



# MATCH

## INSTALLATION AND OPERATING INSTRUCTIONS

2-jaw parallel gripper with  
quick-change system

LWR50L-21

LWR50L-22

DDOC01071

THE KNOW-HOW FACTORY

## Glossary

Term	Explanation
ActualPosition	Value of the current position of the product [1/100 mm]
Adjust	Starts the travel routing stored in the product to teach the BasePosition and WorkPosition.
BasePosition	Outer jaw position Depending on the application, this can be the base position or the work position.
ControlWord	Activation of the product Only one bit is permitted to be active in ControlWord. The value "0" is also permitted.
DeviceMode	Used to select gripping profiles as well as the additional help modes in the product.
Diagnosis	If an error occurs, outputs a diagnostic code that can be compared with the error list.
DIR	Direction/24 V DC cable connection Depending on the product, this signal is used to move the product.
Error	Fault
GND	Abbreviation for ground connection
GripForce	Setting the gripping force
Offset	Correction value
PositionTolerance	Tolerance range for TeachPosition, BasePosition and WorkPosition The value of the parameter acts in both directions.
PWR	Abbreviation for power supply
ShiftPosition	ShiftPosition is a switching position between pre-positioning and gripper movement.
StatusWord	Summary of binary states of the product that can be returned as information to the control system.
Teach	Adoption of the ActualPosition as the TeachPosition.
TeachPosition	Taught-in workpiece position
Traversing routine	Defined procedure for movement of the gripper jaws
Travel path	Path on which the gripper jaws travel.
WorkpieceNo	Number of the selected workpiece recipe
WorkPosition	Inner jaw position Depending on the application, this can be the end position or the work position.

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## 1 Supporting documents

### NOTICE



Read through the installation and operating instructions before installing or working with the product.

The installation and operating instructions contain important notes for your personal safety. They must be read and understood by all persons who work with or handle the product during any phase of the product lifetime.



The documents listed below are available for download on our website [www.zimmer-group.com](http://www.zimmer-group.com).

- Installation and operating instructions
  - Catalogs, drawings, CAD data, performance data
  - Information on accessories
  - Technical data sheets
  - General Terms and Conditions, including warranty information.
- ⇒ Only those documents currently available on the website are valid.

In these installation and operating instructions, "product" refers to the product designation on the title page!

### 1.1 Notices and graphics in the installation and operating instructions

#### DANGER



This notice warns of an imminent danger to the life and health of people. Ignoring these notices can lead to serious injury or even death.

- ▶ You absolutely must comply with the described measures for avoiding these dangers!
- ⇒ The warning symbols are assigned according to the type of danger.

#### WARNING



This notice warns of a situation that is potentially hazardous to personal health. Ignoring these notices can cause serious injury or damage to health.

- ▶ You absolutely must comply with the described measures for avoiding these dangers!
- ⇒ The warning symbols are assigned according to the type of danger.

#### CAUTION



This notice warns of a situation that is potentially hazardous to persons. Ignoring these notices can cause minor, reversible injuries.

- ▶ You absolutely must comply with the described measures for avoiding these dangers!
- ⇒ The warning symbols are assigned according to the type of danger.

#### NOTICE



This notice warns of possible material and environmental damage. Ignoring these notices can result in damage to the product or the environment.

- ▶ You absolutely must comply with the described measures for avoiding these dangers!
- ⇒ The warning symbols are assigned according to the type of danger.

#### INFORMATION



This category contains useful tips for handling the product efficiently. Failure to observe these tips will not result in damage to the product. This information does not include any information relevant to health or workplace safety.

## 2 Safety notices

### WARNING



#### Risk of injury caused by suspended loads

Improper handling of suspended loads can cause serious injury.

- ▶ Always keep an adequate safety distance from suspended loads.
- ▶ Do not stand or walk underneath suspended loads.

### CAUTION



#### Risk of injury and material damage in case of non-compliance

Installation, commissioning, maintenance and repairs may only be performed by qualified specialists in accordance with these installation and operating instructions.

The product is state-of-the-art.

The following are examples of situations in which the product may cause a hazard:

- The product is not properly installed, used or maintained.
- The product is not used for its designated purpose.
- The locally applicable regulations, laws, directives or guidelines are not observed.
- ▶ The product may only be used in accordance with these installation and operating instructions and the product's technical data. Any changes or additions to the intended use of the product, as well as modifications to the product, such as those in the following examples, require the written permission of the manufacturer:
  - Use of the product under extreme conditions, such as aggressive fluids or abrasive dusts
  - Additional drilled holes or threads
- ⇒ Zimmer GmbH shall accept no liability for any damage caused by improper use. The operator bears sole responsibility.
- ▶ Make sure that the power supply is disconnected before you mount, adjust, modify, maintain or repair the product.
- ▶ Whenever work is carried out on the product, make sure that the product cannot be actuated by mistake.
- ▶ Perform maintenance tasks, renovation work or attachment work outside of the machine's danger zone when possible.
- ▶ Do not reach into the operational range of the product.
- ▶ Always adhere to the required maintenance intervals.
- ▶ When using the product under extreme conditions, adjust the maintenance interval according to the degree of contamination.

**CAUTION****Notes and handling regulations for electrostatically sensitive components**

Electrostatically sensitive components are individual components, integrated circuits or assemblies that can be damaged by electrostatic fields or electrostatic discharge.

- ▶ When handling electrostatic components, make sure that persons, the work area and packaging are all fully grounded.
- ▶ Touch electronic components only in appropriately identified areas with conductive flooring and only if:
  - You are grounded by means of special bracelets.
  - You wear shoes that are suitable and approved for the discharge of electrostatic charges.
- ▶ Do not bring electronic assemblies into contact with plastics and parts of clothing that have plastic content.
- ▶ Store electronic assemblies on conductive underlays only.
- ▶ Do not install electronic assemblies in the vicinity of data back-up devices or monitors (monitor distance > 100 mm).
- ▶ Perform measurements on electronic assemblies only if:
  - The measuring instrument is grounded (e.g. via a ground conductor).
  - The measuring head is momentarily discharged before measuring with a floating measuring instrument.

### 3 Proper use

#### NOTICE



#### Material damage and malfunction in case of non-compliance

The product is only to be used in its original state with its original accessories, with no unauthorized changes and within the stipulated parameter limits and operating conditions.

Any other or secondary use is deemed improper.

- ▶ Operate the product only in compliance with the associated installation and operating instructions.
- ▶ Operate the product only when it is in a technical condition that corresponds to the guaranteed parameters and operating conditions.
- ⇒ Zimmer GmbH shall accept no liability for any damage caused by improper use. The operator bears sole responsibility.

- The product is designed specifically for (cooperative/collaborative) use on robot systems and in combination with the MATCH quick-change system.
- The product is designed exclusively for electric operation using a 24 V DC power supply.
- The product must always be mounted on materials that dissipate heat.
- The product is intended for industrial use.
- The product is to be used as intended in enclosed rooms for temporary gripping, handling and holding.
- The product is not suitable for clamping workpieces during a machining process.
- Direct contact with perishable goods/food is not permitted.



## 4 Personnel qualification

### WARNING



#### **Injuries and material damage due to inadequate qualification**

If inadequately qualified personnel perform work on the product, this can cause serious injuries and significant material damage.

- ▶ All work on the product must be performed by qualified personnel.
- ▶ Before working with the product, read the document in its entirety and make sure that you have understood everything.
- ▶ Observe country-specific accident prevention regulations and the general safety notices.

The following qualifications are a prerequisite for performing various work on the product.

#### **4.1 Electricians**

Electricians are able to perform work on electrical systems, can recognize and avoid possible dangers and know the relevant standards and provisions due to their technical training, knowledge and experience.

#### **4.2 Specialists**

Specialists are able to perform the assigned work, can recognize and avoid possible dangers and know the relevant standards and provisions due to their technical training, knowledge and experience.

#### **4.3 Instructed personnel**

Instructed personnel have been trained by the operating company on the tasks and possible dangers of improper behavior.

#### **4.4 Service personnel**

Service personnel are able to perform the assigned work and can recognize and avoid possible dangers due to their technical training, knowledge and experience.

#### **4.5 Additional qualifications**

Persons who work with the product must be familiar with the valid safety regulations and laws as well as the standards, guidelines and laws listed in this document.

Personnel who work with the product must have facility-issued authorization to commission, program, configure, operate, maintain and also decommission this product.

## 5 Product description

### CAUTION



**Reduction of the gripping force can cause personal injury and material damage**

When flexible components are gripped, the gripping force of the product is reduced.

Reduced gripping force can lead to personal injury or material damage, because the components that are being gripped can no longer be securely gripped and transported.

### NOTICE



**Malfunction in case of non-compliance**

► Make sure that the setting of the gripping force and the selection of the gripper finger length are correct to prevent incorrect bracing of the gripper jaws.

The MATCH End-of-Arm Ecosystem is equipped with an extensive range of functions and universal communication interfaces. MATCH is compatible with all common lightweight robots. The system can be mounted on the robot flange and set up with a few manual adjustments.

The product is a safe quick-change system (MATCH gripper).

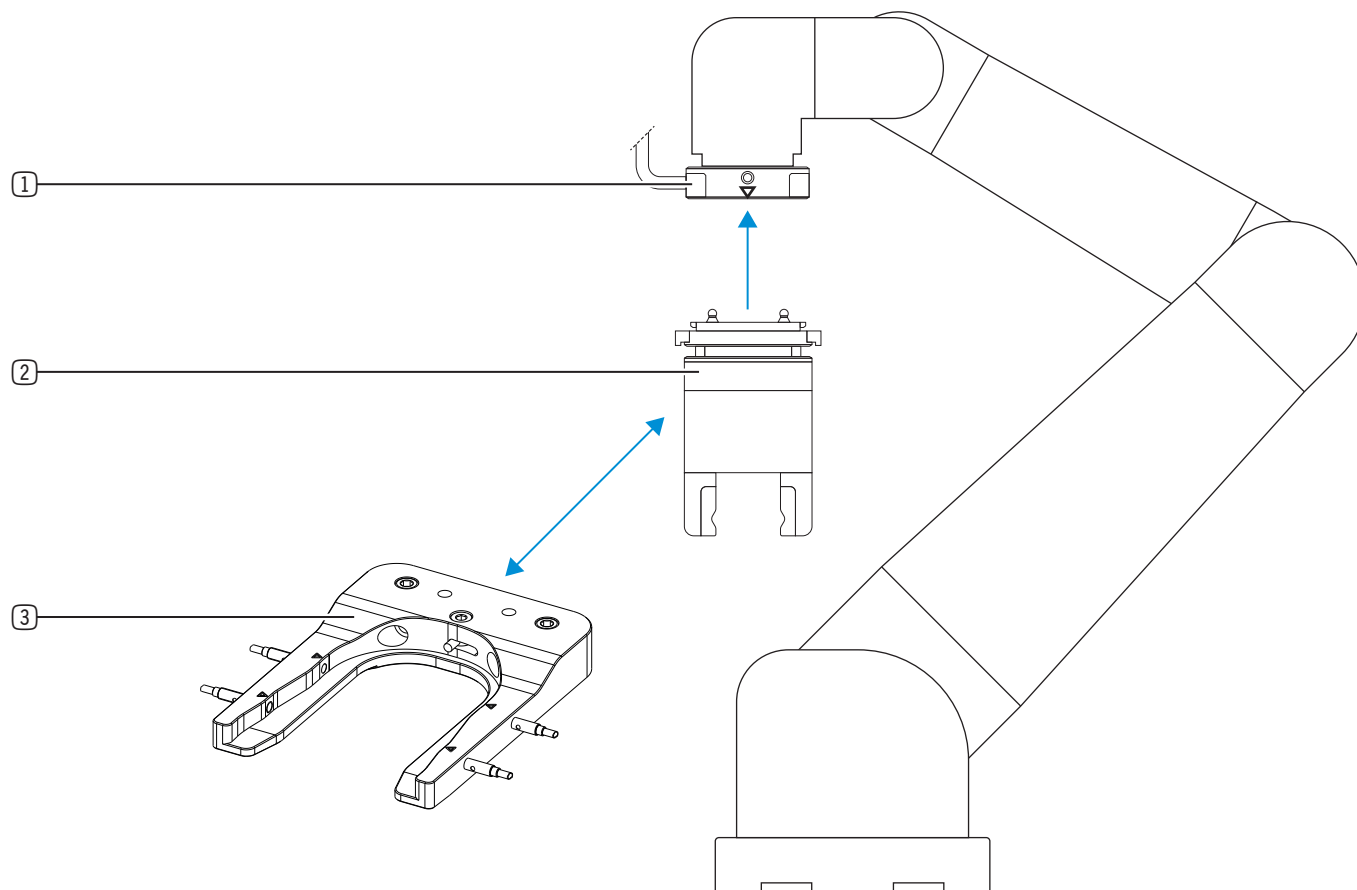
An electric gripper with IO-Link is installed in the product.

The basic and proven safety principles from EN ISO 13849-1 can be complied with only if original parts from Zimmer GmbH are used.

