

**Delta 5 Robot**  
**IP65 protection class**

**CR\_UGD5 Series**

**USER'S MANUAL**

**OMRON**



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## Safety Instructions

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# 1. Attention

Information in this document can change without prior notice.

OMRON EUROPE B.V. cannot be held responsible for any damage to the environment, to the machine or to the functioning of the machine occurred by errors or missing data in the illustrations, drawing or specifications.

No part of this manual and added documentation may be copied, reproduced or translated into another language without prior written approval.

Read and understand the material contained in this user's manual before you work on the CR\_UGD5 robot for the first time. This user's manual is supposed to help you use the capabilities of the CR\_UGD5 robot safely and properly.

# 2. Explanation of warnings and notes

This manual uses the following safety alert symbols and signal words to provide safety instructions that must be observed and to describe handling precautions, prohibited actions, and compulsory actions. Make sure you understand the meaning of each symbol and signal word and then read this manual.

**DANGER**

THIS INDICATES AN IMMEDIATELY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY.

**WARNING**

THIS INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

**NOTE**

Explains the key point in the operation in a simple and clear manner.

## 3. Safety information

### 3.1 General

This '3. Safety information' subchapter contains information regarding working with the CR\_UGD5 robot. Qualified personnel working with the CR\_UGD5 robot must have read and understood the CR\_UGD5 robot documentation, including the safety information chapter.

### 3.2 Qualified personnel

These are people who, due their specialist training, knowledge and experience, and their familiarization with the relevant standards, are able to assess the work to be carried out and detect any potential hazards.

### 3.3 Liability

The CR\_UGD5 robot is build using state-of-the-art technology and in accordance with the recognized safety rules. Nevertheless, misuse of the CR\_UGD5 robot may constitute a risk to life and limb or cause damage to the CR\_UGD5 robot and to other material property.

### 3.4 Installation and operating conditions

You may only use the components in accordance with the installation and operating conditions described in the documentation. The operating conditions at the installation location must be checked and maintained in accordance with the required technical data. Within the meaning of the Machinery Directive the CR\_UGD5 robot is an incomplete machine. Commissioning is prohibited until the usable machine or system in which the CR\_UGD5 robot is installed meets all requirements of the Machine directive 2006/42/EC.

For the CR\_UGD5 robot you have to observe the following standards, directives and regulations:

- EN ISO 10218-1:2011 Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.
- EN ISO 10218-2:2011 Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration.

### 3.5 Residual risks

Safety and health risks arising from the robot mechanics have been reduced by means of safety technology and design engineering. However a residual risk remains, since the robot mechanics will be move by an automated control system.

The following are typical warnings concerning residual risks which cannot be assigned to a specific action. The expression of safety labels is identical to the safety information.

### 3.5.1 Release device

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The robot mechanics are not supplied with an release switch to control the brakes of the motors.

**WARNING**

- MOUNT A RELEASE SWITCH ON THE MACHINE SO THE ARMS (MOTOR) OF THE ROBOT COULD BE MANUALLY MOVED.
  - MOVING AN AXIS WITH AN IMPROPERLY WORKING RELEASE SWITCH CAN DAMAGE THE MOTOR BRAKE. THIS CAN RESULT IN PERSONAL INJURY AND MATERIAL DAMAGE.
  - BEFORE RELEASING THE BRAKE, YOU HAVE TO BE SURE THAT NO ONE IS IN THE HAZARD AREA OF THE ROBOT.
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### 3.5.2 Transport

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The prescribed transport position of the robot must be observed. Transportation must be carried out in accordance with the transportation instructions or assembly instructions of the robot.

**WARNING**

- ONLY USE AUTHORIZED HANDLING EQUIPMENT WITH A SUFFICIENT LOAD-BEARING CAPACITY TO TRANSPORT THE ROBOT.
  - WEAR SUITABLE PROTECTIVE CLOTHING IF NECESSARY.
- 

### 3.5.3 Assembly and start-up

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Before starting up systems and devices for the first time, a check must be carried out to ensure that the system and devices are completed and operational, that they can be operated safely and that any damage is detected.

The valid national or regional work safety regulations must be observed for this check. The correct functioning of all safety circuits must also be tested.

The following tests must be carried out before start-up and recommissioning. It must be ensured that:

- The robot is correctly installed and fastened in accordance with the specifications in the assembly instructions.
- There are no foreign bodies or loose parts on the robot.
- All required safety equipment is correctly installed and operational.

**WARNING**

- A WRONG INSTALLED ROBOT MAY THROW OFF HIS ARMS.
  - WEAR SUITABLE PROTECTIVE CLOTHING IF NECESSARY.
- 

### 3.5.4 Maintenance and repair

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After maintenance and repair work, checks must be carried out to ensure the required safety level. The valid national or regional work safety regulations must be observed for this check. The correct functioning of all safety circuits must also be tested.

The purpose of maintenance and repair work is to ensure that the system is kept original or, in the event of a fault, to return the system to an operational state. Repair work includes troubleshooting in addition to the actual repair itself.

The following safety measures must be carried out when working on the robot:

- Switch of the machine (system) where the robot is built-in (e.g. with a padlock) to prevent it from being switched on again
- Label the machine (system) with a sign indication that work is in progress. This sign must remain in place, even during temporary interruptions to the work.
- The emergency stop from the machine (system) must remain active. If safety functions or safeguards are deactivated during maintenance or repair work, they must be reactivated immediately after the work is completed.

### 3.5.5 System integrator

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The robot is safely integrated into a complete system by the system integrator. The system integrator is responsible for the following tasks:

- Installing the robot
- Performing risk assessment
- Implementing the required safety functions and safeguards
- Issuing the declaration of conformity
- Attaching the CE mark
- Creating the operating instructions for the complete system

# Chapter 1 Introduction

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# 1. Introduction

Congratulations with the purchase of your high speed Delta robot 5 axes.

This manual should be read before the commissioning of the robot. By mechanical engineers in the design phase during the integration of the robot in the machine and by software engineers to check the performance envelope of the robot.

This manual describes the main versions of the CR\_UGD5 robot, and all options. Where applicable check the appropriate data for your robot type, the type can be found on the identification tag of the robot.



## 1.1 Description of the robot

The CR\_UGD5 Delta robot is a high speed pick and place robot which uses state-of-the-art carbon composite materials and the latest servo drive technology to be put in use in the most demanding pick and place applications. The robot is designed as a 5-axis Delta kinematic system.

Characteristics of the robot:

- Requires very low maintenance
- 5 degrees of freedom
- Compact design for mounting in a machine
- Low noise level < 68 dB (A)

## 1.2 Type code explanation

CR\_UGD5\_XL: 5 axes, 1300 mm working range, max. payload: 1 kg

CR\_UGD5: 5 axes, 1100 mm working range, max. payload: 1 kg

CR\_UGD5\_XS: 5 axes, 650 mm working range, max. payload: 1 kg

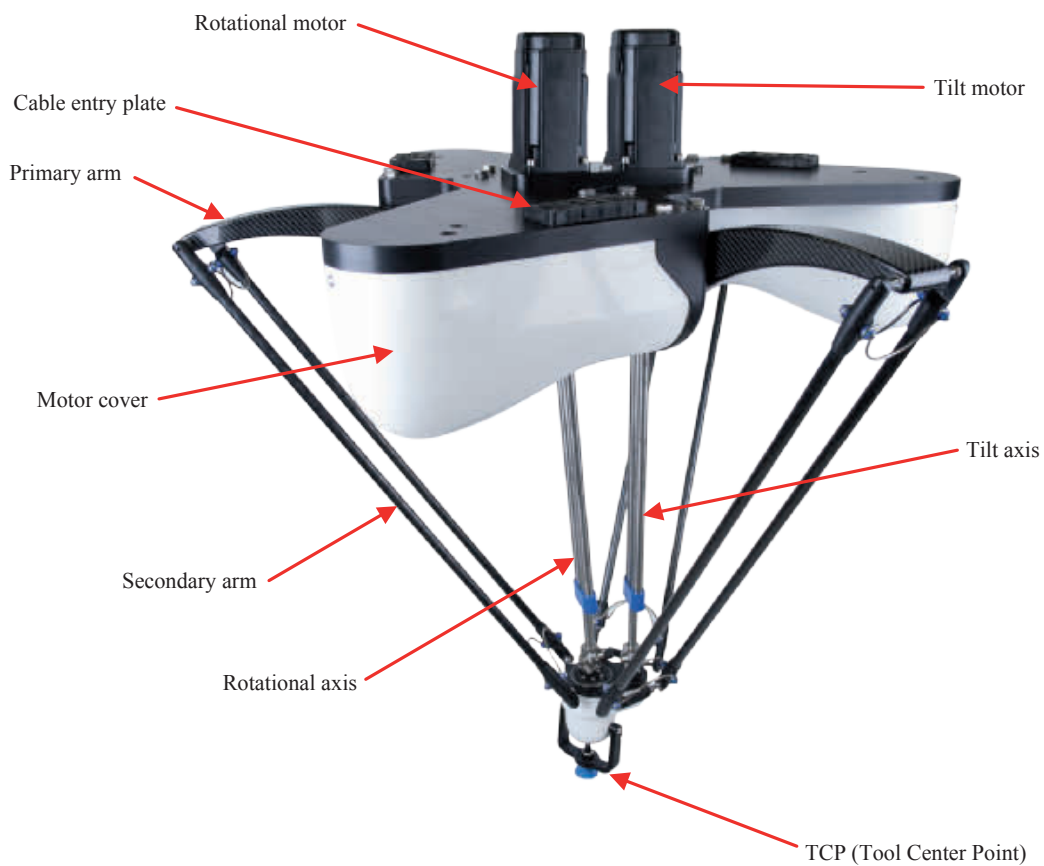
# 2. Identification

On the robot base plate an identification tag is mounted, important data on this plate:

- Robot type
- Total weight of the robot
- Month and year of production
- Serial number, important for ordering spareparts

