SAFEMASTER STS
Safety switch- and key interlock system POWER INTERLOCKING

Translation of the original instructions

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Content

Before installing, operating or maintaining this device, these instructions must be carefully read and understood.

The installation must only be done by a qualified electrican!

The installation must only be done by a qualified mechanic!

Do not dispose of household garbage!
The device must be disposed of in compliance with nationally applicable rules and requirements.

Storage for future reference.

To help you understand and find specific text passages and notes in the operating instructions, we have important information and information marked with symbols.

Symbol and Notes Statement

DANGER:
Indicates that death or severe personal injury will result if proper precautions are not taken.

WARNING:
Indicates that death or severe personal injury can result if proper precautions are not taken.

CAUTION:
Indicates that a minor personal injury can result if proper precautions are not taken.

INFO:
Referred information to help you make best use of the product.

ATTENTION:
Warns against actions that can cause damage or malfunction of the device, the device environment or the hardware / software result.

General Notes

The product hereby described was developed to perform safety functions as a part of a whole installation or machine. A complete safety system normally includes sensors (SAFEMASTER STS System), evaluation units, signals and logical modules for safe disconnections. The manufacturer of the installation or machine is responsible for ensuring proper functioning of the whole system. DOLD cannot guarantee all the specifications of an installation or machine that was not designed by DOLD. The total concept of the control system into which the device is integrated must be validated by the user. DOLD also takes over no liability for recommendations which are given or implied in the following description. The following description implies no modification of the general DOLD terms of delivery, warranty or liability claims.

Notes

Risk!
Danger to life or risk of serious injuries.

- Hazards must be ruled out before a key can be entered and the movable part of the guard can then be opened!

INFO

- For information regarding use in the system and validation according to EN ISO 13849-2, see SAFEMASTER STS application guide.
- Take advantage of the advice of the **E. DOLD & SÖHNE KG** specialists regarding the choice of units and combination of a system.

ATTENTION !

- To avoid wrong usage (e.g. by overload, mounting position or usage in acid, alkaline or other hostile ambient conditions) the limitations of the product have to be observed. Please check in advance if your application requires the usage of the more robust stainless steel model of SAFEMASTER STS. The requirements of the mounting and operating instruction must be fulfilled.

Product Description Switch Modules

Safety switches of the SAFEMASTER STS series (stainless steel) reliably protect accesses and safety doors or flaps and are suitable for safety applications up to Cat. 4 / PL e according to EN ISO 13849-1 without fault exclusion. They are ideal for applications requiring a high level of security. The very narrow design also allows space-saving mounting on movable guards.

Safety Category

Up to

Cat. 4 / PL e
SIL 3

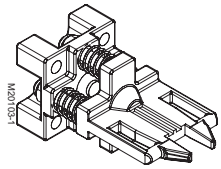
SAFEMASTER STS systems can be used as individual solutions in applications up to category 4, Performance Level e according to EN ISO 13849-1 can be used.

EC Type Tested

TÜVRheinland CERTIFIED
Product Safety
Functional Safety
www.tuv.com
ID 0600000000

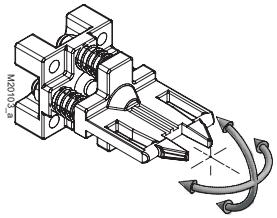
SAFEMASTER STS systems are logic units for safety functions according to Annex IV, S21 and are EC type tested in accordance with legal requirements.

Mechanically Coded Actuators



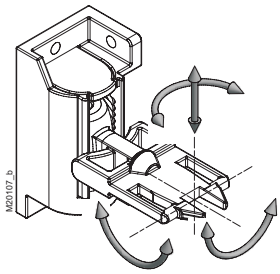
All actuators belonging to the SAFEMASTER STS system are also available in the coding level medium, according to EN ISO 14119:2013.

Actuator C With Angle Compensation



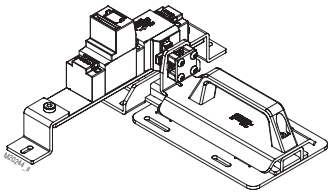
The C actuator with adjustable actuator angle is spring-mounted. It returns to its set state after a load.

Actuator J With Self-Adjustment



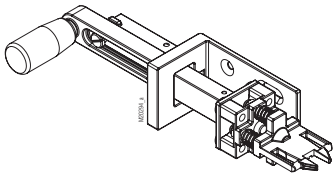
When plugged in, the J actuator is self-adjusting over 4 degrees of freedom and retains its last alignment state.
It can have an offset of up to 20 mm to compensate.

CW Bolt Actuator



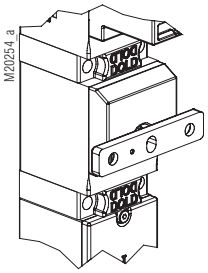
The CW bolt moves under the mounted unit, making the slider suitable for securing hinged doors with both left and right stop.
It is designed in such a way that shear forces cannot act directly on the STS unit. It is particularly suitable for applications, where high forces can act on the STS units, e.g. in double swing doors.

