog the robot.



The Jog type is selected in the [Top Menu](#) by means of the [Jog type command](#)..

There are some common buttons, available for any Jog types, and someone else, dedicated to the cosen Jog type:

- [Common buttons](#)
- [Joint](#)
- [JPAD](#)
- [Cartesian](#).

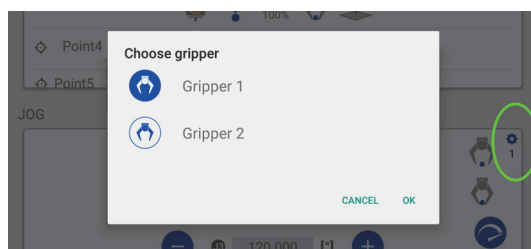
#### 4.2.1.3.1 Common buttons

- Gripper buttons
- General Speed
- Turn motors ON/OFF.

##### **Gripper buttons**

- Select gripper
- Open/Close gripper.

##### **Select gripper**



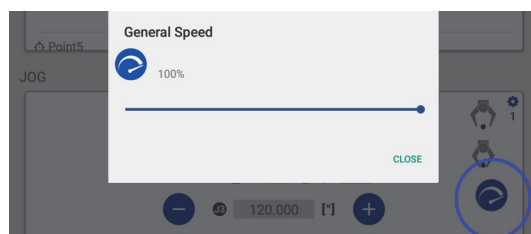
##### **Open/Close gripper**

These buttons (figure below) are just available when drives are ON. They, respectively, open and close the gripper.



##### **General Speed**

Allows displaying and modifying the general speed, if wished. This speed refers to all the robot movements, both for [Step by step](#) execution and automatic [Run](#) cycle.



##### **Turn motors ON/OFF**

Touching this button causes the motors to be switched to the opposite state: OFF to ON, ON to OFF.



The information about the DRIVES status is also displayed by means of a coloured bar on the page top ([par. 4.2.1.1.7 DRIVES status on page 31](#)).

#### 4.2.1.3.2 Joint

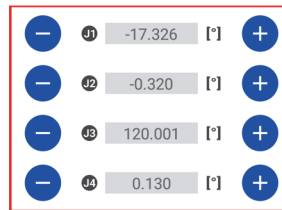


The following information is displayed (refer to the previous figure):

- Jog data:
  - [Joint coordinates](#)
  - [Jog keys](#).

#### **Joint coordinates**

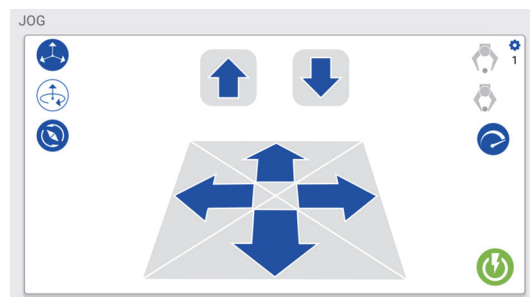
Robot current position coordinates



#### **Jog keys**

The + and - keys (see the figure above) allow jogging the individual robot axes

#### 4.2.1.3.3 JPAD



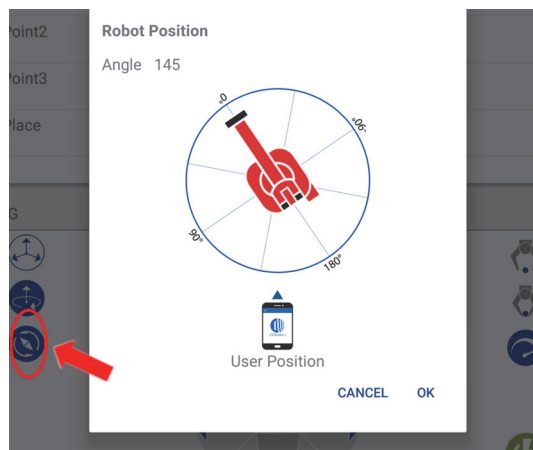
The following information is displayed (refer to the figure above):

- [Robot position](#)
- Jog buttons
  - [JPAD - translation](#)
  - [JPAD - rotation](#).

---

### Robot position

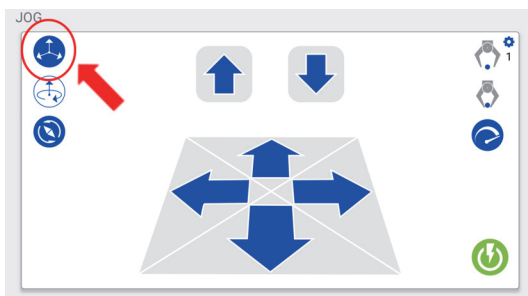
It allows modifying the relative position between the tablet and the robot. A window is opened in which the user is allowed to rotate the robot position until it matches the actual one.



---

### JPAD - translation

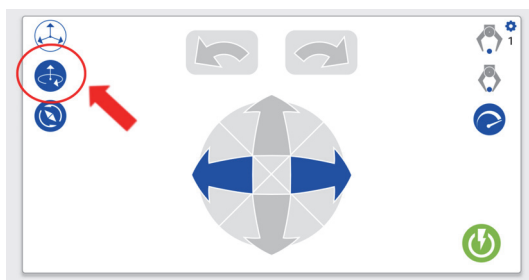
The robot moves referred to the user position.



- The group of two arrow buttons are for moving along **Z** axis
- The group of four arrow buttons are for moving along **X** axis (up and down) and **Y** axis (left and right).

---

### JPAD - rotation



These arrow buttons allow to rotate around the cartesian axes.

In the figure above the example refer to a **Rebel** robot, which only has the possibility of rotating around **Z** axis.

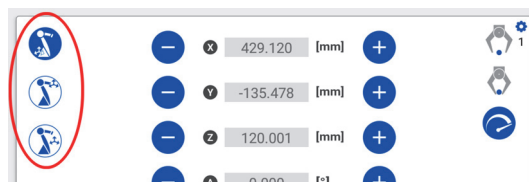
#### 4.2.1.3.4 Cartesian



The following information is displayed (refer to the previous figure):

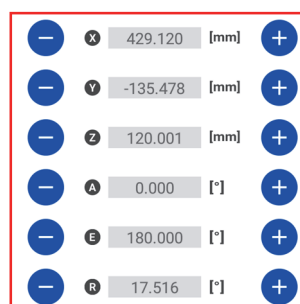
- Reference frame
- Jog data:
  - Cartesian coordinates
  - Jog keys.

#### Reference frame



These buttons allow selecting the wished reference frame (base, tool and uframe) for the cartesian trajectory.

#### Cartesian coordinates



These are the cartesian coordinates of the robot current position (X, Y, Z, Euler angles).

#### Jog keys

The + and - keys (see the figure above) allow jogging the robot according to the individual cartesian coordinates (X, Y, Z, Euler angles).

#### 4.2.1.4 Function buttons



This section makes some special “buttons” available, dedicated to teach the points and the teach SETUP:

- Teach current robot position
- Teach SETUP.

##### 4.2.1.4.1 Teach current robot position

Each time this button is touched, The current robot position is added to the displayed **PATH** as a new point, according to the current **Teach SETUP**.



##### 4.2.1.4.2 Teach SETUP



The following buttons are used to set the characteristics of the being taught point:

- Edit point name
- Select input signal
- Choose trajectory
- Set speed
- Choose gripper action
- Select Tool and Uframe references
- Select Fixed/Vision.

##### **Edit point name**

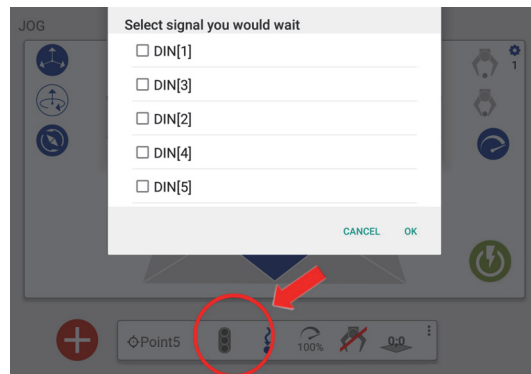
A touch-keyboard is displayed in order to allow modifying the point name.

Point1

##### **Select input signal**

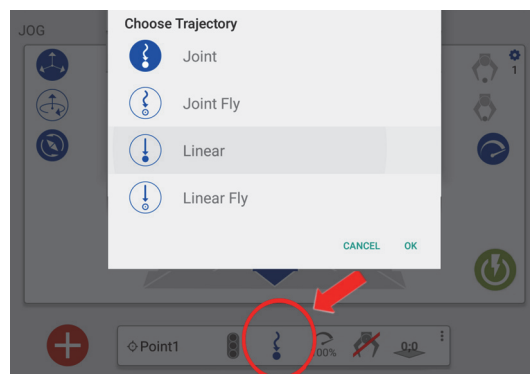
A window is opened (see the following figure) to allow selecting an input signal to be waiting for, on the being taught point.





### Choose trajectory

A window is displayed to choose the being taught point trajectory.

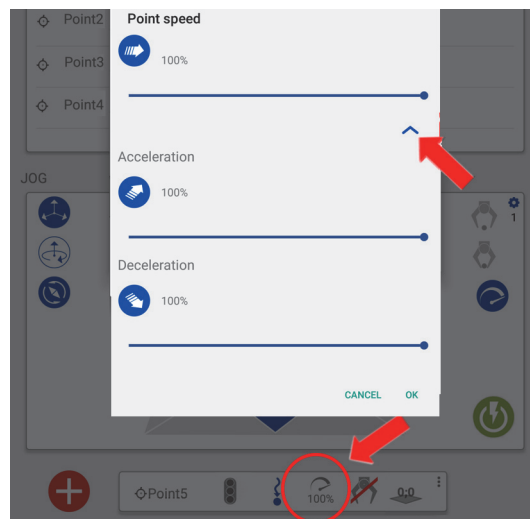
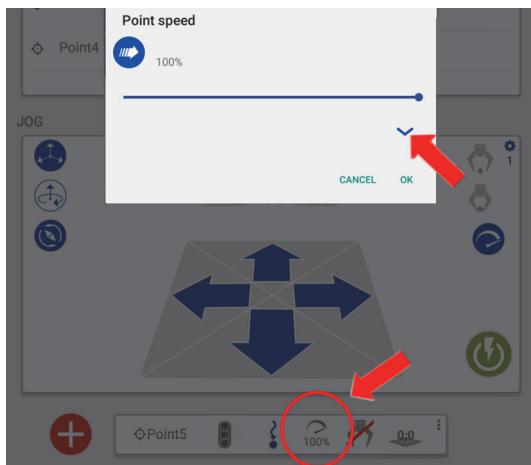


- *Joint* - all robot axes start and stop together. The TCP trajectory and orientation is unpredictable
- *Joint Fly* - continuous joint motion, without stopping the robot on the taught position
- *Linear* - the TCP moves in a straight line from the initial position to the final position. The orientation of the tool also changes from the initial position to the final position according to what is specified
- *Linear Fly* - continuous linear motion, without stopping the robot on the taught position.