### 3. Part names

#### CR\_UGD5 series





# Chapter 2 Model overview

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1. Overview

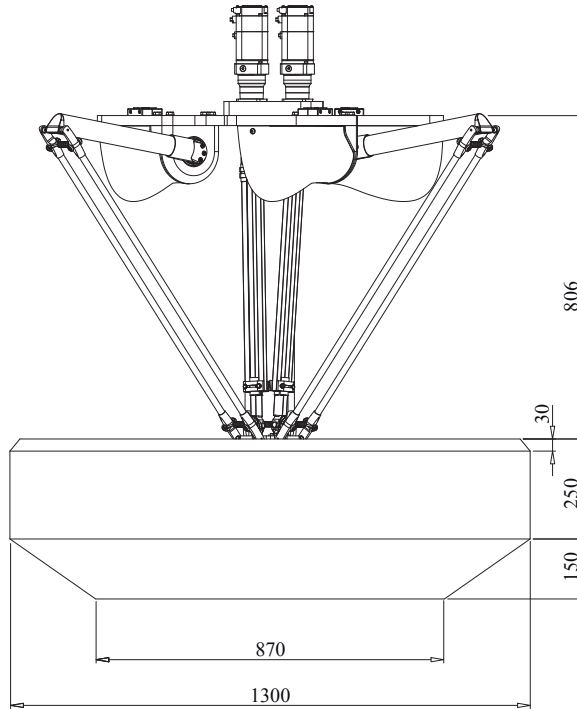
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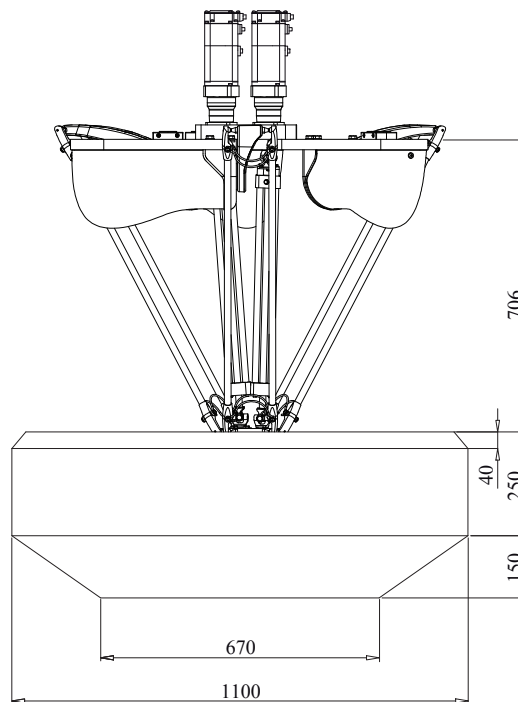
# 1. Overview

The specifications are given in the below figure, if specifications differ for models, it is indicated in the specification list. The Delta robot 5 axes is delivered standard with sanitary secondary arms, this means they are fully closed to prevent any contamination on the inside of the secondary arms.

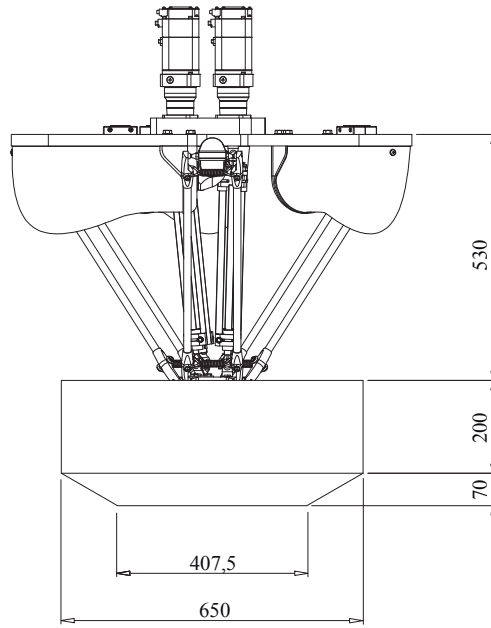
## CR\_UGD5\_XL (1300 mm)



## CR\_UGD5 (1100 mm)



CR\_UGD5\_XS (650 mm)



# Chapter 3 Installation

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# 1. Unpacking

## 1.1 Unpacking the shipping box

The robot comes in a special shipping box.

The following step must be carried out to remove the cover from the box:

- Unscrew the screws from the cover of the wooden box
- Now remove the cover

## 1.2 Check the damage

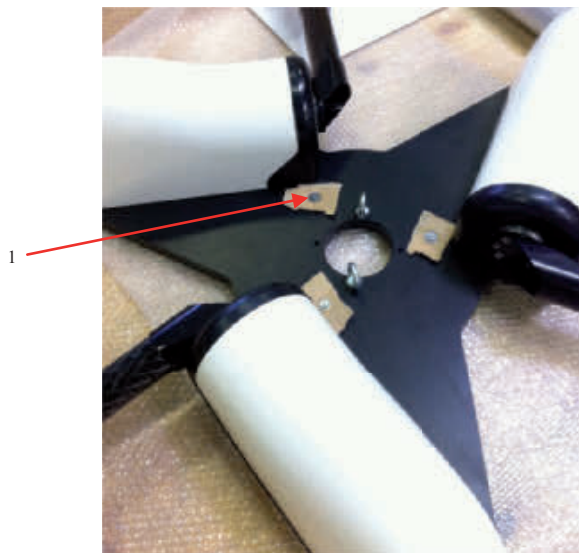
First take out the individual components from the package and check that everything is complete according to the following list:

- 1 x rotational axis including head
- 1 x tilt axis including head
- 1 x adaptor plate for the rotational axis gear
- 1 x adaptor plate for the tilt axis gear
- 6 x secondary arms
- 1 x spring package (12 x spring)

Check all the components and the robot for transportation damage.

## 1.3 Lifting and transportation

Before the robot is lifted, it must be ensured that it is free from obstructions. Remove all the screws where the robot is mounted with in the box.



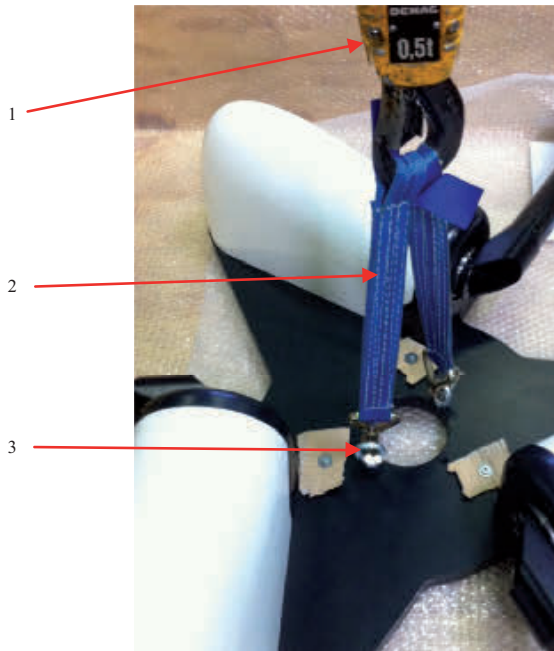
No.	Description
1	3 x screws with protection material

The robot must be lifted and transported by using lifting tackle or a forklift truck. Two lifting straps has to be attached into two eyebolts that are screwed into the baseplate. The lifting straps has to be long enough and must be routed in such a way that the robot is not damaged.



**WARNING**

- THE ROBOT MAY TILT DURING TRANSPORTATION.
- ADDITIONAL SAFEGUARDING MEASURE MUST BE TAKEN.
- WEAR SUITABLE PROTECTIVE CLOTHING IF NECESSARY.
- WHEN USING A FORKLIFT TRUCK, DRIVE EXTREMELY SLOWLY AND CAREFULLY.



No.	Description
1	Lifting tackle
2	2 x lifting straps
3	2 x eyebolts

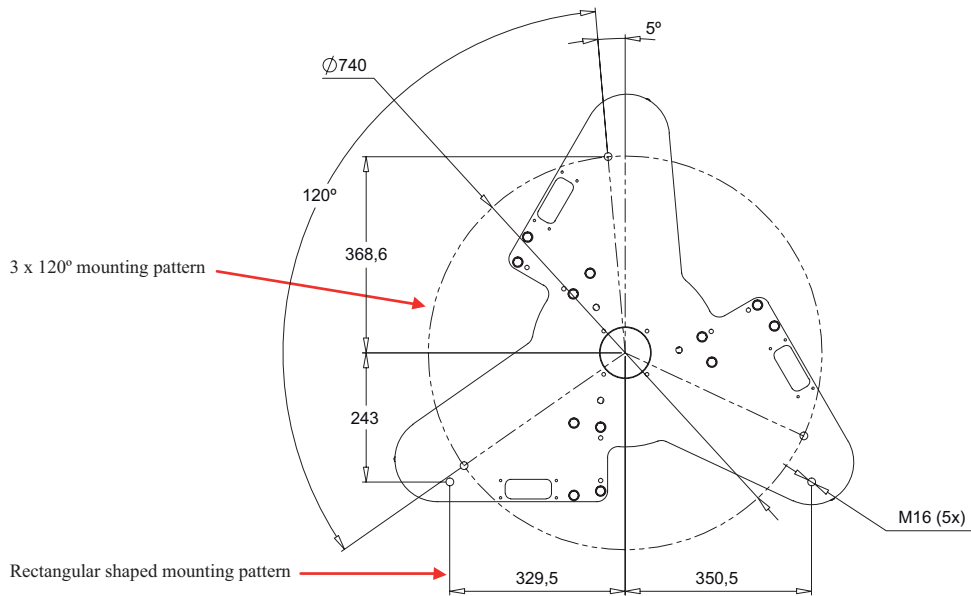


## 2. Mounting the robot

The mounting surface for the robot must be machined and of an appropriate quality. It's also possible to use a levelling element to align the robot.

Three M16 bolts are needed to mounting the robot to the frame, exact bolt length depends on frame layout. The tightening torque of a M16 6.8 bolt is 140Nm.

The below figure shows the mounting pattern from the robot.



### NOTE

It is advisable to put one motor of the robot in line with the direction of the transport belt to make programming easier.

## 3. Mounting the motors and cabling

### 3.1 Mounting the motors

When your robot is delivered without motors, you have to mount them by yourself. First of all you have to remove the three motor covers from the robot.

The following steps must be carried out to remove the motor covers from the robot. Please see also the following picture:

- Remove the M6 Allen bolt



No.	Description
1	1 x M6 Allen bolt
2	Motor cover

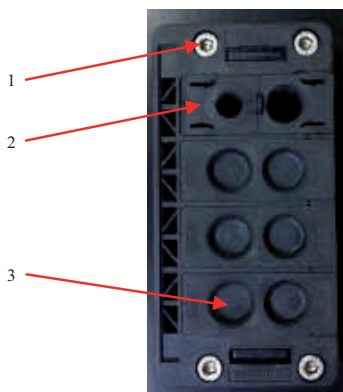
- Remove the motor cover
- Repeat this process for the other two motor covers

### 3.2 Connecting the cables

The robot is delivered with 3 cable entry plates. They are mounted above every primary arm motor to feed his cables through.

