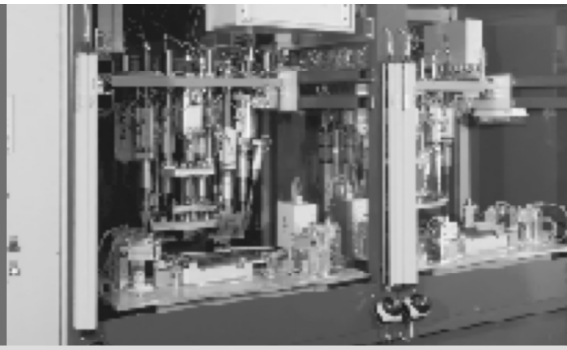
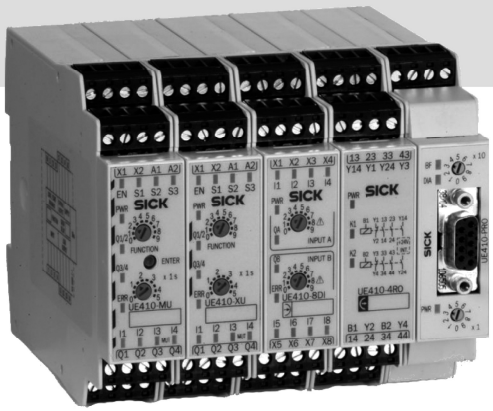
OPERATING INSTRUCTIONS



Flexi Classic

Modular Safety Controller



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Contents

Contents

1 About this document

Please read this chapter carefully before working with this documentation and the Flexi Classic modular safety controller.

1.1 Function of this document

These operating instructions are designed to address *the technical personnel of the machine manufacturer* or the *machine operator* in regards to safe mounting, configuration, electrical installation, commissioning, operation and maintenance of the Flexi Classic modular safety controller.

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

1.2 Target group

These operating instructions are addressed to *planning engineers*, *machine designers* and *operators* of plants and systems which are to be protected by a Flexi Classic modular safety controller. They are also addressed to people who integrate the Flexi Classic modular safety controller into a machine, initialise its use, or who are in charge of servicing and maintaining the device.

1.3 Information depth

These operating instructions contain the following information on the Flexi Classic modular safety controller:

- mounting
- electrical installation
- commissioning and configuration
- care and maintenance
- fault, error diagnosis and troubleshooting
- part numbers
- conformity and approval

Planning and using SICK protective devices also require specific technical skills which are not detailed in this documentation.

When operating the Flexi Classic modular safety controller, the national, local and statutory rules and regulations must be observed.

General information on accident prevention using opto-electronic protective devices can be found in the competence brochure “Guidelines Safe Machinery”.

Note We also refer you to the homepage on the Internet at www.sens-control.com.

Here you will find information on:

- product and application animations
- configuration aid
- these operating instructions in different languages for viewing and printing

1.4 Scope

These operating instructions are original operating instructions.

These operating instructions apply to all Flexi Classic safety controller modules with the following entry in the field *Operating Instructions* on the type label: “E-01” or higher. Take into account the respectively applicable operating instructions (refer to the type label entry on the modules).

1.5 Abbreviations

EDM External device monitoring

ESPE Electro-sensitive protective equipment (e.g. C4000)

OSSD Output signal switching device

PLC Programmable logic controller

SIL Safety Integrity Level

SILCL SIL claim limit

1.6 Symbols used

Note Refer to notes for special features of the device.

●, ☼, ○ LED symbols describe the state of a diagnostics LED. Examples:

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

➢ Take action … Instructions for taking action are shown by an arrow. Read carefully and follow the instructions for action.

WARNING

Warning!

A warning notice indicates an actual or potential risk or health hazard. They are designed to help you to prevent accidents.

Read carefully and follow the warning notices!

Tab. 1: Sensor symbols

Symbol	Sensors
	Electro-mechanical safety switches
	Emergency stop button
	Electro-sensitive protective equipment (ESPE)
	Sensors that can be tested (e.g. photoelectric switches)
	Inductive safety sensors (e.g. IN4000)
	Two-hand operating panel (IIIA)
	Two-hand operating panel (IIIC)
	Jog mode via two-hand operating panel (IIIA) (time limit 5 s)
	Muting lamp and Reset required lamp (not monitored) Lamp permanently ON: Muting active Lamp flashing 1 Hz: Reset required
	Pressure sensitive mats (4-wire system)
	Reset button
	Flexi Loop

Tab. 2: Module function symbols

Symbol	Module functions
	Bypass function with electro-mechanical dual-channel equivalent switch (e.g. enabling switch), Bypass function limited to 60 s
	Muting station with two inputs for muting sensors
	Retriggering
	Monitored semiconductor output
	Off delay
	ENABLE (EN)

Tab. 3: Input assignment symbols

Symbol	Input assignment
	Single-channel N/C contact
	Single-channel N/C contact, cross-circuit detecting
	Single-channel N/C contact at two inputs
	Dual-channel N/C contact, equivalent, cross-circuit detecting, with monitoring of synchronisation (1500 ms)
	Dual-channel N/C contact, equivalent, cross-circuit detecting
	Dual-channel N/C contact, equivalent
	Dual-channel N/C / N/O contact, complementary, cross-circuit detecting
	Dual-channel N/C / N/O contact, complementary, cross-circuit detecting, with monitoring of synchronisation (1500 ms), (e.g. magnetically coded switch RE300)
	Dual-channel semiconductor input, monitored (ESPE)
	Single-channel N/C contact/semiconductor input (e.g. sensors that can be tested)
	Switching mats, pressure-sensitive (4-wire system)

Tab. 4: Logic symbols

Symbol	Logic
	OR link
	AND link

2 On safety

This chapter deals with your own safety and the safety of the equipment operators.

➢ Please read this chapter carefully before working with the Flexi Classic modular safety controller or with the machine protected by the Flexi Classic modular safety controller.

2.1 Qualified safety personnel

The Flexi Classic modular safety controller must be mounted, commissioned and serviced only by qualified safety personnel.

Qualified safety personnel are defined as persons who ...

- have undergone the appropriate technical training

and

- who have been instructed by the responsible machine operator in the operation of the machine and the current valid safety guidelines

and

- have access to the operating instructions of the Flexi Classic and those of the particular modules and have read and familiarised themselves with them

and

- have access to the operating instructions for the protective devices (e.g. C4000) connected to the safety controller and have read and familiarised themselves with them.

2.2 Applications of the device

The Flexi Classic modular safety controller is a configurable control system for safety applications.

The category in accordance with EN ISO 13849-1 or the SIL in accordance with IEC 61508 and the SILCL in accordance with EN 62061 depend on the external circuit, the realisation of the wiring, the choice of the sensors and their location at the machine.

The device corresponds to up to category 4 in accordance with EN ISO 13849-1; applications can reach up to SIL3 in accordance with IEC 61508, up to SILCL3 in accordance with EN 62061 or PL e in accordance with EN ISO 13849-1. The emergency stop function in the device corresponds to stop category 0 or 1 in accordance with EN 60204-1.

In order to reach the SIL3 safety level (see chapter 11 “Technical specifications” on page 96) in accordance with IEC 61508, the following test must be made at least every 365 days:

- The Flexi Classic system must be powered down.
- The Flexi Classic system must be powered up.
- All safety functions of the connected safety sensors must be verified.

The type of safety sensors as well as the method of wiring must be chosen according to the category which is to be achieved.

Opto-electronic and tactile safety sensors (e.g. light curtains, laser scanners, safety switches, sensors, emergency stop pushbuttons) are connected to the modular safety controller and are linked logically. The corresponding actuators of the machines or systems can be switched off safely via the switching outputs of the safety controller.

The Flexi Classic safety controller has been tested in accordance with UL 508.

2.3 Correct use

The Flexi Classic modular safety controller may only be used as intended in section 2.2 “Applications of the device”. It may only be used by specialist personnel and only at the machine at which it was mounted and initially commissioned by qualified safety personnel in accordance with these operating instructions.

If the device is used for any other purposes or modified in any way — also during mounting and installation — any warranty claim against SICK AG shall become void.

2.4 General safety notes and protective measures

WARNING

Observe the safety notes and protective measures!

Please observe the following items in order to ensure correct use of the Flexi Classic modular safety controller.

- When mounting, installing and using the Flexi Classic, observe the standards and directives applicable in your country.
- The national/international rules and regulations apply to the installation, use and periodic technical inspection of the Flexi Classic modular safety controller, in particular:
  - Machinery Directive 2006/42/EC
  - EMC Directive 2004/108/EC (valid until 19.04.2016)
    EMC Directive 2014/30/EU (valid from 20.04.2016)
  - Provision and Use of Work Equipment Directive 2009/104/EC
  - Low Voltage Directive 2006/95/EC (valid until 19.04.2016)
    Low Voltage Directive 2014/35/EU (valid from 20.04.2016)
  - The work safety regulations/safety rules
- Manufacturers and owners of the machine on which a Flexi Classic is used are responsible for obtaining and observing all applicable safety regulations and rules.
- The notes, in particular the test notes (see chapter 8 “Commissioning” on page 90) of these operating instructions (e.g. on use, mounting, installation or integration into the existing machine controller) must be observed.
- The tests must be carried out by qualified safety personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time by third parties.
- These operating instructions must be made available to the operator of the machine where the Flexi Classic is used. The machine operator is to be instructed in the use of the device by qualified safety personnel and must be instructed to read the operating instructions.
- To meet the requirements of the relevant product standards (e.g. EN 61496-1), the external voltage supply for the devices (SELV) must, among other aspects, be able to bridge a power failure lasting 20 ms. Suitable power supplies are available as accessories from SICK.
- The modules of the Flexi Classic family conform to Class A, Group 1, in accordance with EN 55011. Group 1 encompasses all ISM devices in which intentionally generated and/or used conductor-bound RF energy that is required for the inner function of the device itself occurs.

WARNING

The Flexi Classic system complies, as per the “radiated emissions” generic standard, with the requirements of class A (industrial applications).

The Flexi Classic system is therefore only suitable for use in an industrial environment.

WARNING

Loss of the safety function through an incorrect configuration!
Plan and carry out configuration carefully!

The configuration of safety applications must be carried out with the greatest accuracy and must match the status and the condition of the machine or system to be monitored.

- Check whether the configured safety application monitors the machine or system as planned and whether the safety of a configured application is ensured at all times. This must be ensured in each operating mode and partial application. Document the result of this check!
- In each case, observe the instructions for commissioning and daily checking in the operating instructions of the protective devices integrated into the safety application!
- Note the warnings and function descriptions of protective devices connected to the safety controller! Contact the respective manufacturer of the protective device if in doubt!

2.5 Environmental protection

The Flexi Classic modular safety controller has been designed to minimise environmental impact. It uses only a minimum of power and natural resources.

➢ At work, always act in an environmentally responsible manner.

2.5.1 Disposal

Disposal of unusable or irreparable devices should always occur in accordance with the applicable country-specific waste-disposal regulations (e.g. European Waste Code 16 02 14).

Note We would be pleased to be of assistance to you on the disposal of these devices. Contact us.

2.5.2 Separation of materials

WARNING

Material separation may only be performed by qualified safety personnel!

Caution is required when dismantling devices. There is a risk of injuries.

Before you send the devices for appropriate recycling, it is necessary to separate the different materials in the Flexi Classic.

➢ Separate the housing from the rest of the parts (in particular the circuit board).

➢ Send the separated components for recycling as appropriate (see Tab. 5).

Tab. 5: Overview on disposal by components

Components	Disposal
Product Housing, circuit boards, cables, connectors and electrical connecting pieces	Electronic recycling
Packaging Cardboard, paper	Paper/cardboard recycling

3 Product description

This chapter provides information on the special features and properties of the Flexi Classic modular safety controller. It describes the construction and the operating principle of the device.

➢ Please read this chapter before mounting, installing and commissioning the device.

3.1 Special features

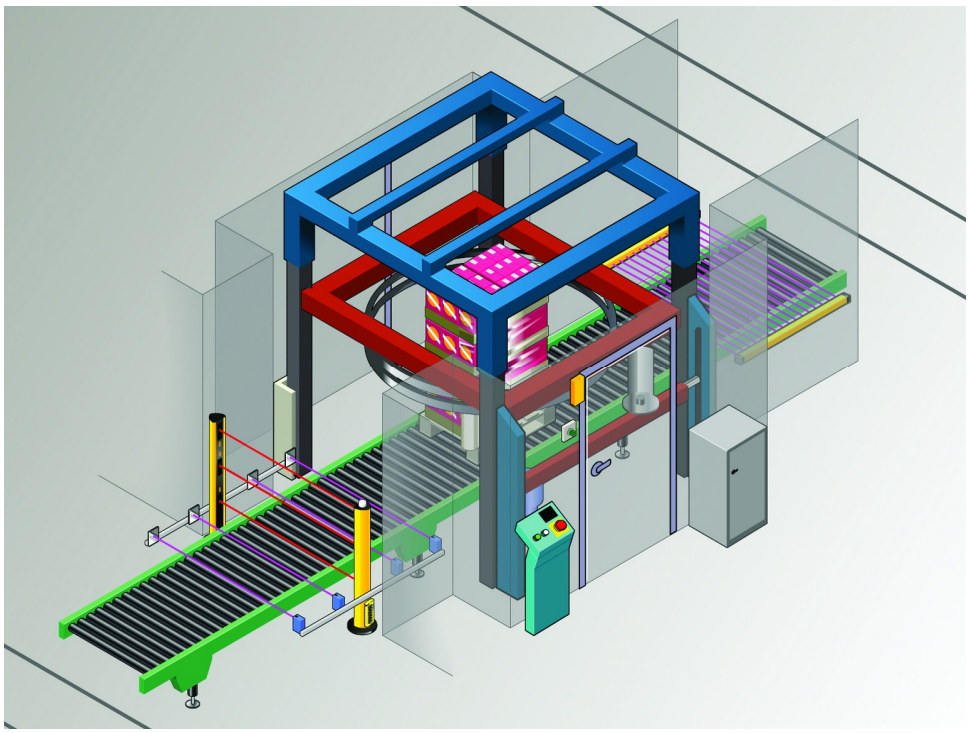


Fig. 1: Flexi Classic modular safety controller

The Flexi Classic series is a safety controller concept comprising different modules that can be interconnected individually. This allows the system to be extended to up to 104 inputs or outputs.

Each of these modules has a compact width of 22.5 mm. The units are of plug-in style with communication between the individual units over an internal bus.

The required logic and function is specified by means of rotary switches on the modules. An exception thereof are the relay modules and the fieldbus modules that are used for integration in a higher level controller without a safety function. These modules are output units and have no effect on the logic set or the function of the upstream units.

The Flexi Classic series consists of the following modules:

- main module UE410-MU
- main module UE410-GU
- input/output extension module UE410-XU
- input extension module UE410-8DI
- output modules UE410-2RO and UE410-4RO
- gateways, e.g.
  - UE410-PRO (PROFIBUS-DP)
  - UE410-CAN (CANopen)
  - UE410-DEV (DeviceNet)
  - UE410-EN1 (EtherNet/IP)
  - UE410-EN3 (Modbus TCP)
  - UE410-EN4 (PROFINET IO)

3.2 Structure

A Flexi Classic system always consists of a single main module (UE410-MU or UE410-GU) and, if necessary, additional input and output extensions as well as a corresponding bus module.

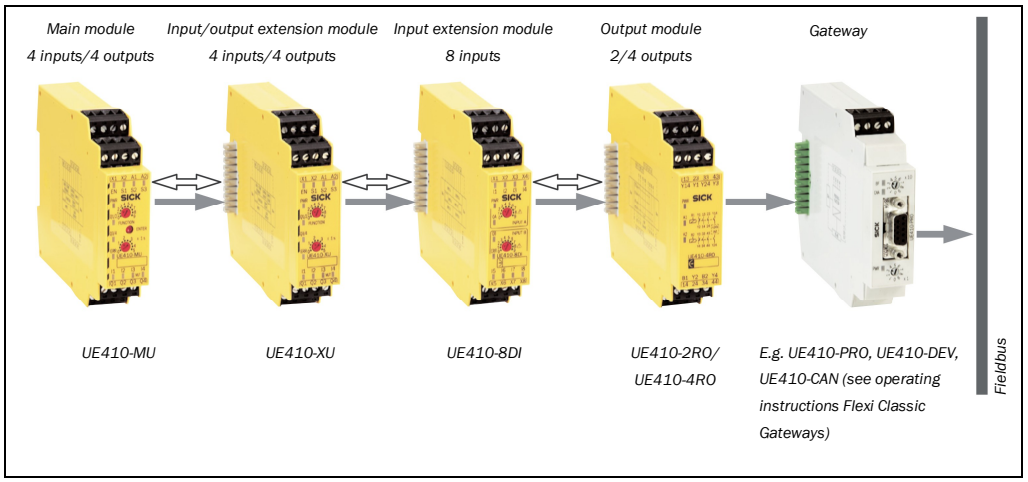


Fig. 2: Safety controller structure Flexi Classic (example with UE410-MU)

3.2.1 UE410-MU main module

The UE410-MU is the main module in which the system configuration of the entire Flexi Classic system is stored.

The UE410-MU has 4 safety inputs, 4 semiconductor outputs and 2 test outputs. The 9 programs that are available can be set by means of rotary switches that ensure the connection of a large number of safety components. Functions such as EDM, resetting, etc. are selected by means of the wiring of S1, S2 and S3. The UE410-MU can control two applications acting independently as well as two applications that are dependent on each other.

The devices listed in the following can be connected to the UE410-MU and the modules connected to it:

- emergency stop pushbuttons
- pressure sensitive mats
- two-hand controllers
- safety switches
- non-contact safety switches (e.g. RE300, T4000 Compact, IN4000)
- single-beam photoelectric safety switches (e.g. L21, L41)
- safety light curtains and multiple light beam safety devices (e.g. MSL, miniTwin, C/M2000, C/M4000)
- safety laser scanners and safety camera systems (e.g. S300, V300, S3000)

Typical applications such as muting and OR links can be implemented simply, depending on the setting of the program switch. If additional inputs or outputs are required, the UE410-MU can be supplemented with a UE410-XU input/output extension module and/or one or several UE410-8DI input extension modules.

If relay outputs are required, these can be implemented with the UE410-2RO/UE410-4RO output modules.

3.2.2 UE410-GU main module

The UE410-GU is a main module that can be used as an alternative to the UE410-MU. As in the UE410-MU, the system configuration for the entire Flexi Classic system is saved in the UE410-GU. The UE410-GU makes possible a global emergency stop function for several stations connected together that must each be equipped with a UE410-GU. A local emergency stop is also possible on each UE410-GU.

The UE410-GU has 4 safety inputs (I1-I4), 1 semiconductor output (Q1), 1 output for a lamp for “Global emergency stop status” and “Reset required” (Q2), 2 test outputs (X1, X2) and 2 inputs and 2 outputs for the global emergency stop function (I_P, I_N, O_P and O_N). The safe control inputs I5 and I6 are used to connect external device monitoring and a reset button. The 9 available programs can be set using a rotary switch and make it possible to connect a variety of safety components.

The following devices can be connected to the UE410-GU:

- emergency stop pushbutton
- safety switch
- non-contact safety switches (e.g. RE300, T4000 Compact)
- single-beam photoelectric safety switches (e.g. L21, L41)
- safety light curtains and multiple light beam safety devices (e.g. MSL, miniTwin, C/M2000, C/M4000)
- safety laser scanners and safety camera systems (e.g. S300, V300, S3000)

If additional inputs are required, the UE410-GU can be expanded with one or more input extension modules UE410-8DI.

The UE410-GU can also be expanded with a UE410-XU. This module does not act on the global emergency stop.

If relay outputs are required, these can be implemented with the UE410-2RO/UE410-4RO output modules.

Note The UE410-GU does not support all data sets from all gateways.

3.2.3 UE410-8DI input extension module

The UE410-8DI module is an input extension with 8 inputs that can be linked using the OR, AND or Bypass logic function to the respectively upstream UE410-MU, UE410-GU or UE410-XU module. The 9 switch positions of the UE410-8DI rotary switch determine which safety components can be connected to the UE410-MU/GU/XU and which type of logic is used. The input extension module UE410-8DI acts exclusively on the next UE410-MU, UE410-GU or UE410-XU module positioned to the left in the module structure, thus forming a function group. It is allowed to connect a maximum of 8 UE410-8DI modules to a UE410-MU, UE410-GU or UE410-XU.

For more informationen on this topic see section 4.12 “Grouping of subsystems” on page 78.

3.2.4 UE410-XU input/output extension

The UE410-XU module is an input/output extension with 4 safety inputs, 4 semiconductor outputs and 2 test outputs. It has the same switch positions, logic functions and facilities for connecting sensors as the UE410-MU. In contrast to the UE410-MU and UE410-GU, the UE410-XU cannot store the system configuration.

Notes

- A UE410-XU can only be operated in combination with a UE410-MU or UE410-GU main module.
- A main module and a UE410-XU can be linked logically with each other, thus forming a subsystem (for further information please refer to section 4.12 “Grouping of subsystems” on page 78).

3.2.5 UE410-2RO/UE410-4RO output modules

The UE410-2RO/UE410-4RO output extensions make one or two dual-channel, contact-based outputs available. They do not have any influence on the specified logic instructions of a system structure and are controlled by the UE410-MU, UE410-GU or UE410-XU outputs.

3.2.6 Gateways

Gateways (fieldbus modules) can be added to the Flexi Classic modular system for diagnostic purposes. They output the system configuration and the input/output states as well as the error and status information of all the modules.

Several gateways are available, e.g.:

- UE410-PRO for PROFIBUS-DP
- UE410-DEV for DeviceNet
- UE410-EN1 for EtherNet/IP

Note The UE410-GU does not support all data sets from all gateways.

You will find a complete list of all gateways and the data sets supported in the operating instructions “Flexi Classic Gateways” or in the Internet on our homepage www.sens-control.com.

All gateways have 4 non-safe application diagnostic outputs. The outputs are short-circuit protected (see also the Flexi Classic Gateways operating instructions).

3.2.7 Module overview, adjustments and facilities for connecting sensors

Tab. 6: Module overview

Module	Description
UE410-MU	• Main unit of the Flexi Classic modular safety controller • 4 safe inputs and 4 safe outputs • Storage of the system configuration
UE410-GU	• Central function block of the Flexi Classic modular safety controller • Global emergency stop can be realized • 4 safe inputs • 1 safe output • Storage of the system configuration
UE410-XU	• Input/output extension/subsystem • 4 safe inputs and 4 safe outputs • Identical functionality as UE410-MU
UE410-8DI	• Input extension • 8 safe inputs • Information coupling to the upstream UE410-MU, UE410-GU or UE410-XU module
UE410-2RO	2 contacts (N/O), 1 signal contact (N/C)
UE410-4RO	4 contacts (N/O), 2 signal contacts (N/C)
Flexi Classic gateways e.g. UE410-PRO, UE410-DEV, UE410-CAN	Status and diagnostics (information that is not safety relevant) of a Flexi Classic on a fieldbus (see Flexi Classic Gateways operating instructions)

Tab. 7: Overview of setting possibilities

Setting possibility	Can be set at the module	Comment
ENTER button	UE410-MU/UE410-GU	Saving of all Flexi Classic system programs, settings and wiring
Program 1-9	UE410-MU/UE410-GU/UE410-XU	Selection of the safety sensors and of the logic elements to be connected
Off delay 0-5 s, 0-50 s or 0-300 s	UE410-MU/UE410-XU	Delays 1 or 2 outputs on the module 3 different variants available (Not on UE410-xxxT0)
Switch position 0-9	UE410-8DI	Selection of the logic elements and of the safety sensors to be connected

Tab. 8: Connection of sensors to the UE410-MU, UE410-XU and UE410-8DI

Sensor	Program			
	UE410-MU/UE410-XU		UE410-8DI	
	A (I1/I2)	B (I3/I4)	A (I1-I4)	B (I5-I8)
	7, 8	1, 2, 7, 8, 9	1, 6, 7	1, 6, 7
	7, 8	1, 2, 7, 8, 9	6, 7	6, 7
	1, 5, 6, 9	5, 6	2, 3, 8	2, 3, 8
	–	–	4	4
	2	–	5	5
	1	–	2	2
	3, 7, 8	1, 2, 7, 8, 9	6, 7	6, 7
	3, 7, 8	1, 2, 7, 8, 9	6, 7	6, 7
	3, 7, 8	1, 2, 7, 8, 9	6, 7	6, 7

Sensor	Program			
	UE410-MU/UE410-XU		UE410-8DI	
	A (I1/I2)	B (I3/I4)	A (I1-I4)	B (I5-I8)
	4	4	–	–
	–	5.2	–	–
	–	5.1	–	–
	2	–	5	5
	3	–	–	–
	1, 5, 6, 7, 8	1, 2, 6, 7, 8, 9	2, 3, 6, 7, 8	2, 3, 6, 7, 8
	3	–	1	1
	3	3	–	–
	1, 5, 6, 9	5, 6	2, 3, 8	2, 3, 8

3.3 UE410-MU main module

The UE410-MU main module is the main module of the Flexi Classic modular safety controller. Only one UE410-MU can be integrated for each Flexi Classic system. A UE410-MU can control up to two applications acting independently or two applications that are dependent on each other.

In order to increase the number of inputs, one or more UE410-8DI extension modules can be used additionally.

An additional UE410-XU module can be used in order to increase the number of outputs (for further information refer to section 4.12 “Grouping of subsystems” on page 78).

The system configuration is stored in the UE410-MU main module (ENTER button to accept the program settings and system configuration) (for further information refer to section 9.1 “Accepting the system configuration” on page 92).

9 programs that can be set with a screwdriver at the program switch are available.

Fig. 3: Scheme programs 1-3

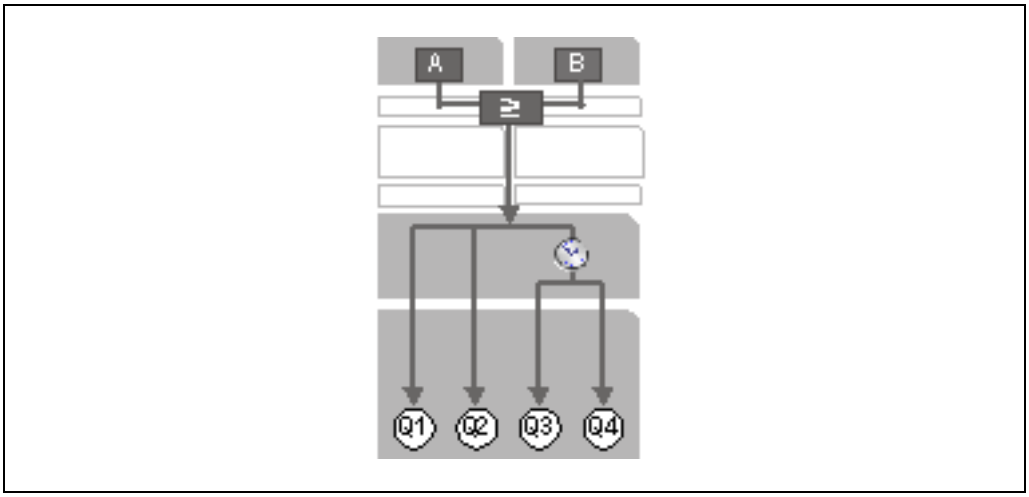


Fig. 4: Scheme program 4

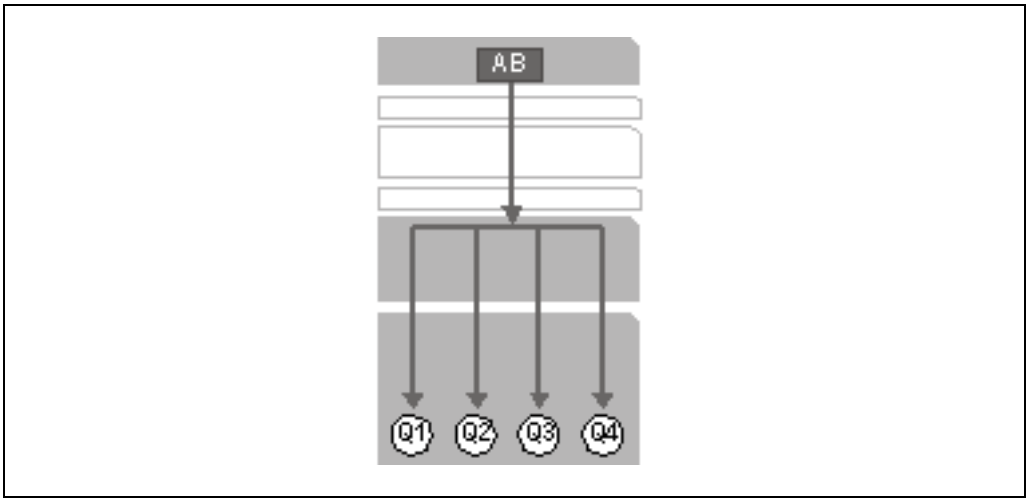


Fig. 5: Scheme programs 5-7, 9

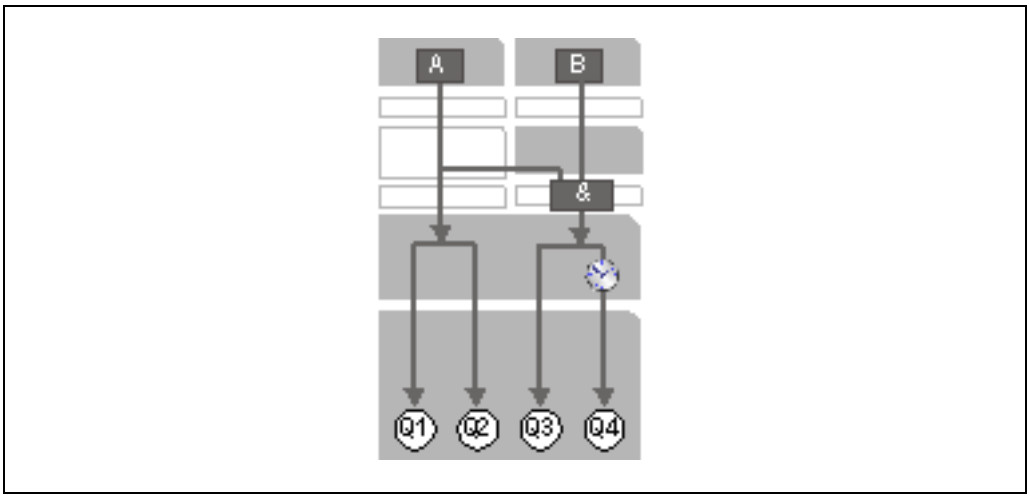
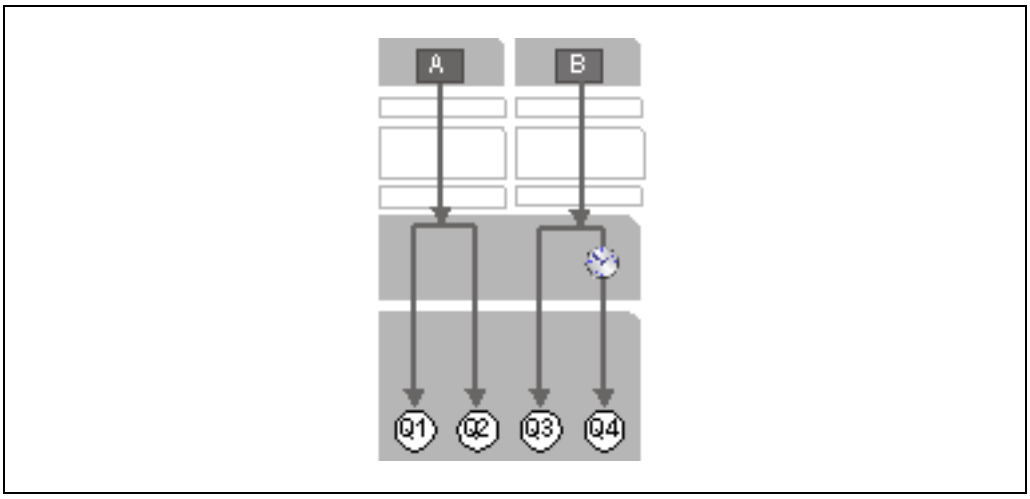


Fig. 6: Scheme program 8



The following functions can be set by selecting the program and connecting the terminals S1, S2, and S3 at the module:

- type of the logic and of the safety sensors to be connected
- restart interlock
- external device monitoring (EDM)

Q1 and Q2 always switch off within the response time.

Q3[1)] and Q4 can be deactivated with off delay by using the lower rotary switch (depending on the device variant 0-5 s/0-50 s/0-300 s/not on UE410-xxxT0).

Note

The outputs are tested periodically in order to detect errors in the safety outputs Q1-Q4. When using XU modules see section 4.12 “Grouping of subsystems” on page 78.

For further information see section 3.6 “UE410-MU/UE410-XU programs” on page 36.

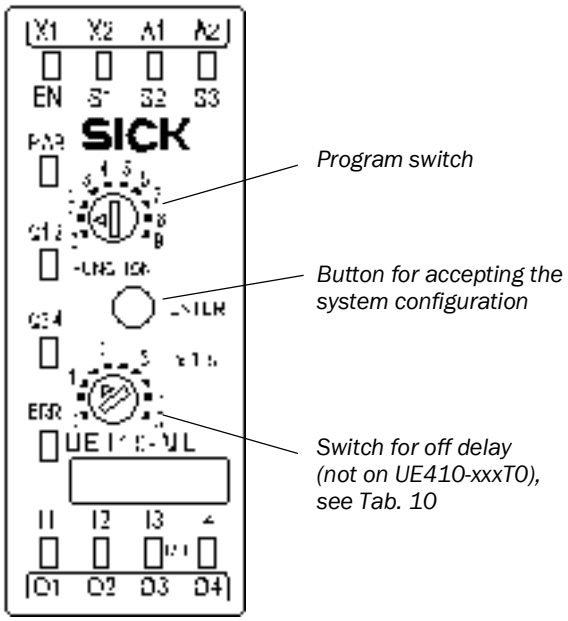
WARNING

Subsequent changes to the program or to the wiring (S1-S3) without saving will result in a safety-related shutdown.

