



SAFEMASTER STS/K
Safety switch-
and key interlock system
locking module
ZRX/K, ZAX/K, ZRH/K, ZRHC/K

Translation
of the original instructions



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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/K 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/K 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/K. The requirements of the mounting and operating instruction must be fulfilled.



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



The installation must only be done by a qualified electrician!



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.

SAFEMASTER STS/K Safety Switch- And Key Interlock System Locking Module ZRX/K, ZAX/K, ZRH/K, ZRHC/K



STS/K-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 composite version of stainless steel and plastic 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
- Locking module to monitor
- Actuator and key position
- Doors and entries
- Locking module position
- Module expansions possible only above the module
- Standby current or load current principle
- Optionally with manual unlocking
- With integrated LEDs for status indication
- This modules are also available in stainless steel

Product Description

Safety switch for mounting an interlocking unit for targeted enabling or blocking of keys and / or actuators.
For safeguarding separating protective devices such as safety doors and hoods in mechanical and plant engineering.

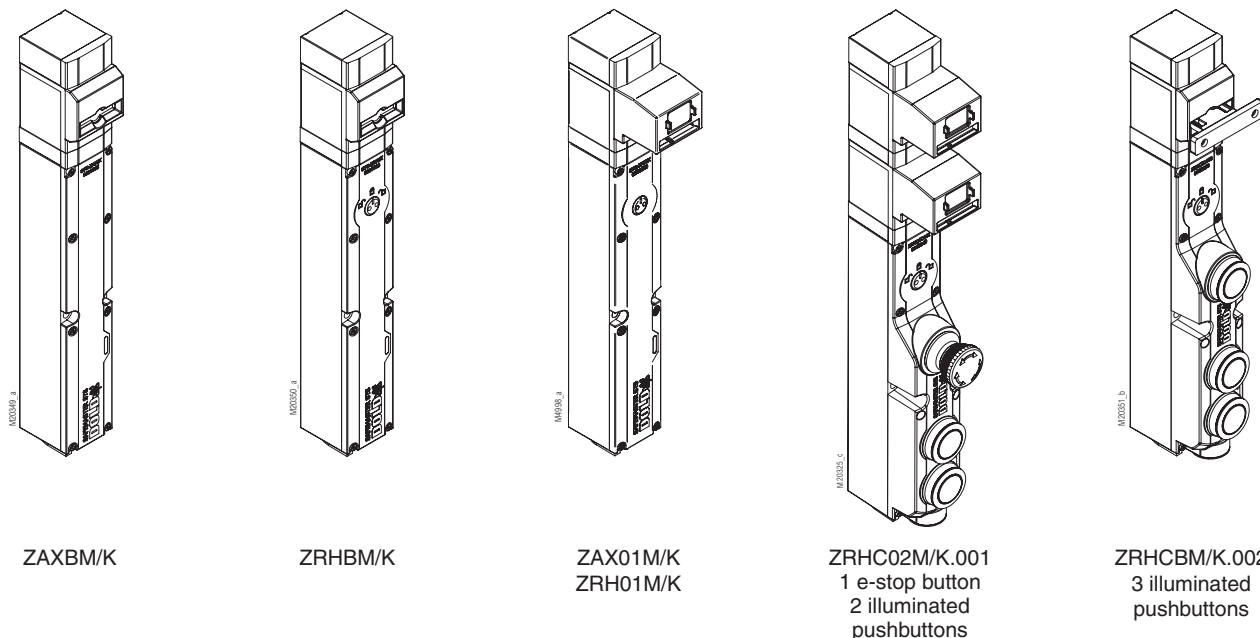
Approvals and Markings



Application

Locking modules ZRX/K, ZAX/K, ZRH/K and ZRHC/K are assembled with other modules to an STS/K unit. They serve as a solenoid lock of separating guards on machines, e.g. with cycle and overrun times or other hazards which may still be present even following access queries. It must therefore be ensured that there is no hazard remaining when removing the actuator or key and access can be unlocked.

