MECADEMIC

INDUSTRIAL ROBOTICS

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Contents

User Manual for the MEGP 25E/25LS Electric Grippers

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Original instructions

About this manual

This user manual describes how to install and operate the MEGP 25E and MEGP 25LS (MEGP 25*) electric grippers onto the Meca500 (R3 & R4) industrial robot arm. You must read this manual thoroughly before installing or operating the MEGP 25* grippers.

Symbol definitions

The following table lists the symbols that may be used in Mecademic documents to denote certain conditions. Particular attention must be paid to the warning and danger messages in this manual.

Note

Identifies information that requires special consideration.

Warning

Provides indications that must be respected in order to avoid equipment or work (data) on the system being damaged or lost.

Danger

Provides indications that must be respected in order to avoid a potentially hazardous situation, which could result in injury.

Revision history

The firmware that is installed on Mecademic products has the following numbering convention:

{major}.{minor}.{patch}.{build}

Each Mecademic manual is written for a specific {major}.{minor}.{*}.{*} firmware version. On a regular basis, we revise each manual, adding further information and improving certain explanations. We only provide the latest revision for each {major}.{minor}.{*}.{*} firmware version. Below is a summary of the changes made in each revision.

Revision	Date	Comments
A	March 17, 2025	This version

The document ID for each Mecademic manual in a particular language is the same, regardless of the firmware version and the revision number.

Introduction

The MEGP 25E and MEGP 25LS grippers (MEGP 25* grippers) are electric parallel grippers developed by Mecademic and Schunk specifically for the Meca500 (R3 & R4) robot arm. The MEGP 25* grippers use a removable connector cable.

Note

Familiarity with the Meca500 robot and its user manual is required prior to installing and using the grippers.

Warning

Improper installation of the grippers could seriously damage the Meca500 and the grippers themselves. These grippers should therefore be used only by technical personnel who are familiar with the Meca500.

Inside the box

Each of the two gripper models is supplied either individually or with the Meca500. In both cases, the gripper is delivered in an anti-static bag containing the standard kit:

- 1 MEGP 25E or 1 MEGP 25LS gripper;
- 1 MGC-SS35 35-mm light-duty communication cable with straight connectors,
- 1 MGC-AA25 25-mm light-duty communication cable with 90° connectors, or
- 1 MGC-HFC coiled, production-grade communication cable with straight connectors;
- 1 MEGP25-TAP adapter plate (made of non-anodized aluminum) for attaching the gripper to the Meca500's mechanical interface (flange);
- 4 M3X0.5 Torx flat head screws of length 8 mm;
- 2 M2.5X0.45 socket head screws of length 20 mm.

Note

The MGC-SS35 and MGC-AA25 cables are suitable only for light-duty operations, where joints 5 and 6 do not rotate frequently. For applications involving frequent rotations of joints 5 and 6, you need to order the MGC-HFC cable.

Note

Note that we also offer an optional 90° adapter plate for each of the two grippers: M500-ATAP01 (for the MEGP 25E) and M500-ATAP02 (for the MEGP 25LS).

Note

We do not supply gripper fingers. These must be designed and machined based on the workpiece that needs to be handled.

Technical specifications

Table 1 lists the main technical specifications for both electric grippers. Further specifications are provided in the next section.

Table 1: Technical specifications for the MEGP 25* grippers

Characteristics	Value for MEGP 25E	Value for MEGP 25LS
Maximum weight per finger	0.02 kg	0.02 kg
Maximum gripping force	40 N	40 N
Recommended maximum workpiece weight	0.2 kg	0.2 kg
Stroke per jaw	3 mm	24 mm
Repeatability	0.03 mm	0.03 mm
IP protection class	30	30
Power supply (nominal)	24 V, 0.14 A	24 V, 0.14 A
Noise emission	< 70 dB	< 70 dB
Housing	Coated aluminum alloy, steel	Coated aluminum alloy, steel
Total weight	0.106 kg	0.136 kg
Operating temperature	5° to 55°C	5° to 55°C
Operating humidity	10% to 95% RH (non-condensing)	10% to 95% RH (non-condensing)

Designing and mounting the fingers

Fingers must be designed and installed before mounting the MEGP 25* gripper on the Meca500. Designs must respect the measurements and maximum finger dimensions and loads provided in the following.