The original parts from Zimmer GmbH required for the safety principles are:

- ① MATCH robot module (LWR50F-xx)
- ② MATCH gripper (LWR50L-xx)
- ③ MATCH storage station (ALWR1-50-A) (sensors optional)

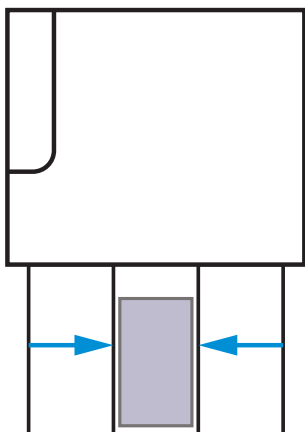
For the overall safety of the function, all three components (MATCH robot module, MATCH gripper, and MATCH storage station) must be taken into account (see "Functional Safety" section).



### 5.1 Possible applications

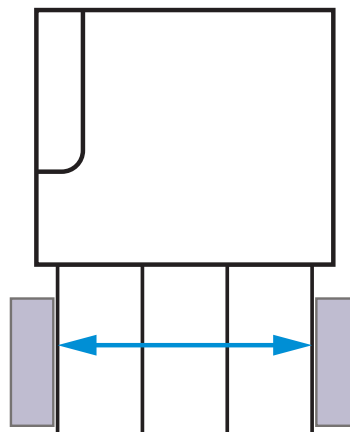
#### Outside gripping

The product can be used for outside gripping.  
MoveToWork command



#### Inside gripping

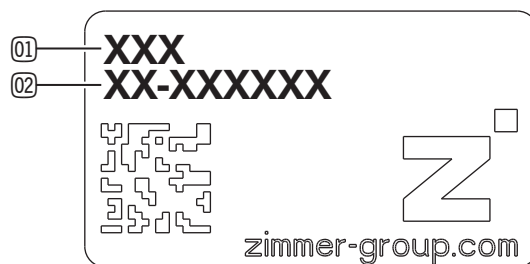
The product can be used for inside gripping.  
MoveToBase command



### 5.2 Type plate

A type plate is attached to the product.  
The article number and confirmation number are shown on the type plate.

- ① Article number
- ② Confirmation number



### 5.3 Product variants and compatibility

#### INFORMATION



- ▶ You can find information about product variants and their compatibility on our website.
- ▶ Please contact Customer Service if you have any questions.

## 6 Functional description

The gripper jaws of the product are arranged parallel to each other on two opposing guide rails and can be moved relative to each other.

The force of the motor is transmitted by a worm drive. A pinion and a rack generate the movement of the gripper jaws and synchronize these movements.

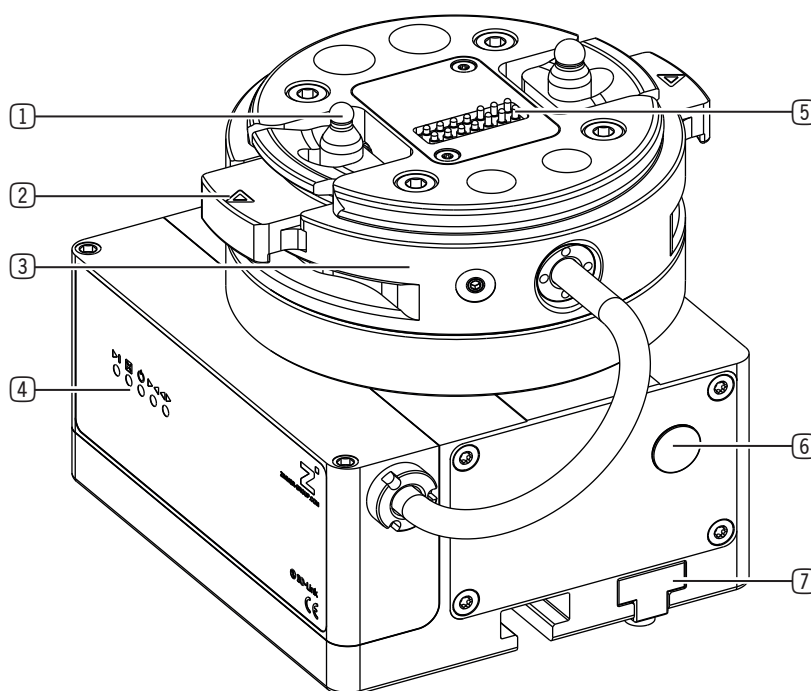
Despite its small installation space, the product is suited for gripping a wide range of form-fit and frictional fit parts.

The product can be easily integrated into the existing control system.

The gripping force can be adapted optimally to the workpiece conditions via IO-Link.

The product has the hot plug function, which enables changing a MATCH gripper while electrified.

The MATCH gripper is designed in such a way that incorrect insertion into the MATCH storage station is impossible.



- ① Rotation prevention/torque absorption
- ② Locking
- ③ MATCH gripper for quick-change system
- ④ LED display
- ⑤ Signal transmission
- ⑥ Emergency release
- ⑦ Gripper jaw

## 6.1 LED status display

### INFORMATION

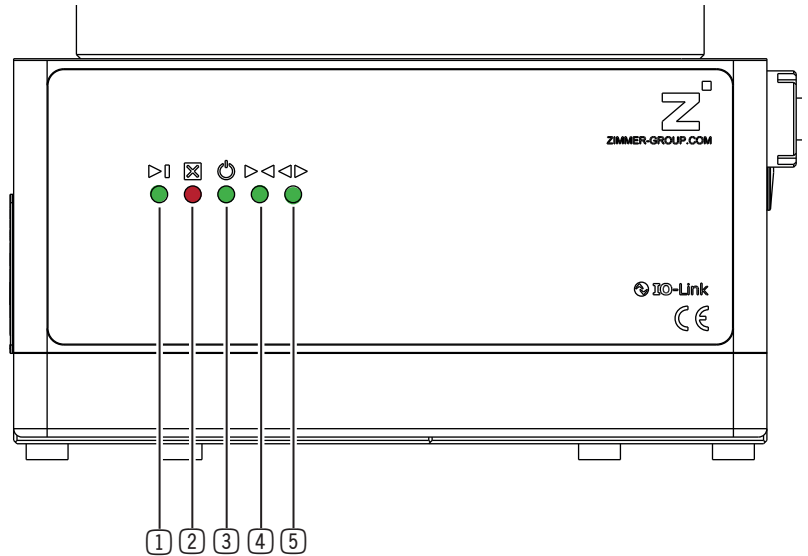


► For information on the LED display, refer to the installation and operating instructions of the MATCH robot module on our website.

- LWR50F

The LED display is optionally available on the MATCH robot module.

- ① TeachPosition
- ② Error
- ③ Power/communication
- ④ WorkPosition
- ⑤ BasePosition



## 6.2 Sensors

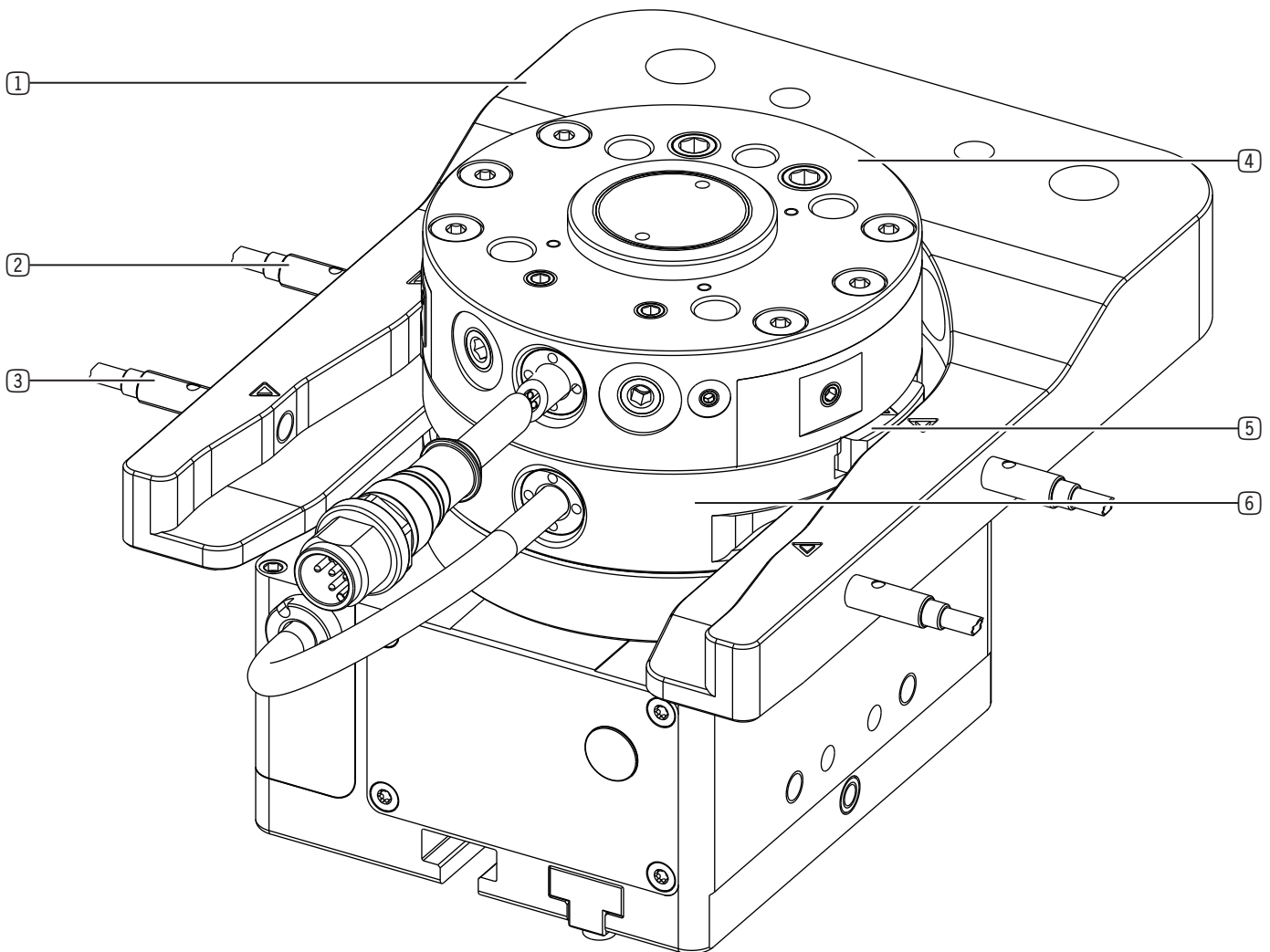
Example image of a combination consisting of a MATCH robot module, MATCH gripper, and MATCH storage station. Check up to two sensors in the storage position to see whether the MATCH gripper is present in the MATCH storage station. Then move the MATCH robot module onto the MATCH gripper from above. The centering pins of the MATCH gripper help in insertion.

The robot, along with the MATCH robot module and MATCH gripper, moves to the inspection position sensors in the MATCH storage station.

The two sensors in the inspection position (test channel) respond if the lockings are extended and make contact in the MATCH robot module.

When the MATCH robot module and MATCH gripper are joined, the internal spring-pin contacts for signal transmission are contacted.

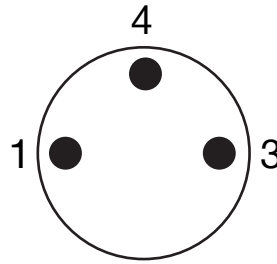
Then the Connect LED changes color from red to green and a Connect signal (depending on the variant) is passed to the higher-level control system.



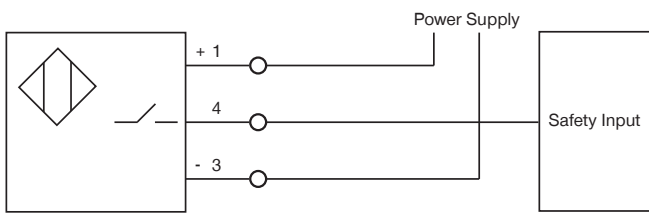
- |  |  |
|--|--|
| ① MATCH storage station  | ④ MATCH robot module for quick-change system |
| ② Sensor in storage position (MATCH gripper present)             | ⑤ Locking                                    |
| ③ Sensor in inspection position (test channel, locking extended) | ⑥ MATCH gripper for quick-change system      |

### 6.2.1 Wiring diagram sensor system

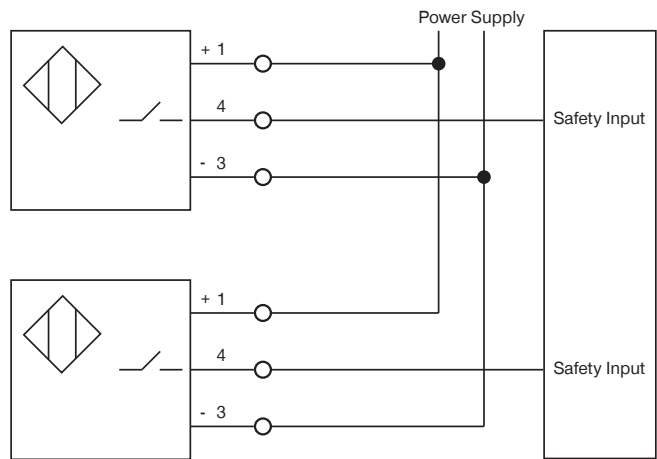
Sensor plug connection M8 3-pin:



#### Graphical symbol for sensor in storage position



#### 2 sensors in inspection position connected in series

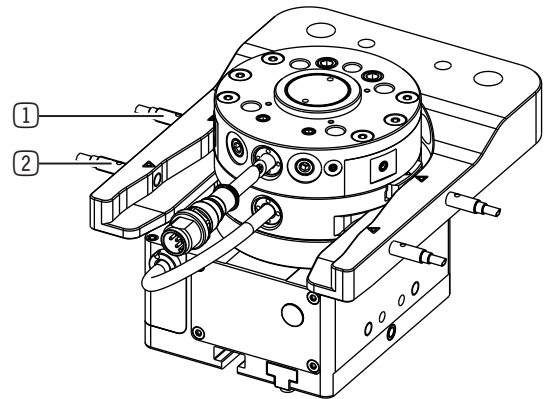


### 6.2.2 Adjust the sensors in the inspection position

- ▶ Bring the markings on the locking elements of the MATCH gripper to the position of the front markings of the MATCH storage station.
- ▶ Turn in the sensors until they emit a signal.
- ▶ Fasten the sensors at this position.
- ▶ Coat the sensors with sealing lacquer.

