SAFEMASTER STS
Safety Switch- and Key Interlock System
Basic Unit
ZRHA and ZRHBM

Translation of the original instructions

DOLD

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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!

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 locking modules

Guard locking devices of the SAFEMASTER STS (plastic) family combine the proven operating principle and the advantages of electromechanical safety switches with 2-channel guard locking function. Thanks to guard lock monitoring, they can be used for both process and reliable personal protection. Different coding levels, very high locking forces and extensive diagnostic options enable use in almost any safety-relevant application.

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

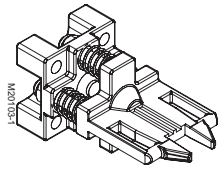
Product Safety
Functional
Safety

TÜVRheinland®
CERTIFIED

www.tuv.com
ID 0600000000

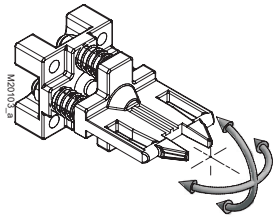
SAFEMASTER STS systems are logic units for safety functions according to Annex IV, S21 and are EC type tested in accordance with legal requirements.

Mechanically coded actuators



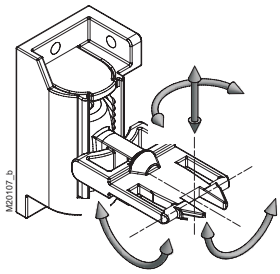
All actuators belonging to the SAFEMASTER STS system are also available in the coding level medium, according to EN ISO 14119:2013.

Actuator C with angle compensation



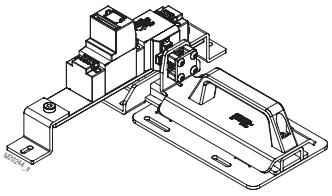
The C actuator with adjustable actuator angle is spring-mounted. It returns to its set state after a load.

Actuator J with self-adjustment



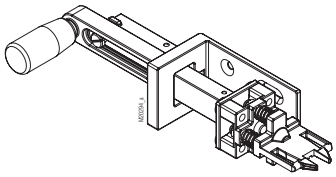
When plugged in, the J actuator is self-adjusting over 4 degrees of freedom and retains its last alignment state.
It can have an offset of up to 20 mm to compensate.

CW bolt actuator



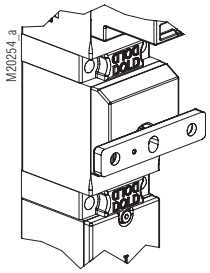
The CW bolt moves under the mounted unit, making the slider suitable for securing hinged doors with both left and right stop.
It is designed in such a way that shear forces cannot act directly on the STS unit. It is particularly suitable for applications, where high forces can act on the STS units, e.g.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

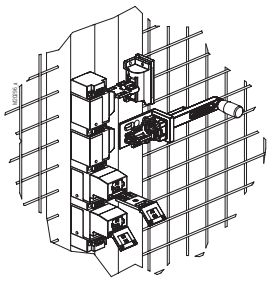
Actuator locking force



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

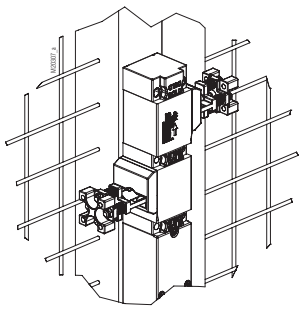
(plastic versions 2000 N)

Double actuators



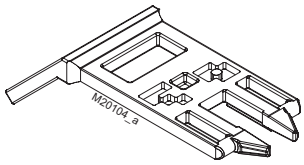
For applications with Category 4, Performance Level e, SAFEMASTER STS units can also be equipped with 2 actuators.

Monitoring of 2 doors with one unit (electrical)



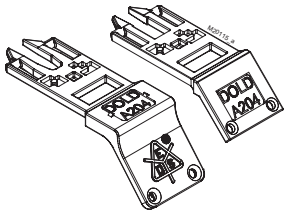
SAFEMASTER STS units with double actuators can be used to monitor 2 adjacent accesses.