Installation Examples



Function

An extremely robust and flexible solenoid lock, which monitors the safe position of one or more entries in a system, for instance, of a guard or protective door. For this purpose the module is used in combination with other mechanical modules, for instance, actuator, key and/or padlock module. The key and padlock modules can only be installed above the locking module.

The entries can only be released after the safety of the plant for the operating personnel has been ensured. The locking modules ZRX/K, ZAX/K and ZRH/K with manual unlocking can also be used without actuator module only for releasing keys in a key interlock system. This function is used in key interlock systems with central shut-off or shut-off outside the system, for instance in Ex zones, with strong vibration or dirt build-up, etc.

The ZRHC modules contain command and signalling functions which enable operation directly at the door.

When installing one of the modules e.g. key module 01/K, 01S/K, padlock module V/K or actuator module B/K above a locking module ZRX/K and/or ZRH/K, their release only takes place after applying a control signal to the magnet of the locking module. If emergency or escape unlocking is required, please refer to data sheet locking module ZRN/K and ZAN/K.

The ZRHC module combines the functions of a guard locking module with command and signalling functions. Several configurations are available for integrating command functions into the SAFEMASTER STS/K safety switch and key transfer system.

Up to 3 control units can be integrated per module. These can consist of illuminated pushbuttons and emergency stop pushbuttons. The illuminated pushbuttons can be provided with different symbols and colours by the customer. A transparent colour screen and an unlabelled symbol label are included in the scope of delivery of the illuminated pushbuttons. Further colour trims and symbol plates for the illuminated pushbuttons are available as accessories.

The command and display functions are integrated in the cover and allow easy connection using flat receptacles or an optional 12-pin M20 circular connector.

The functions of the interlocking module can be connected via a separate cable or optionally a separate 19-pin M23 circular connector.

The compression of the guard locking, command and display functions in one device allows an extremely space-saving design.

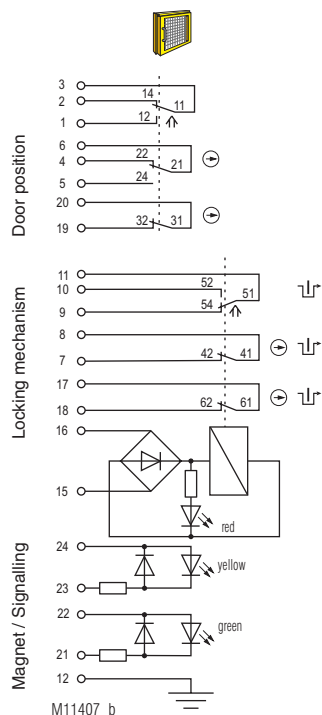


Fig. 1:
Locking module activated:
Magnet locked,
Actuator or key inserted,
Door closed

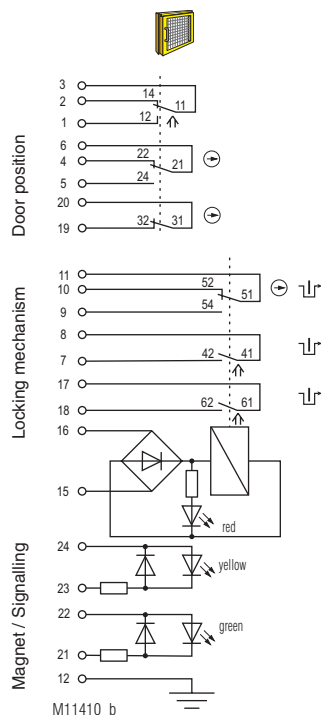


Fig. 2:
Locking module deactivated:
Magnet released,
Actuator or key inserted,
Door closed