### 6.2.3 Adjust the sensors in the storage position

- ▶ Position an MATCH gripper in the MATCH storage station.
- ▶ Turn in the sensors until they emit a signal.
- ▶ Coat the sensors with sealing lacquer.



- ① Sensor in storage position (MATCH gripper present)
- ② Sensor in inspection position (test channel, locking extended)

### 6.3 Functional safety

For the overall safety of the function, all three components (MATCH robot module, MATCH gripper and MATCH storage station) must be taken into account.

The safety function that ensures secure locking between the MATCH robot module and MATCH gripper of the product is implemented via two redundant action channels that consist of a mechanical locking and springs.

Technical supplementary safety measures (sensors) provide a high degree of diagnostic coverage. The product can thus be classified into control category 3 in accordance with Chapter 6.2.6 of DIN EN ISO 13849-1. According to Figure 5, Chapter 4.5.4 of the specified standard, the PL d can be achieved with this product.

Fault elimination in accordance with DIN EN ISO 13849-2, Annex A, Table A2 and A3 for the helical compression springs used can be given.

### 6.4 Control

#### INFORMATION



- ▶ You can find the information in the technical data sheet on our website.
- ▶ Please contact Customer Service if you have any questions.

### 6.5 Self-locking mechanism

#### INFORMATION



- ▶ The product has a mechanical self-locking mechanism to ensure that the workpiece remains held by the product in the event of power supply loss or failure (e.g. an emergency stop).
- ▶ Please contact Customer Service if you have any questions.



## 7 Technical data

### INFORMATION



- ▶ You can find the information in the technical data sheet on our website.
- ▶ This data varies within the series, depending on the specific design.
- ▶ Please contact Customer Service if you have any questions.

## 8 Accessories/scope of delivery

### INFORMATION



- ▶ If any accessories not sold or authorized by Zimmer GmbH are used, the function of the product cannot be guaranteed. Zimmer GmbH accessories are specifically tailored to the individual products.
- ▶ For optional accessories and those included in the scope of delivery, refer to our website.

## 9 Transportation/storage/preservation

- ▶ Transport and storage of the product must be done only with the original packaging.
- ▶ If the product has already been installed on the superordinate machine unit, care must be taken during transport to ensure that no unexpected movements can occur.
  - ▶ Before commissioning the product and after transport, check all power and communication connections as well as all mechanical connections.
- ▶ If the product is stored for an extended period, the following points are to be observed:
  - ▶ Keep the storage location as dust-free and dry as possible.
  - ▶ Avoid temperature fluctuations.
  - ▶ Avoid wind/drafts/water condensation formation.
  - ▶ Pack the product and do not expose it to direct sunlight during storage.
- ▶ Clean all components. There must be no soiling left on the components.
- ▶ Visually inspect all components.
- ▶ Remove all foreign substances.
- ▶ Properly remove potential corrosion spots.
- ▶ Close electrical connections using suitable covers.

## 10 Installation

### WARNING



#### Risk of injury due to uncontrolled movements

Risk of injury in case of unexpected movement of the machine or system into which the product is to be installed.

- ▶ Switch off the energy supply of the machine before any work.
- ▶ Secure the power supply against being switched on unintentionally.
- ▶ Check the machine for any residual energy that may be present.

### CAUTION



#### Risk of injury due to uncontrolled movements

Risk of injury in the event of uncontrolled movement of the product when the power supply is connected.

- ▶ Switch off the power supply to the machine before carrying out any work.
- ▶ Secure the power supply against being switched on unintentionally.
- ▶ Check the machine for any residual energy that may be present.

### NOTICE



#### Non-compliance may result in material damage.

Installation may only be carried out by qualified personnel in accordance with these installation and operating instructions.

- ▶ Switch off the power supply before any assembly, installation or maintenance work.

### 10.1 Installing the product

Fasten the product on the MATCH robot module. No assembly work is necessary for the product. The gripper is already connected to the loose part.

### INFORMATION



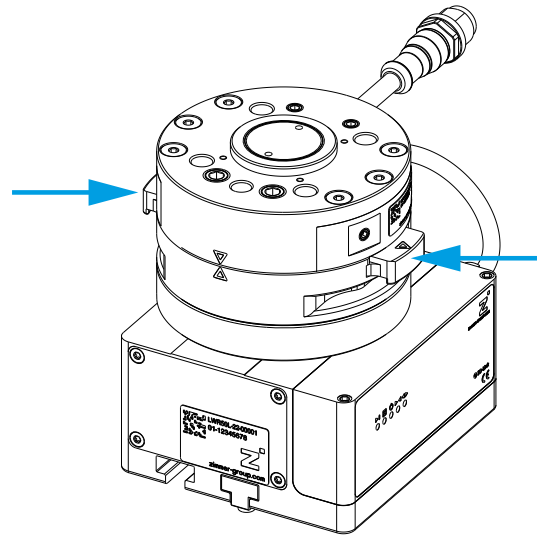
- ▶ For information, refer to the installation and operating instructions of the MATCH robot module on our website.
  - LWR50F

### 10.1.1 Installing the flat swivel unit

Example image of a combination consisting of a MATCH robot module, MATCH gripper, and MATCH storage station.

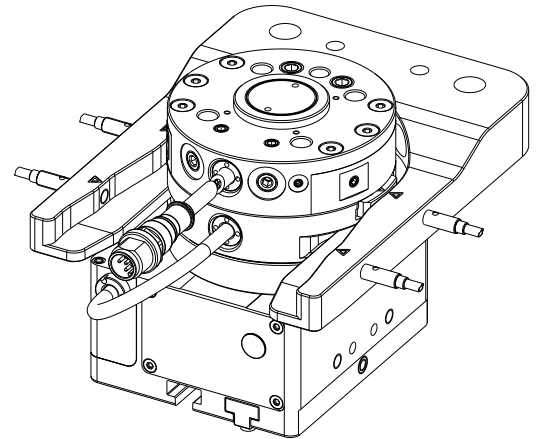
#### Manual exchange:

The MATCH gripper can be installed on the MATCH robot module and locked manually.



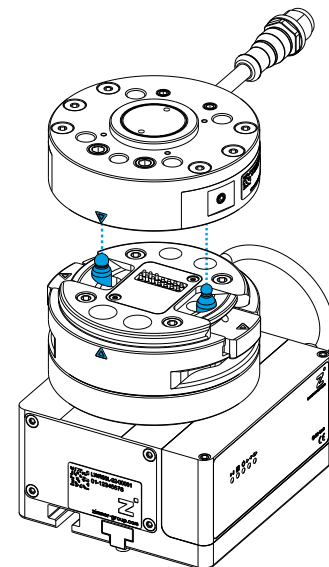
#### Automatic exchange:

The MATCH robot module is moved to the MATCH gripper in the MATCH storage station and locked by means of the MATCH storage station (see "Sensors" section).



#### Rotation prevention:

The design rules out incorrect joining, as the MATCH gripper is equipped with two different bolts.



## 10.2 Installing the energy supply

### NOTICE



#### Malfunction in case of non-compliance

Installation of voltage supply is done internally. This means that the MATCH gripper is equipped with internal contacts. These contacts transmit all signals.

- ▶ The contacts of the energy supply must be dry, clean and undamaged at all times.

### INFORMATION



- ▶ For more information, refer to the "Sensors" section.
- ▶ Please contact Customer Service if you have any questions.

### INFORMATION



- ▶ Note the deviation from the IO-Link port class B specification: There is no electrical isolation between the actuator and sensor voltage in the product.

## 10.3 Static charge

### NOTICE



#### Non-compliance may result in material damage.

Grounding the product is recommended if ESD sensitive parts come into contact with the product.

Grounding is also recommended in applications that require high EMC shielding.

The movement of the gripper jaws creates low voltages as a result of static charging. These charges cannot be dissipated if the product is mounted on an insulating surface and if discharge is also not possible through the workpiece.

## 10.4 Heat dissipation

In the event of high ambient temperatures, the product must be installed on heat-dissipating materials.

If the product is operated under very high ambient temperatures and with fast clock cycles on an ongoing basis, this might reduce its service life.

### INFORMATION



- ▶ Reduce the load as the temperature increases.

## 10.5 Installing accessories

### NOTICE



#### Non-compliance may result in material damage.

- ▶ Before installing an accessory, make sure it is suitable for use with the selected variant.
- ▶ You can find information on our website.
- ▶ Please contact Customer Service if you have any questions.

## 11 Commissioning the IO-Link

### 11.1 Process data

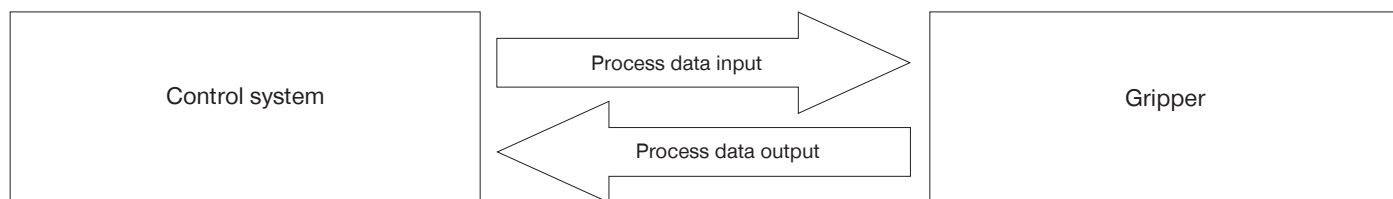
There is an option to control the product only with the process data that is transmitted in each cycle.

#### INFORMATION



The terms process data input and output are to be understood from the perspective of the gripper.

Process data input	Data type
ControlWord	UINT16
DeviceMode	UINT8
WorkpieceNo	UINT8
Reserve	UINT8
PositionTolerance	UINT8
GripForce	UINT8
DriveVelocity	UINT8
BasePosition	UINT16
ShiftPosition	UINT16
TeachPosition	UINT16
WorkPosition	UINT16



Process data output	Data type
StatusWord	UINT16
Diagnosis	UINT16
ActualPosition	UINT16

## 11.2 IODD Import

- ⇒ As soon as the hardware configuration is complete and the IO-Link connection to the product is established, data will be displayed in the process input data.
- ⇒ Some control systems demand a byte swap to bring this process data into a logical sequence.
- ▶ Look at bit 6 (GripperPLCActive) in the StatusWord to determine whether a byte swap is necessary.
  - ▶ Determine whether bit 6 is active in the first or second byte of the StatusWord.
    - ⇒ Bit 6 is active in the first byte: The bytes already have the correct sequence.
      - ▶ Continue with the commissioning.
    - ⇒ Bit 6 is active in the second byte.
      - ▶ Apply a byte swap, refer to the "StatusWord" section.

### INFORMATION



The product is controlled via IO-Link by means of the cyclical process data as well as the acyclic service data with a cycle time of 10 ms.

- ▶ It is mandatory to verify the process data!

## 11.3 Handshake Data Transfer Method

The handshake method makes it possible to transfer the process data about the product. All process data described in the following sections must be transferred with the handshake.

- ▶ Send the ControlWord = 0x0001 to the product.
- ⇒ The data transfer was started.
- ▶ Check the response of the product by using Statusbit 12 = TRUE (data transfer OK).
- ▶ Send the ControlWord = 0x0000 to stop the data transfer.
- ⇒ The data transmission is complete when the product sends back Statusbit 12 = DataTransferOK = FALSE.

### INFORMATION



- ▶ For examples, refer to the "Quickstart Basic Parameters" section.

## 11.4 Parameters

### 11.4.1 ControlWord

**NOTICE**



In the ControlWord parameter, only one single bit or the value 0 may be set at a time. Only the values listed in the following table are valid.