[1)] Q3 has various functions; see section 3.6 “UE410-MU/UE410-XU programs” on page 36.

3.3.1 Controls and status indicators

Fig. 7: UE410-MU controls and status indicators



Tab. 9: UE410-MU indications

LED indicators	Meaning
PWR (green)	Supply voltage present
Q1/Q2, Q3/Q4 (green)	Switching state of the safety outputs (high level)
Q3/Q4 (green flashing)	Q3/Q4 to high level during the course of the delay time
ERR (red flashing)	Indication for erroneous operational status on this module, see chapter 10 “Diagnostics” on page 93
ERR (red)	Indication for erroneous operational status on the whole system (the error is on another module), see chapter 10 “Diagnostics” on page 93
EN, S1-S3 (green)	Voltage is present.
I1-I4 (green)	Signal is present.
I1/I2 flash in phase	Cross-circuit between I1/I2
I3/I4 flash in phase	Cross-circuit between I3/I4
I1/I2 flash out of phase	Process error at I1/I2
I3/I4 flash out of phase	Process error at I3/I4
I1 to I4 flashes	Synchronization time/concurrence error, expected signal is not present at the respective input.
S1-S3 flashes	Expected signal is not present (e.g. EDM or Reset).
Other indicators	Device error, see chapter 10 “Diagnostics” on page 93

Tab. 10: UE410-MU operating elements

Switch/button	Function
FUNCTION	10-step rotary switch (position 0 forbidden) for setting an input circuit function (see section 3.6 “UE410-MU/UE410-XU programs” on page 36)
X1s, X10s, X1min[2)]	10-step rotary switch for setting the off delay time (see section 3.6 “UE410-MU/UE410-XU programs” on page 36)
ENTER	Button for accepting the system configuration (Teach-in). See section 9.1 “Accepting the system configuration” on page 92.

3.3.2 Terminal assignment

Tab. 11: UE410-MU terminal assignment

Assignment	Description
I1/I2	Input for logic path A
I3/I4	Input for logic path B
EN	ENABLE input, activates the logic path(s)
S1	Input for reset buttons (RESET), restart interlock (EDM), retriggering, etc.
S2	
S3	
A1 (+U_B)	Voltage supply
A2 (GND)	
X1	Test outputs: cross-circuit detecting and short-circuit detecting control signals for controlling safety sensors[3)]
X2	
Q1-Q4	Monitored semiconductor outputs (OSSD)[3)]
Q3	Is used in Program 3 as the output for the muting lamp and Reset required.

[2)] The maximum adjustable duration of the switch off delay is 5, 50 or 300 s depending on the device variant, see section 12.1 “Available modules” on page 112.

[3)] When using multiple modules see section 4.12 “Grouping of subsystems” on page 78.

3.3.3 Outputs

You have two possibilities to reach SIL3 or Category 4 for your application:

- dual-channel wiring of the outputs, e.g. Q1/Q2 to K1/K2

  or

- single-channel wiring *only with routing within protected areas* such as in a control cabinet, e.g. Q1 to K1/K2.

WARNING

Safety-oriented devices must be suitable for safety related signals!

A function interruption of safety outputs results in a loss of the safety functions so that the risk of serious injury exists.

- Do not connect any loads that exceed the rated values of the safety outputs.
- Wire the Flexi Classic system so that 24 V DC signals cannot contact the safety outputs.
- Connect the GND wires of the power supply to earth so that the devices do not switch on when the safety output line is applied to frame potential.
- Use suitable components or devices that fulfil all the applicable regulations and standards.

Actuators at the outputs can be wired single-channeled. In order to maintain the respective Safety Integrity Level the lines have to be routed in such a manner that cross circuits to other live signals can be excluded, for example by routing them within protected areas such as in a control cabinet or in separate plastic-sheathed cables.

3.4 UE410-GU main module

The UE410-GU is a main module that can be used as an alternative to the UE410-MU. The system configuration is stored in the main module (for further information please refer to section 9.1 “Accepting the system configuration” on page 92).

Only one UE410-GU can be used per Flexi Classic system.

In order to increase the number of inputs, one or more UE410-8DI extension modules can be used additionally.

To increase the number of outputs, an additional UE410-XU can be used (see section 4.12 “Grouping of subsystems” on page 78). A total of up to 12 Flexi Classic modules and one gateway can be connected to the UE410-GU.

The UE410-GU makes possible a global emergency stop function for several stations connected together that must each be equipped with a UE410-GU. If the global emergency stop on a module is operated, the safety outputs on all modules switch off. To reset a global emergency stop, the reset button must be operated on the same module on which the global emergency stop was triggered.

Note A global emergency stop must always be reset manually.

Along with the global emergency stop function, on each module it is also possible to select a local emergency stop function with or without restart interlock. The local emergency stop only acts on the safety output on the related module. A local emergency stop can be reset either automatically or manually.

The safety output Q1 always switches within the response time. A switch off delay as on the UE410-MU is not possible with the UE410-GU.

Different programs for the local inputs can be selected with the aid of a rotary switch. 9 programs are available using which the following functions can be set:

- type of the safety sensors to be connected
- global emergency stop or global and local emergency stop
- automatic or manual reset of a local emergency stop

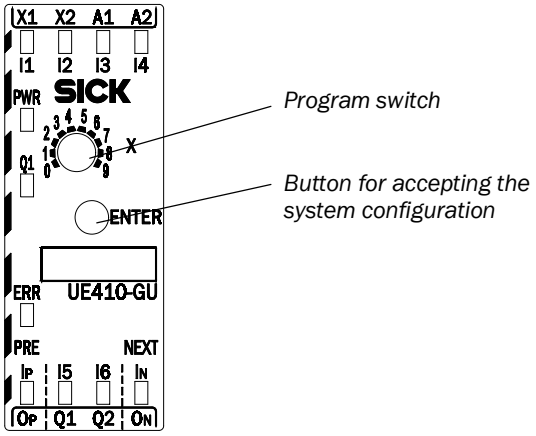
For further information see section 3.7 “UE410-GU programs” on page 49.

WARNING

Subsequent changes to the program will result in a safety-related shutdown without saving.

3.4.1 Controls and status indicators

Fig. 8: UE410-GU controls and status indicators



Tab. 12: UE410-GU indications

LED indicators	Meaning
PWR (green)	Supply voltage is present.
Q1 (green)	Safety output Q1 is high.
ERR (red flashing)	Indication for erroneous operational status on this module, see chapter 10 “Diagnostics” on page 93
ERR (red)	Indication for erroneous operational status on the whole system (the error is on another module), see chapter 10 “Diagnostics” on page 93
I1/I2 (green)	Global cut-off path closed
I3/I4 (green)	Cut-off path closed
I1/I2 (green flashing in phase)	Cross-circuit between I1/I2
I3/I4 (green flashing in phase)	Cross-circuit between I3/I4
I1/I2 (green flashing out of phase)	Process error at I1/I2
I3/I4 (green flashing out of phase)	Process error at I3/I4
I5 (green)	External device monitoring contact is closed.
I6 (green)	Reset button is closed.
I_P (green)	Input I_P is high.
I_N (green)	Input I_N is high.
Other indicators	Device error, see chapter 10 “Diagnostics” on page 93

Tab. 13: UE410-GU operating elements

Switch/button	Function
X	10-step rotary switch (position 0 forbidden) for setting an input circuit function, see section 3.7 “UE410-GU programs” on page 49
ENTER	Button for accepting the system configuration (Teach-in), see section 9.1 “Accepting the system configuration” on page 92

3.4.2 Terminal assignment

Tab. 14: UE410-GU terminal assignment

Assignment	Description
I1/I2	Global emergency stop (equivalent switch with test pulses)
I3/I4	Local emergency stop (local input, depending on the program set)
A1 ($+U_B$)	Voltage supply
A2 (GND)	
X1	Test outputs: cross-circuit detecting and short-circuit detecting control signals for controlling safety sensors[4)]
X2	
Q1	Single-channel safety output (OSSD)[4)]
Q2	Connection for the lamp for “Global emergency stop status” and “Reset required”
I5	Connection for the external device monitoring (EDM)
I6	Connection for the reset button
I_P	Input signal from the previous module (PRE_IN)
I_N	Input signal from the next module (NEXT_IN)
O_P	Output signal to the previous module (PRE_OUT)
O_N	Output signal to the next module (NEXT_OUT)

3.4.3 Global emergency stop with the UE410-GU

The global emergency stop makes possible the simultaneous shut down of the safety outputs on several Flexi Classic stations connected together that are each equipped with a UE410-GU as the main module.

Notes

- In theory as many UE410-GU modules as required can be connected together to form a global emergency stop system. However, it is recommended not to exceed 32 modules, because each module increases the response time of the overall system (see the information on the global response time in section 11.1.2 “UE410-GU module” of the technical data on page 101).
- The different UE410-GU modules that together form a global emergency stop circuit do not need to be in the same protected area. Faults in the area O_X and I_X, e.g. a short-circuit or cross circuit, are detected and will result in shutdown.
- All UE410-GU modules that are on a common global emergency stop cut-off path must be connected to the same GND connection.

Principle of operation

As long as the system is enabled, each UE410-GU sends a signal to the previous UE410-GU (PRE) and to the next UE410-GU (NEXT). If the global emergency stop is activated on a module (falling edge on I1/I2), then this module sets its safety output Q1 as well as the signals to its neighboring modules (outputs O_P and O_N) to low. The neighboring modules now also set their safety output Q1 as well as their outputs O_P and O_N to low.

The status of the global emergency stop is also output via the output Q2. If the global emergency stop is activated on this UE410-GU, this status is indicated with a signal flashing at 2 Hz on output Q2. If the global emergency stop has been activated on another UE410-GU, then this status is indicated with a continuous high on output Q2.

[4)] When using multiple modules see section 4.12 “Grouping of subsystems” on page 78.

Once the cause of the global emergency stop has been rectified (inputs I1 and I2 are high again, e.g. protective field clear), then the UE410-GU on which the global emergency stop was originally triggered signals on output Q2 the status Reset required with a signal flashing at 1 Hz.

Reset

A global emergency stop can only be reset manually. The reset must be undertaken on the same module on which the global emergency stop was triggered.

Once the global cut-off path for this module is closed again (inputs I1 and I2 are high again, e.g. protective field clear) and the reset button on this module is then operated, the safety output Q1 on this module as well as the outputs O_P and O_N switch to high again.

The following conditions are to be noted for the reset:

- Only the falling edge is evaluated.
- The minimum actuation time for the reset button is ≥ 50 ms.
- The maximum actuation time for the reset button is ≤ 5 s.

If one of these criteria is not met, the emergency stop is not reset.

Wiring of the modules

To connect several UE410-GU modules together, the input I_N on the previous UE410-GU must be connected to the output O_P on the next UE410-GU and the output O_N on the previous UE410-GU must be connected to the input I_P on the next UE410-GU.

For the specification of the connection cable please refer to the data sheet in section 11.1.2 “UE410-GU module” on page 101.

The first and last UE410-GU in an emergency stop system act as end modules. An end module is a UE410-GU that has only one neighboring station. These modules are defined by the wiring of the outputs X1 and X2.

- The end module without PRE is defined by wiring X1 to I_P.
- The end module without NEXT is defined by wiring X2 to I_N.

This wiring is saved with the configuration and checked each time on switching on.

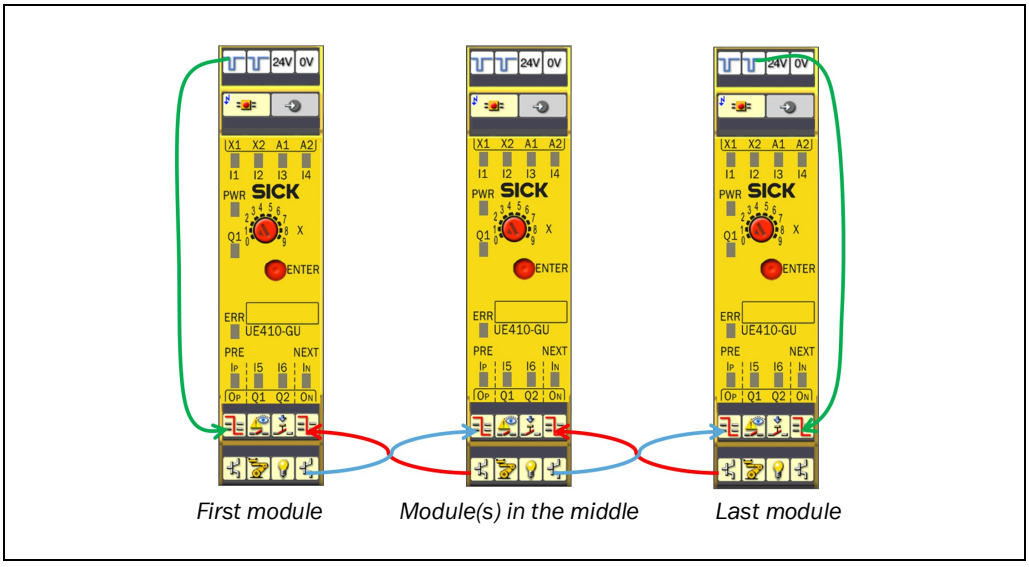


Fig. 9: Connecting several UE410-GU modules

WARNING

Test the entire emergency stop function after any change to the wiring!

If a UE410-GU is subsequently removed from an emergency stop system and the system is then correctly wired, this change will not be detected. For this reason the entire emergency stop function must always be tested after any change to the wiring.

Stand-alone mode of a UE410-GU

It is also possible to operate a UE410-GU as a standalone device. For this purpose X1 must be wired to I_P and X2 must be wired to I_N on this device.

3.4.4 Local emergency stop on the UE410-GU

A local emergency stop can be configured on each UE410-GU depending on the program set (see section 3.7 “UE410-GU programs” on page 49).

Principle of operation

If the local emergency stop is activated on a UE410-GU (falling edge on I3 and/or I4, depending on the program set), this module sets its safety output Q1 to low. The signals O_P and O_N remain high, i.e. the local emergency stop only acts on the safety output on the UE410-GU on which the local emergency stop was triggered.

Once the cause of the local emergency stop has been rectified (inputs I3 and I4 are high again, e.g. protective field clear), the safety output Q1 on the module switches to high again after a successful reset.

Reset

A local emergency stop can be reset either manually or automatically depending on the program set:

- Automatic reset: Once the local cut-off path is closed again (e.g. protective field clear), then the safety output Q1 on the module also switches to high again.
- Manual reset: Once the local cut-off path is closed again (e.g. protective field clear), output Q2 starts to flash at 1 Hz. If the reset button is then operated, the safety output Q1 on the module switches to high again.

The following conditions are to be noted for the manual reset:

- Only the falling edge is evaluated.
- The minimum actuation time for the reset button is ≥ 50 ms.
- The maximum actuation time for the reset button is ≤ 5 s.

If one of these criteria is not met, the emergency stop is not reset.

3.4.5 Inputs

Connection of the emergency stop pushbutton for the global emergency stop (I1 and I2)

A two-pole equivalent safety switch must be connected to the inputs I1 and I2 as the emergency stop pushbutton for the global emergency stop. The emergency stop pushbutton is tested via the connection of X1–I1 and X2–I2.

Connection of the sensors for the local emergency stop (I3 and I4)

The sensors for the local emergency stop are connected to the inputs I3 and I4 (see section 3.7 “UE410-GU programs” on page 49). The sensors are tested via the connection of X1–I3 and X2–I4.

Connection of the external device monitoring (EDM) (I5)

The external device monitoring (EDM) is connected to I5.

Before each enable it is checked whether I5 is high. If this condition is not met, the safety output Q1 is not set to high.

Connection of the reset button (I6)

The reset button must be connected to input I6.

Notes

- The reset button acts both as a reset button for the global emergency stop and for the local emergency stop, if a program with manual reset is set for the local emergency stop (program 2, 4, 6 or 8) (see section 3.7 “UE410-GU programs” on page 49).
- If a program with automatic reset is set for the local emergency stop, then the reset button only acts on a global emergency stop, i.e. if a global emergency stop has been triggered on the module and the module has the status Reset required.

3.4.6 Outputs

WARNING

Lay the single-channel connection in a protected area!

To achieve SIL3 or category 4, you must lay the single-channel connection Q1 to K1/K2 such that cross-circuits to other electrical signals can be excluded, e.g. by laying *in protected areas* such as in a control cabinet or in separate plastic-sheathed cables.

WARNING

Safety-relevant devices must be suitable for safety-relevant signal requirements!

Serious injury may occur due to breakdown of safety outputs or loss of required safety functions.

- Do not connect loads that exceed the rated value of the safety outputs.
- Wire the Flexi Classic system so that 24 V DC signals cannot contact the safety outputs.
- Connect the GND wires of the power supply to earth so that the devices do not switch on when the safety output line is applied to frame potential.
- All UE410-GU modules that are on a common global emergency stop cut-off path must be connected to the same GND connection.
- Use appropriate components or devices in accordance with regulations and standards.

3.4.7 Connection of a UE410-8DI

A UE410-8DI acts on the cut-off path A/B on a UE410-GU as follows:

- Input A (I1-I4) ➜ QA acts on the global cut-off path.
- Input B (I5-I8) ➜ QB acts on the local cut-off path.

Note An OR function or a bypass function that acts on the global cut-off path of the UE410-GU (switch position 7 or 8, input A on the UE410-8DI) is not permitted and will result in a configuration error (ERROR).

3.4.8 Power-up delay and response time of the UE410-GU

Power-up delay

The power-up delay of the UE410-GU is calculated as follows:

Power-up delay = local power-up delay + (N–1) × global power-up delay

Where:

Local power-up delay	= power-up delay for the module on which the emergency stop was triggered and reset
Global power-up delay	= power-up delay of the other modules in the system
N	= number of the UE410-GU modules in the system

You will find the values for the power-up delay on the data sheet in section 11.1.2 “UE410-GU module” on page 101.

Response times

WARNING

Extended response time of the overall system on the usage of several UE410-GU modules!

In a system consisting of several UE410-GU modules connected together, the power-up delay and the response time are increased depending on the number of UE410-GU modules connected together. Take this aspect into account on planning your system. Otherwise the operator of the system will be in danger.

The response time of the UE410-GU is calculated as follows:

Response time = local response time + (N–1) × global response time

Where:

Local response time	= response time of the module on which the emergency stop was triggered
Global response time	= response time of the other modules in the system
N	= number of the UE410-GU modules in the system

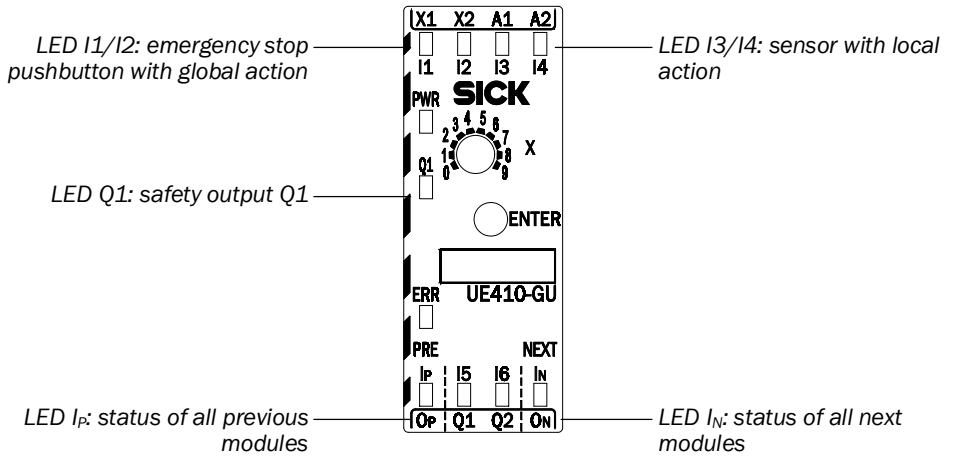
You will find the values for the response times on the data sheet in section 11.1.2 “UE410-GU module” on page 101.

3.4.9 Diagnostics and troubleshooting for the UE410-GU

If a system with a global emergency stop function comprising several UE410-GU modules is either entirely or partially at the standstill, then you can determine which module has triggered the emergency stop as follows:

➢ Based on the LED indicators on any UE410-GU module in the system check whether the emergency stop has been triggered by this module or the direction of the module that has triggered the global or local emergency stop, see Tab. 15.

Fig. 10: Diagnostic displays on the UE410-GU



➢ Also pay attention to the lamp on output Q2 (“Global emergency stop status”, “Reset required”) on the related UE410-GU.

Tab. 15: Diagnostics on the UE410-GU
- ● *The LED or lamp is illuminated constantly.*
- ☼● *The LED or lamp is flashing (1 Hz).*
- ☼☼● *The LED or lamp is flashing (2 Hz).*
- ○ *The LED or lamp is off.*
- X *Any*

Q1	I1/I2	I3/I4	I_P	I_N	Lamp Q2	Cause
○	●	○	●	●	○	A local emergency stop has been triggered on this station.
○	●	X	○	X	●	A previous station has triggered a global emergency stop.
○	●	X	X	○	●	A next station has triggered a global emergency stop.
○	○	X	X	X	☼☼●	A global emergency stop has been triggered on this station.
○	●	●	●	●	☼●	Reset is required on this station.
●	●	●	●	●	○	The safety output on the module is active and the system enabled.

Note A combination of several causes may occur, e.g. if a local emergency stop and a global emergency stop have been triggered.

LED I5 and I6 indications

In normal operation with safety output Q1 active the LEDs I5 and I6 are ○ **Off**.

Tab. 16: Significance of the diagnostics LEDs I5 and I6 on the UE410-GU

LED	Meaning
I5 illuminates ● **Green**	The safety output Q1 is shut down, the external actuators have dropped out. Otherwise check the wiring.
I5 flashes ☼● **Green**	EDM error. Check the wiring. If necessary, replace the actuator.
I6 illuminates ● **Green**	The reset button is pressed. Otherwise check the wiring.
I6 flashes ☼● **Green**	The reset button has been operated for too long. Check the wiring if necessary.

Also note the description of the LED indicators on the UE410-GU in section 3.4.1 “Controls and status indicators” on page 28 as well as chapter 10 “Diagnostics” on page 93.

3.5 UE410-XU module

The UE410-XU module is an input/output extension or a subsystem with 4 safe inputs and outputs. It has the **identical** functionality to the UE410-MU main module, however without the system save using the ENTER button.

The UE410-XU cannot be used as a stand-alone device and always requires a UE410-MU main module.

3.5.1 Controls and status indicators

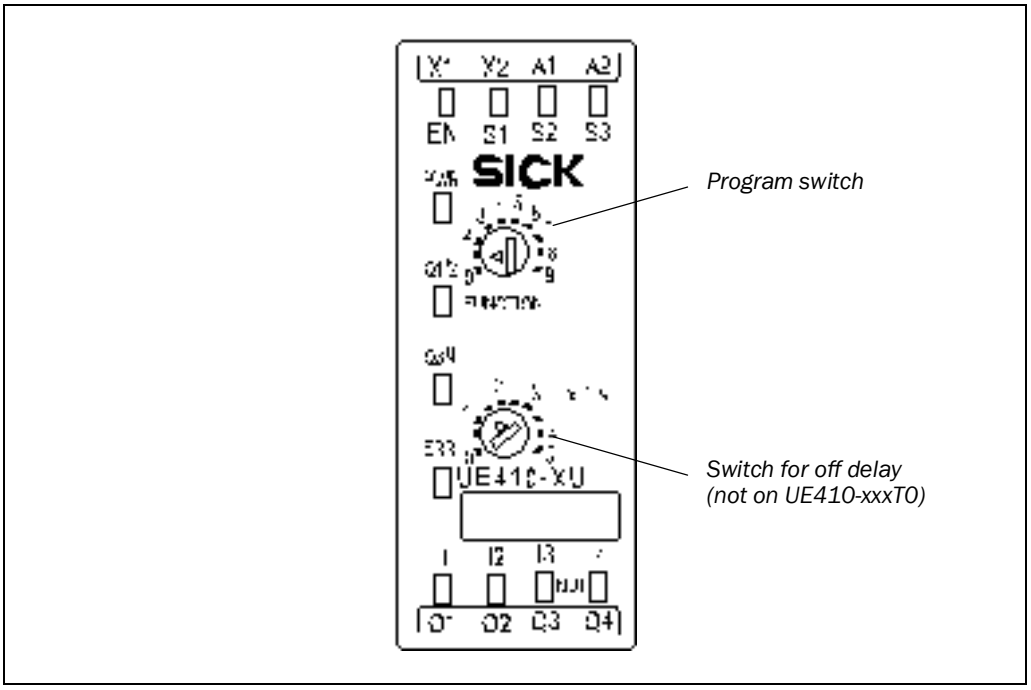


Fig. 11: UE410-XU controls and status indicators

Indicators, controls and terminal assignments are the same as on the UE410-MU main module (see Tab. 9-Tab. 11).

3.6 UE410-MU/UE410-XU programs

The modules have 9 settable programs each that can be set via a rotary switch.

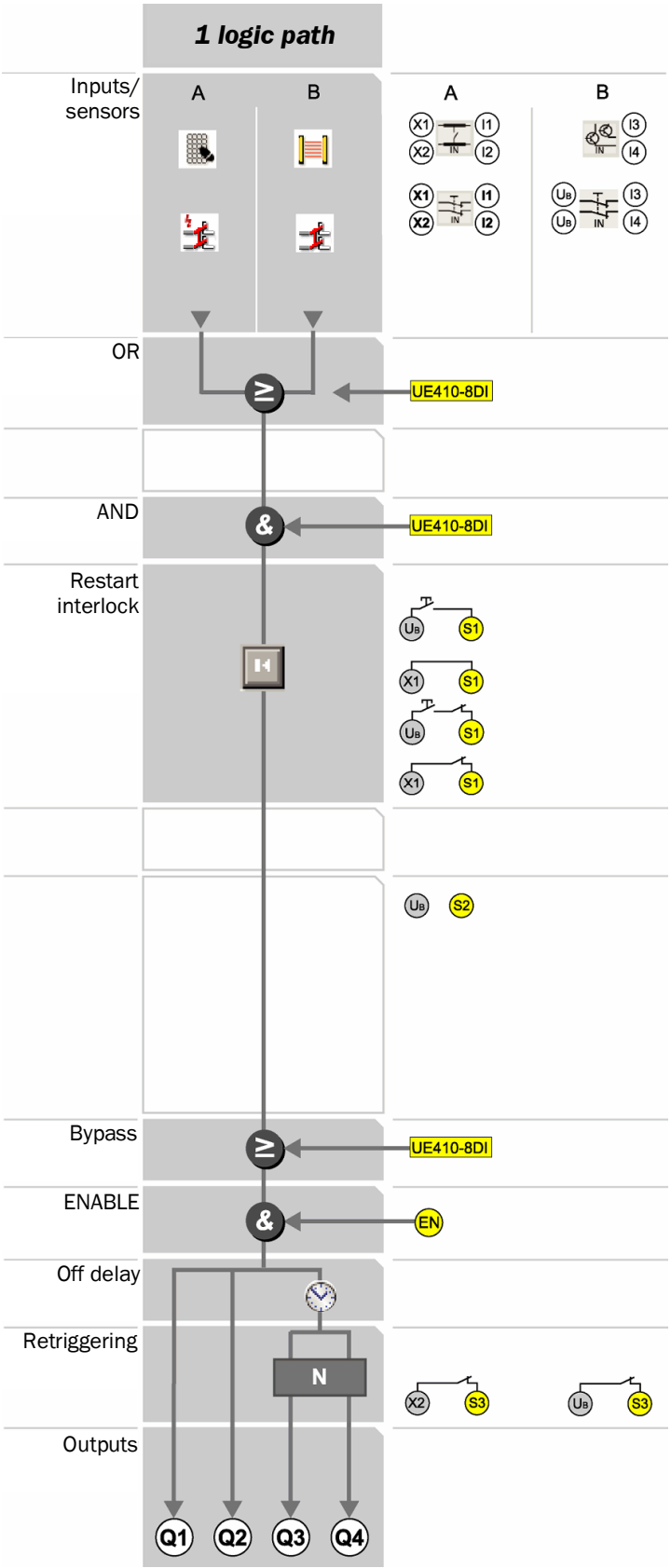
Up to two applications acting independently or two applications that are dependent on each other (A and B) can be controlled. These can act independently or dependent on each other, depending on the program (see Fig. 3-Fig. 6).

The program selection determines the type of safety sensor equipment to be connected **and** the logic instructions.

Tab. 17: UE410-MU/UE410-XU programs

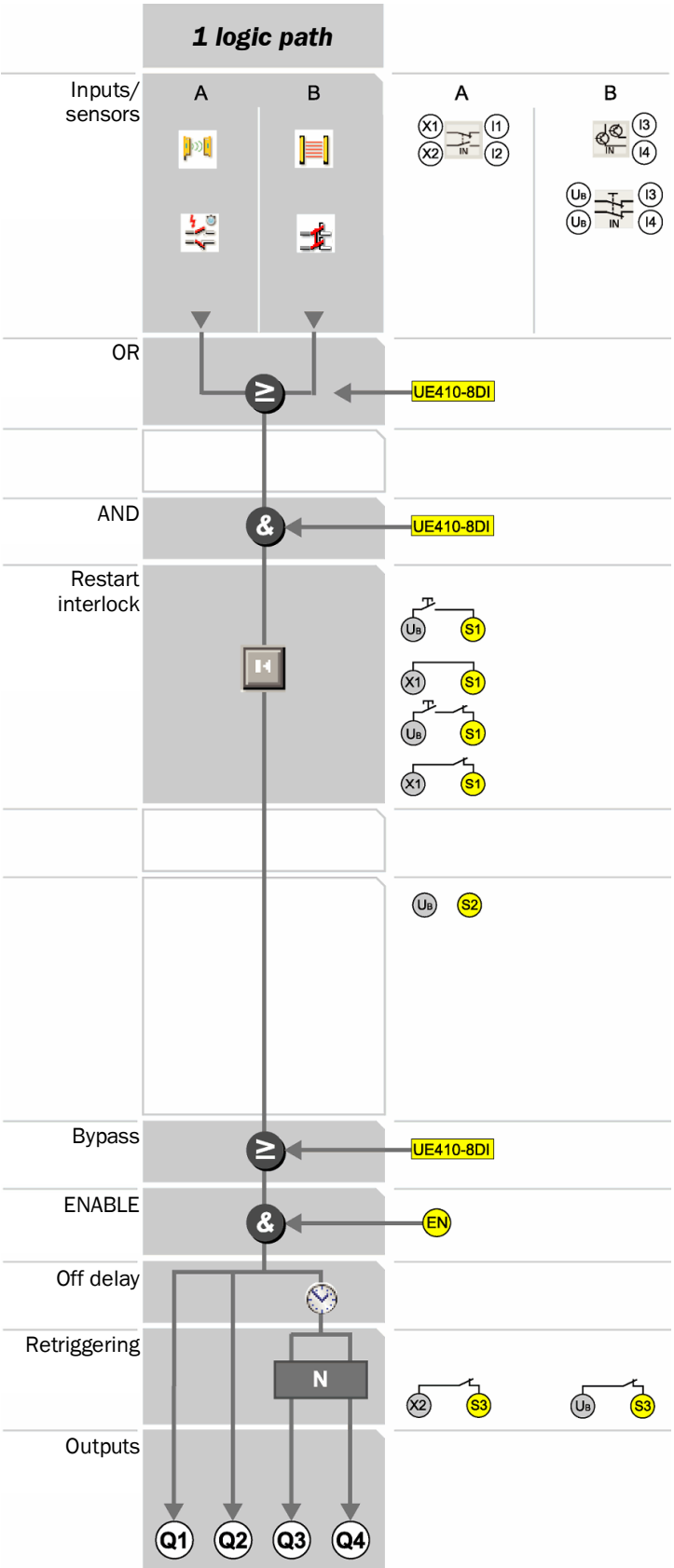
Program	Description
0	Module inactive
1-2	Input control circuit A is linked by means of OR logic to input control circuit B and acts on all the safety outputs Q1-Q4.
3.1-3.2	• Input control circuit A acts on the safety outputs Q1, Q2, Q4. • Input control circuit B is muting input and controls the muting lamp via Q3.
4	Input control circuit AB acts on all the safety outputs AB (two-hand IIIC).
5-7	• Input control circuit A acts on both safety outputs Q1/Q2 and Q3/Q4. • Input control circuit B acts only on the safety output Q3/Q4.
8	• Input control circuit A acts only on the safety output Q1/Q2. • Input control circuit B acts only on the safety output Q3/Q4.
9	• Input control circuit A acts on both safety outputs Q1/Q2 and Q3/Q4. • Input control circuit B acts only on the safety output Q3/Q4.