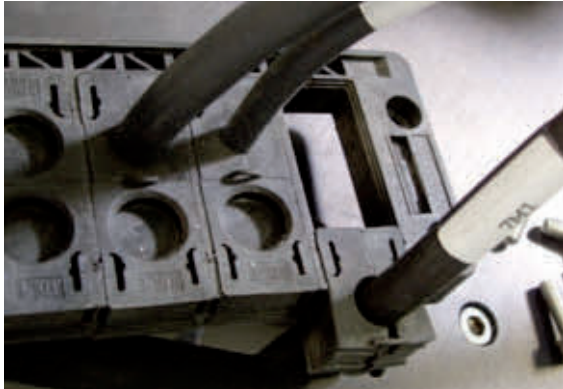
The following steps must be carried out to feed the cables through the entry plates. Please see also the below pictures:

- Remove the 4 bolts of the cable entry plates
- Remove the cable entry glands



No.	Description
1	4 x M5 Allen bolt
2	Cable entry glands
3	Blind thule

- Insert the cables into the opening of the robot baseplate
- Connect the cables



- Clamp the cable entry glands around the cable and slide it back into the cable entry plate. Afterwards also slide the blind thule back into the cable entry plate
- Mount the cable entry plate on the baseplate, using the 4 M5 Allen bolts

### 3.3 Mounting the motor covers

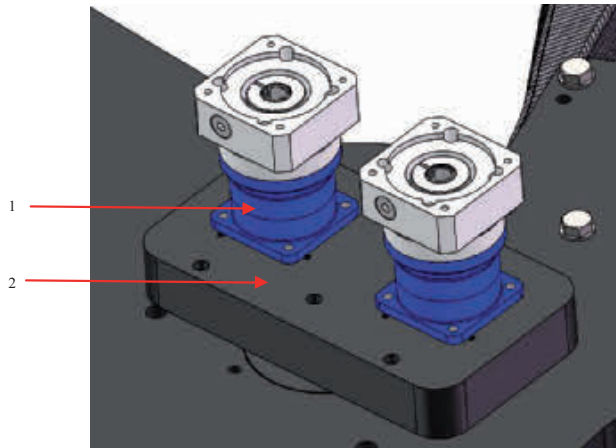
- Mount the cover in the machined groove
- Install the Allen M6 bolt in the cover bracket and tighten
- Repeat the process for the other two motor covers
- The motor covers are now mounted



No.	Description
1	Cover bracket
2	Machined groove

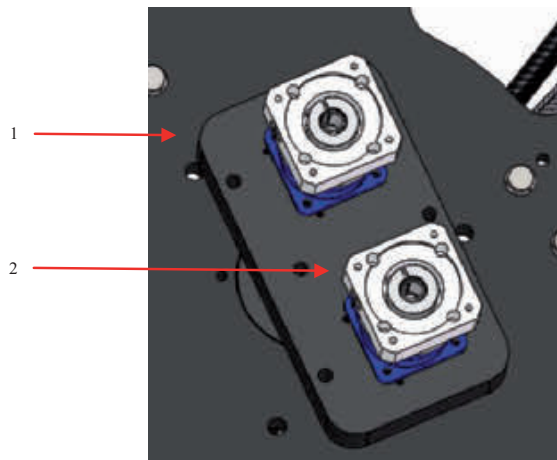
### 3.4 Mounting the rotational and tilt gearbox with their adaptor plate

Dependent on the type of rotational and tilt gearbox, a special adaptor plate for mounting is included.



No.	Description
1	Gearbox or motor
2	Adaptor ring

Now mount the adaptor plate with the gearboxes on the top of the baseplate from the robot with the included bolts and rings.

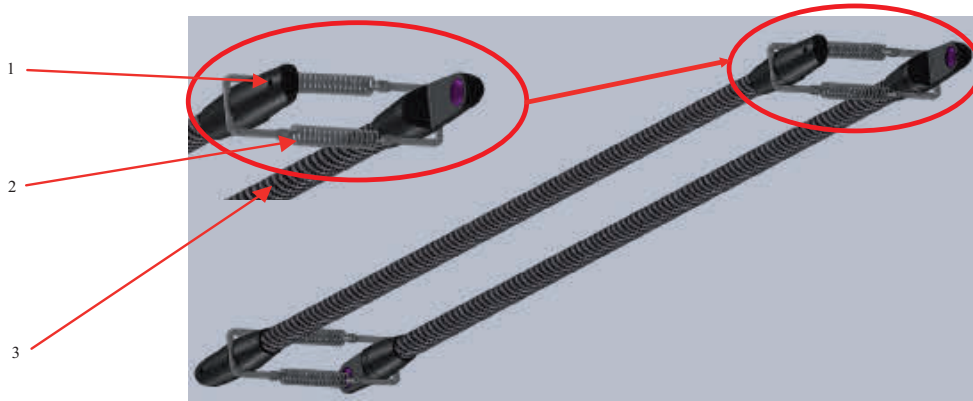


No.	Description
1	Top of the baseplate
2	Rotation adaptor ring with motor or gearbox

## 4. Assembling the secondary arms

### 4.1 Make an assembly

Before mounting the secondary arms on the robot, we have to pre-assemble them as shown on the below figure, so that we get an arm assembly.



No.	Description
1	Sanitary cup holder incl. ball bearing cup
2	Spring package
3	Secondary arm

Repeat this action for the other 2 arm sets.



#### WARNING

- INCORRECT MOUNTED SPRINGS CAN JUMP AWAY.
- WEAR SUITABLE PROTECTIVE CLOTHING AND SAFETY GLASSES.
- NEVER PULL THE SPRINGS FURTHER APART THAN NECESSARY WHEN MOUNTING THE ARM ASSEMBLY ON THE PRIMARY ARM OR TCP BALL JOINTS.
- REPLACE SPRINGS AFTER OVERSTRETCHING.

## 4.2 Mount the arm assembly on the robot

For mounting, pull a secondary arm with his cup holder over the ball joint of the primary arm. Now pull the arms apart against the force of the spring in order to pull the second arm over the second ball joint of the primary arm. Then repeat this action for the TCP (see below picture).



No.	Description
1	TCP - Tool Center Point

Repeat this action for the other 2 secondary arm assembly's.  
Now your robot mechanic is completely installed.

## 5. Mounting the rotational and tilt axis on the gearbox shafts

Please perform the following steps first.

- Extend the rotational and tilt axis to its entire length, then retract the same and check whether it is easy to operate or whether some resistance occurs



### NOTE

A light irregular resistance is normal and caused by the manufacturing tolerances of the tubes. The axis is run in during the first 150 hours of operation. In case of problems, please check the axis for damage or contact your OMRON representative.

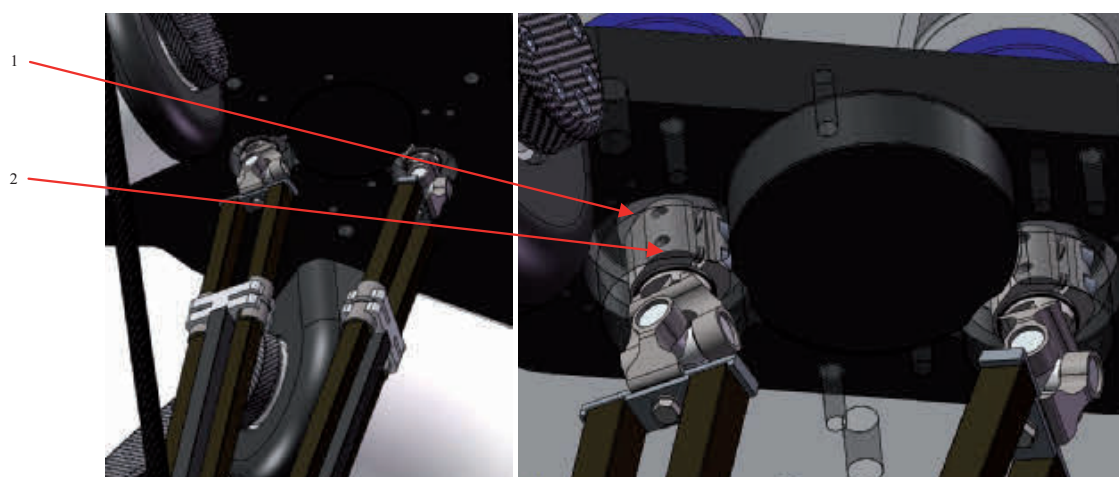


No.	Description
1	Clamping bush with bolts
2	Tilt axis
3	Rotational axis

Release the two M5 Allen bolts which are mounted into the clamping bush (see above picture).

In delivery condition, an extra fill bush is located in the clamping bush.

Measure your motor/gearbox axis and determine if you need the extra fill bush.



No.	Description
1	Motor or gear shaft
2	Top connector rotational axis

Now push the top connector into the shaft until the top connector comes into its stop position on the shaft. Tighten the two M5 Allen bolts with 7 Nm.

The rotational and tilt axis are now mounted.

## 6. Calibration

No every robot that is delivered is calibrated.

If you want to calibrate the robot by yourself, 2 calibration tools are available (shown in the below picture).

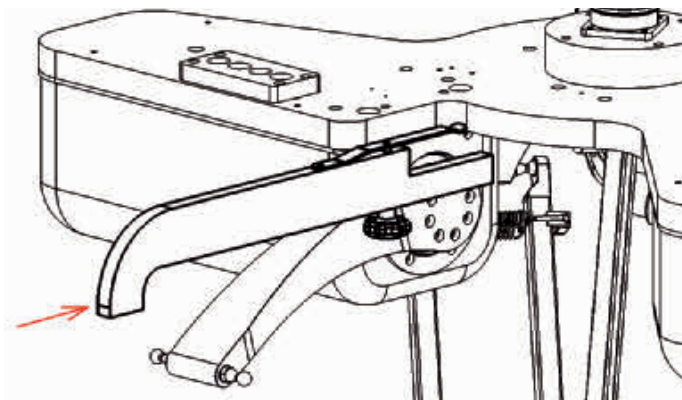
The calibration tool for the primary arms can be ordered as CR\_AS-2436 for CR\_UGD5\_XL robot, CR\_AS-00745 for CR\_UGD5 robot or CR\_AS-2447 for CR\_UGD5\_XS robot.

The calibration tool for the tilt axis can be ordered as CR\_AS-2080.