Parameter	Decimal value	Hexadecimal value
DataTransfer	1	0x0001
WritePDU	2	0x0002
ResetDirectionFlag	4	0x0004
Teach	8	0x0008
Adjust	128	0x0080
ErrorReset	32768	0x8000
MoveToBase	256	0x0100
MoveToWork	512	0x0200
JogToWork +	1024	0x0400
JogToBase -	2048	0x0800

Name	ControlWord
Data format	UINT16
Permission	Write
Transfer	Cyclical
Value range	0 - 65535

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Byte 1	-	-	-	-	JogToBase	JogToWork	MoveToWork	MoveToBase
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 2	-	-	-	-	Teach	ResetDirectionFlag	WritePDU	DataTransfer

#### Bit 0: DataTransfer

When this bit is set, the product accepts the data transferred in the process data.

#### Bit 1: WritePDU

Setting this bit tells the product that it should write the current process data to the selected workpiece recipe.

#### Bit 2: ResetDirectionFlag

Setting this bit tells the product that the direction flag needs to be reset. This makes a repeated movement to a position possible. This is logical during a switchover of workpiece recipes.

#### Bit 3: Teach

Setting this bit tells the product to save the current position as the TeachPosition in the selected WorkpieceNo. This only works if there is no "0" that is transmitted in the workpiece number.

**Bit 8: MoveToBase**

Setting this bit tells the product to move toward the BasePosition.

**Bit 9: MoveToWork**

Setting this bit tells the product to move toward the WorkPosition.

**Bit 10: JogToWork**

Setting this bit in the ControlWord puts the product in jog mode and slowly moves it toward the WorkPosition. If the bit is reset, the product stops.

**Bit 11: JogToBase**

Setting this bit in the ControlWord puts the product in jog mode and slowly moves it toward the BasePosition. If the bit is reset, the product stops.

**11.4.2 DeviceMode**

Name	DeviceMode
Data format	UINT8
Permission	Write
Transfer	Cyclical
Value range	0 to 256

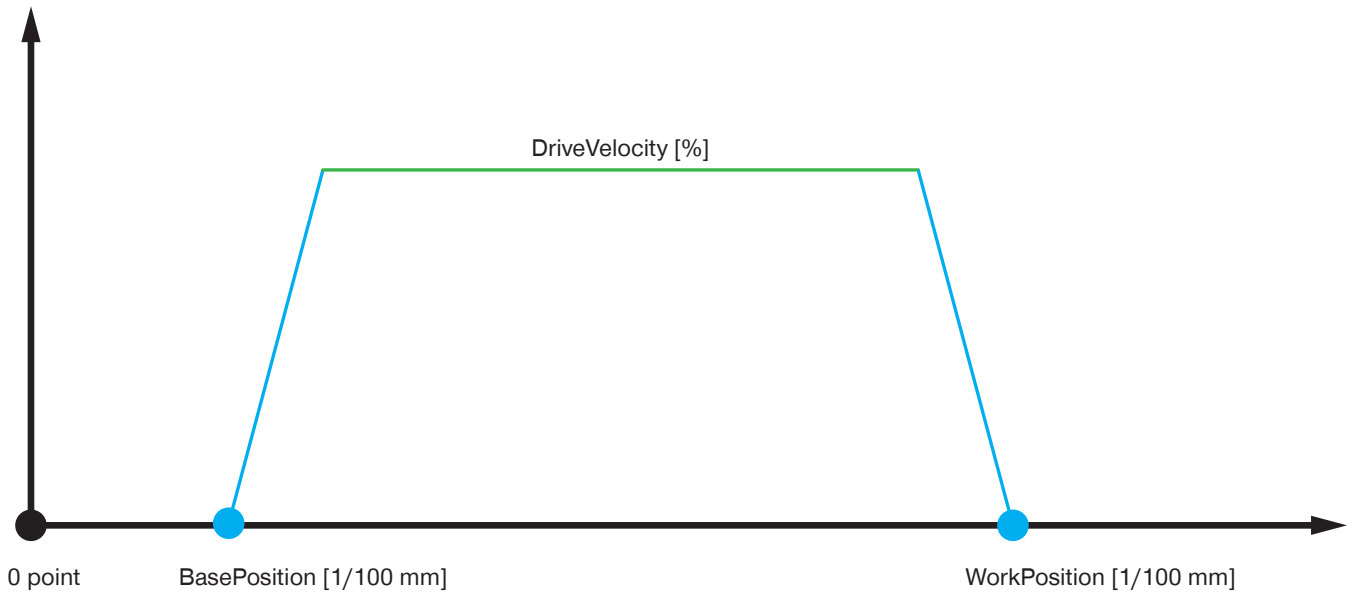
These modes control the basic product actions.

DeviceMode	Action	ControlWord
1	Idle	0x0001
2	Gripper reset	0x0001
3	Switch on the motor.	0x0001
5	Switch off motor/stop gripping movement.	0x0001
11	Activate jog mode.	0x0400/0x0800



### 11.4.3 Movement profiles

#### 11.4.3.1 PositionProfile



This mode is used to move the product into the PositionProfile.

The movement speed is configured using the DriveVelocity parameter.

The TeachPosition does not have any significance in this mode, because the BasePosition or WorkPosition is always approached precisely.

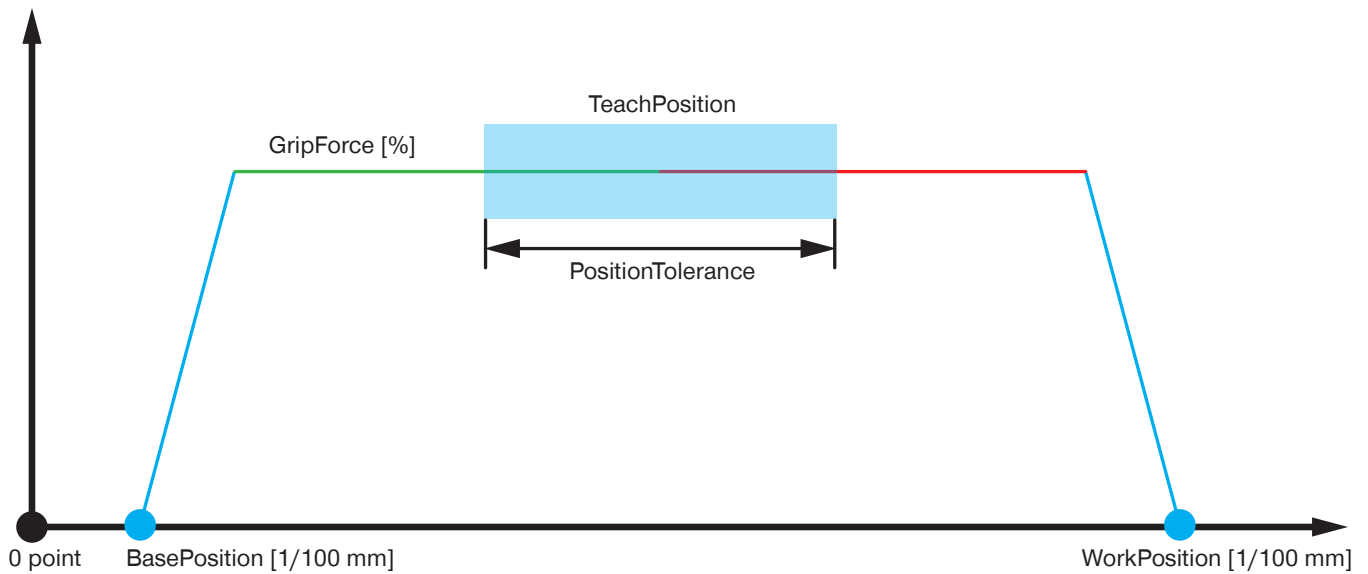
If the product encounters an obstacle in this mode while moving, it stops and issues an error message.

The product can be moved from the obstacle back to the starting position if the command is switched in the ControlWord.

No defined gripping forces can be generated in this mode. As a result, friction-locked gripping is not permitted in this mode.

DeviceMode	Action	ControlWord
50	Move to the BasePosition.	0x0100
50	Move to the WorkPosition.	0x0200
51	Move to the BasePosition. Special movement profile for a faster movement of the product. The product must never be jammed, i.e. neither be stopped at the end stop nor have gripped a workpiece.	0x0100
51	Move to the WorkPosition. Special movement profile for a faster movement of the product. The product must never be jammed, i.e. neither be stopped at the end stop nor have gripped a workpiece.	0x0200

11.4.3.2 ForceProfile LWR50L-21



In this mode, the product moves onto the workpiece in the ForceProfile.

GripForce is used to configure the desired gripping force.

TeachPosition is used to define the position of the workpiece.

Since gripping typically only occurs in one direction, there is a distinction made between the two mode groups 60 and 70.

In Mode Group 60, ControlWord 0x0200 moves the product in the ForceProfile toward the workpiece from the BasePosition in the direction of WorkPosition. If ControlWord 0x0100 is written in Mode Group 60, the product moves away from the workpiece and to the BasePosition in the PositionProfile without the user having to configure this. Here, the gripper moves at the speed set in the DriveVelocity parameter.

This procedure is reversed in Mode Group 70. Mode Group 60 is therefore used for outside gripping and Mode Group 70 for inside gripping.

The two mode groups are usually used for an optimized gripping cycle of hard workpieces because the main focus here is on quick product movement with relatively low current values. If the product is slowed down significantly by a spring-loaded workpiece, the desired gripping force can no longer be built up.

Therefore, for elastic/spring workpieces, both Mode Groups 65 and 75 are to be used. In these mode groups, the product has a relatively low movement speed, since the majority of the gripping force is generated directly with the current.

However, it is no longer possible to generate the full gripping force. The gripping force generated in these mode groups depends on the elasticity of the workpiece.

**Mode Group 60 – typically used for outside gripping**

DeviceMode	Action	ControlWord
60	Move toward the WorkPosition until this position or the workpiece is reached.	0x0200
60	Move toward the BasePosition to open the product.	0x0100
61	Move toward the WorkPosition until this position or the workpiece is reached. Special movement profile for a faster movement of the product. In the "open position", the product must not be jammed, i.e. it must neither be stopped at the end stop nor have gripped a workpiece.	0x0200
61	Move toward the BasePosition to open the product.	0x0100

**Mode Group 65 – typically used for outside gripping with elastic workpieces**

DeviceMode	Action	ControlWord
65	Move toward the WorkPosition until this position or the workpiece is reached.	0x0200
65	Move toward the BasePosition to open the product.	0x0100

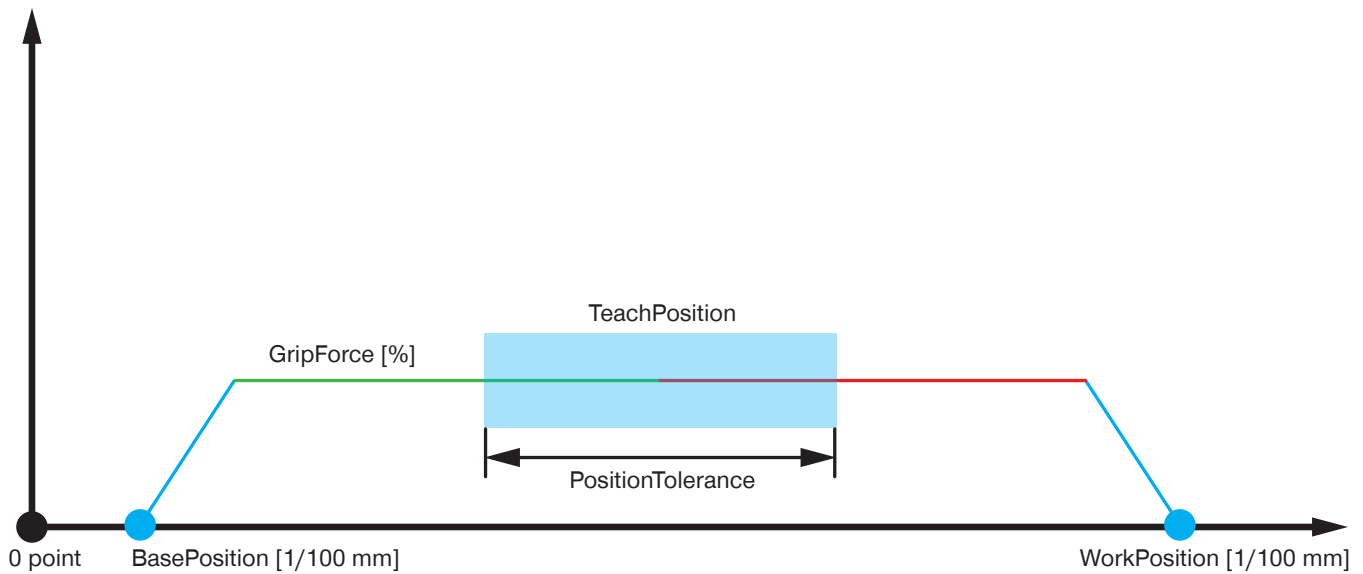
**Mode Group 70 – typically used for inside gripping**

DeviceMode	Action	ControlWord
70	Move toward the BasePosition until this position or the workpiece is reached.	0x0100
70	Move toward the WorkPosition for opening the product.	0x0200
71	Move toward the BasePosition until this position or the workpiece is reached. Special movement profile for a faster movement of the product. In the "open position", the product must not be jammed, i.e. it must neither be stopped at the end stop nor have gripped a workpiece.	0x0100
71	Move toward the WorkPosition for opening the product.	0x0200

**Mode Group 75 – typically used for inside gripping with elastic workpieces**

DeviceMode	Action	ControlWord
75	Move toward the BasePosition until this position or the workpiece is reached.	0x0100
75	Move toward the WorkPosition for opening the product.	0x0200

11.4.3.3 ForceProfile LWR50L-22



In this mode, the product moves onto the workpiece in the ForceProfile.

