GB

Operating instructions (supplement)

System description
Deactivation of UA without interaction in IO-Link systems with suitable devices

11601028 / 03 01 / 2025

Contents

1 Preliminary note

1.1 Purpose of the document

This document describes a concept for a system for deactivating the supply voltage of an actuator without interaction using a safety relay and suitable devices of the ifm device families AL1xxx (IO-Link master) and AL2xxx (IO-Link input / output module).

1.2 Symbols used

✓	Requirement
▶	Instructions
▷	Reaction, result
[...]	Designation of keys, buttons or indications
→	Cross-reference
!	Important note Non-compliance may result in malfunction or interference.
i	Information Supplementary note

1.3 Warnings

Warnings indicate the possibility of personal injury and damage to property. This enables safe product handling. Warnings are graded as follows:

WARNING

Warning of serious personal injury

▷ If the warning is not observed, fatal and serious injuries are possible.

CAUTION

Warning of minor to moderate personal injury

▷ If the warning is not observed, minor to moderate injuries are possible.

ATTENTION

Warning of damage to property

▷ If the warning is not observed, damage to property is possible.

1.4 Change history

Version	Subject	Date
00	New document created	04 / 2024
01	Added: supported devices AL2236, AL4302, AL4303, AL4322, AL4323	07 / 2024
02	Added: supported devices AL4342, AL4343	01 / 2025
03	• Added: supported devices AL2236, AL2507, AL2527, AL2607, AL2627 • Added: note on discharging the capacitors, Actuators (→ 🗋 7)	01 / 2025

2 Safety instructions

- The system architect is responsible for the safety of the system.
- The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the system and keep it during the entire service life.
- Only use the system for its intended purpose (→ Intended use).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- Installation, electrical connection, set-up, programming, configuration, operation and maintenance of the system must be carried out by personnel qualified and authorised for the respective activity.
- Protect units and cables against damage.
- Observe other applicable documents, System description (→ 🗋 6).

2.1 Required background knowledge

The information described in this document is intended only for

- qualified personnel who plan and develop safety equipment for machines and systems and are familiar with safety regulations in the workplace and accident prevention measures.
- qualified personnel who are familiar with the implementation of functional safety functions and standards.

Qualified personnel are people who, because of their education, experience, and training, and their knowledge of relevant standards, regulations, accident prevention, and operating conditions, have been authorised by those responsible for the safety of the plant to carry out any required operations and who are able to recognise and avoid any possible dangers.

3 Intended use

Intended use:

The following applies to the supported devices: The UA supply voltage of an actuator can be deactivated by an external safety relay without interaction to the US supply voltage. Deactivating the device’s internal outputs remains a non-safe function.

The supported devices must not be used for the following functions:

- Safe deactivation of the actuator via the device
- Execution of a safety function via the device

WARNING

Use of the supported devices for the implementation of safety-related functions

▷ No safe deactivation of the actuator

▷ No execution of the safety function

▶ Implement non-interacting deactivation only via the safety relay.