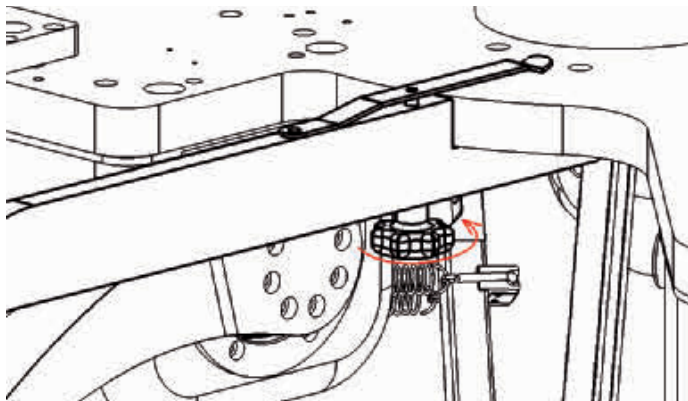
No.	Description
1	Calibration tool for the primary arms
2	Calibration tool for the tilt axis

The following steps must be carried out to put the three upper arms from the robot in the zero position. Please see also the below pictures:

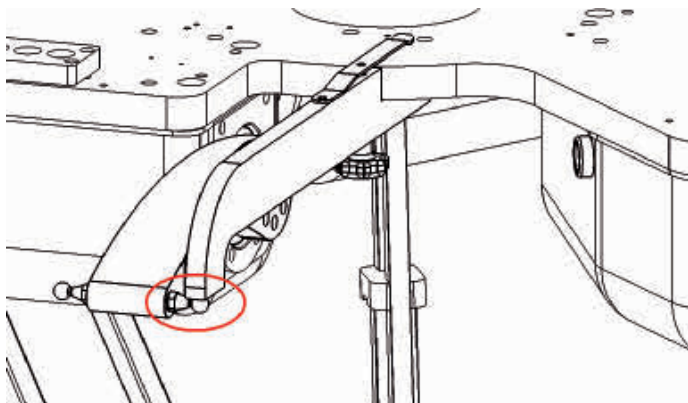


- Make sure all the secondary arms are disassembled
- Release the motor brake and make sure all the primary arms are rotated down far enough, so the calibration tool could be mounted
- Slide the calibration tool on the baseplate as shown in the above picture





- Now tighten the star nut until the tool is fixed



- Release the motor brake from the selected motor and push the upper arm with his ball joint against the calibration tool as shown in the above picture
- Now fix the motor brake from the selected motor
- Repeat the calibration steps for the other two primary arms
- Remove the tool
- Now all the primary arms are in zero position from the kinematic model
- Now put the encoder values from the servo motors in  $0^\circ$
- Check that the angle indicated for the three motors is  $0^\circ (\pm 0.1^\circ)$

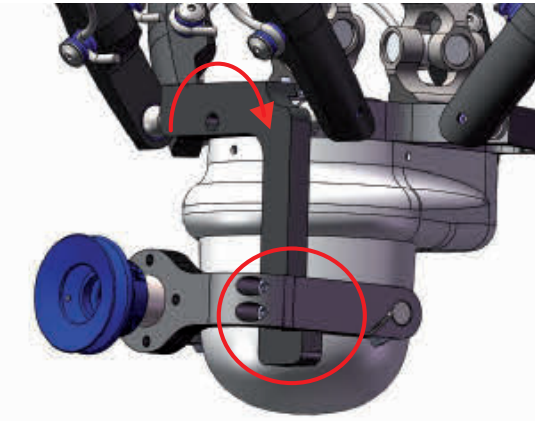
The following steps must be carried out to put the rotational and tilt axis from the robot in the zero position. Please see also the below pictures:



- First put the swivel in the position as shown in the above picture.



- Now mount the calibration tool on the TCP as shown in the above picture.



- Now tighten the star nut until the tool is fixed
- Release the motor brake from both axis and push the swivel arm against the calibration tool as shown in the above picture
- Now fix the motor brake from the selected motor
- Now both axis are in zero position from the kinematic model
- Now put the encoder values from the servo motors in  $0^\circ$
- Check that the angle indicated for the two motors is  $0^\circ (\pm 0.1^\circ)$
- Remove the tool
- Your robot is now calibrated

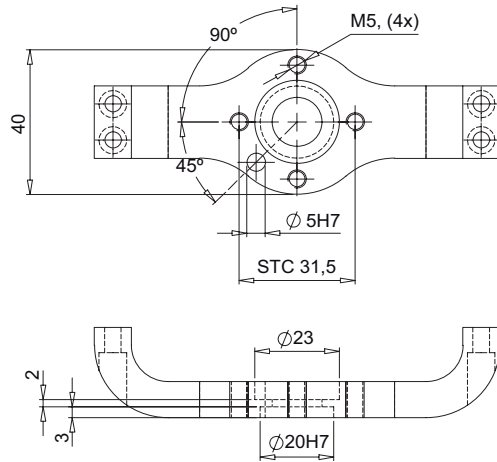


**WARNING**

- CALIBRATING THE ROBOT MUST BE CARRIED OUT BY QUALIFIED PROGRAMMING PERSONNEL ONLY, AS THIS REQUIRES AN EXCELLENT LEVEL OF KNOWLEDGE OF THE CONTROL SYSTEM.
- WHEN CARRYING OUT THE HOMING YOURSELF, THIS MUST BE CARRIED OUT EXACTLY IN THE WAY AND THE ORDER THAT THEY ARE DESCRIBED.

## 7. Gripper interface

The below picture shows you the gripper connection sizes according to ISO 9409-1-A31,5.



The design of the gripper that is mounted under the robot have great influence on the performance of the robot. Both the weight of the gripper and the distance of the center of gravity of the gripper to the TCP base point have negative influence on the final performance of the robot.

If you need to install cabling for the gripper, please follow the following steps:

- Mount the cables on the baseplate or frame, near the turning point from the primary arm on the gearbox
- Mount the cables on the primary arm, with ty-raps or clamping parts
- Keep a big loop at the hinge point from the primary and secondary arm
- Mount the cables on the secondary arm, with ty-raps or clamping parts
- Keep a big loop from the lowest mounting point at the secondary arm till the connection on the gripper



# Chapter 4 Maintenance

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# 1. Periodic maintenance

Before working on the robot, please be ensured that the machine where the robot is built in, is totally switched off.



## DANGER

- SWITCH OFF THE MACHINE ( SYSTEM ) WHERE THE ROBOT IS BUILT IN (E.G. WITH A PADLOCK) TO PREVENT IT FROM BEING SWITCHED ON AGAIN.
- LABEL THE MACHINE (SYSTEM) WITH A SIGN INDICATION THAT WORK IS IN PROGRESS. THIS SIGN MUST REMAIN IN PLACE, EVEN DURING TEMPORARY INTERRUPTIONS TO THE WORK.
- THE EMERGENCY STOP FROM THE MACHINE (SYSTEM) MUST REMAIN ACTIVE. IF SAFETY FUNCTIONS OR SAFEGUARDS ARE DEACTIVATED DURING MAINTENANCE OR REPAIR WORK, THEY MUST BE REACTIVATED IMMEDIATELY AFTER THE WORK IS COMPLETED.

## 1.1 Springs

How to maintain the springs:

- The springs has to be replaced every 3800 working hours or once a year
- When the robot is fall apart, check the springs on damages
- Only use springs delivered by OMRON, otherwise the guarantee will expire
- Replace springs after overstretching
- For spare parts, see **Section 3 Spare parts** in this chapter



## WARNING

- INCORRECT MOUNTED SPRINGS CAN JUMP AWAY.
- WEAR SUITABLE PROTECTIVE CLOTHING AND SAFETY GLASSES.
- NEVER PULL THE SPRINGS FURTHER APART THAN NECESSARY WHEN MOUNTING THE ARM ASSEMBLY ON THE PRIMARY ARM OR TCP BALL JOINTS.

How to disassemble the springs:

- Disassemble the secondary arms from the robot
- Replace the springs
- For re-assembling the secondary arms, see **Section 4 Assembling the secondary arms** in Chapter 3

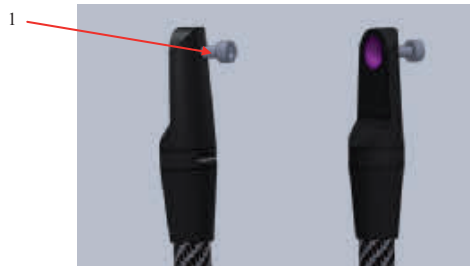
## 1.2 Ball bearing cups

The ball bearing cups has the same lifetime as the springs. We recommend to exchange these at the same time as the springs.

How to maintain the ball bearing cups:

- The ball bearing cups has to be replaced every 3800 working hours or once a year
- When the ball bearing cups make squeaking noises, take of the secondary arm assembly's and clean the cups with pressed air
- **Do not lubricate the ball bearing cups!**

For instructions to replace the ball bearing cups, see the below picture:



No.	Description
1	M5 bolt

- Screw an M5 bolt in the backside from the cup holder
- Now the ball bearing cup will come out

## 1.3 Rotational and tilt axis

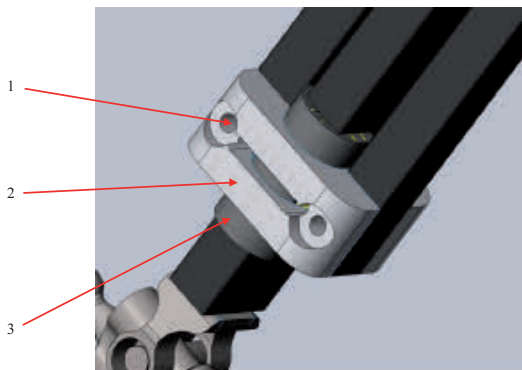
The plain bearings on the rotational and tilt axis wear with time so that backlash starts to occur on the rotational and tilt axis. How fast the plain bearings become worn depends strongly on the following factors:

- The working path
- The payload
- The speed of the robot
- The rotation actions

When do I have to exchange the plain bearings?

- If there is a lot of play on the rotational axis
- Every 3000 working hours or once a year

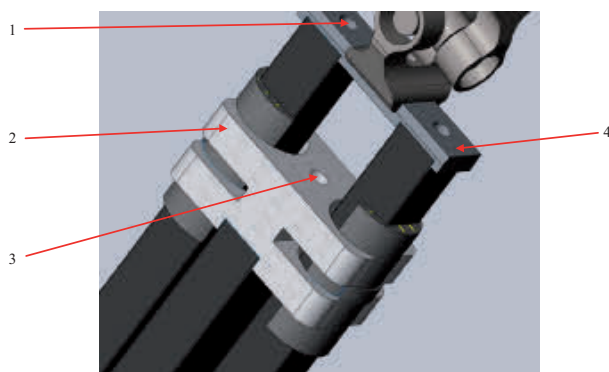
For instructions to replace the plain bearings, see the below picture:





No.	Description
1	M5 bolt with washer
2	Slider clamp bottom
3	Plain bearing

- Unscrew the two M5 bolts with washer and take of the slider clamp bottom
- Now exchange the old bearing with a new one
- Put back the slider clamp bottom and the two M5 bolts with washer
- Repeat this for the other side of the axis



No.	Description
1	2 x M5 bolt with washer
2	Slider clamp top
3	1 x M5 bolt with washer
4	Top connector

- Unscrew the three M5 bolts with washer from the top connector and the slider clamp top
- Remove the top connector from the tubes
- Remove the slider clamp top with the plain bearings
- Now exchange the old plain bearings with the new ones
- Put back the slider clamp top and the M5 bolt with washer
- Mount the top connector with the two M5 bolts with washer on the two tubes


**WARNING**

- PLAIN BEARINGS HAS TO BE MOUNTED VERY CAREFULLY.
- WRONG MOUNTED PLAIN BEARINGS MAY DAMAGE.
- EXTEND THE ROTATIONAL AXIS TO ITS ENTIRE LENGTH, THEN RETRACT THE SAME AND CHECK WHETHER IT IS EASY TO OPERATE OR WHETHER SOME RESISTANCE OCCURS.

## 2. Cleaning the robot
























Clean the robot by washing with soft cloth or sponge. Use soap or mild detergent and warm water followed by clear water rinse.















For oil and grease stains use alcohol with soft cloth.

Do not use a high pressure water cleaner, or any other high pressure cleaning device.

