

# Assembly and Operating Manual

## MEG 64 EC

Electrical parallel gripper



## Imprint

### Copyright:

This manual is protected by copyright. The author is SCHUNK GmbH & Co. KG. All rights reserved. Any reproduction, processing, distribution (making available to third parties), translation or other usage - even excerpts - of the manual is especially prohibited and requires our written approval.

### Technical changes:

We reserve the right to make alterations for the purpose of technical improvement.

**Document number:** 389203

**Version:** 03.00 | 05/02/2020 | en

© SCHUNK GmbH & Co. KG

All rights reserved.

Dear Customer,

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

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

Best regards,

Your SCHUNK team

SCHUNK GmbH & Co. KG  
Spann- und Greiftechnik

Bahnhofstr. 106 – 134  
D-74348 Lauffen/Neckar

Tel. +49-7133-103-0

Fax +49-7133-103-2399

info@de.schunk.com

schunk.com

## Table of Contents

<b>1</b>	<b>General</b> .....	<b>5</b>
1.1	About this manual .....	5
1.1.1	Presentation of Warning Labels .....	5
1.1.2	Applicable documents .....	6
1.2	Warranty .....	6
1.3	Accessories .....	6
1.4	Scope of delivery .....	6
1.4.1	Scope of delivery Gripper .....	6
1.4.2	Scope of delivery Controller .....	6
<b>2</b>	<b>Basic safety notes</b> .....	<b>7</b>
2.1	Intended use.....	7
2.2	Not intended use.....	7
2.3	Constructional changes .....	7
2.4	Spare parts .....	7
2.5	Gripper fingers .....	8
2.6	Ambient conditions and operating conditions .....	8
2.7	Personnel qualification .....	9
2.8	Personal protective equipment.....	10
2.9	Notes on safe operation.....	10
2.10	Transport.....	10
2.11	Malfunctions.....	11
2.12	Disposal .....	11
2.13	Fundamental dangers.....	11
2.13.1	Protection during handling and assembly .....	11
2.13.2	Protection during commissioning and operation .....	12
2.13.3	Protection against dangerous movements.....	12
2.13.4	Protection against electric shock.....	13
2.14	Notes on particular risks.....	14
<b>3</b>	<b>Technical data</b> .....	<b>16</b>
3.1	Gripper MEG 64 EC.....	16
3.2	Controller MEG C.....	17
<b>4</b>	<b>Assembly</b> .....	<b>18</b>
4.1	Mechanical connection .....	18
4.1.1	Gripper.....	18
4.1.2	Controller.....	20
4.2	Electrical connection .....	21
4.2.1	Gripper connector assignment .....	21
4.2.2	Terminal assignment MEG C 64.....	22
4.2.3	Connecting ground cable.....	23

<b>5</b>	<b>Start-up .....</b>	<b>24</b>
5.1	Notes on start-up .....	24
5.2	MEG 64 EC and MEG C 64 connection description.....	24
5.3	Performing a reference run .....	27
5.4	Position mode.....	28
5.5	Live mode .....	31
5.6	External reset .....	33
5.7	Analog set values.....	34
5.7.1	Gripping speed - specification .....	35
5.7.2	Step - specification .....	37
5.7.3	Gripping force - specification.....	38
5.8	Example of a possible gripping cycle .....	39
5.9	Table of functions .....	41
<b>6</b>	<b>Troubleshooting .....</b>	<b>43</b>
6.1	Status LED flashing .....	43
6.2	Product does not execute a complete stroke.....	44
6.3	The gripping force drops .....	44
6.4	Product opens or closes jerkily.....	44
<b>7</b>	<b>Maintenance .....</b>	<b>45</b>
7.1	Maintenance intervals.....	45
7.2	Lubricate gripper .....	46
7.3	Disassembly and assembling .....	46
<b>8</b>	<b>Translation of original declaration of incorporation .....</b>	<b>47</b>
<b>9</b>	<b>Annex to Declaration of Incorporation.....</b>	<b>48</b>

## 1 General

### 1.1 About this manual

This manual contains important information for a safe and appropriate use of the product.

This manual is an integral part of the product and must be kept accessible for the personnel at all times.

Before starting work, the personnel must have read and understood this operating manual. Prerequisite for safe working is the observance of all safety instructions in this manual.

Illustrations in this manual are provided for basic understanding and may differ from the actual product design.

In addition to these instructions, the documents listed under [Applicable documents](#) [► 6] are applicable.

#### 1.1.1 Presentation of Warning Labels

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



#### **⚠ DANGER**

##### **Danger for persons!**

Non-observance will inevitably cause irreversible injury or death.



#### **⚠ WARNING**

##### **Dangers for persons!**

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



#### **⚠ CAUTION**

##### **Dangers for persons!**

Non-observance can cause minor injuries.

#### **CAUTION**

##### **Material damage!**

Information about avoiding material damage.

### **1.1.2 Applicable documents**

- General terms of business \*
- Catalog data sheet of the purchased product \*
- Assembly and operating manuals of the accessories \*

The documents marked with an asterisk (\*) can be downloaded on our homepage [schunk.com](http://schunk.com)

### **1.2 Warranty**

If the product is used as intended, the warranty is valid for 24 months from the ex-works delivery date under the following conditions:

- Observe the specified maintenance and lubrication intervals
- Observe the ambient conditions and operating conditions

Parts touching the workpiece and wear parts are not included in the warranty.

### **1.3 Accessories**

A wide range of accessories are available for this product  
For information regarding which accessory articles can be used with the corresponding product variants, see catalog data sheet.

### **1.4 Scope of delivery**

#### **1.4.1 Scope of delivery Gripper**

The scope of delivery includes

- Electrical parallel gripper MEG 64 EC in the ordered model
- Accessory pack

#### **1.4.2 Scope of delivery Controller**

The scope of delivery includes

- Controller MEG C in the version ordered

## 2 Basic safety notes

### 2.1 Intended use

The product is designed exclusively for gripping and temporarily holding workpieces or objects.

- The product may only be used within the scope of its technical data, [Technical data](#) [▶ 16].
- When implementing and operating components in safety-related parts of the control systems, the basic safety principles in accordance with DIN EN ISO 13849-2 apply. The proven safety principles in accordance with DIN EN ISO 13849-2 also apply to categories 1, 2, 3 and 4.
- The product is intended for installation in a machine/system. The applicable guidelines must be observed and complied with.
- The product is intended for industrial and industry-oriented use.
- Appropriate use of the product includes compliance with all instructions in this manual.

### 2.2 Not intended use

It is not intended use if the product is used, for example, as a pressing tool, stamping tool, lifting gear, guide for tools, cutting tool, clamping device or a drilling tool.

- Any utilization that exceeds or differs from the appropriate use is regarded as misuse.

### 2.3 Constructional changes

#### Implementation of structural changes

By conversions, changes, and reworking, e.g. additional threads, holes, or safety devices can impair the functioning or safety of the product or damage it.

- Structural changes should only be made with the written approval of SCHUNK.

### 2.4 Spare parts

#### Use of unauthorized spare parts

Using unauthorized spare parts can endanger personnel and damage the product or cause it to malfunction.

- Use only original spare parts or spares authorized by SCHUNK.

## 2.5 Gripper fingers

### Requirements for the gripper fingers

Stored energy within the product creates the risk of serious injuries and significant property damage.

- Arrange the gripper fingers in a way that the product reaches either the position "open" or "closed" in a de-energized state.
- Only exchange the gripper fingers when no residual energy remains in the product.
- Make sure that the product and the top jaws are a sufficient size for the application.

## 2.6 Ambient conditions and operating conditions

### Required ambient conditions and operating conditions

Incorrect ambient and operating conditions can make the product unsafe, leading to the risk of serious injuries, considerable material damage and/or a significant reduction to the product's life span.

- Make sure that the product is used only in the context of its defined application parameters, [Technical data](#) [► 16].
- Make sure that the product is a sufficient size for the application.
- Make sure that the environment is free from splash water and vapors as well as from abrasion or processing dust. Exceptions are products that are designed especially for contaminated environments.

## 2.7 Personnel qualification

### Inadequate qualifications of the personnel

If the personnel working with the product is not sufficiently qualified, the result may be serious injuries and significant property damage.

- All work may only be performed by qualified personnel.
- Before working with the product, the personnel must have read and understood the complete assembly and operating manual.
- Observe the national safety regulations and rules and general safety instructions.

The following personal qualifications are necessary for the various activities related to the product:

<b>Trained electrician</b>	Due to their technical training, knowledge and experience, trained electricians are able to work on electrical systems, recognize and avoid possible dangers and know the relevant standards and regulations.
<b>Qualified personnel</b>	Due to its technical training, knowledge and experience, qualified personnel is able to perform the delegated tasks, recognize and avoid possible dangers and knows the relevant standards and regulations.
<b>Instructed person</b>	Instructed persons were instructed by the operator about the delegated tasks and possible dangers due to improper behaviour.
<b>Service personnel of the manufacturer</b>	Due to its technical training, knowledge and experience, service personnel of the manufacturer is able to perform the delegated tasks and to recognize and avoid possible dangers.

## 2.8 Personal protective equipment

### Use of personal protective equipment

Personal protective equipment serves to protect staff against danger which may interfere with their health or safety at work.

- When working on and with the product, observe the occupational health and safety regulations and wear the required personal protective equipment.
- Observe the valid safety and accident prevention regulations.
- Wear protective gloves to guard against sharp edges and corners or rough surfaces.
- Wear heat-resistant protective gloves when handling hot surfaces.
- Wear protective gloves and safety goggles when handling hazardous substances.
- Wear close-fitting protective clothing and also wear long hair in a hairnet when dealing with moving components.

## 2.9 Notes on safe operation

### Incorrect handling of the personnel

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Avoid any manner of working that may interfere with the function and operational safety of the product.
- Use the product as intended.
- Observe the safety notes and assembly instructions.
- Do not expose the product to any corrosive media. This does not apply to products that are designed for special environments.
- Eliminate any malfunction immediately.
- Observe the care and maintenance instructions.
- Observe the current safety, accident prevention and environmental protection regulations regarding the product's application field.