Actuator CS



The CS actuator is particularly suitable for harsh and dirty ambient conditions. In addition, the CS actuator is designed for applications with high shear and tensile forces, so that overload breaks can be largely excluded.

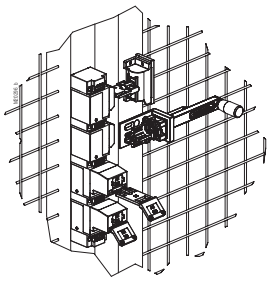
Actuator Locking Force



The holding force F_{zh} according to EN ISO 14119:2013 is 4000 N.

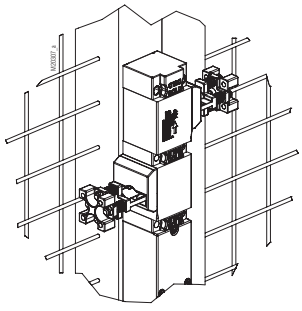
(plastic versions 2000 N)

Double Actuators



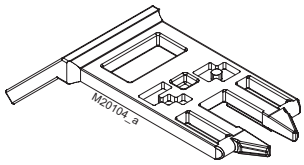
For applications with Category 4, Performance Level e, SAFEMASTER STS units can also be equipped with 2 actuators.

Monitoring Of 2 Doors With One Unit



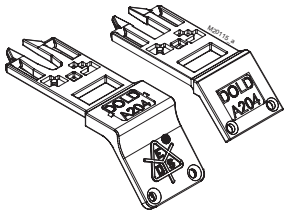
SAFEMASTER STS units with double actuators can be used to monitor 2 adjacent accesses.

Mechanically Coded Key



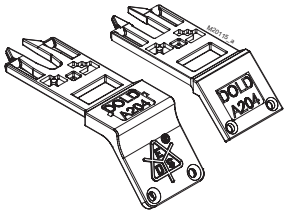
More than 50,000 codes are available for the keys of the SAFEMASTER STS system.

The Right Key To The Field Of Application



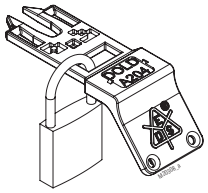
The SAFEMASTER STS system offers 2 different key designs.

Key Labeling



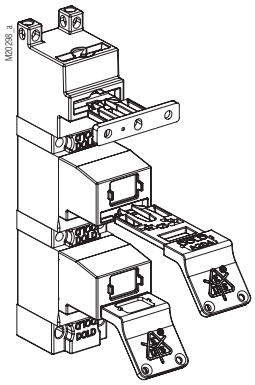
SAFEMASTER STS keys are labeled according to customer requirements.
When plugged in, easily legible on the front side or on the top side when the key is removed.

Lockable Key



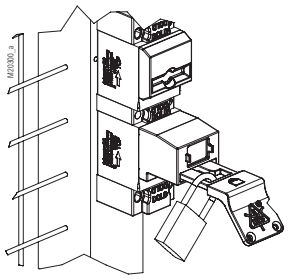
The keys of the SAFEMASTER STS system can be locked with padlocks.

Protection Against Confinement



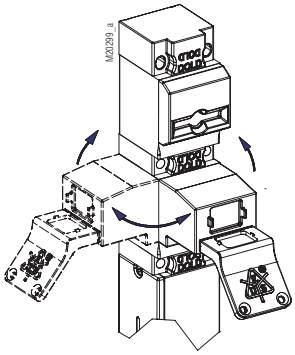
The keys can be removed and carried into the system as protection against lock-in.
They also serve as protection against an unexpected restart of the machine.

Lock Out Tag Out (LOTO)



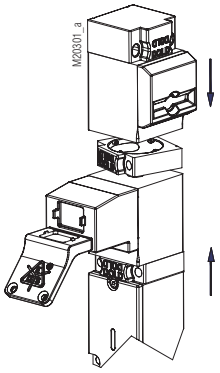
Lock Out Tag Out (LOTO) processes can be very well integrated into SAFEMASTER STS systems

Variable Alignment / Assembly



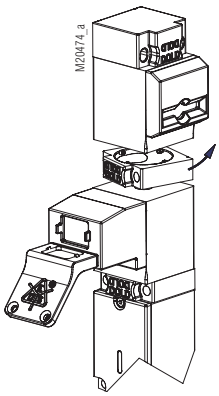
The modular design and the plug-in keys allow a variable alignment of the modules.
Keys and actuators can therefore also be operated from the side.

Modular And Expandable System



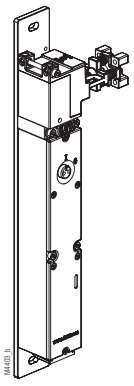
The modular design allows subsequent changes to the units or in the system

Easy To Assemble



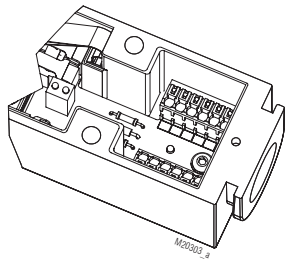
Units can be mounted simple and easily via ring locks (bayonet ring).