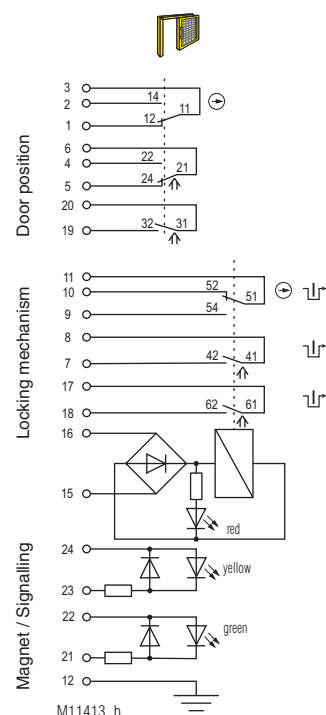


Fig. 3:
Locking module deactivated:
Magnet released,
Actuator or key removed,
Door open

Switching logic

			Fig. 1	Fig. 2	Fig. 3
Door contacts	3	2			
	3	1			
	6	4			
	6	5			
	19	20			
Magnet contact	11	9			
	11	10			
	7	8			
	17	18			
Control signal Magnet	U_N				
	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 key inserted the solenoid locking changes to the state of **Figure 2**.

If no signal is applied and the key inserted the solenoid locking changes to the state of **Figure 1**.

Mechanical Data	
Mechanical principle:	Rotating axis with redundant actuation and mechanical locking
Housing:	PA + GF
Inner parts:	Stainless steel V4A / AISI 316 Stainless steel V4A / AISI 316 / AISI 630 (according to EN 10027-2; 1.4401; 1.4404; 1.4542; 1.4301; 1.4310)
Protection class:	IP 65
Holding force:	Fzh 2000 N
Shearing force:	Depends on the actuator
Guard locking principle:	Closed-circuit current, fail-safe
Solenoid principle:	Quiescent or operating current
Operating speed min. / max.:	100 / 250 mm/s
Entrance	
Nominal voltage UN (rated voltage):	AC/DC 24 V
Nominal voltage range:	0.85 ... 1.1 U _N (see operating voltage limit curve)
Power consumption:	5.5 W
Output	
Contacts	
Door position:	1 NC contact, 2 complementary Changeover contacts
Locking mechanism:	2 NC contacts + 1 changeover contact
Switching elements:	IEC EN 60947-5-1 Annex K
Switching principle:	Changeover contact with positive break Snap switches
Contact material:	Ag / AgSnO ₂
Max switching frequency:	360/h
Max. operating current:	
Closed-circuit current principle:	2 A
Operating current principle:	1 A
Utilization category of the switching elements	
According to AC 15:	1 A
According to DC 13:	0.5 A
Electrical life:	5 x 10 ⁶ switching cycles
Short circuit resistance, max. fuse rating:	2 A gG
Conditional sizing short circuit current (rated conditional short circuit current):	1000 A
Mechanical life:	1 x 10 ⁶ switching cycles
General data	
Operating mode	
Electromagnet:	100% ED
Temperature range	
Closed-circuit current principle:	- 25°C to + 45°C
Operating current principle:	- 25°C to + 45°C
Storage temperature:	- 25°C to + 60°C
Rated surge voltage:	0.8 kV
Rated Insulation-voltage:	≤ 50 V
Overvoltage category:	III
Pollution degree:	2
Connection technology:	Spring-loaded terminals
Connection cross sections Min. / max.:	0.25 / 0.75 mm ² (with ferrule and collar according to DIN 46228-4)
Cable entry with thread:	1 x M20x1.5
As intended use:	Up to maximum cat. 4, PL e according to DIN EN ISO 13849-1 According to DIN EN 50041
Assembly:	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
Test specifications:	