3.6.1 Program 1



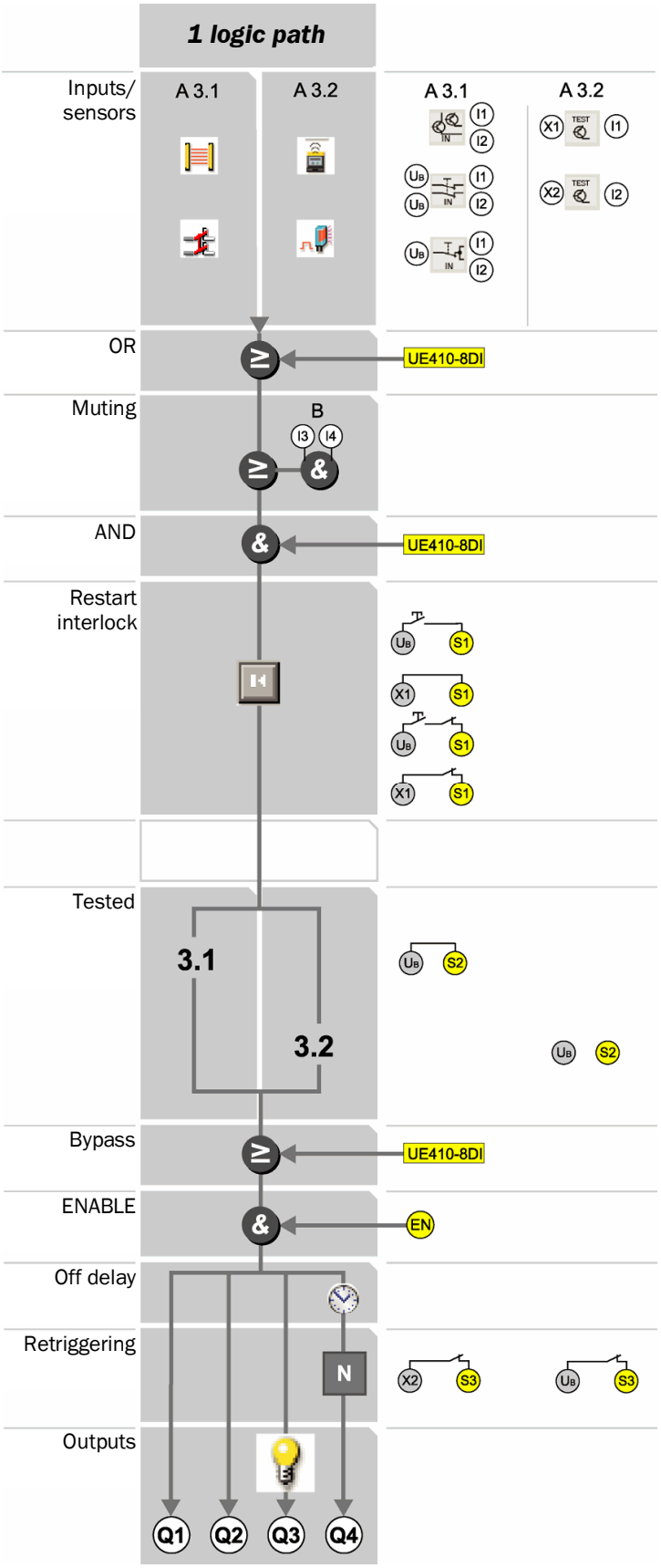
A	B
A Dual-channel equivalent N/C contact Cross-circuit detecting control signals Synchronous time monitoring (1500 ms) Pressure-sensitive switching mats (four-wire) Flexi Loop	**B** Single-channel N/C contact Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE (sensors with semiconductor output)
OR with UE410-8DI — switch position 7	
AND with UE410-8DI — switch position 1-6	
Connecting of S1: • with restart interlock Q1/Q2, without EDM • without restart interlock Q1/Q2, without EDM • with restart interlock Q1/Q2, with EDM • without restart interlock Q1/Q2, with EDM	
Connecting of S2: S2 may not be connected.	
OR limited 60 s with UE410-8DI — switch position 8	
Always wire ENABLE (expected 24 V DC)! At ENABLE low Q1-Q4 are always low.	
Off delay acts on Q3/Q4 (not on UE410-xxxT0).	
Connecting of S3:	
with/without EDM Q3/Q4 • retriggering ON	with/without EDM Q3/Q4 • retriggering OFF
Undelayed OSSDs Q1/Q2 Delayable OSSDs Q3/Q4	

3.6.2 Program 2



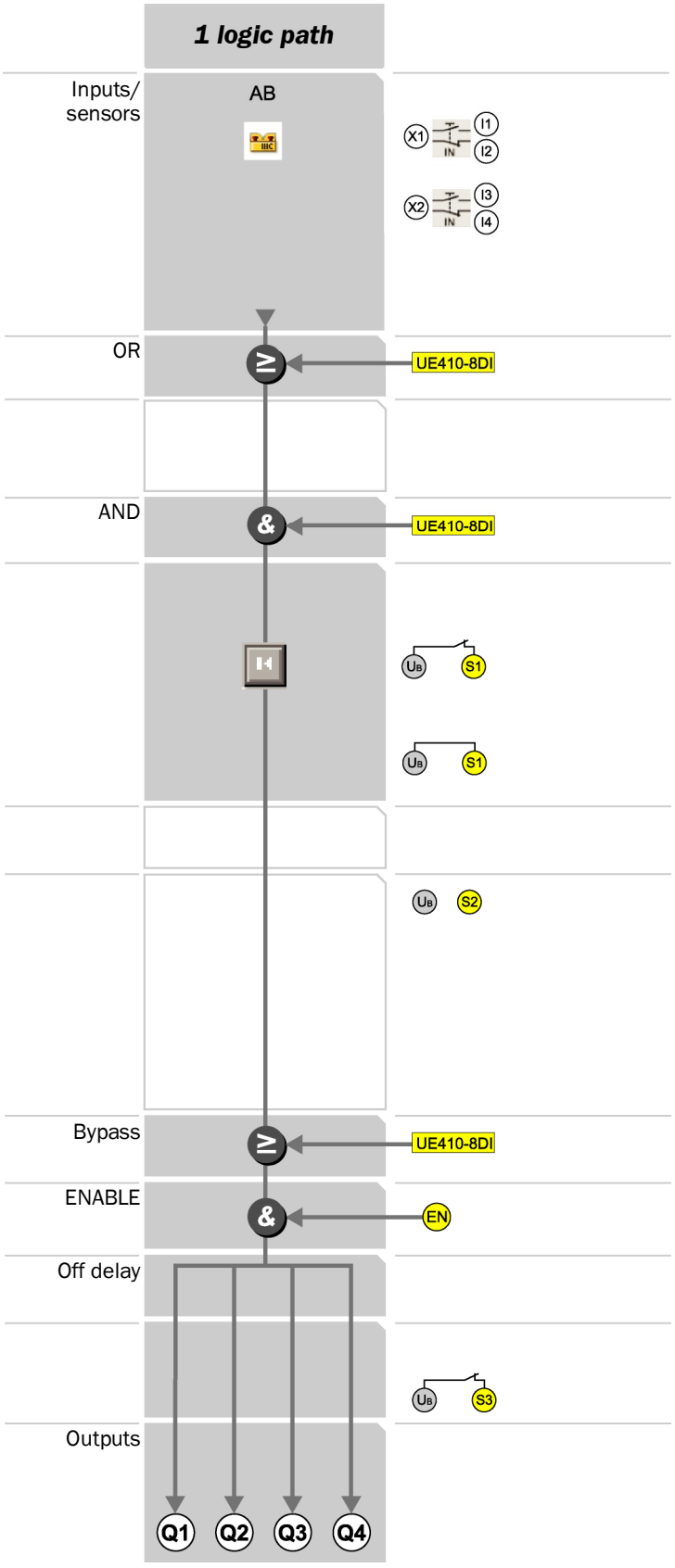
A Dual-channel complementary N/C / N/O contact ESPE (e.g. RE300) Cross-circuit detecting control signals Synchronous time monitoring (1500 ms)	**B** Single-channel N/C contact Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE (sensors with semiconductor output)
OR with UE410-8DI — switch position 7	
AND with UE410-8DI — switch position 1-6	
Connecting of S1: • with restart interlock Q1/Q2, without EDM • without restart interlock Q1/Q2, without EDM • with restart interlock Q1/Q2, with EDM • without restart interlock Q1/Q2, with EDM	
Connecting of S2: S2 may not be connected.	
OR limited 60 s with UE410-8DI — switch position 8	
Always wire ENABLE (expected 24 V DC)! At ENABLE low Q1-Q4 are always low.	
Off delay acts on Q3/Q4 (not on UE410-xxxT0).	
Connecting of S3:	
with/without EDM Q3/Q4 • retriggering ON	with/without EDM Q3/Q4 • retriggering OFF
Undelayed OSSDs Q1/Q2 Delayable OSSDs Q3/Q4	

3.6.3 Programs 3.1 and 3.2



Program 3.1	Program 3.2
Single-channel N/C contact Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE (sensors with semiconductor output)	X1-I1 IN4000; Bridge X2-I2. X2-I2 ESPE (sensors with PNP semiconductor output) Bridge X1-I1. Bridge the input circuit not used (does not apply to I3-I4).
OR with UE410-8DI — switch position 7	
Muting sensors I3-I4 (PNP switching)	
AND with UE410-8DI — switch position 1-6	
Connecting of S1: • with restart interlock Q1/Q2, without EDM • without restart interlock Q1/Q2, without EDM • with restart interlock Q1/Q2, with EDM • without restart interlock Q1/Q2, with EDM	
Connecting of S2: S2 is connected to U_B.	**Connecting of S2:** S2 may not be connected.
OR limited 60 s with UE410-8DI — switch position 8	
Always wire ENABLE (expected 24 V DC)! At ENABLE low Q1-Q4 are always low.	
Off delay acts only on Q4 (not on UE410-xxxT0).	
Connecting of S3:	
with/without EDM Q4 • retriggering ON	with/without EDM Q4 • retriggering OFF
Undelayed OSSDs Q1/Q2 Delayable OSSD Q4 Output for muting lamp and Reset required lamp Q3 Q3 permanently High:Muting active Q3 1 Hz flashing: Reset required	

3.6.4 Program 4



2 dual-channel complementary N/C / N/O contacts
Two-hand control (to EN 574 IIIC)
Cross-circuit detecting control signals

OR with UE410-8DI — switch position 7

AND with UE410-8DI — switch position 1-6

Connecting of S1:
without restart interlock/with two-hand control start-up testing (to EN 574 IIIC)

- with EDM Q1/Q2
- without EDM Q1/Q2

Connecting of S2:
S2 may not be connected.

OR limited 60 s with UE410-8DI — switch position 8

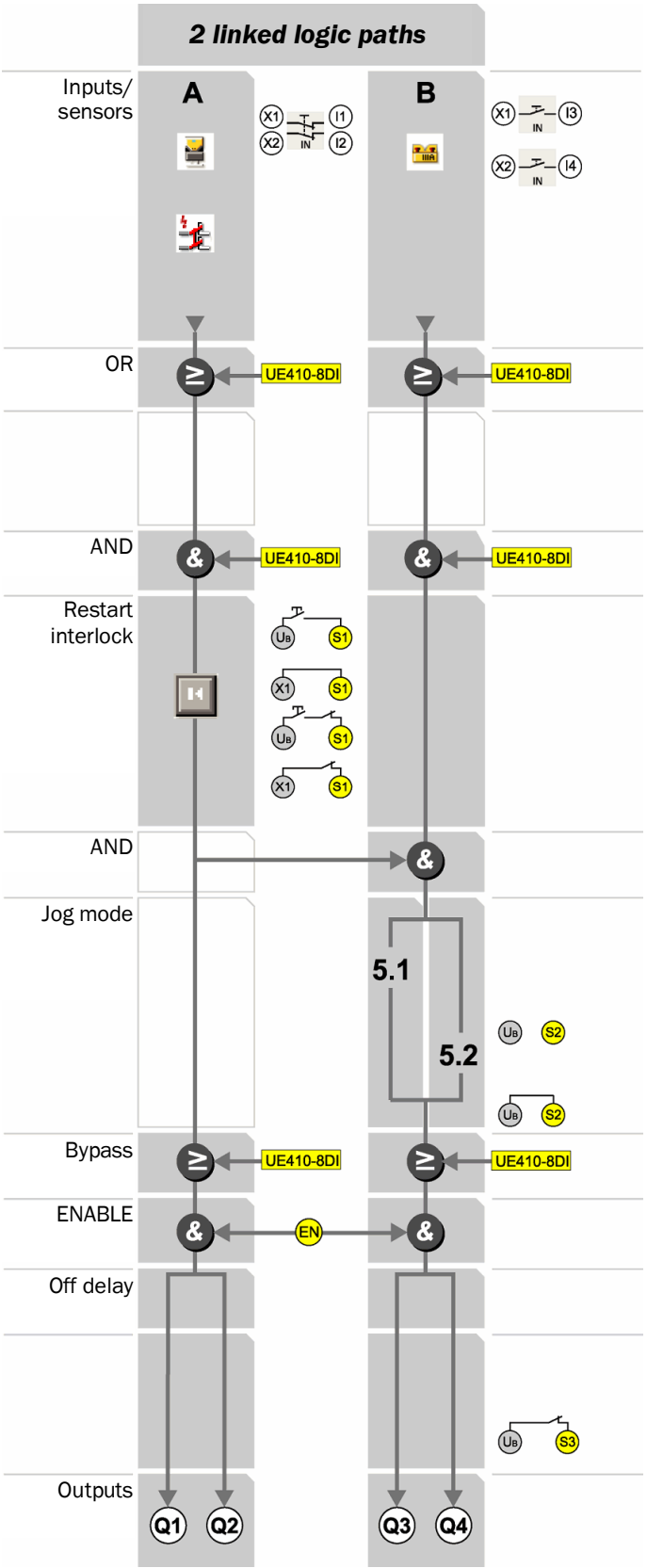
Always wire ENABLE (expected 24 V DC)!
At ENABLE low Q1-Q4 are always low.

No off delay — switch DELAY to 0.
An off delay may not be set!

Connecting of S3:
with/without EDM Q3/Q4

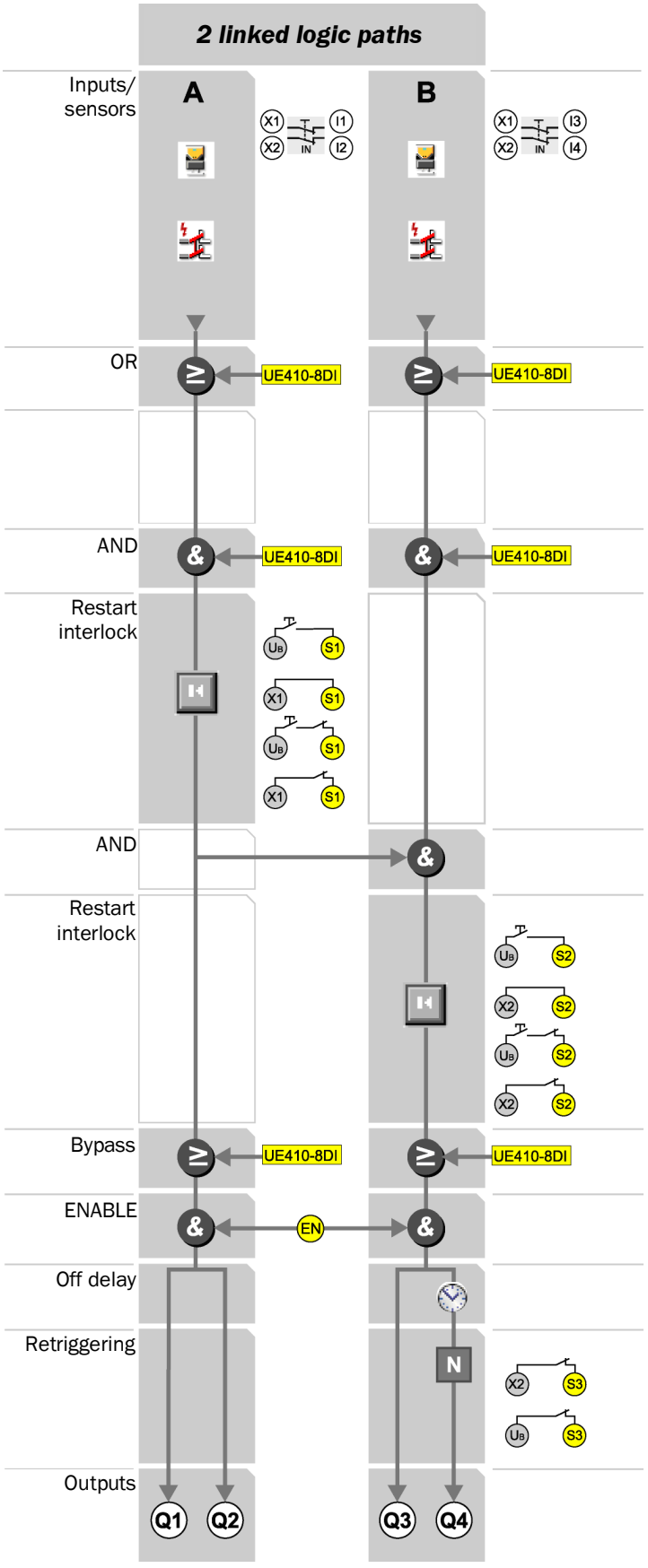
Undelayed OSSDs Q1-Q4
No delayable OSSDs (two-hand standard)

3.6.5 Programs 5.1 and 5.2



Program 5.1	Program 5.2
A Dual-channel equivalent N/C contacts Flexi Loop	**B** 2 single-channel N/C contacts Two-hand control (to EN 574 IIIA) with or without jog mode Cross-circuit detecting control signals
OR with UE410-8DI — switch position 7	
AND with UE410-8DI — switch position 1-6	
Connecting of S1: • with restart interlock Q1/Q2, without EDM • without restart interlock Q1/Q2, without EDM • with restart interlock Q1/Q2, with EDM • without restart interlock Q1/Q2, with EDM	
Connecting of S2: without restart interlock + with start-up testing (two-hand standard) Acts only on Q3/Q4. Switch off path B: Two-hand control unit (to EN 574 IIIA) with jog mode Jog mode max. 5 s (Q3/Q4 remain switched on for only 5 s) Two-hand control unit (to EN 574 IIIA) without jog mode	
OR limited 60 s with UE410-8DI — switch position 8	
Always wire ENABLE (expected 24 V DC)! At ENABLE low Q1-Q4 are always low.	
No off delay — switch DELAY to 0. **An off delay may not be set!**	
Connecting of S3: with/without EDM for Q3/Q4	
Undelayed OSSDs Q1-Q4 No delayable OSSDs (two-hand standard)	

3.6.6 Program 6



A	B
Dual-channel equivalent N/C contacts Cross-circuit detecting control signals Flexi Loop	Dual-channel equivalent N/C contacts Cross-circuit detecting control signals Flexi Loop

OR with UE410-8DI — switch position 7

AND with UE410-8DI — switch position 1-6

Connecting of S1:

- with restart interlock Q1/Q2, without EDM
- without restart interlock Q1/Q2, without EDM
- with restart interlock Q1/Q2, with EDM
- without restart interlock Q1/Q2, with EDM

Connecting of S2:

- with restart interlock Q3/Q4, without EDM Q3
- without restart interlock Q3/Q4, without EDM Q3
- with restart interlock Q3/Q4, with EDM Q3
- without restart interlock Q3/Q4, with EDM Q3

OR limited 60 s with UE410-8DI — switch position 8

Always wire ENABLE (expected 24 V DC)!
At ENABLE low Q1-Q4 are always low.

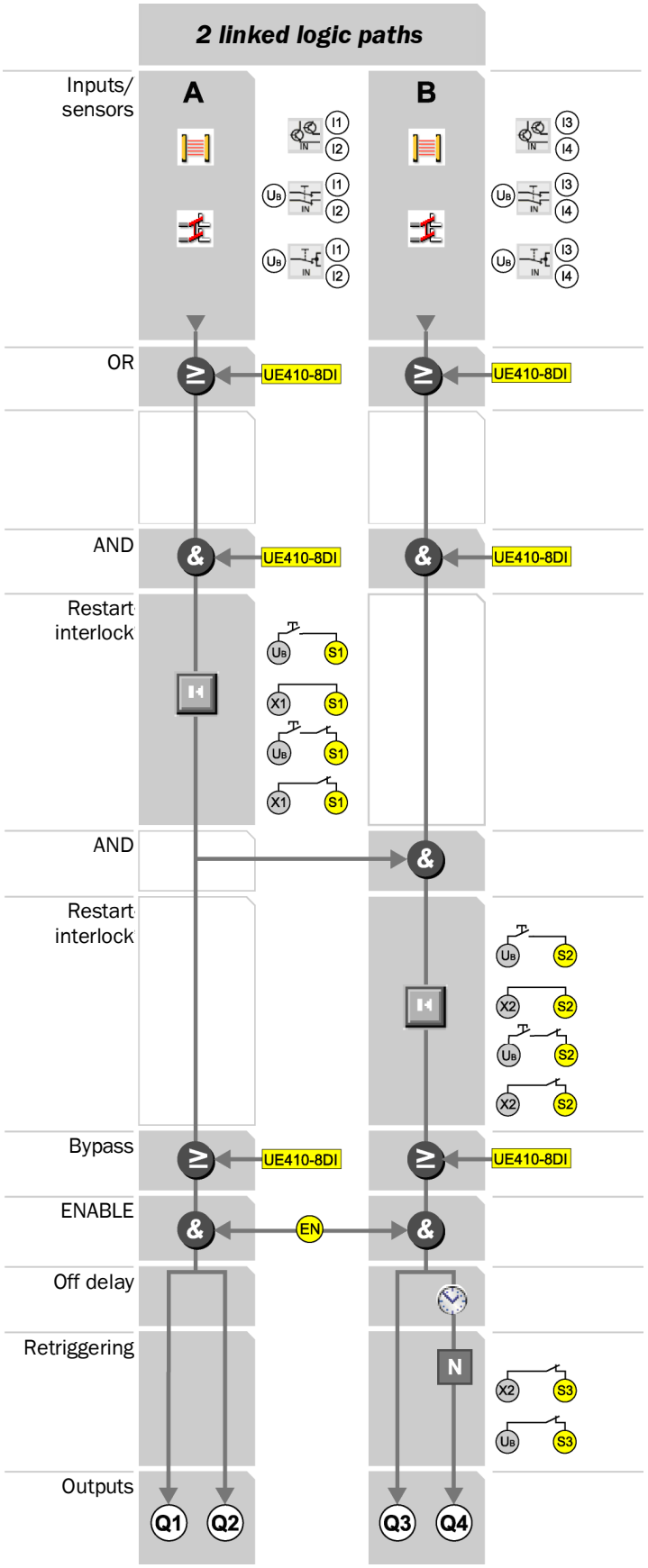
Off delay acts only on Q4
(not on UE410-xxxT0).

Connecting of S3:
with/without EDM Q4

- retriggering ON
- retriggering OFF

Undelayed OSSDs Q1-Q3
Delayable OSSD Q4

3.6.7 Program 7



A	**B**
Single-channel N/C contact Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE and sensors with semiconductor output	Single-channel N/C contacts Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE and sensors with semiconductor output

OR with UE410-8DI — switch position 7

AND with UE410-8DI — switch position 1-6

Connecting of S1:

- with restart interlock Q1/Q2, without EDM
- without restart interlock Q1/Q2, without EDM
- with restart interlock Q1/Q2, with EDM
- without restart interlock Q1/Q2, with EDM

Connecting of S2:

- with restart interlock Q3/Q4, without EDM Q3
- without restart interlock Q3/Q4, without EDM Q3
- with restart interlock Q3/Q4, with EDM Q3
- without restart interlock Q3/Q4, with EDM Q3

OR limited 60 s with UE410-8DI — switch position 8

Always wire ENABLE (expected 24 V DC)!
At ENABLE low Q1-Q4 are always low.

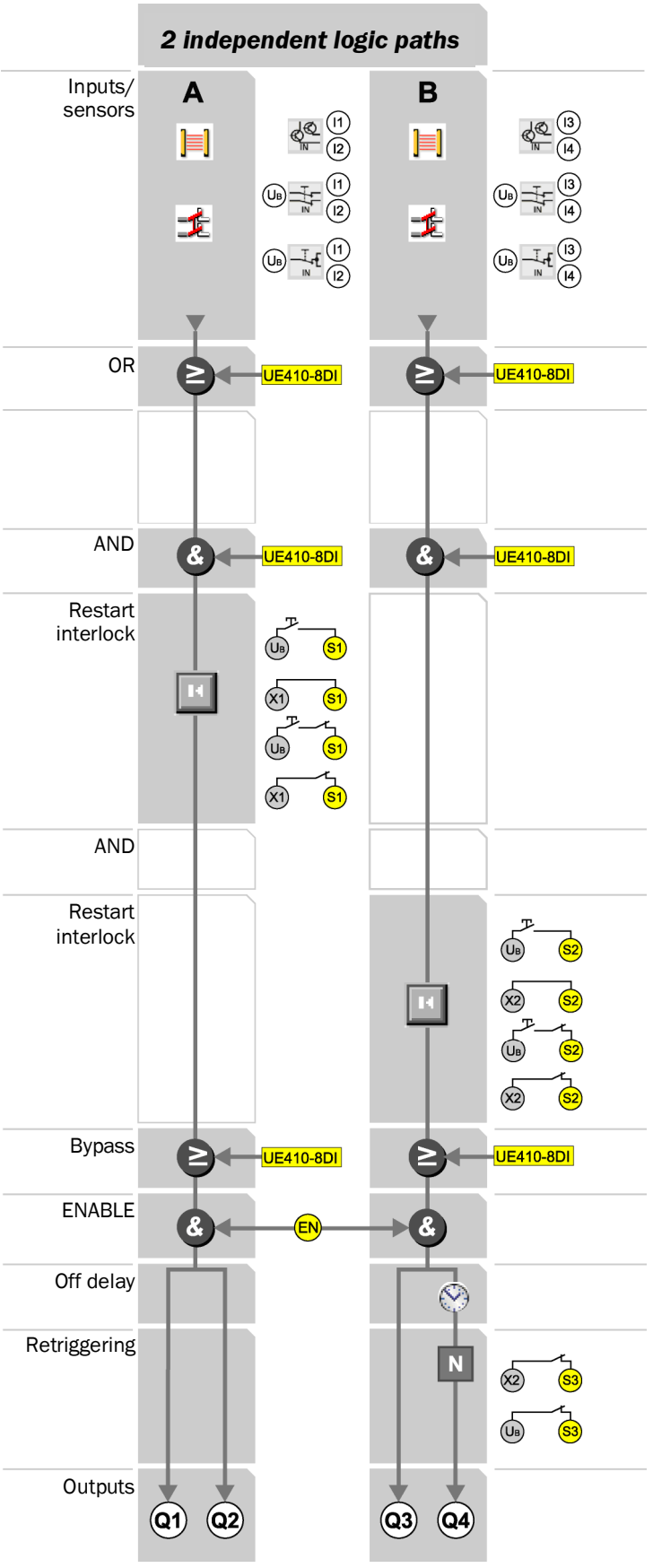
Off delay acts only on Q4
(not on UE410-xxxT0).

Connecting of S3:
with/without EDM Q4

- retriggering ON
- retriggering OFF

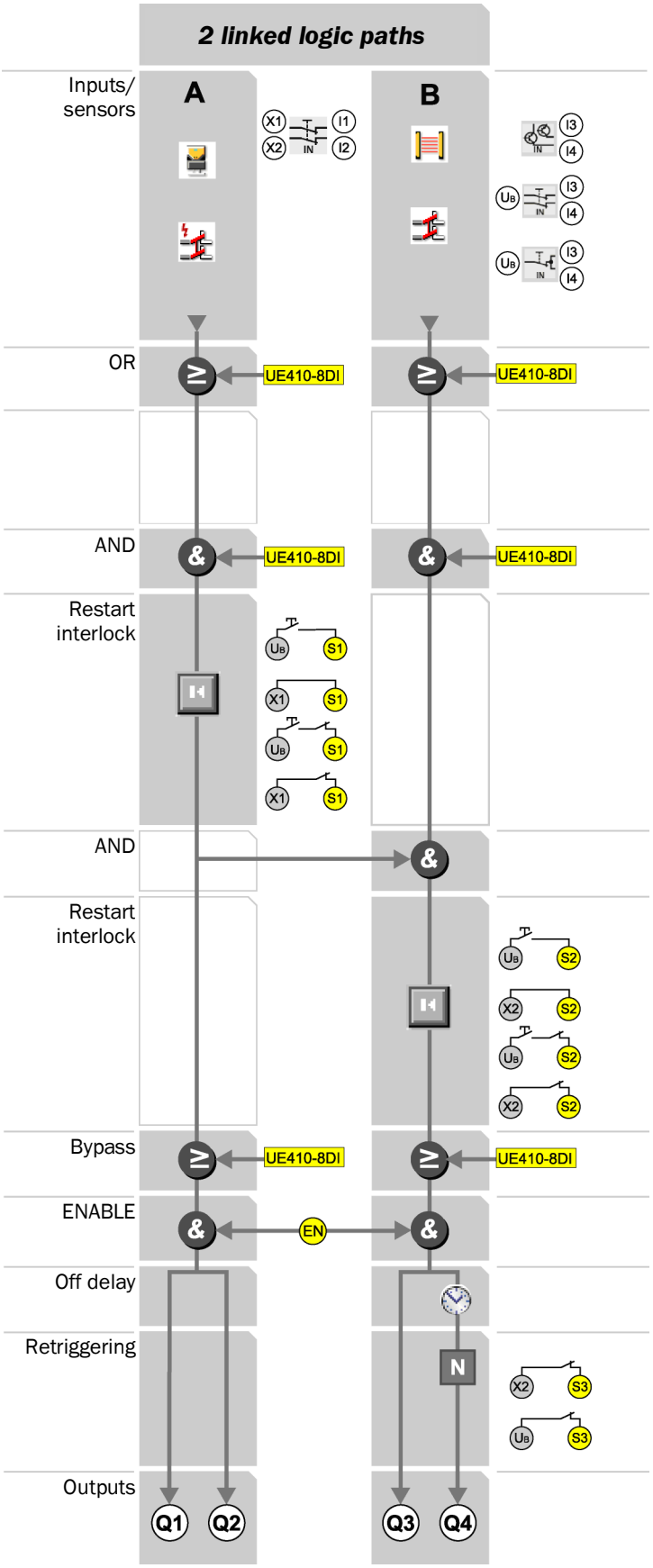
Undelayed OSSDs Q1-Q3
Delayable OSSD Q4

3.6.8 Program 8



A Single-channel N/C contact Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE and sensors with semiconductor output	**B** Single-channel N/C contacts Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE and sensors with semiconductor output
OR with UE410-8DI — switch position 7	
AND with UE410-8DI — switch position 1-6	
Connecting of S1: • with restart interlock Q1/Q2, without EDM • without restart interlock Q1/Q2, without EDM • with restart interlock Q1/Q2, with EDM • without restart interlock Q1/Q2, with EDM	
Connecting of S2: • with restart interlock Q3/Q4, without EDM Q3 • without restart interlock Q3/Q4, without EDM Q3 • with restart interlock Q3/Q4, with EDM Q3 • without restart interlock Q3/Q4, with EDM Q3	
OR limited 60 s with UE410-8DI — switch position 8	
Always wire ENABLE (expected 24 V DC)! At ENABLE low Q1-Q4 are always low.	
Off delay acts only on Q4 (not on UE410-xxxT0).	
Connecting of S3: with/without EDM Q4 • retriggering ON • retriggering OFF	
Undelayed OSSDs Q1-Q3 Delayable OSSD Q4	

3.6.9 Program 9



A	B
Dual-channel equivalent N/C contacts Cross-circuit detecting control signals Flexi Loop	Single-channel N/C contacts Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE and sensors with semiconductor output

OR with UE410-8DI — switch position 7

AND with UE410-8DI — switch position 1-6

Connecting of S1:

- with restart interlock Q1/Q2, without EDM
- without restart interlock Q1/Q2, without EDM
- with restart interlock Q1/Q2, with EDM
- without restart interlock Q1/Q2, with EDM

Connecting of S2:

- with restart interlock Q3/Q4, without EDM Q3
- without restart interlock Q3/Q4, without EDM Q3
- with restart interlock Q3/Q4, with EDM Q3
- without restart interlock Q3/Q4, with EDM Q3

OR limited 60 s with UE410-8DI — switch position 8

Always wire ENABLE (expected 24 V DC)!
At ENABLE low Q1-Q4 are always low.

Off delay acts only on Q4
(not on UE410-xxxT0).

Connecting of S3:
with/without EDM Q4

- retriggering ON
- retriggering OFF

Undelayed OSSDs Q1-Q3
Delayable OSSD Q4

3.6.10 Connection of sensors to the UE410-MU/UE410-XU

Notes

- The allocation of the outputs X1 to X2 to the inputs I1 to I4 depends on the selected input circuit function.
- The functions of logic paths A and B can be set independently of each other.

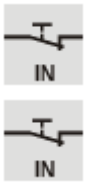
WARNING

Warning!

Unused inputs must be bridged as per the state shown!

➢ Connect the sensors (type depending on the switch position) in accordance with Tab. 18.