MEGP 25E mounting diagrams

Figure 1 shows the MEGP 25E dimensions and the adapter plate provided. Each finger must be attached to the outer side of a gripper jaw using an M4X0.7 screw and two Ø1.5 mm locating pins.

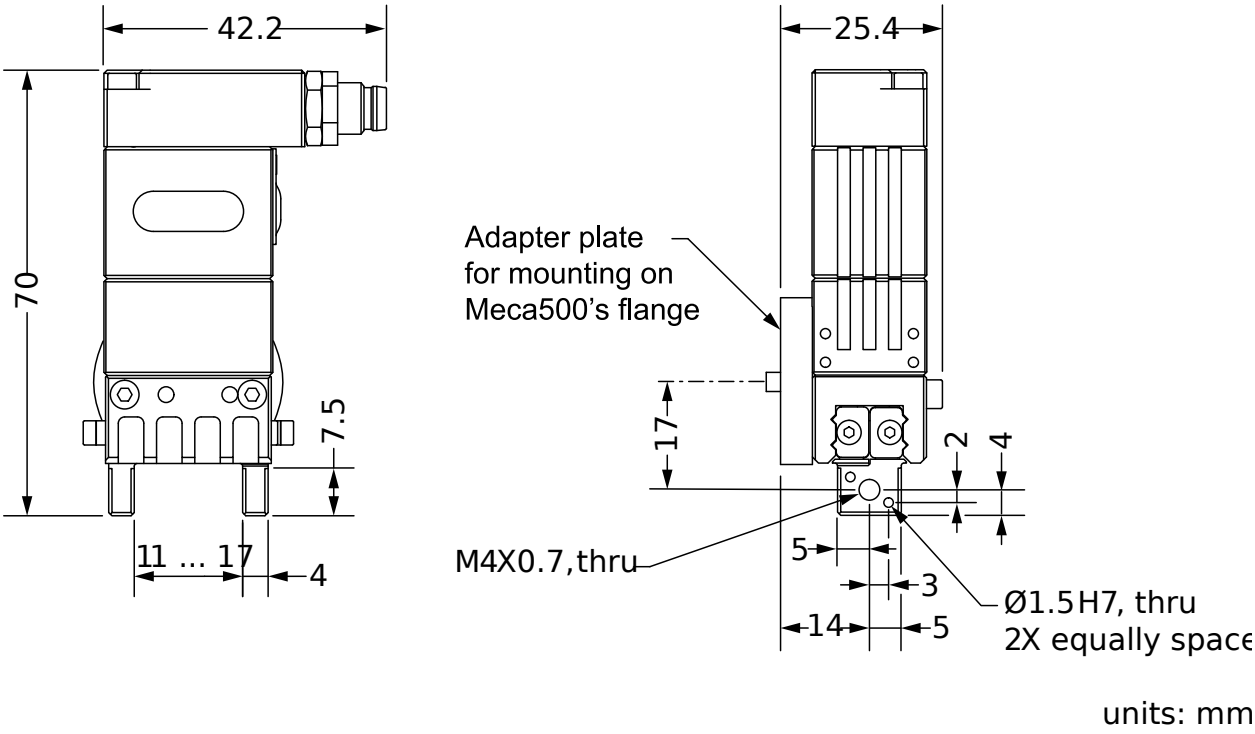


Figure 1: MEGP 25E gripper dimensions

The maximum dimensions for the fingers and the maximum loads allowed on the gripper jaws are shown in Figure 2.