Mechanically coded key



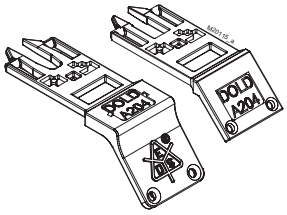
More than 50,000 codes are available for the keys of the SAFEMASTER STS system.

The right key to the field of application



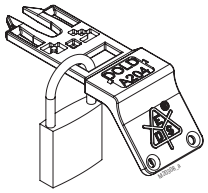
The SAFEMASTER STS system offers 2 different key designs.

Key labeling



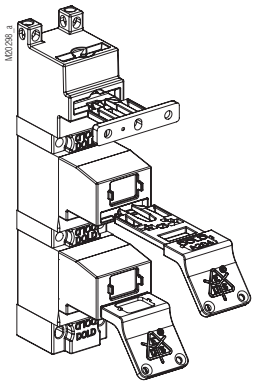
SAFEMASTER STS keys are labeled according to customer requirements.
When plugged in, easily legible on the front side or on the top side when the key is removed.

Lockable key



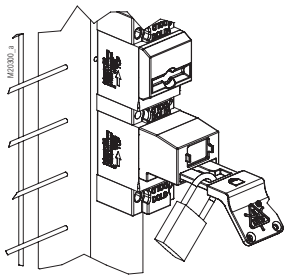
The keys of the SAFEMASTER STS system can be locked with padlocks.

Protection against confinement



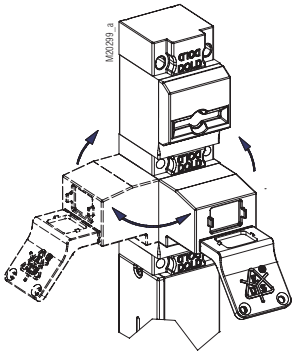
The keys can be removed and carried into the system as protection against lock-in.
They also serve as protection against an unexpected restart of the machine.

Lock Out Tag Out (LOTO)



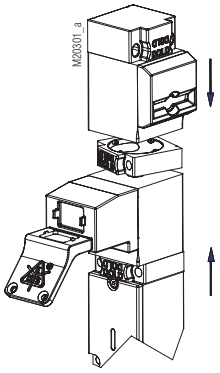
Lock Out Tag Out (LOTO) processes can be very well integrated into SAFEMASTER STS systems.

Variable alignment / assembly



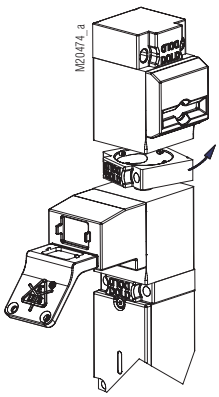
The modular design and the plug-in keys allow a variable alignment of the modules.
Keys and actuators can therefore also be operated from the side.

Modular and expandable system



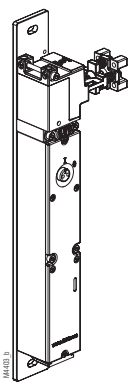
The modular design allows subsequent changes to the units or in the system.

Easy to assemble



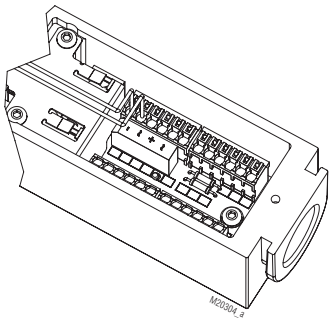
Units can be mounted simple and easily via ring locks (bayonet ring).

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.

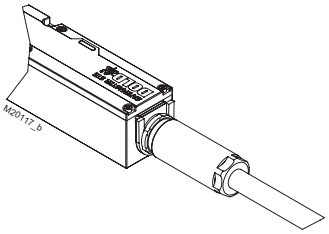
Push-in connection technology (guard locking)



The screwless connection technology enables fast wiring.