## 3. Spare parts

Keep a stock of the most important components to make sure the equipment is functioning and ready for operation at all times.

Robot part	Description	Quantity per robot	OMRON Part No.		
			CR_UGD5_XL	CR_UGD5	CR_UGD5_XS
Robot base	1 x motor cover	3	CR_PT-05104 		
Primary arm	1 x primary arm	3	CR_AS-2910 	CR_AS-2912 	CR_AS-2911 
Secondary arm	1 x secondary arm	6	CR_AS-2127 	CR_AS-2122 	CR_AS-2482 
	1 x secondary arm spring	6	CR_AS-2291 		
	1 x ball bearing cup	12	CR_PT-01841 		
Rotational/Tilt axis	1 x mounting clamp with cardan joint	2	CR_AS-2938 		
	1 x gripper flange	1	CR_AS-2934 		
	1 x complete rotational axis	2	CR_AS-2993 	CR_AS-2992 	CR_AS-2990 
	1 x upper side rotational axis	2	CR_AS-2956 	CR_AS-2953 	CR_AS-2944 
	1 x lower tube and cardan joint rotational axis	2	CR_AS-2997 	CR_AS-2996 	CR_AS-2994 
	1 x rotational + tilt axis including head	1	CR_AS-3083 	CR_AS-3082 	CR_AS-3080 

Robot part	Description	Quantity per robot	OMRON Part No.		
			CR_UGD5_XL	CR_UGD5	CR_UGD5_XS
Rotational/Tilt axis	1 x tilt part	2	CR_AS-3073 		
	1 x tilt stool	1	CR_AS-3074 		
	1 x connection head	1	CR_AS-3075 		
	1 x complete head	1	CR_AS-3079 		
	1 x head cover	1	CR_PT-05244 		
	1 x dome	1	CR_PT-05246 		
	1 x plain bearing	4	CR_CP-1000 		
Primary arm & TCP	1 x ball joint	12	CR_AS-2920 		
Gearbox for primary arm	1 x gearbox	3	CR_GEARP-16 		
Gearbox for rotational/tilt axis	1 x gearbox	2	CR_GEARP-14 		
Calibration tool for the primary arms	1 x calibration tool	1	CR_AS-2436 	CR_AS-0745 	CR_AS-2447 
Calibration tool for the tilt axis	1 x calibration tool	1	CR_AS-2080 		



# Chapter 5 Robot settings

## Contents

1. Kinematics	5-1
2. Workspace	5-2
3. Software limits	5-3



# 1. Kinematics

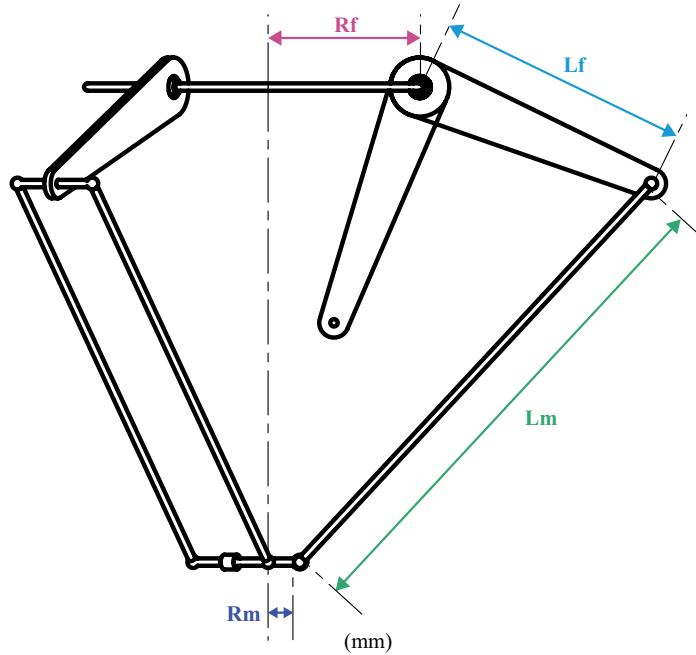
The kinematics parameters for the CR\_UGD5 robots are shown below. Set these parameters corresponding to the controller settings.



## WARNING

IF THE KINEMATICS PARAMETERS ARE NOT SET PROPERLY, THIS MAY CAUSE THE ROBOT TO MALFUNCTION. SO, BE SURE TO SET THESE PARAMETERS CORRECTLY.

## Kinematics parameters



### CR\_UGD5\_XL

- Rf:** 200 mm Distance (radius) from the center of the fixed frame to the motor of the axis
- Rm:** 60 mm Distance (radius) from the center of the moving frame to the connection point of Link 2
- Lf:** 420 mm Length of Link 1
- Lm:** 950 mm Length of Link 2

### CR\_UGD5

- Rf:** 200 mm Distance (radius) from the center of the fixed frame to the motor of the axis
- Rm:** 60 mm Distance (radius) from the center of the moving frame to the connection point of Link 2
- Lf:** 320 mm Length of Link 1
- Lm:** 850 mm Length of Link 2

### CR\_UGD5\_XS

- Rf:** 200 mm Distance (radius) from the center of the fixed frame to the motor of the axis
- Rm:** 60 mm Distance (radius) from the center of the moving frame to the connection point of Link 2
- Lf:** 220 mm Length of Link 1
- Lm:** 600 mm Length of Link 2

## 2. Workspace

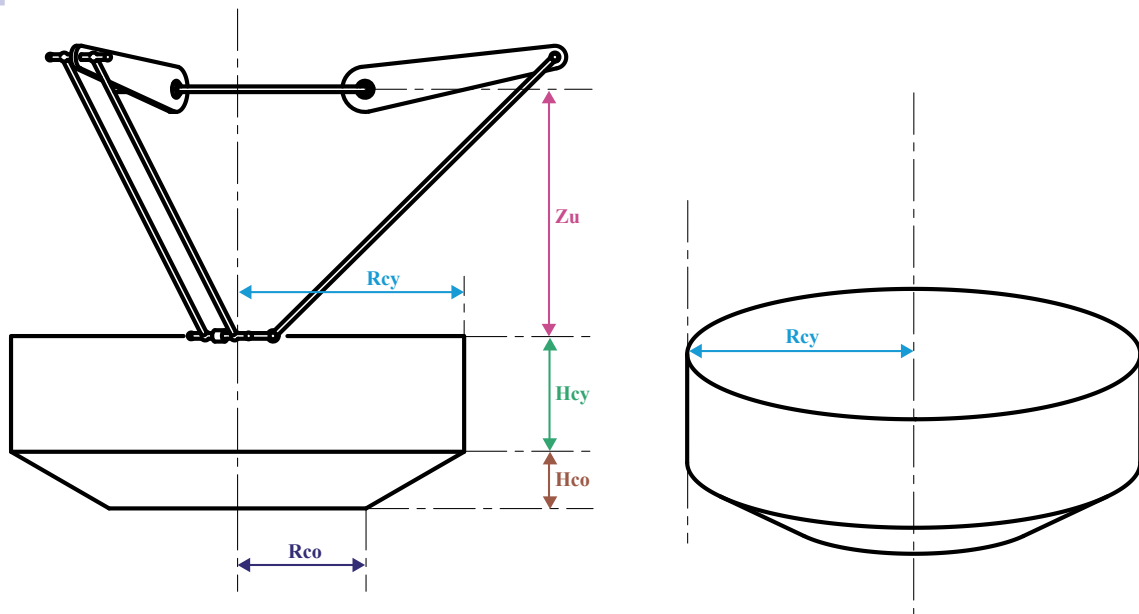
The workspace parameters for the CR\_UGD5 robots are shown below. Set these parameters corresponding to the controller settings.



### WARNING

IF THE WORKSPACE PARAMETERS ARE NOT SET PROPERLY, THIS MAY CAUSE THE ROBOT TO MALFUNCTION. SO, BE SURE TO SET THESE PARAMETERS CORRECTLY.

### Workspace parameters



#### CR\_UGD5\_XL

- Zu:** -716 mm Distance from the Z-axis origin position  
**Rcy:** 650 mm Radius of the cylinder  
**Hcy:** 250 mm Height of the cylinder  
**Rco:** 435 mm Radius of the frustum cone of underside  
**Hco:** 150 mm Height of the frustum cone

#### CR\_UGD5

- Zu:** -616 mm Distance from the Z-axis origin position  
**Rcy:** 550 mm Radius of the cylinder  
**Hcy:** 250 mm Height of the cylinder  
**Rco:** 335 mm Radius of the frustum cone of underside  
**Hco:** 150 mm Height of the frustum cone

#### CR\_UGD5\_XS

- Zu:** -440 mm Distance from the Z-axis origin position  
**Rcy:** 325 mm Radius of the cylinder  
**Hcy:** 200 mm Height of the cylinder  
**Rco:** 203,75 mm Radius of the frustum cone of underside  
**Hco:** 70 mm Height of the frustum cone



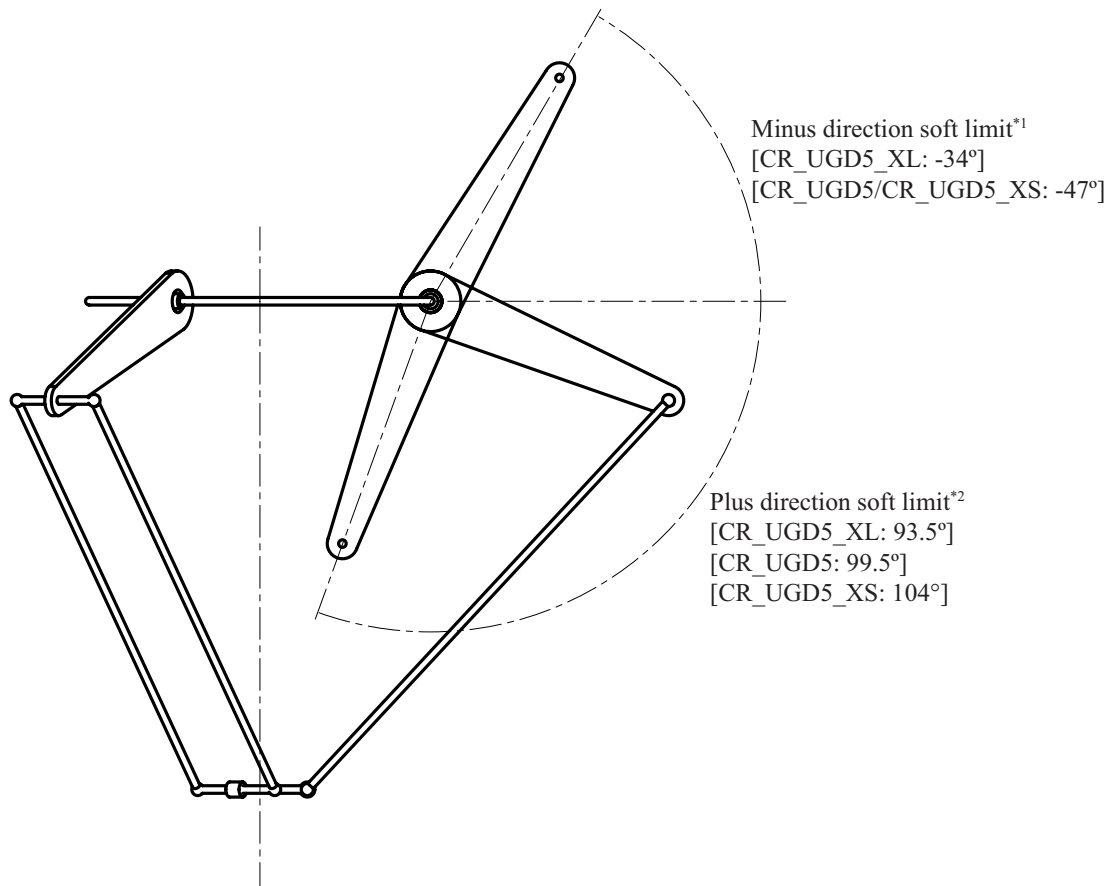
### 3. Software limits

The software limits for the CR\_UGD5 robots are shown below.