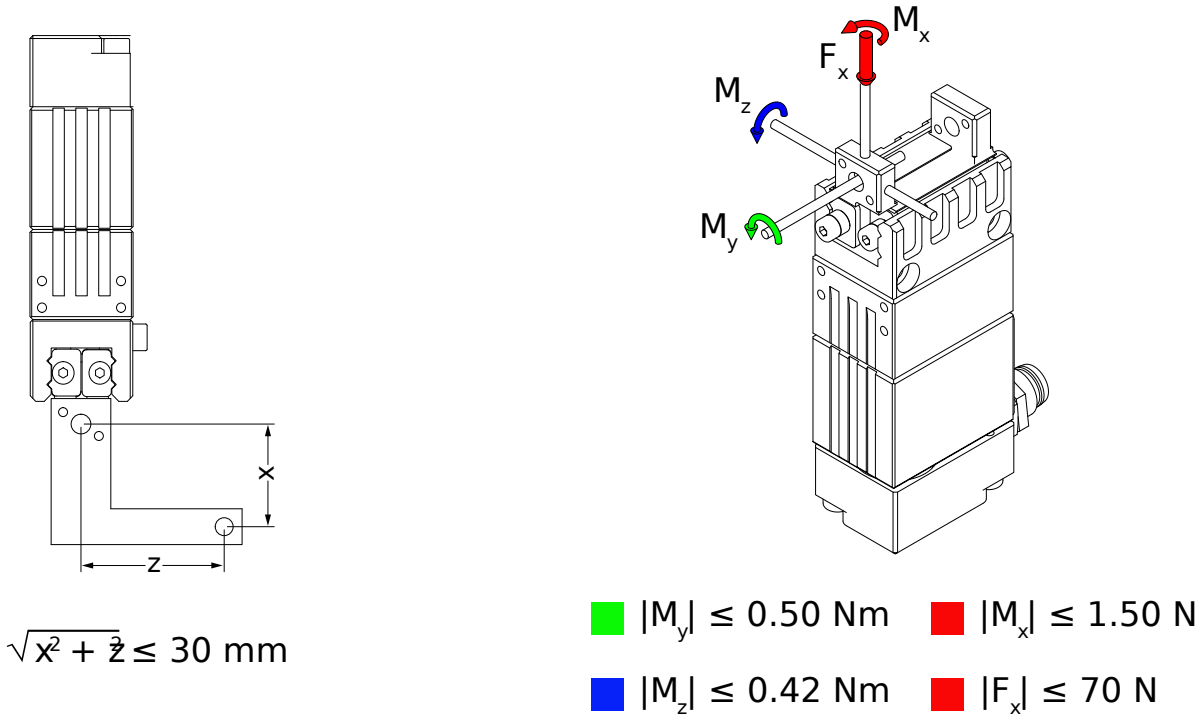


Figure 2: Maximum finger dimensions and finger loads for the MEGP 25E gripper

Note

You can download the CAD file of the MEGP 25E gripper, its default adapter plate as well as its 90° optional adapter plate from here.

MEGP 25LS mounting diagrams

Figure 3 shows the MEGP 25LS dimensions and the adapter plate provided. Each finger must be attached to the outer side of a gripper jaw using an M4X0.7 screw and two Ø1.5 mm locating pins.