Program	Inputs of logic path A			Inputs of logic path B		
0	Module inactive					
1	Dual-channel equivalent N/C contact cross-circuit detecting synchronisation time monitoring 1500 ms		X1-I1 X2-I2	Dual-channel non-isolated semiconductors		U_B-I3 U_B-I4
				Dual-channel N/C contact, three-wire		U_B-I3 U_B-I4
	Four-wire cross-circuit detecting (e.g. cross-circuit detecting switching mats)		X1-I1 X2-I2	Single-channel N/C contact		U_B-I3 U_B-I4
2	Dual-channel complementary N/C contact cross-circuit detecting synchronisation time monitoring 1500 ms		X1-I1 X2-I2	Dual-channel non-isolated semiconductors		U_B-I3 U_B-I4
				Dual-channel N/C contact, three-wire		U_B-I3 U_B-I4
	Dual-channel complementary N/C contact cross-circuit detecting synchronisation time monitoring 1500 ms		X1-I1 X2-I2	Single-channel N/C contact		U_B-I3 U_B-I4

Program	Inputs of logic path A				Inputs of logic path B		
3	**3.1**	Single-channel N/C contact		U_B-I1 U_B-I2	Muting 2 single-channel N/C contacts or dual-channel non-isolated semiconductor		U_B-I3 U_B-I4
		Dual-channel N/C contact, three-wire		U_B-I1 U_B-I2			
		Dual-channel non-isolated semi-conductors		U_B-I1 U_B-I2			
	3.2	Single-channel N/C contacts/ESPE (sensors with semi-conductor output)		X2-I2 (bridge X1-I1)			
	3.2	Single-channel N/C contacts/IN4000 (inductive switch with semiconductor output)		X1-I1 (bridge X2-I2)			
4	Two-hand control (X1-I1 N/O contact; X1-I2 N/C contact)			X1-I1 X1-I2	Two-hand control (X1-I3 N/O contact; X2-I4 N/C contact)		X2-I3 X2-I4
5	Dual-channel equivalent N/C contact cross-circuit detecting			X1-I1 X2-I2	2 single-channel N/O contacts, cross-circuit detecting		X1-I3 X2-I4
6	Dual-channel equivalent N/C contact cross-circuit detecting			X1-I1 X2-I2	Dual-channel equivalent N/C contact cross-circuit detecting		X1-I3 X2-I4
7	Dual-channel non-isolated semiconductors			U_B-I1 U_B-I2	Dual-channel non-isolated semiconductors		U_B-I3 U_B-I4
	Dual-channel N/C contact, three-wire			U_B-I1 U_B-I2	Dual-channel N/C contact, three-wire		U_B-I3 U_B-I4
	Single-channel N/C contact			U_B-I1 U_B-I2	Single-channel N/C contact		U_B-I3 U_B-I4

Program	Inputs of logic path A			Inputs of logic path B		
8	Dual-channel non-isolated semiconductors		U_B-I1 U_B-I2	Dual-channel non-isolated semiconductors		U_B-I3 U_B-I4
	Dual-channel N/C contact, three-wire		U_B-I1 U_B-I2	Dual-channel N/C contact, three-wire		U_B-I3 U_B-I4
	Single-channel N/C contact		U_B-I1 U_B-I2	Single-channel N/C contact		U_B-I3 U_B-I4
9	Dual-channel equivalent N/C contact cross-circuit detecting		X1-I1 X2-I2	Dual-channel non-isolated semiconductors		U_B-I3 U_B-I4
				Dual-channel N/C contact, three-wire		U_B-I3 U_B-I4
				Single-channel N/C contact		U_B-I3 U_B-I4

Tab. 18: Connection of sensors to the UE410-MU/UE410-XU

3.7 UE410-GU programs

The UE410-GU has 9 programs that are set using the program switch.

The global emergency stop function with manual reset is active in all programs. Depending on the program set, a local emergency stop function can also be configured with which it is possible to choose between manual reset and automatic reset.

The selection of the program defines the type of safety sensor to be connected and the principle of operation of the local reset. The operator logic is identical for all programs.

Tab. 19: UE410-GU programs

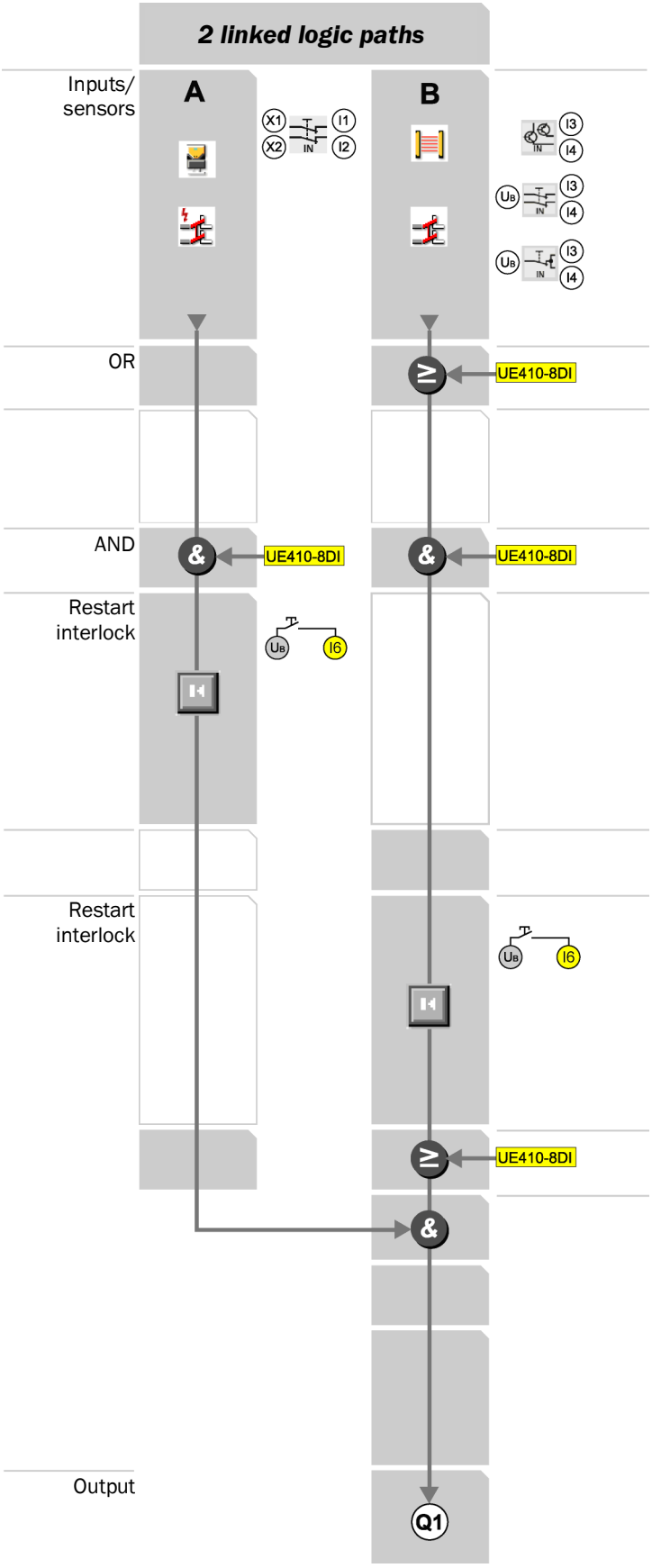
Program	Function I1/I2 (global emergency stop)	Function I3/I4 (local emergency stop)	Moni-toring	Function I6 (reset of the local emergency stop)[5]
1	Equivalent switch, cross-circuit detecting 	–	–	–
2		Equivalent switch, cross-circuit detecting 	I3–X1 I4–X2	Manual
3				Automatic
4		Dual-channel N/C / N/O contact, complementary, cross-circuit detecting 	I3–X1 I4–X2	Manual
5				Automatic
6		OSSD or untested safety switch 	I3–Ux[6] I4–Ux	Manual
7				Automatic
8		Single-channel N/C contact, cross-circuit detecting, e.g. • emergency stop pushbutton • safety switch • testable sensors (e.g. L41) 	I3–n. u.[7] I4–X2	Manual
9				Automatic

Note Switch position 0 is not permitted.

[5] A reset button for the global emergency stop must always be connected to I6. This button also acts as the reset button for manually resetting the local emergency stop if necessary.

[6] Ux = independent 24 V supply that must be connected to the same GND connection as the power supply for the UE410-GU.

[7] Not connected, i.e. I3 must not be connected.



A	B
Global emergency stop **e.g. program 6** Dual-channel equivalent N/C contacts Cross-circuit detecting control signals Flexi Loop	**Local cut-off path** for programs see Tab. 19 **e.g. program 6** Single-channel N/C contacts Dual-channel equivalent N/C contact (not cross-circuit detecting) ESPE and sensors with semiconductor output

OR with UE410-8DI — switch position 7 input B
Switch position 7 input A is **not permitted**, UE410-GU switches to ERROR (configuration error).

AND with UE410-8DI — switch position 1-6

Global reset — connecting of I6:

- with restart interlock Q1

Local reset — connecting of I6:

- with restart interlock Q1
- only in the programs 2, 4, 6, 8

OR limited 60 s with UE410-8DI — switch position 8 input B
Switch position 8 input A is **not permitted**, UE410-GU switches to ERROR (configuration error).

3.8 UE410-8DI input extension module

The UE410-8DI module is an input extension with 8 safe inputs.

A UE410-8DI is used to add additional inputs either to a UE410-MU, UE410-GU or UE410-XU. The simultaneous use of up to UE410-8DI per UE410-MU, UE410-GU or UE410-XU is possible.

A UE410-8DI input extension module acts exclusively on the next UE410-MU, UE410-GU or UE410-XU module on the left in the module structure. It has two separate input groups each with 4 inputs for connecting safe signal detectors and sensors. The UE410-8DI has a separate switch for each input group (input A and B). The 9 positions on the rotary switch determine the type of safety component which can be connected and with which logic (OR, AND or Bypass) it will act on the UE410-MU, UE410-GU or UE410-XU.

The input group A of a UE410-8DI acts on the logic path A of a connected UE410-MU, UE410-GU or UE410-XU.

The input group B of a UE410-8DI acts on the logic path B of a connected UE410-MU, UE410-GU or UE410-XU.

Each input group consists of two input pairs. At input A, for example, this is I1/I2 and I3/I4. Two inputs are AND-linked and form an input pair. This does not apply for switch position 1.

Tab. 20: UE410-8DI switch positions

Switch position	Description
0	Selected input (A/B) is inactive — input signals are ignored.
1	The connected single-channel sensor equipment is **AND**-linked to the respective logic path of the UE410-MU/UE410-GU/UE410-XU modules. Unused inputs have to be jumpered in accordance with the state logical “1” (e.g. X4-I4, U_B-I4).
2-6	The connected dual-channel sensor equipment is **AND**-linked to the respective logic path of the UE410-MU/UE410-GU/UE410-XU modules. Unused inputs have to be jumpered in accordance with the state logical “1” (e.g. X4-I4, U_B-I4).
7	The connected dual-channel sensor equipment is **OR**-linked to the respective logic path of the UE410-MU/UE410-GU/UE410-XU modules.[8)]
8	The connected dual-channel sensor equipment is **Bypass**-linked to the respective safety outputs of the UE410-MU/UE410-GU/UE410-XU modules (time-limited OR function).[9)]
9	Reciprocal assignment of input A/input B in order to link all 8 inputs on a logic path.

For more informationen on this topic see section 4.12 “Grouping of subsystems” on page 78.

8) An OR function that acts on the global cut-off path on the UE410-GU (switch position 7, input A on the UE410-8DI) is not permitted and will result in a configuration error (ERROR).

9) A bypass function that acts on the global cut-off path on the UE410-GU (switch position 8, input A on the UE410-8DI) is not permitted and will result in a configuration error (ERROR).

3.8.1 AND link

The switch settings 1 to 6 of the UE410-8DI add inputs to the UE410-MU/UE410-GU/ UE410-XU modules and link them with AND logic.

If the input conditions I1-I4 and I5-I8 are logical “1”, the AND function is active and the LED Q_A or Q_B is illuminated.

Tab. 21: UE410-8DI switch positions

Switch position	Application		Electrical configuration
0	For unused inputs		–
1		• Emergency stop button • Safety switch • Testable sensors	Single-channel N/C contact
2		• Emergency stop button • Safety switch • Switching mat (pressure-sensitive) • Flexi Loop	Dual-channel N/C contact, equivalent, cross-circuit detecting
3		• Emergency stop button • Safety switch • Flexi Loop	Dual-channel N/C contact, equivalent, cross-circuit detecting, synchronous time monitoring 1500 ms
4		• Safety switch	Dual-channel N/C / N/O contact, complementary, cross-circuit detecting
5		• Safety switch • RE300	Dual-channel N/C / N/O contact, complementary, cross-circuit detecting, synchronous time monitoring. 1500 ms
6		• Emergency stop button • Safety switch • ESPE (e.g. C4000)	Single-channel N/C contact
			Dual-channel N/C contact, equivalent
			Dual-channel semiconductor output

3.8.2 OR link

The switch position 7 of the UE410-8DI adds inputs to the UE410-MU/UE410-XU modules and links these with OR logic.

All input pairs are AND-linked internally. For example, only if I1 and I2 are high is the OR signal from this pair active. If the input conditions I1/I2 or I3/I4 are logical “1”, the OR function is active and the LED Q_A or Q_B is illuminated.

OR function on the UE410-GU via UE410-8DI

On the UE410-GU the OR function is only available via the UE410-8DI input extension module (switch position 7) and only on the local cut-off path, i.e. via input B.

Note An OR function that acts on the global cut-off path on the UE410-GU (switch position 7, input A on the UE410-8DI) is not permitted and will result in a configuration error (ERROR).

Tab. 22: OR link UE410-8DI

Switch position	Application		Electrical configuration
7		• Safety switch • ESPE (e.g. C4000)	Single-channel N/C contact
			Dual-channel N/C contact, equivalent
			Dual-channel semiconductor output

3.8.3 Bypass

The switch position 8 of the UE410-8DI jumpers the outputs of the UE410-MU/UE410-XU modules for the maximum duration of 60 s. The bypass is only active if I1 and I2 or I5 and I6 are logical “1”. input pairs I3/I4 and I7/I8 do not have to be wired, they have no function.

Bypass function on the UE410-GU via UE410-8DI

On the UE410-GU the bypass function is only available via the UE410-8DI input extension module (switch position 8) and only on the local cut-off path, i.e. via input B.

Note A bypass function that acts on the global cut-off path on the UE410-GU (switch position 8, input A on the UE410-8DI) is not permitted and will result in a configuration error (ERROR).

Tab. 23: Bypass UE410-8DI

Switch position	Application		Electrical configuration
8		• Teach-in key-operated switch • Enabling switch	Dual-channel N/C contact, equivalent, cross-circuit detection

WARNING

Bypass bypasses the safety device!

It should only be possible to generate the bypass signal by means of a dual-channel N/O key switch. The bypass should only be activated through a conscious act of the operator and with a view of the hazardous area.

3.8.4 Reciprocal assignment — Mirror mode

Switch position 9:

The functionality and logical link of input B is assigned to the logic of input A. Input group A then has 8 inputs.

Or:

The functionality and logical link of input A is assigned to the logic of input B. Input group B then has 8 inputs.

Note Function 9 may only be selected for one of the two input groups respectively. Otherwise a device error ERROR is generated and the ERR LED flashes.

3.8.5 Connection of sensors to the UE410-8DI

WARNING

A UE410-8DI has two test pulse generators. This means that short-circuits between odd (X1) and evenly (X2) numbered outputs will be detected. Short-circuits between two odd (i.e. X1 and X3) or two evenly (i.e. X2 and X4) numbered outputs will not be detected. Please heed this when wiring the safety sensors.

Notes

- The assignment of outputs X1 to X8 to inputs I1 to I8 depends on the selected rotary switch position.
- The functions of logic paths A and B can be set independently of each other.

WARNING

When AND logic is used, unused inputs have to be jumpered in accordance with the state logical “1” (e.g. X4-I4, U_B-I4)!

➢ Connect the sensors (type depending on the switch position) in accordance with Tab. 24.

Switch position			**Input A**				**Input B**			
0	All the inputs of Group A or B are not used	N.c.	Terminals not connected				Terminals not connected			
1	AND 4 × single-channel with testing		X1-I1	X2-I2	X3-I3	X4-I4	X5-I5	X6-I6	X7-I7	X8-I8
	AND 4 × single-channel with sensors that can be tested (ESPE)		X1-I1	X2-I2	X3-I3	X4-I4	X5-I5	X6-I6	X7-I7	X8-I8
2	AND 2 × dual-channel, cross-circuit detection		X1-I1 X2-I2		X3-I3 X4-I4		X5-I5 X6-I6		X7-I7 X8-I8	
	AND 2 × dual-channel, cross-circuit detection		X1-I1 X2-I2		X3-I3 X4-I4		X5-I5 X6-I6		X7-I7 X8-I8	

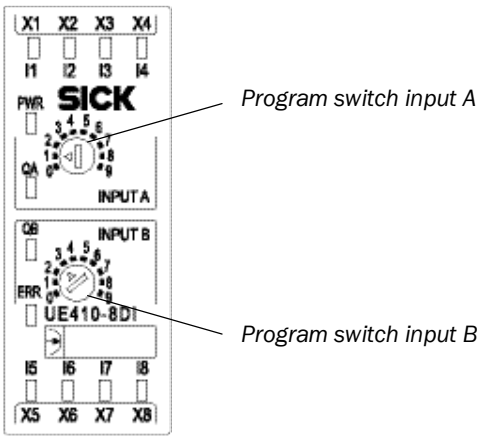
Flexi Classic

Switch position			Input A		Input B	
3	AND 2 × dual-channel, cross-circuit detection, synchronous time monitoring 1500 ms		X1-I1 X2-I2	X3-I3 X4-I4	X5-I5 X6-I6	X7-I7 X8-I8
4	AND 2 × dual-channel, cross-circuit detection		X1-I1 X2-I2	X3-I3 X4-I4	X5-I5 X6-I6	X7-I7 X8-I8
5	AND 2 × dual-channel, cross-circuit detection, synchronous time monitoring 1500 ms		X1-I1 X2-I2	X3-I3 X4-I4	X5-I5 X6-I6	X7-I7 X8-I8
6	AND 2 × dual-channel, semiconductor		$OSSD1_{Sensor}$-I1 $OSSD2_{Sensor}$-I2	$OSSD1_{Sensor}$-I3 $OSSD2_{Sensor}$-I4	$OSSD1_{Sensor}$-I5 $OSSD2_{Sensor}$-I6	$OSSD1_{Sensor}$-I7 $OSSD2_{Sensor}$-I8
	AND 2 × dual-channel, three-wire		$+U_B$-I1 $+U_B$-I2	$+U_B$-I3 $+U_B$-I4	$+U_B$-I5 $+U_B$-I6	$+U_B$-I7 $+U_B$-I8
	AND 2 × single-channel		$+U_B$-I1 $+U_B$-I2	$+U_B$-I3 $+U_B$-I4	$+U_B$-I5 $+U_B$-I6	$+U_B$-I7 $+U_B$-I8
7	OR 2 × dual-channel, semiconductor		$OSSD1_{Sensor}$-I1 $OSSD2_{Sensor}$-I2	$OSSD1_{Sensor}$-I3 $OSSD2_{Sensor}$-I4	$OSSD1_{Sensor}$-I5 $OSSD2_{Sensor}$-I6	$OSSD1_{Sensor}$-I7 $OSSD2_{Sensor}$-I8
	OR 2 × dual-channel, three-wire		$+U_B$-I1 $+U_B$-I2	$+U_B$-I3 $+U_B$-I4	$+U_B$-I5 $+U_B$-I6	$+U_B$-I7 $+U_B$-I8
	OR 2 × single-channel		$+U_B$-I1 $+U_B$-I2	$+U_B$-I3 $+U_B$-I4	$+U_B$-I5 $+U_B$-I6	$+U_B$-I7 $+U_B$-I8
8	Bypass 1 × dual-channel, cross-circuit detection		X1-I1 X2-I2	I3 n.c. I4 n.c.	X5-I5 X6-I6	I7 n.c. I8 n.c.
9	Input supplement	_	Function as for input B		Function as for input A	
With AND logic, unused inputs must be bridged to logical “1” (e.g. X4-I4, U_B-I4)!						

Tab. 24: Connection of sensors to the UE410-8DI

3.8.6 Controls and status indicators

Fig. 12: UE410-8DI controls and status indicators



Tab. 25: UE410-8DI LED indications

LED indicators	Meaning
PWR (green)	Supply voltage via safety bus is present.
I1-I8 (green)	Logical “1” is applied at the corresponding input.
I1, I2 flash in phase	Cross-circuit between I1, I2
I3, I4 flash in phase	Cross-circuit between I3, I4
I5, I6 flash in phase	Cross-circuit between I5, I6 or modules with different revision code (see section 10.2 “Replacement of a module” on page 93)
I7, I8 flash in phase	Cross-circuit between I7, I8 or modules with different revision code (see section 10.2 “Replacement of a module” on page 93)
I1, I2 flash out of phase	Process error at I1, I2
I3, I4 flash out of phase	Process error at I3, I4
I5, I6 flash out of phase	Process error at I5, I6
I7, I8 flash out of phase	Process error at I7, I8
I1 or I2 flashing	Synchronous time (1500 ms) exceeded
I3 or I4 flashing	Synchronous time (1500 ms) exceeded
I5 or I6 flashing	Synchronous time (1500 ms) exceeded
I7 or I8 flashing	Synchronous time (1500 ms) exceeded
QA (green)	Input conditions input A of inputs I1 to I4 are fulfilled.
QB (green)	Input conditions input B of inputs I5 to I8 are fulfilled.
ERR (red flashing)	Erroneous operational status on this module, see chapter 10 “Diagnostics” on page 93
ERR (red)	Erroneous operational status on the whole system (the error is on another module), see chapter 10 “Diagnostics” on page 93

Tab. 26: UE410-8DI operating elements

Switch/button	Function
INPUT A	10-step rotary switches for setting an input circuit function (input group A or B)
INPUT B	

3.8.7 Inputs and outputs

Tab. 27: Terminals UE410-8DI

Assignment	Description
I1-I4	Inputs for the connection of signal detectors or sensors (input A)
X1-X4	Test outputs: cross-circuit detecting control signals for controlling sensors of the module (input A)
I5-I8	Inputs for the connection of signal detectors or sensors (input B)
X5-X8	Test outputs: cross-circuit detecting control signals for controlling sensors of the module (input B)

For more informationen on this topic see section 4.12 “Grouping of subsystems” on page 78.

3.9 UE410-2RO/UE410-4RO output modules

The UE410-2RO/UE410-4RO output modules make dual-channel contact-based outputs with positively guided relay contacts available.

The output modules may only be operated in a system combination with a UE410-MU/XU.

A maximum of four UE410-4RO or eight UE410-2RO can be connected to a Flexi Classic system.

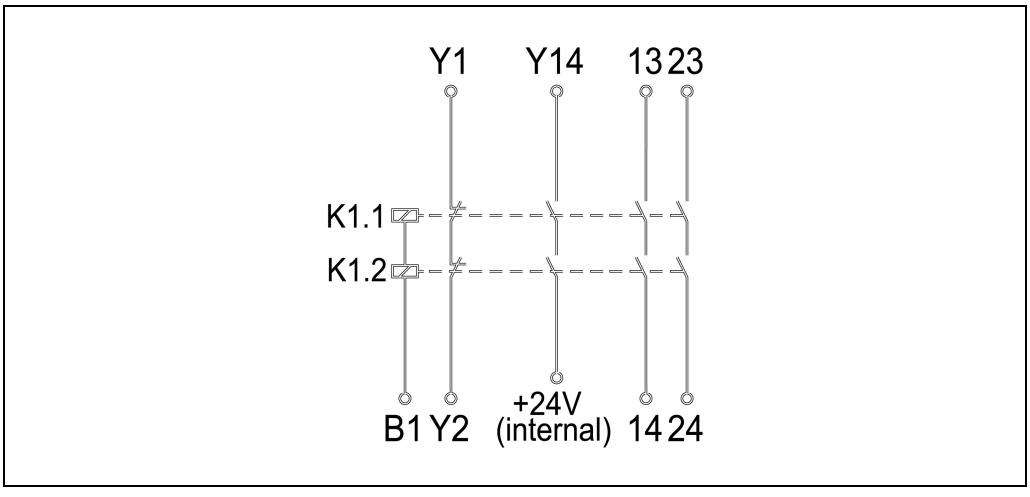
The slot of an output module in the Flexi Classic system is on the end of the safety assembly.

3.9.1 Output module UE410-2RO

The UE410-2RO has one control input (B1). This input controls two internal relays and forms a redundant shutdown path comprising:

- two “safe enable current paths” (13/14, 23/24), dual-channel and floating,
- one “safe enable current path” (Y14), dual-channel and not floating,
- one “external device monitoring feedback circuit” (Y1/Y2), dual-channel and floating.

Fig. 13: Internal structure UE410-2RO



3.9.2 Output module UE410-4RO

The UE410-4RO has two control inputs (B1, B2). These inputs control two-by-two internal relays that form two independent redundant shutdown paths.

Control input (B1) operates two internal relays and forms one redundant shutdown path comprising:

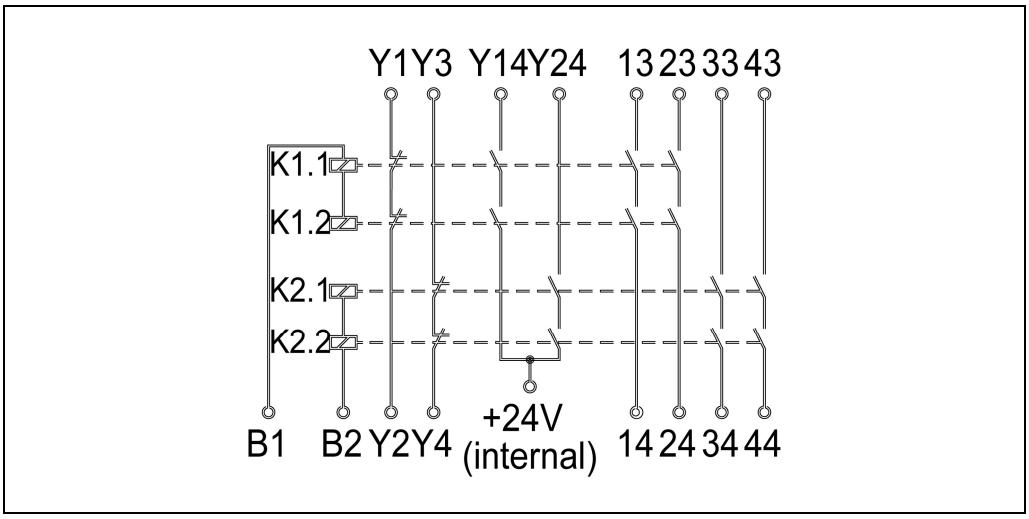
- two “safe enable current paths” (13/14, 23/24), dual-channel and floating,
- one “safe enable current path” (Y14), dual-channel and not floating,
- one “external device monitoring feedback circuit” (Y1/Y2), dual-channel and floating.

Control input (B2) operates two internal relays and forms one redundant shutdown path comprising:

- two “safe enable current paths” (33/34, 43/44), dual-channel and floating,
- one “safe enable current path” (Y24), dual-channel and not floating,
- one “external device monitoring feedback circuit” (Y3/Y4), dual-channel and floating.

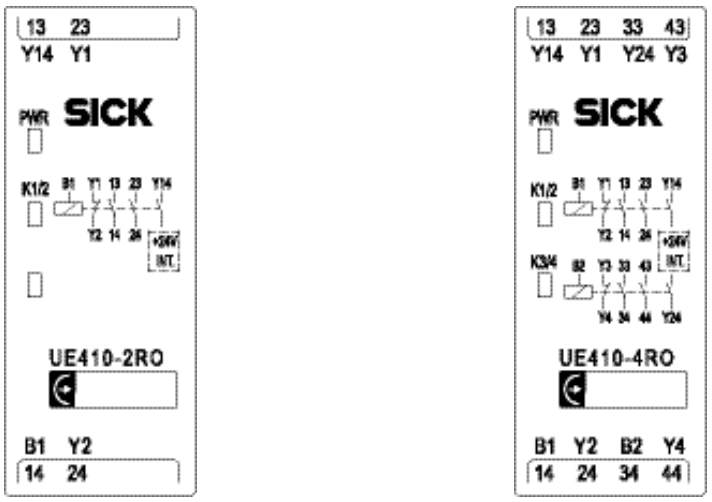
The UE410-4RO therefore has twice the functionality of an UE410-2RO.

Fig. 14: Internal structure UE410-4RO



3.9.3 Controls and status indicators

Fig. 15: UE410-2RO/UE410-4RO controls and status indicators



Tab. 28: UE410-2RO/UE410-4RO indicators

LED indicators	Meaning
PWR (green)	Supply voltage via safety bus is present
K1/2 (green)	Relay K1/K2 — safety contacts closed
K3/4 (green)	Relay K3/K4 — safety contacts closed

3.9.4 UE410-2RO inputs and outputs

Tab. 29: Terminals UE410-2RO

Assignment	Description
B1	Connecting relay K1/K2
13/14 and 23/24	Safety contacts for switch-off circuit K1/K2
Y1/Y2	Feedback circuit external device monitoring (EDM), N/C contact
Y14	N/O safety contact K1/K2, current-limited, see chapter 11 “Technical specifications” on page 96

3.9.5 UE410-4RO inputs and outputs

Tab. 30: Terminals UE410-4RO

Assignment	Description
B1	Connecting relay K1/K2
B2	Connecting relay K3/K4
13/14 and 23/24	Safety contacts for switch-off circuit outputs K1/K2
33/34 and 43/44	Safety contacts for switch-off circuit outputs K3/K4
Y1/Y2	Feedback EDM K1/K2, N/C contact
Y3/Y4	Feedback EDM K3/K4, N/C contact
Y14	N/O safety contact K1/K2, current-limited, see chapter 11 “Technical specifications” on page 96
Y24	N/O safety contact K3/K4, current-limited, see chapter 11 “Technical specifications” on page 96

4 Special applications and functions

This chapter describes the special applications and functions that can be implemented with a Flexi Classic system.

These are the connection and configuration of the safety sensors and the settings at the Flexi Classic system:

- RE300 magnetic safety switch
- IN4000 inductive safety switch
- connection of testable single-beam photoelectric safety switches
- two-hand operation/jog mode
- OR function
- muting function
- bypass function
- connecting of S1, S2, S3
  - restart interlock
  - external device monitoring (EDM)
- retriggering
- grouping of subsystems
- ENABLE input

4.1 RE300 magnetic safety switch

RE300 magnetic safety sensors can be connected directly to the inputs of the UE410-MU/UE410-GU/UE410-XU as well as UE410-8DI units. Up to eight RE300 can be connected in series.

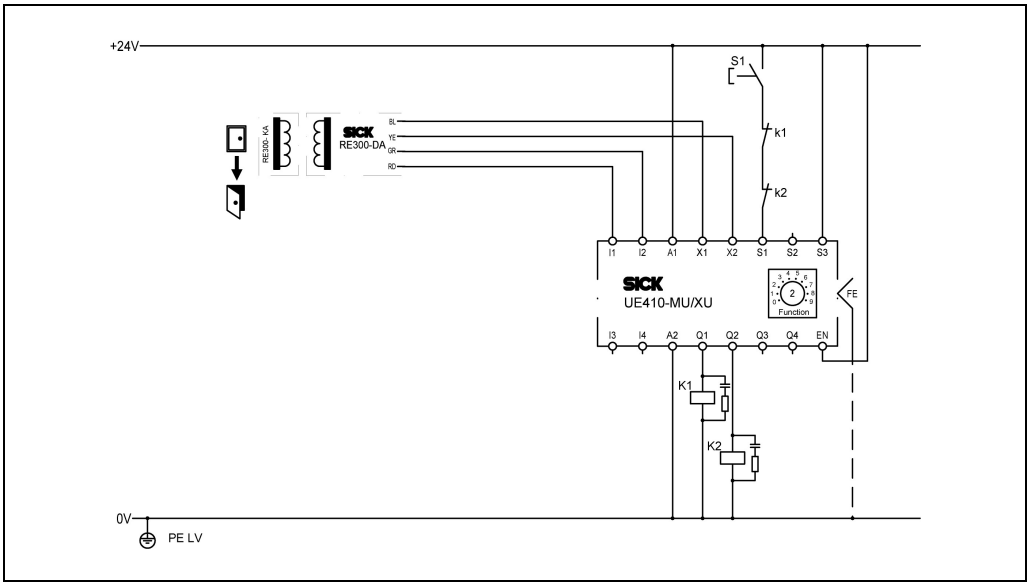
The necessary test signals for the RE300 switch are only generated in program 2 on the UE410-MU/UE410-XU and in switch position 5 on the UE410-8DI. They comply with the requirements for an application up to PL e according to EN ISO 13 849-1.

An RE300 can only be connected to the local cut-off path on I3 and I4 on the UE410-GU in program 4 or 5. The necessary test signals (X1/X2) for the magnetic safety switch RE300 meet the requirements for applications up to PL e as per EN ISO 13 849-1.

WARNING

Pay attention to the safety notes for the RE300 switch.

Fig. 16: Connection of a RE300 to the UE410-MU/XU



Notes

- If RE300 sensors are cascaded, these have to be tested/activated regularly (for example opening and closing of the protective doors connected to the sensors).
- Cascading of several RE300 sensors is limited by the line resistance (refer to the operating instructions of the RE300 for further information).
- If RE300 sensors (N/C / N/O contacts) are connected, the unused input pairs have to be connected to simulate a logical “1” input correspondingly at the UE410-8DI. The odd-numbered inputs/test outputs have to be jumpered respectively (for example I1-X1), the even-numbered inputs/test outputs are not interconnected (for example I2-X2).

4.2 IN4000 inductive safety switch

IN4000 inductive safety sensors can be connected directly to the inputs of the UE410-MU/UE410-XU units. The required test signals for the sensors are generated in the program 3.2 of the UE410-MU/UE410-XU.

Up to nine safety sensors can be cascaded per input.

Note Inductive safety switches IN4000 cannot be connected to a UE410-GU.

Connection:

A safety sensor/cascade is connected to the input I1 and test output X1.

Further information is available in the IN4000 operating instructions.