**WARNING**

IF THE  $\alpha$ -,  $\beta$ - OR  $\gamma$ - AXIS SOFT LIMIT IS SET INCORRECTLY, THE ARM MAY COLLIDE WITH THE ROBOT BASE OR BASE PREPARED BY THE USER, CAUSING BREAKAGE. SO, BE SURE TO SET THE SOFT LIMITS CORRECTLY.



<sup>\*1</sup>. For the CR\_UGD5\_XL and CR\_UGD5 robots ordered before September 2023, the Minus direction soft limit is -35°. For the CR\_UGD5\_XS robots ordered before September 2023, the Minus direction soft limit is -48.

<sup>\*2</sup>. For the CR\_UGD5\_XL and CR\_UGD5 robots ordered before September 2023, the Plus direction soft limit is 88°. For the CR\_UGD5\_XS robots ordered before September 2023, the Plus direction soft limit is 102°.



# Chapter 6 Specifications

## Contents

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# 1. Basic specifications

Robot model		CR_UGD5_XL	CR_UGD5	CR_UGD5_XS	
Working volume	X, Y axis	Stroke	Ø1300mm	Ø1100mm	Ø650mm
	Z axis	Stroke	250mm (max. Ø1300mm)/ 400mm (center Ø870mm)	250mm (max. Ø1100mm)/ 400mm (center Ø670mm)	200mm (max. Ø650mm)/ 270mm (center Ø407.5mm)
	RZ axis	Rotation angle	±180° (default setting, it can be changed)		
	RY axis	Tilt angle	Mechanically limited		
Servo motor	Arm 1, 2, 3		1000W		
	Rotational axis 4		750W		
	Tilt axis 5		750W		
Repeatability* <sup>1</sup>	X, Y, Z axis		±0.2mm		
	RY, RZ axis		±0.3°		
Maximum through-put* <sup>2</sup>		120 CPM* <sup>3</sup>	125 CPM* <sup>3</sup>	150 CPM* <sup>3</sup>	
Maximum payload		1kg			
Gear box ratio	X, Y, Z axis		1:31		
	RY, RZ axis		1:10* <sup>4</sup>		
Torque limitation	RZ axis		12.5Nm* <sup>5</sup>		
	RY axis		12.5Nm		
Travel limit		Soft limit			
Noise level		< 68 dB (A)			
Ambient temperature		5°C to 45°C			
Relative humidity		Max. 90%			
Protection class		IP65			
Weight		70kg		65kg	

\*1: This is the value at a constant ambient temperature.

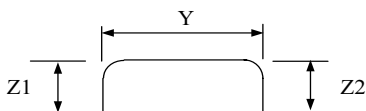
\*2: With 0.1kg payload. When reciprocating 305mm in horizontal and 25mm in vertical directions.

\*3: CPM: Cycle per minutes. Check the note 2 for the cycle definition.

\*4: Ratio between rotational axis 1 and yaw rotation of the wrist (rotation around Rz) is 1:2. Ratio between rotational axis 2 and pitch rotation of the swing arm (rotation around Ry) is 1:2.

\*5: For the robots ordered before September 2023, the Torque limitation for the RZ axis is 7Nm.

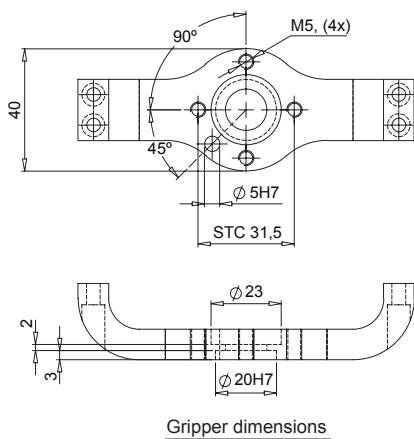
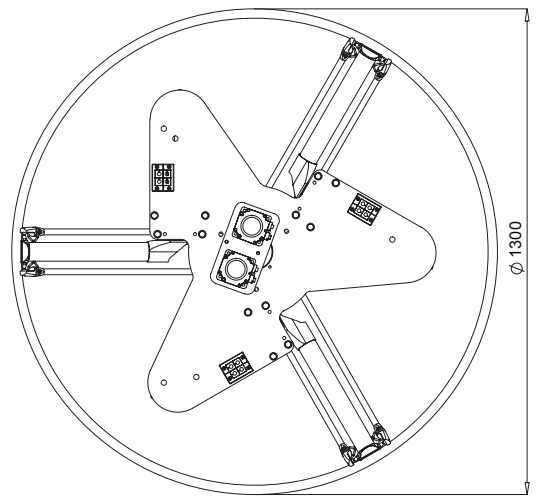
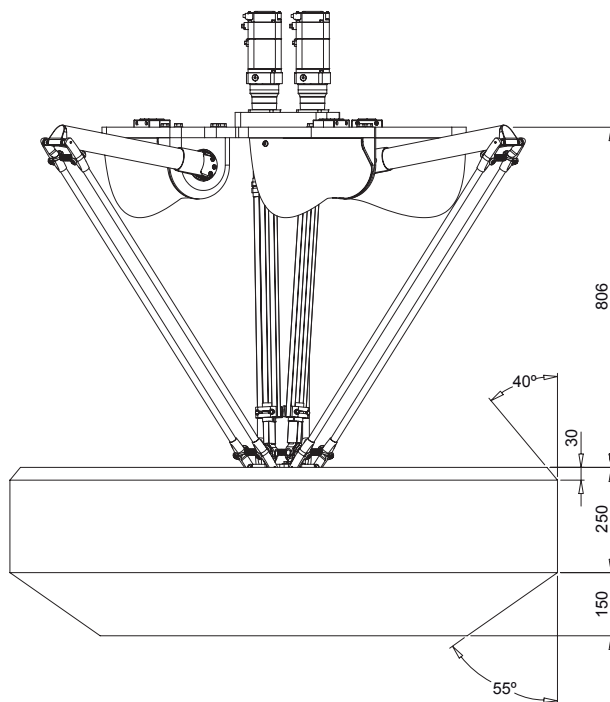
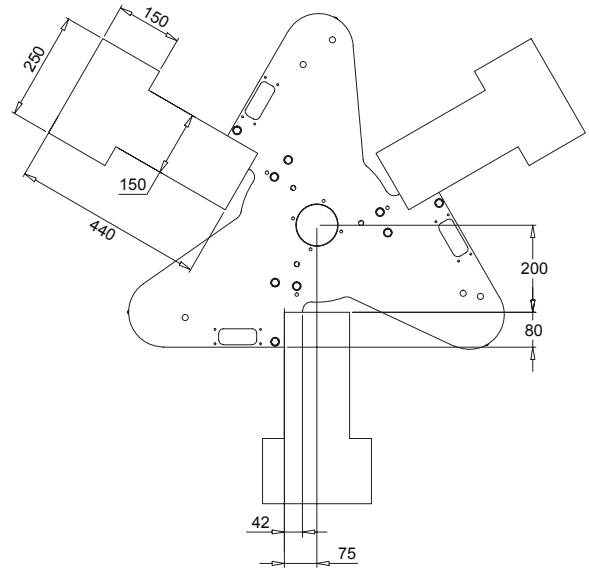
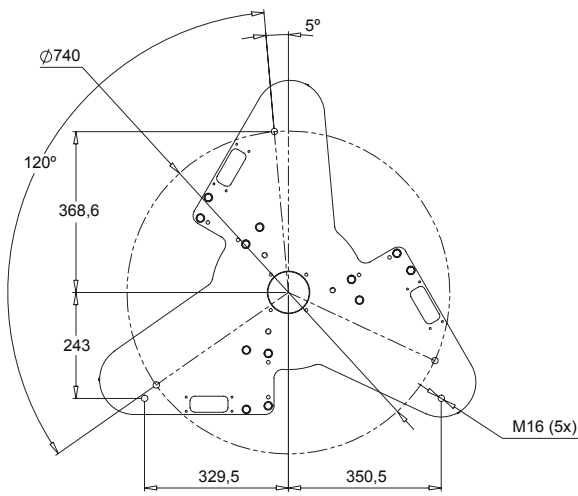
## 1.1 Cycle time



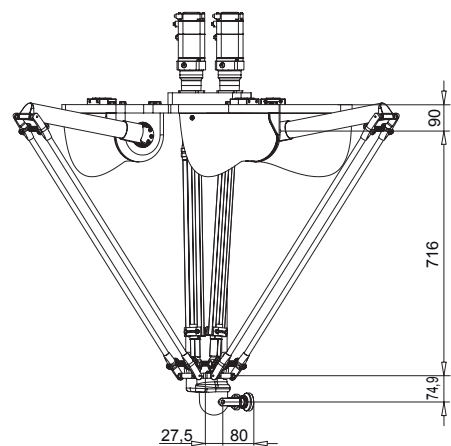
P&P path	Payload	CR_UGD5_XL cycle time	CR_UGD5 cycle time	CR_UGD5_XS cycle time
25 x 305 x 25 mm (Z1 x Y x Z2)	0.1 kg	0.50 s	0.48 s	0.40 s
	0.5 kg	0.57 s	0.55 s	0.47 s
	1 kg	0.69 s	0.67 s	0.59 s