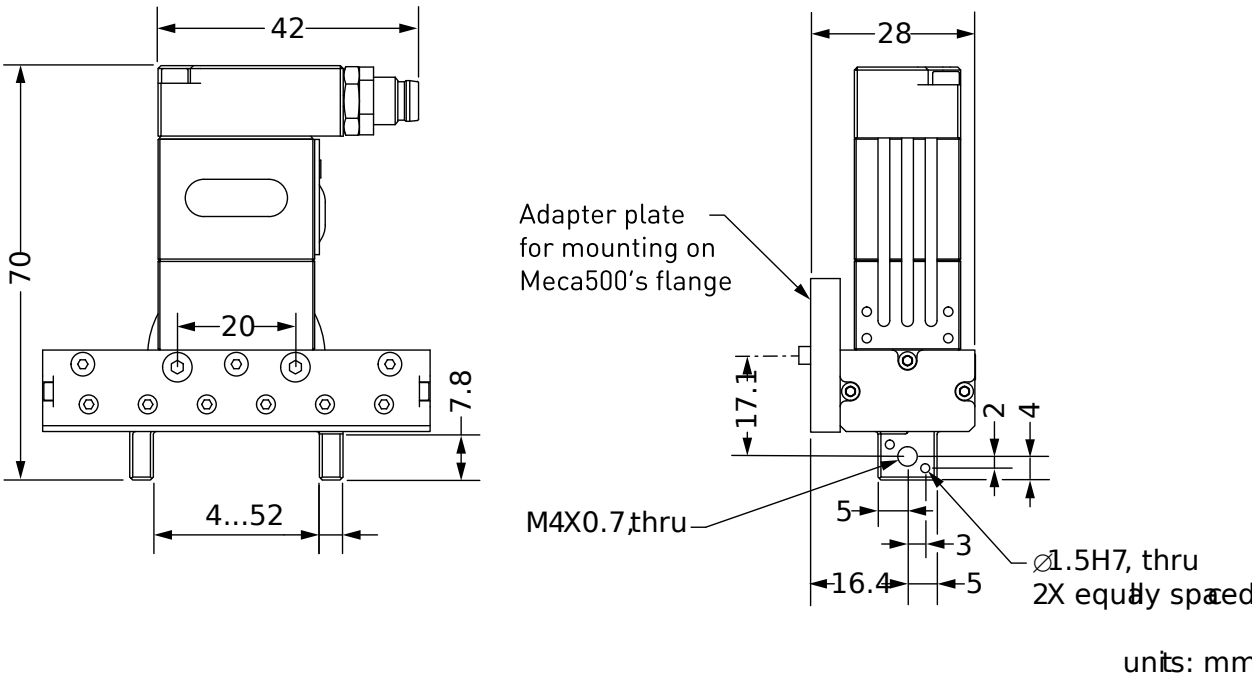
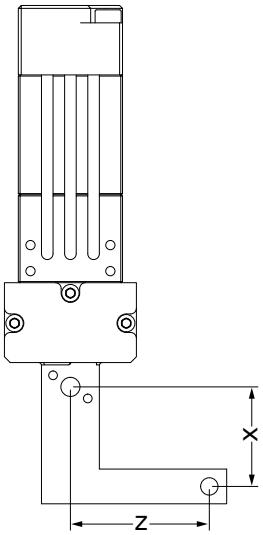
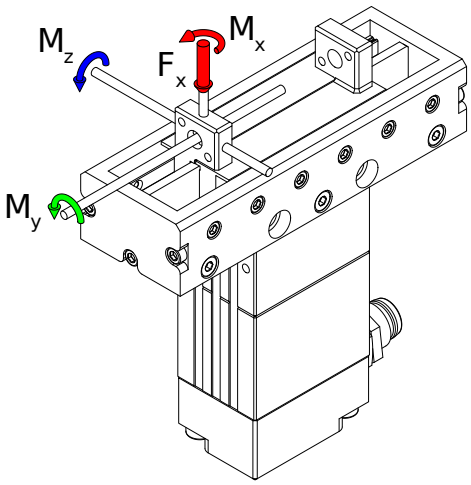


Figure 3: MEGP 25LS gripper dimensions

The maximum dimensions for the fingers and the maximum loads allowed on the gripper jaws are shown in Figure 4.



$\sqrt{x^2 + z^2} \leq 32$ mm



$|M_y| \leq 0.50$ Nm $|M_x| \leq 1.30$ Nm

$|M_z| \leq 0.42$ Nm $|F_x| \leq 70$ N

Figure 4: Maximum finger dimensions and finger loads for the MEGP 25LS gripper

Note

You can download the CAD file of the MEGP 25LS gripper, its default adapter plate as well as its 90° optional adapter plate from here.

Installing the gripper

The communication cables that come with the MEGP 25* grippers are designed for only two types of installation: using the standard adapter plate or the optional 90° adapter plate. If mounting the gripper on the Meca500 flange differently, you must design and machine your own adapter plate.

