OPERATING INSTRUCTIONS

MOC3ZA

Standstill Monitor

SICK
Sensor Intelligence.

Described product

MOC3ZA

Manufacturer

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Legal information

Original document

This document is an original document of SICK AG.

Contents

1 About this document

1.1 Purpose of this document

These operating instructions are designed to address the technical personnel of the machine manufacturer or the machine owner in regards to safe mounting, installation, configuration, electrical installation, commissioning, operation and maintenance of the Standstill Monitor.

These operating instructions do not provide instructions for operating machines on which the MOC3ZA is, or will be, integrated. Information on this is to be found in the operating instructions for the machine.

1.2 Scope

Product

This document applies to the following products:

- Product code: MOC3ZA
- “Operating instructions” type label entry: 8014608

Document identification

Document part number:

- This document: 8027992
- Available language versions of this document: 8014608

You can find the current version of all documents at www.sick.com.

1.3 Target groups of these operating instructions

Some chapters of these operating instructions are intended for certain target groups. However, the entire operating instructions are relevant for intended use of the product.

Table 1: Target groups and selected chapters of these operating instructions

Target group	Chapters of these operating instructions
Project developers (planners, developers, designers)	"Project planning", page 13 "Technical data", page 33
Installers	"Mounting", page 19
Electricians	"Electrical installation", page 21
Safety experts (such as CE authorized representatives, compliance officers, people who test and approve the application)	"Project planning", page 13 "Commissioning", page 24 "Technical data", page 33 "Checklist for initial commissioning and commissioning", page 41
Operators	"Troubleshooting", page 26
Maintenance personnel	"Troubleshooting", page 26

1.4 Additional information

www.sick.com

The following information is available on the Internet:

- Data sheets and application examples
- CAD data and dimensional drawings
- Certificates (e.g. EU declaration of conformity)
- Guide for Safe Machinery Six steps to a safe machine

1.5 Symbols and document conventions

The following symbols and conventions are used in this document:

Safety notes and other notes

DANGER
Indicates a situation presenting imminent danger, which will lead to death or serious injuries if not prevented.

WARNING
Indicates a situation presenting possible danger, which may lead to death or serious injuries if not prevented.

CAUTION
Indicates a situation presenting possible danger, which may lead to moderate or minor injuries if not prevented.

NOTICE
Indicates a situation presenting possible danger, which may lead to property damage if not prevented.

NOTE
Indicates useful tips and recommendations.

Instructions to action

- ▶ The arrow denotes instructions to action.

1. The sequence of instructions for action is numbered.
2. Follow the order in which the numbered instructions are given.

- ✓ The check mark denotes the result of an instruction.

LED symbols

These symbols indicate the status of an LED:

- ○ The LED is off.
- ☼ The LED is flashing.
- ● The LED is illuminated continuously.

2 Safety information

2.1 General safety notes

Product integration

DANGER
The product can not offer the expected protection if it is integrated incorrectly.

- ▶ Plan the integration of the product in accordance with the machine requirements (project planning).
- ▶ Implement the integration of the product in accordance with the project planning.

Mounting and electrical installation

DANGER
Death or severe injury due to electrical voltage and/or an unexpected startup of the machine

- ▶ Make sure that the machine is (and remains) disconnected from the voltage supply during mounting and electrical installation.
- ▶ Make sure that the dangerous state of the machine is and remains switched off.

Repairs and modifications

DANGER
Improper work on the product

A modified product may not offer the expected protection if it is integrated incorrectly.

- ▶ Apart from the procedures described in this document, do not repair, open, manipulate or otherwise modify the product.

2.2 Intended use

The Standstill Monitor is used for the sensor-less monitoring of electric motors for standstill. It makes possible the safe detection of the standstill of electric motors, e.g. to enable the unlocking of guards on machine tools or to activate retaining brakes. The Standstill Monitor can be used as per the following standards:

- IEC 61508 and IEC 61511 up to SIL3
- IEC 62061 up to SIL3
- ISO 138491 up to category 4
- ISO 138491 up to Performance Level e

The degree of safety actually attained depends on the external circuit and the design of the wiring.

NOTICE
The Standstill Monitor complies with the requirements as defined for class B as per EN 55011:2009 + A1:2010.

Class B devices are devices that are suitable for operation in the residential sector as well as in those sectors that are connected directly to a low voltage supply network that (also) supplies residential buildings.

The Standstill Monitor must be used only by qualified personnel and only on the machine where it has been installed and initialized by qualified safety personnel in accordance with these operating instructions.

The product may be used in safety functions.

Incorrect use, improper modification or manipulation of the product will invalidate any warranty from SICK; in addition, any responsibility and liability of SICK for damage and secondary damage caused by this is excluded.

2.3 Requirements for the qualification of personnel

The product must be configured, installed, connected, commissioned, and serviced by qualified safety personnel only.

Project planning

You need safety expertise to implement safety functions and select suitable products for that purpose. You need expert knowledge of the applicable standards and regulations.

Mounting, electrical installation and commissioning

You need suitable expertise and experience. You must be able to assess if the machine is operating safely.

Operation and maintenance

You need suitable expertise and experience. You must be instructed in machine operation by the machine operator. For maintenance, you must be able to assess if the machine is operating safely.

3 Product description

3.1 General description

Overview

The Standstill Monitor permits the sensor-less monitoring of electric motors for safe standstill. It detects the standstill of three-phase motors, single-phase motors and DC motors that generate a voltage due to their remanence as they coast down. By adjusting the voltage threshold for the standstill detection (U_{an}) and the standstill time (t_s: time delay between the voltage dropping below the voltage threshold and switching on the safety-related output relay) the function can be adapted to a large number of different motors and applications.

Properties:

- safe standstill monitoring of three-phase and single-phase AC motors
- safe standstill monitoring of DC motors
- suitable for use with frequency inverters
- no external sensors necessary
- direction of rotation-independent standstill detection
- wire break detection in the measurement circuit
- adjustable voltage threshold for standstill detection
- adjustable standstill time
- LED indicators for motor standstill, wire break and supply voltage
- 3 enable current paths as safe outputs for up to 250 V AC (normally open contact)
- 1 positively guided N/C contact for up to 250 V AC
- 1 non-safety output as application diagnostic output for 250 V AC (normally open contact)
- 2 non-safety outputs as semiconductor application diagnostic outputs for 24 V DC

Important information

WARNING
You are responsible for the correct setting of the MOC3ZA in relation to the voltage threshold U_{an} and standstill time t_s. The correct setting must be determined by corresponding tests under worst-case conditions.

▶ Always ensure the MOC3ZA setting is safe in the context of your application.

WARNING
Test the suitability of the motor!

If the motor current is gradually reduced to zero by a frequency inverter or soft starting device, the motor may be demagnetized.

▶ In this case check whether the remaining remanence voltage is sufficient to ensure correct standstill detection.

MOC3ZA

The MOC3ZA measures the voltage induced at the terminals of the winding by the residual magnetization of a motor coming to a standstill. Two redundant measurement channels (L2 against L1, and L3 against L1) are used for this purpose. If the induction voltage on both channels drops below the configured voltage threshold (U_{an}) at the same time, this means the motor of the device is coming to a standstill and the output relay is activated, i.e. the outputs are enabled.

To be able to adjust the device to a large number of different motors and applications, the voltage threshold U_{an} is adjustable. Also adjustable is the length of time for which the voltage must drop below U_{an} so that standstill is finally detected and the output circuit is enabled (standstill time t_s).

The device detects wire breaks on the measurement channels (L1/L2/L3). If a wire break is detected, the output relay switches to the safe position (as when the motor is running). This state is saved and can be deleted by bridging the terminals S2/X1.

The input voltages on the measurement channels (L1/L2/L3) are continuously compared. If the input voltages are different for longer than approx. 2.5 s, a simultaneity error is triggered. This error is reset when all measurement channels simultaneously have input voltages that are above the voltage threshold U_{an} set.

The terminals S1/X1 are the feedback loop for monitoring externally connected contactors (EDM or contactor monitoring, N/C contact). If no external device monitoring is required, the terminals S1/X1 must be bridged, otherwise an error message is issued.