Mountable On Mounting Plate



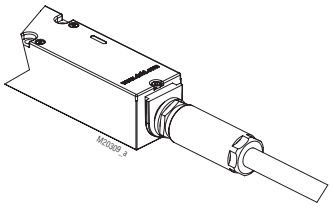
SAFEMASTER STS units can optionally be supplied on mounting plates.
The alignment of the modules can be specified by the customer.

Push-In Connection Technology (Switch)



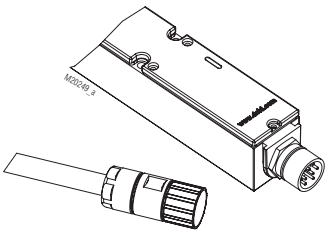
Wiring can be connected quickly and easily.
Up to 1 mm² (with ferrule and without sleeve).

Pre-Assembled Cables



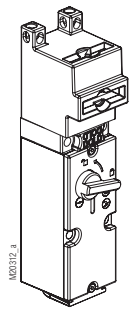
SAFEMASTER STS units are optionally available with pre-assembled and already connected cable in different lengths.

Plug Connectors



The SAFEMASTER STS switch modules can also be equipped with connectors.

Manual Unlocking



The SAFEMASTER STS switch modules can be equipped with a manual release.

SAFEMASTER STS
Safety switch and key transfer system
POWER INTERLOCKING

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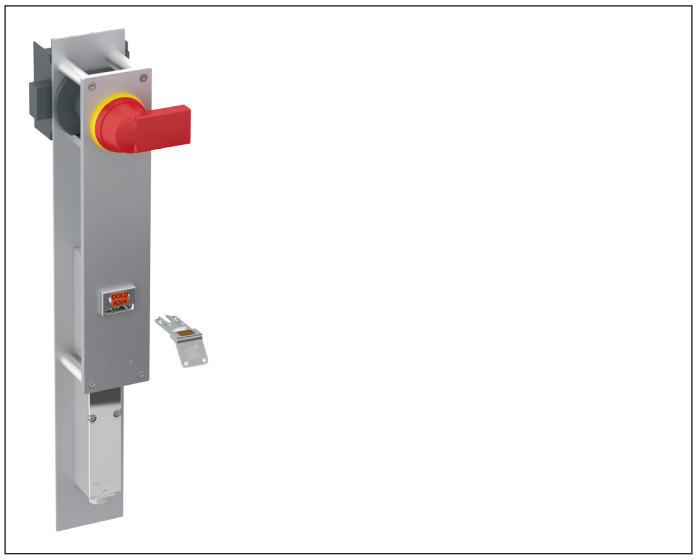


Advantages STS-Power Interlocking
- EC Type test certificate according to the Machinery Directive 2006/42/EC, Annex IX
- For safety applications up to PLe/Cat. 4 according to DIN EN ISO 13849-1
- Coding level low, medium and high according to DIN EN ISO 14119:2014-03
- It is ensured that the main switch is turned off before a machine can be entered.
- Machine is securely disconnected from mains with load isolation and secured against reclosure, e.g. during repair work.
- Secure locking even if auxiliary and control circuits fail
- The load isolator can be operated at all times with all versions to trigger an emergency stop (Stop 0)
- When using frequency converters with STO (Safe Torque Off) contactors are not required

Features
- Up to Performance Level (PL) e and Category 4 according to EN ISO 13849-1
- Emergency-off or zone stop
- High switching capacity, currents from 25 A to 800 A (AC23)

Function

Secure disconnection of machines and systems via a load isolator. Locking of the load isolator in switched-off condition.

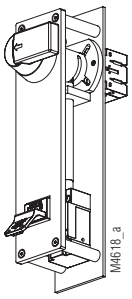
Approvals and Marking

CE · TÜVRheinland CERTIFIED · Functional Safety Type Approved · www.tuv.com ID 0600000000 · TÜVRheinland C US *

*Refers to the components of „Safemaster STS“

Additional Examples

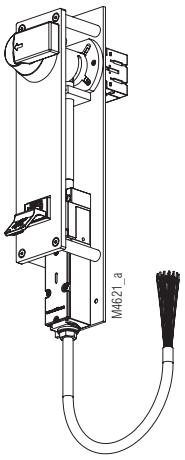
Mechanical



M10SL1PR40

(Load isolator, front mounting)

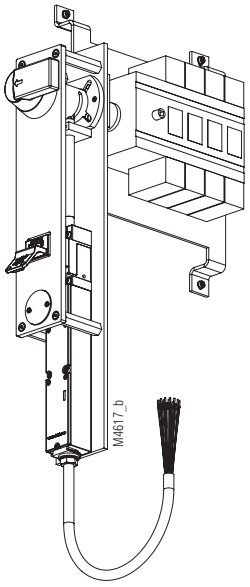
Switch



SX01SLPR40

(Load isolator, front mounting)

Solenoid locking



ZRH01SLPR250

(Load isolator, side mounting)

Application

With key transfer systems there are two different types of disconnection:

Control interlocking
The machine is disconnected via electrical or electronic control for example, the machine is disconnected via contactors.