## 2. External view and dimensions

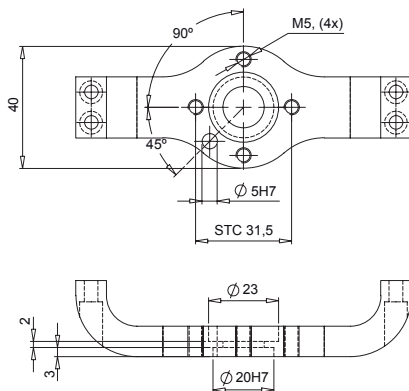
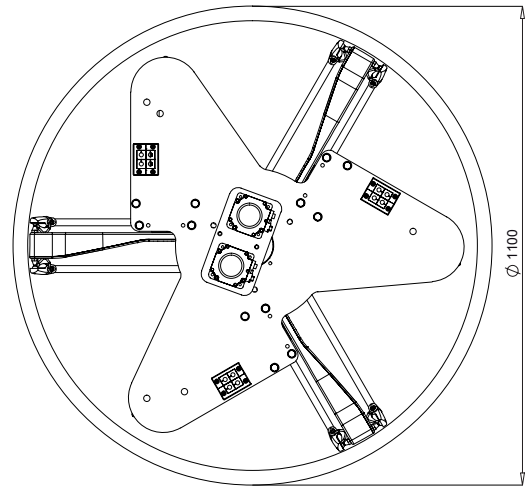
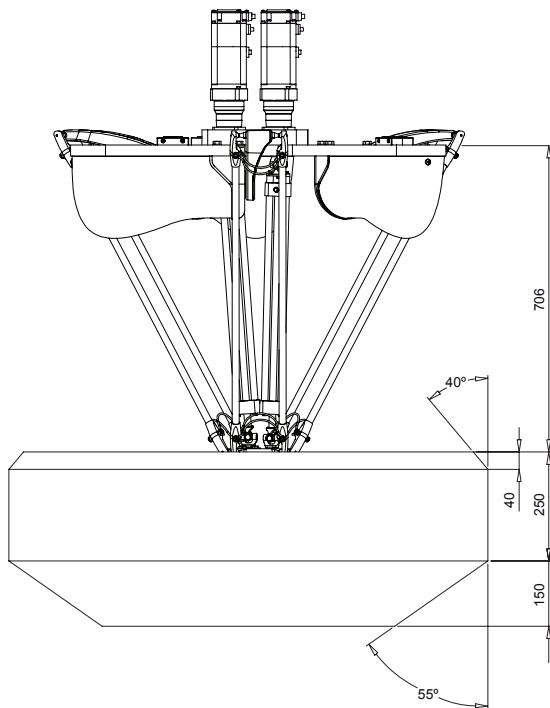
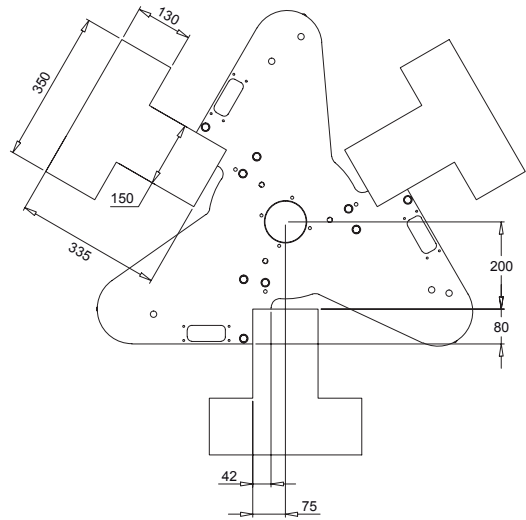
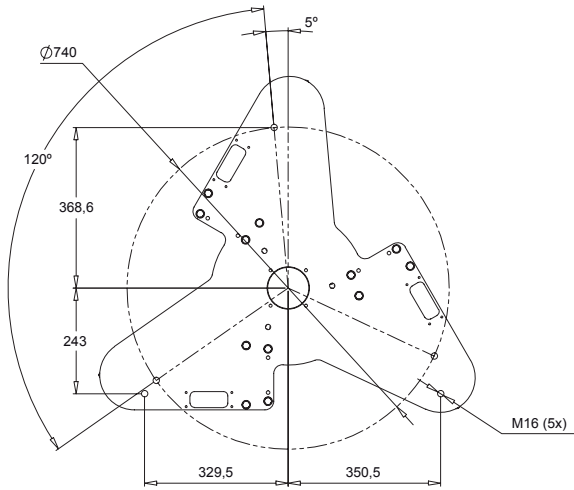
### 2.1 CR\_UGD5\_XL



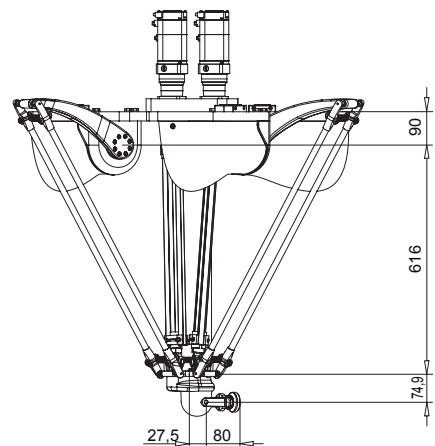
Gripper dimensions



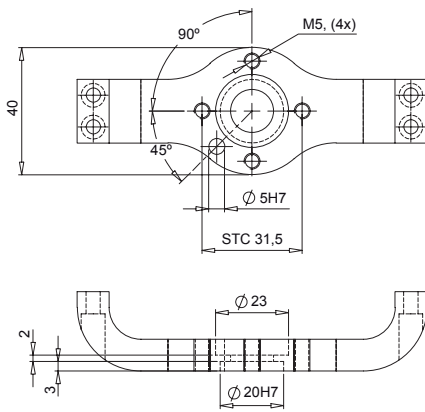
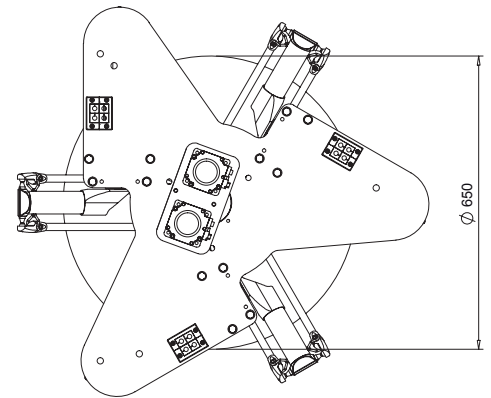
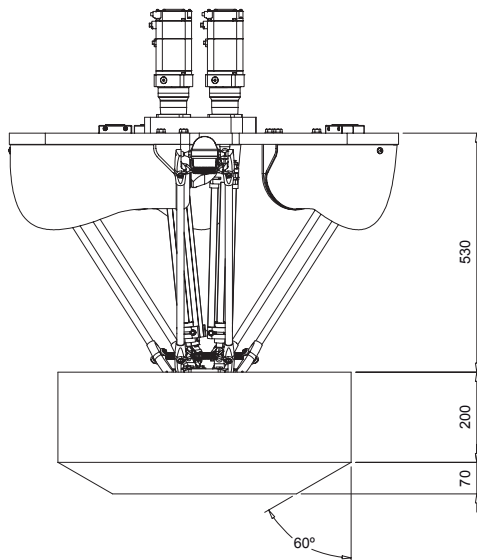
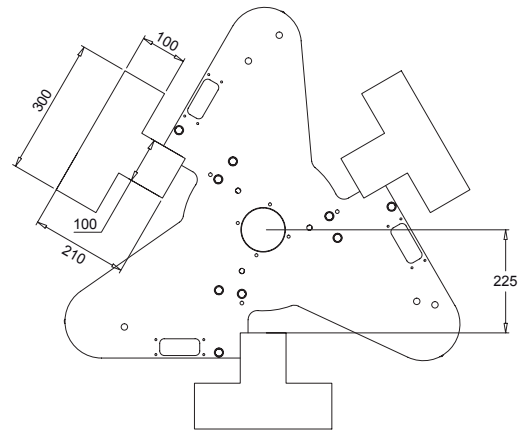
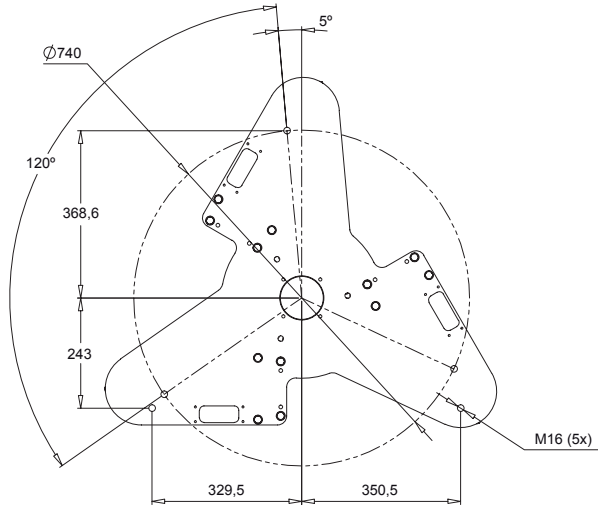
## 2.2 CR\_UGD5