### Set speed

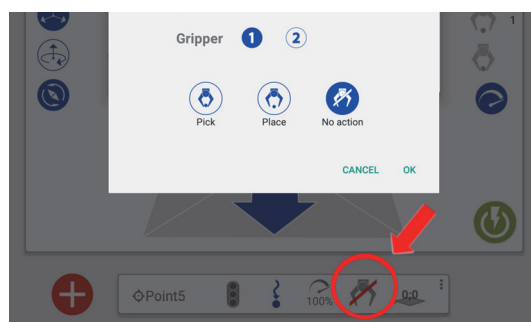
A window is displayed (see the following figures) to set the speed override for the being taught point.  
Advanced setting is also provided for acceleration and deceleration ramps.





### Choose gripper action

A window is displayed (figure below) to choose the associated gripper action for the being taught point.



- *Pick* - is the action of taking the object
- *Place* - is the action of releasing the object
- *No action* - neither pick nor place actions are associated to this point.



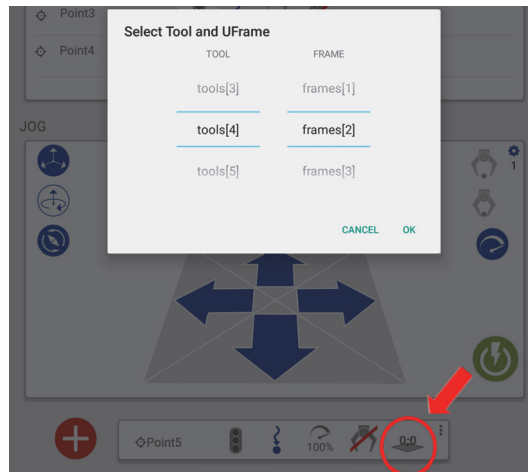
NOTE that the gripper action associated to the being taught point, can also be affected by the Open/Close [Gripper](#) buttons.

### Select Tool and Uframe references

A window is displayed (figure below) to select Tool and Uframe references for the being taught point. The displayed numbers, with the icon, respectively refer to the active Tool and UFrame: tool[5] and frame[7], in the example beside.

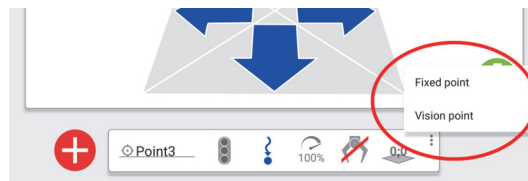






### Select Fixed/Vision

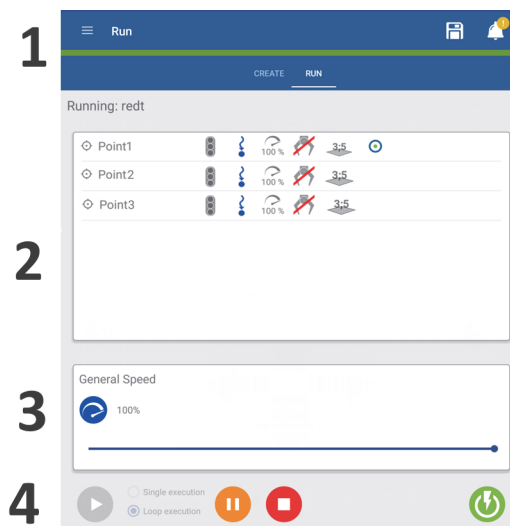
If the optional **Vision System** is present, touching the three vertical dots, a menu is displayed which allows specifying whether the being taught point is a fixed point or a point coming from the **Vision System**. The default is **Fixed point**.



The **Vision** type point is dynamically calculated. This means that if the object is moved, the camera looks for it and the taught point is the found one.

## 4.2.2 Run

This environment allows the user to run the current program.



The **Run** page is divided into the following parts (see previous figure):

- [Top Menu \(1\)](#)
- [Program \(2\)](#)
- [Speed \(3\)](#)
- [Function buttons \(4\).](#)

---

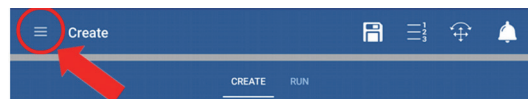
#### 4.2.2.1 Top Menu

- [Open the Navigation Menu](#)
- [Current environment name](#)
- [Program Save](#)
- [Alarm notification](#)

---

##### 4.2.2.1.1 Open the Navigation Menu

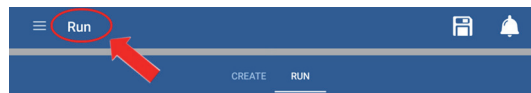
Touching the shown below symbol, causes the [Navigation Menu](#) to be open.



---

##### 4.2.2.1.2 Current environment name

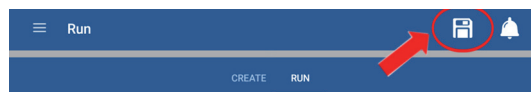
The name of the current environment is displayed as shown in the figure below.



---

##### 4.2.2.1.3 Program Save

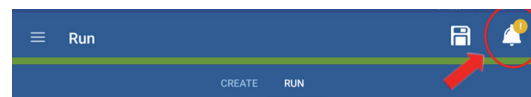
Touching the **Program Save** icon causes the current program to be saved with the same name.



---

##### 4.2.2.1.4 Alarm notification

The bell icon indicates whether or not an alarm occurred. For further information see [Alarm Page](#).

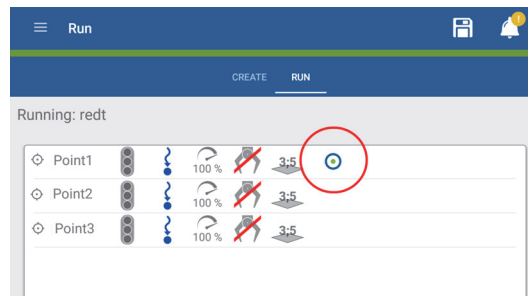


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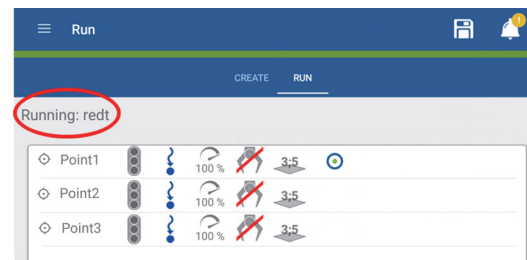
#### 4.2.2.2 Program

This section displays points belonging to the current program (the currently executed

point is marked when the program is running, as shown in the figure above).



The program current status is displayed in the top left corner.



#### 4.2.2.3 Speed



This section displays the General Speed percentage and allows modifying it.

#### 4.2.2.4 Function buttons



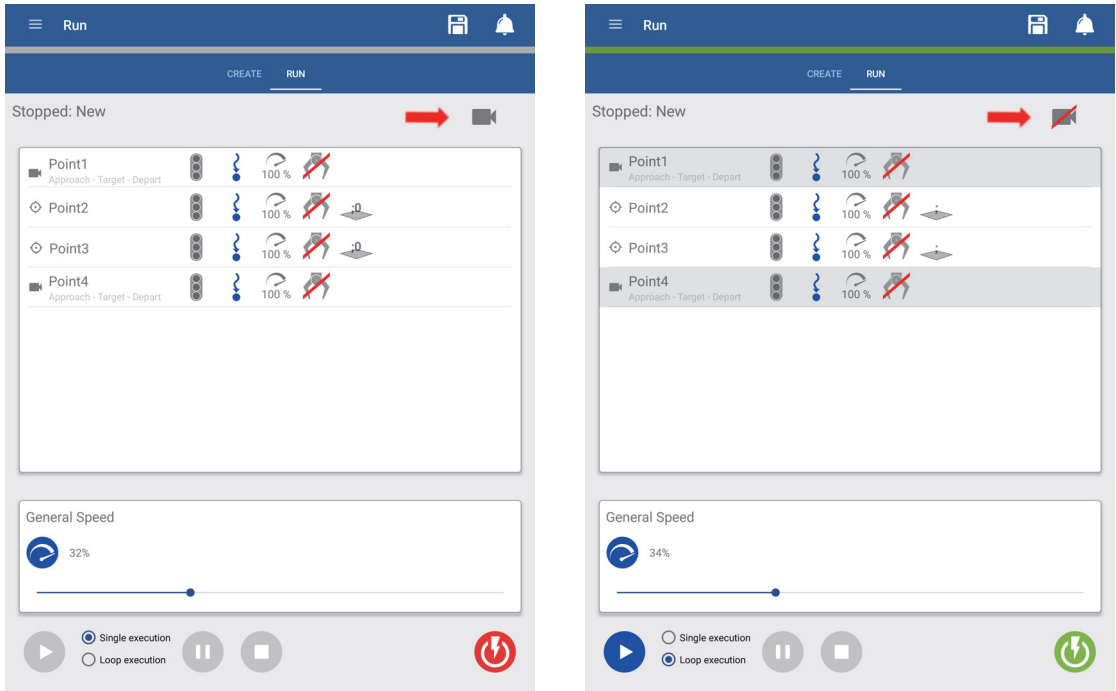
This section makes some special “buttons” available, dedicated to the program execution:

- Turn motors ON/OFF
- Choose single/loop execution
- Play / Pause / Stop



#### WARNING

If the integrated **Vision System** is present, the user can specify whether executing the **Vision** points or not, if any (par. [Select Fixed/Vision on page 41](#)), acting on the camera symbol, as shown in the next figures.



4.2.2.4.1 Turn motors ON/OFF

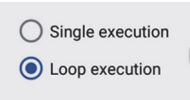
Touching this button causes the motors to be switched to the opposite state: OFF to ON or ON to OFF.

See also [par. 4.2.1.1.7 DRIVES status on page 31](#).



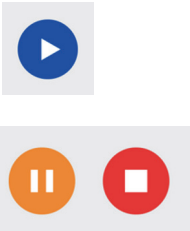
4.2.2.4.2 Choose single/loop execution

The user must choose whether to execute the program just once (**Single**) or to continuously execute it (**Loop**).



4.2.2.4.3 Play / Pause / Stop

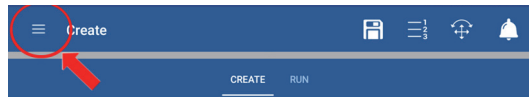
- These buttons are available to act on the program execution:
- at the beginning the only available button is **Play**, to start the program execution; this button is also enabled when the program is Paused or Stopped, in order to continue/restart its execution.
  - While the program is running, two buttons are enabled, **Pause** to temporarily pause the program and (**Stop**) to finally stop it.



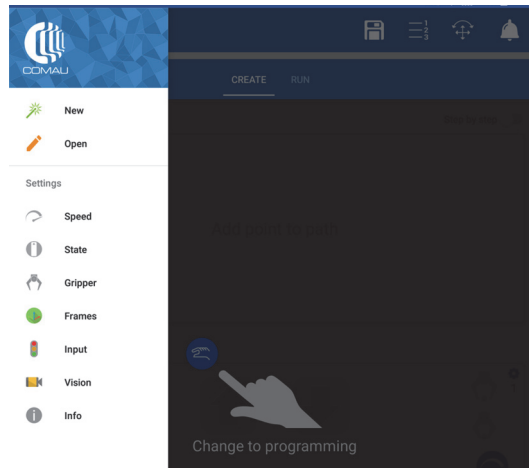
NOTE that, when **Play** button is touched, if any modifications have been made to the program, not saved yet, a message is displayed asking the user to save it.