## 2.10 Transport

### Handling during transport

Incorrect handling during transport may impair the product's safety and cause serious injuries and considerable material damage.

- When handling heavy weights, use lifting equipment to lift the product and transport it by appropriate means.
- Secure the product against falling during transportation and handling.
- Stand clear of suspended loads.

## 2.11 Malfunctions

### Behavior in case of malfunctions

- Immediately remove the product from operation and report the malfunction to the responsible departments/persons.
- Order appropriately trained personnel to rectify the malfunction.
- Do not recommission the product until the malfunction has been rectified.
- Test the product after a malfunction to establish whether it still functions properly and no increased risks have arisen.

## 2.12 Disposal

### Handling of disposal

The incorrect handling of disposal may impair the product's safety and cause serious injuries as well as considerable material and environmental harm.

- Follow local regulations on dispatching product components for recycling or proper disposal.

## 2.13 Fundamental dangers

### General

- Observe safety distances.
- Never deactivate safety devices.
- Before commissioning the product, take appropriate protective measures to secure the danger zone.
- Disconnect power sources before installation, modification, maintenance, or calibration. Ensure that no residual energy remains in the system.
- If the energy supply is connected, do not move any parts by hand.
- Do not reach into the open mechanism or movement area of the product during operation.

### 2.13.1 Protection during handling and assembly

#### Incorrect handling and assembly

Incorrect handling and assembly may impair the product's safety and cause serious injuries and considerable material damage.

- Have all work carried out by appropriately qualified personnel.
- For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

### **Incorrect lifting of loads**

Falling loads may cause serious injuries and even death.

- Stand clear of suspended loads and do not step into their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.

## **2.13.2 Protection during commissioning and operation**

### **Falling or violently ejected components**

Falling and violently ejected components can cause serious injuries and even death.

- Take appropriate protective measures to secure the danger zone.
- Never step into the danger zone during operation.

## **2.13.3 Protection against dangerous movements**

### **Unexpected movements**

Residual energy in the system may cause serious injuries while working with the product.

- Switch off the energy supply, ensure that no residual energy remains and secure against inadvertent reactivation.
- The faulty actuation of connected drives may cause dangerous movements.
- Operating mistakes, faulty parameterization during commissioning or software errors may trigger dangerous movements.
- Never rely solely on the response of the monitoring function to avert danger. Until the installed monitors become effective, it must be assumed that the drive movement is faulty, with its action being dependent on the control unit and the current operating condition of the drive. Perform maintenance work, modifications, and attachments outside the danger zone defined by the movement range.
- To avoid accidents and/or material damage, human access to the movement range of the machine must be restricted. Limit/prevent accidental access for people in this area due through technical safety measures. The protective cover and protective fence must be rigid enough to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily and quickly accessible. Before starting up the machine or automated system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function correctly.

### 2.13.4 Protection against electric shock

#### Work on electrical equipment

Touching live parts may result in death.

- Work on the electrical equipment may only be carried out by qualified electricians in accordance with the electrical engineering regulations.
- Lay electrical cables properly, e. g. in a cable duct or a cable bridge. Observe standards.
- Before connecting or disconnecting electrical cables, switch off the power supply and check that the cables are free of voltage. Secure the power supply against being switched on again.
- Before switching on the product, check that the protective earth conductor is correctly attached to all electrical components according to the wiring diagram.
- Check whether covers and protective devices are fitted to prevent contact with live components.
- Do not touch the product's terminals when the power supply is switched on.

#### Possible electrostatic energy

Components or assembly groups may become electrostatically charged. When the electrostatic charge is touched, the discharge may trigger a shock reaction leading to injuries.

- The operator must ensure that all components and assembly groups are included in the local potential equalisation in accordance with the applicable regulations.
- While paying attention to the actual conditions of the working environment, the potential equalisation must be implemented by a specialist electrician according to the applicable regulations.
- The effectiveness of the potential equalisation must be verified by executing regular safety measurements.

## 2.14 Notes on particular risks



### **⚠ DANGER**

#### **Danger from electric voltage!**

Touching live parts may result in death.

- Switch off the power supply before any assembly, adjustment or maintenance work and secure against being switched on again.
- Only qualified electricians may perform electrical installations.
- Check if de-energized, ground it and hot-wire.
- Cover live parts.



### **⚠ DANGER**

#### **Risk of fatal injury from suspended loads!**

Falling loads can cause serious injuries and even death.

- Stand clear of suspended loads and do not step within their swiveling range.
- Never move loads without supervision.
- Do not leave suspended loads unattended.
- Wear suitable protective equipment.



### **⚠ WARNING**

#### **Risk of injury from objects falling and being ejected!**

Falling and ejected objects during operation can lead to serious injury or death.

- Take appropriate protective measures to secure the danger zone.



### **⚠ WARNING**

#### **Risk of injury due to unexpected movements!**

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

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

**⚠ WARNING****Risk of injury from crushing and impacts!**

Serious injury could occur during the base jaw procedure and when breaking or loosening the gripper fingers.

- Wear suitable protective equipment.
- Do not reach into the open mechanism or the movement area of the product.

**⚠ WARNING****Risk of injury from sharp edges and corners!**

Sharp edges and corners can cause cuts.

- Use suitable protective equipment.

**⚠ WARNING****Risk of burns through contact with hot surfaces!**

Surfaces of components can heat up severely during operation. Skin contact with hot surfaces causes severe burns to the skin.

- For all work in the vicinity of hot surfaces, wear safety gloves.
- Before carrying out any work, make sure that all surfaces have cooled down to the ambient temperature.

**⚠ WARNING****Risk of injury from objects falling in the event of an energy supply failure**

In case of an energy supply failure, the gripping force decreases and a secure hold on the gripped workpiece cannot be guaranteed.

- Take suitable protective measures to secure the danger zone.

### 3 Technical data

#### 3.1 Gripper MEG 64 EC

Stroke per finger [mm]	10
Gripping force [N] *	40 – 140
Workpiece weight [kg] (Recommendation) [kg] **	0.85
Power supply [VDC] (nominal range)	Supply via MEG C 64
Current input	Input via MEG C 64
Max. speed (gripping) [mm/s]	17
Weight [kg]	1.42
Max. permissible finger length [mm]	64
Min. ambient temperature [°C]	+5
Max. ambient temperature [°C]	+55
Repeatability [mm] ***	0.02
IP rating	30
Noise emission [dB(A)]	≤ 70

- \* Gripping force is the arithmetical sum of the individual forces acting on the gripper jaws at a distance of P=25 mm.
- \*\* Values for friction coefficient  $\mu = 0.1$  and safety factor  $v = 2$ . The values can be increased in the case of form-fitting.
- \*\*\* Distribution of the mechanical end positions after 100 consecutive strokes.

A controller is needed to operate the gripper. For this purpose, SCHUNK offers the MEG C 64 (ID number 307006).

More technical data is included in the catalog data sheet. Whichever is the latest version.

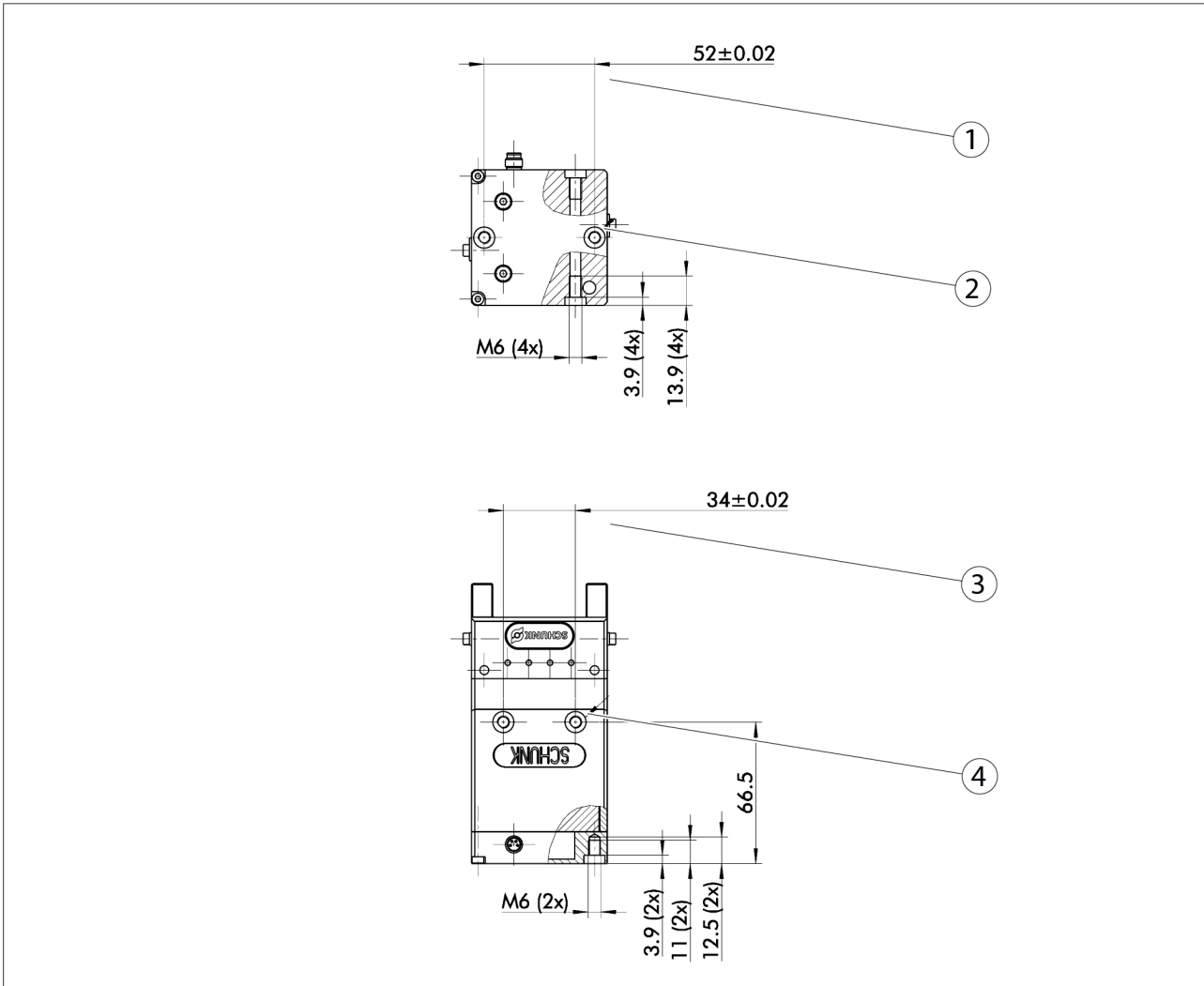
### 3.2 Controller MEG C

Power supply [VDC]	24
Max. Current input [A]	1.5
Weight [kg]	0.3
IP rating	30
Nominal temperature range [°C]	-10 to 65
Setting options	<ul style="list-style-type: none"><li>• Force setting</li><li>• Closing and opening times (speed)</li><li>• Stroke adjustment</li></ul>
Interface	Digital / Analog I/Os