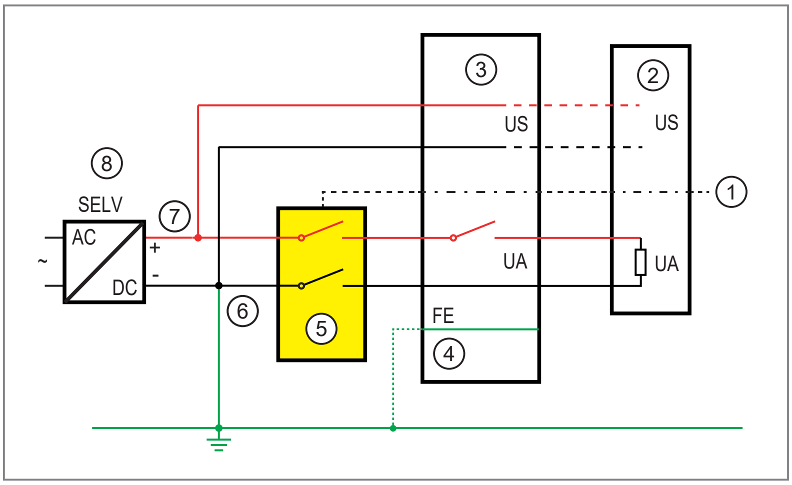
4 System description

The information in this chapter describes a system for the non-interacting deactivation of the supply voltage of an actuator using a safety relay and suitable devices from the ifm device families AL1xxx (IO-Link master) and AL2xxx (IO-Link input / output module).

▶ Observe the following instructions when implementing the system structure.

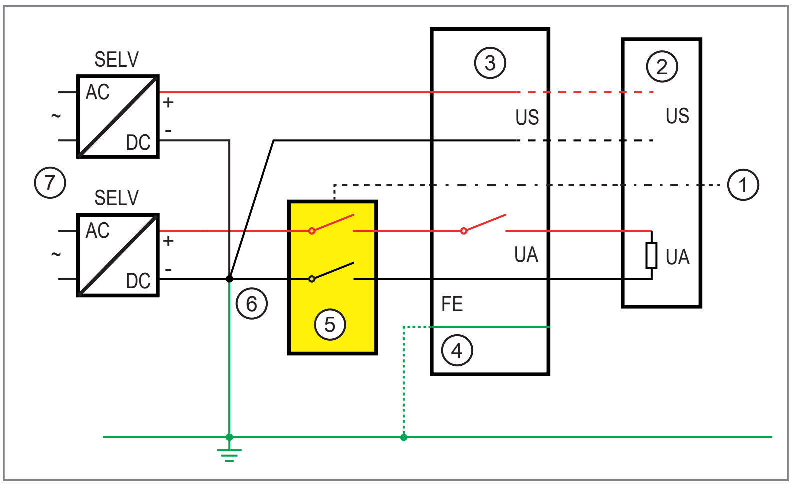
Only the following variants may be used for the system structure:

- Supply via 1 power supply



1: Isolation to ISO 13849
2: Actuator
3: Supported devices (ALxxxx)
4: Functional earth (FE)
5: Safety relay
6: Star point US- / UA- / GND
7: Star point US+ / UA+
8: Voltage supply

- Supply via 2 power supplies



1: Isolation to ISO 13849
2: Actuator
3: Supported devices (ALxxxx)
4: Functional earth (FE)
5: Safety relay
6: Star point US- / UA- / GND
7: Voltage supply

4.1 Isolation

The system architect is responsible for implementing the isolation in accordance with ISO 13849.

Continuous electrical isolation in accordance with ISO 13849 must be ensured throughout the application from UA downstream of the safety relay to US / UA upstream of the safety relay.

This applies for:

- The entire cabling and all electrical connections
- All components used in the system with connections for US and UA

CAUTION

No electrical isolation to ISO 13849 from UA downstream of the safety relay to US / UA upstream of the safety relay

▷ Loss of the safety function of the safety relay

▷ No deactivation of UA without interaction possible

▶ Implement continuous isolation in accordance with ISO 13849 as described above.

▶ Wire the system in accordance with the requirements of functional safety.

4.2 Actuators

The system architect is responsible for selecting a suitable actuator.

The following applies to actuators with US and UA supply voltages:

Only actuators with internal electrical isolation from US to UA in accordance with ISO 13849 may be used.

CAUTION

Use of actuators without internal electrical isolation from US to UA in accordance with ISO 13849

▷ Loss of the safety function of the safety relay

▷ No deactivation of UA without interaction possible

▶ Only use actuators that ensure continuous internal isolation from US to UA in accordance with ISO 13849.

After deactivation of UA by the external safety relay, the capacitors for UA in the device are not actively discharged.

▷ The stored energy can still supply connected high impedance loads for a short time, depending on their electrical properties.