3.2 Control elements and status indicators

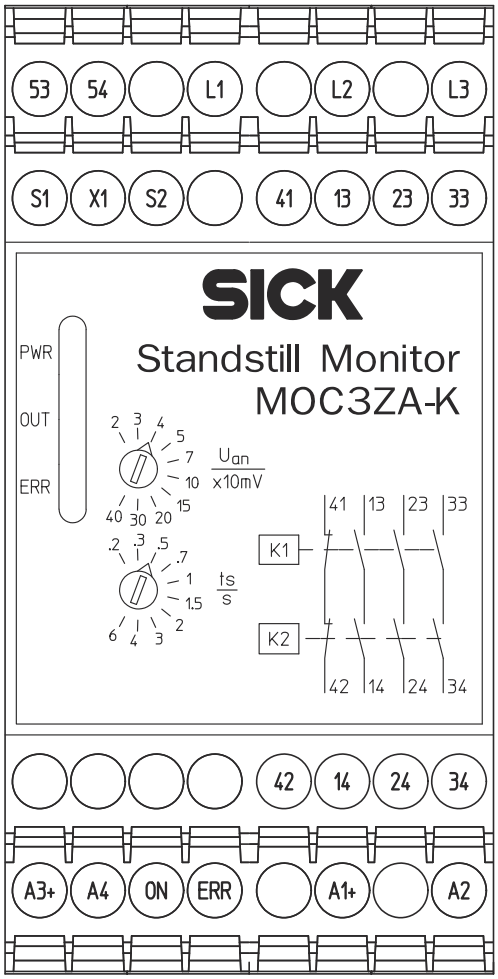

Figure 1: Control elements and status indicators of the Standstill Monitor MOC3ZA

Table 2: Status indicators

Display		Meaning
PWR	○	No supply voltage
	● Green	Supply voltage is present
	● Red	Internal device error
OUT	● Green	The outputs are released.
	☼ Green	Standstill time t_s elapsed
	● Yellow	The voltage on at least one of the measurement channels (L1/L2/L3) exceeds the voltage threshold U_{an}.
ERR	○	The device is operating correctly.
	● Red	Internal device error
	☼ Red	Error in the measurement circuit, error in the external device monitoring or excessively low supply voltage U_B

○ LED off. ☼ LED flashes. ● LED illuminates.

Table 3: Control elements

Control element	Function
Rotary switch U_{an}	Voltage threshold (U_{an}) setting for standstill detection
Rotary switch t_s	Standstill time (t_s) setting for enabling the safety contacts

3.3 Function of the Standstill Monitor

The supply voltage of the device is connected to the terminals A1/A2; the PWR LED lights up ● Green. In case of undervoltage, the safety outputs of the device are generally not enabled.

If the semiconductor application diagnostic outputs are used, a supply voltage (24 V DC) must also be connected to the terminals A3 and A4.

An electric motor connected to the measurement channels L1/L2/L3 generates an induced voltage due to the residual magnetism (remanence) as it coasts down (i.e. if the supply voltage to the motor is switched off); the magnitude of the voltage is proportional to the rotational speed of the motor.

This voltage is evaluated redundantly by the Standstill Monitor. For this purpose the measurement inputs L2 and L3 are used; L1 is a common reference point. If the voltage on both measurement inputs is below the voltage threshold U_{an} set, standstill is detected.

If the voltage drops below the voltage threshold U_{an}, the external device monitoring (EDM) S1/X1 is closed and the standstill time t_s has elapsed, the output relay switches on. The safety contacts 13/14, 23/24 and 33/34 close and the contact on 41/42 opens.

At the same time the signal relay is energized (signal contacts 53/54 close), the semiconductor output ON is switched on and the OUT LED illuminates ● Green. While the standstill time t_s elapses, the OUT LED flashes ☼ Green.

If the voltage measured on the measurement inputs L1/L2/L3 exceeds the value for U_{an} on one of the measurement channels (i.e. there is power flowing through the motor connected or it is running under mechanical action), the output relay is switched off immediately (the safety contacts 13/14, 23/24 and 33/34 open and the positively guided N/C contacts 41/42 close). The signal relay drops out (signal contacts 53/54 open), the semiconductor output ON switches off and the OUT LED illuminates ● Yellow (U_{an} exceeded).

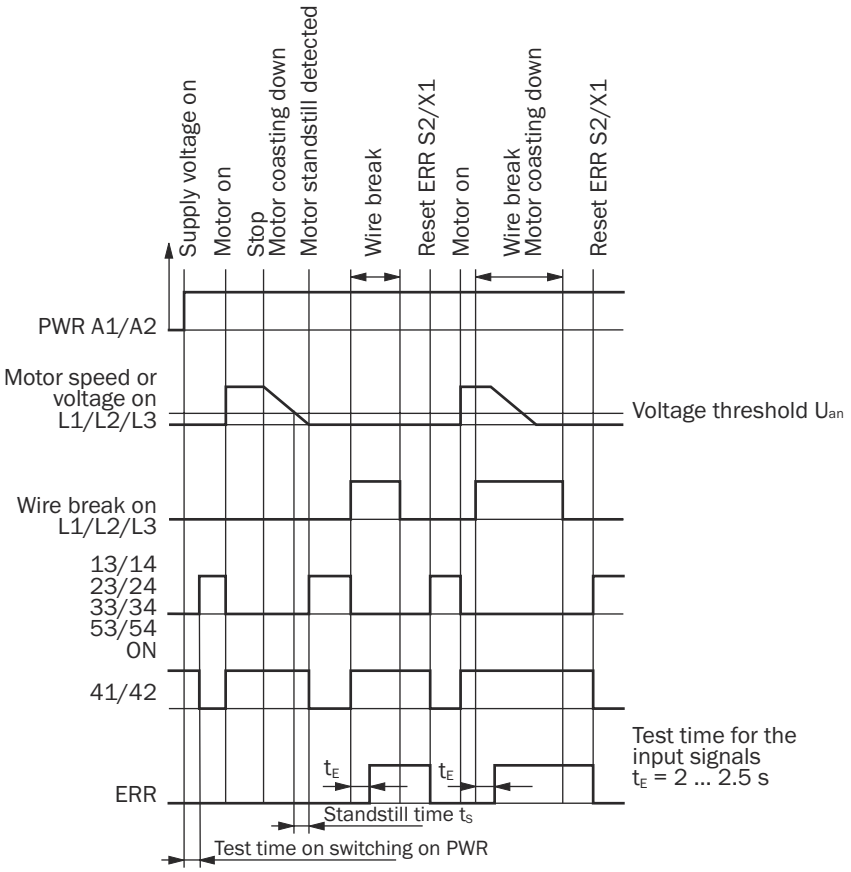

Figure 2: Function diagram

3.4 External device monitoring (EDM)

External device monitoring (EDM)

The static external device monitoring monitors whether the positively guided contactors have dropped out prior to enabling the output circuits. The N/C contacts for the external device monitoring are connected between S1 and X1.

Further topics

- "External device monitoring (EDM)", page 13
- "Device connection", page 21

4 Project planning

4.1 Manufacturer of the machine

The manufacturer of the machinery must carry out a risk assessment and apply appropriate protective measures. Further protective measures may be required in addition to the product.

The product must not be tampered with or changed, except for the procedures described in this document.

The product must only be repaired by the manufacturer of the product or by someone authorized by the manufacturer. Improper repair can result in the product not providing the expected protection.

4.2 Operating entity of the machine

Changes to the electrical integration of the product in the machine controller and changes to the mechanical mounting of the product necessitate a new risk assessment. The results of this risk assessment may require the entity operating the machine to meet the obligations of a manufacturer.

After each change to the configuration, it is necessary to check whether the protective measure provides the necessary protection. The person making the change is responsible for ensuring that the protection measure provides the necessary protection.

The product must not be tampered with or changed, except for the procedures described in this document.

The product must only be repaired by the manufacturer of the product or by someone authorized by the manufacturer. Improper repair can result in the product not providing the expected protection.

4.3 Integrating the equipment into the electrical control

4.3.1 External device monitoring (EDM)

The terminals S1/X1/S2 are not galvanically separated from the measuring circuit L1/L2/L3. The terminals must therefore be controlled using volt-free contacts. The insulation of the terminals must correspond to the insulation of the measuring circuit L1/L2/L3. Otherwise, safe functioning of the Standstill Monitor is not guaranteed.

If no external device monitoring is required, the terminals S1/X1 must be bridged.

The external device monitoring must be wired inside the control cabinet.

Further topics

- "External device monitoring (EDM)", page 12
- "Device connection", page 21

4.3.2 Operation with DC motors

Operation with DC motors

It is possible to use the Standstill Monitor for the detection of the standstill of DC motors if the motors generate a remanence voltage as they coast down. For this purpose connect the measurement input terminals as for a single-phase AC motor.

Complementary information

Since the remanence voltage of DC motors is usually a DC voltage signal, the MOC3ZA continuously reports an offset or wire breakage error at the LED ERR and at the semiconductor output ERR during operation and coastdown. All other functions are not affected. Bridge the terminals S2/X1 so that the saving of this error does not prevent the automatic release of the outputs at standstill.

Further topics

- "Error storage and deletion", page 28

4.3.3 Operation with electronic motor controllers

Operation with electronic motor controllers

It is possible to use the Standstill Monitor for the detection of the standstill of motors with electronic motor controllers (e.g. frequency converters, brake modules), if the latter do not supply any output voltage in case of motor standstill (i.e. in the case of frequency inverters there must not be, e.g., any position control and in the case of brake modules the brake voltage must be switched off).

If the frequency inverter supplies a DC offset or if there is braking with a DC voltage, then during this time an offset or wire break error will be signaled on the ERR LED and on the semiconductor output ERR.

This error can be reset automatically by switching off the supply voltage for a short time or by a jumper between the terminals S2/X1.

Complementary information

In the case of operation with frequency converters, it may be necessary to use screened measurement connection cable to the motor; the screen must be connected to the motor.

4.3.4 Motors with switched windings

Motors with switched windings

In the case of motors with switched windings (e.g. star-delta switching, direction of rotation reversal, pole switching) note that the measurement inputs L1/L2/L3 on the Standstill Monitor must always be connected to the motor windings for the detection of the standstill, otherwise the error message “wire break” will prevent the enable of the outputs.