## 4.3 Navigation Menu

This menu is available from the [Main Page](#) by either swiping the screen or touching the corresponding symbol (see figure below).



The following menu is displayed, as shown below.



The available commands refer to

- [Programs](#)
- [General settings](#).

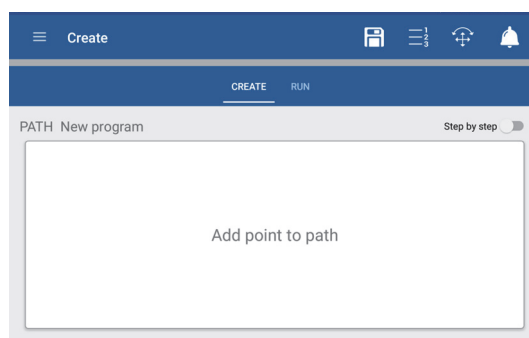
### 4.3.1 Programs

- [New](#)
- [Open](#).

#### 4.3.1.1 New

Create a new program.

Touching this command, the [Create](#) subpage is open in which the [PATH](#) section is empty (as shown in the figure below), ready to receive the new program points.





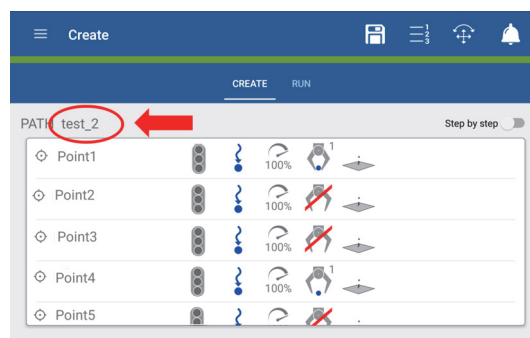
If, when the **New** command is activated, a program is already open in the [Create](#) subpage, the user is allowed to save all changings, if any, before the new program is opened.

#### 4.3.1.2 Open

Open an already existing program.

Touching this command, the application displays the existing programs list, to allow the user choosing the wished one.

The [Create](#) subpage is opened to handle the chosen program: view, edit, check, save and execute it, as described in the previous sections.



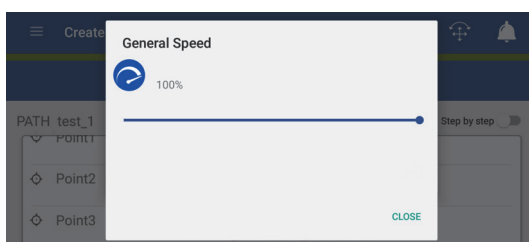
If, when the **Open** command is activated, another program is already open in the [Create](#) subpage, the user is allowed to save all changings, if any, before the newly chosen program is opened.

### 4.3.2 General settings

- [Speed](#)
- [State](#)
- [Gripper](#)
- [Frames](#)
- [Input](#)
- [Vision](#)
- [Info.](#)

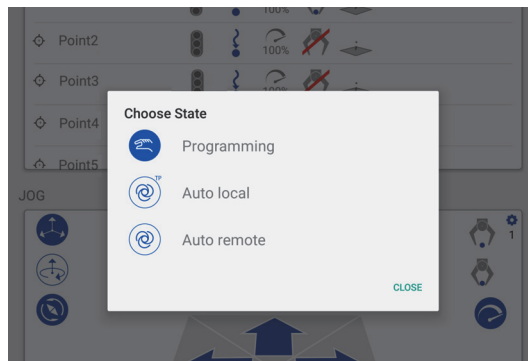
#### 4.3.2.1 Speed

Set the General Override value at system level.



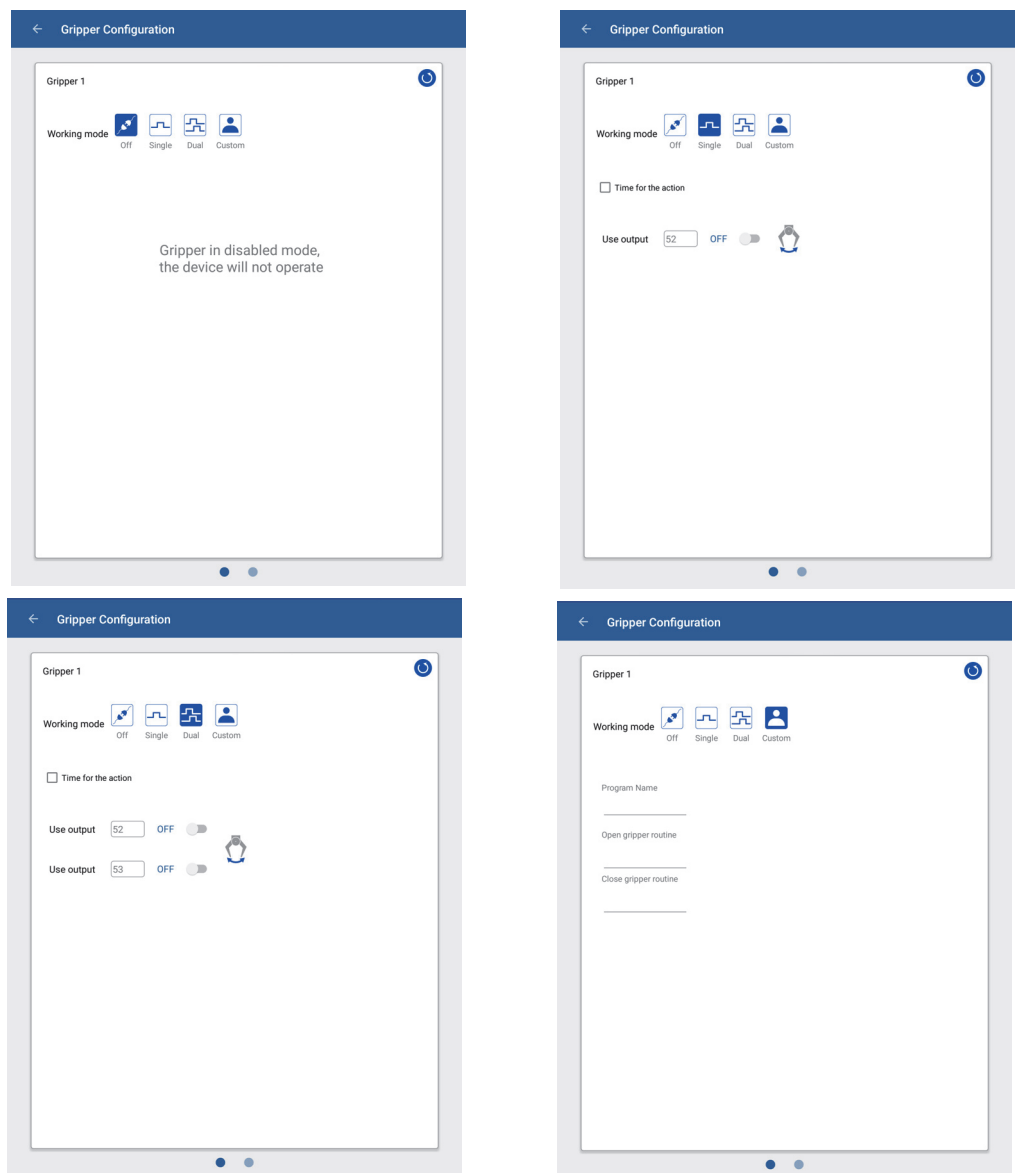
### 4.3.2.2 State

Select the system state (Programming, Auto local, Auto remote).



### 4.3.2.3 Gripper

Gripper configuration: one page is available for each existing gripper.



The following data can be set:

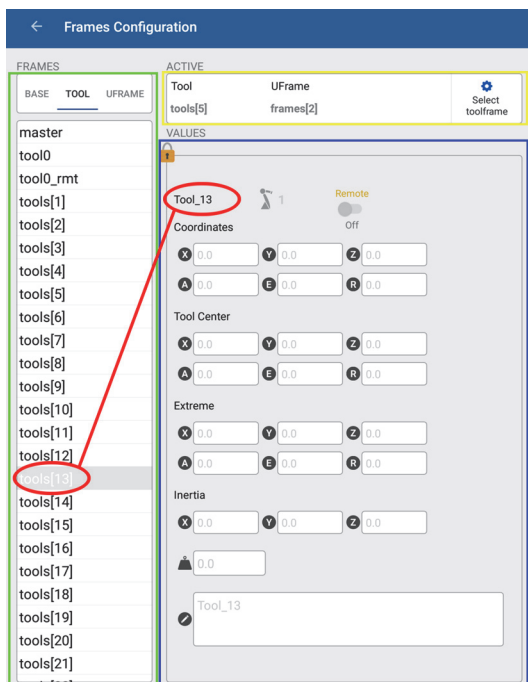
- **Working mode**
  - **disabled** - the gripper is not operational
  - **single** - one output line configuration
  - **doppia** - two output lines configuration
  - **custom** - configuration in which the user specifies a program and two customized routines (written by the user) for gripper open/close. To make the configuration operational, act as follows:
    - create folder **Gripper** in  
UD : /SYS/APPS/PICKAPP/SETTINGS/
    - copy **.pdl** files (including the customized routines) to handle the gripper, to such a folder
    - insert the name of the wished gripper program to **Program Name** field,
    - go to [Create](#) page and select the gripper buttons (open and close) to check whether they work properly.
- **Time for the action** - duration of the specified gripper action
- **Use output** output port(s) to be used.

#### 4.3.2.4 Frames

Select, modify and activate the **Base**, **Tool** and **UFrame** reference frames, at system level.

Touching this command opens a subpage divided into three sections (figure below):

- **FRAMES** (green) - existing elements
- **ACTIVE** (yellow) - active frames
- **VALUES** (blue) - values corresponding to the selected element.



Choosing the wished frame type (**BASE**, **TOOL**, **UFRAME**), as shown in the figure below, all the available information for such a frame type is displayed in the subpage. If any information is required about a different frame type, change the selection.

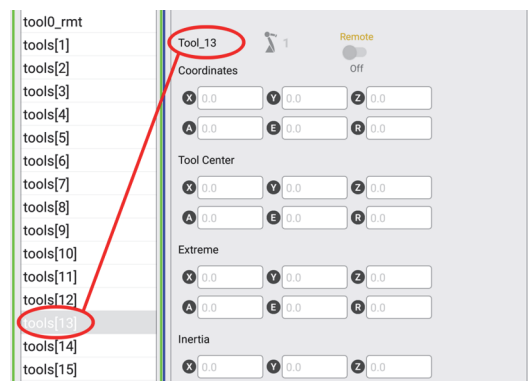




In the shown above example, the **TOOL** frame type has been chosen, so all the information in the subpage is corresponding to **TOOL** frame type: elements list, active frame, selected element values.