Installation steps

Before installing the gripper, the robot must be setup properly:

1. Turn the robot on.
2. Open the MecaPortal web interface and activate and home the robot.
3. Bring all joints to zero degrees.
4. Once all joints are zeroed, switch the robot off before proceeding to install the gripper.

Warning

The robot must be powered off before proceeding to install the gripper. The fingers must already be installed on the gripper.

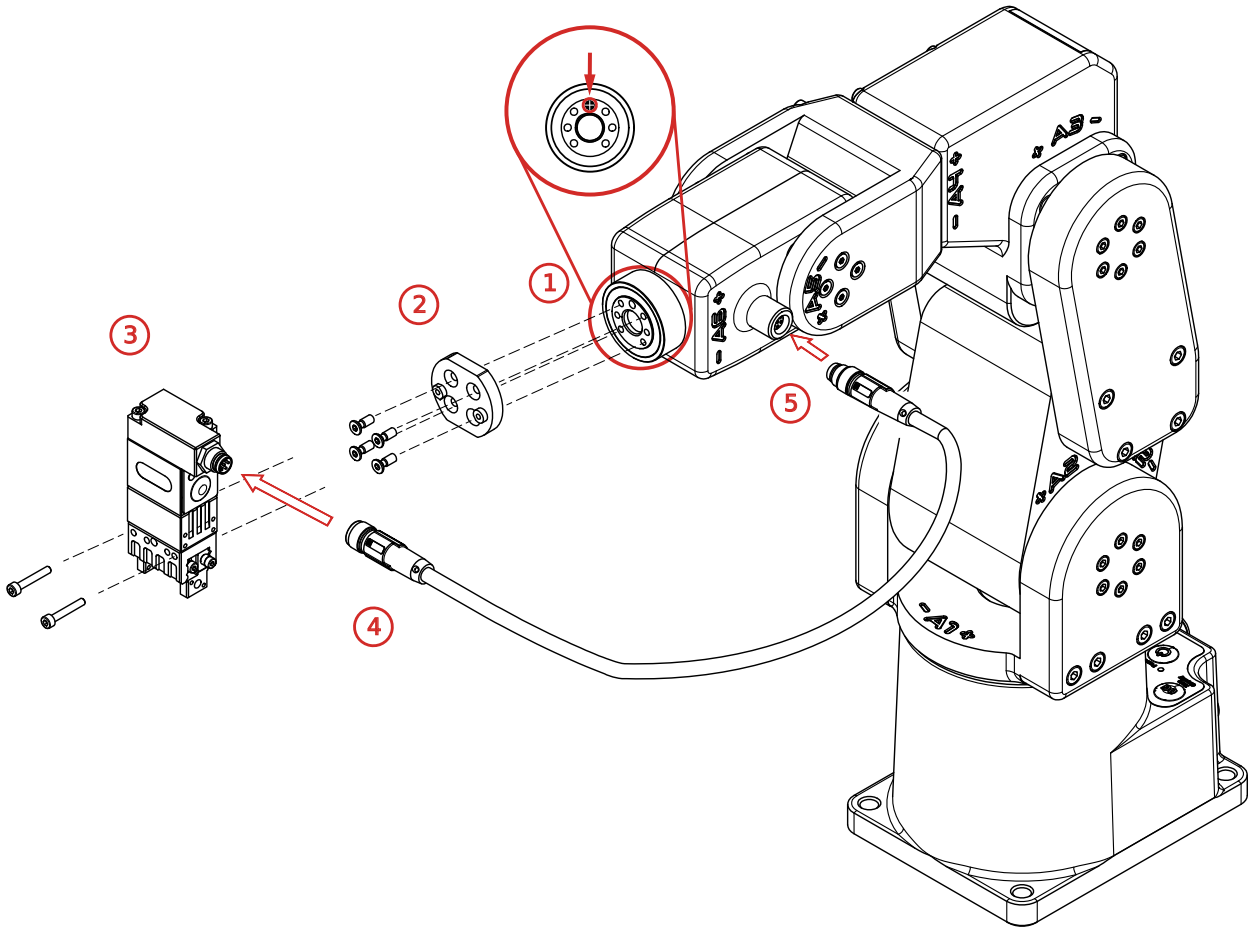


Figure 5: Installing the MEGP 25E gripper (fingers are not shown)