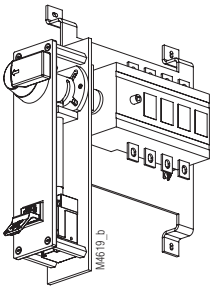
Power interlocking
A load isolator must be positively switched over before releasing a key. This ensures that the machine or system is securely disconnected from power. This type of disconnection does not depend on auxiliary or control circuits.

The electrical circuits built into the SAFEMASTER STS Power Interlocking systems for both tumbler or switch systems, are suitable for diagnostic monitoring by safety relays in Emergency stop circuits. Disconnection errors can then be detected and faulty operation can be prevented. In addition this forms a second channel which ensures reliable operation in the case of a fault.

The purely mechanical designs do not feature any diagnostic functions. They can therefore only be employed up to Performance Level (PL) c max. It is possible by adding additional STS units or Power I=nterlocking units with integrated electric diagnostic function to achieve Performance Level (PL) d or (PL) e.

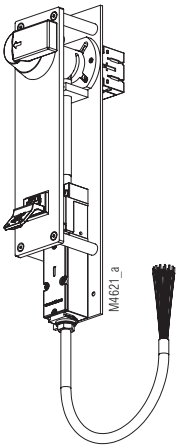
Design and Working Principle

Mechanical
After the operating lever is turned to the off-position, the key can be removed. The locking mechanism prevents further operation of the load isolator while the key is pulled. 1 key can be removed. This design is suitable for applications where a machine can be disconnected directly (Stop 0), see application example 1. Without fault exclusion, Performance Level (PL) c is reached. If an STS delay unit e. g. YRX13M is positioned in the system between the mechanical solenoid locking e.g. M10LPR250 unit a Performance Level (PL) e can be achieved through the corresponding design of the monitoring circuits of this delay unit. With this measure, the application is also suitable for stop categories 1 and 2.



M10SL1PR250

Switch
The function is identical with the mechanical design. In addition, three contacts are positively switched when removing the keys. These contacts may be part of one or several safety-oriented circuits. In connection with the auxiliary contacts of the load isolator they monitor the safe function of the mechanics (see application example 2). Only 1 key can be removed. This design is suitable for applications where machines or systems come to an immediate stop after disconnection. Performance Level (PL) e / Category 3 can be achieved. By adding a logic unit, Performance Level (PL) e / Category 4 can also be achieved. For applications with stop categories 0, 1 or 2. For a solenoid locking unit must be added in the system with an associated monitoring function.



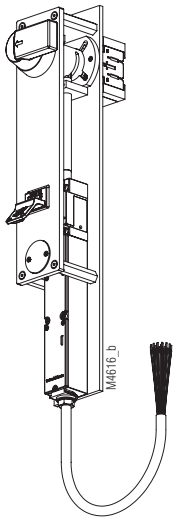
SX01SLPR40
This design features a preassembled cable with stranded wires with a length of 2 m as standard. EMC protection must be provided by the customer.

For further information about connection and technical data of the switch, refer to the SX data sheet.

Solenoid locking

Design and Working Principle

The design with the solenoid system is similar in function to the switch system. However in addition the key must be released by the tumbler magnet. Only then can the key be removed. The solenoid locking magnet is monitored via 3 contacts which switch positively when the electromagnet picks up. These contacts may be part of one or several safety-oriented circuits (see application example 3 or 4). In connection with the auxiliary contacts of the load isolator they monitor the safe function of the mechanics. Only 1 key can be removed. This design is suitable for applications for the stop categories 0, 1 and 2 when connected with corresponding monitoring units. Up to Performance Level (PL) e / Category 4 can be achieved.



ZRH01SLPR40
This design features a preassembled cable with stranded wires with a length of 2 m as standard. EMC protection must be provided by the customer.

For further information about connection and technical data of the solenoid locking, refer to the ZRH data sheet.

Normative Consideration of the Components

Mechanical
The mechanical design features a 1-channel structure. Individual faults cannot be detected. Without fault exclusion, Performance Level (PL) c according to EN ISO13849-1 (see application example 1) can be reached as maximum.

Switch and solenoid locking
The designs with switch and solenoid locking can reach up to Performance Level (PL) e and Category 4, as additional circuits according to EN ISO 13849-1 are used.
Designs with solenoid locking function feature auxiliary release. This ensures that the key can be removed in the event of a power failure.

Operating lever
The operating lever is available in the two designs black/grey or red/yellow. The colour combination depends on the application. Red/yellow is used if the switch is also used as emergency-stop switch disconnecting a complete machine or system. The red/yellow version must always be freely accessible and operable. The black/grey design is used if only part of a machine or a partial section of a system is disconnected (zone stop).