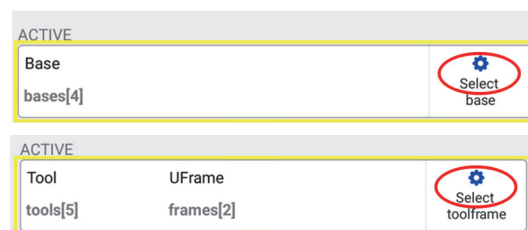
#### 4.3.2.4.1 FRAMES

After choosing the wished frame type (**BASE**, **TOOL**, **UFRAME**), the user can select an element from the displayed list, in order to view/modify it. The associated data are displayed in the **VALUES** section (as shown in the next figure).



#### 4.3.2.4.2 ACTIVE

This section displays the currently active frames (**BASE**, **TOOL**, **UFRAME**).

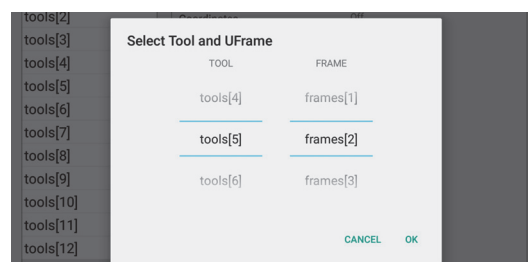


The **Select** button allows selecting the wished active frame.

As shown in the figures above, Tool and UFrame are always selected together. Whereas the Base frame is selected by itself.

Touching the **Select** button, a window is displayed allowing to choose the frames to be activated.

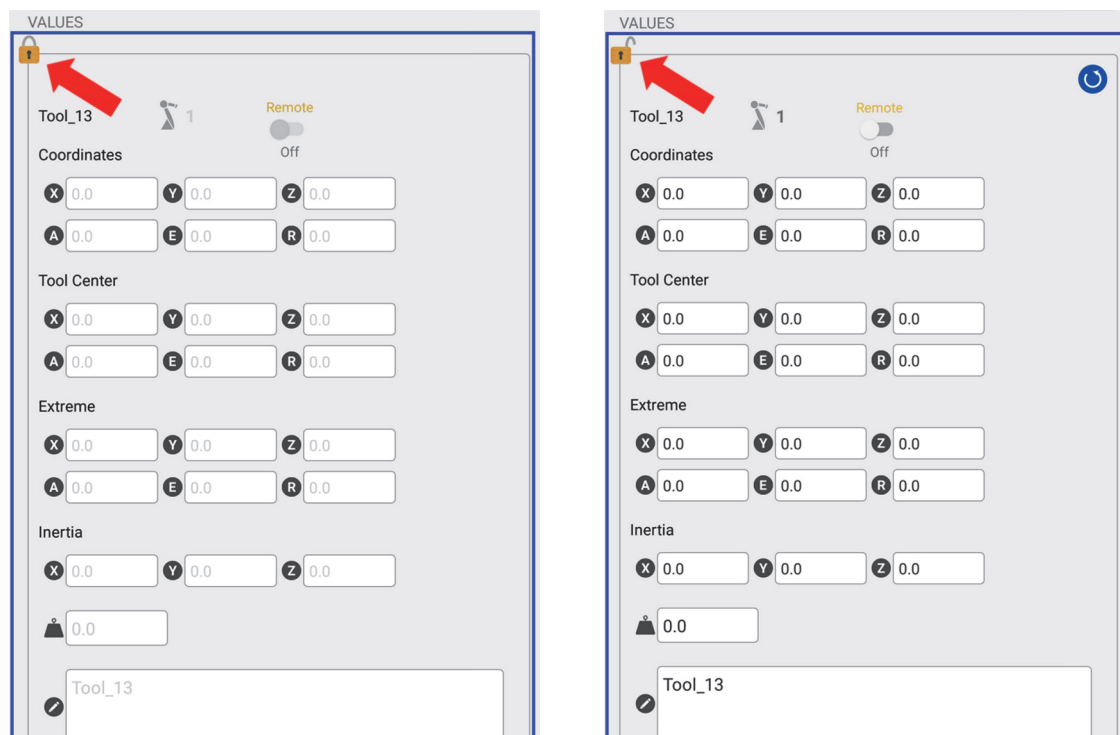
The example in the figure below, shows the Tool and UFrame selection.



#### 4.3.2.4.3 VALUES

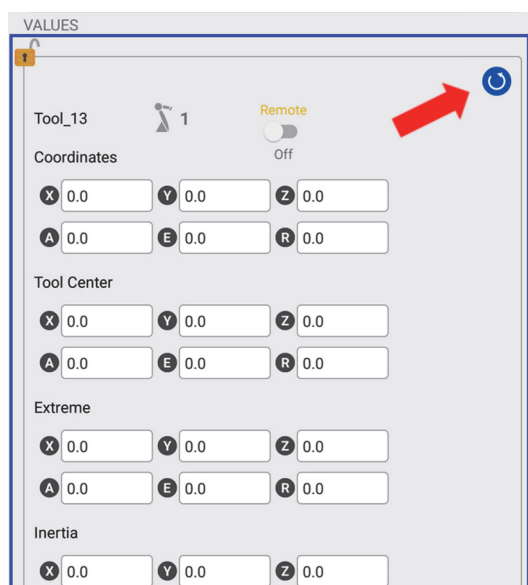
This section displays the values corresponding to the selected element of the list.

To modify them, open the lock in the top leftmost corner. All fields become editable.



Closing the lock again, the inserted data are acquired by the system.

If, before closing the lock, deleting the modifications and loading the previous data again is wished, touch the reload button (see figure below).



#### CAUTION!

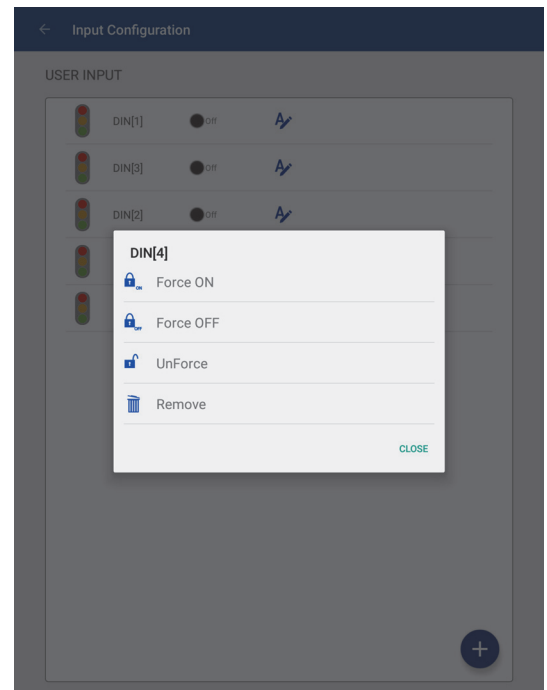
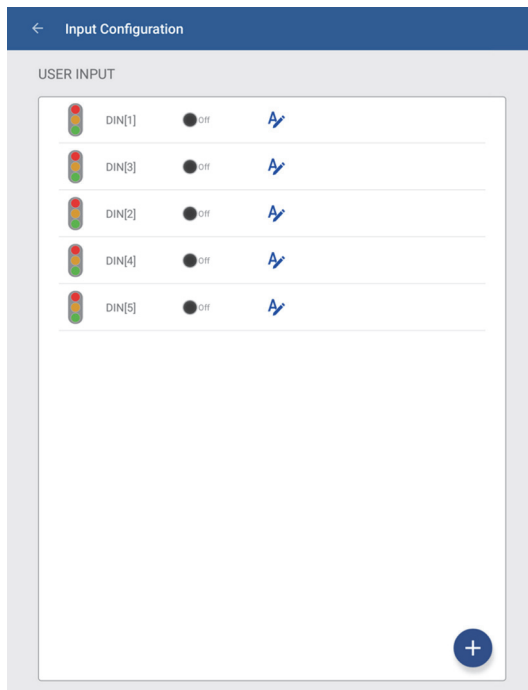
If some changings are made to an **ACTIVE** frame, it is needed to activate it again, by means of **Select base** and **Select toolframe** buttons, in order to make such modifications operational, as described in [par. 4.3.2.4.2 ACTIVE on page 49](#).

#### 4.3.2.5 Input

Configure the User Inputs.

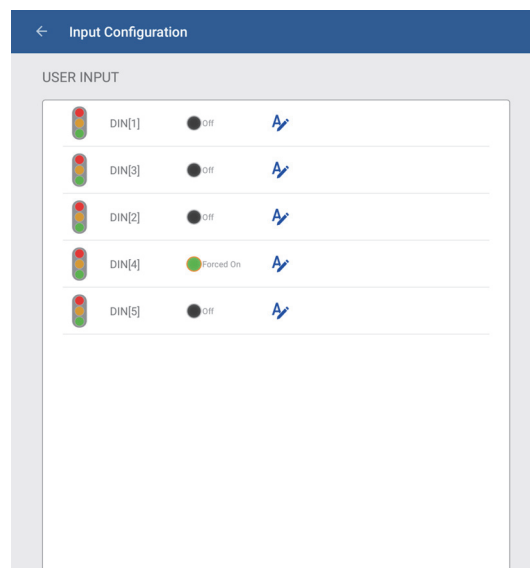
Touching this command, the application displays the User Inputs list and allows configuring them.

Long touching one of the User Inputs, the dedicated command menu is displayed (as shown in the following right figure):

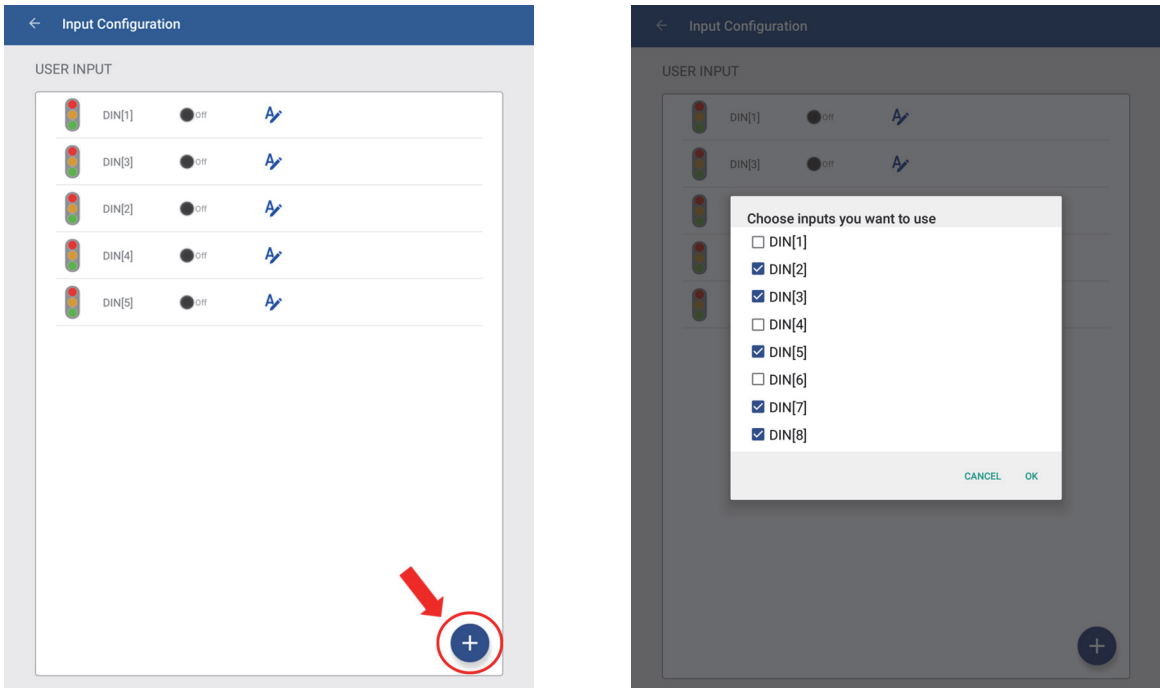


- **Force ON** - force Input to ON
- **Force OFF** - force Input to OFF
- **Unforce** - remove forcing
- **Remove** - remove Input from the list.