Install the gripper following the installation steps below, as shown in Figure 5

1. Make sure the flange of the robot is in zero position (screw in the flange is at 12 o'clock).

2. Attach the adapter plate using the four M3X0.5X8 Torx flat head screws provided. Make sure to install the plate in the proper orientation, as shown in Figure 6

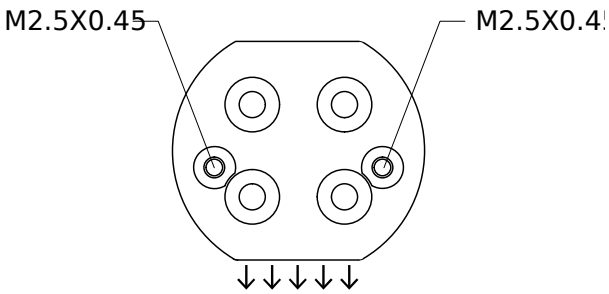


Figure 6: Proper adapter plate orientation (when all joints are at zero degrees, arrows should point towards the robot base)

Warning

Use only the screws provided; longer screws will damage joint 6.

3. Attach the gripper to the adapter plate using the two M2.5X0.45 socket head screws provided.
4. Attach the appropriate end of the cable to the gripper.
5. Remove the screw cap from the tool I/O port on the robot (keep for future use). Attach the other end of the cable to the port.

Figure 7 shows the MEGP 25 gripper installed, in the case of all three types of cables.

(a) MGC-AA25 (b) MGC-SS35

(c) MGC-HFC

Figure 7: MEGP 25E gripper installed with the three different cables (fingers not shown)

Once the gripper is installed, you can start using the robot. When the Meca500 is activated, it will automatically detect the gripper, and the green LED on the gripper will flash slowly.

The gripper is automatically homed when the robot is homed; it will fully open then close its fingers. This homing procedure is necessary to detect the range of motion of the fingers (in case their design reduces the nominal 6-mm range, for the MEGP 25E, or 48-mm range, for the MEGP 25LS). Once the gripper is homed, the green LED on the gripper will light up continuously.

Now that you have installed and homed your gripper, you must carefully test and then redefine the range of joint 6 with the command SetJointLimits in order to make sure that the gripper cable does not cause interferences. In the case of the standard adapter plate described in this section and the optional 90° adapter plate, the recommended maximal range for joint 6 is $[-180°, 180°]$.

⚠ Warning

Once you have installed your MEGP 25* gripper you must redefine the range of joint 6 using the command SetJointLimits, or else you risk to damage the gripper and its cable.

Gripper LEDs

There are two LEDs on the gripper, just below the tool I/O port: one green and one red. Their behavior indicates the gripper status as described in the table below.

Table 2: LED description

LED	Steady ON	Slow Blink	Fast Blink
RED	Holding part	Error	n/a
GREEN	Homed	Activated but not homed	Connected but not activated

Note

The button on the gripper, immediately below the two LEDs, is reserved for future use by Mecademic technicians.

Operating the grippers

The MEGP 25* grippers are controlled in a similar manner as the Meca500. They can be opened or closed using the GripperOpen and GripperClose commands. The gripping force can be configured using the SetGripperForce(f) command, where f ranges from 5% to 100% (i.e., from 0 to approximately 40 N). By default, the grip force limit is 40%. Gripping velocity can be set using the SetGripperVel(v) command, where v is the finger velocity limit, ranging from 5% to 200% (approximately 100 mm/s). By default, the finger velocity limit is 40%.

The gripper also has position control commands such as MoveGripper and SetGripperRange that allow users to move the gripper or set a range limit. Consult the Mecademic Robots Programming Manual for more details on these commands.

Firmware update

If you upgrade the firmware of your robot (using the procedure described in the MecaPortal operating manual) while an MEGP 25* gripper is installed, the firmware of the gripper will be automatically updated. Otherwise, you can update the firmware of your gripper separately by following the same procedure, but selecting the file m500_exttools_*.update, instead of the file Meca500_E_LD_*.update.