## 4 Assembly

### 4.1 Mechanical connection

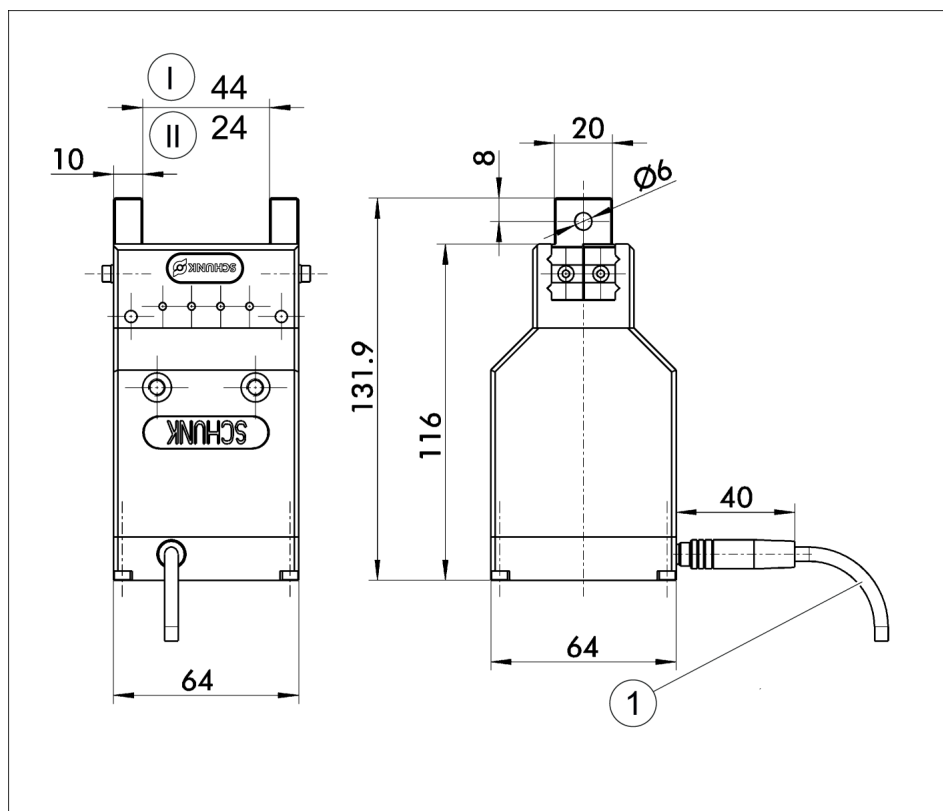
#### 4.1.1 Gripper



Connection dimensions MEG 64 EC

1	for bore hole $\varnothing 10$ $\pm 0.1$ for M6 thread	3	for bore hole $\varnothing 10$ $\pm 0.1$ for M6 thread
2	Centering sleeve $\varnothing 10$ (2x)	4	Centering $\varnothing 10$ (4x)

The gripper is mounted to the base or side via M6 threads. The centering is performed via the centering sleeves contained in the accessory kit.

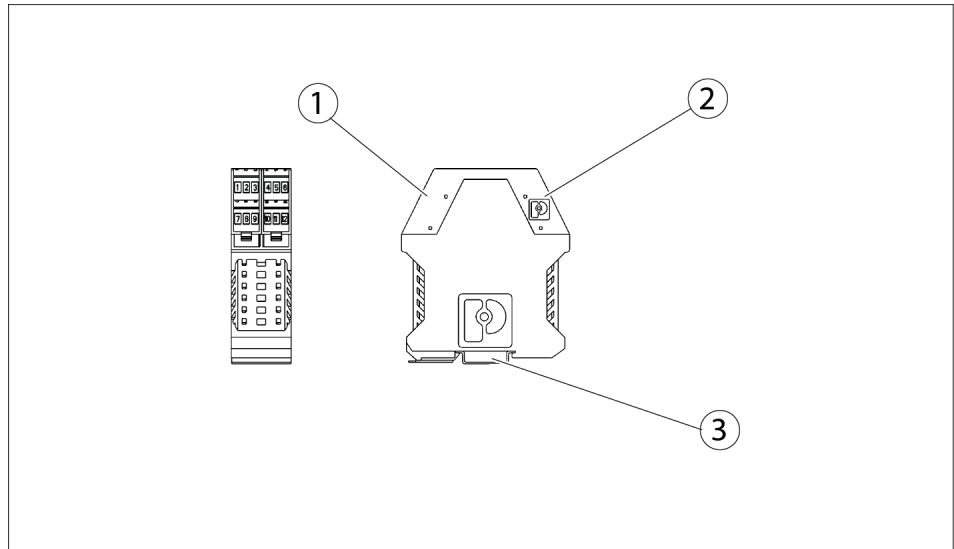


Dimensions MEG 64 EC (5xD bending radius applies to Schunk connection cables)

I	OPEN	II	CLOSED
1	5xD bending radius		

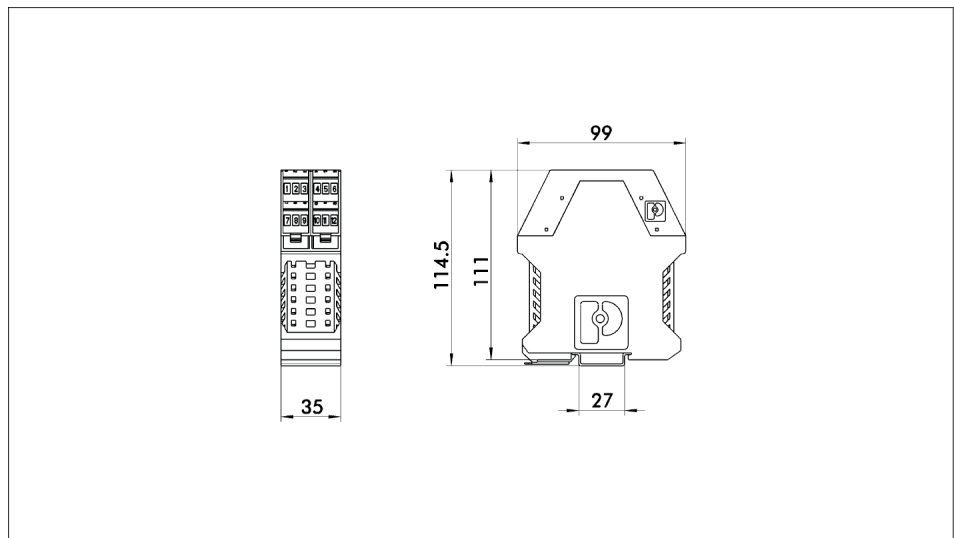
### 4.1.2 Controller

The MEG C controller is mounted to a mounting rail as per EN 50022 via the metal foot locking device.



Mounting MEG C 64

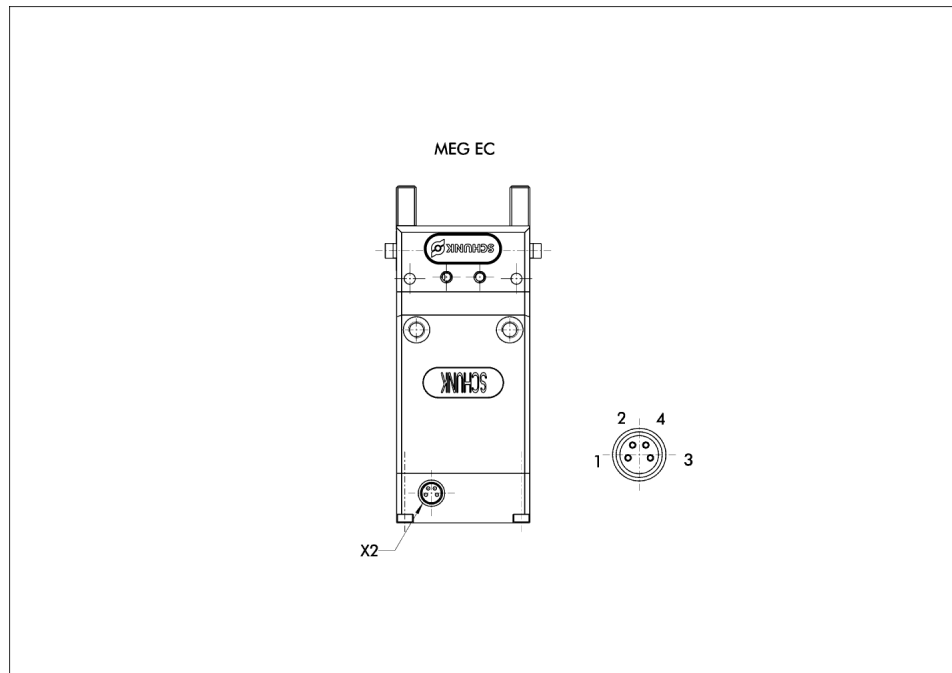
1	Terminals for PLC	3	Assembly on mounting rail as per EN 50022
2	Terminals for MEG-EC assembly on mounting rail as per EN 50022		