In the case of a three-phase connection to a motor with star-delta switching, e.g., after shutting down the motor the star contactor must be switched on so that the connection of L1/L2/L3 via the motor windings is ensured.

If switching on the star contactor after switching off the motor is not possible or not desired, connect the measurement inputs of the MOC3ZA directly to one of the motor windings in single-phase mode (see "Connecting the measurement inputs directly to a motor winding in single-phase mode", page 15).

The same applies to motor circuits with direction of rotation reversal or pole switching. In this case a renewed safety assessment may need to be undertaken.

If the motor windings are switched over when the MOC3ZA is connected in three-phase mode and the resulting interruptions of the measuring circuit last longer than 2 s, the Standstill Monitor detects a wire breakage fault. To ensure this error does not remain stored when the changeovers are completed, error storage should be deactivated by bridging the terminals S2/X1.

Further topics

- "Error storage and deletion", page 28

4.3.4.1 Connecting the measurement inputs directly to a motor winding in single-phase mode

Approach

1. Connect the bridged terminals L2/L3 to one end of the motor winding.
2. Connect L1 to the other end of the same motor winding.

4.3.5 Connection diagrams

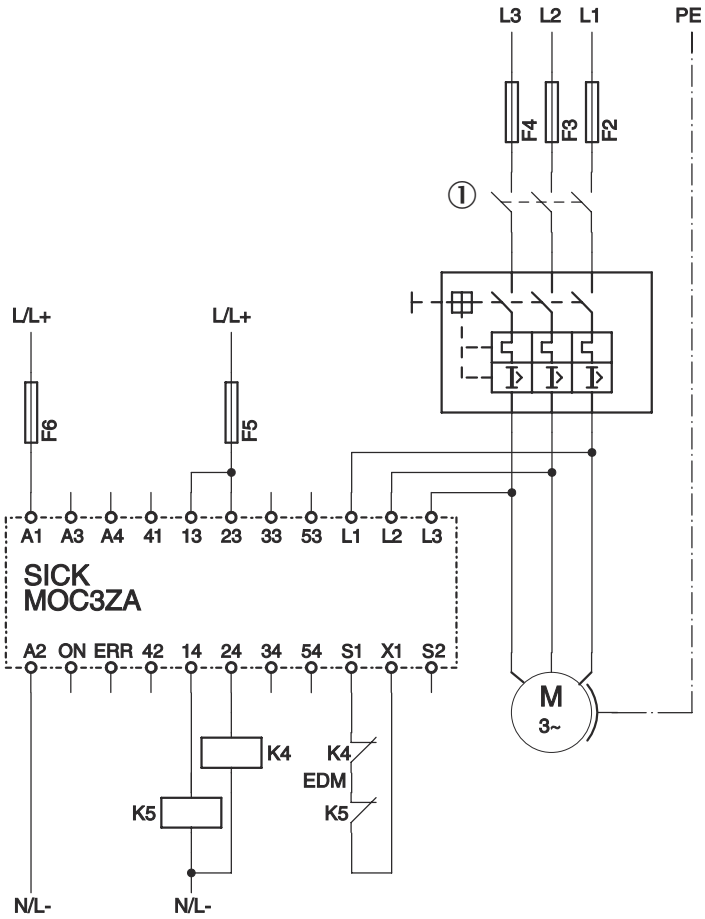

Figure 3: Connection of the MOC3ZA to a three-phase motor

① Motor contactor

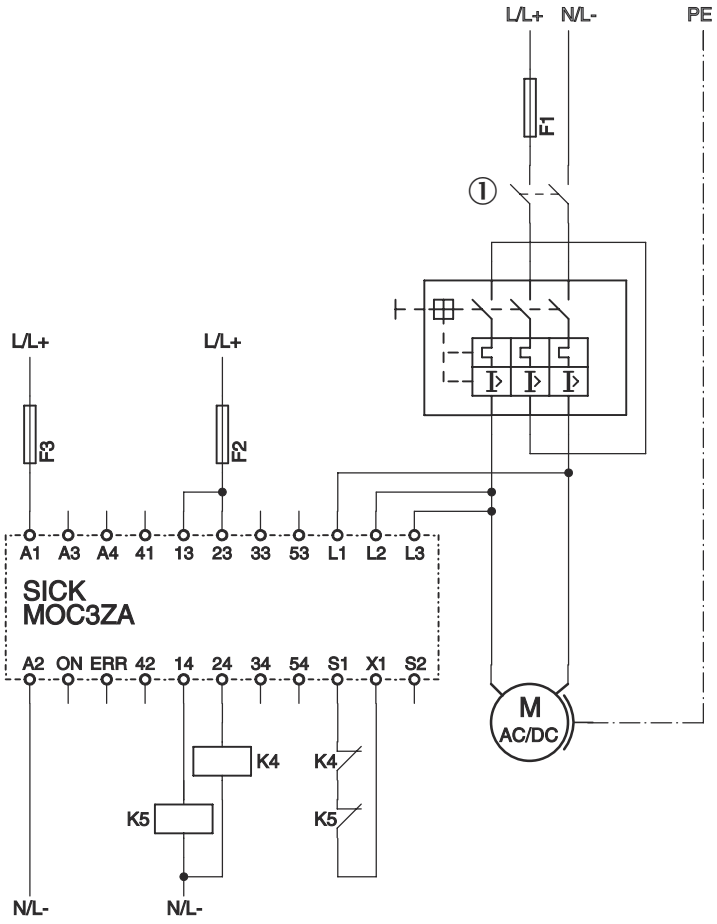

Figure 4: Connection of the MOC3ZA to a single-phase motor/DC motor

① Motor contactor

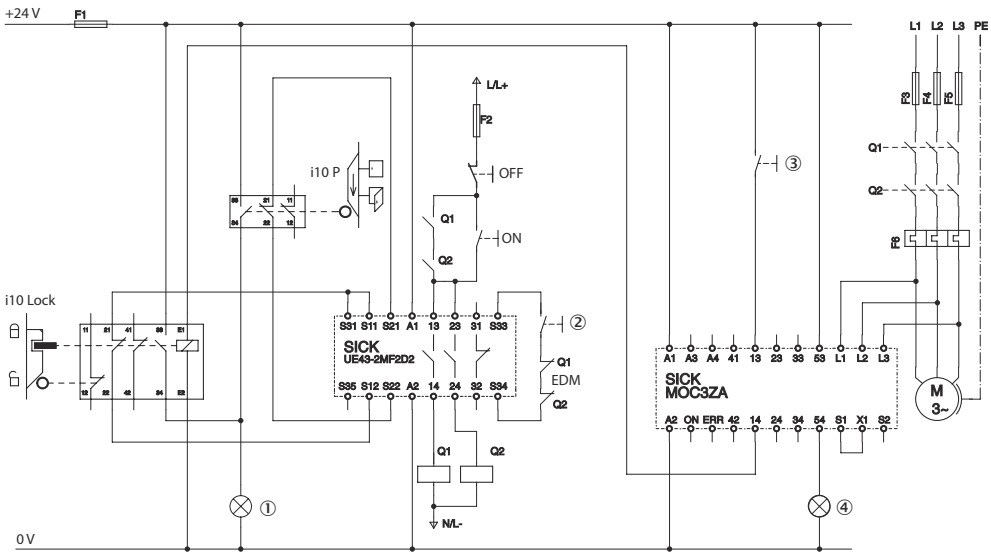

Figure 5: Guard unlocking with standstill detection

① Unlocking
② Reset
③ Unlocking
④ Standstill

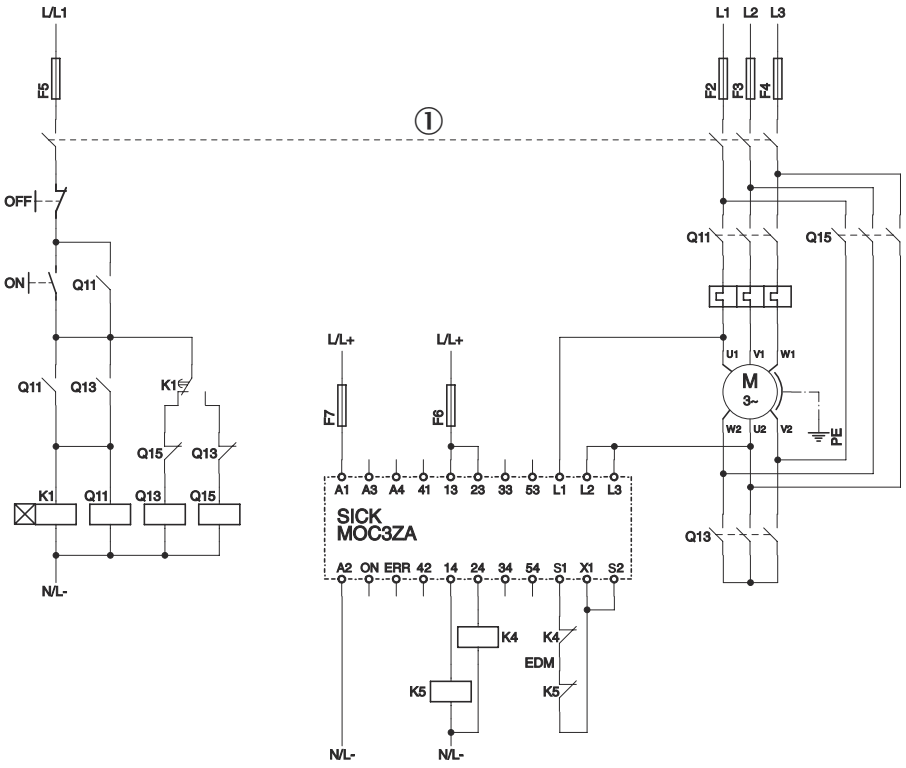

Figure 6: Star-delta circuit with timer relay and MOC3ZA

① Main switch

4.4 Testing plan

The manufacturer of the machine and the operating entity must define all required thorough checks. The definition must be based on the application conditions and the risk assessment and must be documented in a traceable manner.