Safety

The MEGP 25* grippers are designed with safety in mind, however, additional parts connected to (e.g., fingers) or held by the gripper may lead to risks of injuries. Pay attention to gripping force to avoid ejecting workpieces or third-party hardware.

⚠ Warning

If the gripper is holding a part for a long time, its main body will become very hot. This is normal.

Activation, homing and E-Stop

If an activated and homed robot with an MEGP 25* gripper becomes deactivated, the gripper fingers are no longer controlled and become freely movable. However, the fingers positioning is still being precisely measured, and you do not need to home the robot again (only re-activate it).

If an E-Stop is activated on a Meca500 R3, the whole system is powered off, while on a Meca500 R4, power is removed from the robot motors AND the MEGP 25* gripper connected to the robot. Therefore, once the E-Stop is removed and reset, you must not only reactivate the robot, but also home it.

Danger

After an E-Stop or after deactivating the robot, the MEGP 25* gripper no longer maintains a gripping force and if it is holding a part, the part might fall.

Maintenance and inspection

As part of regular maintenance, it is important to ensure that the MEGP 25LS gripper travels the full stroke every 1,000 cycles or at least once daily, whichever occurs first.

Periodically inspect the connectors of the communication cable. If the connectors are loose or broken, stop using the gripper immediately and order a replacement cable.

Terminology

Below is the list of terms used by us in our technical documentation.

active line: The line in the MecaPortal where the cursor is currently positioned.

BRF: Base Reference Frame.

Cartesian space: The six-dimensional space defined by the position (x, y, z) and orientation (α, β, γ) of the TRF with respect to the WRF.

control port: The TCP port 10000, over which commands to the robot and messages from the robot are sent.

data request commands: Commands used to request some data regarding the robot (e.g., GetTrf, GetBlending, GetJointVel). These commands are executed immediately and generally return values for parameters that have already been configured (sent and executed) with a Set* command (or the default values).

default value: There are different settings in the robot controller that can be configured using Set* commands (e.g., SetCartAcc). Many of these settings have default values. Every time the robot is powered up, these settings are initialized to their default values. In the case of motion commands settings, their values are also initialized to their default values every time the robot is deactivated. In contrast, some settings are persistent and their values are stored on an SD drive.

detailed event log: This file mirrors the content of the event log panel in the MecaPortal when in detailed mode. It can be downloaded from the MecaPortal (see *troubleshoot-prog* of the Programming Manual).

EOAT: End-of-arm tooling.

EOB: End-of-block message, [3012][], sent by default every time the robot has stopped moving AND its motion queue is empty. You can disable this message with the command SetEob.

EOM: End-of-motion message, [3004][], sent by the robot whenever it has stopped moving for at least 1 ms, if this option is activated with SetEom.

error mode: The robot goes into error mode when it encounters an error while executing a command or a hardware problem (see *tab:error-messages*).

Euler angles: A set of three angles, {α, β, γ}, used the define an orientation in space. We use the mobile (intrinsic) XYZ convention. See *Euler-angles* of the Programming manual for more details.

FCP: Flange Center Point. The origin of the FRF.

FRF: Flange Reference Frame.

instantaneous commands: These are commands that are executed immediately, as soon as received by the robot. All data request commands (Get*), all robot control commands,

all work zone supervision and collision prevention commands and some optional accessories commands (*_Immediate) are instantaneous.

inverse kinematics: The problem of obtaining the robot joint sets that correspond to a desired end-effector pose. See *inverse-kinematics* of the Programming manual for more details.

joint position: The joint angle associated with a specific joint.

joint set: The set of all joint positions.

joint space: The six-dimensional space defined by the positions of the robot joints.

monitoring port: The TCP port 10001, over which data is sent periodically from the robot.

motion commands: Commands used to construct the robot trajectory (e.g., Delay, MoveJoints, SetTRF, SetBlending). When a Mecademic robot receives a motion command, it places it in a motion queue. The command will be run once all preceding motion commands have been executed.

motion queue: The buffer where motion commands that were sent to the robot are stored and executed on a FIFO basis by the robot.

offline program: A sequence of commands saved in the internal memory of the robot. The term *offline* is often omitted and will eventually be removed altogether.

online mode programming: Programming the robot in online mode involves moving it directly to each desired robot position, typically using jogging controls.