Design of the load isolators
The load isolator are suitable for currents from 25 A to 800 A. They are always equipped with 4 NC with 2 additional auxiliary contacts (1NO, 1NC).

Versions and Combination Options

Different SAFEMASTER STS modules can be combined with different load isolators.
This provides a variety of possible units and functions.
The designation of the Power Interlocking units follows the scheme of the following table.

Type	Power Inter-locking	Operating lever		Load isolator ABB OT Series									
		Red/ Yellow	Black/ Grey	Load current [A]									
Mechanical													
M10SL1	P	R	B	25	40	80	125	160	250	315	400	630	800
M20SL1*)	P	R	B	25	40	80	125	160	250	315	400	630	800
M30SL1*)	P	R	B	25	40	80	125	160	250	315	400	630	800
M40SL1*)	P	R	B	25	40	80	125	160	250	315	400	630	800
M50SL1*)	P	R	B	25	40	80	125	160	250	315	400	630	800
Switch													
SX01SL	P	R	B	25	40	80	125	160	250	315	400	630	800
Solenoid locking													
ZRH01SL	P	R	B	25	40	80	125	160	250	315	400	630	800
				front-mounting				side-mounting					

*) on request

Data sheets

STS switch module SX/SV
STS solenoid locking modules ZRH
STS key module 01/10
Refer to the ABB data sheet for the data on the load isolator chosen

Info Let the specialists of **E. DOLD & SÖHNE KG** assist you with their advice regarding the selection of the units and combination of a system.

Ordering Example

STS- ZRH 01S L P R 630

- 630 — Load current
  25, 40, 80, 125, 160
  250, 315, 400, 630, 800 A
- R — Operating Lever
  R = Red/Yellow
  B = Black/Grey
- P — Power Interlocking
- L — Upper module
  - L-Module
  - L1-Module (only for mechanical design)
- 01S — Key module
  - 01S
  - 10S (only for mechanical design)
- ZRH — Lower module
  - ZRH
  - SX
  - M

Technical Data

Load isolator
Number of contacts: 4 NC

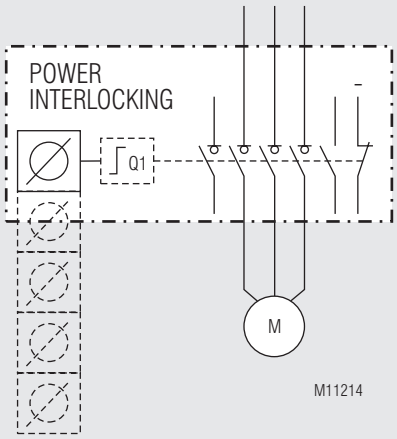
Auxiliary contacts: 1 NO contact, 1 NC contact

Test intervals:
for PL a to d: min. once a year
for PL e: min. once a month

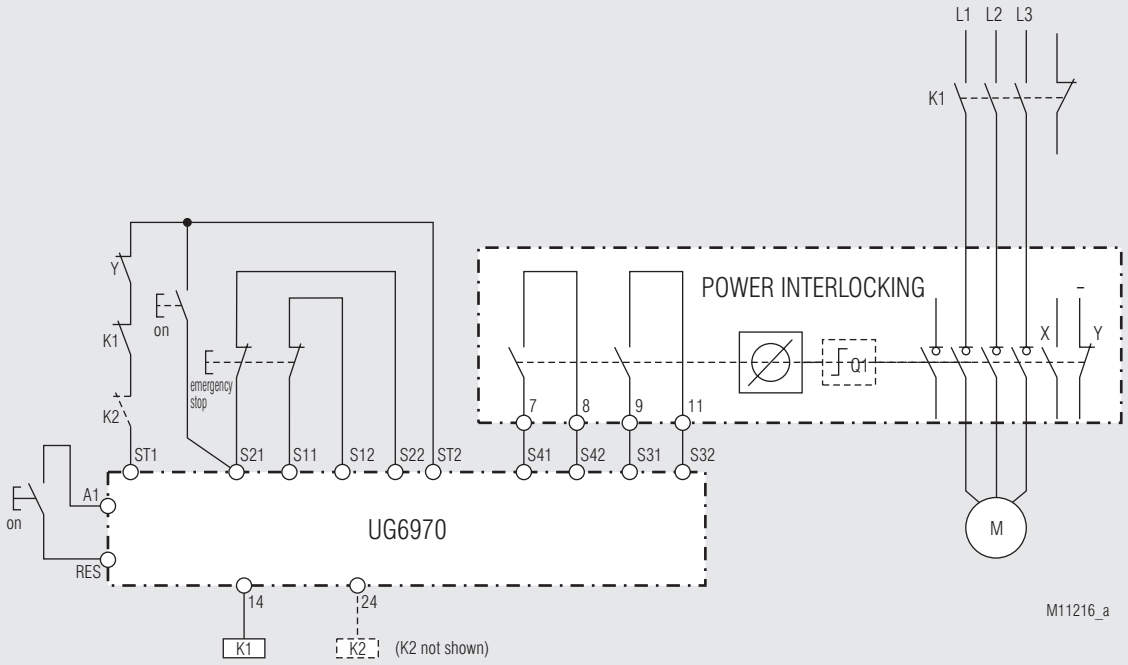
ATTENTION!