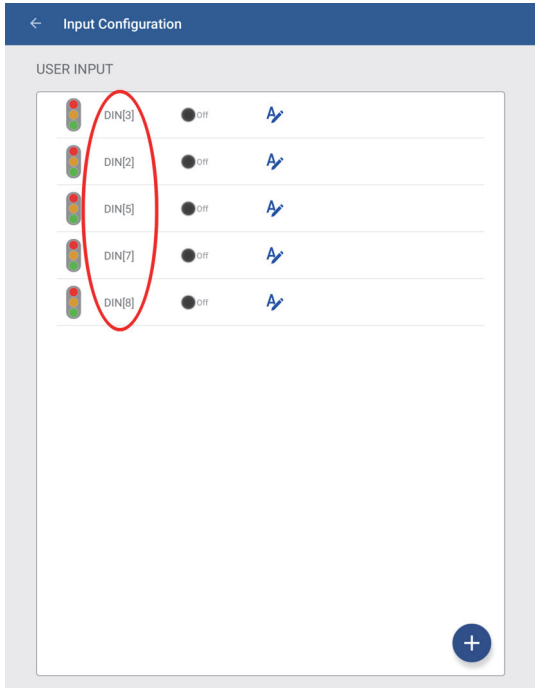
An example of **Force ON** is shown in the figure below .



The user is allowed to add/remove User Inputs from the list, by touching the button in the low rightmost corner (as shown in the left figure below example), and then selecting/unselecting the wished elements.

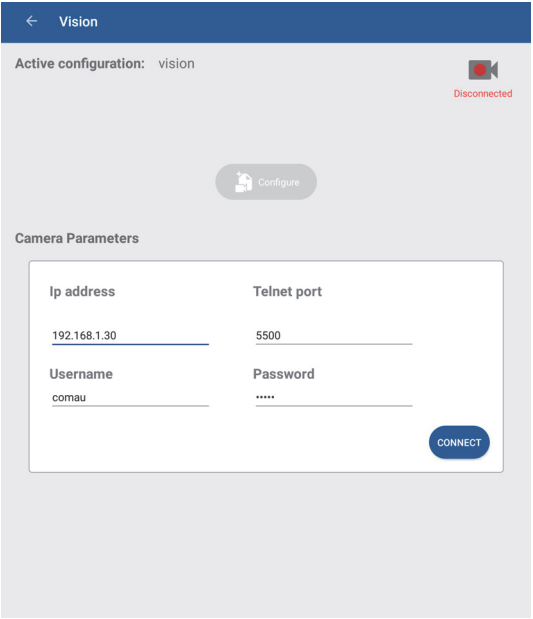


The new User Inputs list is as follows:



4.3.2.6 Vision

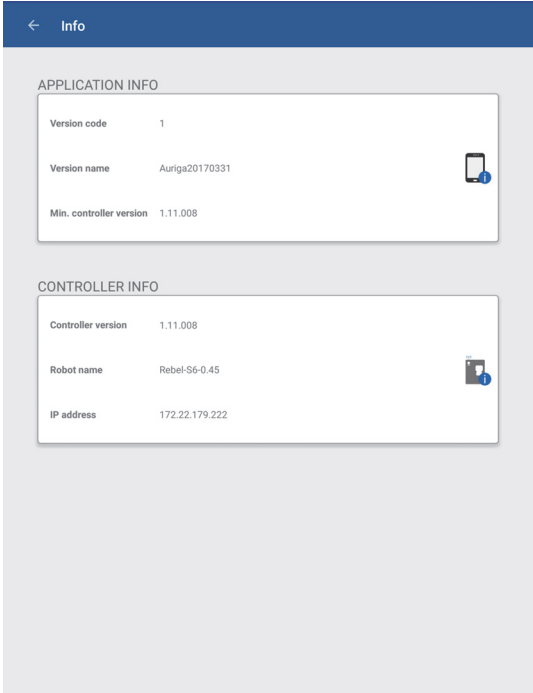
Allows handling both the integrated **Vision System** connection and configuration, if existing in the current robotic system.



Refer to [Chap.5. - Integrated Vision System \(optional feature\)](#) on page 61 for a detailed description.

### 4.3.2.7 Info

Provides information about the application (version code, version name, minimum required version for the system software) and the Control Unit (system software version, robot name, IP address), as shown in the figure below.



---

## 4.4 Alarm Page

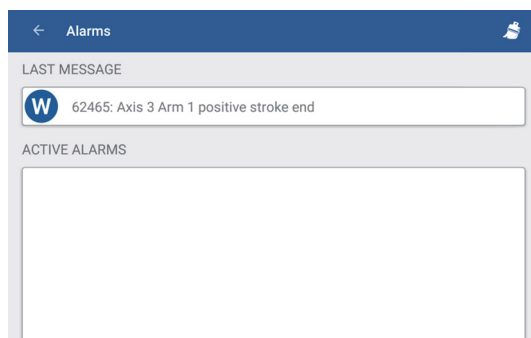
Touching the bell icon, causes to open the Alarm page, displaying the messages.

- Warning messages (yellow notification)
- Alarms (red notification)
- Latched alarms.

---

### 4.4.1 Warning messages (yellow notification)

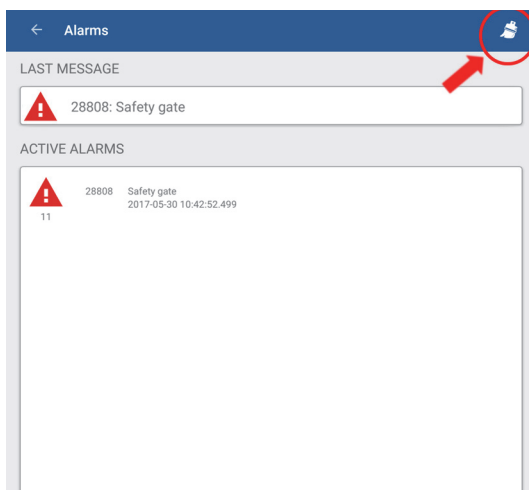
These messages are automatically confirmed when exiting from the Alarm page.



---

### 4.4.2 Alarms (red notification)

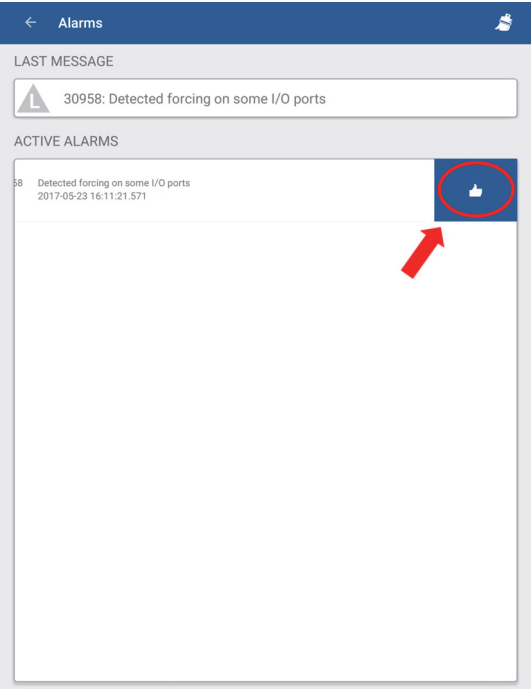
The paintbrush in the rightmost top corner is provided to **Reset** all the occurred alarms with red notification, exactly like pressing the Teach Pendant **RESET** button.



---

### 4.4.3 Latched alarms

If the occurring alarm is a LATCHED type alarm, using the paintbrush button does not reset it: so, swipe each active alarm from right to left and touch the “confirm” symbol to confirm it, as shown in the figure below.



---

## 4.5 Usage procedures

- Changing the environment
- Creating a new program
- Modifying an already existing program
- Step by step executing a program
- Running a program in automatic mode.

---

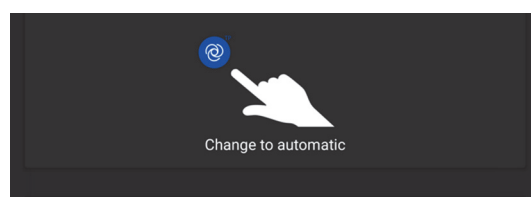
### 4.5.1 Changing the environment

To choose the wished environment ([Create](#) / [Run](#)), act as follows:

- a. touch the wished environment as shown in the next figure



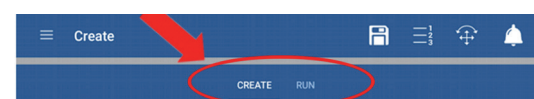
- b. Change to the required system status, as suggested by the application. In the displayed example, changing from [Create](#) to [Run](#) is shown.



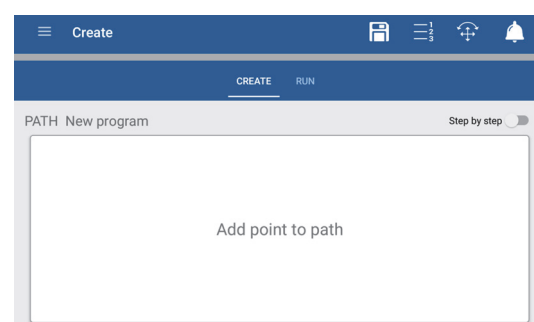
---

### 4.5.2 Creating a new program



- a. Be sure that the current environment is [Create](#). Otherwise switch to it as described in par. 4.5.1 [Changing the environment](#) on page 56.