If monitoring of the actuator is required to achieve a certain safety classification, this must be implemented separately via the application.

4.3 Supported devices (ALxxxx)

When the supported devices are used, the deactivation of the UA supply voltage is not influenced by the US supply voltage (without interaction). Depending on the device type and hardware version, different safety classifications can be implemented for the system.

The system described can be implemented by using the following devices for applications where UA deactivation according to PL c category 1 behaviour is sufficient:

Device type	Hardware version	Applicable document
AL1200	AA	Operating instructions AL1200
AL1202	AA	Operating instructions AL1202
AL1220	AA	Operating instructions AL1220
AL1222	AA	Operating instructions AL1222
AL1400	AA	Operating instructions AL1400
AL1401	AA	Operating instructions AL1401
AL1402	AA	Operating instructions AL1402

Device type	Hardware version	Applicable document
AL1403	AA	Operating instructions AL1403
AL1420	AA	Operating instructions AL1420
AL1421	AA	Operating instructions AL1421
AL1422	AA	Operating instructions AL1422
AL1423	AA	Operating instructions AL1423
AL1430	AA	Operating instructions AL1430
AL1431	AA	Operating instructions AL1431
AL1432	AA	Operating instructions AL1432
AL1433	AA	Operating instructions AL1433
AL2230	AA, AB	Operating instructions AL2230 AL2330 AL2231 AL2331
AL2330	AA, AB	Operating instructions AL2230 AL2330 AL2231 AL2331
AL2231	AA	Operating instructions AL2230 AL2330 AL2231 AL2331
AL2331	AA	Operating instructions AL2230 AL2330 AL2231 AL2331

The system described can be implemented by using the following devices for applications where UA deactivation according to PL d category 3 behaviour is sufficient:

Device type	Hardware version	Applicable document
AL2230	AC	Operating instructions AL2230 AL2330 AL2231 AL2331
AL2330	AC	Operating instructions AL2230 AL2330 AL2231 AL2331
AL2236	AA	Operating instructions AL2236
AL2336	AA	Operating instructions AL2336
AL4302	AA	Operating instructions AL4302
AL4303	AA	Operating instructions AL4303
AL4322	AA	Operating instructions AL4322
AL4323	AA	Operating instructions AL4323
AL4342	AA	Operating instructions AL4342
AL4343	AA	Operating instructions AL4343
AL2507	AB	Operating instructions AL2507
AL2527	AB	Operating instructions AL2527
AL2607	AB	Operating instructions AL2607
AL2627	AB	Operating instructions AL2627

No monitoring or diagnostic function is implemented in the devices.

▶ Connect devices with FE connection to the functional earth of the system.

4.4 Safety relay

! The system architect is responsible for selecting a suitable safety relay.

The safety relay must be suitable for the intended safety classification of the system.

The safety relay must implement the 2-pole deactivation (UA+, UA-).

▶ Make sure that the safety relay is rated for the current switching capability of the system and the actuator. For this purpose, select a suitable safety factor in accordance with the tried-and-tested safety principles (e.g. factor 2).

▶ Observe the user documentation of the safety relay.

▶ Only use system components that are suitable for achieving the requested safety classification in accordance with the relevant functional safety criteria.

4.5 Star point connections

The user is responsible for the implementation of the star point connections.

- Supply by means of 1 power supply:
  - US+ corresponds to UA+
  - US- corresponds to UA- on the supply side near the power supply
- Supply by means of 2 power supplies:
  - US- corresponds to UA- on the supply side near the power supply

4.6 Voltage supply

▶ Only use the system with a protective extra-low voltage (PELV) within the technical data.

5 Certification

Validation of the overall system is absolutely necessary.

The functional safety of the system must be assessed and approved by an external body.

The following points must be taken into account when assessing the functional safety of the system:

- Cabling of the system
- Connection of further devices to the US and UA supply voltages