GripForce is used to configure the desired gripping force.

TeachPosition is used to define the position of the workpiece.

Since gripping typically only occurs in one direction, there is a distinction made between the two mode groups 62 and 72.

In Mode Group 62, the product in the ForceProfile moves from the BasePosition toward the WorkPosition onto the workpiece with ControlWord 0x0200.

If the ControlWord 0x0100 is written in Mode Group 62, then the product moves away from the workpiece to the BasePosition in the PositionProfile without the need for any prompts from the user. Here, the gripper moves at the speed set in the DriveVelocity parameter.

This procedure is reversed in the Mode Group 72. Mode Group 62 is therefore used for outside gripping and the Mode Group 72 for inside gripping.

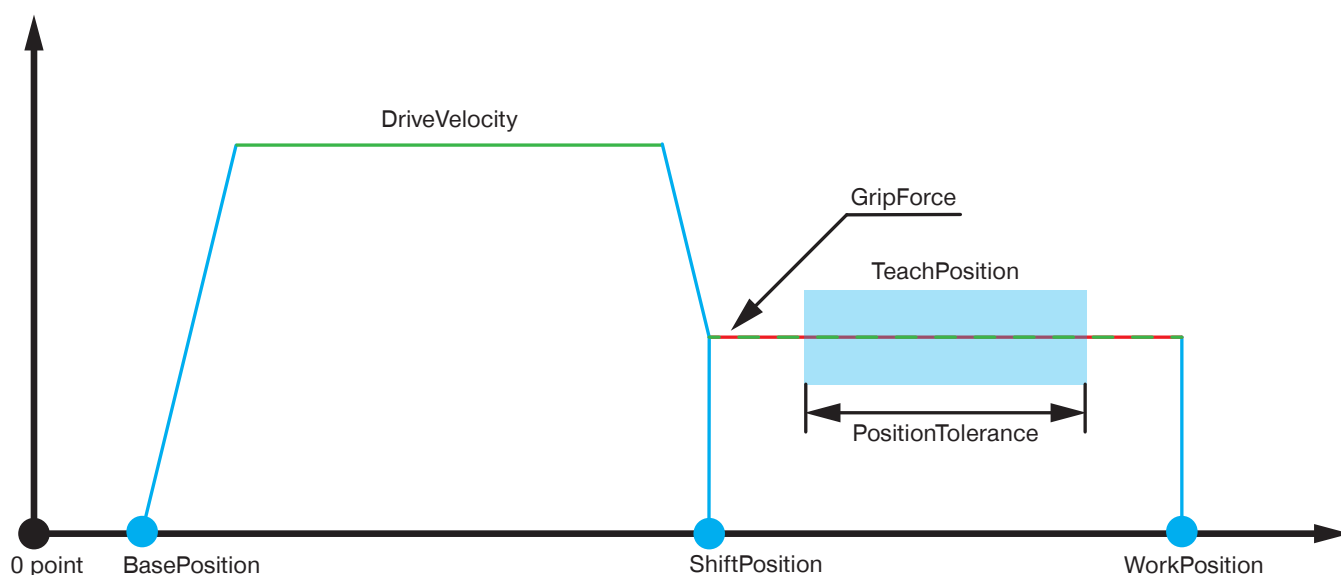
**Mode Group 62 – typically used for outside gripping**

DeviceMode	Action	ControlWord
62	Move toward the WorkPosition until this position or the workpiece is reached.	0x0200
62	Move toward the BasePosition to open the product.	0x0100

**Mode Group 72 – typically used for inside gripping**

DeviceMode	Action	ControlWord
72	Move toward the WorkPosition until this position or the workpiece is reached.	0x0200
72	Move toward the BasePosition to open the product.	0x0100

### 11.4.3.4 PrePosition-ForceProfile LWR50L-21



This mode is an extension of the ForceProfile. This means that a typically quick prepositioning process occurs until the ShiftPosition is reached.

When it reaches the ShiftPosition, the product switches over to the ForceProfile without stopping the motor. Therefore, the BasePosition, ShiftPosition and WorkPosition have to be defined for ForceProfile.

The DriveVelocity and GripForce parameters also have to be configured.

Here, the TeachPosition also defines the workpiece position with adjustable tolerance.

Just as in the ForceProfile, the product moves away from the workpiece using the PositionProfile at the speed specified with the DriveVelocity parameter.

In this mode, the tolerance range is also configured in the respective Mode Groups 80 and 90 or 85 and 95. The gripper switches off the motor after reaching the workpiece for the Mode Groups 80 and 90. This means that at that point, the gripping force is retained by means of the self-locking mechanism.

In Mode Groups 85 and 95, the product attempts to constantly apply light holding pressure. The product readjusts its position automatically if, for instance, the workpiece was clamped incorrectly and released itself.

#### Mode Group 80 – typically used for outside gripping

DeviceMode	Action	ControlWord
80	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the WorkPosition is reached.	0x0200
80	Move toward the BasePosition to open the product.	0x0100
81	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the WorkPosition is reached. Special movement profile for faster movement of the product. In the open position, the product must not be jammed, i.e. it must neither be stopped at the end stop nor have gripped a workpiece.	0x0200
81	Move toward the BasePosition to open the product.	0x0100

11.4.3.5 PrePosition-ForceProfile LWR50L-22

Mode Group 85 – typically used for outside gripping with a holding pressure current

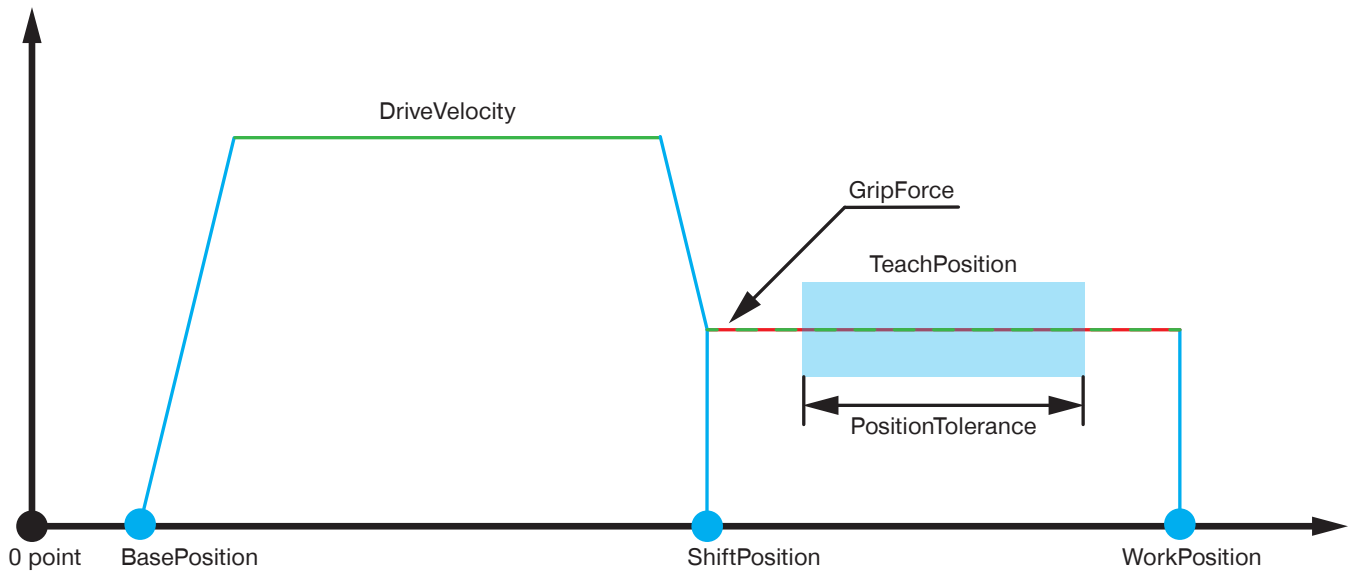
DeviceMode	Action	ControlWord
85	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the WorkPosition is reached.	0x0200
85	Move toward the BasePosition to open the product.	0x0100

Mode Group 90 – typically used for inside gripping

DeviceMode	Action	ControlWord
90	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the BasePosition is reached.	0x0100
90	Move toward the WorkPosition for opening the product.	0x0200
91	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the BasePosition is reached. Special movement profile for a faster movement of the product. In the open position, the product must not be jammed, i.e. it must neither be stopped at the end stop nor have gripped a workpiece.	0x0100
91	Move toward the WorkPosition for opening the product.	0x0200

Mode Group 95 – typically used for inside gripping with a holding pressure current

DeviceMode	Action	ControlWord
95	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the BasePosition is reached.	0x0100
95	Move toward the WorkPosition for opening the product.	0x0200



This mode is an extension of the ForceProfile. This means that a typically quick prepositioning process occurs until the ShiftPosition is reached.

When it reaches the ShiftPosition, the product switches over to the ForceProfile without stopping the motor. Therefore, the BasePosition, ShiftPosition and WorkPosition have to be defined for ForceProfile.

The DriveVelocity and GripForce parameters also have to be configured.

Here, the TeachPosition also defines the workpiece position with adjustable tolerance.

Just as in the ForceProfile, the product moves away from the workpiece using the PositionProfile at the speed specified with the DriveVelocity parameter.

**Mode Group 82 – typically used for outside gripping**

DeviceMode	Action	ControlWord
82	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the WorkPosition is reached.	0x0200
82	Move toward the BasePosition to open the product.	0x0100

**Mode Group 92 – typically used for inside gripping**

DeviceMode	Action	ControlWord
92	Move with $v = \text{DriveVelocity}$ to the ShiftPosition and then with GripForce until the workpiece or the BasePosition is reached.	0x0100
92	Move toward the WorkPosition for opening the product.	0x0200

### 11.4.4 WorkpieceNo

The workpiece number is used for selecting the previously stored workpiece data, as well as for selecting the "WorkpieceNo" data record in which the current process data is stored.

The "WorkpieceNo" data set enables individual workpieces to be taught in to the product very quickly.

**INFORMATION**



For example codes, refer to the "Quickstart Basic Parameters" and "Recipe Examples" sections.

Name	WorkpieceNo
Data format	UINT8
Permission	Write
Transfer	Cyclical
Value range	0 - 32

At a value > 0, the corresponding workpiece recipe is loaded in the product.

### 11.4.5 PositionTolerance

Used to configure the position tolerance with a resolution of 0.01 mm.

Thus, the value range of 0 to 255 can be used to set a maximum tolerance of 2.55 mm in both directions.

**INFORMATION**



Example:  
For TeachPosition 1500 (15 mm), PositionTolerance 150 lets you configure a tolerance of 1.5 mm in both directions.

This means that the TeachPosition range starts at 13.5 mm and goes all the way up to 16.5 mm.

Name	PositionTolerance
Data format	UINT8
Permission	Write
Transfer	Cyclical
Value range	0 to 255



### 11.4.6 GripForce

The product can use various gripping forces for an optimized process sequence. The gripping force is indicated as a percent from the minimum to the maximum gripping force. The user can transmit the required gripping force in increments of 1%.

#### INFORMATION



When the product reaches 100% gripping force, it switches to a higher maximum permitted peak current. This means that, in the range of 100% to 130%, the product can draw a maximum current of 7.5 A for a brief period.

Name	GripForce
Data format	UINT8
Permission	Write
Transfer	Cyclical
Value range	1 to 100 %

### 11.4.7 DriveVelocity

The product can work at various movement speeds for an optimized process sequence.

This parameter determines the movement speed of the product in both directions in PositionProfile.

In the other modes, this parameter determines the movement speed from the workpiece.

In PrePosition-ForceProfile mode, it determines the movement speed to the switching position.

The positioning speed is specified as a percentage value (1% to 100%). The product converts this information to its maximum movement speed.

#### INFORMATION



Example:  
To set a movement speed of 75%, a value of 75 (DriveVelocity = 75) must be transmitted.

Name	DriveVelocity
Data format	UINT8
Permission	Write
Transfer	Cyclical
Value range	1 to 100 %

### 11.4.8 BasePosition

The BasePosition defines the target position in the MoveToBase direction. It must always be less than the ShiftPosition.

The product verifies this and, if necessary, displays an error message.

If the current position of the product within the tolerance range is in the vicinity of the BasePosition, bit 8 is set in the StatusWord.

Moving beyond this position is also possible.

- Select an appropriately large distance to the mechanical end stop.