- b. If there is an already open program, open the [Navigation Menu](#) and choose **New** command. Save the current program, if needed.
- c. The application displays an empty program

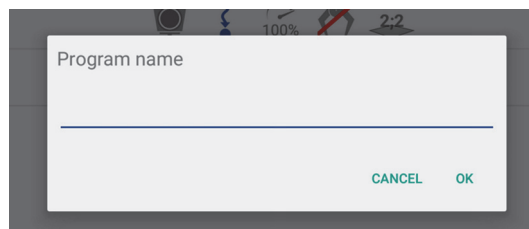




- d. Turn motors ON ([par. Turn motors ON/OFF on page 34](#))  
- e. Jog the robot to the wished point ([par. 4.2.1.3 JOG on page 33](#))
- f. Check the current configuration for the being taught point, in order to verify whether it is as wished:



- point name ([par. Edit point name on page 38](#)),
  - input signal ([par. Select input signal on page 38](#)),
  - trajectory ([par. Choose trajectory on page 39](#)),
  - speed ([par. Set speed on page 39](#)),
  - gripper action ([par. Choose gripper action on page 40](#)),
  - tool and uframe ([par. Select Tool and Uframe references on page 40](#))
  - fixed/vision ([par. Select Fixed/Vision on page 41](#)).
- g. Modify it, if needed, acting on the listed above point characteristics.
- h. Touch the [Teach current robot position](#) button to teach a point corresponding to the robot current position and to add it to the [PATH](#). 
- i. Repeat steps [e.](#) to [h.](#) for each needed point.
- j. Save the newly created program ([par. 4.2.1.1.3 Program Save on page 29](#)).
- k. A window is displayed to insert the program name.



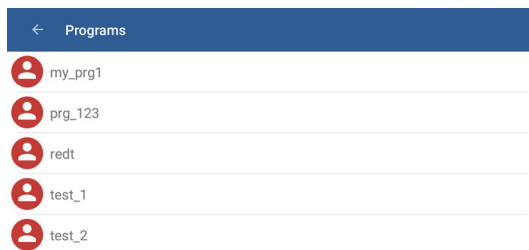
- l. Type the program name and touch **OK** to confirm. The newly created program is then inserted into the available programs list.

### 4.5.3 Modifying an already existing program

- a. Be sure that the current environment is [Create](#). Otherwise switch to it as described in [par. 4.5.1 Changing the environment on page 56](#).



- b. Open the [Navigation Menu](#) and choose **Open** command.
- c. The available programs list is displayed.



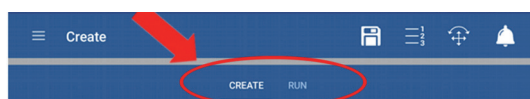
- d. Touch the wished program
- e. The application software opens it.



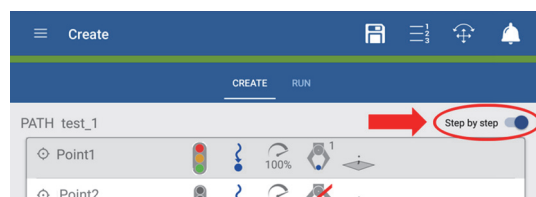
From this situation, execute the same steps of [par. 4.5.2 Creating a new program on page 56](#), from step [d.](#) to the procedure end.

#### 4.5.4 Step by step executing a program

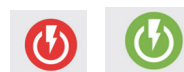
- a. Be sure that the current environment is [Create](#). Otherwise switch to it as described in [par. 4.5.1 Changing the environment on page 56](#).



- b. Touch **Step by step** switch ([par. 4.2.1.2.2 Step by step on page 32](#)) to activate the associated functionality.



- c. Turn motors ON ([par. Turn motors ON/OFF on page 34](#)).



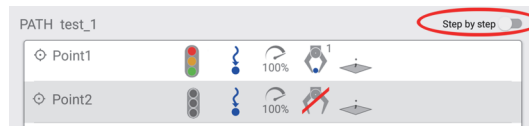
- d. Touch **Play** button to execute the first selected movement in the current program.



- e. Touch **Backward** and/or **Forward** buttons, depending on the program check requirements.



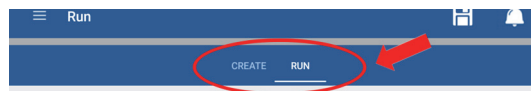
- f. Turn the **Step by step** switch OFF when checking is accomplished.



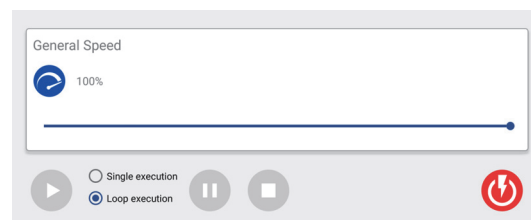
- g. If any modifications have been made, save the program ([par. 4.2.1.1.3 Program Save on page 29](#))

## 4.5.5 Running a program in automatic mode

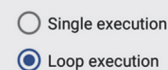
- a. Be sure that the current environment is **Run**. Otherwise switch to it as described in [par. 4.5.1 Changing the environment on page 56](#).



- b. Modify the General Speed override if needed ([par. 4.2.2.3 Speed on page 43](#)).



- c. Select the wished execution type: *Single* or *Loop* (see [par. 4.2.2.4.2 Choose single/loop execution on page 44](#)).



### WARNING

If the integrated **Vision System** is present, the user can specify whether executing the **Vision** points ([par. Select Fixed/Vision on page 41](#)) if any, or not, acting on the camera symbol, as described in [par. 4.2.2.4 Function buttons on page 43](#).

- d. Turn motors ON ([par. Turn motors ON/OFF on page 34](#)).



- e. Touch **PLAY** button to start the execution ([par. 4.2.2.4.3 Play / Pause / Stop on page 44](#)).



## USAGE AND PROCEDURES

- f. Touch **PAUSE** button if temporarily pause the program execution is wished (par. 4.2.2.4.3 Play / Pause / Stop on page 44).



- g. Touch **STOP** button to terminate the program execution (par. 4.2.2.4.3 Play / Pause / Stop on page 44).



NOTE that before running a program in Automatic status, it is suggested to check it in [Step by step](#) mode, in PROGR status.

## 5. INTEGRATED VISION SYSTEM (OPTIONAL FEATURE)



To be able to use the integrated **Vision System**, the related option is required. Comau option code is **CR17926411**.

### 5.1 Introduction

The integrated **Vision System** is based upon an **IN-SIGHT MICRO 8402 - Cognex** smart camera.

COMAU supports any models compatible with **Cognex** objects identification algorithm.

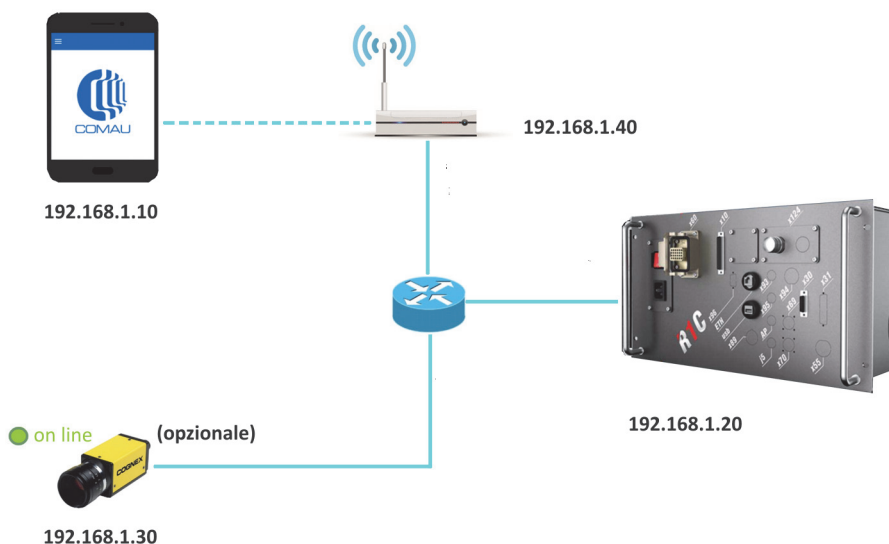
The smart camera programming is made by means of its own software, provided by the constructor.

The only goal of integrating such a **Vision System** is to handle a subpattern of parameters which helps implementing a **Pick and Place** type process. Knowledge about the objects identification algorithm is absolutely not needed.



As already stated in [par. 3.4 Activation on page 25](#), please remember that all the involved devices (Tablet, Access Point, Control Unit, **Vision System Camera**) must be both connected and configured on the same network.

An example of connections and IP addresses is shown in the figure below.



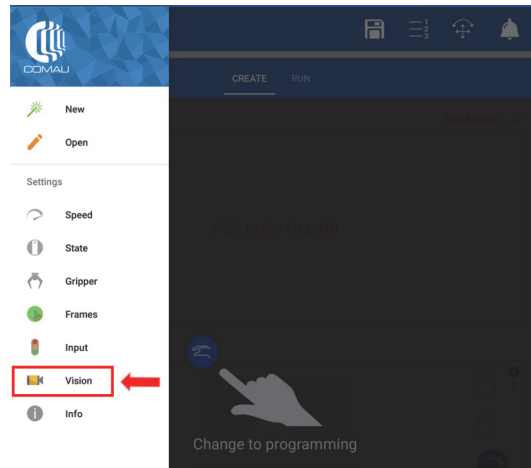
Suggestions for inserting the smart camera in the Comau System:

- mount the camera perpendicularly to the plane in which objects will be identified
- use a continuous flow light source (LED type).

## INTEGRATED VISION SYSTEM (OPTIONAL FEATURE)

Programming the camera is made by means of its dedicated software, provided by the Constructor.

Open the [Navigation Menu](#) and choose [Vision](#) item to handle the integrated **Vision System** [Connection](#) and [Configuration](#).



The following commands are available:

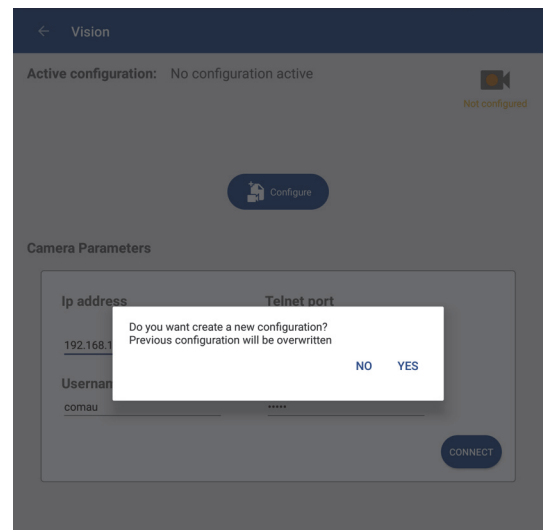
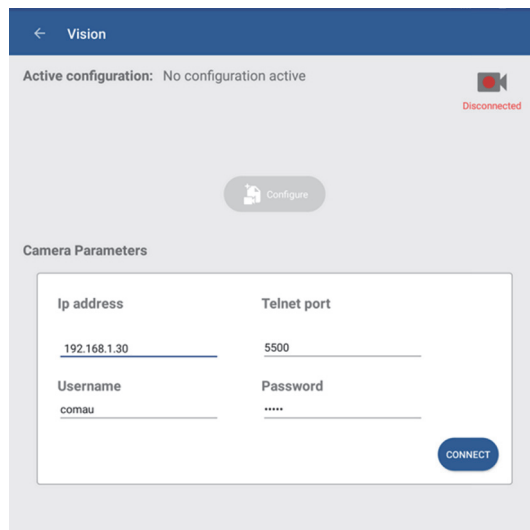
- [Connect](#)
- [Configure](#)
- [Go Live.](#)

## 5.2 Connect

The **Vision** environment provides the **Vision** page, in which the following scenarios may occur:

- Not Connected Vision System
- Not Configured Vision System
- Configured Vision System.