Technical Data	
Housing:	PA + GF
Protection class:	IP 65
Entrance	
Nominal voltage U_a (rated voltage):	AC/DC 24 V
Nominal voltage range:	0.85 ... 1.1 U _N (see operating voltage limit curve)
Output	
Max. operating current	
Closed-circuit current principle:	2 A
Operating current principle:	1 A
General data	
Temperature range:	- 25°C to + 45°C
Storage temperature:	- 25°C to + 60°C
Rated surge voltage:	0.8 kV
Rated Insulationvoltage:	≤ 50 V
Connection technology:	Insulated flat plugs 2.8 x 0.8 mm
Connection cross sections min. / max.:	0.75 / 1.5 mm ² (with ferrule and collar according to DIN 46228-4)
Cable entry with thread:	1 x M20x1.5
Assembly:	According to DIN EN 50041
Repair and replacement:	Only by manufacturer
Test intervals emergency stop function:	
For PL a to d:	At least once a year
For PL e:	At least once a month
Weight:	Approx. 90 g
Emergency stop button	
For the intended use, the one-shot requirements for the installation and operation of emergency stop buttons must be observed in particular:	
- EN 60204-1:2006	
- EN 13849-1/-2:2008	
- EN ISO 13850:2008	
Installation opening:	Ø 22.3
Contacts:	2 normally closed
Foolproof:	Yes
Switch position indication:	Yes
Anti-lock collar:	No
Unlocking right and left rotation	
Protection class:	IP 65
Temperature range	
Storage temperature:	- 40 °C ... + 80 °C
Operating temperature:	- 25 °C ... + 70 °C
Mechanical life:	50,000 switching cycles
Electrical life:	50,000 operations at nominal load
Bounce time	
N/O contact:	< 10 ms
Normally closed:	< 10 ms
Switching elements	
NC contact positive opening:	IEC EN 60947-5-1 Annex K
Illuminated pushbutton	
Contacts:	1 NO contact
Actuation travel:	2.3 mm
Mechanical life:	106 switching cycles
Electrical life:	106 switching cycles
Contact resistance	
Normally open /	
Normally closed contact:	< 50 m (Au)
Bounce time	
Normally open /	
Normally closed:	< 10 ms
NC contact positive opening:	IEC EN 60947-5-1 Annex K
Indicator light (not replaceable)	
Lamp voltage:	Max. AC/DC 30 V
Lamp current:	Max. 14 mA (at DC 24 V)

Variants

Locking module ZRX/K

Locking module, de-energized on trip, without additional functions.

Locking module ZRH/K

Locking module, de-energized on trip, manual unlocking.

In the case of electrical faults, for instance, during power failure, the manual unlocking allows the mechanical release of an access from outside the dangerous area with the help of a tool.

With the actuation of the manual unlocking, the circuits on terminals 7 and 8; 9 and 11 as well as 17 and 18 will be cut off at the same time and contact between 10 and 11 will be closed. Opening of these circuits must generate an emergency-stop.

The manual unlockings are not sealed or lead-sealed because of the typically rugged applications. When using a locking module with manual unlocking we therefore recommend combining it with acoustic and also visual warning signals and to provide additional locking on the control level.

Zuhaltemodule ZRHC.001 und ZRHC.002

Zuhaltemodul, Ruhestromprinzip, Hilfsentriegelung

Für Anwendungen, bei denen bis zu 3 Befehlsgeber pro Modul eingebunden werden können.

Locking module ZAX/K

Locking module, energized on trip, without additional functions.

Locking modules YRX/K, YRH/K and YAX/K

For applications where the key modules 10/K, 10S/K or an actuator module K/K or padlock module W/K shall be installed above the locking module, the YRX/K, YAX/K and YRH/K versions are available. Additional information about the circuit diagram and use of the locking modules YRX/K, YAX/K and YRH/K is available in the data sheet locking module YRX/K, YAX/K and YRH/K as well as in data sheet actuator module K/K.

Important Notes

Function differences of locking modules with load current principle and locking modules with standby current principle.

Locking modules based on the standby current principle are in de-energized condition when in the locked position. This must be remembered especially when examining faults such as power failure or wire break.

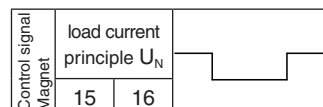
Only when the safety evaluation shows, that a solenoid lock with closed circuit operation is not suitable or is not required, a solenoid lock with open circuit operation can be used.

See DIN EN ISO 14119:2014-03 Abs. 5.7.1.

Contrary to the locking modules based on the standby current principle locking modules based on the load current principle lock only when the circuit is closed. The locking modules unlock if the circuit opens with the load current principle.