! Power Interlocking units are part of a SAFEMASTER STS System.
The final safety-related characteristic values must be evaluated as system according to the requirements of EN ISO 13849-1 an validated according to 13849-2.

Application examples (in zero voltage state)

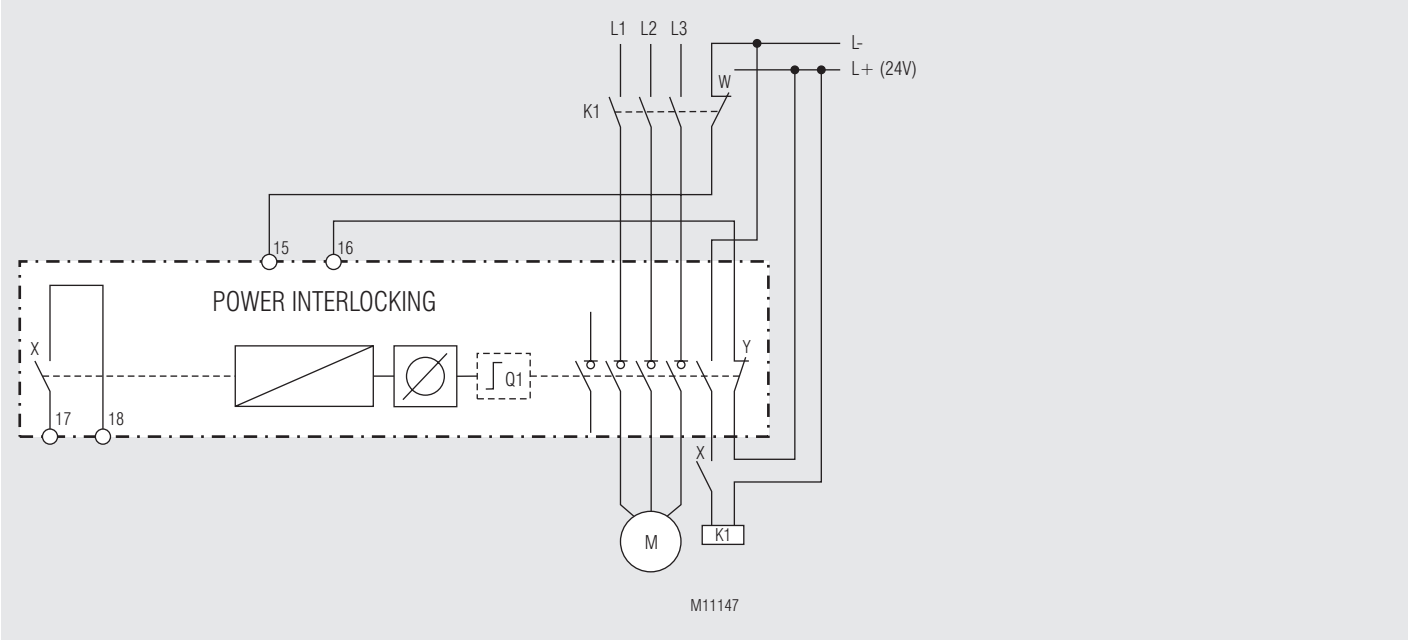


Application example 1: Mechanical design
Power Interlocking without monitoring function and without redundancy (Stop 0).
After disconnecting the load isolator 1 to 5 keys can be removed.