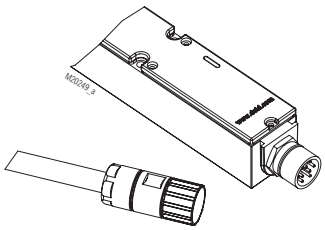
Up to 1 mm² (without ferrule).

Pre-assembled cables



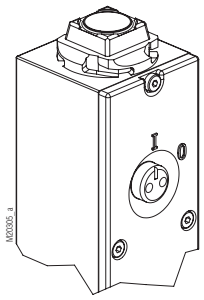
SAFEMASTER STS units are optionally available with pre-assembled and already connected cable in different lengths.

Plug connectors



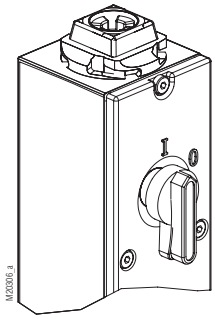
The SAFEMASTER STS locking modules can also be equipped with connectors.

Mechanical release



The SAFEMASTER STS locking modules with mechanical release permit release even in the event of a power failure.

Emergency unlocking



The SAFEMASTER STS locking modules with emergency unlocking can be used there, where people locked up must be rescued.
If the release can be reached within the danger zone, it can also be used as an emergency release.

SAFEMASTER STS
Safety Switch- and Key Interlock System
Basic Unit ZRHA and ZRHBM

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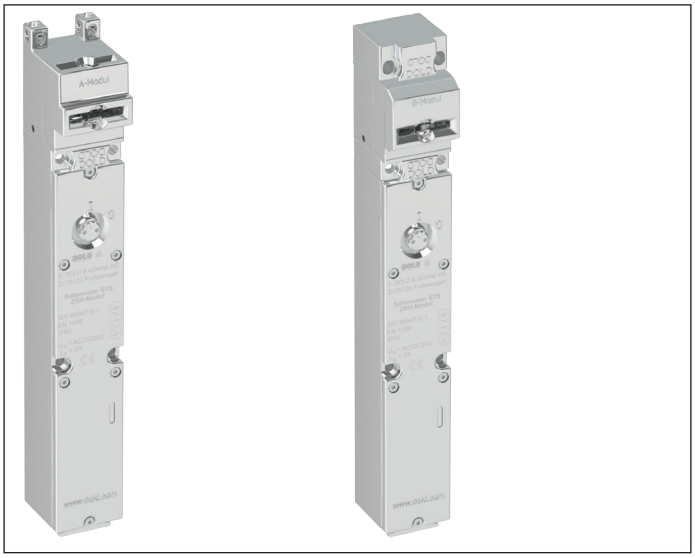


Presentation in the deactivated condition:
Actuator removed

STS-System Benefits
- EU-Test certificate according to the directive 2006/42/EG, annex IX
- For safety applications up to PLe/Category 4 according to EN ISO 13849-1
- Modular and expandable system
- Rugged stainless steel design
- Wireless mechanical safeguarding
- Combines the benefits of safety switch, solenoid locking and key transfer in a single system
- Easy installation through comprehensive accessories
- Protection against lock-in
- Coding level low, medium, high according to DIN EN ISO 14119:2014-03

Features
The units are particularly suitable for applications with:
- Full body access (lock-in danger)
- Several secured entries
- Single-channel/ redundant/ diverse safety circuits
- Rugged ambient conditions
- Required access rights

Approvals and Markings

Product description

Switch with separate actuator and guard locking function.
When actuated, the contacts which monitor the blocking position are locked. When the actuator is removed, the contacts for actuator monitoring switch.

To secure separating guards such as safety gates and hoods in machine and plant engineering.

Function

Safety switch (type 2) for separating guards with electromagnetic solenoid locking.

When te magnet is actuated, the magnetic contacts switch. The actuator contacts switch when the actuator is removed.

With the ZRHA version, actuators can be inserted into the actuator module from the side or from above. The coding level of the associated actuator according to EN ISO 14119:2013 is low.