Dimensions MEG C 64

## 4.2 Electrical connection

### 4.2.1 Gripper connector assignment



*X2 device plug on the MEG 40 EC*

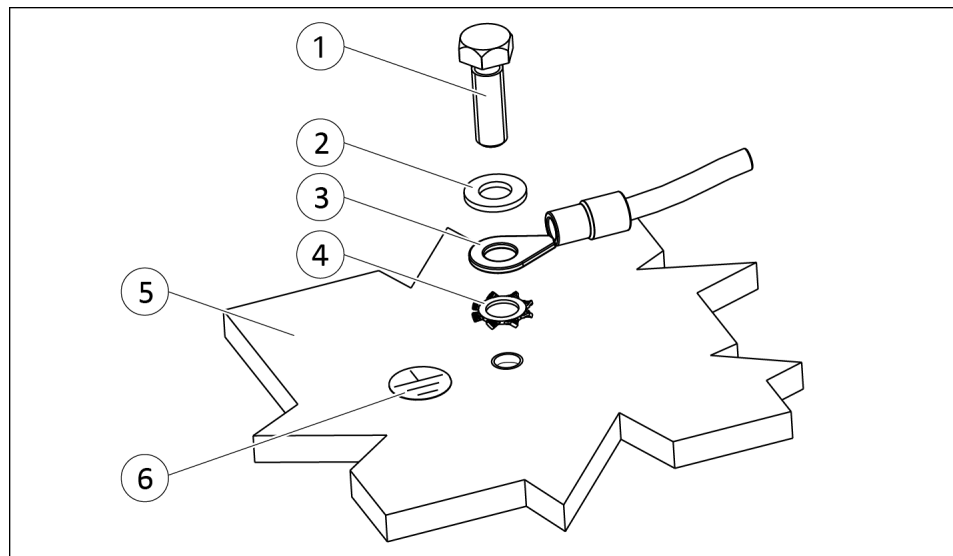
#### Device plug pin assignment X2

Pin	Function
1	Connection 1 motor
2	Connection 2 motor
3	Connection 3 motor
4	Connection 4 motor

#### 4.2.2 Terminal assignment MEG C 64

Terminal	Function	Miscellaneous	Cable color
1	Connection 3 motor	Connection for MEG 64 EC	Blue
2	Shield (gripper connecting cable PE)	Connection for MEG 64 EC	
3	Connection 4 motor	Connection for MEG 64 EC	Black
4			
5			
6	GND for position output	GND analog output	
7	Connection 1 motor	Connection for MEG 64 EC	Brown
8			
9	Connection 2 motor	Connection for MEG 64 EC	White
10	Supply (+24 V)	24 VDC $\pm$ 2%	
11	External reset	Digital input	
12	Supply (GND)	GND	
13	Gripper stopped	Digital output	
14	Reference run carried out	Digital output	
15	Analog position output (0-5V)	Analog output	
16	24V PLC	24 VDC $\pm$ 10%	
17	GND PLC	GND, potential of PCL	
18	Target position reached	Digital output	
19	Reference run	Digital input	
20	Gripper closed	Digital input	
21	Gripper open	Digital input	
22	Analog input: Speed	0V-10V (to the GND PLC)	
23	Analog input: Steps	0V-10V (to the GND PLC)	
24	Analog input: Force	0V-10V (to the GND PLC)	

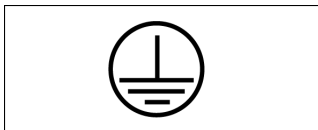
### 4.2.3 Connecting ground cable



Ground connection

1	Screw *	4	Toothed lock washer
2	Washer	5	Product
3	Cable lug	6	Ground marking

\*) Tightening torque: 5 Nm



A ground connection with a sufficient cross-section must be established between the product and the machine on the customer's premises.

The ground cable must be mounted on the threaded hole identified by the ground marking.

#### NOTE

Only connect the ground cable at the location intended for this purpose.

Always mount the ground cable singly.

Always use all components to screw in the ground cable and install them in this order: toothed lock washer, cable lug, washer and bolt. See "Ground connection" diagram. Observe the tightening torque.

## 5 Start-up

### 5.1 Notes on start-up

The control cable must be de-energized when connecting to the gripper.

The workpiece to be gripped should then be gripped in "live movement" mode.

The current at the input "Analog input: steps" (terminal 23) must correspond to the distance from the current position to the position which you wish to use for pre-positioning. Resulting from a rising edge on the inputs "Gripper open" or "Gripper closed", the gripper moves inwards or outwards by the distance set. Monitoring of the output "Target pos. reached".

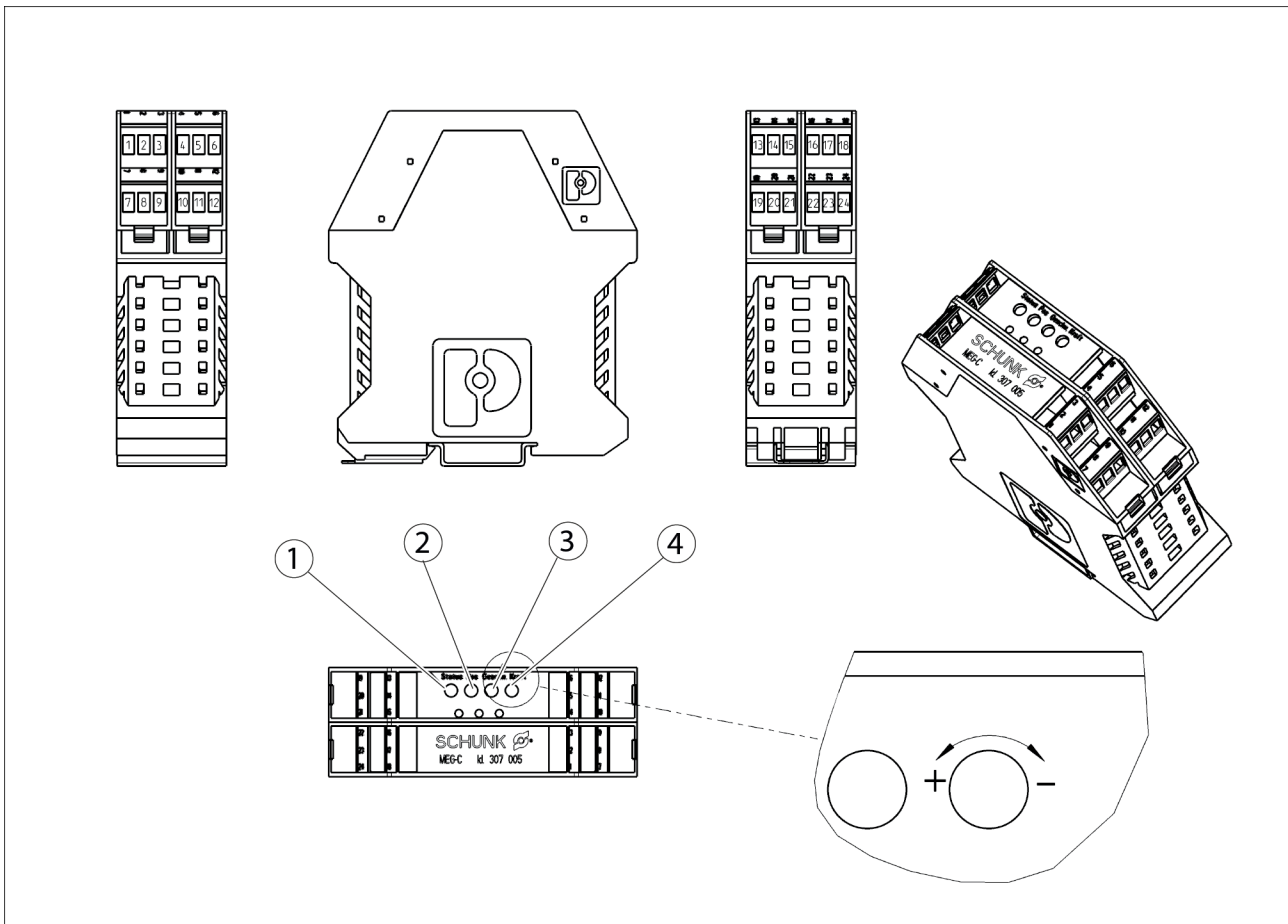
Prepositioning reached - output issues high signal.

The gripper is prepositioned in "positioning movement" mode, then the workpiece is gripped in live movement. The gripper can be prepositioned accordingly and the gripping cycle can start anew.

### 5.2 MEG 64 EC and MEG C 64 connection description

The MEG 64 EC does one stroke of 10 mm per jaw.

Stroke, force and speed can be set on the external MEG C controller via analog inputs or potentiometers. Gripper functionalities such as opening, closing and reference run are specified via decoupled digital inputs on the MEG C controller. Status signals of the MEG C external controller are sent back to the superordinate control (e.g. PLC) via digital outputs. The current position is issued as analog value.



MEG C

1	"Status" LED	3	Speed (P2)
2	Position (P3)	4	Force (P1)

The MEG C external controller for actuating the MEG EC gripper has three potentiometers:

- P1: Adjusting the gripping force
- P2: Adjusting the gripping speed
- P3: Adjusting the traverse path / the position (incremental input of the relative value)

Each potentiometer is assigned a measuring jack, on which the voltage set can be tapped for measuring.

The "Status" LED provides information about possible operating statuses of the controller and about problems in the event of a malfunction. The possible causes for malfunctions that can be displayed by the Status LED are listed in the chapter on Problem Analysis.

The MEG C controller (terminals 1, 3, 7, 9) is connected via a 4-pin control cable on the X2 device plug of the MEG EC gripper. We offer prefabricated control cables for this purpose (👉 accessories in the catalog).