If a locking module is used based on the load current principle terminals 7 and 8 or 17 and 18 must be included in the safety circuit.

With the load current principle the control signal for the magnet is inverted (see switching logic).



Manual unlocking

If misuse of the manual unlocking must be suspected a locking module based on the standby current principle without manual unlocking can also be used as an alternative. In the event of a power interruption the locking module must be unlocked in this case by removing the cover and subsequently pushing back the magnetic tappet (refer to the SAFEMASTER STS/K Installation and Operating Instructions).

A locking module based on the load current principle with manual unlocking is not available since it releases in the event of a power interruption.

Function selection / Versions

Locking module	Selectable functions		
	de-energized on trip	energized on trip	Manual unlocking
ZRX/K	X		
ZRH/K	X		X
ZAX/K		X	
ZRHC.001	X		X
ZRHC.002	X		X

Accessories

Coloured cap and symbol plates ST2451.3 consisting of:

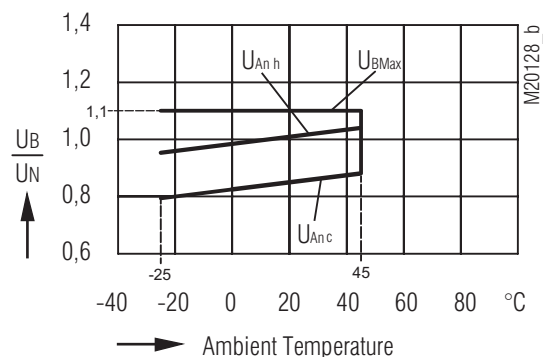
- 4 coloured caps: red, green, blue, yellow

- 4 symbol plates: EIN, AUS, ON, OFF

Article number: 0066802

Connector 12-poles Article number: 0068126

Solenoid derating graph



$U_{B\text{Max}}$ 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 $1.1 \times U_N$

Ordering Designation

Locking module ZRX/K

Article number: 0066788

Locking module ZRH/K

Article number: 0066833

Locking module ZRH/K-Deckel

Article number: 0067004

Locking module ZAX/K

Article number: 0066985

Locking module ZRHC.001

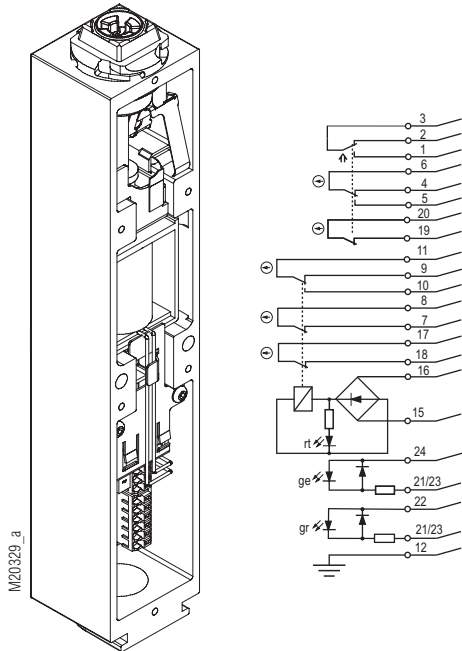
1 e-stop button,
2 separately controlled buttons