The ZRHBM version offers increased stability of the actuator module. It is also available in accordance with EN ISO 14119:2013 with actuators for low and medium coding levels.

Optionally, both versions can be equipped without an auxiliary release, with emergency release or with escape release. Padlock modules and key modules can also be added. Locking modules with emergency release have the designation ZRN module, with escape release ZRF module and without auxiliary, emergency or escape release ZRX module.

These units can be connected to the Safemaster STS option module, which includes command functions and is designed for wiring cross-sections up to 1,5 mm^2.

Design and Function

Solenoid locking units prevent opening of separating guards and keep them closed as long as their is a risk of injury in the secured plant.

Attention!

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

The solenoid locking unit is to be integrated into a system and connected with a control unit so that the hazardous machine can run only when the guard is locked and closed.

An access can only be opened and the actuator removed from actuator module A after a release signal was sent by the machine control to the ZRHA solenoid locking unit. The movable part of the guard can be opened and closed as long as the release signal is still applied; the solenoid locking is not activated. The solenoid locking is activated again once no more release signal is applied and the guard is closed. The machine can now be restarted.
Actuator and magnet position are monitored by separate contacts. This makes this solenoid locking unit especially suitable for the setup mode of a machine.

ZRHA is usually used in the system in connection with additional STS units and SAFEMASTER products (e.g. release by speed monitor UH 5947, standstill monitor LH 5946 or speed/standstill monitor BH 5932).