The following tests must be planned:

- A thorough check must be carried out during commissioning and following modifications.
- The regular tests of the device must fulfill certain minimum requirements.

4.4.1 Planning the thorough check during commissioning and in certain situations

Overview

Before commissioning the machine and after making changes, you must check whether the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

Minimum requirements

The device and its application must be thoroughly checked in the following situations:

- Before commissioning
- After changes to the safety function
- After changes to the mounting or the electrical installation
- After exceptional events, such as after manipulation has been detected, after modification of the machine, or after replacing components

The thorough check ensures the following:

- All relevant regulations are complied with and the device is effective in all of the machine's operating modes.
- The documentation accurately reflects the state/condition of the machine, including the protective device.

The thorough checks must be carried out by qualified safety personnel or specially qualified and authorized personnel, and must be documented in a traceable manner.

Recommended thorough checks

- Using the checklist in the appendix, check that the protective device on the machine is effective in all the operating modes that can be selected on the machine.
- Ensure that all operators have been instructed by the qualified safety personnel before they start working on a machine protected by a Standstill Monitor. This instruction and the written documentation are the responsibility of the machine operator.
- Checking the relevant items on the checklist.

Further topics

- "Checklist for initial commissioning and commissioning", page 41

4.4.2 Planning the regular thorough check

Overview

The purpose of regular tests is to identify any defects due to changes or external influences (e.g. damage or manipulation) and to ensure that the protective measure provides the necessary protection.

Minimum requirements

The following thorough checks must be carried out at regular intervals:

- Check the device for signs of misuse or manipulation
- Check the effectiveness of the mounted Standstill Monitor
- Check the safety function

Checking the effectiveness of the mounted Standstill Monitor:

1. Switch off the motor and allow it to coast down.
2. Check whether the configured values for U_{an} and t_s are still identical to the values determined and documented during commissioning.
3. Check that the MOC3ZA does not enable the output circuit until the time t_s you have specified and documented has elapsed.

5 Mounting

5.1 Mounting the Standstill Monitor

Prerequisites

- The control cabinet or the mounting housing for the MOC3ZA must fulfill an enclosure rating of at least IP 54.
- The MOC3ZA is protected against manipulation, e.g., by a locked control cabinet.
- The device is mounted according to EN 50274.
- Mounting on a 35 mm × 7.5 mm mounting rail in accordance with IEC 60715.
- The module is enclosed in a 45 mm wide housing.

Approach

▶ Hang the module onto the mounting rail from above.
▶ Lightly press down the module so it snaps onto the standard rail.

5.2 Removing the Standstill Monitor

Approach

▶ Remove the pluggable terminal blocks along with the wiring and end pieces.
▶ Release the interlocking integrated into the housing and detach the device from the mounting rail.

5.3 Plug-in terminal blocks

There are various connection options available for the Standstill Monitor:

- Plug-in terminal blocks with spring terminals
- Plug-in terminal blocks with screw type terminals

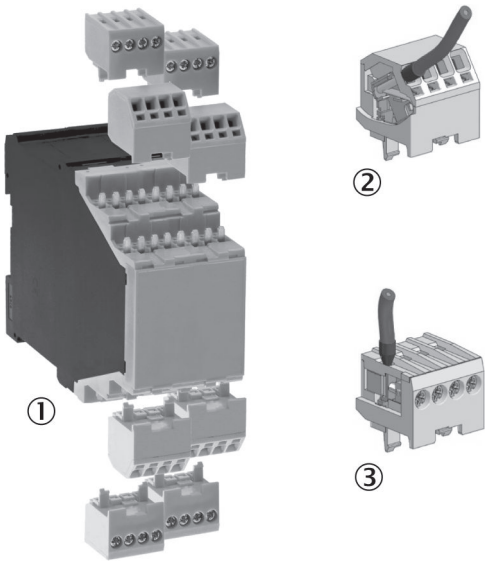

Figure 7: Connection options with plug-in terminal blocks

① MOC3ZA
② Connection block with spring terminals (PC or Plugin Cageclamp)
③ Connection block with screw type terminals (SC or Plugin Screw)

5.4 Removing the pluggable terminal blocks

Important information

NOTE

When removing the terminal blocks, note the correct assignment of the connections.

Ensure the disconnected terminal blocks are always reconnected to the correct slot. You can ensure this, for example, by clearly labeling the terminal blocks.

Approach

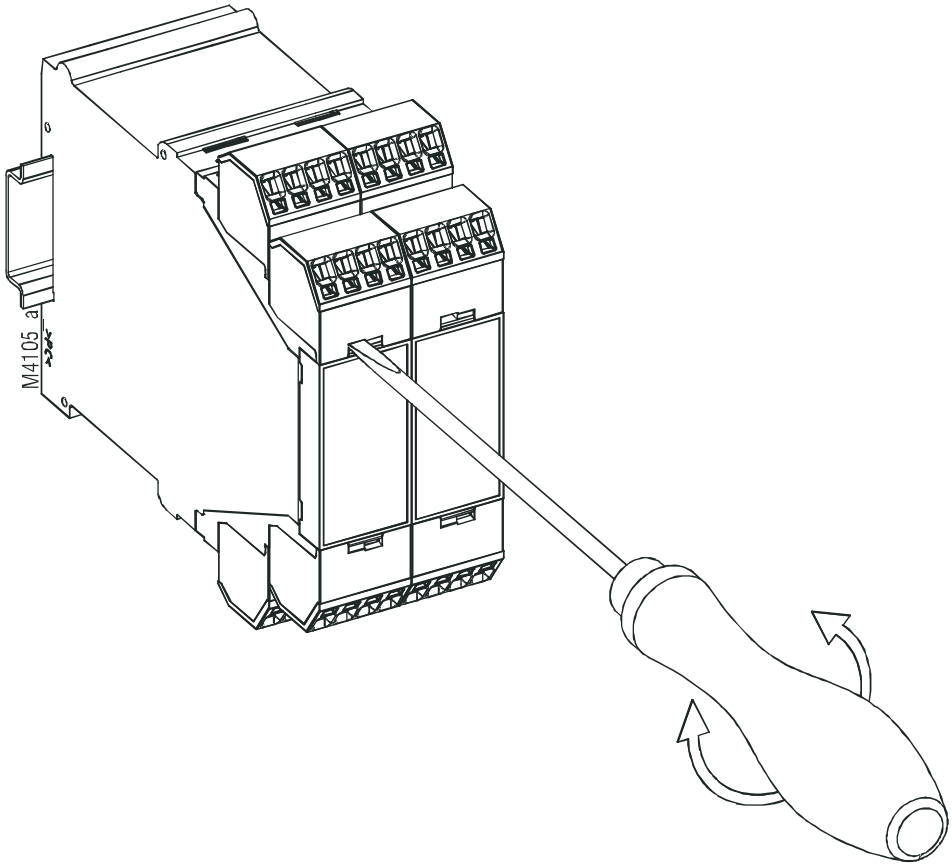

Figure 8: Removal of the pluggable terminal blocks

1. Disconnect the device from the voltage.
2. Push the screwdriver into the recess at the front between the terminal block and the front panel.
3. Turn the screwdriver around its longitudinal axis.

6 Electrical installation

6.1 Device connection

Important information

WARNING
The signal contacts 53/54, ON and ERR are only used for signaling purposes and may not be used for safety circuits.

▶ Do not use the outputs 53/54, ON or ERR for safety purposes.

Prerequisites

- Mounting is completed.
- Electrical installation is carried out according to the project planning.
- Dangerous condition of the machine is and remains off during the electrical installation.
- In the control cabinet, the power components (electric drives, valve controls, mains regeneration, etc.) and control components (PLC, auxiliary relays, etc.) are spatially separated.
- The power supply unit is able to jumper a brief power failure of 20 ms as specified in IEC 60204-1.
- The voltage supply for DC devices (A1/A2) and the A3/A4 connection comply with the regulations for extra-low voltages with safe isolation according to EN 60664 and EN 50178.
- If the outputs are connected to a capacitive or inductive load, a suitable suppressor is used to protect the connected load against overloading of the switching contacts.