For the allocation of further inputs and outputs / voltage supplies, see the terminal configuration [Terminal assignment MEG C 64](#) [► 22]

To operate the MEG C 40 with the MEG 40 EC, at least the following terminals need to be connected:

- Supply voltage (terminals 10 and 12)
- Supply voltage of the digital I/Os (terminals 16 and 17)
- Connection of the MEG 40 EC gripper (terminals 1, 3, 7, 9)
- Digital inputs "Gripper open" (terminal 21) and "Gripper closed" (terminal 20)

The other inputs and outputs must be assigned in accordance with the application or relevant case. After connecting the supply voltage, the Status LED flashes six times and then lights up continuously. The MEG C controller is then ready for operation. If the Status LED flashes constantly after switching on the MEG C, this indicates a malfunction and you will need to perform a fault analysis

A new command is always carried out with a rising edge on the digital inputs. This command in turn is completed with a falling edge. During command execution it must be ensured that the input signal does not bounce.

The gripper opens if a rising edge is identified at the "Gripper open" input. In the event of a falling edge, the command is ended, and the gripper stops. This works in the same way for the "Gripper closed" input. It is necessary to end the previous command with a falling edge before a new command is executed. In other words, it is imperative to ensure that the previous command was ended with a falling edge.

### 5.3 Performing a reference run

The reference run is only required if the analog output "Analog position output" (terminal 15) is to be used in the application. A reference run can be performed outward or inward.

#### Procedure

- Apply a High signal to the digital input "Reference run" (terminal 19).
- In the case of a reference run outward, apply a High edge to the digital input "Gripper open" (terminal 21).
- In the case of a reference run inward, apply a High edge to the digital input "Gripper closed" (terminal 20).
- Wait until the digital output "Reference run performed" (terminal 14) has been set to high.
- After having performed the reference run, set the inputs "Reference run" and "Gripper open" or "Gripper closed" to Low signal.

After performing the reference run, a High signal is issued at the digital output "Reference run performed" (terminal 14). A High level will be applied at the output until the voltage supply is switched off or the external reset is actuated or a new reference run is triggered.

## 5.4 Position mode

In order to attain an economical cycle time in an automation process, we recommend prepositioning the claw jaws. This means that the gripper is moved to a position that is minimally "larger" (with O.D. grippers) or "smaller" (with I.D. grippers) than the workpiece to be gripped. For this purpose, the "position mode", i.e. step mode is used. The distance the gripper is to cover from the current position towards "open" or "closed" is in this mode specified by "Analog input: Position" (terminal 23) or by "Pos." potentiometer (potentiometer P3).

This means that the stroke that the gripper performs depends on the analog voltage value that is present at the input or the potentiometer. This analog value must be present prior to execution of the "Gripper open" or "Gripper closed" command.

If the gripper moves to an end position or onto a workpiece in position mode, the current movement command is reset and the gripper stops. The superordinate control unit only receives the digital signal "Gripper stopped" (terminal 13), but not the "Target position reached" signal (terminal 18).

MEG 64 EC achieves a relative positioning accuracy of 0.1 mm. This is the accuracy with which a stroke specified by the potentiometer or the analog input is moved from the current position, if no step loss occurs due to collision of the claw jaws with a workpiece or the like.

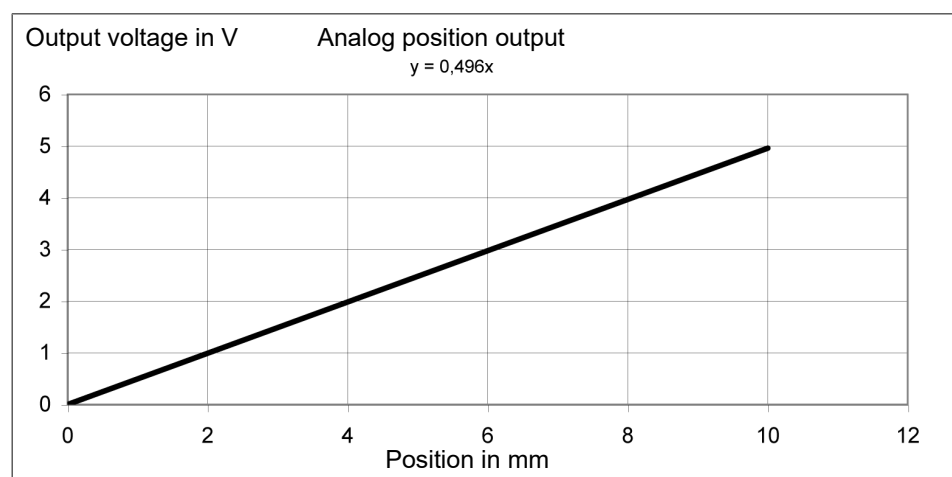
## Procedure

- Specification of the distance the gripper is to travel at the "Analog input: Position" (terminal 23) or at the "Pos." potentiometer (potentiometer P3) - (specification applies as of the current position).
- The analog values for speed ("Analog input: Speed" (terminal 22) or "Speed" potentiometer (potentiometer P2) and force ("Analog input: Force" (terminal 24) or "Force" potentiometer (potentiometer P1) must also be present prior to command execution (the desired values can be found under "Analog inputs").
- With a rising edge on one of the two digital inputs "Gripper open" (terminal 21) or "Gripper closed" (terminal 20) the new gripping position is approached by the specified value.
- During the movement the digital output "Gripper stopped" (terminal 13) becomes low.
- The gripper movement can be measured via the output "analog position output".
- After successful performance of a positioning movement, a High signal is issued at the "Target-pos. reached" output (terminal 18) and at the digital output "Gripper stopped" (terminal 13).

Successful performance of the positioning movement means that the gripper could perform the stroke travel that was specified by the analog value. If the next travel command is specified, a Low signal is again issued at the output.

The output "Analog position output" (terminal 15) issues the current gripper position in the form of an analog value after each reference run and at any point in time.

The following diagram shows in which way the output voltage and the position of the gripper are connected.



Connection between analog position output (terminal 15) and position of the gripper

Note that the position may drift due to step losses. To counter this drift, we recommend performing another reference run before the deviation is too large for the application.

### **NOTE**

If precise measurements are necessary, it is recommendable to adjust the output voltage once (this will not prevent a position output drift).

---

### **Procedure**

- Reference gripper "internally" or "externally".
- Insert gauge blocks with regard to the gripping positions approached later.
- Open or close gripper.
- Measure the output voltage for each gauge block and use it as the reference voltage for the respective position.

During operation of the gripper in the automated system, these reference voltages can then be compared with the analog output signal "Position output" (terminal 15) (e.g. in order to start further actions). Depending on the required precision and due to the position output drift, all x-cycles must be re-referenced (High signal on "Reference run [terminal 19] + High edge on "Gripper open" (terminal 21) or "Gripper closed" (terminal 20). In the case of high demands on the precision of the output "Analog position output", we recommend performing a reference run before each gripping cycle.

(x must be determined experimentally in the application)

## 5.5 Live mode

In order to safely grip a workpiece with a reproducible force (within the specifications), we recommend performing the gripping process in one of the two "live movement" modes.

**Live mode 1** is recommendable if you can rule out that the workpiece to be gripped may be lost as a result of excessively dynamic gripper movements (e.g. gripper on a 6-axis robot with very dynamic swivel movements). In this mode the system-related gripping force fluctuations are minimized (e.g. due to torque fluctuations of the stepper motor). Once the gripper jaws arrive at a resistance (workpiece), the gripper is only further provided with current, but no longer actively clocked so as to allow for gentle gripping.

**Live mode 2** is recommended if the above mentioned condition is not fulfilled, i.e. to not lose the gripped workpiece when the gripper is attached to a highly dynamic axis and an inelastic workpiece is to be force-fit gripped. The gripper drive is actively clocked on during gripping. This means that the claw jaws move against the resistance generated by the workpiece. This prevents workpiece loss. With this method, system-related gripping force fluctuations of +/-15% of the maximum force may occur.

### Procedure for live mode 1

- The voltage at the input "Analog steps" (terminal 23) and at the "Pos." potentiometer (potentiometer P3) must be set to 0V.
- The analog values for speed ("Analog input: Speed" (terminal 22) or "Speed" potentiometer (potentiometer P2) and force ("Analog input: Force" (terminal 24) or "Force" potentiometer (potentiometer P1) must be set to the application-specific value (the desired values can be found under "Analog inputs").
- Due to a rising edge at the digital inputs "Gripper open" (terminal 21) or "Gripper closed" (terminal 20), the gripper opens or closes based on the preset force. During the gripper finger movement, the digital output "Gripper stopped" (terminal 13) issues a Low signal.
- If the gripper moves to the workpiece stop, the output "Gripper stopped" (terminal 13) issues a High signal; the gripper is, however, further supplied with electrical current.
- The workpiece is safely gripped until the signal on the input "Gripper open" (terminal 21) or "Gripper closed" (terminal 20) is reset by a falling edge.

### Procedure for live mode 2

- The voltage at the input "Analog steps" (terminal 23) and at the "Pos." potentiometer (potentiometer P3) must be set to 0V.
- The analog values for speed ("Analog input: Speed" (terminal 22) or "Speed" potentiometer (potentiometer P2) and force ("Analog input: Force" (terminal 24) or "Force" potentiometer (potentiometer P1) must be set to the application-specific value (the desired values can be found under "Analog inputs").
- When twice applying a rising edge at the digital inputs "Gripper open" (terminal 21) or "Gripper closed" (terminal 20), the gripper opens or closes in live mode 2 based on the preset force. For this the second rising edge must be carried out on the same terminal ("Gripper open" (terminal 21) or "Gripper closed" (terminal 20) as the first rising edge. If prior to the live movement a position movement was performed in the same direction, only one rising edge is required at the input terminals. During the gripper finger movement, the digital output "Gripper stopped" (terminal 13) issues a Low signal.
- If the gripper moves to the workpiece stop, the output "Gripper stopped" (terminal 13) issues a High signal; the gripper is, however, further supplied with electrical current and clocked.
- The workpiece is safely gripped until the signal on the input "Gripper open" (terminal 21) or "Gripper closed" (terminal 20) is reset by a falling edge.