Indication

LED red:	Magnet energized
LED yellow/green:	Separately controllable

Circuit Diagrams

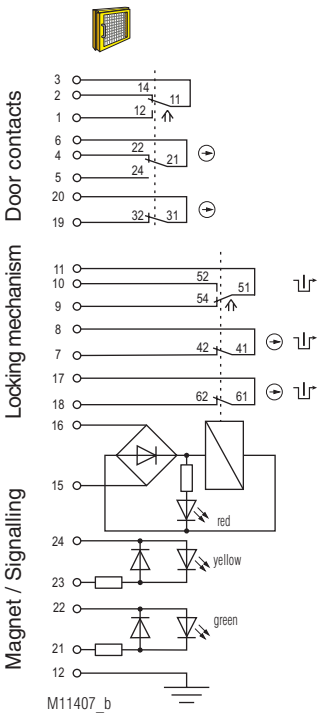


Fig. 1:
Solenoid locking activated:
Magnet locked,
Actuator inserted

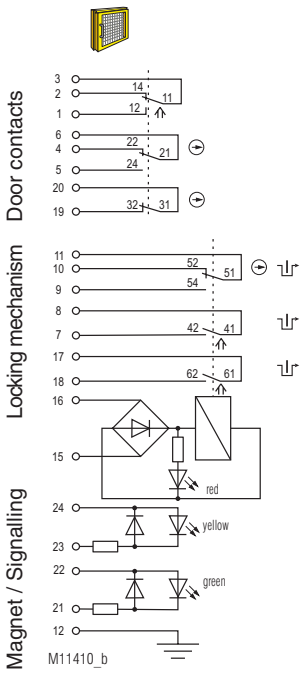


Fig. 2:
Solenoid locking deactivated:
Magnet released,
Actuator inserted

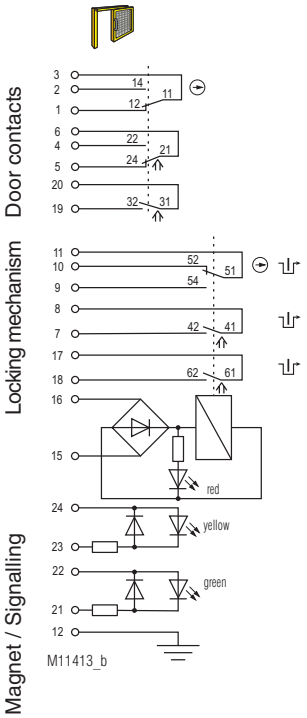


Fig. 3:
Solenoid locking deactivated:
Magnet released,
Actuator removed

ZRHA, ZRHBM

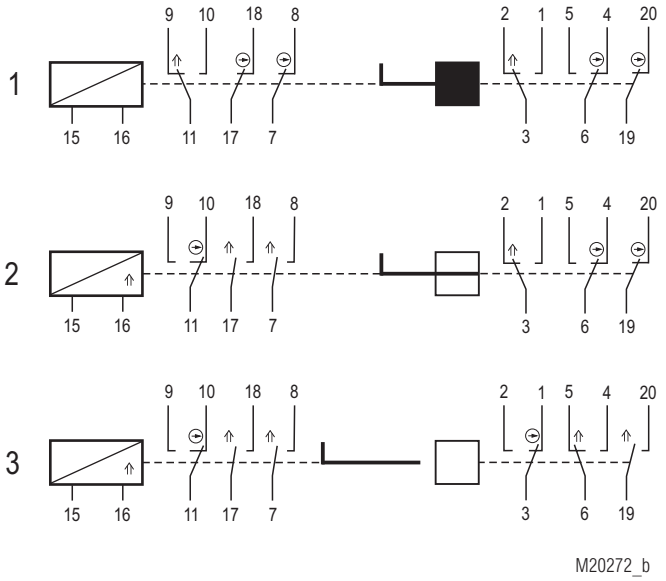
Mechanical switch positions					
Circuit diagram			Fig. 1	Fig. 2	Fig. 3
Door contacts	3	2	■	■	
	3	1			■
	6	4	■	■	
	6	5			■
	19	20	■	■	
Locking mechanism	11	9	■		
	11	10		■	■
	7	8	■		
	17	18	■		
Magnet / Signalling	De-energized on trip				
	15	16			
	Open circuit operation				
	15	16			

■ closed

□ open

The state shown in **Figure 3** does not depend on the control signal of the magnet.
If the control signal is applied and the actuator inserted the solenoid locking changes to the state of **Figure 2**.
If no signal is applied and the actuator inserted the solenoid locking changes to the state of **Figure 1**

Mechanical switch positions ZRHA ZHRBM



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	Coded key captive	Removal not possible
	Coded key plugged	Removal possible
	Coded key extracted	Plugging possible
	Coded key extracted and blocked	Plugging in not possible
	Actuator captive	Removal not possible
	Actuator plugged	Removal possible
	Actuator extracted	Plugging in possible
	Actuator extracted and blocked	Plugging in not possible

Technical Data

Mechanical Data

Mechanical principle: Rotating axis with redundant actuation and mechanical interlock
Enclosure: Stainless steel V4A / AISI 316L
Internal parts: Stainless steel V4A / AISI 316 / AISI 630 (acc. to EN 10027-2; 1.4401; 1.4404; 1.4542; 1.4301; 1.4310)
Degree of protection: IP 65
Locking force: F_{zh} 4000 N
Locking module principle: Failure locking-proof
Magnetic principle: Standby current or load current
Operating speed
min. / max.: 100 / 500 mm/s

Input

Nominal voltage U_N
(Measured nominal voltage): AC/DC 24 V
Nominal voltage range: 0,85 ... 1,1 U_N
(see solenoid derating graph)
Power consumption: 5,5 W

Output

Contacts
Door position: 1 NC contact, 2 antivalent changeover contacts
Sperrmechanismus: 2 NC contacts + 1 C/O contact
Switching element: IEC EN 60947-5-1 Appendix K
Switching principle: Change-over contact with forced opening spring contact
Contact material: Ag / $AgSnO_2$
Max. switching frequency: 360/h
max. Betriebsstrom
Ruhestromprinzip: 2 A
Arbeitsstromprinzip: 1 A
Utilization category of switching elements to AC 15:
1 A
to DC 13: 0,5 A
Electrical service life: 5 x 10^6 switching cycles
Short circuit strength, max. fusing: 2 A gG
Conditional rated short-circuit current:
(rated conditional short circuit current): 1000 A
Mechanical life: 1 x 10^6 switching cycles