Pin assignment

Table 4: Pin assignment of the terminals

Terminal	Description
L1/L2/L3	Measurement channels, connections to the motor
41/42	Positively guided N/C contacts
13/14, 23/24, 33/34	Safety contacts (normally open)
53/54	Signaling contacts for the switching state of the outputs (non-safety, normally open)
S1/X1	Connection for feedback circuit (External device monitoring, EDM)
S2/X1	Deletion of errors caused externally
A1 (+U_B)/A2 (GND)	Supply voltage (PWR) of the device
A3 (+U_B)/A4 (GND)	Supply voltage for the semiconductor outputs
ON	Semiconductor application diagnostic output for output state of the safety contacts
ERR	Semiconductor application diagnostic output for error message

Connecting the supply voltage A1/A2

▶ Connect the supply voltage according to the voltage specification on the type label.
▶ Limit the supply voltage using an external fuse.

Connecting the measurement inputs L1/L2/L3

- Connect the measurement inputs L1/L2/L3 directly to the windings of the motor to be monitored for standstill (i.e. not via transformers, for example) to ensure continuous monitoring of the windings and the supply cable for wire breakage.
- Do not disconnect the motor windings from the measurement input cables by means of motor contactors or the like otherwise a wire breakage error will be triggered and no standstill detection is possible.
- Avoid interference coupling to the measurement input cables, otherwise the MOC3ZA may not be able to detect a standstill.
- If necessary, lay the measurement input cables separately or shielded. The shield can be connected to the motor.
- Take into consideration the measures for reducing emitted interference recommended by the drive or motor manufacturer, e.g., the use of shielded cables, chokes and filters.
- If you use frequency inverters and servo drives, the installation and mounting instructions of the manufacturers must be observed with regard to cable shielding, filtering and interference suppression measures.

Connecting the semiconductor application diagnostic outputs ON/ERR

- When using the non-safe semiconductor application diagnostic outputs, a supply voltage must be connected to A3/A4 and protected by an external fuse.
- Connect the supply voltage to A3/A4.
- Protect the supply voltage using an external fuse.

Complementary information

To protect the safety outputs, it is recommended to protect the safety contacts with a fuse as well. To increase the service life, the external loads must be equipped with varistors or RC circuits, for example. It should be noted that the response times may be extended depending on the type of suppressor.

Further topics

- "Integrating the equipment into the electrical control", page 13
- "Data sheet", page 33

6.1.1 Internal circuitry

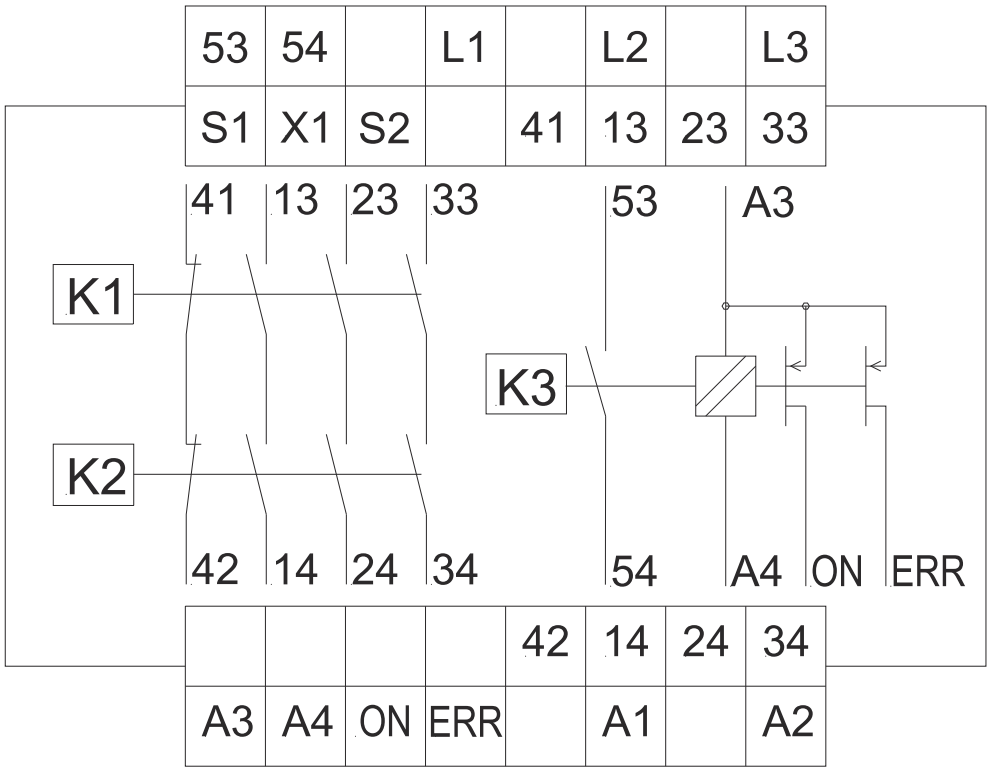

Figure 9: Internal circuitry MOC3ZA

7 Commissioning

7.1 General acceptance

Prerequisites

- Ensure there is no person in the hazardous area before commissioning.
- Only qualified personnel with the appropriate training are to carry out the general acceptance procedure.

Approach

▶ Check whether the connection of the components complies with the required safety-related parameters.
▶ Unambiguously mark all connecting cables and plug connectors on the MOC3ZA to avoid confusion.
▶ Completely verify the safety function (e.g. error simulation). Please pay attention to the response times.

7.2 Commissioning

Prerequisites

- You may only start operating the system when the general acceptance was successful.
- Before you operate a system protected by the Standstill Monitor for the first time, make sure that the system is first checked and released by qualified safety personnel.
- Ensure there is no person in the hazardous area before commissioning.

Approach

Preparation for commissioning

▶ Ensure the motor to be monitored is stationary.
▶ Check all connections. Pay particular attention to ensuring the connection of L1/L2/L3 has been made to suit the application.
▶ Check the wiring of the terminals S1/X1.
▶ In case of DC motors check whether a jumper is fitted to S2/X1.
▶ Set U_{an} to the minimum value (e.g. 20 mV).
▶ Set t_s to the minimum value (0.2 s).

Commissioning

1. Apply the supply voltage to A1/A2.

✓ After 1 s, the PWR and OUT LEDs must light up ● Green and the output circuit must be enabled.
If the standstill is not detected (OUT LED lights up ● Yellow), this may be due to an interference voltage at the measurement input.
  - Screen the measurement input cables.
  - Gradually increase the voltage threshold U_{an} until the OUT LED lights up ● Green.

2. Start the motor.

✓ The OUT LED changes color to ● Yellow. The output circuit switches off. For DC motors, after 2 s the ERR LED flashes ☼ Red with error code 2 and the semiconductor output ERR switches on.

3. Switch off the motor and allow it to coast down. The OUT LED must only light up ● Green again and the output circuit be enabled at the next standstill of the motor.

4. Document the U_{an} and t_s values you determined and set.
5. Protect the values you have set for U_{an} and t_s against manipulation, e.g., by means of a locked control cabinet.

Complementary information

- The standstill time (delay between the voltage dropping below the voltage threshold and the switching on of the safety-related output relay) can be set using the rotary switch t_s.
- In case or uneven and very slow coasting down, it may be necessary to set the standstill time t_s to a larger value to prevent alternating switching on and off of the output relay. To avoid this effect, the voltage threshold U_{an} can also be set a little higher. In this case a renewed safety assessment should be undertaken taking into account the higher voltage threshold U_{an}.
- If the enable is only to be provided at very low motor rotational speeds, then set U_{an} to the minimum value. Possible alternating switching on and off of the output relay can be avoided with a higher setting of t_s. With a longer delay until the output relay is enabled, you can also ensure that the safety relay is only switched when the motor is at an absolute standstill, depending on the coasting down behavior of the motor. This statement applies in particular for motors that generate a relatively low remanence voltage.
- In the case of a slow coastdown, a simultaneity error may occur if the voltage only slowly falls below the voltage threshold U_{an} and not within 2.5 s simultaneously by both measurement channels. See also "Simultaneity of the measured signals", page 27
- If the time the motor takes to coast down is short, then set ts to the minimum value (0.2 s). This setting is advantageous for shortening machine cycles in automatic systems.
  Set U_{an} and t_s such that the standstill enable is only provided once a hazard for people and material due to the rotation of the motor is excluded.

7.3 Check during commissioning and modifications

The thorough check is intended to ensure that the safety functions are fulfilling their planned purpose and whether persons are being adequately protected.

▶ Carry out the checks specified in the test plan of the manufacturer of the machine and the operating entity.

8 Troubleshooting

8.1 In the event of faults or errors

WARNING
Cease operation if the cause of the malfunction has not been clearly identified!

Stop the machine if you cannot clearly identify or allocate the error and if you cannot safely rectify the malfunction.

- ▶ Check whether the Standstill Monitor only switches after the time t_s you determined and documented has elapsed.
- ▶ After rectifying a fault, perform a complete function test.

8.2 Error monitoring

The Standstill Monitor has various functions for error detection. These functions are run both on switching on the supply voltage and also cyclically during operation. If an error is detected, then the device switches off the output circuit, the ERR and PWR LEDs indicate the type of error state, and the semiconductor output ERR is switched on until the error has been rectified and deleted.