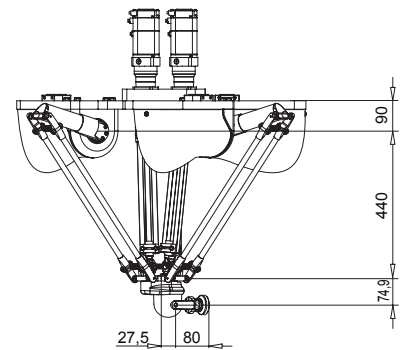
Gripper dimensions



## 2.3 CR\_UGD5\_XS



Gripper dimensions



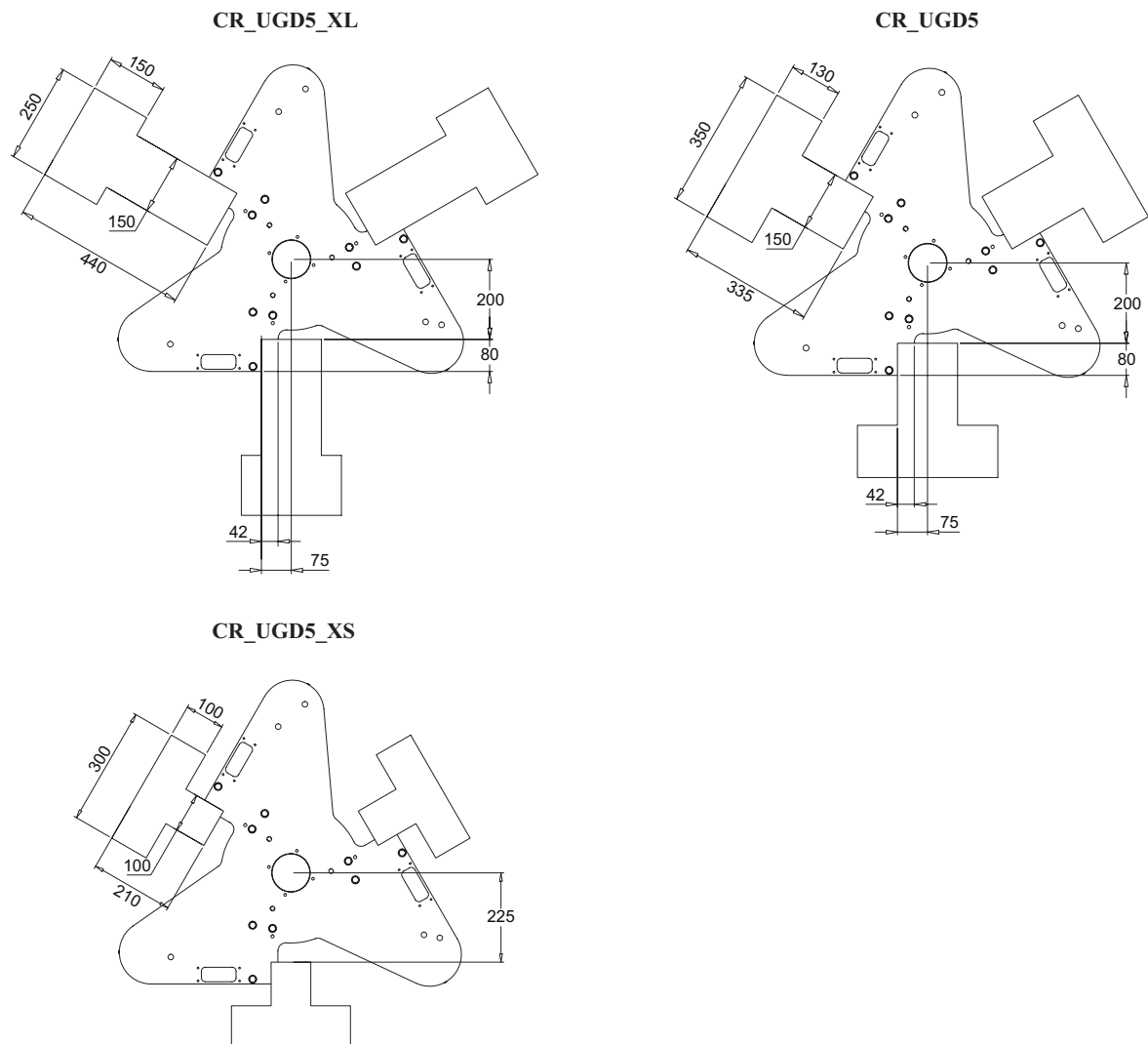


## 3. Design specifications

### 3.1 Occupation area of robot

If the robot is integrated into the machine it must be considered what the reach is of all robot parts to prevent collision with other parts in the machine.

When the TCP moves to its outer positions, the primary and secondary arms can rise above the baseplate, take care that no mechanical obstructions are in the areas indicated in the below picture.

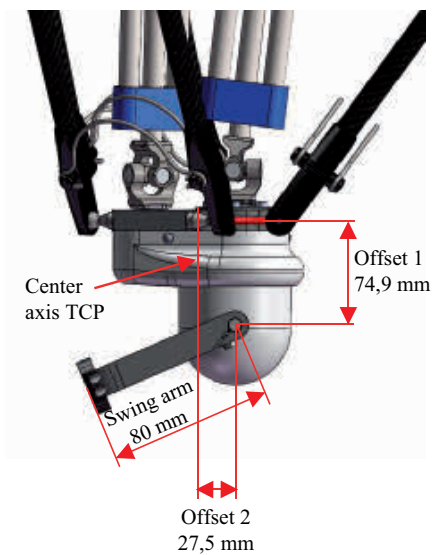
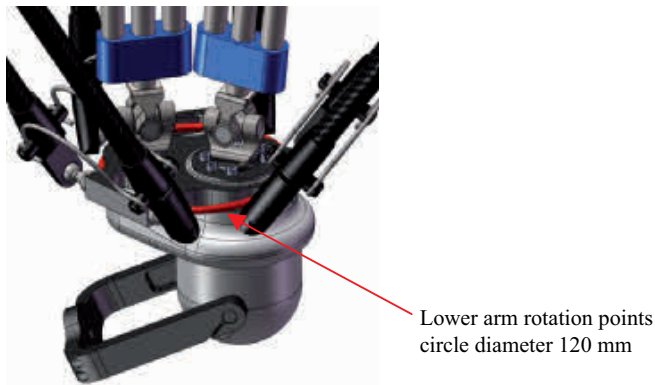


#### WARNING

IF MECHANICAL OBSTRUCTIONS ARE IN THE INDICATED AREA, THE ROBOT OR THE OTHER MACHINE PARTS COULD BE DAMAGED.

## 3.2 Software design

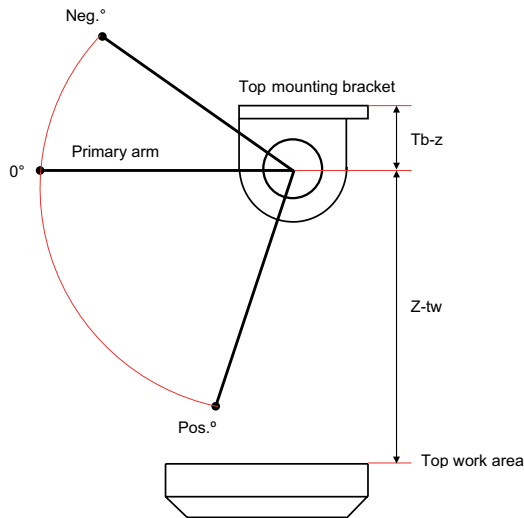
The arm lengths and pitch circles of the rotation points are shown in the below picture.



### 3.2.1 Dimensions and limits

Description	CR_UGD5_XL	CR_UGD5	CR_UGD5_XS
Negative software limit*1	-34°	-47°	
Positive software limit*2	93.5°	99.5°	104°
Tb-z (top baseplate to zero position)	90 mm		
Z-tw (zero position to ball bearings)	716 mm	616 mm	440 mm

- \*1. For the CR\_UGD5\_XL and CR\_UGD5 robots ordered before September 2023, the Negative software limit is -35°. For the CR\_UGD5\_XS robots ordered before September 2023, the Negative software limit is -48.
- \*2. For the CR\_UGD5\_XL and CR\_UGD5 robots ordered before September 2023, the Positive software limit is 88°. For the CR\_UGD5\_XS robots ordered before September 2023, the Positive software limit is 102°.



### 3.2.2 Gear ratio

Description	Ratio	Comments
Rotational axis 4	1:2	Gear ratio achieved by a belt with pulleys.
Tilt axis 5	1:2	The rotation of the swing arm is linked to the vertical rotation (rotational axis 4). The swing arm rotates with a ratio of 1:4 between the swing arm and the motor of rotational axis 4.



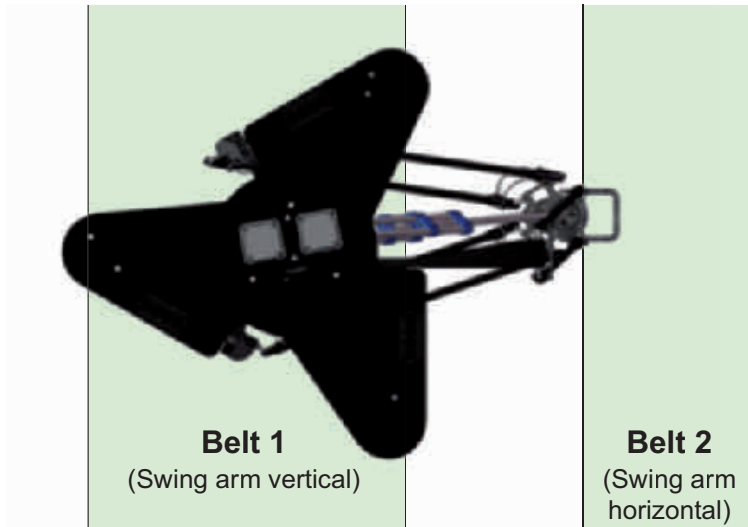
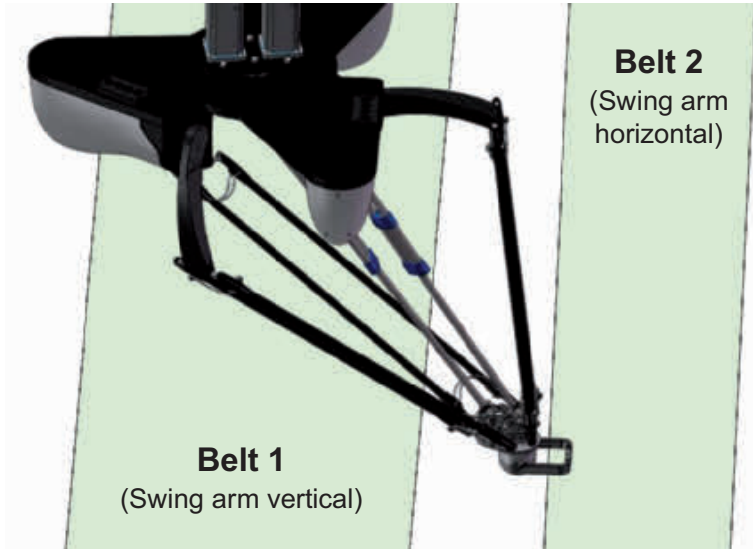
#### WARNING

THE DIRECTION OF ROTATION OF THE SWING ARM DEPENDS ON THE POSITION OF THE INTERNAL GEARBOX. THERE ARE TWO POSSIBLE POSITIONS FOR THE GEARBOX (ROTATED 180 DEGREES FROM EACH CONTROLLER). THE POSITION OF THE GEARBOX CANNOT BE DETERMINED FROM THE INSIDE OR OUTSIDE OF THE STRUCTURE. THE POSITION HAS TO BE DETERMINED BY ROTATING TILT AXIS WHEN THE ROBOT IS COMPLETELY INSTALLED. PLEASE, TAKE NOTE THAT THE POSITION OF THE GEARBOX HAS TO BE REDETERMINED WHEN THE ROTATION AXES ARE DISCONNECTED AND THE CALIBRATION IS LOST.

### 3.3 Recommended robot position

It is recommended to place the robot in such way that there is no risk of the product or gripper hitting the lower arm of the robot in the situation where the swing arm is rotated to the horizontal position. This issue occurs due to the fact that the dome in which the swing arm is mounted isn't placed in the center of the TCP. Therefore the optimal position of the baseplate (in terms of rotation) is the position where there is the most space for the swing arm to move around (when the swing arm is placed horizontal).

**Example:** The optimal position of the base plate for the below situation is when the upper arm closest to tilt axis is placed closest and perpendicular to belt 2.







## Revision history

A manual revision code appears as a suffix to the catalog number on the front cover manual.

Cat. No. I205E-EN-03B



The following table outlines the changes made to the manual during each revision.

Revision code	Date	Description
01	October 2016	Original production
01A	January 2017	Small error was corrected
02	October 2017	New model CR_UGD5_XS was included. Spare parts section was updated. Some dimensions were modified. Basic specifications section was updated
02A	February 2018	Spare parts section was updated
03	June 2018	Spare part references were modified
03A	March 2020	Torque limitation of rotational axis was modified
03B	June 2024	Negative and Positive limits of the robot and Torque limitation for the RZ axis were updated

# OMRON

**Authorized Distributor:**