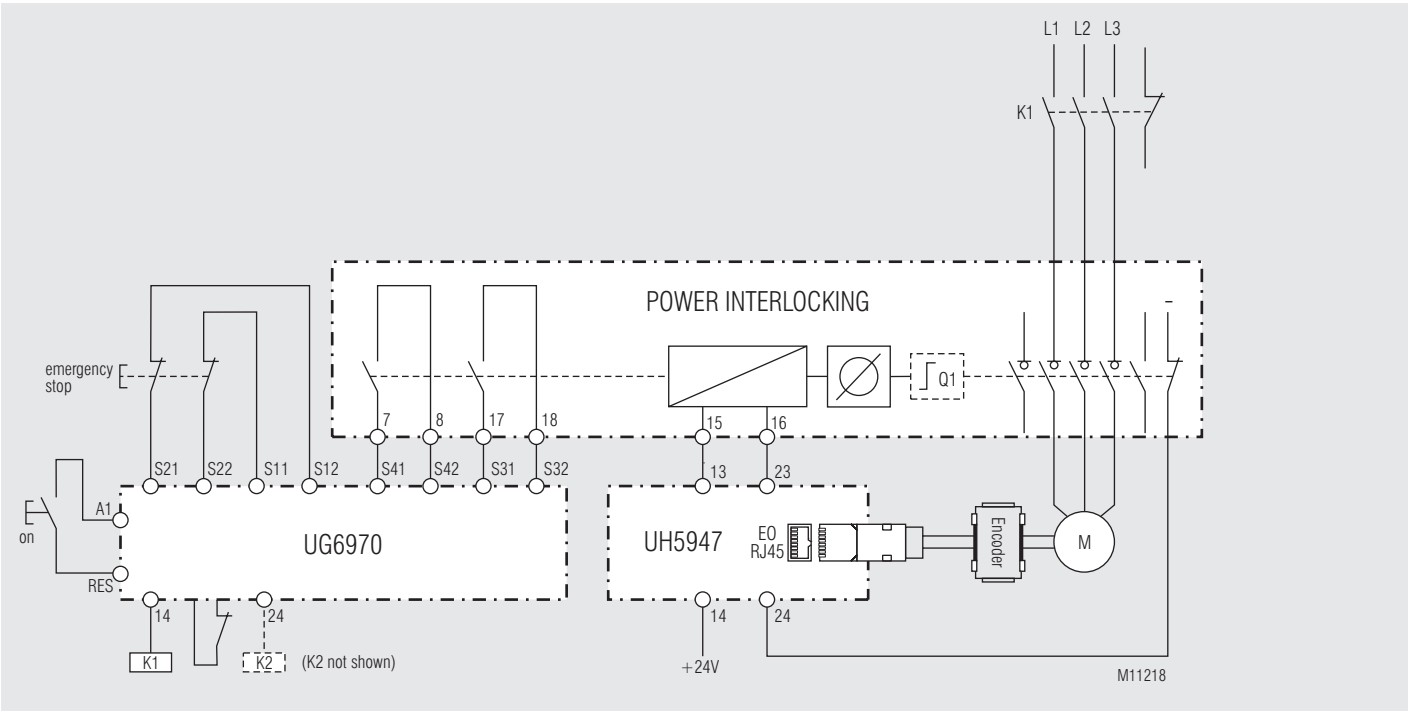


Application example 2: Version with switch
Power Interlocking with monitoring function.
After disconnecting the load isolator 1 key can be removed immediately. This key is equipped, in addition, with monitoring contacts. If necessary, they can be included in a safety circuit together with an auxiliary contact of the load isolator.

Application examples (in zero voltage state)



Application example 3: Version with solenoid locking
Disconnected state, magnet energized (24 V), key inserted and removable.
Power Interlocking where standstill monitoring, time delay or other monitoring functions can be added.
The key can be removed only after disconnecting the load isolator and release by the magnet.

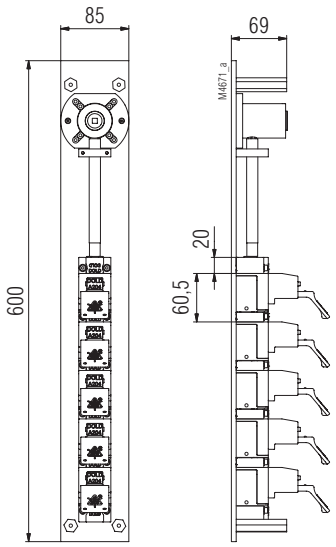


Application example 4: Version with solenoid locking
Disconnected state, magnet energized (24 V), key inserted and removable.
Power Interlocking with monitoring function and mechanical redundancy;
- Stop 0 over Q1;
- Stop 1 over circuit logic and additional alarm function

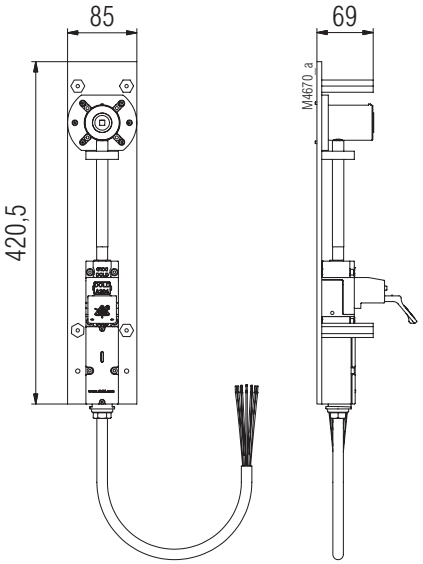
Dimensional Drawings [mm]

SAFEMASTER STS units
The drawings presented specify the maximum space required for the STS unit and base plate within the switching cabinet.