The device differentiates between two types of error:

- Internal error: ERR LED is illuminated ● Red.
- Errors caused externally: ERR LED flashes ☼ Red. The type of error is indicated by various error codes.

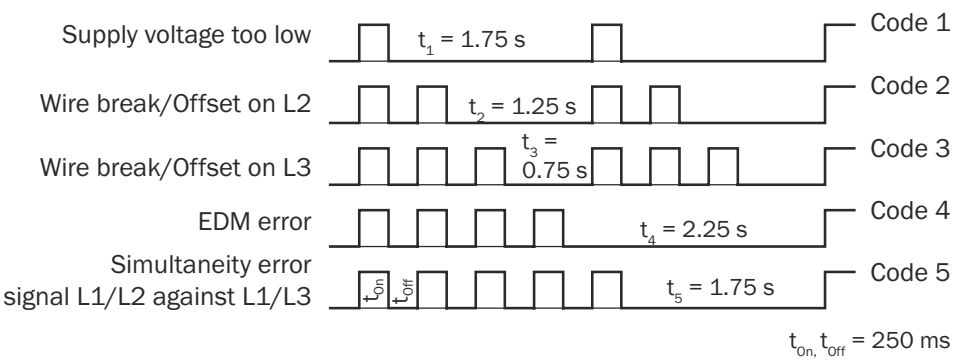

Figure 10: Error codes on the ERR LED in order of priority

A sequence of flashes is output cyclically with the illumination of the LED from one to five times, followed by a longer pause. The error code indicates the type of the error. If there are several errors at the same time, then only the error with the highest priority (i.e. with the lowest error code) is indicated. After this error has been rectified, the remaining errors are indicated as a function of their priority.

8.2.1 Internal errors

Internal errors are saved independent of the wiring of input S2 (EDM), the output circuit is switched off immediately and the semiconductor output ERR is switched on. The ERR LED illuminates ● Red and the PWR LED changes color from ● Green to ● Red.

Examples of the internal device errors detected are:

- Error on the safety output relay (e.g. welded contacts)
- Internal error on the measurement channels and the sampling
- Internal error on the operation of the safety-related output relay
- Error on the rotary switches for U_{an} and t_s

8.2.2 Wire break/offset

Wire break/offset

The cables for the measurement inputs L1/L2/L3 to the motor are continuously monitored for wire break and for a DC offset greater than U_{an}.

In case of a wire break or offset error, the output circuit is immediately switched off and the OUT LED illuminates ● Yellow.

In addition, an error message is output with a delay (in case of a wire break after 2 s, in case of an offset error after 8 s): The semiconductor output ERR switches on and the ERR LED flashes ☼ Red with the error code 2 or 3, depending on whether the open circuit or the offset has occurred between L1 and L2 or between L1 and L3.

The error message for wire break/offset can either be saved or automatically reset after error rectification.

Further topics

- "Error storage and deletion", page 28

8.2.3 EDM error

EDM error

The error message "EDM" occurs if there is no connection between the terminals S1 and X1 when the output circuit is not enabled: The semiconductor output ERR is switched on and the LED ERR flashes ☼ Red with error code 4.

Even if both measurement inputs then have signals < U_{an} and there is no other error apart from the missing connection between S1 and X1, the “EDM” error is retained and the output circuit is not enabled.

If the connection between S1 and X1 (EDM) is now closed and the storage of the external errors is not activated, the output circuit is enabled.

The error message for an EDM error can either be saved or automatically reset after error rectification.

Further topics

- "Error storage and deletion", page 28

8.2.4 Simultaneity of the measured signals

Simultaneity of the measured signals

As a further safety function the signals on both measurement channels are continuously compared (L2 against L1 and L3 against L1). In this way the internal failure of a measurement channel can be detected at an early stage.

If the signals on the measurement channels differ in relation to the voltage threshold set for longer than 2.5 s (one measurement channel > U_{an} and the other < U_{an}), then a simultaneity error is signaled: The semiconductor output ERR switched on and the ERR LED flashes ☼ Red with the error code 5.

If then also the measurement channel that had supplied signals > U_{an}, has not provided any further signals (measurement input voltage drops to < U_{an}), the simultaneity error remains nevertheless saved, i.e. the output relays are switched off.

A simultaneity error is only reset once simultaneous signals > U_{an} are detected again on both measurement channels. If then the signals on both measurement channels again (simultaneously) drop to < U_{an}, the output relays are energized again

Complementary information

If the simultaneity error occurs frequently on the motor coasting down, e.g. with slow coasting down, then you can solve this problem with the following measures:

- ▶ Set the voltage threshold U_{an} higher.
- ▶ Connect the measurement circuit to the motor using a single-phase configuration instead of a three-phase configuration.
- ▶ If necessary undertake a new safety assessment.

8.2.5 Error storage and deletion

Important information

WARNING
The storage of the external errors “wire break/offset” and “external device monitoring” is not designed for safety-related purposes. During the safety assessment you must therefore assume the automatic deletion of these error messages after the rectification of the related error.

- ▶ Do not use the storage of external errors for safety purposes.

Error storage and deletion

In the case of errors caused externally, “wire break/offset” and “EDM”, the user can choose whether the error messages remain saved after the rectification of the error or are automatically deleted:

- S2/X1 open: Errors remain saved
- S2/X1 jumpered: Errors deleted

Complementary information

The infrequently occurring internal device errors (e.g. due to temporary faults) can be deleted by switching off and on again the supply voltage. If it is not possible to delete this type of internal error despite re-applying the supply voltage with the correct magnitude, there may be a fault in the device. In this case return the device for checking and repair.

8.3 Fault indicators

Fault indicators

Table 5: Fault indicators

Display	Error	Troubleshooting
PWR ●Green OUT ●Green ERR ○	The device enables the outputs even though the motor is running.	▶ Reduce the voltage threshold U_{an} if necessary to the minimum value. ▶ Check the wiring of the measurement inputs.
PWR ●Green OUT ●Green ERR ○	The device enables the outputs too early (motor is not yet fully at standstill).	▶ Reduce the voltage threshold U_{an}. ▶ If necessary increase the standstill time t_s (delay time to enable).
PWR ○	The device does not enable the outputs even though the motor is fully at a standstill.	Undervoltage error or internal device error ▶ Disconnect the supply voltage to the MOC3ZA for at least 3 seconds. ▶ Replace the device if the problem persists.

Display	Error	Troubleshooting
PWR ●Green ERR ☼Red with code 1	The device does not enable the outputs even though the motor is fully at a standstill.	Undervoltage error ▶ Check the supply voltage.
PWR ●Green or OUT ☼Green/ yellow	The device does not enable the outputs even though the motor is fully at a standstill.	Standstill has been detected, but the delay time t_s has not elapsed yet. ▶ Wait until t_s has elapsed. If the outputs are not enabled after 6 s at the latest, then the measurement inputs L1/L2/L3 are probably occasionally detecting voltage spikes greater than the U_{an} set. These voltage spikes can be detected by the OUT LED flashing ☼ Green/yellow (i.e. illuminated green and flashing yellow sporadically). ▶ In this case set U_{an} higher. ▶ If necessary, eliminate any interference at the measurement inputs (for example by using a shielded cable).
PWR ●Green OUT ○ ERR ☼Red with code 2 or 3	The device does not enable the outputs even though the motor is fully at a standstill.	A previous wire breakage or offset error at L2 or L3 is still stored (terminals S2/X1 are not bridged). ▶ Bridge the terminals S2/X1 (error storage disabled). See also "Wire break/offset", page 27
PWR ●Green OUT ○ ERR ☼Red with code 4	The device does not enable the outputs even though the motor is fully at a standstill.	The external device monitoring (EDM, contacts S1/X1) is not closed or a previous EDM error is still stored (terminals S2/X1 are not bridged). ▶ Close the external device monitoring (EDM). ▶ Bridge the terminals S2/X1 (error storage disabled). See also "EDM error", page 27
PWR ●Green OUT ○ ERR ☼Red with code 5	The device does not enable the outputs even though the motor is fully at a standstill.	Simultaneity error on measured signals on L2 and L3. How to reset the error: ▶ Disconnect the supply voltage to the MOC3ZA for at least 3 seconds. ▶ The simultaneity error will be automatically reset when the motor starts again (both measurement inputs L2 and L3 simultaneously receive measured signals greater than U_{an}). If the simultaneity error is still present: ▶ Check the wiring of the measurement inputs L1/L2/L3. See also "Simultaneity of the measured signals", page 27

Display	Error	Troubleshooting
PWR ●Green OUT ●Yellow ERR ○	The device does not enable the outputs even though the motor is fully at a standstill.	The voltage on the measurement inputs is greater than the voltage threshold U_{an} set. If the ERR LED continues to remain off after waiting 8 s, the problem is probably interference or residual voltage (coupled AC) on the measurement inputs. ▶ Increase the voltage threshold U_{an}. If the error is still present or if it is undesirable to increase U_{an}: ▶ Reduce the coupling of interference onto the cables on the measurement inputs L1/L2/L3, e.g. using screening, by shortening the cables or laying them separately. ▶ To do so, carry out the following test: If you short-circuit the terminals L1/L2/L3 when the motor is not energized, the OUT LED must go out.
PWR ●Green OUT ●Yellow ERR ☼Red with code 2 or 3	The device does not enable the outputs even though the motor is fully at a standstill.	Wire break between the measurement inputs L1 and L2 or L1 and L3 or DC offset between L1/L2 and L1/L3 ▶ Check the wiring from measurement inputs L1/L2/L3 to the motor windings for an open circuit. See also "Motors with switched windings", page 14. Once errors due to open circuits on the measurement channels have been excluded, then the error may be caused by a DC offset > U_{an}. This problem may be due to incompletely shut down electronic controllers such as frequency inverters or brake modules that are still supplying a DC element to the measurement circuit (possibly check with a voltmeter). ▶ Increase the voltage threshold U_{an} (OUT LED must extinguish). Or: ▶ Shut down the electronic motor controller such that the motor standstill is detected correctly. See also "Wire break/offset", page 27
PWR ●Red OUT ○	An error message is displayed while the motor is running.	An internal device error has occurred. ▶ Disconnect the supply voltage to the MOC3ZA for at least 3 seconds. ▶ Replace the device if the problem persists.