Fig. 17: Connection of an IN4000

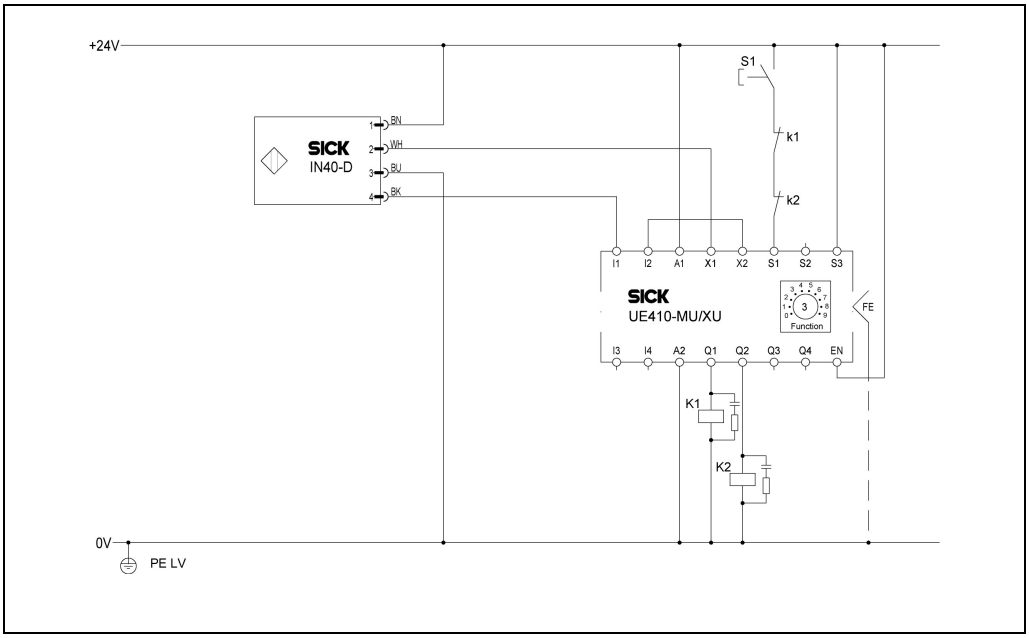
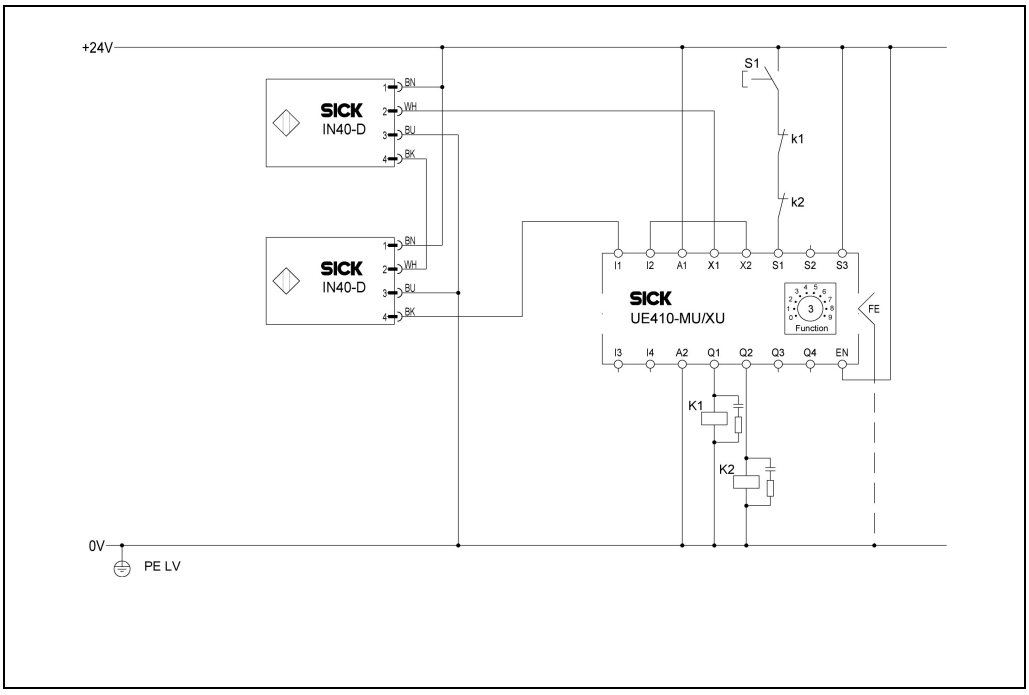


Fig. 18: Connection of two IN4000



Note Input I2 and test output X2 have to be jumpered. Terminal S2 may not be interconnected. A selection of the IN4000 safety sensors is available in section 12.2 “Accessories/spare parts” on page 115.

4.3 Testable single-beam photoelectric safety switches

Testable single-beam photoelectric safety switches can be connected directly to the inputs of the UE410-MU/UE410-GU/UE410-XU as well as UE410-8DI units.

Notes

- For category 2 testable photoelectric safety switches (e.g. L21) the response time of the respective program applies.
- For category 4 testable photoelectric safety switches (e.g. L41), the response time is calculated from the response time of the program plus the test period of the program.
- You can find the response times of the programs in chapter 11 “Technical specifications” on page 96.

The required test signals at X2 for the sensors are generated in program 3.2 of the UE410-MU/UE410-XU.

The required test signals are generated on X2 in programs 8 and 9 on the UE410-GU.

In switch position 1 of the UE410-8DI the required test signals are generated at outputs X1 to X8.

Up to 4 testable single-beam photoelectric switches can be cascaded per input. This means, at the modules UE410-MU/UE410-GU/UE410-XU with one input (I2) each respectively, at the UE410-8DI with inputs I1 to I8.

A selection of the testable single-beam photoelectric safety switches is available in section 12.2 “Accessories/spare parts” on page 115.

WARNING

Ensure protected laying of the connection cables!

If cascades are used, protected separate laying of the connection cables must be ensured.

Connection to UE410-MU/UE410-XU

A testable single-beam photoelectric safety switch/cascade uses the input I2 and test output X2.

Connection to UE410-GU

A testable single-beam photoelectric safety switch/cascade uses the input I4 and test output X2.

Connection to UE410-8DI

A testable single-beam photoelectric safety switch/cascade uses the inputs and test outputs that belong together (for example I1/X1 to I8/X8).

Note

- UE410-MU/UE410-XU:
  Input I1 and test output X1 have to be jumpered. Terminal S2 may not be interconnected.
- UE410-8DI:
  The unused inputs have to be jumpered to the corresponding test outputs (for example the free inputs I2/X2 to I8/X8).

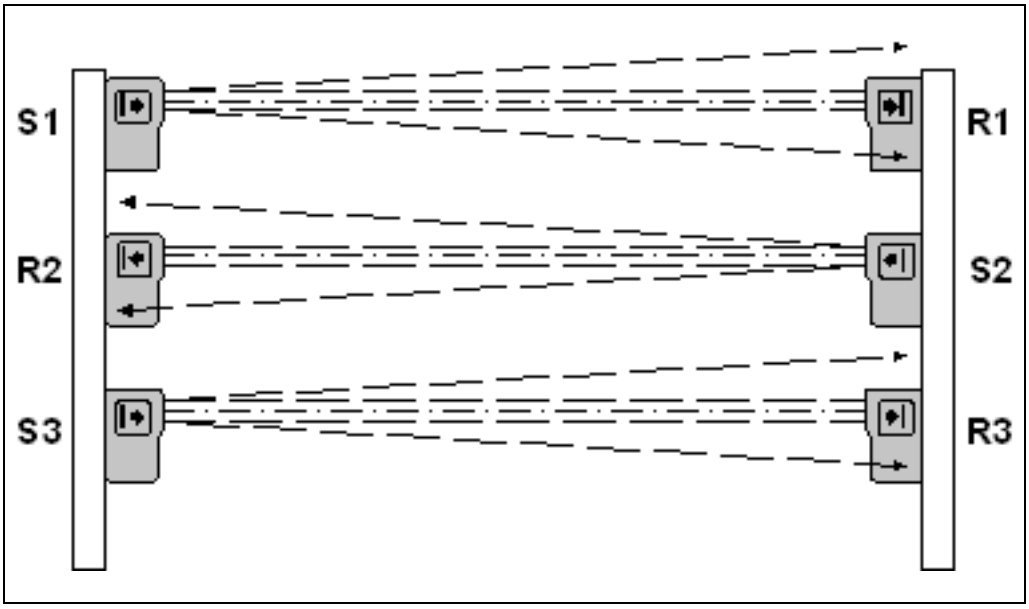
Ensuring the protective function when a Flexi Classic system with single-beam photoelectric safety switches is used

- Single-beam photoelectric safety switches may only be used as access protection in accordance with EN ISO 13855. Usage as finger and hand protection is not permissible.
- Interference beams (for example, direct/indirect sun irradiation, remote controls) are to be prevented since they can reduce the availability of single-beam photoelectric safety switches.
- The number of beams of the sender and receiver as well as the distance between the beams must agree.

Mutual influence of single-beam photoelectric safety switches

- If several pairs of single-beam photoelectric safety switches are used, it is imperative that the aperture angle of the sensors is observed to avoid the possibility of mutual interference.
- If the senders are only mounted on one side, the light beams may not overlap on the receiver side, i.e. the light beam of one sender may not reach two receivers.
- If the senders and receivers are mounted alternately, ensure that the light beam of sender S1 cannot be received by receiver R3 and that the light beam of sender S3 cannot be received by receiver R1.

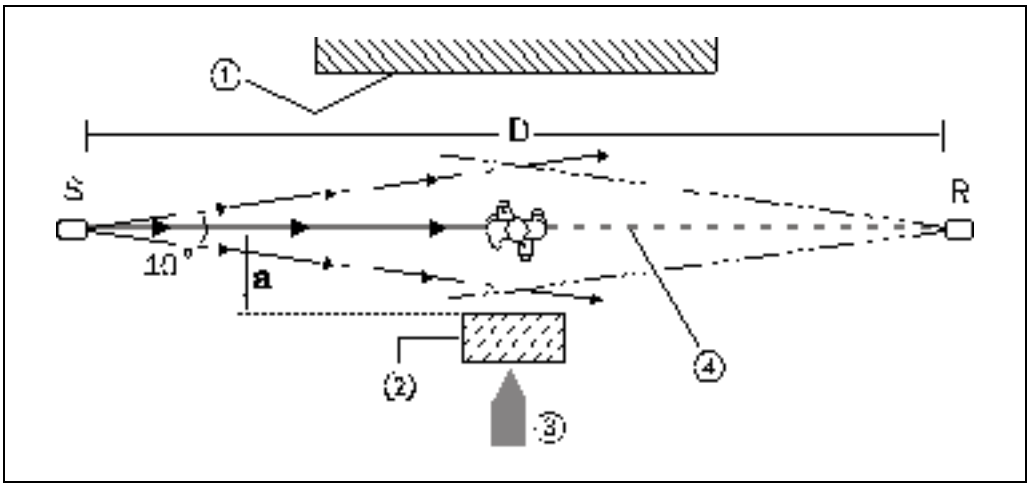
Fig. 19: Mounting to avoid mutual optical influence



Mutual optical influence between cascades must be excluded.

Reflective surfaces that exist within the sending and receiving cones, placed or mounted there can cause incorrect reflection and therefore non-detection of an object or a person. All reflective surfaces and objects (for example material bins) must therefore be located at a minimum distance (a) rotational-symmetrically around the optical axis between the sender and receiver.

Fig. 20: Minimum distance (a) to reflective surfaces, correct mounting and alignment



S = Sender

R = Receiver

D = Distance sender-receiver

a = Minimum distance from reflective surfaces

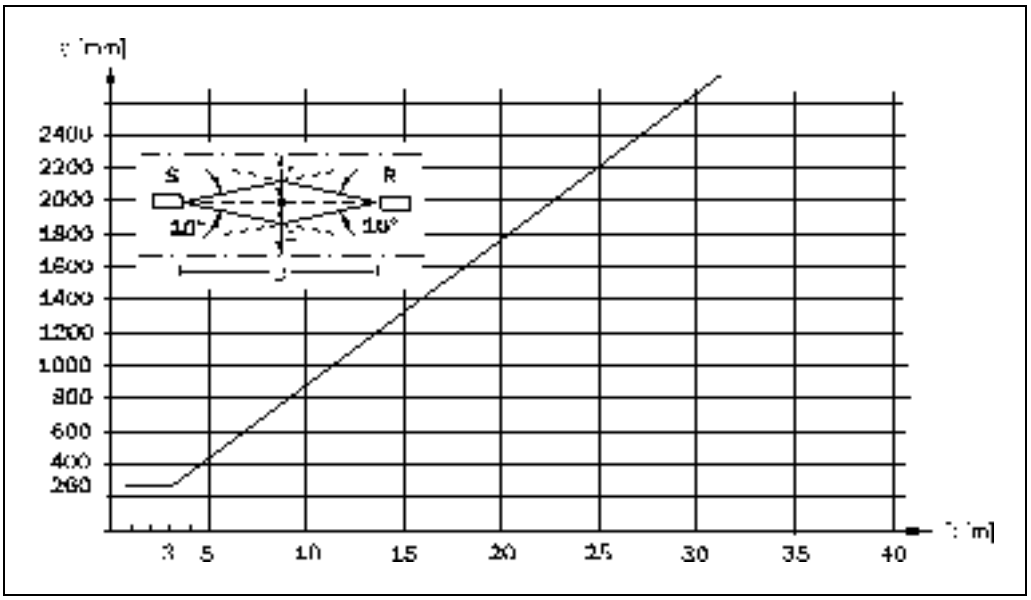
1 = Limit of the hazardous area

3 = Direction of access to the hazardous area

2 = Reflective surface

4 = Optical axis

Fig. 21: Minimum distance (a) as a factor of the distance D for testable single-beam photoelectric safety switches



The minimum distance (a) to reflective surfaces for single-beam photoelectric safety switches with a field of view of 10° is calculated as follows:

- If the distance D = 3 m, the minimum distance a = 260 mm.
- If the distance D > 3 m, the minimum distance (a) is calculated using the following equation:

  a (mm) = 88.2 × D × 10³ (m)

Example:

Distance D between the sender and receiver amounts to 28 m.

With the corresponding value entered:

a (mm) = 88.2 × 28 m × 10³ = 2469.6 mm

The minimum distance (a) to the reflective surface has to amount to 2469.6 mm in this example.

4.4 Two-hand operation/jog mode

The two-hand operation function in accordance with type IIIC can be set in program 4 of the UE410-MU/UE410-XU:

- Two pairs of complementary inputs (N/O / N/C contact pairs of both two-hand buttons) are monitored.
- A valid input signal is only generated if the ON state (H/L level) exists at both inputs within a period of 0.5 s (synchronous change, both two-hand buttons pressed) and if both were in the OFF state (L/H level) beforehand.

In Program 5 at the main module UE410-MU the logic path B can monitor normal two-hand operation (synchronous pressing of two pushbuttons within 0.5 s program 5.1), or two-hand operation in jog mode (program 5.2), for example for traversing movements. Two-hand operation in jog mode allows feeding or setting-up procedures.

The two-hand operation function in accordance with type IIIA can be set in program 5.1 of the UE410-MU/UE410-XU:

- Two equivalent inputs (N/O contacts of both two-hand buttons) are monitored.
- A valid input signal is only generated if the ON state (H level) exists at both inputs within a period of 0.5 s (synchronous change, both two-hand buttons pressed) and if both were in the OFF state (L level) beforehand.

The jog operation function can be set in program 5.2 of the UE410-MU/XU:

- The evaluation in jog mode corresponds to two-hand operation IIIA with the difference that the ON signal is limited to a duration of 5 s.

In the case of two-hand operation in jog mode an output signal is only generated as long as both actuating parts are pressed. In jog mode, the duration for which the safety outputs Q3/Q4 are on is limited to 5 s.

When the two actuating parts are released, the time is reset. Renewed activation of the two actuation parts is possible.

In order to activate jog mode, terminal S2 remains unused. For two-hand applications, S2 is jumpered with the supply voltage $+U_B$.

Note It is not impossible to implement two-hand applications using a UE410-GU.

4.5 OR function

Note The OR function can be implemented at the UE410-MU/UE410-XU modules (switch positions 1 and 2) or by an input extension module UE410-8DI (switch position 7).

WARNING

Switch the machine to a safe state when using the OR function!

As long as the OR function is active, the outputs of the main module do **not** switch off. You must ensure that while the OR function is being used, for example for the set-up mode, other protective measures, e.g. the safe set-up mode of the machine, are activated so that there is no danger to persons or parts of the machine while the OR function is being used.

A logic path A/B can be muted by using an OR signal. Thus, for example, a safety function can be muted in set-up mode by means of an enabling switch. An OR link of two safety functions is also possible.

The OR function does not have a time limit.

OR function with input extension module

All the programs of the main module offer the possibility of linking signals of the OR function at the UE410-8DI input extension modules to the input signals of the UE410-MU/ UE410-XU by means of a logical OR (also refer to section 3.8.2 “OR link” on page 53).

OR function on the UE410-MU/UE410-XU

The OR function can be implemented in the programs 1 and 2. I1/I2 is linked to I3/I4 OR.

OR function on the UE410-GU via UE410-8DI

On the UE410-GU the OR function is only available via the UE410-8DI input expansion module (switch position 7) and only on the local cut-off path, i.e. via input B.

Note An OR function that acts on the global cut-off path on the UE410-GU (switch position 7, input A on the UE410-8DI) is not permitted and will result in a configuration error (ERROR).

4.6 Muting function

Muting overrides the protective effect of a safety device temporarily. This means that material can be transported to or from a machine or system without the working process having to be interrupted.

In the case of muting additional sensor signals are used to differentiate between humans and material. To this purpose an evaluation unit (for example the Flexi Classic modular safety controller) evaluates the signals from external sensors logically and, if the muting condition is valid, mutes the protective device so that the material to be transported can pass the protective device. As soon as anything except the material enters the hazardous area, the working process is interrupted.

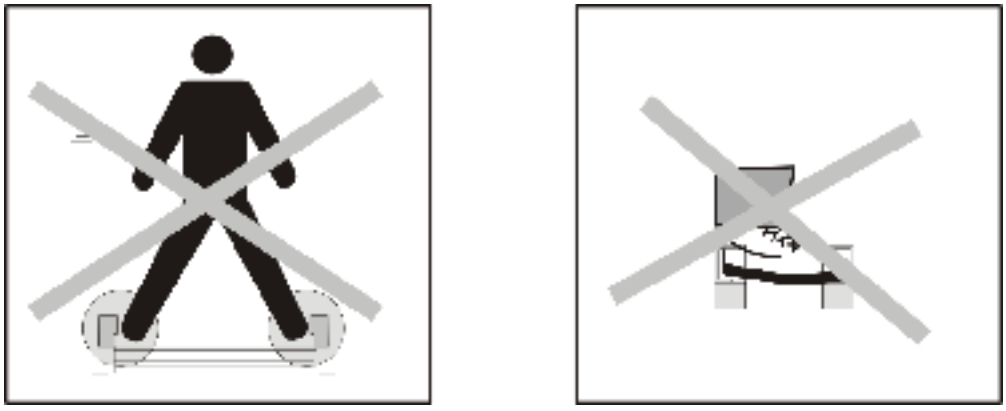
Note It is not possible to implement muting applications using the UE410-GU.

WARNING

Pay attention to the following safety notes!

- Muting is only allowed to be activated during the period when the material to be transported (e.g. on a pallet) blocks the access to the hazardous area.
- Muting must be triggered by at least two independently wired signals (e.g. from muting sensors) and must not depend entirely on software signals (for instance from a PLC).
- Muting must be removed immediately as soon as the material to be transported no longer blocks the access to the dangerous movement so that the protective device is once more effective.
- The material to be transported must be detected over its entire length, i.e. there must be no interruption in the output signals.
- Always position the sensors so that the minimum distance to the protective device is observed!
- Prevent the unintentional triggering of muting by a person by mounting the sensors appropriately!

Fig. 22: Safety on mounting the muting sensors



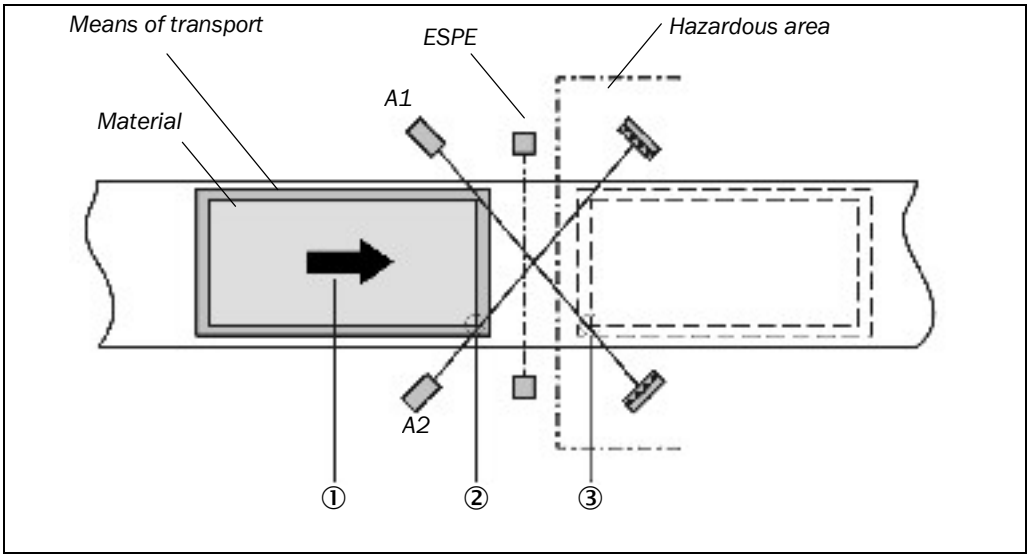
Ensure that muting cannot be unintentionally triggered by a person!

Note **Always mount the muting lamp where it can be clearly seen!**

The muting lamp must be clearly visible from all sides of the hazardous area and for the system operator.

4.6.1 Muting with two sensors

Fig. 23: Schematic layout



In the example, the material moves from left to right on a conveyor belt ①. As soon as the muting sensors A1 and A2 are activated ②, the protection provided by the ESPE protective device is muted and the material can move into the hazardous area. As soon as the muting sensors are clear again ③, the protection provided by the protective device is re-activated.

4.6.2 Muting cycle

The muting cycle is the defined sequence of all processes that take place during muting. The cycle starts when the first muting sensor is activated. The cycle ends when the last muting sensor returns to its initial state (e.g. clear light path for optical sensors). Only then is it possible to activate muting again.

Material can be transported several times during a muting cycle, if the muting condition is maintained continuously, i.e. at least one pair of sensors remains activated continuously.

4.6.3 Muting sensors

Muting sensors detect material and supply the necessary signals as required by an evaluation unit (e.g. the Flexi Classic modular safety controller.) If the muting conditions are met, the evaluation unit can mute the protective device based on the sensor signals.

Sensor signals can be generated by the following external sensors:

- optical sensors
- inductive sensors
- mechanical switches
- controller signals

SICK muting sensors

An overview of the SICK muting sensors is available in the section 4.8 “SICK muting sensors” on page 73.

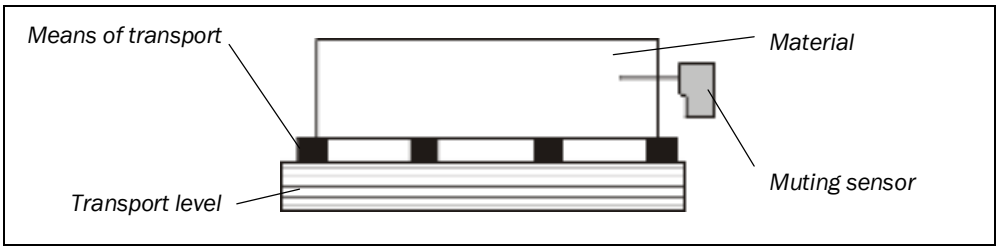
4.7 Placement of muting sensors

WARNING

Pay attention to the following notes on the placement of the muting sensors!

- Always position the muting sensors such that only the material is detected and not the means of transport (pallet or vehicle).
- Always position the muting sensors such that material can pass unhindered, but people are reliably detected.

Fig. 24: Detection of material during muting

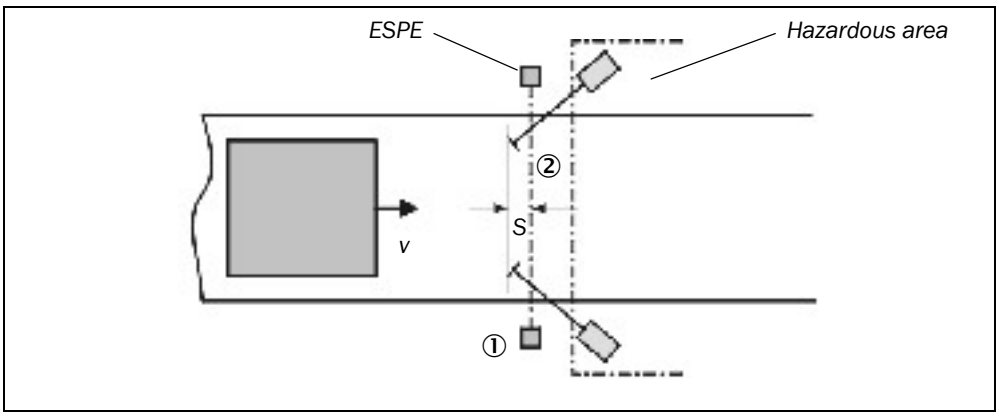


- Always position the muting sensors such that, on the detection of the material ①, a minimum distance to the light beams on the ESPE ② is maintained.

Note

The minimum distance provides the processing time necessary until muting is activated.

Fig. 25: Minimum distance, material detection to the ESPE on muting



How to calculate the minimum distance:

$S \geq v \times 61\ ms$

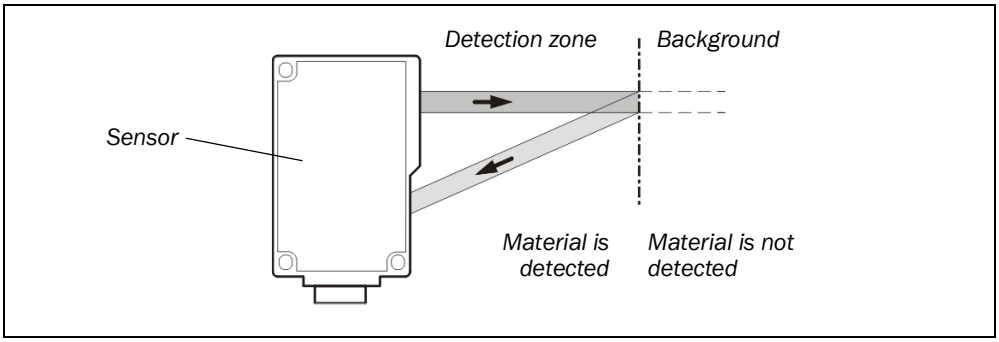
Where ...

S = minimum distance (mm)

v = velocity of the material (e.g. of the conveyor) (m/s)

- Use optical sensors with background suppression. These detect material only up to a specific distance. Objects that are further away than the material to be detected are not detected.

Fig. 26: Principle of operation of sensors with background suppression



4.7.1 Muting with two sensors (a sensor pair), crossed placement

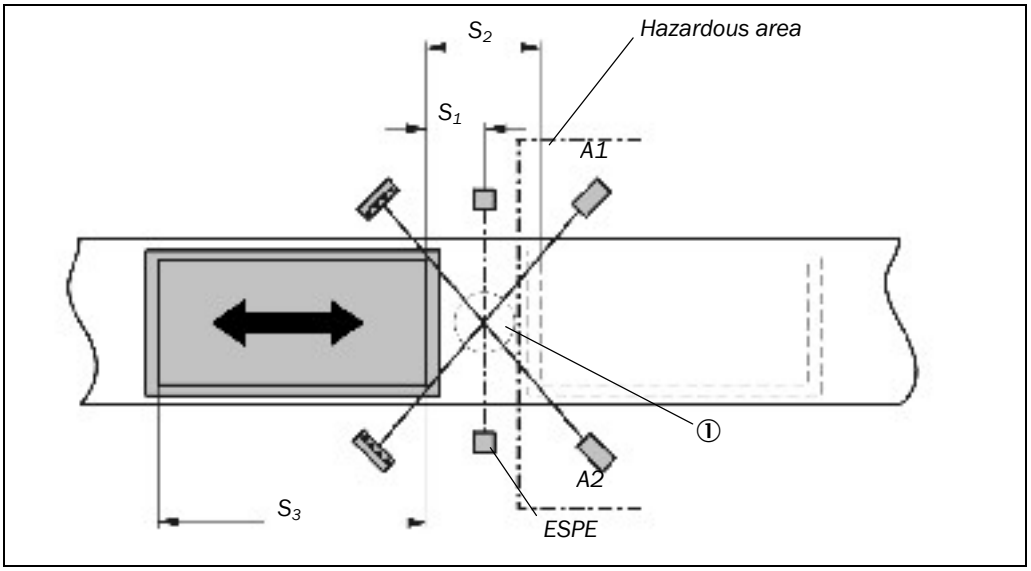


Fig. 27: Muting with two sensors, crossed placement

In the example, the material moves from left to right or, alternatively, from right to left. As soon as the muting sensors A1 and A2 are activated, the protection provided by the protective device (ESPE) is muted.

The following requirements must be met:

Tab. 31: Conditions for muting with two sensors, crossed placement

Condition	Description
A1 & A2	Muting applies as long as this condition is met.

How to calculate the distance:

$S_1 \geq v \times 61$ ms

Where ...

S_1 = minimum distance between the light beams of the ESPE and the detection by the muting sensors (mm)

v = velocity of the material (e.g. of the conveyor) (m/s)

Notes

- The material can flow in both directions.
- In order for materials to be conveyed in both directions, place the intersection of the muting sensors ① exactly on the course of the light beams of the ESPE. In order for material to be conveyed in one direction only, place the intersection behind the light beams of the ESPE seen from the conveyor direction.
- This placement is suitable for through-beam photoelectric switches and photoelectric reflex switches.

4.7.2 4-sensor muting, sequential layout

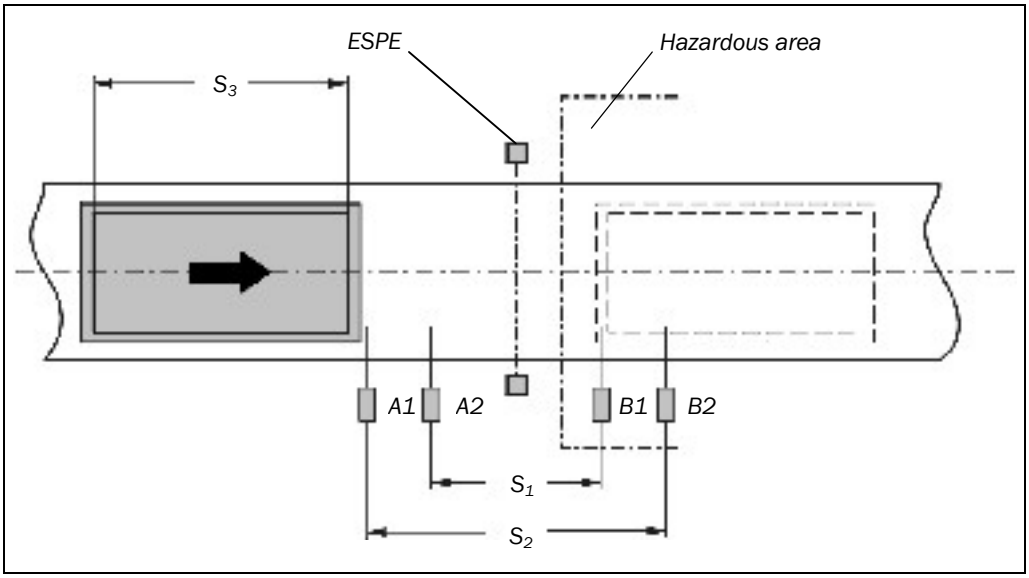


Fig. 28: Simulated 4-sensor muting

In the example, the material moves from left to right. As soon as the muting sensors A1 & A2 are activated, the protection provided by the protective device (ESPE) is muted. The protection remains muted until one of the sensors in the muting sensor pair B1 & B2 is clear again.

4.7.3 Muting with UE410-MU/UE410-XU

A simple muting function can be implemented at the UE410-MU/UE410-XU modules (programs 3.1 and 3.2) by using inputs I3 and I4 for the muting sensors. Inputs I3 and I4 are AND-linked to each other and mute the safety sensor equipment connected to I1/I2.

A muting lamp can be connected to output Q3.

Features of the muting function for UE410-MU/UE410-XU:

- The outputs on the muting sensors must be “0” on powering up the Flexi Classic, otherwise a process error will be generated and the system will generate ERROR.
- Muting duration indefinite
- Switching behaviour of the muting sensors is not limited in time.
- Direction independent muting
- Inputs I3/I4 for muting sensors can be “1” simultaneously.
- The muting lamp is not current monitored and has two functions:
  - Muting lamp ON continuously, then muting is active,
  - Muting lamp flashes at 1 Hz, then the Reset required is active.

Muting with 4 sensors:

WARNING

- With this 4-sensor muting two muting sensors each are connected to one input of the UE410-MU/UE410-XU. Take into account that the muting sensors A1/B2 and A2/B1 are combined respectively.
- Only “high-side”-switching sensors may be used for 4-sensor muting. Thereby it has to be ensured that a “high” always overwrites a “low”. This type of muting may only be used after thorough risk analysis/error analysis.