PDO (**Process Data Object**): In EtherCAT, a Process Data Object (PDO) is a data structure used for exchanging real-time cyclic data between an EtherCAT master and its slave devices. PDOs can contain individual bits, bytes, or words.

persistent settings: Some settings in the robot controller have default values (e.g., the robot name set by the command SetRobotName), but when changed, their new values are written on an SD drive and persist even if the robot is powered off.

pose: The position and orientation of one reference frame with respect to another.

position mode: One of the two control modes, in which the robot's motion is generated by requesting a target end-effector pose or joint set (see *pos-vel-modes* of the Programming Manual).

robot posture configuration: The set of two-value (−1 or 1) parameters c_s, c_e, and c_w that normally defines each of the eight possible robot postures for a given pose of the robot's end-effector.

queued commands: Commands that are placed in the motion queue, rather than executed immediately. All motion commands are queued commands, as well as some external-tool commands.

reach: The maximum distance between the axis of joint 1 and the center of the robot's wrist.

real-time data request commands: Commands used to request some real-time data regarding the current status of robot (e.g., GetRtTrf, GetRtCartPos, GetStatusRobot).

robot control commands: Commands used to immediately control the robot, (e.g., ActivateRobot, PauseMotion, SetNetworkOptions). These commands are executed immediately, i.e., are instantaneous.

robot is ready for motion: The robot is considered *ready* to receive motion commands, i.e. when it is activated and homed, or alternatively when recovery-mode is enabled while the robot is activated but not homed.

Note that if the robot is in error or if a safety stop condition is present, it will refuse motion commands, but it will still be considered *ready* since its motion queue remains initialized and retains the latest received settings (e.q., velocity, acceleration, blending, WRF, TRF, etc.).

robot log: This file is a more detailed version of the user log, intended primarily for our support team. It can be downloaded from the MecaPortal (see *troubleshoot-prog* of the Programming Manual).

robot position: A robot position is equivalent to either a joint set or the pose of the TRF relative to the WRF, along with the definitions of both reference frames, and the robot posture and last joint turn configuration parameters.

robot posture: The arrangement of the robot links. Equivalent to a joint set in which all joint angles are normalized, i.e. have been converted to the range $(-180°, 180°]$.

SDO (**Service Data Object**): In EtherCAT, a Service Data Object (SDO) is a data structure used for non-real-time communication between an EtherCAT master and its slave devices. SDOs are typically used to configure device parameters and access diagnostic information through the object dictionary. Unlike PDOs, SDOs exchange structured data rather than individual bits or bytes.

singularities: A robot posture where the robot's end-effector is blocked in some directions even if no joint is at a limit (see *singularities* of the Programming Manual).

TCP: Tool Center Point. The origin of the TRF. Not to be confused with Transmission Control Protocol.

TRF: Tool reference frame.

turn configuration parameter: Since the last joint of the robot can rotate multiple revolutions, the turn configuration parameter defines the revolution number.

user log: This file is a simplified log containing user-friendly traces of major events (e.g., robot activation, movement, E-Stop activation). It can be downloaded from the MecaPortal (see *troubleshoot-prog* of the Programming Manual).

velocity mode: One of the two control modes, in which the robot's motion is generated by requesting a target joint velocity vector or end-effector Cartesian velocity vector (see *pos-vel-modes* of the Programming Manual).

workspace: The Cartesian workspace of a robot is the set of all feasible poses of its TRF with respect to its WRF. Note that many of these poses can be attained with more than one set of configuration parameters.

WRF: World reference frame.

wrist center: the point where the axes of joints 4, 5, and 6 intersect.