Complementary information

When operating DC motors, it is normal for the ERR LED to flash with error code 2 or 3 while the motor is running. If the terminals S2/X1 are bridged (error storage not active), the error message is automatically reset at motor standstill and the outputs are enabled. This also applies when using electronic motor actuators, e.g., if they generate a DC voltage during the braking phase.

Further topics

- "Control elements and status indicators", page 10
- "Error storage and deletion", page 28

9 Decommissioning

9.1 Disposal

Approach

- Always dispose of unusable devices in accordance with national waste disposal regulations.

Complementary information

SICK will be glad to help you dispose of these devices on request.

10 Technical data

10.1 Data sheet

Electrical data

Table 6: Supply voltage (A1/A2)

	Minimum	Typical	Maximum
Supply voltage U_B (A1/A2)[1)]	See type label		
+ 24 V DC	21.6 V DC	+ 24 V DC	28.8 V DC
230 V AC	184 V AC	230 V AC	253 V AC
400 V AC	320 V AC	400 V AC	440 V AC
Voltage range (for UL-508 applications only)			
24 V DC devices (a CLASS 2 voltage supply must be used)	21.6 V DC		26.4 V DC
230 V AC devices	196 ´ V AC		253 V AC
400 V AC devices	340 V AC		440 V AC
Power consumption			
+ 24 V DC			4 W
230 V AC			6 VA
400 V AC			10 VA
Recommended protection	According to the maximum power consumption		
Frequency range (AC)	45 Hz	50/60 Hz	65 Hz
Max. residual ripple (DC)	10 %		
Switch-on delay of the output relays after applying the supply voltage (stationary motor)	0.4 s	0.6 s	0.8 s
	Value + configured standstill time t_s		

Table 7: Supply voltage (A3/A4)

	Minimum	Typical	Maximum
Supply voltage U_B (A3/A4)	11 V DC	+ 24 V DC	30 V DC
Recommended protection	0.5 A		
Max. residual ripple (DC)	10 %		

Table 8: Measurement inputs (L1/L2/L3)

	Minimum	Typical	Maximum
Measurement/motor voltage For UL-508 applications only		400 V AC	690 V AC 600 V AC
Input resistors	500 kΩ		
Voltage threshold U_{an}	20 mV ... 400 mV, adjustable		
Downtime t_s	0.2 ... 6 s, adjustable		
Hysteresis (for detecting when the motor is running)	100 %		
Response time			100 ms

1) To meet the requirements of the relevant product standards (e.g., IEC 61496-1), the external voltage supply for the devices must be able to bridge a brief mains failure of 20 ms. Suitable power supply units are available as accessories from SICK.

Table 9: Frequency dependence of the response value

Input frequency (Hz)	50	100	200	400	600	1 k	1.5 k	2 k
Multiplier for U_{an}	1.0	1.1	1.2	1.5	2.0	2.8	5	8

Table 10: Safety outputs: Normally open contacts (13/14, 23/24, 33/34), positively guided normally closed contacts: normally closed contacts (41/42)

	Minimum	Typical	Maximum
Contacts provided (safety contacts)	3 N/O contacts, 1 N/C contact		
Contact type	Relay, positively guided		
Rated switching voltage	250 V AC		
Thermal current I_{th}	10´ mA		5 A (up to 40 °C)
Sum of the squared currents	see figure 11, page 36		
Breaking capacity according to AC 15			
N/O contact	3 A/230 V AC (EN 60947-5-1)		
Normally closed	1 A/230 V AC (EN 60947-5-1)		
Breaking capacity according to DC 13			
N/O contact / N/C contact	1 A/24 V DC (EN 60947-5-1) 4 A/24 V at 0.1 Hz (EN 60947-5-1)		
Switching capacity (for UL-508-applications only)			
Ambient temperature 40 °C	Pilot duty B300 5 A 250 V AC G. P. 5 A 24 V DC		
Ambient temperature 60 °C	Pilot duty B300 2 A 250 V AC G. P. 2 A 24 V DC		
Protection of the safety contacts	Max. fuse 5 A gL (up to 40 °C, see figure 11, page 36) Max. fuse 4 A gL Circuit breaker C6A		
Maximum switching frequency	1200 /h		
Contact service life at 230 V/5 A AC cos φ = 1	≥ 2 × 10^5 switching operations		
Mechanical service life	≥ 50 × 10^6 switching operations		

Table 11: Application diagnostic outputs (non safety)

	Minimum	Typical	Maximum
Semiconductor application diagnostic outputs (ON, ERR)	Galvanically isolated supply via A3/A4 I_{max} = 100 mA (short-circuit protected) ON for enable, ERR for error		
Signaling contacts 53/54 (normally open)	3 A/250 V AC G. P.		

General data

Table 12: General data

	Minimum	Typical	Maximum
Ambient operating temperature	– 25 ... + 60 °C		
Storage temperature	– 40 ... + 75 °C		
Clearance and creepage distances			
Rated surge voltage/ degree of contamination	According to EN 60664-1		
Contacts 13/14, 23/24, 33/34, 41/42 to the rest	6 kV/2		
Contacts 13/14, 23/24, 33/34, 41/42 to each other	4 kV/2		

	Minimum	Typical	Maximum
Signaling contacts 53/54 to the rest	4 kV/2		
Semiconductor outputs A3/A4/ON/ERR to the rest	6 kV/2		
Supply voltage A1/A2 to the rest at AC supply voltage	6 kV/2 (EN 60947-5-1)		
Supply voltage A1/A2 to the rest at DC supply voltage	4 kV/2 (EN 60947-5-1)		
Supply voltage A1/A2 to the rest for control terminals S1/X1/S2	No galvanic separation of L1/L2/L3		
EMC			
Static discharge (ESD)	8 kV (air discharge) (EN 61000-4-2)		
HF interference	20 V/m (EN 61000-4-3)		
Fast transients	2 kV (EN 61000-4-4)		
Surge voltages between measurement inputs L1/L2/L3	2 kV (EN 61000-4-5)		
Supply cables A1/A2 at AC – U_B	2 kV		
Supply lines A1/A2 at 24 V DC	1 kV (EN 61000-4-5)		
Supply cables A1/A2 HF cable bound	10 V (EN 61000-4-6)		
Radio interference suppression	Class B limit (EN 55011)		
Enclosure rating			
Housing	IP 40 (EN 60529)		
Terminals	IP 20 (EN 60529)		
Housing	Thermoplastic with V0 behavior (UL subject 94)		
Vibration resistance	Amplitude 0.35 mm 10 ... 55 Hz (EN 60068-2-6)		
Climatic resistance	25/060/04 (EN 60068-1)		
Cable connections	DIN 46228-1/-2/-3/-4		
For UL-508 applications only	Only 60 °C copper strands		
Terminal blocks pluggable with screw terminals			
Max. connection cross section	• 1 × 2.5 mm^2 solid or • 1 × 2.5 mm^2 stranded wire with sleeve and plastic collar		
For UL-508 applications only	• AWG 20-14 solid, torque 0.8 Nm or • AWG 20-18 stranded wire, torque 0.8 Nm		
Stripping of the conductor or sleeve length	8 mm		
Terminal blocks pluggable with spring terminals			
Max. connection cross section	• 1 × 4 mm^2 solid or • 1 × 2.5 mm^2 stranded wire with sleeve and plastic collar		
Min. connection cross section	0.5 mm^2		
For UL-508 applications only	AWG 20-12 solid/stranded		
Stripping of the conductor or sleeve length	12 mm (± 0,5 mm)		

	Minimum	Typical	Maximum
Conductor fastening	Captive plus-minus terminal screws M3.5 box terminal with self-lifting wire protection or spring terminals		
Quick fastening	Mounting rail (EN 60715)		
Net weight	Approx. 400 g		
Device dimensions (W × H × D)	45 × 90 × 121 mm		

Safety-related parameters

These data apply to an ambient temperature of +40 °C.