4.8 SICK muting sensors

Tab. 32: Selection of the optical SICK muting sensors

Sensor	Type	Switching output Q type
Photoelectric proximity switch	WT24-2	Light switching
	WT27-3	
	WT260	
Photoelectric reflex switch	WL23-2	Dark switching
	WL27-3	
	WL260	
	WL12-3	
	WL14-2	
	WL18-3	
Through-beam photoelectric switch	WS/WE24-2	Dark switching
	WS/WE27-3	
	WS260/WE260	

Notes

For the selection and settings for the SICK optical muting sensors in muting applications, the following applies:

- The outputs must be PNP switching.
- Other type series are possible.

4.9 Bypass

The bypass function bypasses the logic paths A/B in the UE410-MU/UE410-XU or the logic path B in the UE410-GU and forces their safety outputs to logical “1” for 60 s. The bypass function overrides the logic paths A/B in the UE410-MU/UE410-XU and forces the corresponding safety outputs to logical “1” for 60 s. The bypass function can be implemented via a UE410-8DI input extension module (switch position 8).

The bypass signal is limited to a duration of 60 s. After the period has expired, bypass operation can be activated again after deactivation.

Notes

- On the UE410-GU the bypass function can only be implemented on the local cut-off path via input B.
- A bypass function on the UE410-GU that acts on the global cut-off path (input A) is not permitted and will result in a configuration error (ERROR).

WARNING

Ensure that there is no danger during bypass operation!

As long as the bypass function is active, the safety outputs of the UE410-MU/UE410-GU/UE410-XU modules are activated. You have to ensure that there is no danger to persons or parts of the machine or system during bypass operation.

The bypass function may only be activated by a key-operated switch with an automatic reset and two levels or by two input signals that are independent of each other, e.g. two position switches.

WARNING

Check the connected key-operated pushbutton for bypass regularly!

- ➢ Using organisational measures, ensure that the key-operated pushbutton for bypass is actuated once after a certain interval. This is necessary so that the Flexi Classic can identify an error condition of the key-operated pushbutton for bypass or an error condition in its connection cable that occurs up until then. The interval is to be defined to suit the specific case dependant on the application.
- ➢ Constantly check in the operating mode in which you have configured the bypass active whether the bypass function can be activated and deactivated.

Notes

- It must be possible to view the entire hazardous point when pressing the key-operated pushbutton for bypass.
- It may not be possible to actuate the key-operated pushbutton for bypass in the hazardous area.
- The safety controller ends the bypass automatically when an error occurs.

4.10 Connecting S1, S2, S3

Three control inputs S1, S2, and S3 are available for the configuration of the control circuit functions (restart interlock, retriggering, EDM) at the UE410-MU/UE410-XU modules.

Note No control inputs are available on the UE410-GU.

4.10.1 Operation with restart interlock

In the case of operation with a restart interlock the reset button is connected to the respective input (S1/S2). The required starting condition for cancelling the restart interlock is only fulfilled, when the reset button is pressed and released again and the feedback circuit is closed.

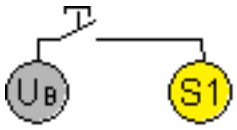
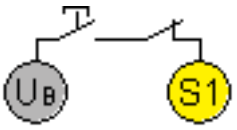
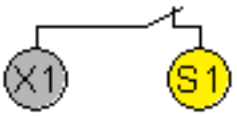
4.10.2 Operation without restart interlock

The outputs are activated as soon as the input conditions of the safety sensors have the value of logical “1”. A reset button is not required.

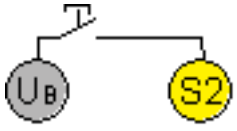
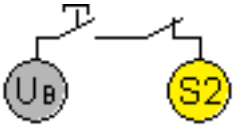
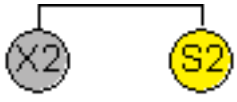
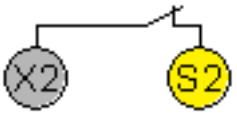
4.10.3 Operation with external device monitoring (EDM)

The static EDM monitors whether the controlled contactors have dropped out during resetting. The EDM is included in the feedback circuits S1, S2 and S3 in accordance with the set program.

Tab. 33: EDM by means of S1

Connecting	S1	
	Without EDM	With EDM
Manual reset (with restart interlock)		
Automatic reset (without restart interlock)		

Tab. 34: EDM by means of S2

Connecting	S2	
	Without EDM	With EDM
Manual reset (with restart interlock)		
Automatic reset (without restart interlock)		

4.11 Retriggering of the delayed OSSDs

The behaviour of the off delay (not on UE410-xxxT0) can be influenced by means of retriggering. Retriggering is specified by connecting Terminal S3 to the voltage supply $+U_B$ or the module-specific cycle output X2.

Note Retriggering is not possible on the UE410-GU.

Example: Retriggering ON

During automatic operation a protective door is opened and the off delay is started for the corresponding releases. If the door is closed again before the delay time has expired, the releases do not switch off and the machine continues to run without interruption.

Example: Retriggering OFF

During manual operation the emergency stop pushbutton is activated and the off delay is started for the corresponding releases. If the emergency stop pushbutton is reset again before the delay time has expired and the reset button is pressed, the releases are nevertheless de-activated. Renewed releasing via the reset button is not possible until the delay time has expired.

Tab. 35: Retriggering time response

Retriggering	Course
ON	If the safe input state (all input conditions are valid) of the input circuits is attained again before the time has expired, the delayed output circuits do not change and the delay time is reset
OFF	The delayed output circuits open after the delay time has expired irrespective of the state of the input circuits. In the case of an automatic start and a safe input state before the delay time has expired, the delayed OSSDs are de-activated for 400 ms, and are then re-activated

Fig. 29: Retriggering ON, with/without restart interlock

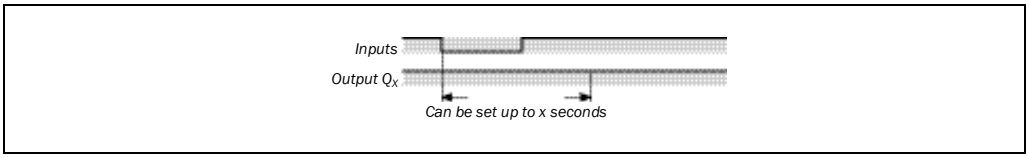


Fig. 30: Retriggering OFF, with restart interlock

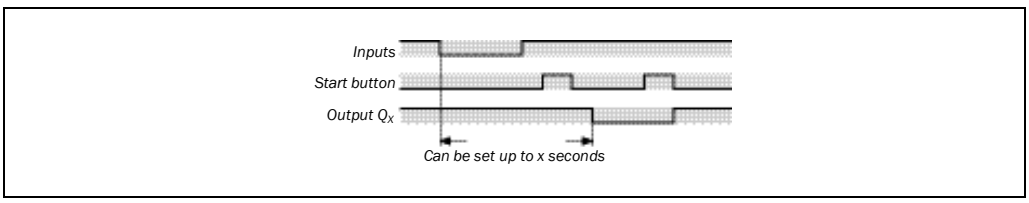


Fig. 31: Retriggering OFF, without restart interlock

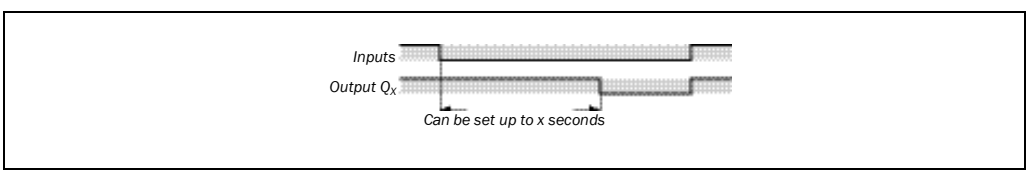
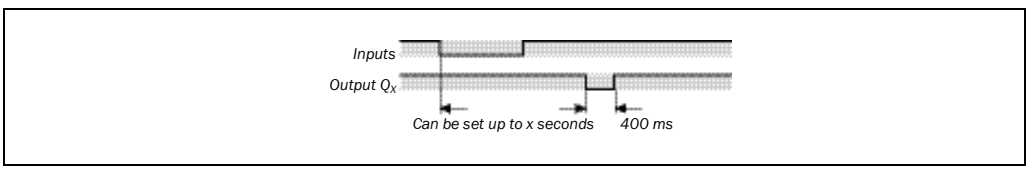
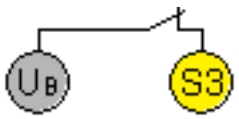
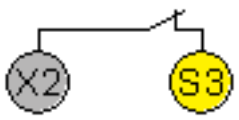


Fig. 32: Retriggering OFF, without restart interlock



Tab. 36: EDM by means of S3

Connecting	**S3**	
	Without EDM	**With EDM**
Without retriggering		
With retriggering		

Notes

- S1 and S3 must always be connected.
- S2 must be connected depending on the program.

All later changes at the connection of S1, S2 and S3 cause a lock-out (ERR).

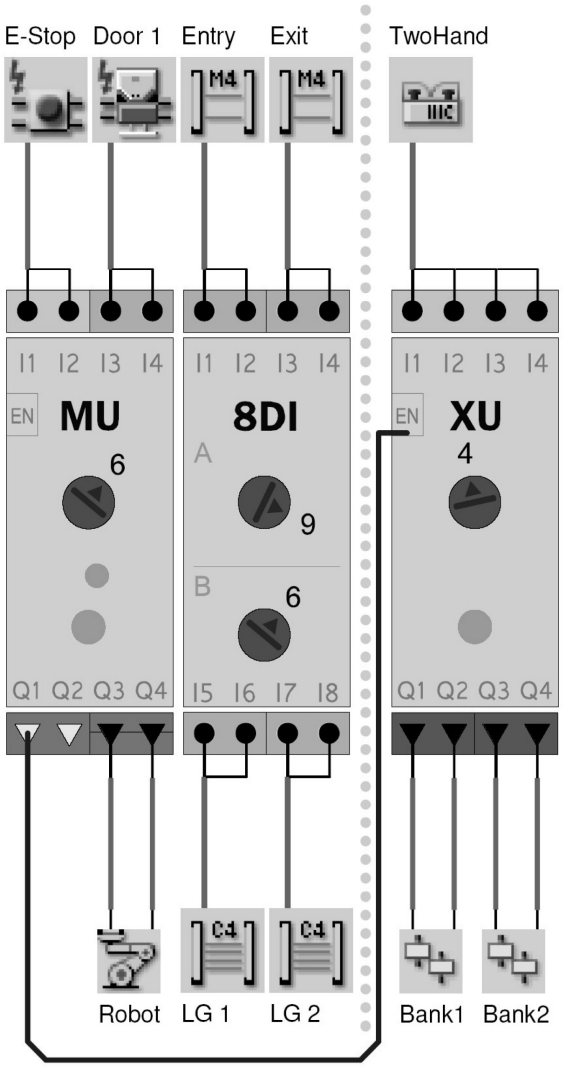
WARNING

- During the configuration phase (when the voltage is activated) of the manual reset with the reset button, the corresponding S-input must be open or be connected to a high-resistance output, for example of a PLC (high or low potential causes an incorrect configuration).
- In order to monitor external contactors that may be connected to the safe outputs Q1 to Q4, the N/C contacts of the respective contactors or output extensions have to be connected in series with the corresponding control inputs.

4.12 Grouping of subsystems

Note In case of single-channel wiring of a safety capable output (Q1-Q4) to a signal input (EN), it is possible to achieve category 4 in accordance with EN ISO 13849-1 or SILCL3 in accordance with EN 62061.

Fig. 33: Cascading of safety circuits



WARNING

Exclude cross-circuits by means of appropriate cabling!

- If several modules are used (> 1), cross-circuits on test pulse outputs (X1-Xn) can not always be detected.
- If two modules are used (UE410-MU or UE410-GU and a UE410- XU), cross-circuits on safety outputs (Q1-Q4) can not always be detected.

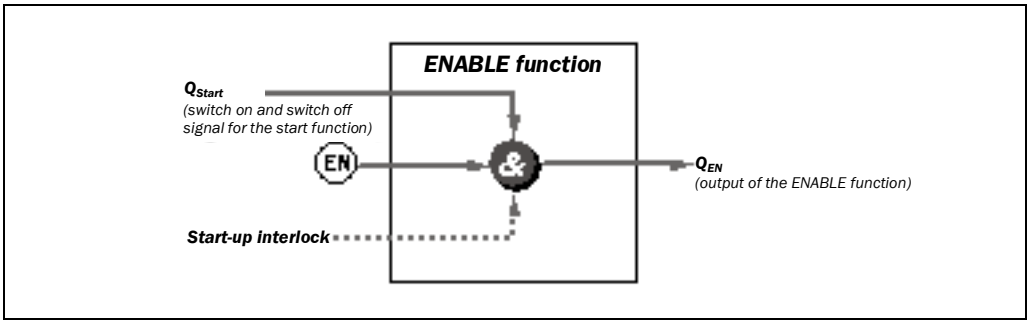
➢ If several modules are used, the possibility of cross-circuits has to be excluded by means of appropriate cabling measures (protected installation, plastic-sheathed cable etc.).

4.13 ENABLE input

For all UE410-MU- and UE410-XU-devices with a type label entry from E1: In case of single-channel wiring of a safety capable output (Q1-Q4) to a signal input (EN), it is possible to achieve category 4 in accordance with EN ISO 13 849-1 or SIL3 in accordance with IEC 61 508.

Note The ENABLE input is not available on the UE410-GU.

Fig. 34: ENABLE input



The ENABLE input makes it possible to cascade safety circuits or to form sub-systems. The ENABLE input has a higher priority than all other input signals (sensors, muting, bypass, OR function).

Note Unused ENABLE inputs must be connected to the supply voltage $+U_B$.

When the ENABLE input goes low (0 V DC), the OSSDs (Q1-Q4) always go low and at the same time no signal such as a reset or muting is detected until ENABLE is high again. Switching OFF and switching ON ENABLE does not require a renewed reset on the related modules, the OSSDs (Q1-Q4) go high.

If a time delay has been set on Q3/Q4, the delay starts after the ENABLE input goes low.

5 Mounting/dismantling

This chapter describes the mounting of the modules and the anti-manipulation cover for the Flexi Classic modular safety controller.

The following steps are necessary after mounting and installation:

- completing the electrical connections (chapter 6)
- configuration (chapter 9)
- checking the installation (section 8.2)

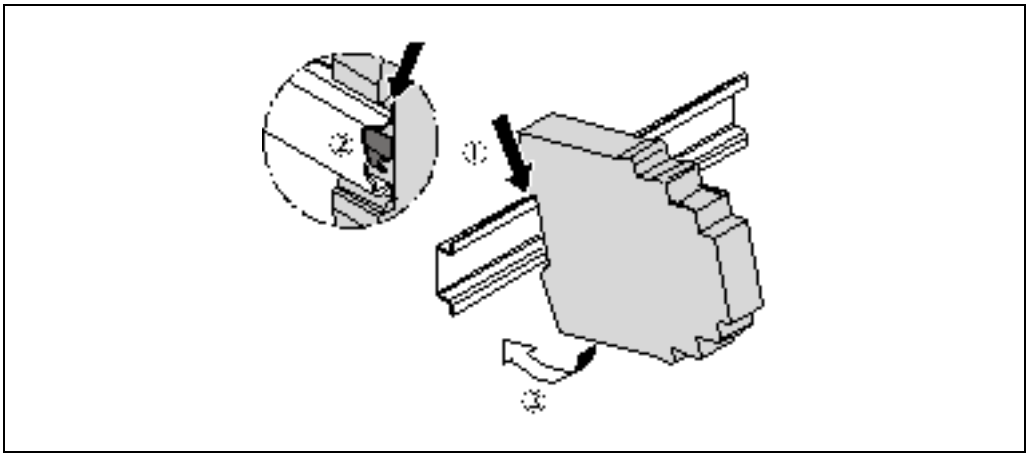
5.1 Steps for mounting the modules

WARNING

The Flexi Classic system is only for use in a control cabinet rated to at least IP 54.

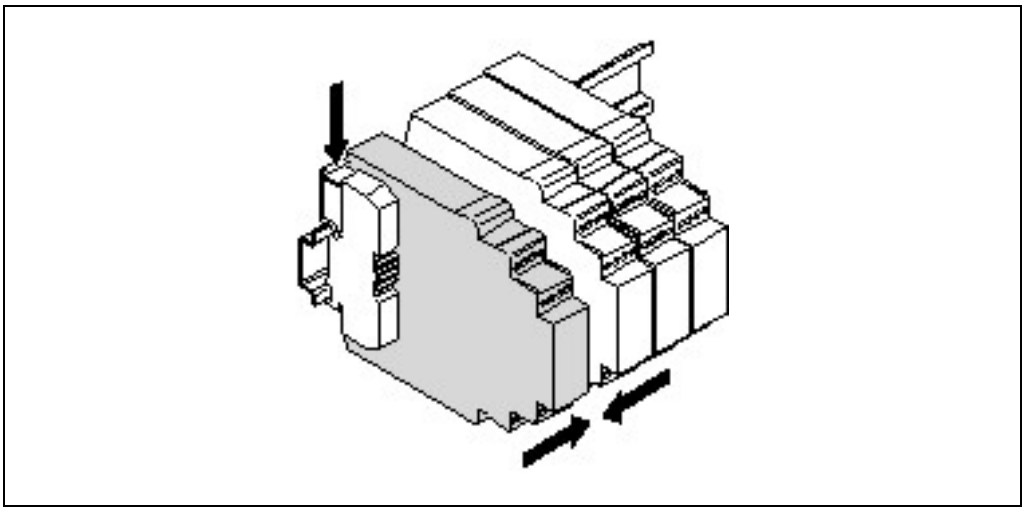
- In a Flexi Classic system the main module UE410-MU is positioned at the extreme left and one of the optional gateways, e.g. UE410-PRO, at the extreme right.
- The connection between the modules is effected by means of the plug connection integrated in the housing.
- Mounting according to EN 50 274
- The modules are located in a 22.5 mm wide housing for 35 mm DIN mounting rails as per EN 60 715.

Fig. 35: Hanging the module into the DIN mounting rail



- ➢ Hang the device onto the DIN mounting rail (①).
- ➢ Ensure that the earthing spring contact is positioned correctly (②). The earthing spring contact of the module must contact the DIN mounting rail making good electrical contact.
- ➢ Latch the module onto the DIN mounting rail by pressing it lightly in the direction of the arrow (③).

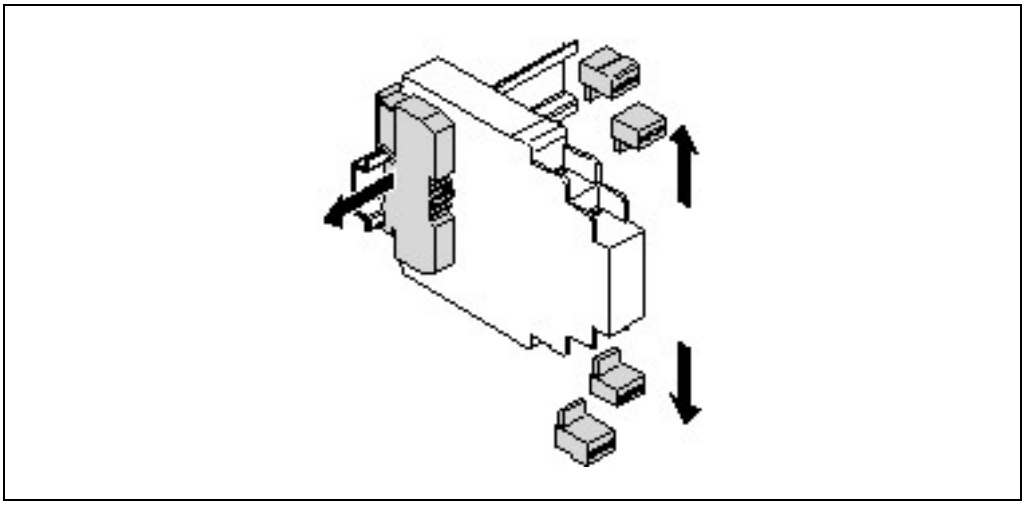
Fig. 36: Installing the end clips



- If there are several modules, slide the modules together individually in the direction of the arrow until the side plug connection latches in.
- Install end clips on the right and left.

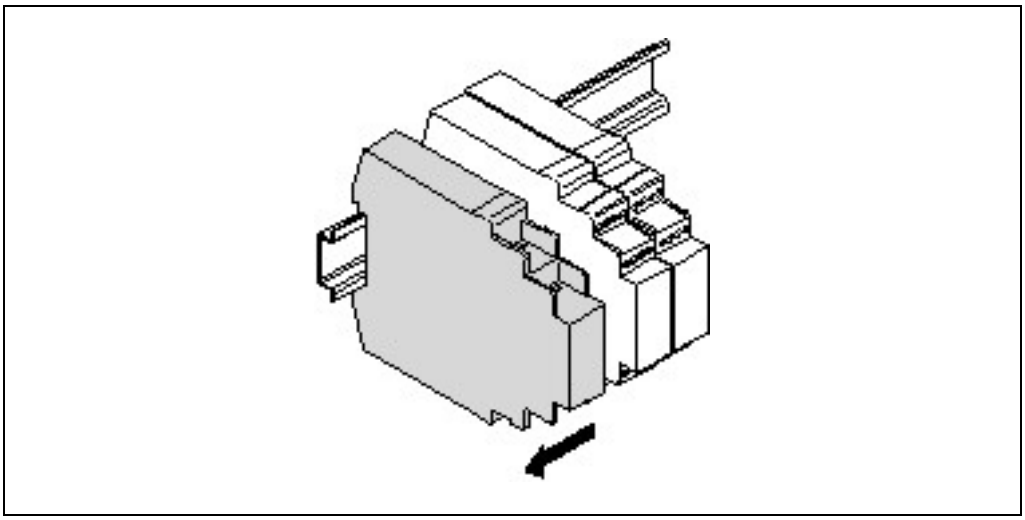
5.2 Steps for dismantling the modules

Fig. 37: Removing the plug-in terminals



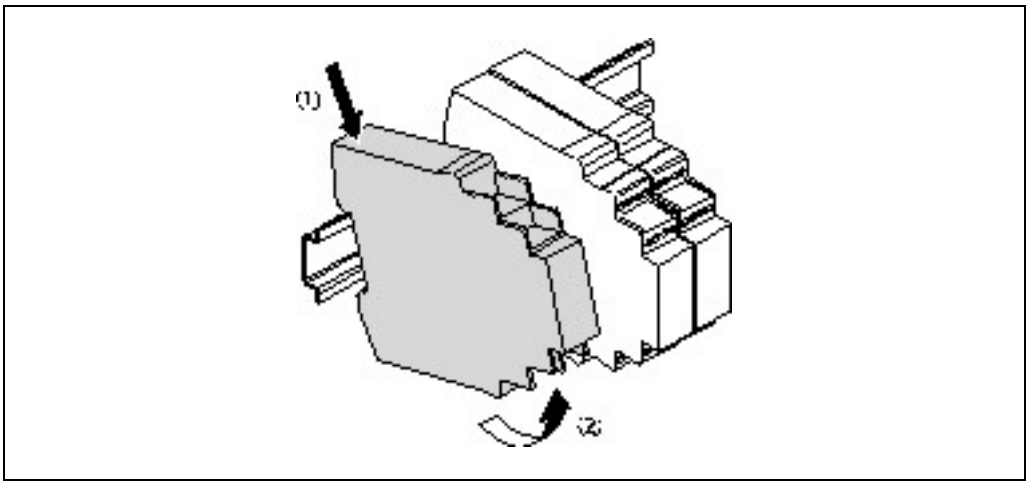
- Remove the plug-in terminals with wiring and the end clips.

Fig. 38: Disconnecting the plug connection



➢ If there are several modules, slide the modules away from each other individually in the direction of the arrow until the side plug connection is separated.

Fig. 39: Removing the module from the DIN mounting rail

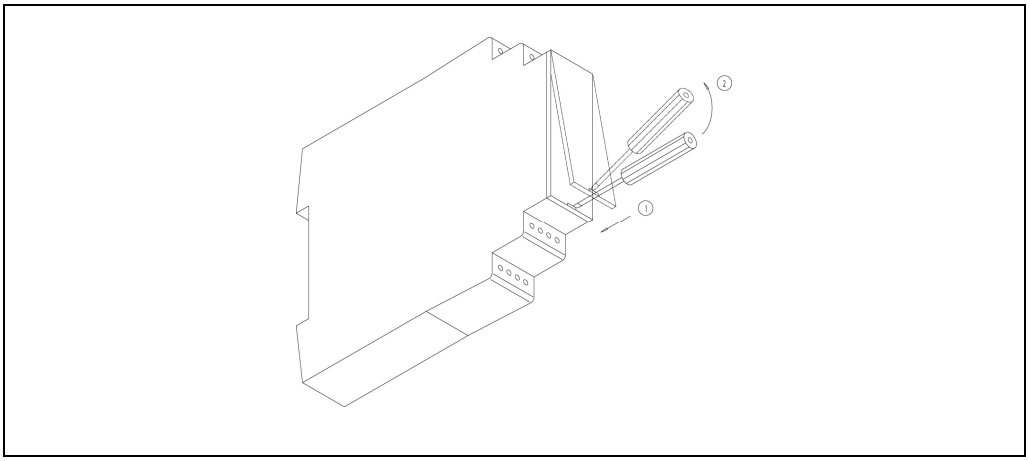


➢ Press the module downwards (①) and remove it from the DIN mounting rail in the direction of the arrow while keeping it pressed down (②).

5.3 Removing the anti-manipulation cover

To prevent tampering on the Flexi Classic, SICK provides an optional anti-manipulation cover (see section 12.2.6 “Anti-manipulation cover” on page 117).

Fig. 40: Anti-manipulation cover



➢ Insert a screwdriver in the opening (①).

➢ The cover fastening is released by upward movements. The cover can be removed (②).

➢ The cover is closed by engaging it.

6 Electrical installation

WARNING

Switch the entire machine/system off line!

The machine/system could inadvertently start up while you are connecting the devices.

Notes

- The Flexi Classic modular safety controller fulfils the EMC requirements in accordance with the basic specification EN 61000-6-2 for industrial use and EN 61131-2 for control systems.
- The control cabinet or mounting housing of the Flexi Classic must at least comply with enclosure rating IP 54.
- The modules of the Flexi Classic family conform to Class A, Group 1, in accordance with EN 55011. Group 1 encompasses all ISM devices in which intentionally generated and/or used conductor-bound RF energy that is required for the inner function of the device itself occurs.
- Mounting according to EN 50274
- In order to ensure EMC safety, the DIN mounting rail must be connected to FE.
- You must connect the Flexi Classic to the same voltage supply as the connected protective devices.
- To meet the requirements of the relevant product standards (e.g. EN 61496-1), the external voltage supply for the devices (SELV) must, among other aspects, be able to bridge a power failure lasting 20 ms. Suitable power supplies are available as accessories from SICK.
- When several power supplies are used, all mass connections (GND) must be connected to each other.
- All UE410-GU modules that are on a common global emergency stop cut-off path must be connected to the same GND connection.
- The power supply as well as all signals connected have to fulfil the regulations for extra-low voltages with safe separation (SELV, PELV) in accordance with EN 60664 and EN 50178 (equipment of electrical power installation with electronic devices) or NEC Class 2 according to UL 1310.
- For installation in environments with overvoltage category III, external protection elements must be used. The required level of protection as per EN 62305-1 can be achieved using an external snubber circuit. The protection elements (SPD – surge protective devices) must comply with the requirements as per EN 61643-11.
- The cables of a connected reset button must be laid in separate plastic-sheathed cables.
- All connected sensors and downstream controllers and wiring/installation must correspond to the required category according to EN ISO 13849-1 and to the SILCL according to EN 62061 (e.g. protected installation, single plastic-sheathed cable with shielding etc.).
- In order to protect the safety outputs and to increase the life of the module, the external load must be equipped with e.g. varistors and RC circuits. Please also note that the selection of the arc suppression can increase the total response time of the safety function.

- The wiring of single-channel safety outputs as well as the external device monitoring (EDM) and ENABLE (EN) must be performed inside the control cabinet.
- External faults (e.g. cross-circuits) between two modules within a Flexi Classic system are to be avoided through use of appropriate countermeasures (separating effected wires, single plastic-sheathed cable etc.). For more informationen on this topic see section 4.12 “Grouping of subsystems” on page 78.

WARNING

Special features to note during wiring:

A UE410-8DI has two test pulse generators. This means that short-circuits between odd (X1) and evenly (X2) numbered outputs will be detected. Short-circuits between two odd (i.e. X1, X3, X5, X7) or two evenly (i.e. X2, X4, X6, X8) numbered outputs will not be detected (see also section 4.12 “Grouping of subsystems” on page 78).

➢ Mount the reset device so that it cannot be actuated by a person located in the hazardous area. When operating the reset device, the operator must have full visual command of the hazardous area.

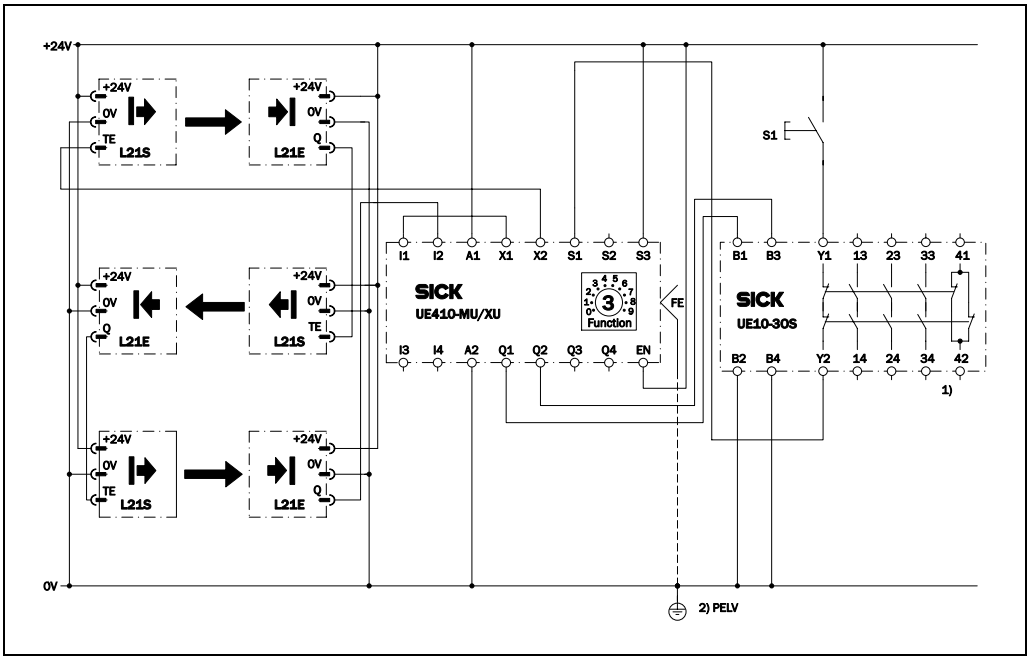
7 Application examples and connection diagrams

Note By taking into account all the necessary boundary conditions and their evaluation in a Failure Mode and Effects Analysis (FMEA), applications up to a maximum of SIL3 (IEC 61508) can be achieved.