### NOTE

If a live movement is performed in the same direction immediately after a travel movement in "position mode", then you will immediately be in live mode 2, since a rising edge has already been applied in order to perform the position movement and the second rising edge has been applied in the same direction of movement for the live movement. For live mode 1, you must first apply a rising edge at the digital input ("Gripper open" (terminal 21) or "Gripper closed" (terminal 20) of the respective other movement direction and then immediately reset it again. Then the live movement can be enabled in the actual direction. You will then be in live mode 1.

## 5.6 External reset

When applying a rising and then a falling edge at the input "Reset", a reset is performed in the internal micro-processor. This means the gripper immediately stops and all outputs are reset. The next command that arrives is then performed entirely normally.

The controller takes about 5 seconds to perform a reset.

## 5.7 Analog set values

The analog values can either be specified by the PLC or entered directly on the gripper control. Setting these values in the gripper control is done via the potentiometers that are accessible via the housing top of the MEG C 40 controller. The analog voltages that are set via the potentiometers can be measured via the corresponding measuring jacks.

When applying analog voltages (level > 0.2 V) to the corresponding inputs (terminals 22, 23, 24) of the gripper control, the preset potentiometer values are ignored.

If the analog values are to be set via the gripper control (potentiometer), there must not be any voltage on the external analog inputs (put inputs onto GND, if possible).

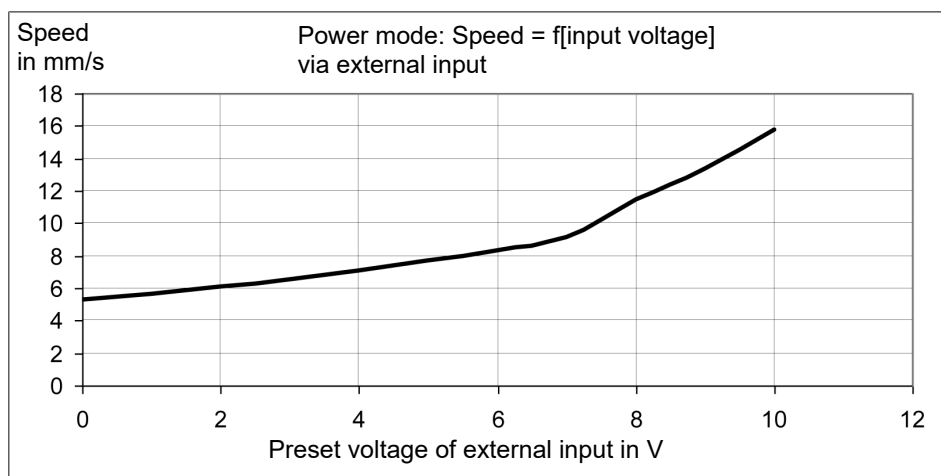
If the analog voltages are specified by the PLC, it is recommendable that the internal analog voltages are set to 0 V on the potentiometers.

You can also combine external (via PLC) and internal (via the potentiometers) specifications. If, for instance, the position movement is to be automated in a process and the force and gripper speed are to remain unchanged, then these two values can be set at the Electronics using the potentiometers and the value for the position is specified separately (PLC).

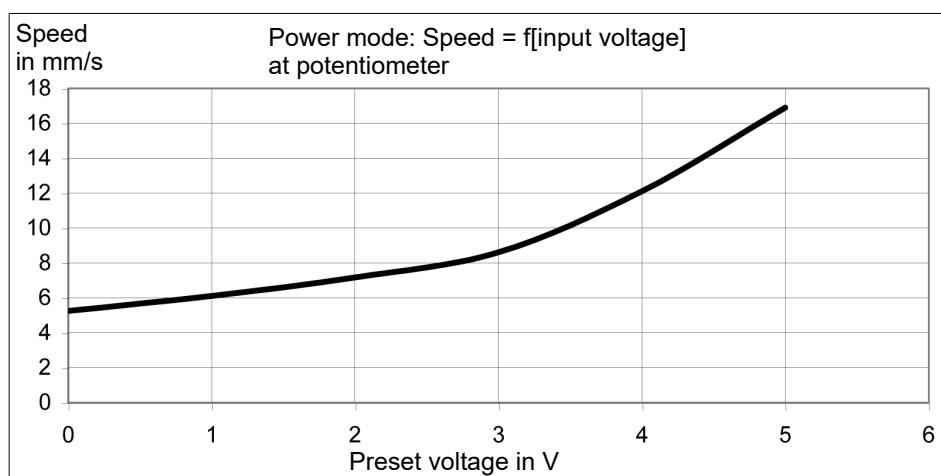
In the event of external voltage specification and due to slight changes in the voltage values, the set values, steps, force and speed may change as well. Ensure that the voltage values do not change to an extent (unintended) that would make damage to the workpiece possible as a result of the gripping process.

### 5.7.1 Gripping speed - specification

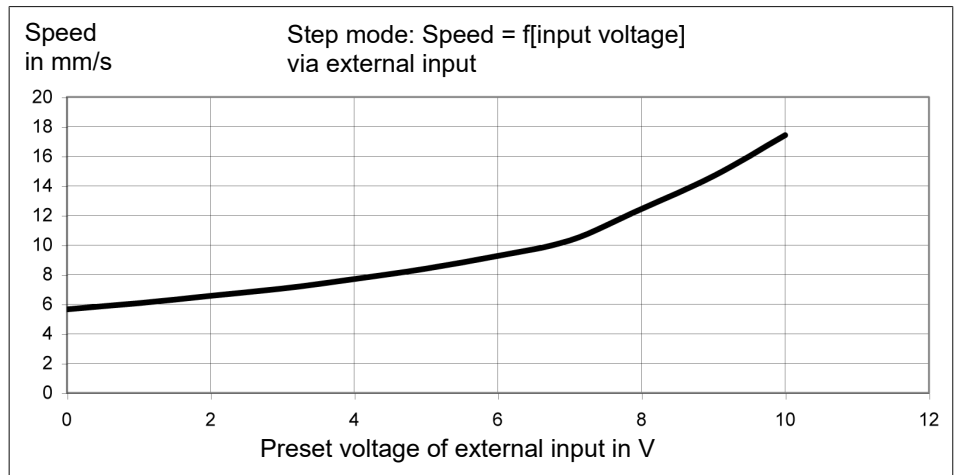
The diagrams below show the connection between the speed and the input voltage of the external input "Speed" (terminal 22) or the "Speed" potentiometer (potentiometer P2).



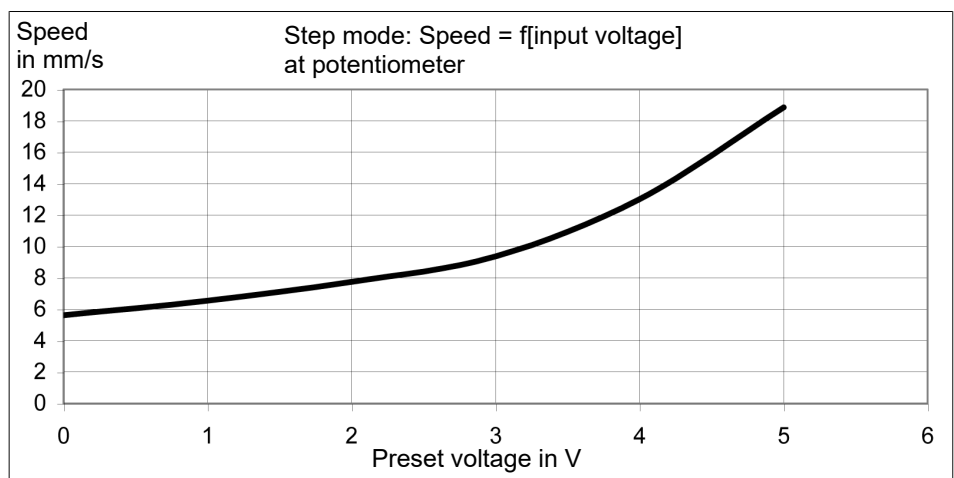
*Speed in live mode in relation to external analog input "Speed" (terminal 22)*



*Speed in live mode in relation to input voltage on the "Speed" potentiometer (potentiometer P2)*



*Speed in step/position mode in relation to the external analog input "Speed" (terminal 22)*

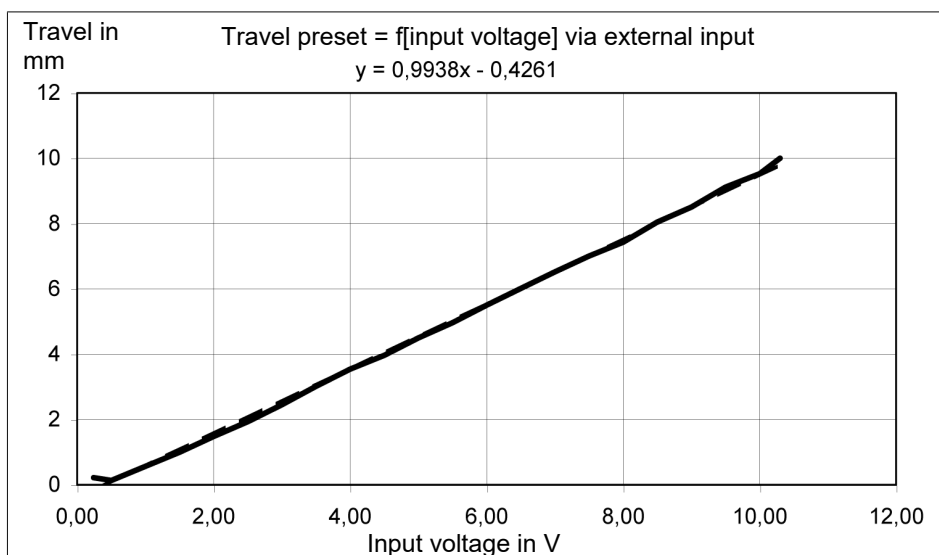


*Speed in step/position mode in relation to input voltage on the "Speed" potentiometer (potentiometer P2)*