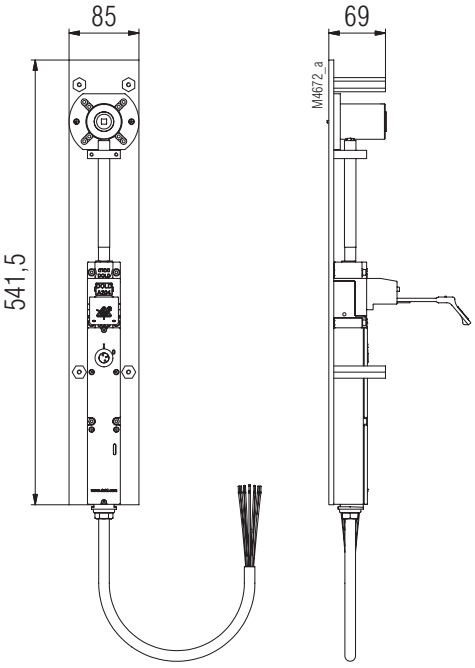
Mechanical
M50SL1



Switch
SX01SL



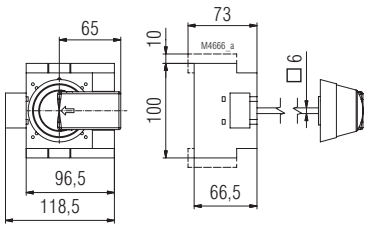
Solenoid locking
ZRH01SL



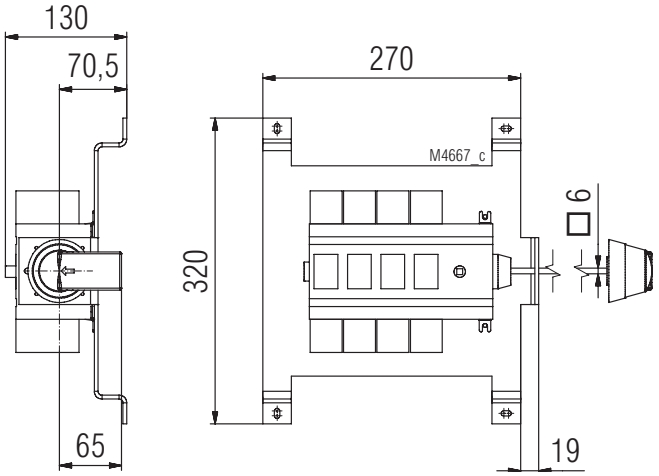
Dimensional Drawings [mm]

Load isolator
The drawings of the load isolator and, if applicable, mounting brackets, specify the maximum space required for the specified amperage range of the load isolators.

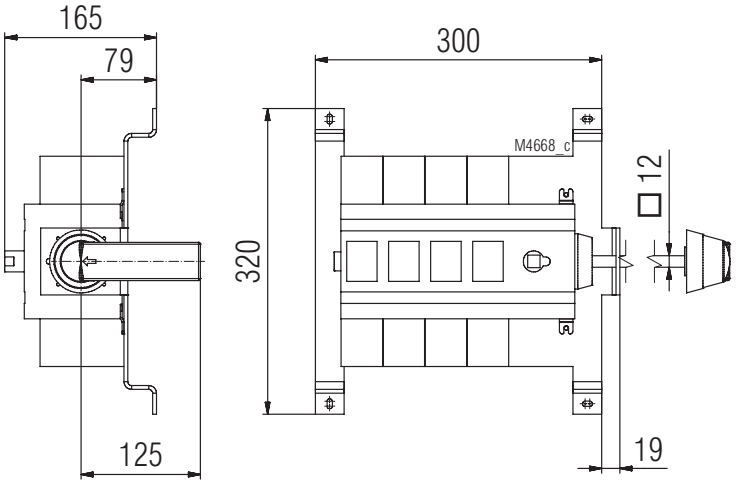
OT 25 - 125 A



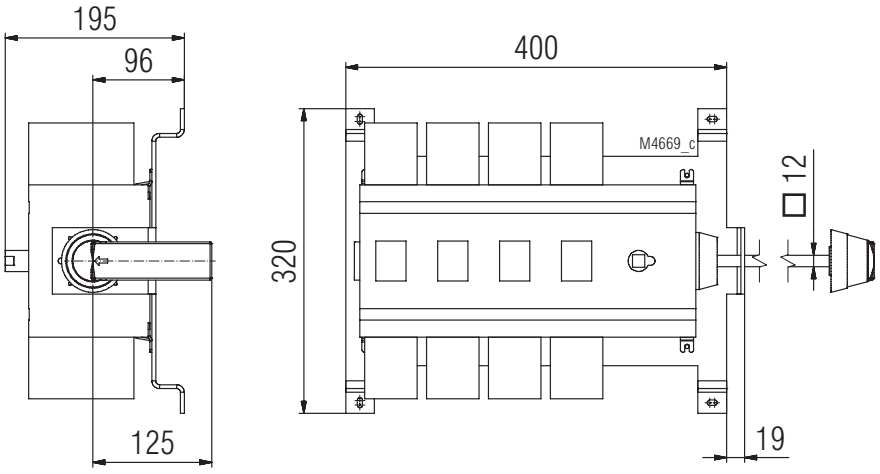
OT 160 - 250 A with mounting bracket



OT 315 - 400 A with mounting bracket



OT 630 - 800 A with mounting bracket



Note:
For dimensions for drill holes and cut-outs in the switching cabinet wall for mounting the STS Power Interlocking, refer to the SAFEMASTER STS mounting and operating instructions.

Dimensional Drawings [mm]

Assembly and installation example

Power Interlocking
M50SL1PR630