7.1 L21 on the UE410-MU/XU

Program 3.2 with restart interlock and EDM

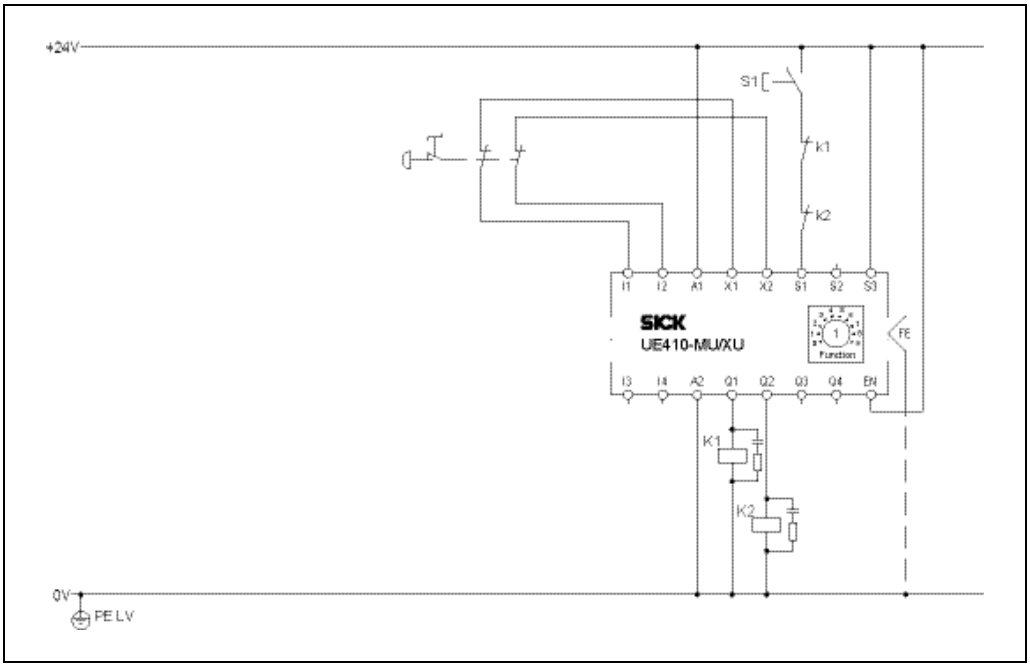
Fig. 41: Connection of three L21 to the UE410-MU/XU



7.2 Emergency stop on the UE410-MU/XU

Program 1 with restart interlock and EDM

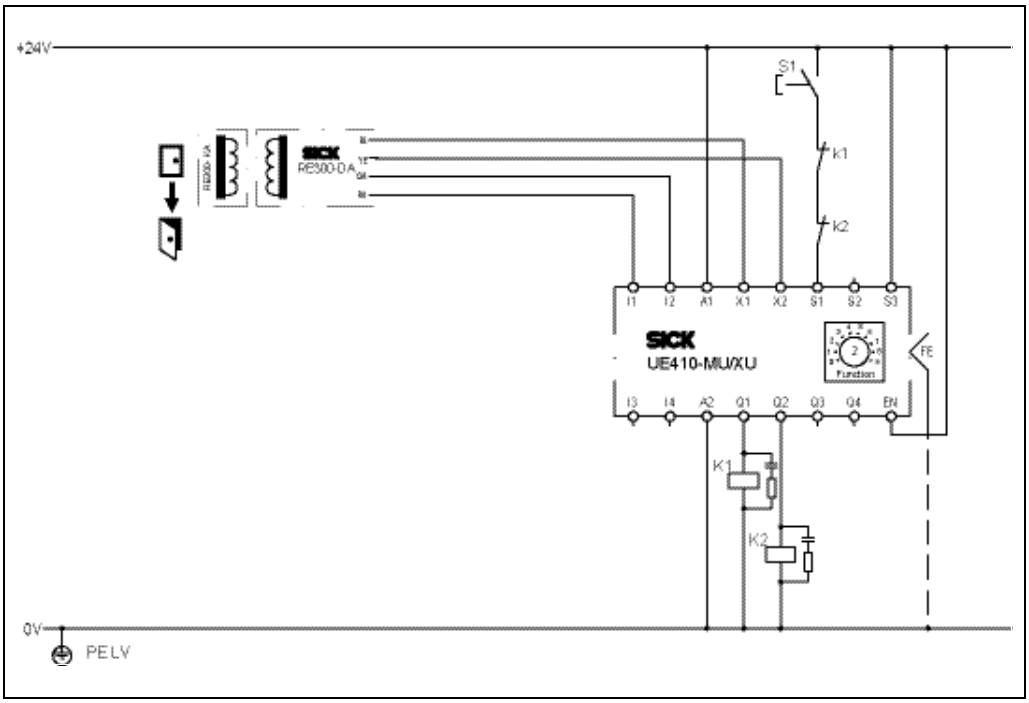
Fig. 42: Connection of an emergency stop to the UE410-MU/XU



7.3 RE300 on the UE410-MU/XU

Program 2 with restart interlock and EDM

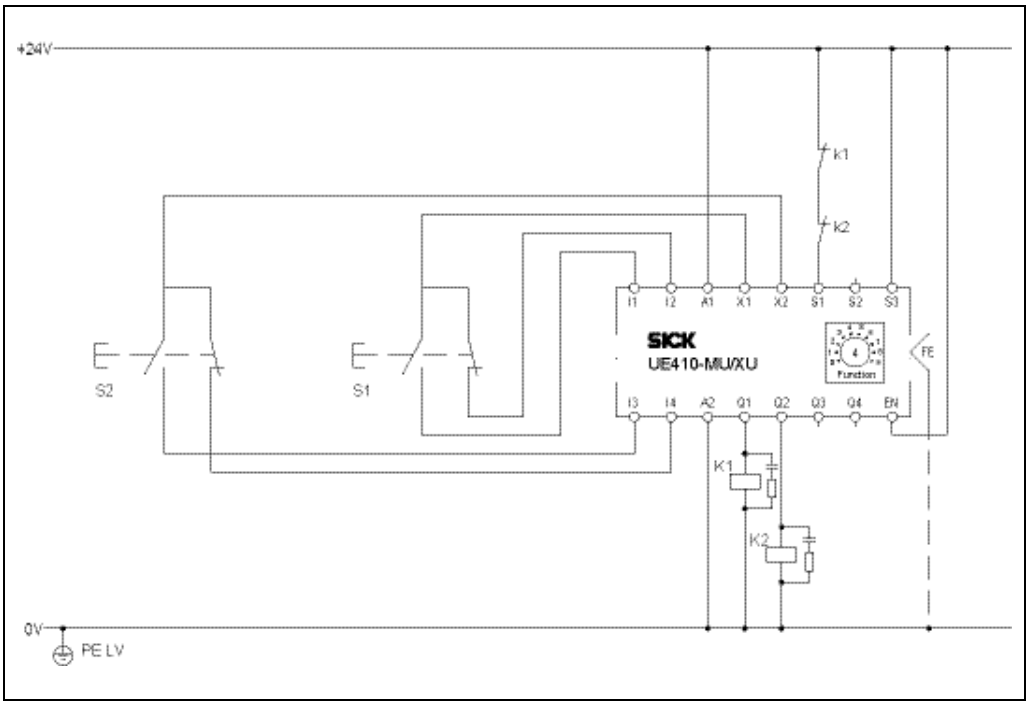
Fig. 43: Connection of an RE300 to the UE410-MU/XU



7.4 Two-hand IIIC on the UE410-MU/XU

Program 4 without restart interlock and with EDM

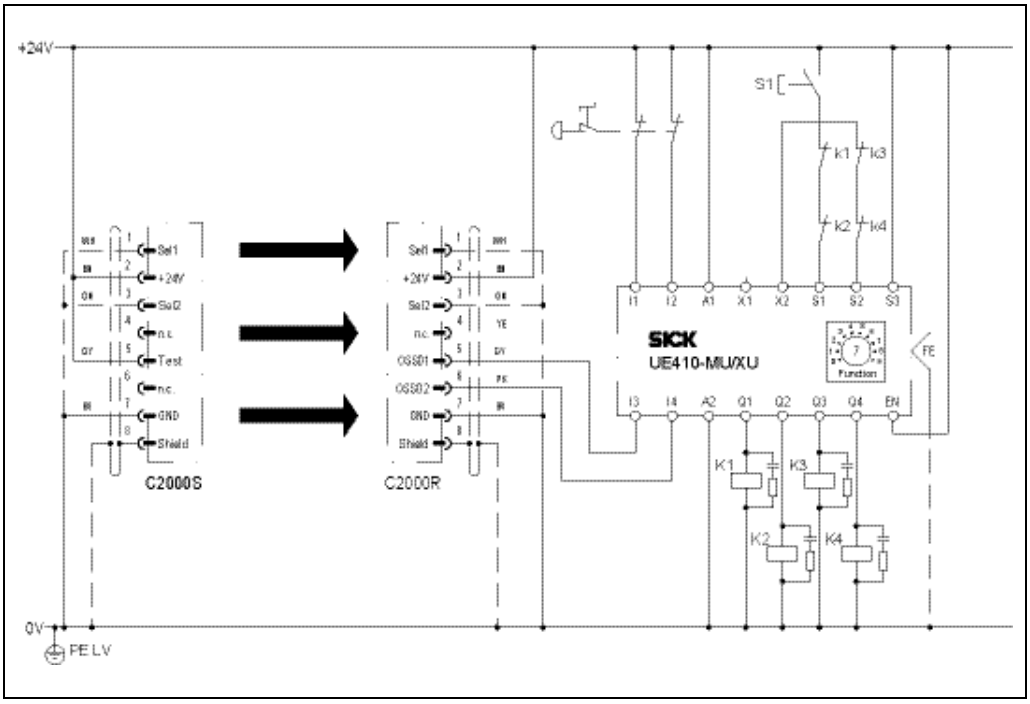
Fig. 44: Connection of a two-hand switch IIIC to the UE410-MU/XU



7.5 C2000 and emergency stop on the UE410-MU/XU, two hazardous areas

Program 7 with restart interlock and EDM

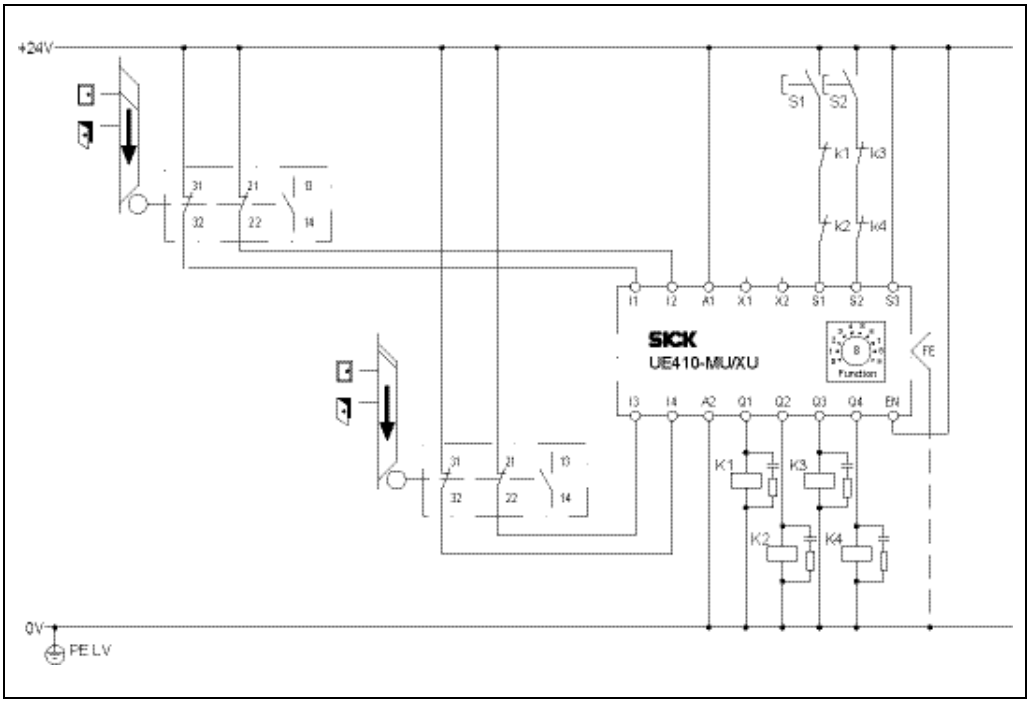
Fig. 45: Connection of a C2000 and emergency stop to the UE410-MU/XU



7.6 i11 on the UE410-MU/XU, two independent hazardous areas

Program 8 with restart interlock and EDM

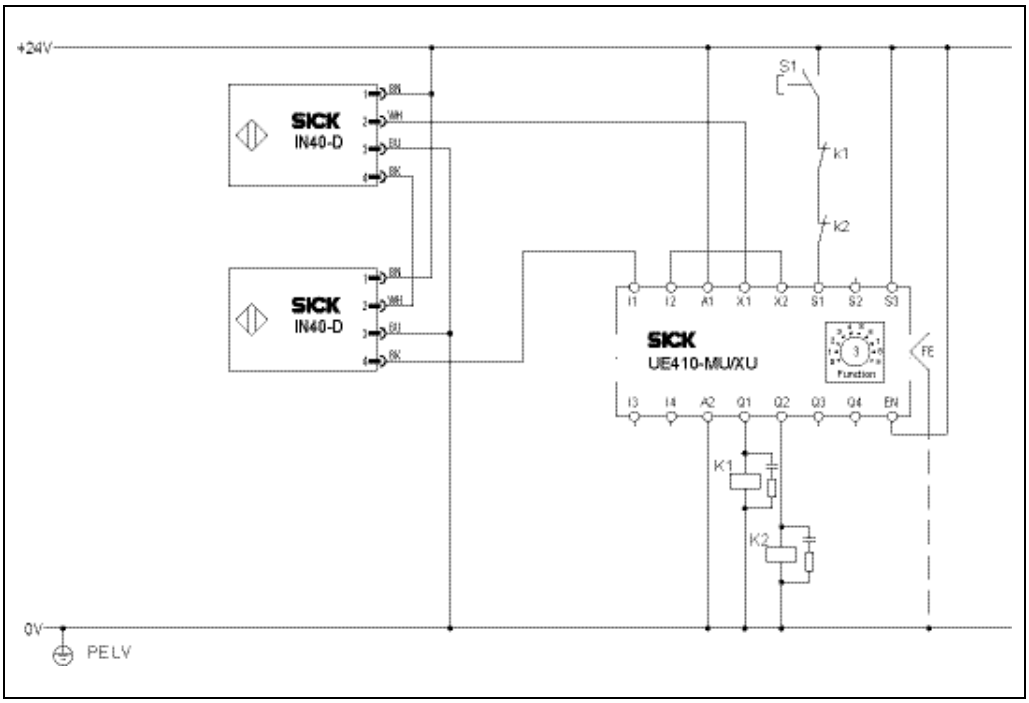
Fig. 46: Connection of two i11 to the UE410-MU/XU, two hazardous areas



7.7 IN4000 on the UE410-MU/XU

Program 3.2 with restart interlock and EDM

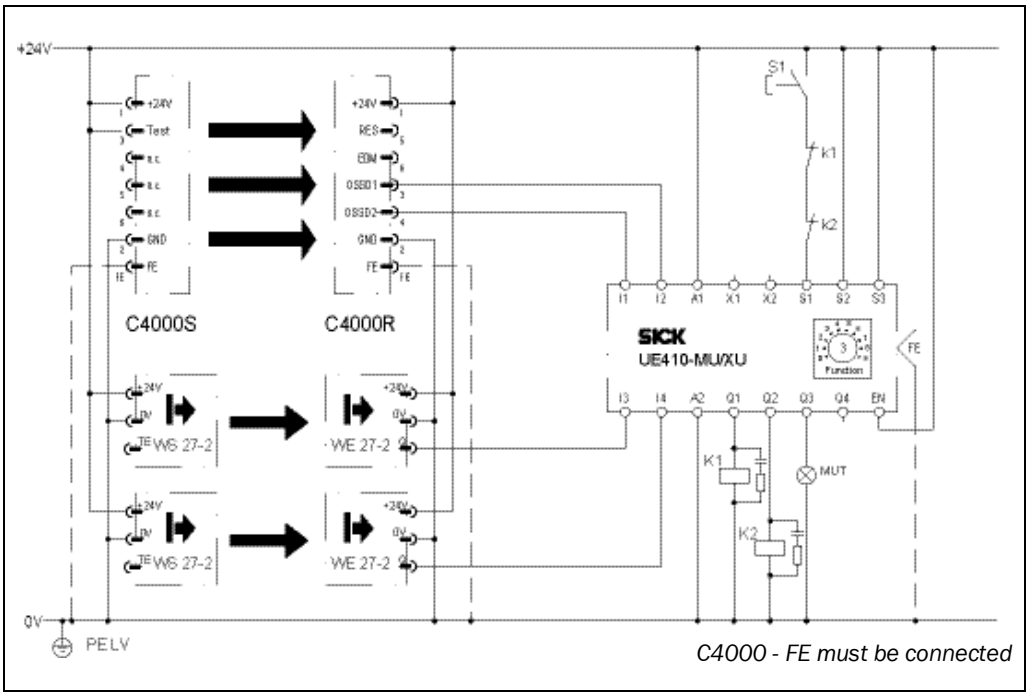
Fig. 47: Connection of two IN4000 to the UE410-MU/XU



7.8 C4000 on the UE410-MU/XU, 2-sensor muting

Program 3.1 with restart interlock and EDM

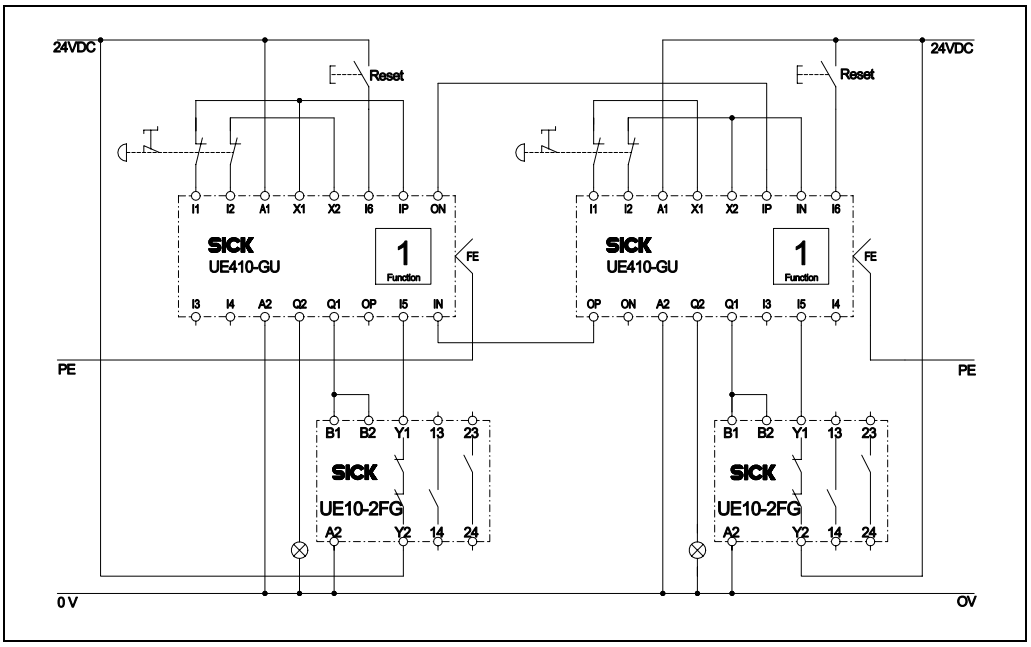
Fig. 48: Connection of a C4000 to the UE410-MU/XU, 2-sensor muting



7.9 Global emergency stop with two UE410-GU

Program 1 (global emergency stop only)

Fig. 49: Global emergency stop with two UE410-GU



8 Commissioning

WARNING

Do not commission without a check by qualified safety personnel!

Before the initial commissioning of the system in which you are using a Flexi Classic modular safety controller, it must be checked and released documented by qualified safety personnel.

WARNING

Check the hazardous area!

You must ensure that no one is located in the hazardous area before commissioning.

- Check the hazardous area and secure it against being entered by people (e.g. set up warning signs, attach blocking ropes or similar). Observe the relevant laws and local regulations.

8.1 Validation of the application

You may only commission the system if validation was successful. Validation may only be performed by professionals trained accordingly.

The general acceptance comprises the following test points:

- Check whether the connection of the components to the connections corresponds to the required Performance Level in accordance with EN ISO 13849-1 or to the SIL in accordance with IEC 61508 or the SILCL in accordance with EN 62061.
- Check the devices connected to the safety controller in accordance with the test notes from the accompanying operating instructions.

Note You will find the “Tests before the first commissioning” chapter for this in the operating instructions of the ESPE from SICK AG.

- Clearly mark all connection cables and plugs at the safety controller.
- Perform a complete verification of the safety functions of the system in each operating mode and an error simulation. Observe the response times of the individual applications in particular.

Completely document the configuration of the system, the individual devices and the result of the safety check.

Note The software for the configuration documentation is available

- on the Internet under http://www.sick.com/senscontrol
- on the Flexi Classic Mini CD (part no. 2040332)

8.2 Test notes

8.2.1 Tests before the first commissioning

The purpose of the tests before the first commissioning is to confirm the safety requirements specified in the national/international rules and regulations, especially in the Machine and Work Equipment Directive.

- ➢ Check the effectiveness of the protective device mounted to the machine, using all selectable operating modes and functions.
- ➢ Ensure that the operating personnel of the machine fitted with the safety controller are instructed by the qualified safety personnel of the machine owner before beginning work. Instructing the operating personnel is the responsibility of the machine owner.

8.2.2 Regular testing

The Flexi Classic system must be tested regularly.

WARNING

In order to reach SILCL3 in accordance with EN 62 061 (see chapter 11 “Technical specifications” on page 96), the following test must be made at least every 365 days:

- The Flexi Classic system must be powered down.
- The Flexi Classic system must be powered up.
- All safety functions of the connected safety sensors must be verified.

8.2.3 Regular inspection of the protective device by qualified safety personnel

- ➢ Check the system following the inspection intervals specified in the national rules and regulations. This procedure ensures that any changes on the machine or manipulations of the protective device after the first commissioning are detected.
- ➢ Each safety application must be checked at an interval specified by you. The effectiveness of the protective devices must be tested by qualified personnel.
- ➢ If any modifications have been made to the machine or the protective device, or if the safety controller has been changed or repaired, the system must be checked again as specified in the checklist in the annex.

9 Configuration

WARNING

Check the configuration for the protective device after every change!

If you change the configuration, you must check the effectiveness of the protective device. Please observe the test notes in the operating instructions of the connected protective device.

To configure the Flexi Classic you will need:

- a screwdriver

9.1 Accepting the system configuration

- Switch off the voltage supply (terminals A1, A2) at all the main modules.
- Use a screwdriver to set the desired switch positions (programs and functions) at the rotary switches of all the modules of the system.
- Set the control functions at all the modules of the system by external connecting of the terminals S1, S2 and S3.
- Switch on the voltage supply of all the modules while keeping the ENTER button of the main module UE410-MU or UE410-GU pressed.

WARNING

Do not actuate any of the RESET buttons connected when in this state!

- When the ERR indicator begins to flash, release the ENTER button within 3 seconds. The selected operating mode is stored in non-volatile memory and is active.

Note If the ENTER button is pressed for more than 3 seconds, the entire system switches to the error state. The ERR indicator flashes.

Please refer to the description in section 10.4 “Error indications of the ERR error LED” on page 94.

WARNING

All later changes at the connection of S1, S2 and S3 will cause a lock-out (ERR).

10 Diagnostics

10.1 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.

Complete function test after rectification of fault!

Carry out a full functional test after a malfunction has been remedied.

The ERROR operational status

With certain malfunctions or a faulty configuration, the Flexi Classic enters the safe status. The ERR LEDs of the safety controller modules show the corresponding errors. To place the device back in operation:

- Rectify the cause of the malfunction in accordance with the indication of the ERR LED.
- Switch the voltage supply of the Flexi Classic off and back on again.

10.2 Replacement of a module

If in an existing Flexi Classic system a module is replaced, the following has to be observed:

UE410-MU and UE410-GU

Each time a device is replaced, it is necessary to accept the system configuration again (see section 9.1 “Accepting the system configuration” on page 92).

UE410-XU

If in an existing Flexi Classic system a device is replaced by another device with a differing revision code (e.g. C-XX to E-XX), then it is necessary to accept the system configuration again (see section 9.1 “Accepting the system configuration” on page 92). This is not necessary if the revision code remains the same.

UE410-8DI

If in an existing Flexi Classic system a device is replaced by another device with a differing revision code (e.g. C-XX to E-XX), then the system configuration must be accepted again (see section 9.1 “Accepting the system configuration” on page 92). This is not necessary if the revision code remains the same.

Additionally from revision code D-XX or higher you must pay attention to the wiring: If the devices were wired as described in these operating instructions (see section 3.8.5 “Connection of sensors to the UE410-8DI” on page 54), no change is necessary. If the devices were wired e.g. via external distributor modules (X1 and X2 led back to I1 to I8), then a module exchange from revision code ≤ C-XX to ≥ D-XX requires that connection I5 is exchanged with I6 and I7 is exchanged with I8.

10.3 SICK support

If you cannot rectify an error with the help of the information provided in this chapter, please contact your local SICK representative.

Note If you send in a device for repair, you will receive it back in the delivery state. Therefore write down the configuration(s) of your devices.

10.4 Error indications of the ERR error LED

This section explains what the LED error indications mean and how you can respond.

Tab. 37: Error indications of the ERR LED

LED indicators	Possible cause	Rectification of the error
●	Sequential error on modules that did not detect the error initially	➢ Eliminate the error at the respective module.
2 × ●	Error at the module configuration	➢ Repeat the configuration.
3 × ●	Rotary switch manipulated	➢ Turn the rotary switch back to the original position. ➢ Carry out a power-up or repeat teaching-in.
4 × ●	Change to the configuration in the electrically unpowered state • on the rotary switch or • to S1-S3 (UE410-MU/XU only) or Slot list comparison found difference or differing module revisions	➢ Reset configuration to original state or ➢ Re-connect module to original position or ➢ Carry out a power-up and accept the configuration again.
5 × ●	Supply voltage defective	➢ Check the voltage supply.
6 × ●	Self-diagnostics, internal error, etc.	➢ Cycle power. Check wiring and rotary switch setting.

Note S3 and ENABLE must always be wired on the UE410-MU/XU. Otherwise the outputs Q1-Q4 cannot be enabled.

10.5 Anti-manipulation measures

Tab. 38: Anti-manipulation measures

Reaction of the system	Cause	Rectification of the error
• Immediate de-activation of all outputs • System changes to “System error” status. • Red ERR LED of the respective module flashes. • Green PWR LED flashes. • All other ERR LEDs to steady red • Message via diagnostics module	Changeover of a rotary switch	➢ Return the switch back to the old position (setting aid if voltage remains activated: flashing PWR LED changes to steady green). ➢ Restart the system by switching the voltage off and on again.
• De-activation of the outputs of the system/ subsystem during the next cycle • Red ERR LED of the respective module flashes. • Message via diagnostics module	UE410-MU/XU only: Change in the control circuit configuration (inputs S1, S2, S3)	➢ Reset the old configuration at S1, S2, S3. ➢ Restart the system by switching the voltage off and on again.
The last configurations are saved internally in non-volatile memory and can be read by the manufacturer if required.	Intentional use of an incorrect configuration	You can read out the last (correct) configuration using one of the Flexi Classic Gateways. ➢ Check the configuration visually at regular intervals.
• Outputs of the system cannot be activated. • Red ERR LED of the master module (UE410-MU) flashes. • All other ERR LEDs to steady red	Changeover of a rotary switch	➢ Return the switch back to the old position (setting aid if voltage remains activated: flashing PWR LED changes to steady green). ➢ Restart the system by switching the voltage off and on again.
• Outputs of the system/subsystem cannot be activated. • Red ERR LED of the master module (UE410-MU) flashes. • All other ERR LEDs to steady red	UE410-MU/XU only: Change in the control circuit configuration (inputs S1, S2, S3)	➢ Reset the old configuration at S1, S2, S3. ➢ Restart the system by switching the voltage off and on again.

11 Technical specifications

11.1 Data sheet

11.1.1 UE410-MU/UE410-XU modules

Tab. 39: Data sheet UE410-MU/UE410-XU

	Minimum	Typical	Maximum
Supply circuit (A1, A2)			
Supply voltage U_B	19.2 V DC	24 V DC	30 V DC
Type of supply voltage	PELV or SELV The current of the power supply unit for the main module has to be limited to a maximum of 6 A — either by the power supply unit itself or by a fuse.		
Residual ripple U_{ss}	–	–	3 V
Power consumption	–	–	3 W
Maximum switch-on time	–	–	60 s
Short-circuit protection	4 A gG with tripping characteristic B or C		
Input circuit (I1-I4, EN, S1-S3)			
Number of inputs	–	–	8
Input voltage (high)	13 V DC	–	30 V DC
Input voltage (low)	–5 V DC	–	5 V DC
Input current (high)	2.4 mA	3 mA	3.8 mA
Input current (low)	–2.5 mA	–	2.1 mA
Input capacitance	9 nF	10 nF	11 nF
Minimum switch-off time[10)] (I1/I2) program 3.1, 7, 8	7 ms	–	–
Minimum switch-off time[10)] (I1/I2) program 1, 2, 4, 5, 6, 9	20 ms	–	–
Minimum switch-off time[10)] (I1/I2) pressure sensitive mat	20 ms	–	–
Minimum switch-off time[10)] (I3/I4) program 1, 2, 7, 8, 9	7 ms	–	–
Minimum switch-off time[10)] (I3/I4) program 4, 5, 6	20 ms	–	–
Minimum switch-off time[10)] (X1-I1/X2-I2) program 3.2	70 ms/20 ms	–	–
Minimum switch-off time (EN)	7 ms	–	–
Maximum break time of the input signal without switching of the outputs (Q1-Q4)	–	–	1 ms

[10)] Time without sensor, the data for the sensors connected apply in addition.

	Minimum	Typical	Maximum
Power-up delay	70 ms	–	–
Synchronous time monitoring program 1, 2	–	1500 ms	–
Synchronous time monitoring program 4 and 5	–	500 ms	–
Muting ON program 3[11)]	–	–	61 ms
Muting OFF program 3	–	61 ms	165 ms[12)]
Muting gap suppression program 3[13)]	95 ms	–	100 ms
Reset time	–	–	124 ms
Teach-in time of ENTER button UE410-MU (during power-up)	–	–	3 s
Duration of actuation of the reset button (only S1, S2)	50 ms	–	5 s

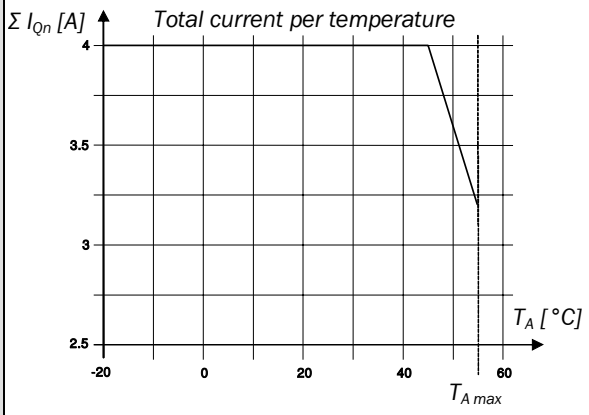
Control outputs (X1, X2)

Number of outputs	–	–	2
Type of output	PNP semiconductors, short-circuit protected, cross-circuit detecting[14)]		
Output voltage	16 V DC	–	30 V DC
Output current[15)]	–	–	120 mA
Test period (X1, X2) program 1, 2, 4, 5, 6, 9	–	–	40 ms
Test period (X1, X2) program 3.2	–	–	X1 = 384 ms X2 = 40 ms
Load capacity	–	–	1,000 nF
Cable resistance	–	–	100 Ω

Output circuit (Q1, Q2, Q3, Q4)

Number of outputs	–	4	–
Type of output	PNP semiconductors, short-circuit protected, cross-circuit detecting[14)]		
Switching voltage	18.4 V DC	–	30 V DC
Switching current			
I_{Qn}, $T_A \leq 45$ °C	–	–	2,0 A
I_{Qn}, $T_A \leq 55$ °C	–	–	1,6 A

11) Time between muting condition valid (I3/I4 high) and muting possible.
12) Max. switch-off time at muting error.
13) One muting input (I3 or I4) may be LOW for the specified time.
14) Cross circuit detecting only within a module.
15) The total output current for a Flexi Classic system is limited. The current for supplying all sensors that are connected to the UE410-MU/XU (X1/X2) and UE410-8DI (X1-X8) must be I < 600 mA and the current on a Flexi Classic gateway must be I < 100 mA. If this total current is insufficient, please contact the SICK hotline.

	Minimum	Typical	Maximum
Total current I_{sum}			
ΣI_{Qn}, $T_A \leq 45$ °C	–	–	4 A
ΣI_{Qn}, $T_A \leq 55$ °C	–	–	3.2 A
	Load diagram for the Q1 to Q4 outputs of the UE410-MU/UE410-XU modules  		
Test pulse width	500 µs	640 µs	700 µs
Test pulse frequency	12.5 Hz	–	32 Hz
Inductive switch-off energy $E = 0.5 \times L \times I^2$	–	–	370 mJ
Load capacity	–	–	500 nF
Cable length (single, ∅ 1.5 mm^2)	–	–	100 m
Response time (I1/I2)[16] program 3.1, 7, 8	–	–	13 ms
Response time (I1/I2)[16] program 1, 2, 4, 5, 6, 9	–	–	29 ms
Response time (I1/I2)[16] program 1 pressure sensitive mat	–	–	38 ms
Response time of all programs with tested ESPE Cat. 4 (e.g. L41)	–	–	56 ms
Response time (I3/I4)[16] program 1, 2, 7, 8, 9	–	–	13 ms
Response time (I3/I4)[16] program 4, 5	–	–	29 ms
Response time (I1-X1, I2-X2)[16] program 3.2	–	–	79 ms/29 ms
Response time[17] on connection of Flexi Loop			56 ms

[16] Time without sensor, the data for the sensors connected apply in addition.
[17] Response time not including Flexi Loop and not including sensor. Also take into account the response times of Flexi Loop and the sensors connected.

	Minimum	Typical	Maximum
Response time (EN)[18]	–	–	13 ms
Time delay (adjustable)	0 / 0.5 / 1 /1.5 / 2 / 2.5 / 3 / 3.5 / 4 / 5 s		
	0 / 5 / 10 / 15 / 20 / 25 / 30 / 35 / 40 / 50 s		
	0 / 0.5 / 1 / 1.5 / 2 / 2.5 / 3 / 3.5 / 4 / 5 min		

General system data

Weight (without packaging)	–	0.18 kg	–
Electrical safety	Class III		
Interference resistance	EN 61000-6-2		
Radiated emission	EN 61000-6-4		

Operating data

Ambient operating temperature (UL/CSA: ambient temperature)	–25 °C	–	55 °C
Storage temperature	–25 °C	–	70 °C
Air humidity	10 % to 95 %, non-condensing		
Climatic conditions	EN 61131-2		

Mechanical strength

Vibration	EN 61131-2
Vibration resistance	5-500 Hz/5 grms (EN 60068-2-64)

Terminal and connection data

Single-wire or fine-wire	1 × 0.14 mm² to 2.5 mm² or 2 × 0.14 mm² to 0.75 mm²		
Fine-wire with terminal crimps to EN 46228	1 × 0.25 mm² to 2.5 mm² or 2 × 0.25 mm² to 0.5 mm²		
Insulation stripping length	–	–	8 mm
Maximum tightening torque	–	–	0.6 Nm
For UL 508 and CSA applications			
UE410-xx**3**..., UE410-xxx**3**...			
– Connection cross-section	AWG 30-12 (only use 60/75 °C copper flexible wire)		
– Tightening torque	5-7 lb·in		
UE410-xx**4**..., UE410-xxx**4**...			
– Connection cross-section	AWG 30-12 (only use 60/75 °C copper flexible wire)		

[18] Cascading subsystems.