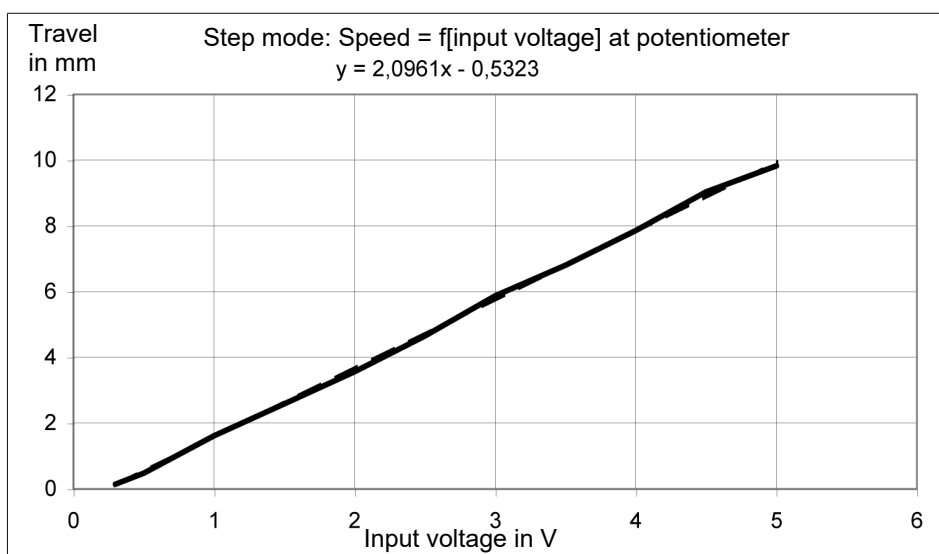
### 5.7.2 Step - specification

The distance the gripper is to cover from the current position towards "open" or "closed" is in this mode specified by "Analog input: Position" (terminal 23) or by "Pos." potentiometer (potentiometer P3). This means that the stroke that the gripper performs depends on the analog voltage value that is present at the input or the potentiometer. This analog value must be present prior to execution of the "Gripper open" or "Gripper closed" command.

The following diagram shows the relative traverse path when the input voltage is specified at the analog input "Steps" (terminal 23). The next diagram shows the relative traverse path when the voltage is specified via the "Pos." potentiometer (potentiometer P3) on the controller MEG C.



*relative traverse path when analog voltage is specified on (terminal 23)*

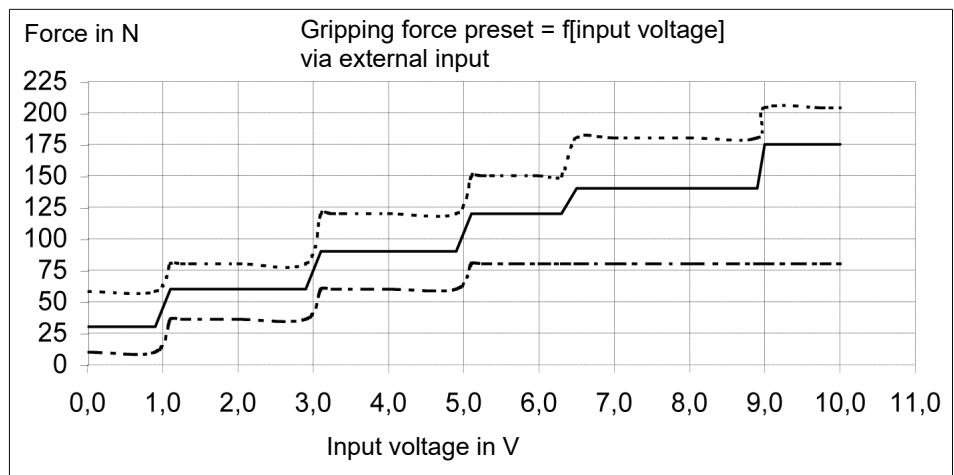


*relative traverse path when analog voltage is specified via potentiometer "Pos." (P3)*

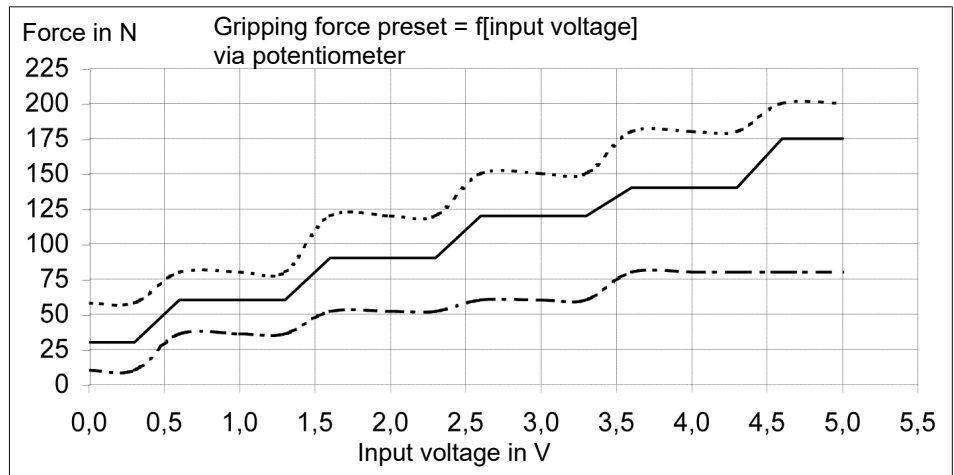
### 5.7.3 Gripping force - specification

For system-related reasons (e.g. friction in the gripper and torque fluctuations), fluctuations of  $\pm 15\%$  are possible when setting the force. To set the gripping force approximately, it suffices to set the gripping force via the "Force" potentiometer (P1) or the external input "Force" (terminal 24).

The following two illustrations show the relationship between the gripping force and the input voltage of the external input "Force" (terminal 24) or the "Force" potentiometer (potentiometer P1) for finger length  $P = 30$  mm.



*Gripping force when the analog voltage is specified on (terminal 24)*



*Gripping force when the analog voltage is specified via potentiometer "Force" (P1)*

(\* Gripping force is the arithmetical sum of the individual forces acting on the gripper jaws at a distance of  $P = 30$  mm)

## 5.8 Example of a possible gripping cycle

In order to attain an economical cycle time in an automation process, we recommend first prepositioning the claw jaws and then gripping in live mode. The following example intends to present the actuation steps required for such a gripping cycle.

First the claw jaws travel to a position that is minimally "larger" (with O.D. grippers) or "smaller" (with I.D. grippers) than the workpiece to be gripped. For this purpose, the "position mode", i.e. step mode is used.

The distance the gripper is to cover from the current position towards "open" or "closed" is in this mode specified by "Analog input: Position" (terminal 23) or by potentiometer "Pos." (potentiometer P3). This analog value as well as the specifications for force and speed must be present before executing the command "Gripper open" or "Gripper closed" in position mode. After successful performance of a positioning movement, a High signal is issued at the "Target-pos. reached" output (terminal 18) and at the digital output "Gripper stopped" (terminal 13). Now the specification for the stroke ("Analog input: Position" (terminal 23)) or on the "Pos." potentiometer (potentiometer P3) is set to zero Volt so as to switch from the position mode to the live mode. The live movement is started via the "Gripper open" or "Gripper closed" command. The set value for the gripping force can be changed during live movement. The gripping force then simultaneously changes to the set value. During the gripper finger movement, the digital output "Gripper stopped" (terminal 13) issues a Low signal. If the gripper fingers move to the workpiece stop, the output "Gripper stopped" (terminal 13) issues a High signal; the gripper is, however, further supplied with electrical current. The workpiece is safely gripped until the signal on the input "Gripper open" (terminal 21) or "Gripper closed" (terminal 20) is reset by a falling edge. If the workpiece is located in its place, the input "Gripper open" (terminal 21) or "Gripper closed" (terminal 20) (and with this live movement) is reset and the gripper is opened again in position movement, due to the specification on the "Analog input: Position" (terminal 23) or on the "Pos." potentiometer (potentiometer P3).

### Procedure

- Specification of the distance the gripper is to travel at the "Analog input: Position" (terminal 23) or at the "Pos." potentiometer (potentiometer P3) - (specification applies as of the current position).
- The analog values for speed ("Analog input: Speed" (terminal 22) or potentiometer "Speed" (potentiometer P2) and force ("Analog input: Force) (terminal 24) or "Force" potentiometer (potentiometer P1) must also be present prior to command execution (the desired values can be found under "Analog inputs").
- With a rising edge on one of the two digital inputs "Gripper open" (terminal 21) or "Gripper closed" (terminal 20) the new gripping position is approached by the specified value.
- During the movement the digital output "Gripper stopped" (terminal 13) becomes low.
- The gripper movement can be measured via the output "analog position output".
- After successful performance of a positioning movement, a High signal is issued at the "Target-pos. reached" output (terminal 18) and at the digital output "Gripper stopped" (terminal 13).
- The voltage at the input "Analog steps" (terminal 23) and at the "Pos." potentiometer (potentiometer P3) must be set to 0V.
- The analog values for speed ("Analog input: Speed" (terminal 22) or potentiometer "Speed" (potentiometer P2) and force ("Analog input: Force) (terminal 24) or potentiometer "Force" (potentiometer P1) must be set to the application-specific value (the desired values can be found under "Analog inputs").
- Due to a rising edge at the digital inputs "Gripper open" (terminal 21) or "Gripper closed" (terminal 20), the gripper opens or closes based on the set force. During the gripper finger movement, the digital output "Gripper stopped" (terminal 13) issues a Low signal.
- If the gripper moves to the workpiece stop, the output "Gripper stopped" (terminal 13) issues a High signal; the gripper is, however, further supplied with electrical current.