Name	BasePosition
Data format	UINT16
Permission	Write
Transfer	Cyclical
Value range	0.75 to max. jaw stroke of the product + 0.75 mm

### 11.4.9 ShiftPosition

The ShiftPosition must always be larger than the BasePosition and smaller than the WorkPosition. The product verifies this and, if necessary, displays an error message.

Name	ShiftPosition
Data format	UINT16
Permission	Write
Transfer	Cyclical
Value range	0.75 to max. jaw stroke of the product + 0.75 mm

### 11.4.10 TeachPosition

The TeachPosition defines the target position of the workpiece and its use is optional. If the current position of the product within the tolerance range is around the TeachPosition, bit 9 is set in the Status. The size of the tolerance range is defined with the parameter PositionTolerance. This is entered at a scale of 1/100 mm (example: 1500 = 15 mm).

Name	TeachPosition
Data format	UINT16
Permission	Write
Transfer	Cyclical
Value range	0.75 to max. jaw stroke of the product + 0.75 mm

### 11.4.11 WorkPosition

The WorkPosition defines the maximum travel path of the product and has to be greater than the ShiftPosition. If the current position of the product is within the tolerance range of the WorkPosition, bit 10 is set in the status. In the PositionProfile, this position is precisely approached because the product is in positioning mode. In DeviceMode 60 and 80, the product is stopped, starting from this position. The product moves past the WorkPosition. A maximum of 2 mm, depending on the movement speed and gripper finger dimensions.

Name	WorkPosition
Data format	UINT16
Permission	Write
Transfer	Cyclical
Value range	0.75 to max. jaw stroke of the product + 0.75 mm

## Outputs: Process data from the product to the IO-Link master

### 11.4.12 StatusWord

StatusWord structure:

	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
Byte 1	Error	ControlWord 0x0200	ControlWord 0x0100	DataTransferOK	Undefined- Position	WorkPosition	TeachPosition	BasePosition
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 2	ControllerError	Gripper- PLCActive	JogWork- Active +	JogBase- Active -	Movement- Complete	InMotion	MotorON	HomingPo- sition OK

#### Bit 0: HomingPosition OK

The product has its reference. This bit is mandatory. If the bit is FALSE, a reference run must be carried out. Refer to "Referencing by Homing" section.

#### Bit 1: MotorON

This bit becomes TRUE when the motor is switched on.

#### Bit 2: InMotion

This bit is active during the run.

#### Bit 3: MovementComplete

This bit is active after the movement is complete.

#### Bit 4: JogBaseActive -

Confirmation during the Jog run in the direction of BasePosition.

#### Bit 5: JogWorkActive +

Confirmation during the Jog run in the direction of WorkPosition.

#### Bit 6: GripperPLCActive

Active as soon as the product has booted up after the cold boot. This bit can be used to verify a "byte swap."

#### Bit 7: ControllerError

This bit indicates an internal error state in the product controller.

#### Bit 8: BasePosition

Active if the product is set to BasePosition.

#### Bit 9: TeachPosition

Active if the product is set to TeachPosition.

#### Bit 10: WorkPosition

Active if the product is set to WorkPosition.

**Bit 11: UndefinedPosition**

Active if the product is not set to TeachPosition, WorkPosition or BasePosition.

**Bit 12: DataTransferOK**

This bit is used for data transmission using the handshake. Active as soon as the product has taken over the data using the parameter ControlWord = 1 (decimal).

**Bit 13: ControlWord 0x0100**

This bit is a direction flag. Active if the last motion task was carried out toward BasePosition.

**Bit 14: ControlWord 0x0200**

This bit is a direction flag. Active if the last motion task was carried out toward WorkPosition.

**Bit 15: Error**

Active if the product has an active error. The error message can be determined using Diagnosis.

**11.4.13 Diagnosis**

The value returned in Diagnosis corresponds to the error code (see "Error Diagnosis" section).

Name	Diagnosis
Data format	UINT16
Permission	Read
Transfer	Cyclical
Value range	0 - 65535

**11.4.14 ActualPosition**

ActualPosition is the current position of the gripper jaws.

The value is specified with a resolution of 0.01 mm.

The values can move between the BasePosition (minimum values) and the WorkPosition (maximum values).

With the position measuring system, it is possible to achieve a position accuracy of ± 0.05 mm.

Name	ActualPosition
Data format	UINT16
Permission	Read
Transfer	Cyclical
Value range	0 to max. jaw stroke of the product

**INFORMATION**



Select a StatusWord bit between 8 and 11 to check whether the workpiece has been gripped correctly. Tolerance ranges are taken into account for these bits.

### 11.5 Cold start

For proper function, Zimmer GmbH recommends that the actuator and sensor voltage be supplied with power separately. The sensor supply must be switched on first.

As soon as the product is communicating with the PLC, the actuator power supply can be switched on. Depending on the application, simultaneous activation of both voltages is also possible.

#### INFORMATION



If the sensor supply is disconnected, the C/Q signal (IO-Link) must be disconnected as well.

### 11.6 Minimum travel path

The gripping force of products with a self-locking mechanism is determined by a combination of the current and kinetic energy of the system.

To increase the gripping force, the product must reach a minimum speed. For each attainable maximum force, there is a different minimum travel path per gripper jaw depending on the installation size.

Design size	Minimum travel path per gripper jaw [mm]
LWR50L-21-00001-A	3
LWR50L-21-00002-A	3
LWR50L-22-00001-A	1
LWR50L-22-00002-A	1

### 11.7 Referencing by Homing

#### NOTICE



► Before each homing command, make sure that the product is able to move freely and easily and that it cannot be blocked by the gripper jaws or interfering edges.

When blocking, the reference position is set. A Homing command is not permitted in the gripped state.

There are various Homing commands available.

#### NOTICE

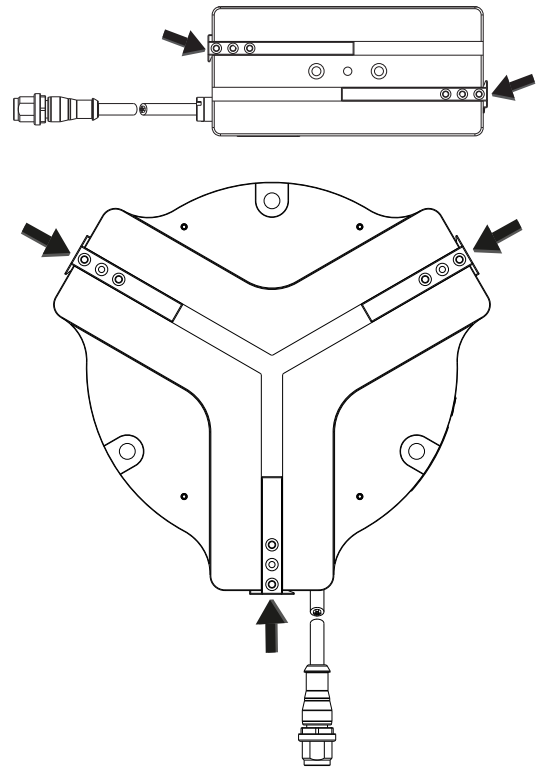


DeviceModes 16 and 17 are not valid for products with safety gripper jaws!

DeviceMode	Action
10	Outside homing – to the internal end stop of the product (see "DeviceMode 10" section)
14	Outside homing – to the internal end stop of the product (see "DeviceMode 14" section)
16	Special outside homing – to the external end stop (see "DeviceMode 16" section)
17	Special inside homing – to the external end stop (see "DeviceMode 17" section)

The product has reached its zero position if the gripper jaws are at the pictured position when referencing (Homing DeviceMode 10).

Depending on installation size, the gripper jaws move slightly beyond the edge of the gripper housing when moving to home position (Homing).



### 11.7.1 DeviceMode 10

- ▶ Assign "DeviceMode 10.
- ▶ Transmit this value to the product with a handshake.
  - The motor can be switched on or off.

#### WARNING



#### Risk of injury due to uncontrolled movements

Transmitting the value might cause the product to move.

- ▶ Always keep an adequate safety distance.
- ▶ Do not reach into the operational range of the product.

- ⇒ The gripper jaws move to the outside at low speed until they encounter the internal mechanical end stops.
- ⇒ If the gripper jaws encounter resistance, they stop at this spot.
  - ⇒ In the process, the ActualPosition is referenced to the value of 0.
- ⇒ The motor is switched on.

### 11.7.2 DeviceMode 14

- ▶ Assign DeviceMode 14.
- ▶ Transmit this value to the product with a handshake.
  - The motor can be switched on or off.

#### WARNING



#### Risk of injury due to uncontrolled movements

Transmitting the value might cause the product to move.

- ▶ Always keep an adequate safety distance.
- ▶ Do not reach into the operational range of the product.

- ⇒ The gripper jaws move to the inside at low speed until they encounter the internal mechanical end stops.
- ⇒ If the gripper jaws encounter resistance, they stop at this spot.
  - ⇒ In the process, the ActualPosition is referenced to the maximum jaw stroke of the product.
- ⇒ The motor is switched on.

### 11.7.3 DeviceMode 16

**WARNING**



**Risk of injury due to increased force of the product during homing**

The product force during the reference run is very high with DeviceMode 16.

- ▶ Make sure that an external end stop is installed in the machine or system into which the product is being installed.
- ⇒ If the internal end stop of the product is used, this will result in higher wear.

- ▶ Set the DriveVelocity to a low value before starting homing.
  - Recommendation: DriveVelocity **10**
  - ▶ Increase the value if a higher force is required for homing.
- ▶ Assign DeviceMode 3.
- ▶ Transmit this value to the product with ControlWord 1.
- ⇒ The motor is switched on.
- ▶ Transmit the following values.

Parameter	Value	Unit
DeviceMode	16	-
WorkpieceNo	0	-
PositionTolerance	50	0.01 mm
DriveVelocity	<b>10</b>	%
BasePosition	<b>100</b>	0.01 mm
WorkPosition	4000	0.01 mm

- ▶ Transmit the parameters to the product with a handshake.
  - ControlWord 1
  - BasePosition must not be smaller than 75.
- ⇒ The gripper jaws move outward until they are stopped by an external end stop or the maximum jaw position.
  - ⇒ The product takes over the BasePosition value as the new ActualPosition.
- ⇒ For example, this would be the new ActualPosition **100** (see table).
- ⇒ After homing, the motor is switched off.
  - ▶ Switch the motor on using DeviceMode 3 and the handshake.
  - ▶ Change the movement profile.
  - ▶ Start the operation.
- ⇒ The product responds with DiagnosisWord 0x0000.
  - ⇒ The product is ready.

**WARNING**



**Risk of injury and material damage in case of non-compliance**

Since the ActualPosition in this DeviceMode has an offset, the product does not know the position of the internal end stop.

- ⇒ This makes it possible to move against the internal end stop at high speed, which can result in jamming of and damage to the product.



11.7.4 DeviceMode 17

**WARNING**



**Risk of injury due to increased force of the product during homing**

The product force during the reference run is very high with DeviceMode 17.

- ▶ Make sure that an external end stop is installed in the machine or system into which the product is being installed.
- ⇒ If the internal end stop of the product is used, this will result in higher wear.

- ▶ Set the DriveVelocity to a low value before starting homing.
  - Recommendation: DriveVelocity **10**
  - ▶ Increase the value if a higher force is required for homing.
- ▶ Assign DeviceMode 3.
- ▶ Transmit this value to the product with ControlWord 1.
- ⇒ The motor is switched on.
- ▶ Transmit the following values.

Parameter	Value	Unit
DeviceMode	17	-
WorkpieceNo	0	-
PositionTolerance	50	0.01 mm
DriveVelocity	<b>10</b>	%
BasePosition	100	0.01 mm
WorkPosition	<b>4000</b>	0.01 mm

- ▶ Transmit the parameters to the product with a handshake.
  - ControlWord 1
  - WorkPosition must not be greater than the maximum position.
- ⇒ The gripper jaws move inward until they are stopped by an external end stop or the maximum jaw position.
  - ⇒ The product takes over the WorkPosition value as the new ActualPosition.
- ⇒ For example, this would be the new ActualPosition **4000** (see table).
- ⇒ After homing, the motor is switched off.
  - ▶ Switch the motor on using DeviceMode 3 and the handshake.
  - ▶ Change the movement profile.
  - ▶ Start the operation.
- ⇒ The product responds with DiagnosisWord 0x0000.
  - ⇒ The product is ready.

**WARNING**



**Risk of injury and material damage in case of non-compliance**

Since the ActualPosition in this DeviceMode has an offset, the product does not know the position of the internal end stop.

- ⇒ This makes it possible to move against the internal end stop at high speed, which can result in jamming of and damage to the product.

### 11.8 Interruption of the power supply

During an interruption of the voltage supply (e.g. when using a tool changer), make absolutely sure that the product stores the last position in the controller.

- ▶ Carry out a handshake before switching off the power supply.
- ▶ Use a timer to delay the shutoff of the power supply by 2 seconds.
- ⇒ This ensures that no change of position occurs during a restart.

### 11.9 Easy Startup

Describes the process from switching on the product to the initial movement.