### 5.2.1 Not Connected Vision System

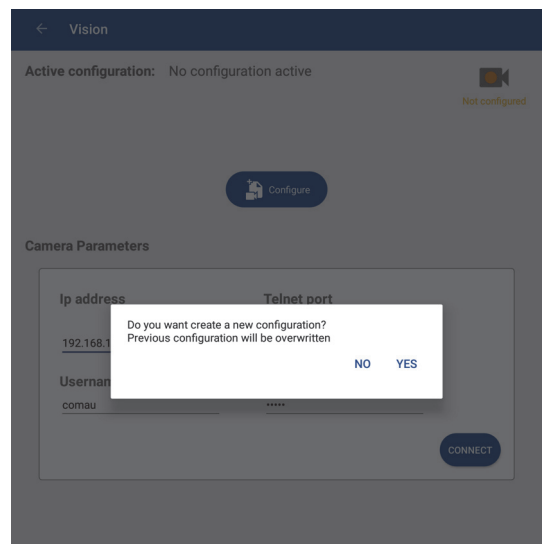
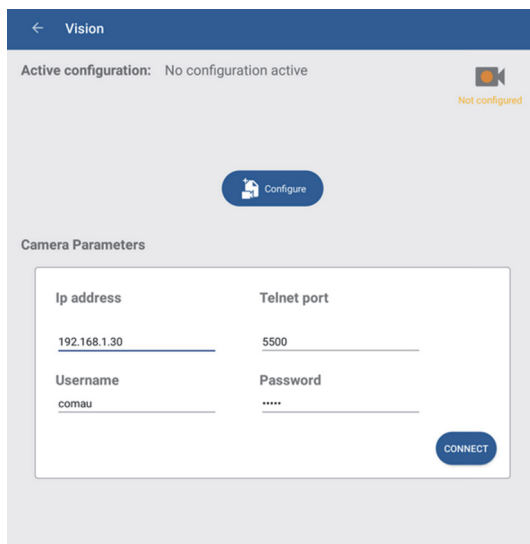


Insert the required data (**Camera Parameters**) and touch **CONNECT** key.

The user is asked for confirmation.

The **Configure** key is enabled, upon the connection, in order to be able to proceed with the Configuration (par. 5.2.2 Not Configured Vision System on page 63).

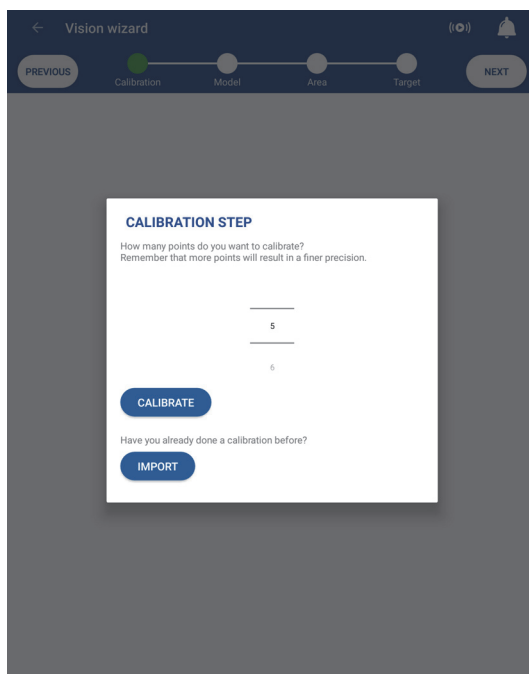
### 5.2.2 Not Configured Vision System



Touch **Configure** key.

The user is asked for confirmation.

Before accessing the **Vision wizard** which helps the user along all the configuration steps, choose whether creating a new configuration or using an already saved one is wished, as shown in the figure below.



The available choices are

- [Calibrate](#)
- [Import](#).

---

#### 5.2.2.1 Calibrate

The user must specify the total amount of points to be used during the Calibration procedure. More points will result in a finer precision.

Touch **CALIBRATE** key.



##### WARNING

Note that even if only one of the camera physical parameters (focus and diaphragm) is modified, the Configuration procedure must be repeated again. Thus, before executing a Configuration process, it is suggested to use the [Go Live](#) command, to check such parameters adjustment and to modify them, if needed.

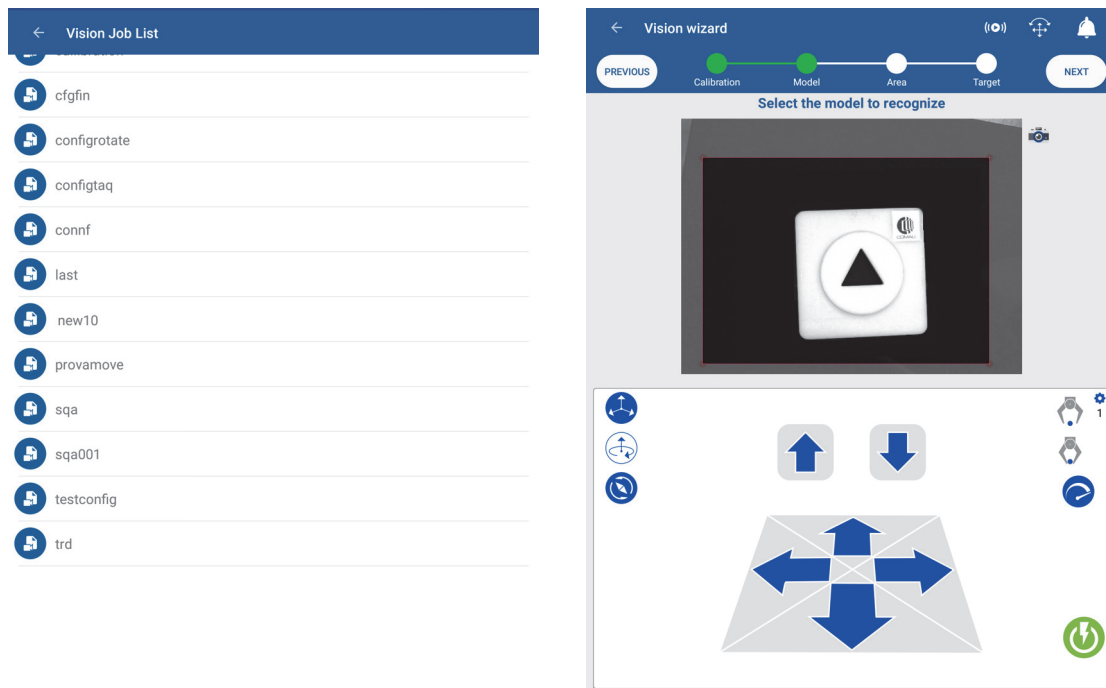
---

#### 5.2.2.2 Import

Touch **IMPORT** key.

The application displays a list of the saved configurations, as shown in the next figure on the left.

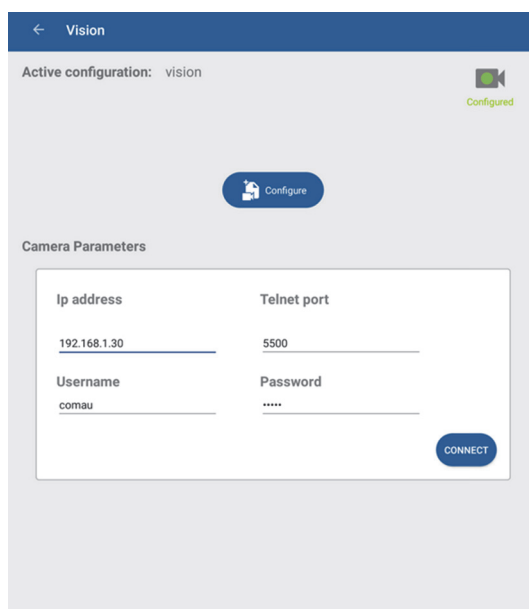




Touch the configuration to be imported.

Using an already existing configuration, the first step ([Calibration](#)) is automatically skipped (right figure above).

### 5.2.3 Configured Vision System



A connected and configured Vision System is ready to be used. Then exit the **Vision** environment and proceed to create/execute programs using it.

On the contrary, if the Vision System is already configured but it is wished to modify the current configuration, touch **Configure** key and act like it was a [Not Configured Vision System](#).

## 5.3 Configure



### WARNING

Note that even if only one of the camera physical parameters (focus and diaphragm) is modified, the Configuration procedure must be repeated again.

Thus, before executing a Configuration process, it is suggested to use the [Go Live](#) command, to check such parameters adjustment and to modify them, if needed.



The **Vision System Configuration**, essential to be able to use it, is composed of **4 phases**, displayed by a step bar, in the top area of the **Vision Wizard** page (as shown in the figure above):

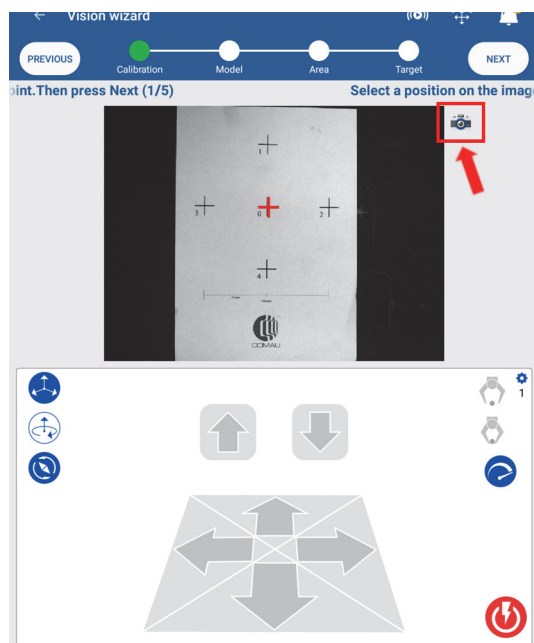
- [Calibration](#)
- [Model](#)
- [Area](#)
- [Target](#).

The symbol associated to a specific phase, becomes green when it is to be executed and it remains green also when it is done and the application switches to the next phase. Switching to the next phase is automatic as soon as a phase is done.

**PREVIOUS** and **NEXT** keys allow moving among the phases, both back and forth.

The central area of the **Vision Wizard** page, belongs to the camera.

The image is not dynamic: it is a picture of what the camera focuses at the page opening. If refreshing the image is wished, touch the camera symbol (highlighted in red in the figure below) to take a new picture.



### 5.3.1 Calibration

This phase associates camera pixels to robot positions.

Using more points results in a finer calibration precision.



Note that a new Calibration is needed just if the relative position between the camera and the reference frame is changed (e.g. the camera has been moved with respect to the UFRAME).