## 5.9 Table of functions

The functions of the terminals are as described in the following table:

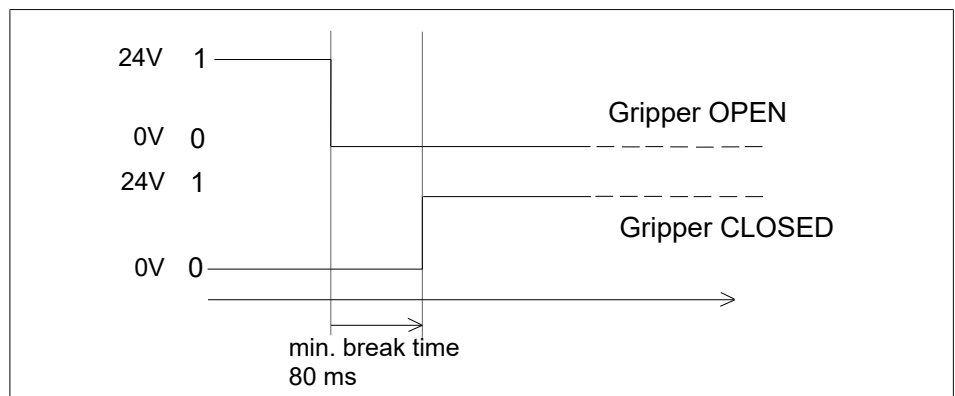
### MEG C terminal actuation

Terminal	Function	Description
11	Reset	0V → no function; 24V → MEG C reset
13	Gripper stopped	0V → gripper travels; 24V → standstill
14	Reference run carried out	0V → not carried out; 24V → carried out
15	Analog position output	0V – 5 V (approximately current position); (0V inside; 5V outside)
18	Target position reached	0V → target position not reached; 24V → target position reached
19	Reference run	0V → standstill; 24V → execute command (with gripper open or closed)
20	Gripper closed	0V → standstill; 24V → execute command
21	Gripper open	0V → standstill; 24V → execute command
22	Speed preselection	0.2V - 10 V
23	Step preselection	0.2V - 10 V
24	Force preselection	0.2V - 10 V

MEG C table of functions

Input control function of gripper	Reference run (terminal 19)	Gripper open (terminal 21)	Gripper closed (terminal 20)	Analog speed specification [V]	Analog step specification [V]	Analog force specification [V]	Reset (terminal 11)
Reference run open	H	┐	L	0*	0*	0*	L
Reference run closed	H	L	┐	0*	0*	0*	L
Gripper open [number of steps]	L	┐	L	0V-10V (extern) 0V-5V (Poti)	0V-10V (extern) 0V-5V (Poti)	0V-10V (extern) 0V-5V (Poti)	L
Gripper closed [number of steps]	L	L	┐	0V-10V (extern) 0V-5V (Poti)	0V-10V (extern) 0V-5V (Poti)	0V-10V (extern) 0V-5V (Poti)	L
Gripper open [live mode]	L	┐	L	0V-10V (extern) 0V-5V (Poti)	0V** (extern) 0V** (Poti)	0V-10V (extern) 0V-5V (Poti)	L
Gripper closed [live mode]	L	L	┐	0V-10V (extern) 0V-5V (Poti)	0V** (extern) 0V** (Poti)	0V-10V (extern) 0V-5V (Poti)	L
Reset	L	L	L	0*	0*	0*	┐

Legend:  
 H = 24 V DC  
 L = GND  
 \* = not mandatory  
 \*\* = mandatory



Minimal rest period between 2 commands

## 6 Troubleshooting

### 6.1 Status LED flashing

Status LED	Possible cause	Troubleshooting
LED on the controller does not flash 6 times briefly when switching on	No power supply	<ul style="list-style-type: none"> <li>• Check power supply on the controller</li> <li>• Repeated switching off and on of the power supply</li> </ul>
LED on the controller does not light up after the process of switching on is complete	No power supply	<ul style="list-style-type: none"> <li>• Check power supply on the controller</li> </ul>
LED on controller flashes continuously (approx. once per sec.)	<ul style="list-style-type: none"> <li>• Gripper not connected</li> <li>• Cable breakage</li> </ul>	<ul style="list-style-type: none"> <li>• Check connection of the gripper to the controller and correct if necessary</li> <li>• Check the coil resistances of the motor cables to each other: approx. 8.2 Ohm</li> </ul>
LED on controller flashes continuously (approx. once every 2 sec.)	Excessive temperature on the controller	<ul style="list-style-type: none"> <li>• Lower gripping force set value</li> <li>• Provide sufficient cooling for controller</li> </ul>
LED on controller flashes continuously (approx. once every 4 sec.)	Under- or overvoltage	<ul style="list-style-type: none"> <li>• Check power supply on the controller</li> </ul>
LED on controller flashes continuously (approx. 4 times every 1 sec.)	Overcurrent warning	<ul style="list-style-type: none"> <li>• Lower gripping force set value</li> </ul>
-	Spindle / spindle nut defective (overload)	<ul style="list-style-type: none"> <li>• The gripper can only be repaired at the factory!</li> </ul>
-	Fingers are mechanically jammed	<ul style="list-style-type: none"> <li>• Check whether the adapter plate is stepped (only in the case of lateral attachment)</li> </ul>

### 6.2 Product does not execute a complete stroke

Possible cause	Corrective action
Dirt deposits between basic jaws and guidance.	Disassemble and clean the product.
Mounting surface is not sufficiently flat.	Check the evenness of the mounting surface.
Component part defective.	Send product with a SCHUNK repair order or dismantle product.

### 6.3 The gripping force drops

Possible cause	Corrective action
Too much grease in the mechanical movement space.	Clean and lubricate product. <a href="#">Maintenance</a> [▶ 45]

### 6.4 Product opens or closes jerkily

Possible cause	Corrective action
Too little grease in the mechanical guiding areas.	Clean and lubricate product. <a href="#">Maintenance</a> [▶ 45]
Mounting surface is not sufficiently flat.	Check the evenness of the mounting surface. <a href="#">Mechanical connection</a> [▶ 18]
Loading too large.	Check permissible weight and length of the gripper fingers. <a href="#">Technical data</a> [▶ 16]

## 7 Maintenance

### 7.1 Maintenance intervals

Interval (million cycles)	Maintenance work
1000 cycles or once per day	Travel an entire stroke.
2	Treat all grease areas with lubricant, <a href="#">Lubricate gripper</a> [► 46]
2	Clean all parts thoroughly, check for damage and wear

For extreme ambient and application conditions, shortened maintenance cycles can ensure the lifespan is maintained.

#### CAUTION

##### Material damage due to hardening lubricants!

Lubricants harden more quickly at temperatures above 60°C, leading to possible product damage.

- Reduce the lubricant intervals accordingly.

#### CAUTION

##### Damage to property caused by insufficient lubrication!

Continuously traveling short strokes when the product is inadequately lubricated risks damaging it by causing it to run dry.

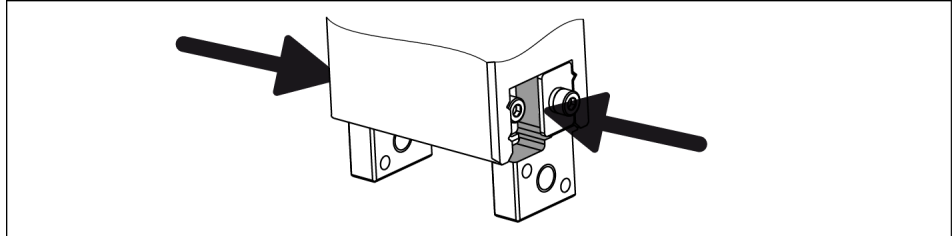
- Travel the full stroke every 1000 cycles or at least once daily.

## 7.2 Lubricate gripper

SCHUNK recommends the listed lubricant.

During maintenance, treat all greased areas with lubricant. Thinly apply lubricant with a lint-free cloth.

Lubricant point	Lubricant
Metallic sliding surfaces	Isoflex-Topas NCA 52



*Position of the greasing areas*

- Move the gripper to the "closed" position and lubricate the greasing areas.
- Move the gripper to the "open" position and lubricate the greasing areas.
- Fully open and close the gripper several times.

## 7.3 Disassembly and assembling

This product must not be disassembled for maintenance.

### **CAUTION**

#### **Material damage due to improper disassembly!**

Incorrect works can cause damage to the mechanics and internal electronics.

- Disassembly or opening of the product is not permitted.
- Only allow SCHUNK to repair the product.



## 9 Annex to Declaration of Incorporation

according 2006/42/EG, Annex II, No. 1 B

1. Description of the essential health and safety requirements pursuant to 2006/42/EC, Annex I that are applicable and that have been fulfilled with:

Product designation	Electrical parallel gripper
Type designation	MEG 64 EC
ID number	0306012, 0306006

To be provided by the System Integrator for the overall machine	↓
Fulfilled for the scope of the partly completed machine	↓
Not relevant	↓

1.1	Essential Requirements			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting		X	
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics		X	
1.1.7	Operating positions			X
1.1.8	Seating			X

1.2	Control Systems			
1.2.1	Safety and reliability of control systems		X	
1.2.2	Control devices		X	
1.2.3	Starting		X	
1.2.4	Stopping		X	
1.2.4.1	Normal stop		X	
1.2.4.2	Operational stop		X	
1.2.4.3	Emergency stop		X	
1.2.4.4	Assembly of machinery		X	
1.2.5	Selection of control or operating modes		X	
1.2.6	Failure of the power supply			X

<b>1.3</b>	<b>Protection against mechanical hazards</b>			
1.3.1	Risk of loss of stability			X
1.3.2	Risk of break-up during operation			X
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions			X
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			X
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X
<b>1.4</b>	<b>Required characteristics of guards and protective devices</b>			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X
<b>1.5</b>	<b>Risks due to other hazards</b>			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.5.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning			X

<b>1.6</b>	<b>Maintenance</b>			
1.6.1	Machinery maintenance		X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	
<b>1.7</b>	<b>Information</b>			
1.7.1	Information and warnings on the machinery		X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks		X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		
	<b>The classification from Annex 1 is to be supplemented from here forward.</b>			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	