- ▶ Connect the product according to its assignment diagram.
- ⇒ The product reports the process parameters StatusWord, Diagnosis and ActualPosition immediately after the internal controller is booted up.
- ⇒ As soon as the PLCActive bit is registered in the StatusWord, the communication process can start.
- ▶ Transmit the process parameters to move the product.
  - DeviceMode
  - WorkpieceNo
  - PositionTolerance
  - GripForce
  - DriveVelocity
  - BasePosition
  - ShiftPosition
  - TeachPosition
  - WorkPosition
- ▶ Transmit the parameters to the product with a handshake.

#### INFORMATION



- ▶ For information and an example code for the handshake, refer to the "Quickstart Basic Parameters" and "Recipe Examples" sections.

### 11.10 Starting the data transfer

- ▶ Start the data transmission with the ControlWord = 1 (decimal).
- ⇒ As soon as the process parameter has been transmitted to the product, the product will report this back in the StatusWord with the DataTransferOK bit.
- ⇒ The product is ready to operate.

#### INFORMATION



- ▶ For information about data transfers, refer to the "StatusWord" section.

### 11.11 Quickstart Basic Parameters

In the following example, you see the first initialization of the product, the activation of the motor and the transmission of the process parameters.

```
// Initialization of the product
// Motor switch-on
// Initial move command
// = EasyStartUp Example

5:
  IF StatusBit.6 THEN                // Query for PLCActive bit in the StatusWord
    ControlWord      := 1;          // Data transfer to the product
    DeviceMode       := 3;          // Command to switch on the motor
    WorkpieceNo      := 0;          // 0 = current process parameters are being used
    PositionTolerance := 50;
    GripForce        := 50;
    DriveVelocity     := 50;
    BasePosition     := 100;
    ShiftPosition    := 2000;
    TeachPosition    := 4000;
    WorkPosition     := 4000;
    iStep            := 10;         // Jump to the next step
  END_IF

10:
  IF StatusBit.12 AND StatusBit.1 THEN // Query for DataTransferOK bit AND MotorON in the StatusWord
    ControlWord      := 0;          // Reset of the initialization
    iStep            := 20;         // Jump to the next step
  END_IF

20:
  IF NOT StatusWord.12 THEN           // Query for completion of the data transfer,
                                        // DataTransferOK = FALSE
    DeviceMode       := 80;         // Loading a DeviceMode
    ControlWord      := 1;          // Begins with the handshake
    iStep            := 30;         // Jump to the next step
  END_IF

30:
  IF StatusWord.12 THEN               // Queries the bit DataTransferOK=TRUE from StatusWord,
                                        // Response of the product to transferred data
    ControlWord      := 0;          // Reset of the ControlWord
    iStep            := 40;         // Jump to the next step
  END_IF

40:
  IF NOT StatusWord.12 THEN           // Query for completion of the data transfer,
                                        // DataTransferOK = FALSE
    ControlWord      := 512;        // Handshake is completed,
                                        // Product moves to WorkPosition (0x0200 or 512(decimal) = MoveToWork)
    iStep            := 50;
  END_IF

50:
...

```

### 11.12 Starting the gripping movement

- ▶ Send ControlWord 0x0200 so that the product moves towards the WorkPosition.
- ⇒ The gripper jaws move towards the inside.
- ▶ Send ControlWord 0x0100 so that the product moves towards the BasePosition.
- ⇒ The gripper jaws move towards the outside.
  - The motion task must be pending for as long as it takes until the desired position is reached.
  - The current motion task is canceled as a result of a new handshake.
- ⇒ When the product reaches the corresponding position, this is displayed in the StatusWord as follows:
  - The product is at the BasePosition: StatusWord bit 8 = TRUE
  - The product is at the TeachPosition: StatusWord bit 9 = TRUE
  - The product is at the WorkPosition: StatusWord bit 10 = TRUE

### 11.13 Repeated movements in the same direction

The StatusWord includes two static flag bits, each of which is set in alternation when the product moves in one direction. This prevents uncontrolled movements of the product in case of faulty data transmission.

Depending on the location of the positions, it is possible that the product may move multiple times in the same direction. For this purpose, the direction flags must be reset.

- ▶ Send the ControlWord = 0x0004 to delete the direction flags.
- ⇒ The direction flags are reset when the product answers with status bit 13 AND 14 = FALSE.

Program example for repeated movements in the same direction:

```
// Multiple movement in one direction in Structured Text (ST)
// In this example, the motor is switched on,
// The movement profile
// Transfer gripping forces and speeds
// The product is at BasePosition = 1000.

10:
    BasePosition      := 100;    // Assignment of a new BasePosition
    ControlWord       := 1;     // Start handshake (DataTransfer bit =TRUE in the ControlWord)
    iStep             := 20;    // Jump to the next step

20:
    IF StatusWord.12 THEN          // Queries the bit DataTransferOK=TRUE from StatusWord,
                                   // Response of the product to transferred data
        ControlWord       := 0;    // Reset the ControlWord
        iStep             := 30;    // Jump to the next step
    END_IF;

30:
    IF StatusWord.12 THEN          // Query for completion of the data transfer,
                                   // DataTransferOK = FALSE
        ControlWord       := 4;    // Reset direction flag
                                   // (DataTransfer bit =TRUE in the ControlWord)
        iStep             := 40;
    END_IF;

40:
    IF NOT StatusWord.13 AND NOT  // Query whether both direction flags
    StatusWord.14 THEN           // (Bit ControlWord 0x0100 AND
                                   // ControlWord 0x0200 = FALSE in ControlWord)
        ControlWord       := 256;  // Moves back toward BasePosition
        iStep             := 50;
    END_IF;

50:
...

```

## 11.14 Recipe examples

### 11.14.1 Save recipe

The following example code shows how process parameters can be stored in the internal workpiece recipe.

// Store tool workpiece recipes in Structured Text (ST)

```

10:
    DeviceMode           := 82;    // Assignment of desired process parameters
    WorkpieceNo          := 3;     // Recipe is to be stored as the third workpiece recipe
    PositionTolerance    := 50;
    GripForce            := 50;
    DriveVelocity        := 50;
    BasePosition         := 100;
    ShiftPosition        := 2000;
    TeachPosition        := 4000;
    WorkPosition         := 4000;
    iStep                := 20;    // Jump to the next step

20:
    ControlWord          := 1;     // Begins with the handshake
    iStep                := 30;    // Jump to the next step

30:
    IF StatusWord.12 THEN          // Queries the bit DataTransferOK=TRUE from StatusWord,
                                   // Response of the product to transferred data
        ControlWord             := 0; // Reset the ControlWord
        iStep                   := 40; // Jump to the next step
    END_IF;

40:
    IF StatusWord.12 THEN          // Query for completion of the data transfer,
                                   // DataTransferOK = FALSE
        ControlWord             := 2; // Handshake is completed,
                                   // storage starts here via the WritePDU bit in the ControlWord
        iStep                   := 50; // Jump to the next step
    END_IF;

50:
    IF StatusWord.12 THEN          // Queries the DataTransferOK = TRUE bit from StatusWord
        ControlWord             := 0; // Reset the ControlWord
        iStep                   := 60; // Jump to the next step
    END_IF;

60:
    IF NOT StatusWord.12 THEN      // Query for completion of the data transfer,
                                   // DataTransferOK = FALSE
        // Do other things...      // Storage is completed
    END_IF;
    
```

### 11.14.2 Loading a recipe

The following example code shows how process parameters can be loaded to the internal workpiece recipe.

```
// Load workpiece recipes in Structured Text (ST)

10:
    WorkpieceNo      := 3;      // Load third workpiece recipe
    iStep            := 20;     // Jump to the next step

20:
    WorkpieceNo      := 1;      // Begins with the handshake
    iStep            := 30;     // Jump to the next step

30:
    IF StatusWord.12 THEN
        // Queries the bit DataTransferOK=TRUE from StatusWord,
        // Response of the product to transferred data
        ControlWord   := 0;     // Reset the ControlWord
        iStep          := 40;     // Jump to the next step
    END_IF;

40:
    IF NOT StatusWord.12 THEN
        // Query for completion of the data transfer,
        // DataTransferOK = FALSE
        // Do other things...
        // Handshake is completed,
        // Parameters from the third recipe have been taken over into the current process parameters.
    END_IF;
```

## 12 Operation

### INFORMATION



In the event of a power failure, the gripper jaws remain in their positions and the gripping force of the product stays constant.

The gripper jaws can be opened using the emergency release if the energy supply drops off.

▶ Please contact Customer Service if you have any questions.

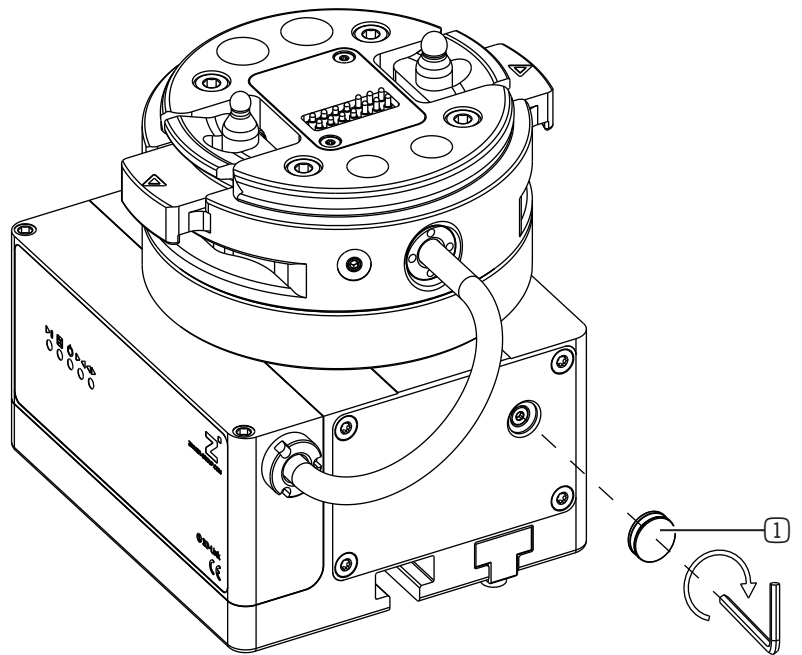
### 12.1 Setting the gripping force

For products with IO-Link, you can adjust the gripping force by using the control system.

### 12.2 Emergency release

The product features an emergency release that can be mechanically opened with an Allen key in the event of a power failure.

- ▶ Remove the protective cap to reach the emergency release.
- ▶ Actuate the emergency release with a corresponding Allen key.
  - Turning counterclockwise opens the jaws (toward the BasePosition).
- ▶ Make sure that the workpiece is secured when opening the product.



Design size	Wrench size [mm]
LWR50L-21	2
LWR50L-22	2

① Protective cap

### INFORMATION



- ▶ Carry out another reference run after any emergency release.
- ▶ Please contact Customer Service if you have any questions.

## 13 Gripping force charts

### INFORMATION



- ▶ You can find the information in the technical data sheet on our website.
- ▶ Please contact Customer Service if you have any questions.

## 14 Error diagnosis

Error code	Error	Possible cause	Measure
0x0000	Device is ready for operation.	-	-
0x0001	Motor controller is switched off.	<ul style="list-style-type: none"> <li>• Motor controller has not yet been activated.</li> <li>• Motor controller has been switched off.</li> <li>• Motor controller was switched off for device protection.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Switch on the motor controller.</li> </ul>
0x0100	Actuator power supply is not present or is too low.	<ul style="list-style-type: none"> <li>• Actuator power supply is not connected</li> <li>• Actuator power supply is not sufficient</li> <li>• Cable break</li> <li>• STO input circuit is interrupted.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the actuator power supply.</li> <li>▶ Switch on the STO input circuit.</li> </ul>
0x0101	Temperature above maximum permitted temperature.	<ul style="list-style-type: none"> <li>• Ambient temperature is too high.</li> <li>• Overload of the products.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Provide sufficient ventilation/cooling/connection.</li> <li>▶ Check that the product moves freely.</li> </ul>
0x0102	Max. permitted temperature undershot.	<ul style="list-style-type: none"> <li>• Ambient temperature is too low.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Provide an adequate operating temperature.</li> </ul>
0x0206	Motion task cannot be executed (CRC error).	<ul style="list-style-type: none"> <li>• Internal error</li> </ul>	<ul style="list-style-type: none"> <li>▶ Apply the process data via a handshake.</li> <li>▶ Please contact Customer Service.</li> </ul>
0x0300	ControlWord is not plausible.	<ul style="list-style-type: none"> <li>• Multiple bits were set in the ControlWord.</li> </ul>	<ul style="list-style-type: none"> <li>▶ In the ControlWord, check that only one bit is set.</li> </ul>
	Initial state after gripper restart	<ul style="list-style-type: none"> <li>• Modified process data were not taken over.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Apply the process data via a handshake.</li> </ul>
0x0301	Positions are not plausible.	<ul style="list-style-type: none"> <li>• Transmitted positions are not plausible.</li> <li>• Modified process data were not taken over.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the transmitted process data.</li> <li>▶ Apply the process data via a handshake.</li> </ul>
0x0302	GripForce is not plausible.	<ul style="list-style-type: none"> <li>• Transmitted GripForce is not plausible.</li> <li>• Modified process data were not taken over.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the transmitted process data.</li> <li>▶ Apply the process data via a handshake.</li> </ul>
0x0303	DriveVelocity is not plausible.	<ul style="list-style-type: none"> <li>• Transmitted DriveVelocity is not plausible.</li> <li>• Modified process data were not taken over.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the transmitted process data.</li> <li>▶ Apply the process data via a handshake.</li> </ul>
0x0304	PositionTolerance is not plausible.	<ul style="list-style-type: none"> <li>• Transmitted PositionTolerance is not plausible.</li> <li>• Modified process data were not taken over.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the transmitted process data.</li> <li>▶ Apply the process data via a handshake.</li> </ul>