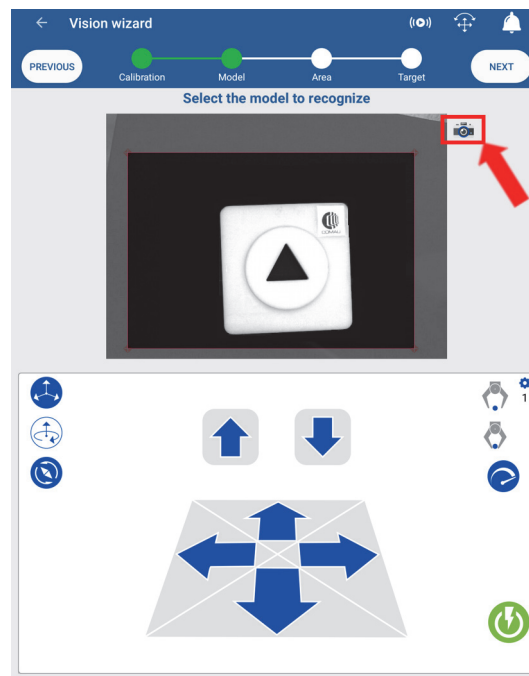
In order to help the user in the Calibration operation, a Calibration Sheet is provided in [Appendix - par. 6.1 Calibration Sheet on page 72](#).

Place under the camera the reference object (e.g. the [Calibration Sheet](#)) which includes the calibration points.

Execute the following steps for each of them:

- select the wished point.
- Move the robot to such a point.
- Touch **NEXT** key.

### 5.3.2 Model

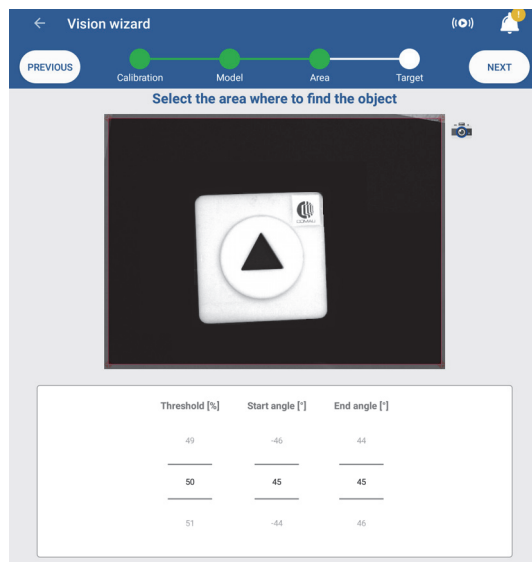


This phase creates the reference (model), for the camera, of the object that will have to be identified. Execute the following steps:

- place the object under the camera.
- Take a picture touching the camera symbol (highlighted in the above figure).

- c. Carefully select the object, by zooming in/out and moving the frame around it.
- d. Touch **NEXT** key.

### 5.3.3 Area



This phase defines the area inside which the object will be searched for and identified. To do this, execute the following steps:

- a. zoom in/out and move the frame around the object, so that it will include the whole search area.
- b. Select the wished tolerances the Vision System should use during the object identification:
  - **Threshold** - tolerance percentage while matching model and object
  - **Start angle / End angle** - tolerances about the object rotation, when compared with the model
- c. Touch **NEXT** key.

### 5.3.4 Target

This phase defines the object picking modality. It is composed of three steps. Touch **NEXT** key to move to the next step:

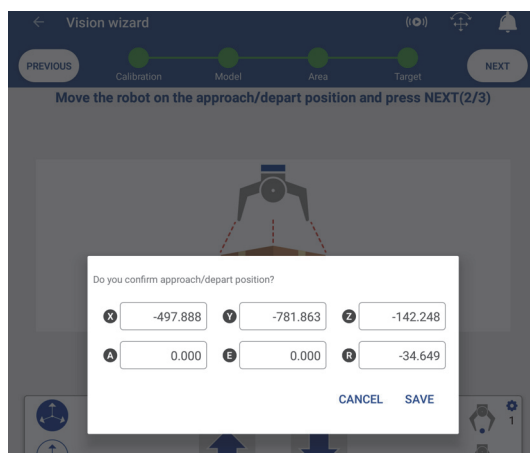
- a. step 1/3 - place the object under the camera and touch **NEXT** key.



When the object is identified, some dashed lines are displayed (as indicated in the figure below).



- b. Step 2/3 - move the robot to the position that will be considered as the **approach/depart** one and touch **NEXT** key.

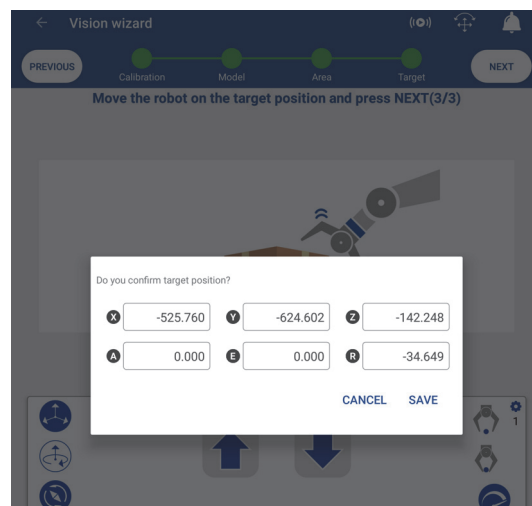
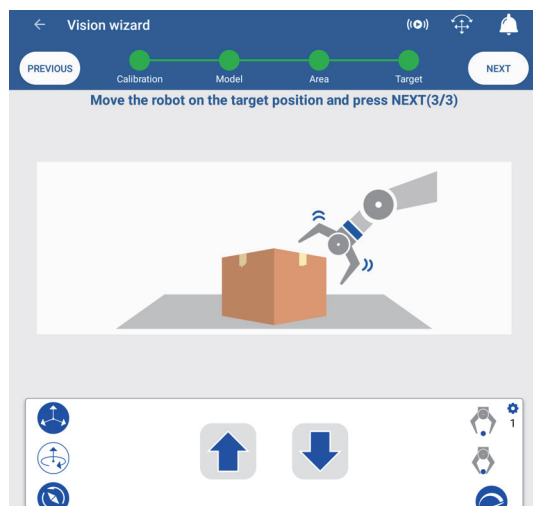


The user is asked to confirm the chosen **approach/depart** position, by touching **SAVE** key.



Note that **approach** and **depart** points are the same, in the current version.

- c. Step 3/3 - move the robot to the **target** position, i.e. the pick position, and touch **NEXT** key.



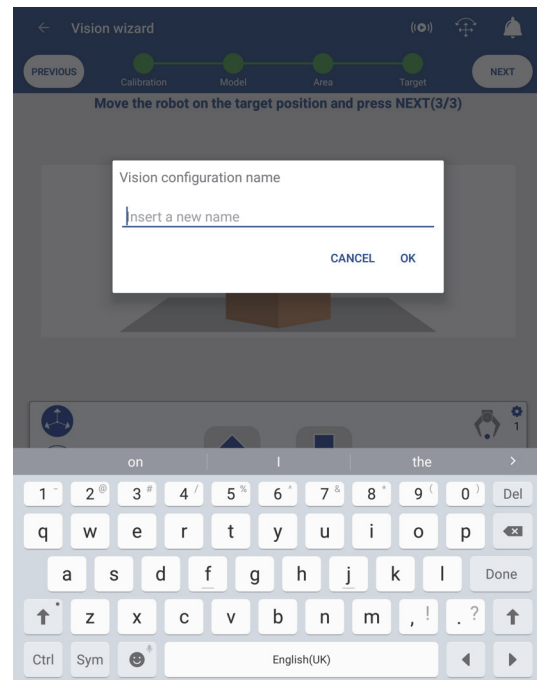
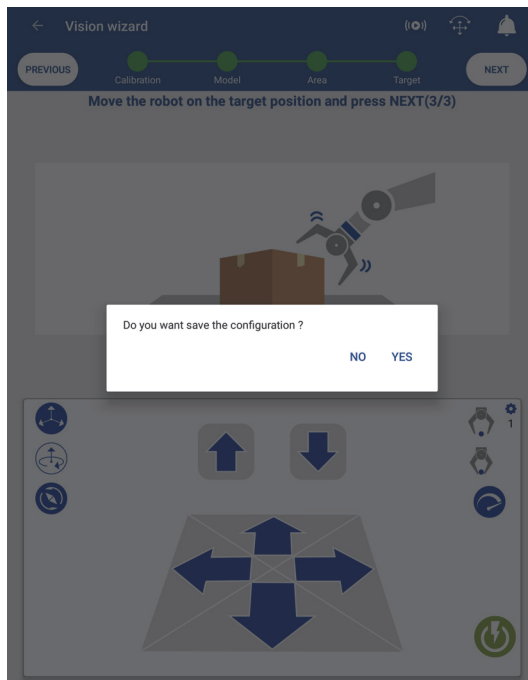
## INTEGRATED VISION SYSTEM (OPTIONAL FEATURE)

The user is asked to confirm the chosen **target** position (previous figure on the right), by touching **SAVE** key

The Configure procedure is completed and the application asks the user whether to save the newly created Configuration. If so, answer YES, insert the wished name and touch **OK** key.

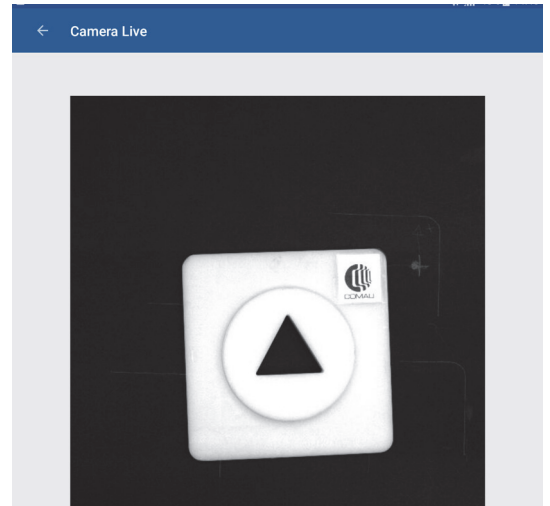
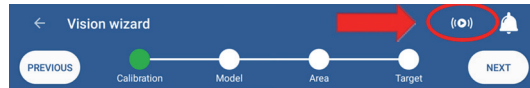
The saved Configuration becomes active and available to be imported later on (refer to [par. 5.2.2.2 Import on page 64](#) for further details).

If it is not saved, all Configuration data are lost.



## 5.4 Go Live

Touching the **Go Live** symbol (as shown in the left figure below) the streaming environment (**Camera Live**) is entered in which all the scenarios focused by the camera, are displayed in real time.



This environment allows the user adjusting the camera physical parameters (focus and diaphragm), by manually acting on it, before executing the Configuration procedure.

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## 6. APPENDIX

- [Calibration Sheet](#)
- 

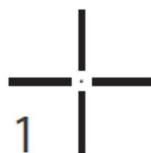
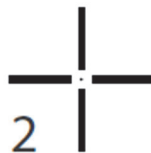
### 6.1 Calibration Sheet

A sample **Calibration Sheet** is provided to help the user during the [Calibration](#) phase.

It is suggested to print the figure shown in the following page and to use it as described in [par. 5.3.1 Calibration on page 67](#).

The user can anyway decide to use his/her customized references, during the **Calibration** operation.







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**Original instructions**

**Made in Comau**