General Data

Operating mode
Mechanical life: 100% ED
Temperature range
Standby current principle: - 25°C to + 60°C
Load current principle: - 25°C to + 60°C
Storage**:** - 40°C to + 80°C
Rated impulse voltage: 0,8 kV
Rated insulation voltage: ≤ 50 V
Overvoltage category: III
Pollution degree: 2
Connection method: Cage tension spring clamping
Cross-section
min. / max.: 0,25 / 0,75 mm²
(with ferrules and sleeve according to DIN 46228-4)
Cable entry with thread: 1 x M20x1,5
Intended use: Up to max. cat. 4, PL e according to DIN EN ISO 13849-1
Mounting: To DIN EN 50041
Test principles: DIN EN ISO 13849-1:2008
DIN EN ISO 14119:2014-03
DIN EN 60947-5-1:2005
GS-ET-15:2011-02
GS-ET-19:2011-02
GS-ET-31:2010-02

Safety Related Data

Data suitable for the PFHd summation method according to EN ISO13849-1: 2016				
Data according to EN ISO13849-1: 2016	ZRHA, ZRHBM			ZRHBA, ZRHBBM
Category	2	3	3	4
PL	d	d	e	e
PFH_D	2.12199E-09	1.36918E-09	1.08914E-09	1.50183E-10
T_{10D}	20	20	20	20
CCF required	65 ...100	85 ...100	85 ...100	85 ...100
B_{10d}	2 x 10^6	2 x 10^6	2 x 10^6	2 x 10^6
d_{op} (d/a)	365	365	365	365
h_{op} (h/d)	24	24	24	24
t_{cycle} (h)	1	1	1	1
n_{op}	8760	8760	8760	8760
Diagnostics Coverage ratio DC	60 %	60 %	90 %	99 %
Test interval	1 / year	1 / year	1 / month	1 / month

Category 2: The prerequisites for installation and integration into a category 2 architecture must be met

Category 3: The prerequisites for installation and integration into a category 3 architecture must be met

Category 4: The prerequisites for installation and integration into a category 4 architecture must be met, in particular 2 actuators must be used

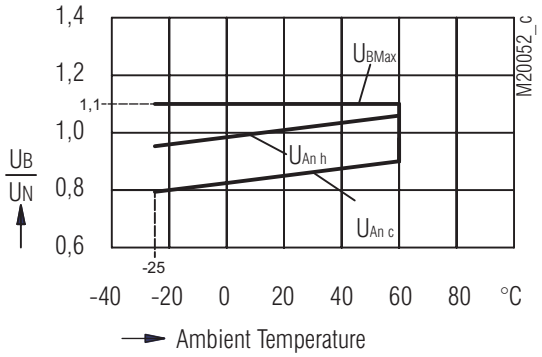
PFH_D: When used as a **„stand-alone unit"** (not as part of a key transfer system), the safety parameters in the table above apply

When used as part of a **key transfer system**:

- PFH_D total STS system = SUM PFH_{D1} + … PFH_{Dn}
- Lowest category of a module = category of whole STS system
- Lowest DC of a module = DC entire STS unit

! If the design of a unit is changed, the safety-related data may also change.

Solenoid derating graph



U_{BMax} maximum power supply dependent upon temperature
$U_{An\,c}$ response voltage at coil temperature = ambient temperature
$U_{An\,h}$ response voltage at preceding agitation at 1.1 x Un

Ordering Example

STS- Z R H A

- A — Actuator module A
- H = Manual unlocking
  X = Without manual unlocking
  N = Emergency unlocking
  F = Escape release
- R = Closed circuit operation
  A = Open circuit operation
- Z — Solenoid locking

Versions of the solenoid locking module

ZRX Solenoid locking standby current principle
ZRH Solenoid locking standby principle with manual unlocking
ZRN Solenoid locking standby principle with emergency unlocking

Variants and Combination Options

Because of their modular design the basic units of the SAFEMASTER STS System can be combined and expanded according to customer requests. This allows for a variety of possible units and functions.