Error code	Error	Possible cause	Measure
0x0305	Position measuring system not referenced.	<ul style="list-style-type: none"> <li>Position measuring system is not referenced.</li> <li>A reference run is being performed.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Reference the product.</li> <li>▶ Wait until the reference run is complete.</li> </ul>
0x0306	DeviceMode is not plausible.	<ul style="list-style-type: none"> <li>Transmitted DeviceMode is not plausible.</li> <li>Modified process data were not taken over.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the transmitted process data.</li> <li>▶ Apply the process data via a handshake.</li> </ul>
0x0307	Motion task cannot be executed.	<ul style="list-style-type: none"> <li>Multiple motion tasks in the same direction.                             <ul style="list-style-type: none"> <li>In DM6x, MoveToWork if ActualPosition &gt; WorkPosition</li> <li>In DM7x, MoveToBase if ActualPosition &lt; BasePosition</li> <li>In DM8x, MoveToWork if ActualPosition &gt; ShiftPosition</li> <li>In DM9x, MoveToBase if ActualPosition &lt; ShiftPosition</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▶ Reset the direction flag.                             <ul style="list-style-type: none"> <li>▶ Send the move command again.</li> </ul> </li> <li>▶ Position the product correctly before gripping.</li> </ul>
0x0308	WorkpieceNo cannot be selected.	<ul style="list-style-type: none"> <li>Transmitted workpiece number is outside the permitted range.</li> <li>Modified process data were not taken over.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check the transmitted process data.</li> <li>▶ Apply the process data via a handshake.</li> </ul>
0x0313	Calculated ShiftPosition exceeded.	<ul style="list-style-type: none"> <li>Start position is not permitted for the selected motion task.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Move to the BasePosition with DeviceMode 60.</li> <li>▶ Move to the WorkPosition with DeviceMode 70.</li> </ul>
0x0402	Jam	<ul style="list-style-type: none"> <li>Gripper jaws are blocked.</li> <li>Gripper jaws are tensioned incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Check that the product moves freely.</li> <li>▶ Send a motion task in the opposite direction.</li> </ul>
0x0404	Position sensor error	<ul style="list-style-type: none"> <li>Fault of the integrated position sensor</li> </ul>	<ul style="list-style-type: none"> <li>▶ Reference the product with a homing command.</li> <li>▶ Please contact Customer Service.</li> </ul>
0x0406	Internal error	<ul style="list-style-type: none"> <li>Internal error</li> </ul>	<ul style="list-style-type: none"> <li>▶ Please contact Customer Service.</li> </ul>
0x040B	Internal error	<ul style="list-style-type: none"> <li>Internal error</li> </ul>	<ul style="list-style-type: none"> <li>▶ Please contact Customer Service.</li> </ul>
0x040C	Internal error	<ul style="list-style-type: none"> <li>Internal error</li> </ul>	<ul style="list-style-type: none"> <li>▶ Please contact Customer Service.</li> </ul>
0x040D	Internal error	<ul style="list-style-type: none"> <li>Internal error</li> </ul>	<ul style="list-style-type: none"> <li>▶ Please contact Customer Service.</li> </ul>
0x040E	Internal error	<ul style="list-style-type: none"> <li>Internal error</li> </ul>	<ul style="list-style-type: none"> <li>▶ Please contact Customer Service.</li> </ul>

Error code	Error	Possible cause	Measure
0x040F	Internal error	<ul style="list-style-type: none"> <li>Internal error</li> </ul>	<ul style="list-style-type: none"> <li>▶ Please contact Customer Service.</li> </ul>

## 15 Table with acyclic data (ISDU)

### INFORMATION



IO-Link distinguishes between cyclical process data (PDU) and acyclic data (ISDU).

Access to acyclic data is not arranged very conveniently for all control system and IO-Link master combinations. For this reason, the product can be used without acyclic data. This makes it as easy as possible to control the product.

► Please contact Customer Service if you have any questions.

### INFORMATION



► Note that the acyclic data with the following parameters correspond to the reflection of the process data:

- StatusWord, Diagnosis, ControlWord, ActualPosition, TeachPosition, WorkpieceNo, DeviceMode, PositionTolerance, GripForce, DriveVelocity, BasePosition, ShiftPosition, WorkPosition

Index	Name	Data format	Access rights	Values	Description
0x0040 (64)	StatusWord	UINT16	Read	0 - 65535	Parameter to read out the StatusWord.
0x0041 (65)	Diagnosis	UINT16	Read	0 - 65535	Read out of the diagnostic code.
0x0042 (66)	Cycle counter	UINT32	Read	0 to 4294967295	Read out of the total number of cycles.
0x0043 (67)	Temperature	UINT16	Read	0 to 100 °C	Current temperature
0x0044 (68)	ControlWord	UINT16	Read	0 - 65535	Read out of the ControlWord.
0x0045 (69)	Error code	STRING	Read	1 to 32	Read out of the current error state.
0x0046 (70)	Error counter	UINT32	Read	0 to 4294967295	Read out of the number of errors since the restart.
0x0100 (256)	ActualPosition	UINT16	Read	0 to max. jaw stroke of the product [0,01 mm]	Read out the current position of the gripper jaws.
0x0101 (257)	TeachPosition	UINT16	Read	0 to max. jaw stroke of the product [0,01 mm]	Read out of the current transmitted TeachPosition.
0x0102 (258)	WorkpieceNo	UINT8	Read	0 - 32	Read out of the transmitted workpiece number.
0x0103 (259)	DeviceMode	UINT8	Read	1-255	Read out of the transmitted travel mode.
0x0104 (260)	PositionTolerance	UINT8	Read	0 to 255	Read out of the transmitted tolerance of the TeachPosition.
0x0105 (261)	GripForce	UINT8	Read	1 to 130 %	Read out of the transmitted gripping force.
0x0107 (263)	DriveVelocity	UINT8	Read	1 to 100 %	Read out of the transmitted movement speed.
0x0108 (264)	BasePosition	UINT16	Read	0 to max. jaw stroke of the product [0,01 mm]	Read out of the transmitted outer jaw position.

Index	Name	Data format	Access rights	Values	Description
0x0109 (265)	ShiftPosition	UINT16	Read	0 to max. jaw stroke of the product [0,01 mm]	Read out of the transmitted toggle position.
0x010A (266)	WorkPosition	UINT16	Read	0 to max. jaw stroke of the product [0,01 mm]	Read out of the transmitted inner jaw position.

## 16 Maintenance

### NOTICE



#### Material damage resulting from blowing out with compressed air

Blowing out the product with compressed air can cause malfunctions and pose a risk of accidents.

- ▶ Never purge the product with compressed air.

### NOTICE



#### Material damage caused by unsuitable cleaning materials

Liquid and solvent-based cleaning agents can cause malfunctions and pose a risk of accidents.

- ▶ Do not clean the product with any cleaning agents that are liquid or contain solvents.

Maintenance-free operation of the product is guaranteed for up to **5 million cycles**.

Maintenance-free operation of the MATCH gripper for quick-change system is guaranteed for up to **100,000 change cycles** (hot plug).

- ▶ Note that the product could become damaged under the following circumstances:
    - Dirty environment
    - Improper use and use that does not comply with the performance data
    - Permissible temperature range not observed
  - ▶ Even though the product is maintenance-free as mentioned above, perform a regular visual inspection to check for any damage or contamination.
  - ▶ Have maintenance work that requires disassembly of the product performed by customer service only.
- ⇒ Dismantling and reassembling the product without authorization may result in complications, as special installation equipment is required in some cases. Zimmer GmbH accepts no liability for any resulting malfunctions or damage.

## 17 Decommissioning/disposal

### INFORMATION



When the product reaches the end of its operational phase, it can be completely disassembled and disposed of.

- ▶ Disconnect the product completely from the power supply.
- ▶ Dispose of the components properly according to the material groups.
- ▶ Comply with the locally applicable environmental and disposal regulations.

## 18 RoHS declaration

in terms of the EU Regulation 2011/65/EU

### Name and address of the manufacturer:

#### Zimmer GmbH

📍 Im Salmenkopf  
77866 Rheinau, Germany  
☎ +49 7844 9138 0  
✉ [info@zimmer-group.com](mailto:info@zimmer-group.com)  
🌐 [www.zimmer-group.com](http://www.zimmer-group.com)

We hereby declare that the incomplete machine described below

**Product designation:** 2-jaw parallel gripper with quick-change system

**Type designation:** LWR50L-21, LWR50L-22

conforms to the requirements of the directive in its design and the version we put on the market.

Michael Hoch  
Authorized representative for the  
compilation of relevant technical  
documents

Rheinau, Germany, 2021-04-01  
(Place and date of issuance)



Martin Zimmer  
(Legally binding signature)  
Managing Partner

## 19 REACH declaration

In terms of the EC Regulation 1907/2006

### Name and address of the manufacturer:

#### Zimmer GmbH

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77866 Rheinau, Germany  
☎ +49 7844 9138 0  
✉ [info@zimmer-group.com](mailto:info@zimmer-group.com)  
🌐 [www.zimmer-group.com](http://www.zimmer-group.com)

REACH stands for **R**egistration, **E**valuation, **A**uthorisation and **R**estriction of **C**hemicals.

A full declaration of REACH can be obtained from the manufacturer due to the duty to notify in accordance with Art. 33 of the REACH regulation ("Duty to communicate information on substances in articles").

Michael Hoch  
Authorized representative for the  
compilation of relevant technical  
documents

Rheinau, Germany, 2021-04-01  
(Place and date of issuance)



Martin Zimmer  
(Legally binding signature)  
Managing Partner

## 20 Declaration of Incorporation

In terms of the EU Machinery Directive 2006/42/EC (Annex II 1 B)

**Name and address of the manufacturer:**

**Zimmer GmbH**

-  Im Salmenkopf  
77866 Rheinau, Germany
-  +49 7844 9138 0
-  [info@zimmer-group.com](mailto:info@zimmer-group.com)
-  [www.zimmer-group.com](http://www.zimmer-group.com)

We hereby declare that the incomplete machine described below

- Product designation:** 2-jaw parallel gripper with quick-change system
- Type designation:** LWR50L-21, LWR50L-22

conform to the requirements of the Machinery Directive, 2006/42/EC, Article 2g, Annex VII.b – Annex II.b, in its design and the version we put on the market.

Basic health and safety requirements:

No. 1.1.2, No. 1.1.3, No. .1.5, No. 1.3.2, No. 1.3.4, No. 1.3.7, No. 1.5.3, No. 1.5.4, No. 1.5.8, No. 1.6.4, No. 1.7.1, No. 1.7.4

A full list of applied standards can be obtained from the manufacturer.

We also declare that the specific technical documents were produced in accordance with Annex VII Part B of this Directive. We undertake to provide the market supervisory bodies with electronic versions of special documents for the incomplete machine through our documentation department, should they have reason to request them.

**The incomplete machine may only be commissioned if it has been ascertained, if applicable, that the machine or system in which the incomplete machine is to be installed satisfies the requirements of Directive 2006/42/EC on Machinery and an EC Declaration of Conformity has been drawn up in accordance with Annex II 1 A.**

Kurt Ross

Authorized representative for the compilation of relevant technical documents

Rheinau, Germany, 2021-04-01

(Place and date of issuance)



Martin Zimmer  
(Legally binding signature)  
Managing Partner

## 21 Declaration of Conformity

As defined by the EC Directive 2014/30/EU on electromagnetic compatibility

**Name and address of the manufacturer:**

**Zimmer GmbH**

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🌐 [www.zimmer-group.com](http://www.zimmer-group.com)

We hereby declare that the products described below

**Product designation:** 2-jaw parallel gripper with quick-change system  
**Type designation:** LWR50L-21, LWR50L-22

conform to the requirements of the Electromagnetic Compatibility Directive 2014/30/EU in its design and the version we put on the market.

The following harmonized standards have been used:

DIN EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction
DIN EN 61000-6-3	EMC Generic standard, Emission standard for residential, commercial and light-industrial
DIN EN 61000-6-2	EMC Generic standard, Emission standard for industrial environments
DIN EN 61000-6-4	EMC Generic standard, Immunity for industrial environments

A full list of applied standards can be obtained from the manufacturer.

Kurt Ross  
Authorized representative for the compilation of relevant technical documents

Rheinau, Germany, 2021-04-01  
(Place and date of issuance)



Martin Zimmer  
(Legally binding signature)  
Managing Partner