Article number: 0068249

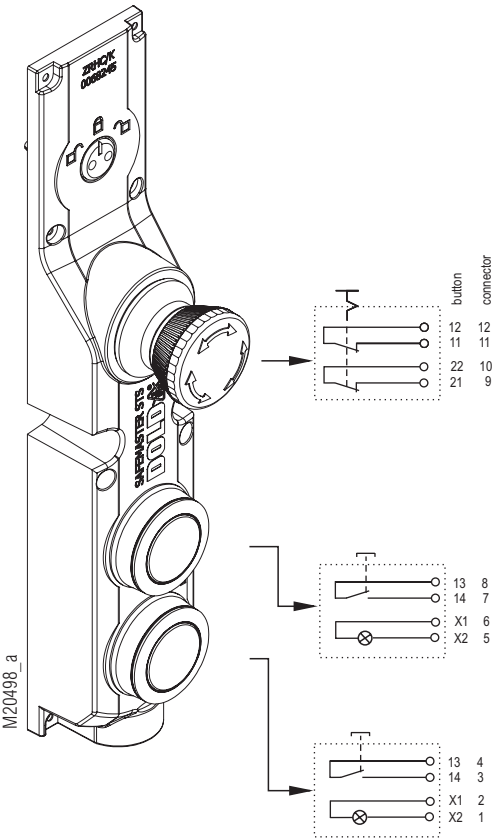
Locking module ZRHC.002

3 buttons

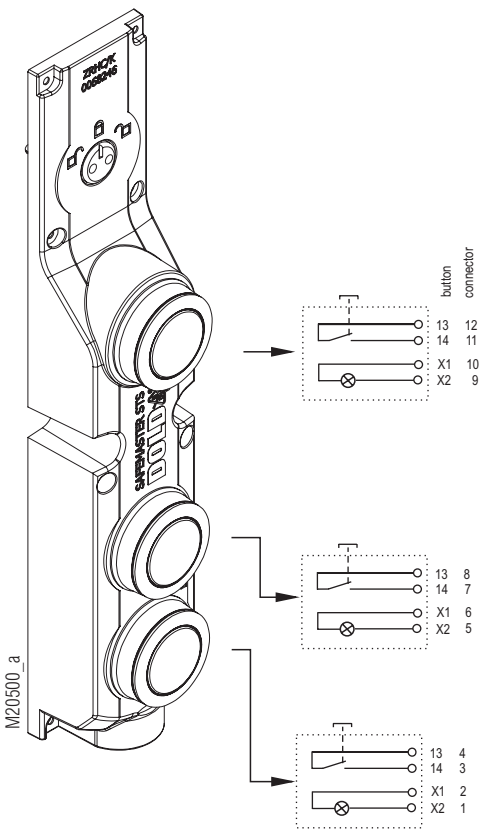
Article number: 0068250



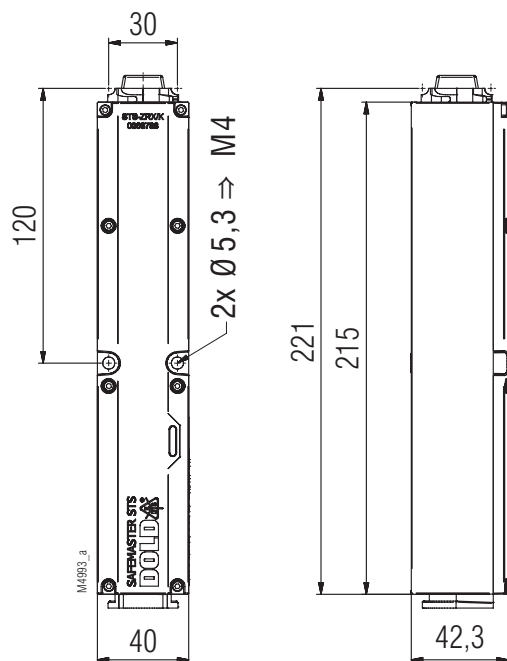
Locking module ZRH/K



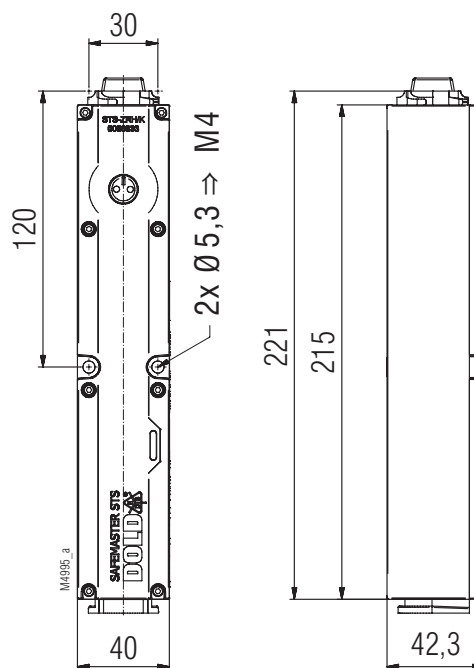
Cover TTN/K



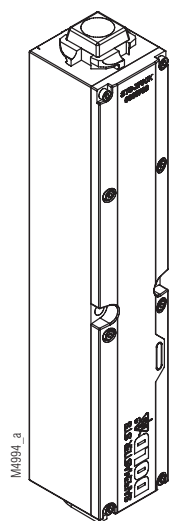
Cover TTT/K



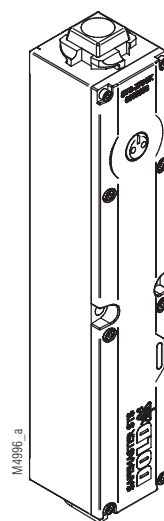
Locking module ZRX/K, ZAX/K without manual unlocking



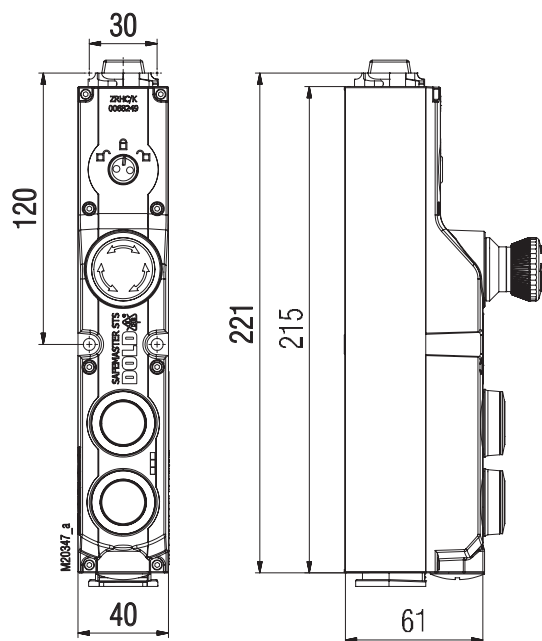
Locking module ZRH/K with manual unlocking



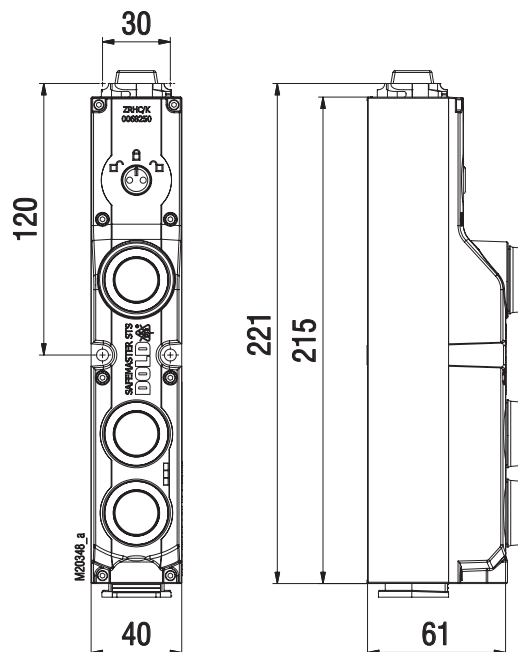
ZRX/K, ZAX/K



ZRH/K,



ZRHCTTN/K.001



ZRHCTTN/K.002

Overview of variants and characteristics

Order designation	Article number	Lower control element		Middle control element		Upper control element	
		Actuator	Contacts	Actuator	Contacts	Actuator	Contacts
Option module ZRHCTTN.001	0068249	illuminated pushbuttons	1 NO, 1 LED	illuminated pushbuttons	1 NO, 1 LED	e-stop button	2 NC
Option module ZRHCTTT.002	0068250	illuminated pushbuttons	1 NO, 1 LED	illuminated pushbuttons	1 NO, 1 LED	illuminated pushbuttons	1 NO, 1 LED
Further versions on request							