Table 13: Safety-related parameters

	Minimum	Typical	Maximum
Safety integrity level (IEC 61508)	SIL 3		
SIL claim limit (IEC 62061)	SIL 3		
Category (ISO 13849-1)	Category 4		
Performance level (ISO 13849-1)	PL e		
T_M (mission time)	20 years (ISO 13849)		
$MTTF_d$	93 years		
MTTF	181800 h (20.8 years)		
t_{Cycle}	28,8 × 10^3 s/cycle or 1 cycle/8 h		
Hardware fault tolerance (HFT)	1		
SFF	99.7 %		
PFH_D (mean probability of a dangerous failure per hour)	41 × 10^{-9}		
B_{10d}	B_{10d} = 500000 cycles (Usage category according to IEC 60947-5-1: DC13)		

Derating curve for the contact currents

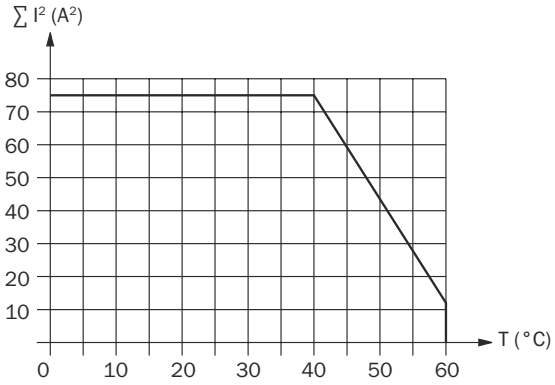

Figure 11: Derating curve for the contact currents of the safety contacts

Sum of the squared currents

$\sum = I_1^2 + I_2^2 + I_3^2$

I_1, I_2, I_3: Current in the contact paths

Max. permissible current up to 40 °C across 3 contact rows = 5 A

($5^2 + 5^2 + 5^2 = 75\ A^2$)

Max. permissible current up to 60 °C across 3 contact rows = 2 A

($2^2 + 2^2 + 2^2 = 12\ A^2$)

10.2 Dimensional drawings

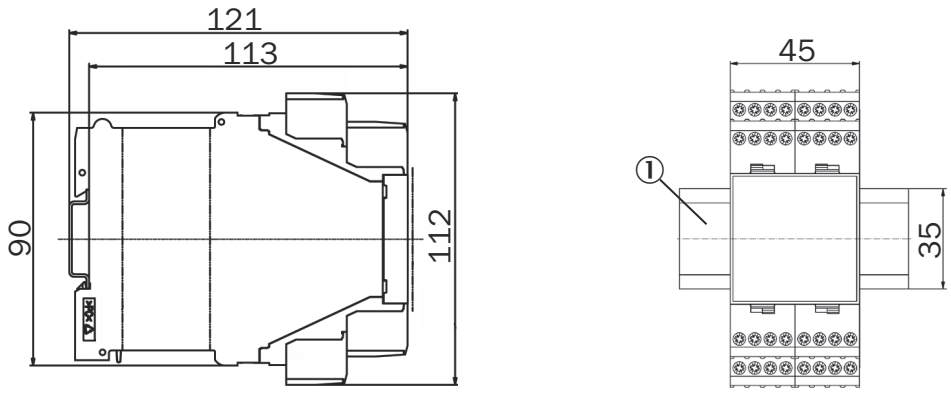

Figure 12: Dimensional drawing MOC3ZA

① Mounting rail

11 Ordering information

11.1 Ordering information MOC3ZA

Table 14: Ordering information MOC3ZA

Part	Type code	Part number
Standstill Monitor MOC3ZA, Supply voltage 24 V DC, with plugin screw type terminals	MOC3ZA-KAZ33D3	6044981
Standstill Monitor MOC3ZA, Supply voltage 230 V AC, with plugin screw type terminals	MOC3ZA-KAZ33A3	6044982
Standstill Monitor MOC3ZA, Supply voltage 400 V AC, with plugin screw type terminals	MOC3ZA-KAZ33A6	6044983
Standstill Monitor MOC3ZA, Supply voltage 24 V DC, with plugin spring terminals	MOC3ZA-KAZ34D3	6047866
Standstill Monitor MOC3ZA, Supply voltage 230 V AC, with plugin spring terminals	MOC3ZA-KAZ34A3	6047865
Standstill Monitor MOC3ZA, Supply voltage 400 V AC, with plugin spring terminals	MOC3ZA-KAZ34A6	6047864

12 Glossary

AWG	American Wire Gage: standardization and classification of wires and cables according to type, diameter, etc.
Dangerous state	A dangerous state is a status of the machine or facility, where people may be injured. Protective devices prevent this risk if the machine is operated within its intended use. The figures in this document always show the dangerous state of the machine as movement of a machine part. In practice, there are different dangerous states, such as: • Machine movements • Electrical parts • Visible and invisible beam • A combination of multiple hazards
EDM	External device monitoring
ESD	Electrostatic discharge
External device monitoring	The external device monitoring (EDM) monitors the status of downstream contactors. In order to use external device monitoring, positively guided contactors must be used to switch off the machine. If the auxiliary contacts of the positively guided contactors are connected to the external device monitoring, the external device monitoring checks whether the contactors switch correctly when the OSSDs are switched off.
Hazardous area	Hazardous area is any space within and/or around machinery in which a person can be exposed to a hazard. (ISO 12100)
PFH_D	Probability of dangerous failure per hour
PL	Performance level (ISO 13849)

Reset	When a protective device has sent a stop command, the stopped state must be maintained until a reset device is activated and the machine can be restarted in a second step.
	
	The reset brings the protective device back to the monitoring state after it has sent a stop command. The reset also quits the start-up or restart interlock of a protective device, so that the machine can be restarted in a second step.
	
	The reset must only be possible, when all safety functions and protective devices are functional.
	
	The reset of the protective device must not introduce any movement or dangerous situations itself. The machine is only permitted to start after the reset once a separate start command has been sent.
	
	• Manual resets are performed using a separate, manually operated device, such as a reset pushbutton.
	• Automatic resets by the protective device are only permitted in special cases, if one of the following conditions is met:
	  ○ It must not be possible for people to be in the hazardous area without triggering the protective device.
	  ○ It must be ensured that no people are in the hazardous area during or after the reset.

Response time	The protective device's response time is the maximum time between the occurrence of the event leading to the sensor's response and supply of the switch-off signal to the protective device's interface (for example OFF state of the OSSD pair).

Safety function	Function of a machine whose failure can result in an immediate increase of the risk(s). (ISO 12100)
Safety output	A safety output provides safety-related information. Safety outputs are OSSDs, for example, or safety-related information on a safety-related network.
SIL	Safety integrity level

13 Annex

13.1 Checklist for initial commissioning and commissioning

Checklist for manufacturers or installers for installing standstill monitors

The details relating to the items listed below must be available no later than when the system is commissioned for the first time. However, these depend on the specific application (the requirements of which must be reviewed by the manufacturer or installer).

This checklist should be retained and kept with the machine documentation to serve as reference during recurring tests.

This checklist does not replace the initial commissioning, nor the regular inspection by qualified safety personnel.

Have the safety rules and regulations been observed in compliance with the directives and standards applicable to the machine?	Yes ☐ No ☐
Are the applied directives and standards listed in the declaration of conformity?	Yes ☐ No ☐
Does the protective device correspond to the required PL/SIL and PFHd in accordance with ISO 13849-1 / IEC 62061 and the required type in accordance with IEC 61496-1?	Yes ☐ No☐
Have measures been taken to prevent the unintentional starting of the drive or the machine after the detection of standstill?	Yes ☐ No ☐
Has the maximum shutdown and/or stopping time of the machine been measured, specified and documented (at the machine and/or in the machine documentation)?	Yes ☐ No ☐
Are the required protective measures against electric shock in effect (protection class)?	Yes ☐ No ☐
Is the entire wiring designed in accordance with the required PL/SIL as per ISO 13849-1/IEC 62061 and does the design of the wiring comply with the circuit diagrams?	Yes ☐ No ☐
Has the protective function been checked in compliance with the test notes of this documentation?	Yes ☐ No ☐

13.2 Conformities and certificates

You can obtain declarations of conformity, certificates, and the current operating instructions for the product at www.sick.com. To do so, enter the product part number in the search field (part number: see the entry in the “P/N” or “Ident. no.” field on the type label).

13.2.1 EU declaration of conformity

Excerpt

The undersigned, representing the manufacturer, herewith declares that the product is in conformity with the provisions of the following EU directive(s) (including all applicable amendments), and that the standards and/or technical specifications stated in the EU declaration of conformity have been used as a basis for this.

- ROHS DIRECTIVE 2011/65/EU
- EMC DIRECTIVE 2014/30/EU
- LV DIRECTIVE 2014/35/EU
- MACHINERY DIRECTIVE 2006/42/EC

13.2.2 UK declaration of conformity

Excerpt

The undersigned, representing the following manufacturer herewith declares that this declaration of conformity is issued under the sole responsibility of the manufacturer. The product of this declaration is in conformity with the provisions of the following relevant UK Statutory Instruments (including all applicable amendments), and the respective standards and/or technical specifications have been used as a basis.

- Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
- Electromagnetic Compatibility Regulations 2016
- Supply of Machinery (Safety) Regulations 2008

14 List of figures

15 List of tables

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