Overview of the basic units

Functions	Safety switches design type 2	Safety switches design type 2 with solenoid lock	Mechanical units design type 2	Mechanical units with electrical monitoring	Mechanical units with electrical release
Units with standard function	SXA SXBM	ZRHA ZRHBM	M10A M10BM MK01M	RX10A RX01BM RXK01M	YRXKM YRXK01M
Units with mechanical lock and forced key extraction	SX01A SX01BM	ZRH01A ZRH01BM	M11A M11BM MK11M	RX11A RX11BM RXK11M	YRX10A YRX10BM YRX11A YRX11BM
Units with optional key extraction	SXB01M	ZRHB01M	M10B01M	RX10B01M RX10K01M	YRX10B01M
Units without actuator	SX01M	ZRH01M	M12M	RX11M	YRX11M
For additional information refer to the data sheets of the individual modules and other basic units.					

Data sheets

Solenoid locking modules ZRX/ZRH/ZAX
Actuator module A
Actuator module B
End module M

Info Take advantage of the advice of the **E. DOLD & SÖHNE KG** specialists regarding the choice of units and combination of a system.

Dimensional Drawings [mm]

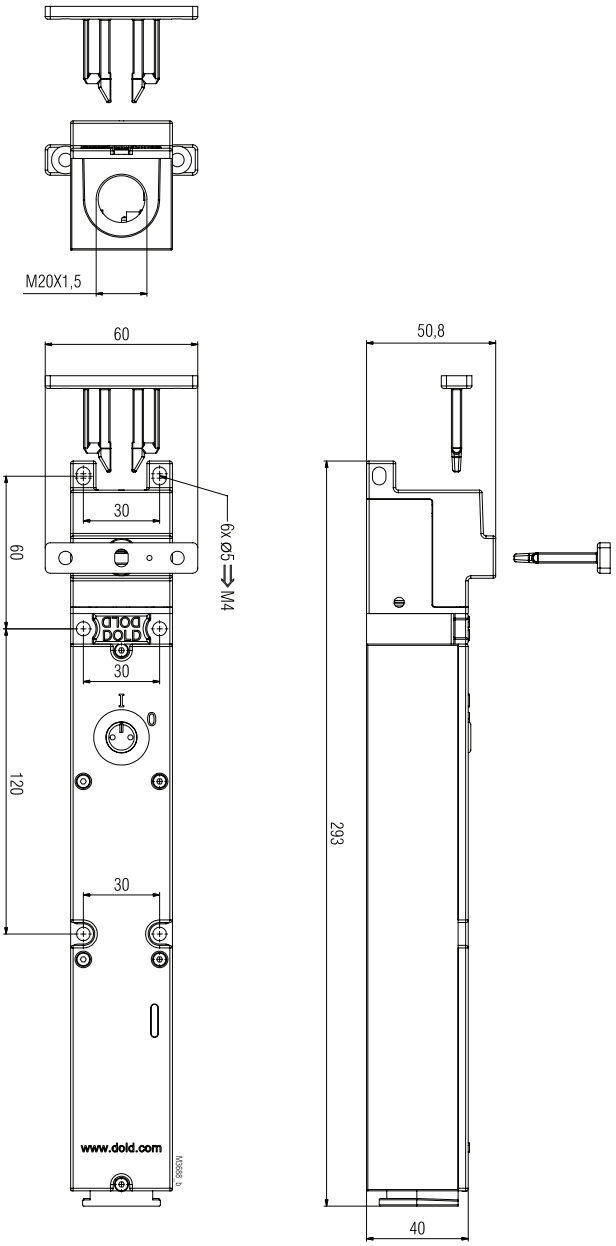


Illustration: ZRHA
Clearance tolerances ± 2%

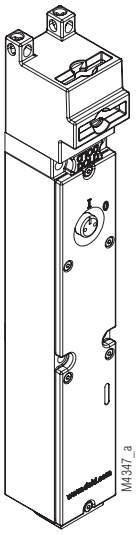


Illustration: ZRHA