Minimum	Typical	Maximum

Safety specific characteristics

All these data are based on an ambient temperature of +40 °C.

Safety Integrity Level[19)]	SIL3 (IEC 61508)
SIL claim limit[19)]	SILCL3 (EN 62061)
Category	Category 4 (EN ISO 13849-1)
Performance Level[19)]	PL e (EN ISO 13849-1)
T_M (mission time)	20 years (EN ISO 13849-1)
PFD	3.9×10^{-6}
PFHd (1/h)	2.5×10^{-9}
SFF	96%
DC	99%

Tab. 40: PFD and PFHd values for UE410-MU/ UE410-XU

	Single-channel input, single-channel output	**Single-channel input, dual-channel output**	**Dual-channel input, single-channel output**	**Dual-channel input, dual-channel output**
PFD (∅)	**2.2×10^{-5}**	**5.2×10^{-6}**	**2.1×10^{-5}**	**3.9×10^{-6}**
% of SIL3	2.2%	0.5%	2.1%	0.4%
PFHd (1/h)	**6.0×10^{-9}**	**2.5×10^{-9}**	**6.0×10^{-9}**	**2.5×10^{-9}**
% of SIL3	6.0%	2.5%	6.0%	2.5%

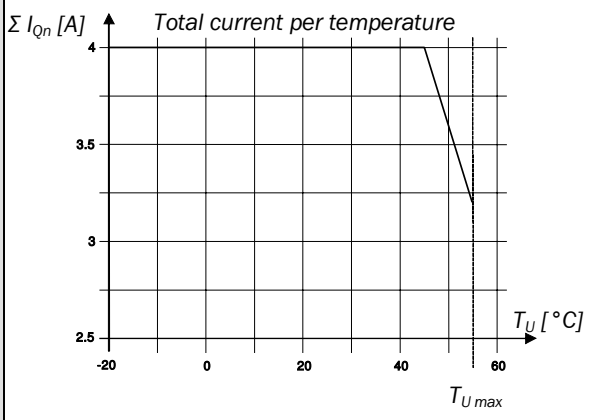
[19)] For detailed information on the safety design of your machine/system, please contact your local SICK representative.

11.1.2 UE410-GU module

Tab. 41: Data sheet UE410-GU

	Minimum	Typical	Maximum
Supply circuit (A1, A2)			
Supply voltage U_B	19.2 V DC	24 V DC	30 V DC
Type of supply voltage	PELV or SELV The current from the power supply that supplies the main module must be limited externally to max. 6 A — either by the power supply itself or by a fuse.		
Residual ripple U_{ss}	–	–	3 V
Power consumption	–	–	3 W
Maximum switch-on time	–	–	60 s
Short-circuit protection	4 A gG with tripping characteristic B or C		
Input circuit (I1-I4, I_P, I5, I6, I_N)			
Number of inputs	–	–	8
Input voltage (high)	13 V DC	–	30 V DC
Input voltage (low)	–5 V DC	–	5 V DC
Input current (high)	2.4 mA	3 mA	3.8 mA
Input current (low)	–2.5 mA	–	2.1 mA
Input capacitance	9 nF	10 nF	11 nF
Minimum switch-off time[20)] (I1/I2)	20 ms	–	–
Minimum switch-off time[20)] (I3/I4) program 6, 7	7 ms	–	–
Minimum switch-off time[20)] (I3/I4) program 2, 3, 4, 5, 8, 9	20 ms	–	–
Maximum interruption time for the input signal without switching the output (Q1)	–	–	1 ms
Local power-up delay (I1-I4)	–	–	70 ms
Local reset time	–	–	124 ms
Teach-in time of ENTER button (during power-up)	–	–	3 s
Duration of actuation of the reset button (I6)	50 ms	–	5 s

[20)] Time without sensor, in addition the data for the sensors connected apply.

	Minimum	Typical	Maximum
Control outputs (X1, X2)			
Number of outputs	–	–	2
Type of output	PNP semiconductors, short-circuit protected, cross-circuit detecting[21)]		
Output voltage	16 V DC	–	30 V DC
Output current[22)]	–	–	120 mA
Test period (X1, X2)	–	–	40 ms
Load capacity	–	–	1,000 nF
Cable resistance	–	–	100 Ω
Output circuit (Q1, Q2)			
Number of outputs	–	2	–
Type of output	PNP semiconductors, short-circuit protected, cross-circuit monitored[21)]		
Switching voltage	18.4 V DC	–	30 V DC
Switching current			
I_{Qn}, $T_U \leq 45$ °C	–	–	2.0 A
I_{Qn}, $T_U \leq 55$ °C	–	–	1.6 A
Total current I_{sum}			
ΣI_{Qn}, $T_U \leq 45$ °C	–	–	4 A
ΣI_{Qn}, $T_U \leq 55$ °C	–	–	3.2 A
	Load diagram for the Q1 and Q2 outputs of the UE410-GU modules 		
Test pulse width	500 µs	640 µs	700 µs
Test pulse frequency	12.5 Hz	–	32 Hz
Inductive switch-off energy $E = 0.5 \times L \times I^2$	–	–	370 mJ

[21)] Cross-circuit detecting only within a module.
[22)] The total output current for a Flexi Classic system is limited. The current for supplying all sensors that are connected to the UE410-GU/XU (X1/X2) and UE410-8DI (X1-X8) must be I < 600 mA and the current on a Flexi Classic gateway must be I < 100 mA. If this total current is insufficient, please contact the SICK hotline.

	Minimum	Typical	Maximum
Load capacity	–	–	500 nF
Cable length (single, Ø 1.5 mm²)	–	–	100 m
Local response time cut-off path (I1/I2)[23)]	–	–	29 ms
Local response time cut-off path (I3/I4)[23)] program 2, 3, 4 and 5	–	–	29 ms
Local response time cut-off path (I3/I4)[23)] program 6, 7	–	–	13 ms
Local response time cut-off path (I4)[23)] program 8, 9 with tested electro-sensitive protective device cat. 4 (e.g. L41)	–	–	56 ms
Local response time[24)] on connection of Flexi Loop	–	–	56 ms

Global emergency stop circuit (O_P-I_N, O_N-I_P)

Cable length O_X to I_X	–	–	100 m
Cable length all stations, global emergency stop function[25)]	–	–	1000 m
Number of stations, global emergency stop function	–	–	32
Global response time I_X to O_X	–	–	40 ms
Global power-up delay I_X	–	80 ms	120 ms

General system data

Weight (without packaging)	–	0.18 kg	–
Electrical safety	Class III		
Interference resistance	EN 61000-6-2		
Radiated emission	EN 61000-6-4		

Operating data

Ambient operating temperature (UL/CSA: ambient temperature)	–25 °C	–	55 °C
Storage temperature	–25 °C	–	70 °C
Air humidity	10 % to 95 %, non-dewing		
Climatic conditions	EN 61131-2		

Mechanical strength

Vibration	EN 61131-2
Vibration resistance	5-500 Hz/5 grms (EN 60068-2-64)

[23)] Time without sensor, in addition the data for the sensors connected apply.
[24)] Response time not including Flexi Loop and not including sensor. Also take into account the response times of Flexi Loop and the sensors connected.
[25)] The input voltage levels (I1-I6, I_P,I_N) must be met.

	Minimum	Typical	Maximum

Terminal and connection data

Single-wire or fine-wire	1 × 0.14 mm² to 2.5 mm² or 2 × 0.14 mm² to 0.75 mm²		
Fine-wire with terminal crimps to EN 46228	1 × 0.25 mm² to 2.5 mm² or 2 × 0.25 mm² to 0.5 mm²		
Insulation stripping length	–	–	8 mm
Maximum tightening torque	–	–	0.6 Nm
For UL 508 and CSA applications			
UE410-xx**3**..., UE410-xxx**3**...			
– Connection cross-section	AWG 30-12 (only use 60/75 °C copper flexible wire)		
– Tightening torque	5-7 lb·in		
UE410-xx**4**..., UE410-xxx**4**...			
– Connection cross-section	AWG 30-12 (only use 60/75 °C copper flexible wire)		

Safety specific characteristics

All these data are based on an ambient temperature of +40 °C.

Safety Integrity Level[26)]	SIL3 (IEC 61508)
SIL claim limit[26)]	SILCL3 (EN 62061)
Category	Category 4 (EN ISO 13849-1)
Performance Level[26)]	PL e (EN ISO 13849-1)
T_M (mission time)	20 years (EN ISO 13849-1)
PFD	2.1×10^{-5}
PFHd (1/h)	6.0×10^{-9}
SFF	96%
DC	99%

Tab. 42: PFD and PFHd values for UE410-GU

	Single-channel input, single-channel output	**Dual-channel input, single-channel output**
PFD (∅)	**2.2×10^{-5}**	**2.1×10^{-5}**
% of SIL3	2.2%	2.1%
PFHd (1/h)	**6.0×10^{-9}**	**6.0×10^{-9}**
% of SIL3	6.0%	6.0%

[26)] For detailed information on the safety design of your machine/system, please contact your local SICK subsidiary.

11.1.3 UE410-8DI input extension module

Tab. 43: Data sheet UE410-8DI

	Minimum	Typical	Maximum
Supply circuits (via UE410-MU or UE410-GU)			
Power consumption	–	–	3 W
Input circuit (I1-I8)			
Number of inputs	–	–	8
Input voltage (high)	13 V DC	–	30 V DC
Input voltage (low)	–5 V DC	–	5 V DC
Input current (high)	2.4 mA	3 mA	3.8 mA
Input current (low)	–2.5 mA	–	2.1 mA
Input capacitance	9 nF	10 nF	11 nF
Minimum switch-off time	See response times		
Break time of the input signal without switching of the outputs	–	–	1 ms
Monitoring of synchronisation, switch position 3, 5	–	1500 ms	–
Power-up delay	70 ms	–	–
Reset time	–	–	120 ms
Output circuit (X1-X8)			
Number of outputs	–	–	8
Type of output	PNP semiconductors, short-circuit protected, cross-circuit detecting[27)]		
Output voltage	16 V DC	–	30 V DC
Output current[28)]	–	–	30 mA
Test period	–	–	40 ms
Load capacity	–	–	1,000 nF
Cable resistance	–	–	100 Ω
Response time UE410-8DI on safety outputs UE410-MU/UE410-XU (Q1-Q4)			
Response time switch setting 6, 7[29)]	–	–	17 ms
Response time switch setting 1, 2, 3, 4, 5, 8[29)]	–	–	34 ms
Response time switch setting 2 pressure sensitive mat[29)]	–	–	42 ms
Response time of all programs with tested ESPE Cat. 4 (e.g. L41)	–	–	60 ms
Response time[30)] on connection of Flexi Loop			60 ms

[27)] Cross circuit detecting only within a module.
[28)] The total output current for a Flexi Classic system is limited. The current for supplying all sensors that are connected to the UE410-MU/XU (X1/X2) and UE410-8DI (X1-X8) must be I < 600 mA and the current on a Flexi Classic gateway must be I<100 mA. If this total current is insufficient, please contact the SICK hotline.
[29)] Time without sensor, the data for the sensors connected apply in addition.

	Minimum	Typical	Maximum
General system data			
Weight (without packaging)	–	0.15 kg	–
Electrical safety	Class III		
Interference resistance	EN 61000-6-2		
Radiated emission	EN 61000-6-4		
Operating data			
Ambient operating temperature (UL/CSA: ambient temperature)	–25 °C	–	55 °C
Storage temperature	–25 °C	–	70 °C
Air humidity	10 % to 95 %, non-dewing		
Climatic conditions	EN 61131-2		
Mechanical strength			
Vibration	EN 61131-2		
Vibration resistance	5-500 Hz/5 grms (EN 60068-2-64)		
Terminal and connection data			
Single-wire or fine-wire	1 × 0.14 mm² to 2.5 mm² or 2 × 0.14 mm² to 0.75 mm²		
Fine-wire with terminal crimps to EN 46228	1 × 0.25 mm² to 2.5 mm² or 2 × 0.25 mm² to 0.5 mm²		
Insulation stripping length	–	–	8 mm
Maximum tightening torque	–	–	0.6 Nm
For UL 508 and CSA applications UE410-xx**3**..., UE410-xxx**3**... – Connection cross-section – Tightening torque UE410-xx**4**..., UE410-xxx**4**... – Connection cross-section	 AWG 30-12 (only use 60/75 °C copper flexible wire) 5-7 lb·in AWG 30-12 (only use 60/75 °C copper flexible wire)		

[30] Response time not including Flexi Loop and not including sensor. Also take into account the response times of Flexi Loop and the sensors connected.

	Minimum	Typical	Maximum

Safety specific characteristics

All these data are based on an ambient temperature of +40 °C.

Safety integrity level[31)]	SIL3 (IEC 61508)
SIL claim limit[31)]	SILCL3 (EN 62061)
Category	Category 4 (EN ISO 13849-1)
Performance Level[31)]	PL e (EN ISO 13849-1)
T_M (mission time)	20 years (EN ISO 13849-1)
PFD	5.8×10^{-6}
PFHd (1/h)	3.8×10^{-9}
SFF	96%
DC	99%

Tab. 44: PFD and PFHd values for UE410-8DI

	Single-channel input, single-channel output	**Single-channel input, dual-channel output**	**Dual-channel input, single-channel output**	**Dual-channel input, dual-channel output**
PFD (∅)	**2.4×10^{-5}**	**7.0×10^{-6}**	**2.3×10^{-5}**	**5.8×10^{-6}**
% of SIL3	2.4%	0.7%	2.3%	0.6%
PFHd (1/h)	**7.3×10^{-9}**	**3.8×10^{-9}**	**7.3×10^{-9}**	**3.8×10^{-9}**
% of SIL3	7.3%	3.8%	7.3%	3.8%

11.1.4 UE410-2RO/UE410-4RO output modules

Tab. 45: Data sheet UE410-2RO/UE410-4RO

	Minimum	Typical	Maximum

Supply circuit (via UE410-MU)

Power consumption			
UE410-4RO	–	–	3.2 W
UE410-2RO	–	–	1.6 W

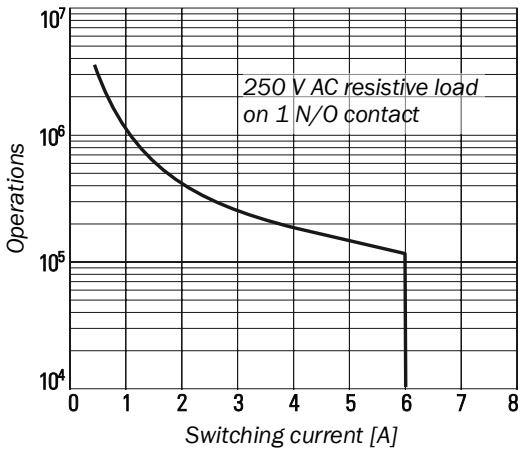
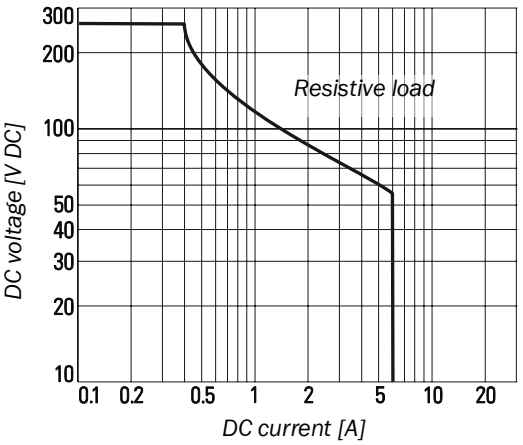
Input circuit B1, B2

Input voltage	18 V DC	–	30 V DC

Output circuit (13/14, 23/24, 33/34, 43/44)

Number of N/O contacts			
UE410-2RO	–	2	–
UE410-4RO	–	4	–
Number of N/C contacts			
UE410-2RO	–	1	–
UE410-4RO	–	2	–

[31)] For detailed information on the safety design of your machine/system, please contact your local SICK representative.

	Minimum	Typical	Maximum
Switching voltage AC	5 V AC	230 V AC	253 V AC
	Electrical endurance output modules UE410-2RO/ UE410-4RO  		
Switching voltage DC	5 V DC	230 V DC	253 V DC
	Maximum DC current UE410-2RO/UE410-4RO  		
Switching current	10 mA	–	6 A
Minimum contact load with U_n = 24 V DC	50 mW	–	–
Total current	–	–	8 A
Response time[32)]	–	–	30 ms
Type of output	Floating N/O contacts, positively guided		
Contact material	$AgSnO_2$		
Output circuit fusing	6 A (gG), per current path		
Usage category	AC-15: U_e 250 V, I_e 3 A		
	DC-13: U_e 24 V, I_e 3 A		

[32)] Time from LOW on B1/B2 to relay drop-out.

	Minimum	Typical	Maximum

Output circuit (Y14, Y24)

Type of output	Non-isolated N/O contact, positively guided, current-limited		
Number of N/O contacts Y14/24			
UE410-2RO	–	1	–
UE410-4RO	–	2	–
Output voltage	16 V DC	24 V DC	30 V DC
Output current[33)]	–	–	75 mA
Load capacity	–	–	200 nF

General data

Electrical isolation	
Supply circuit-input circuit	No
Supply circuit-output circuit	Yes
Input circuit-output circuit	Yes
Weight (without packaging)	
UE410-2RO	0.16 kg
UE410-4RO	0.19 kg

Operating data

Ambient operating temperature (UL/CSA: ambient temperature)	–25 °C	–	55 °C
Storage temperature	–25 °C	–	70 °C
Air humidity	10 % to 95 %, non-condensing		
Climatic conditions	EN 61131-2		

Mechanical strength

Vibration resistance	5-150 Hz/1 G (EN 60068-2-6) 10-500 Hz/3 G_{rms} (EN 60068-2-64)
Shock resistance	
Continuous shock	10 g, 16 ms (EN 60068-2-27)
Single shock	30 g, 11 ms (EN 60068-2-27)

[33)] The total output current is limited. Maximum total current for all relay modules on Y14 and Y24 is I < 400 mA.

	Minimum	Typical	Maximum

Electrical safety EN 61131-2

Impulse voltage withstand level (U_{imp})	4 kV
Overvoltage category	II
Contamination level	2 inside, 3 outside
Rated voltage	300 V AC
Enclosure rating housing/terminals	IP 40/IP 20 (EN 60529)
Interference resistance	EN 61000-6-2
Radiated emission	EN 61000-6-4

Terminal and connection data

Single-wire or fine-wire	1 × 0.14 mm² to 2.5 mm² or 2 × 0.14 mm² to 0.75 mm²		
Fine-wire with terminal crimps to EN 46228	1 × 0.25 mm² to 2.5 mm² or 2 × 0.25 mm² to 0.5 mm²		
Insulation stripping length	–	–	8 mm
Maximum tightening torque	–	–	0.6 Nm
For UL 508 and CSA applications			
UE410-xx**3**..., UE410-xxx**3**...			
– Connection cross-section	AWG 30-12 (only use 60/75 °C copper flexible wire)		
– Tightening torque	5-7 lb·in		
UE410-xx**4**..., UE410-xxx**4**...			
– Connection cross-section	AWG 30-12 (only use 60/75 °C copper flexible wire)		

Safety specific characteristics

All these data are based on an ambient temperature of +40 °C.

Safety integrity level[34)]	SIL3 (IEC 61508)
SIL claim limit[34)]	SILCL3 (EN 62061)
Category	Category 4 (EN ISO 13849-1)
Performance Level[34)]	PL e (EN ISO 13849-1)
PFD	1.6×10^{-7}
PFHd at I = 0.75 A, switching frequency = h^{-1}	1.2×10^{-9} (see also Tab. 46)
B_{10d} value, switching frequency = h^{-1}	0.75 A (AC 15)/4,150,000 (see also Tab. 46)
SFF	99.6%
DC	99%
T_M (mission time)	Depending on PFHd value, ambient temperature, load and switching operations (see Tab. 46)

[34)] For detailed information on the safety design of your machine/system, please contact your local SICK representative.

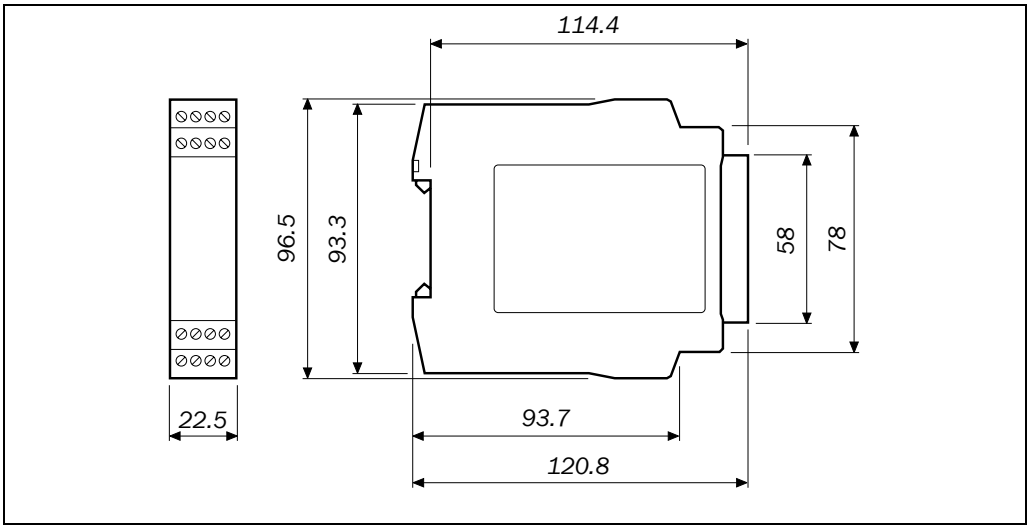
Tab. 46: PFHd values

Load type	I[A]	Switching frequency	Switching operations per annum	B_{10d}	PFHd
AC15	0.1	1/h	8760	10,000,000	5.00×10^{-10}
	0.75	**1/h**	**8760**	**4,150,000**	**1.20×10^{-09}**
	3	1/h	8760	400,000	1.20×10^{-08}
	5	1/h	8760	70,000	7.20×10^{-08}
DC13	1	1/h	8760	2,000,000	2.50×10^{-09}
	3	1/h	8760	450,000	1.10×10^{-08}
AC1	2	1/h	8760	1,000,000	5.00×10^{-09}
	4	1/h	8760	600,000	8.40×10^{-09}

11.2 Dimensional drawings

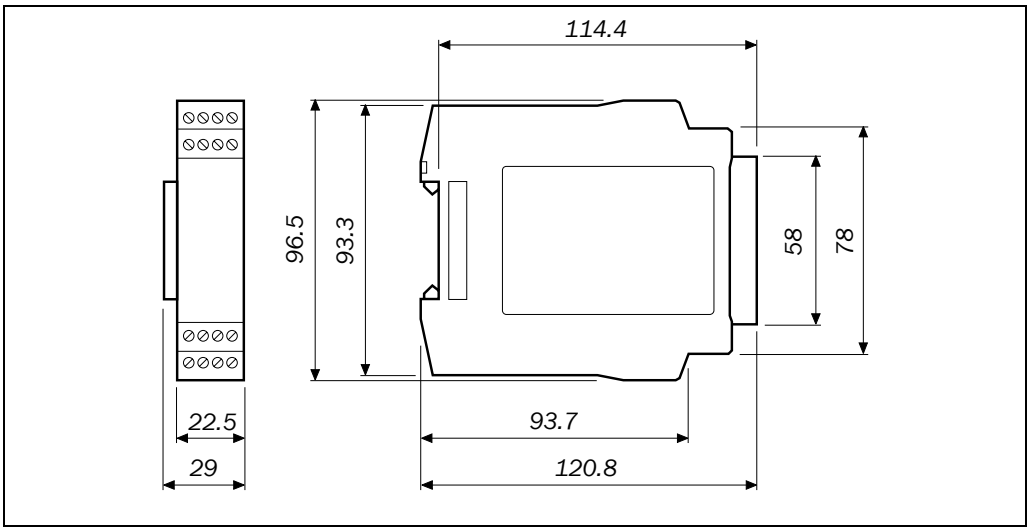
11.2.1 UE410-MU and UE410-GU main modules

Fig. 50: Dimensional drawing UE410-MU and E410-GU (mm)



11.2.2 UE410-XU, UE410-8DI, UE410-2RO, UE410-4RO, UE410-PRO, UE410-DEV, UE410-CAN modules

Fig. 51: Dimensional drawing UE410-XU, UE410-8DI, UE410-2RO, UE410-4RO, UE410-PRO, UE410-DEV, UE410-CAN (mm)



12 Ordering information

12.1 Available modules

Tab. 47: Part numbers of Flexi Classic safety controller modules

Device type	Part	Part number
UE410-MU3T0	Main module 4 inputs/4 outputs No delay Plug-in screw terminals	6035242
UE410-MU3T5	Main module 4 inputs/4 outputs Delay possible: 0-5 s Plug-in screw terminals	6026136
UE410-MU3T50	Main module 4 inputs/4 outputs Delay possible: 0-50 s Plug-in screw terminals	6026137
UE410-MU3T300	Main module 4 inputs/4 outputs Delay possible: 0-300 s Plug-in screw terminals	6026138
UE410-GU	Main module 4 inputs/1 output Plug-in screw terminals	1072177
UE410-8DI3	Input extension module 4 dual-channel inputs Plug-in screw terminals	6026139
UE410-2RO3	Output module 2 N/O contacts and 1 24 V DC alarm signal Plug-in screw terminals	6026144
UE410-4RO3	Output module 4 N/O contacts and 2 24 V DC alarm signals Plug-in screw terminals	6026143
UE410-XU3T0	Input/output extension module 4 inputs/4 outputs No delay Plug-in screw terminals	6035244
UE410-XU3T5	Input/output extension module 4 inputs/4 outputs Delay possible: 0-5 s Plug-in screw terminals	6032470

Device type	Part	Part number
UE410-XU3T50	Input/output extension module 4 inputs/4 outputs Delay possible: 0-50 s Plug-in screw terminals	6032471
UE410-XU3T300	Input/output extension module 4 inputs/4 outputs Delay possible: 0-300 s Plug-in screw terminals	6032472
UE410-MU4T0	Main module 4 inputs/4 outputs No delay Plug-in spring terminals	6035243
UE410-MU4T5	Main module 4 inputs/4 outputs Delay possible: 0-5 s Plug-in spring terminals	6032669
UE410-MU4T50	Main module 4 inputs/4 outputs Delay possible: 0-50 s Plug-in spring terminals	6032670
UE410-MU4T300	Main module 4 inputs/4 outputs Delay possible: 0-300 s Plug-in spring terminals	6032671
UE410-XU4T0	Input/output extension module 4 inputs/4 outputs No delay Plug-in spring terminals	6035245
UE410-XU4T5	Input/output extension module 4 inputs/4 outputs Delay possible: 0-5 s Plug-in spring terminals	6032672
UE410-XU4T50	Input/output extension module 4 inputs/4 outputs Delay possible: 0-50 s Plug-in spring terminals	6032673
UE410-XU4T300	Input/output extension module 4 inputs/4 outputs Delay possible: 0-300 s Plug-in spring terminals	6032674

Device type	Part	Part number
UE410-8DI4	Input extension module 4 dual-channel inputs Plug-in spring terminals	6032675
UE410-4RO4	Output module 4 N/O contacts and 2 24 V DC alarm signals Plug-in spring terminals	6032676
UE410-2RO4	Output module 2 N/O contacts and 1 24 V DC alarm signal Plug-in spring terminals	6032677
UE410-PRO3	PROFIBUS-DP gateway Plug-in screw terminals	6028407
UE410-PRO4	PROFIBUS-DP gateway Plug-in spring terminals	6032678
UE410-CAN3	CANopen gateway Plug-in screw terminals	6033111
UE410-CAN4	CANopen gateway Plug-in spring terminals	6033112
UE410-DEV3	DeviceNet gateway Plug-in screw terminals	6032469
UE410-DEV4	DeviceNet gateway Plug-in spring terminals	6032679
UE410-EN1	EtherNet/IP gateway Plug-in screw terminals	1042964
UE410-EN3	Modbus TCP/IP and Ethernet TCP/IP gateway Plug-in screw terminals	1042193
UE410-EN4	PROFINET IO gateway Plug-in screw terminals	1044078

12.2 Accessories/spare parts

12.2.1 Single-beam photoelectric safety switches

Tab. 48: Part numbers of single-beam photoelectric safety switches

Part	Description	Part number
L21S-33MA2A	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 60 m, PNP, physical size M30, M12 × 4 plug	6034870
L21E-33MA2A	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 60 m, PNP, physical size M30, M12 × 4 plug	6034871
L21S-21KA1A	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 16 m, PNP, physical size M18, M12 × 4 plug	6034872
L21E-21KA1A	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 16 m, PNP, physical size M18, M12 × 4 plug	6034873
L21S-11MA1A	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 5 m, radial axis, PNP, physical size M18, M12 × 4 plug	6034876
L21E-11MA1A	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 5 m, radial axis, PNP, physical size M18, M12 × 4 plug	6034877
L27S-3D2430	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 25 m, PNP, Q+/Q, M12 × 4 plug	2043906
L27E-3P2430	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 25 m, PNP, Q+/Q, M12 × 4 plug	2043904
L28S-3D2431	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 18 m, PNP, Q+/Q, M12 × 4 plug	2044515
L28E-3P2431	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 18 m, PNP, Q+/Q, M12 × 4 plug	2044516
L41S-33MA2A	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 60 m, PNP, physical size M30, M12 × 4 plug	6034863
L41E-33MA2A	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 60 m, PNP, physical size M30, M12 × 4 plug	6034862

Part	Description	Part number
L41S-21KA1A	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 10 m, PNP, physical size M18, M12 × 4 plug	6034864
L41E-21KA1A	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 10 m, PNP, physical size M18, M12 × 4 plug	6034865
L41S-11MA1A	Single-beam photoelectric safety switch, sender, 24 V DC, operating range 5 m, radial axis, PNP, physical size M18, M12 × 4 plug	6034868
L41E-11MA1A	Single-beam photoelectric safety switch, receiver, 24 V DC, operating range 5 m, radial axis, PNP, physical size M18, M12 × 4 plug	6034869

12.2.2 Non-contact safety switches

Tab. 49: Part numbers of non-contact safety switches

Part	Description	Part number
RE21-DA05	RE21 sensor and actuator, 5 m cable	6035617
RE27-DA05L	RE27 sensor and actuator, 5 m cable	6034343
RE13-DAC	RE13 sensor and actuator, M8 plug	6036769
RE31-DAC	RE31 sensor and actuator, M8 plug	6036768
T4000-E0101K	T4000 Direct sensor	6035041
T4000-1KBQ	Actuator for T4000 Direct, cuboid	5311153
IN40-D0101K	IN4000 switch Q40, M12 plug	6027389
IN40-D0202K	IN4000 switch M30, M12 plug	6027392
IN40-D0303K	IN4000 switch M18, M12 plug	6027391
IN40-E0101K	IN4000 Direct Q40, M12 plug	6027388
DOL-1204-G10M	IN4000 connecting cable M12, 4-pin with 10 m cable	6010543
DOL-1208-G10MA	T4000 Direct connecting cable M12, 8-pin with 10 m cable	6022152
DOL-0804-G10M	RE13/RE31 connecting cable M8, 4-pin with 10 m cable	6010754

12.2.3 Safety light curtains and multiple light beam safety devices

Tab. 50: Safety light curtains and multiple light beam safety devices

Part	Description	Part number
C4000	All variants	–
M4000	All variants	–
C2000	All variants	–
M2000	All variants	–
miniTwin	All variants	–

12.2.4 Safety laser scanners and safety camera system

Tab. 51: Laser scanner

Part	Description	Part number
S3000	All variants	–
S300	All variants	–
V300	All variants	–

12.2.5 Muting lamps and cables

Tab. 52: Part numbers of muting lamps and cables

Part	Description	Part number
–	Muting lamp with mounting kit	2020743
–	LED muting lamp with cable 2 m	2019909
–	LED muting lamp with cable 10 m	2019910

12.2.6 Anti-manipulation cover

Tab. 53: Part number anti-manipulation cover

Part	Description	Part number
AM cover	10 anti-manipulation covers	5319789

13 Annex

13.1 Compliance with EU directives

EU declaration of conformity (excerpt)

The undersigned, representing the following 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 respective standards and/or technical specifications are taken as the basis.

Complete EU declaration of conformity for download: www.sick.com

13.2 Manufacturer's checklist

SICK

Checklist for the manufacturer/installer for installation of the Flexi Classic modular safety controller

The information for the points listed below must at least be available the first time the equipment is commissioned. They depend on the application the requirements of which must be verified by the manufacturer/installer.

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

1. Have the safety rules and regulations been observed in compliance with the directives/standards applicable to the machine?	Yes ☐	No ☐
2. Are the applied directives and standards listed in the declaration of conformity?	Yes ☐	No ☐
3. Does the protective device comply with the required category?	Yes ☐	No ☐
4. Are the required protective measures against electric shock in effect (protection class)?	Yes ☐	No ☐
5. Has the potective function been checked in compliance with the test notes of this documentation? In particular: • functional check of the input devices, sensors and actuators connected to the safety controller • test of all switch-off paths	Yes ☐	No ☐
6. Are you sure that the safety controller was tested fully for safety functionality after each configuration change?	Yes ☐	No ☐

This checklist does not replace the initial commissioning and regular tests by qualified safety personnel.

13.3 List of tables

13.4 List of illustrations

8011509/YPP0/2015-10-26 · REIPA/XX (2015-11) · A4 sw int44

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