Safety module SM01-001 A3

Operating Instructions

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Contents

1 Safety Instructions

1.1 The Operator's Duty of Care/Requirements of the Operating Personnel

The operator has to:

- make the operating instructions available to personnel and be certain that the personnel has read and understood them.
- ensure that the subassembly is only used as intended.
- ensure that an skilled worker operates and services it. The term "skilled worker" is explained in the operating instructions on control in the Chapter on <<Personnel>>.

1.2 Explanation of the Safety Symbols Used

danger

This designates an immediately imminent danger to the life and health of personnel

warning

This designates a potentially hazardous situation.
Persons might be killed or suffer very serious injuries if this warning is ignored.
This is also a warning of dangers to machines, materials or the environment.

note

This indicates information that contributes to a better understanding of the machine's functions.

procedure

This gives the sequence in processes.

example

This contributes to a better understanding of the user input by giving parameters.

1.3 Basic Safety Measures

working under voltage means DANGER to life and limb

Disconnect the voltage supply (using the main switch or fuses) before doing service or cleaning work.
Never remove or shut down safety equipment by modifying it.

Comply with the specifications from DIN VDE 0100 and VBG 4.

2 Intended Usage

The SM01-001 subassembly has the purpose of monitoring two independent input signals and it is used as an electrical safety switch in controls for lifts in conformity with

- EN 81-20 Number 5.11.2.3
- EN 81 Part 1 and Part 2 Item 14.1.2.3
- TRA 264.2
- Directive 2014/33/EU Article 1 par. 1, article 15
- Directive 95/16/EG Article 1, Paragraph 1, Article 8, Paragraph 1

It can also be used for monitoring **u**nintended **c**ar **m**ovements of the elevator car from the stop (**UCM**: **u**nintended **c**ar **m**ovement) if the shaft door is not locked and the elevator car door is not closed in conformity with DIN EN 81-1:2010-06 / 9.11 and DIN EN 81-2:2010-06 / 9.13 and EN81-20, par. 5.6.7 under the following conditions:

1. The drive is equipped with a braking device in conformity with DIN EN 81-1: 2010-06 / 9.11, DIN EN 81-2: 2010-06 / 9.13 or DIN EN 81-20, par.5.6.7.
2. The following operating states are observed:
   - the adjustment process is active in conformity with DIN EN 81-1/2: 2010-06 / 14.2.1.2 and DIN EN 81-20 5.12.1.4 (i.e., the control has released adjustment).
   - the quick-start function is active in conformity with DIN EN 81-1/2: 2010-06 / 7.7.2.1 and DIN EN 81-20 5.3.8.2 (i.e., the control has taken preparatory measures for moving the elevator car).
3. There is a monitoring contact available for rope drives on the regulator **and** MPK control for a speed of v < 0.2 m/s.

3 Implementing the Protective equipment for in Case of UCM

There are UCMs when the monitor identifies an unintended movement of the elevator car away from the stop when the shaft and elevator car door are open.

The protective equipment contains 3 basic components:

1. Monitoring the unintended movement of the elevator car away from the stop when the shaft door is not locked and the elevator car door is not closed.
2. Releasing the device if there is a UCM that stops the elevator car.
3. The device used in Item 2 (the **UCM actuator**).

The SM01-001 safety switch complies with items 1 and 2 in combination with the MPK control taking the conditions described in Chapter 2 into consideration.

4 Cross-Section of the Menu Functions

Travel monitor
UCM monitor
monitoring
YES

Travel monitor
UCM monitor fault
clear?

You can use this function to turn on UCM control monitoring.
If the UCM control trips, the fault locks the control. You can **only** suspend this lock under <<Settings>> / <<travel monitor>> with the <<UCM monitor fault clear?>> function.
RESETTING the control does **not** suspend the lock.

Testing/Maintenance
Completion
UCM Assistance
commissioning

This function tests the presettings for the MPK control for the completion of a UCM check (also refer to Chapters 5.6 and 6.5).
It checks the following presettings:

- clamp parametering for the functions:
  - <<Safety module>> input
  - <<Zone safety module >> input
  - <<Completion testing>> input
  - <<UCM Testrelais>> output
  - ..- <<Monitoring v<0.2m/s>> output (only with rope drive)

- the <<YES>> menu setting for the functions:
  - <<Settings>> / <<travel monitor>> / <<UCM monitor monitoring>>
  - <<Settings>> / <<Safety module>> / <<monitoring>>

Testing/Maintenance
Completion
UCM test
nomi. speed

UCM test nomi. speed
Travel Up= ↑ Down= ↓
Fl. 1
Distance: 876 mm

You can use this function to give a travel command for the direction desired with the correct arrow key on the MPK control. The travel command is issued as long as the button is pressed. The distance covered is continually recorded and appears on the 4th line.

Testing/Maintenance
Completion
UCM test
automatic self test

You can use this function to carry out 10 trips in conformity with DIN EN 81-1/-2:2010-06 / F.8.3.2.4 and EN 81-50 5.8.3.2.5 for checking the function of the equipment.

NOTE

You will find a detailed description of the processes for lifts with a hydraulic drive in Chapter 5.7 and for lifts with rope drive in Chapter 6.6.

5 Lifts with Hydraulic Drive

5.1 Description of Their Function

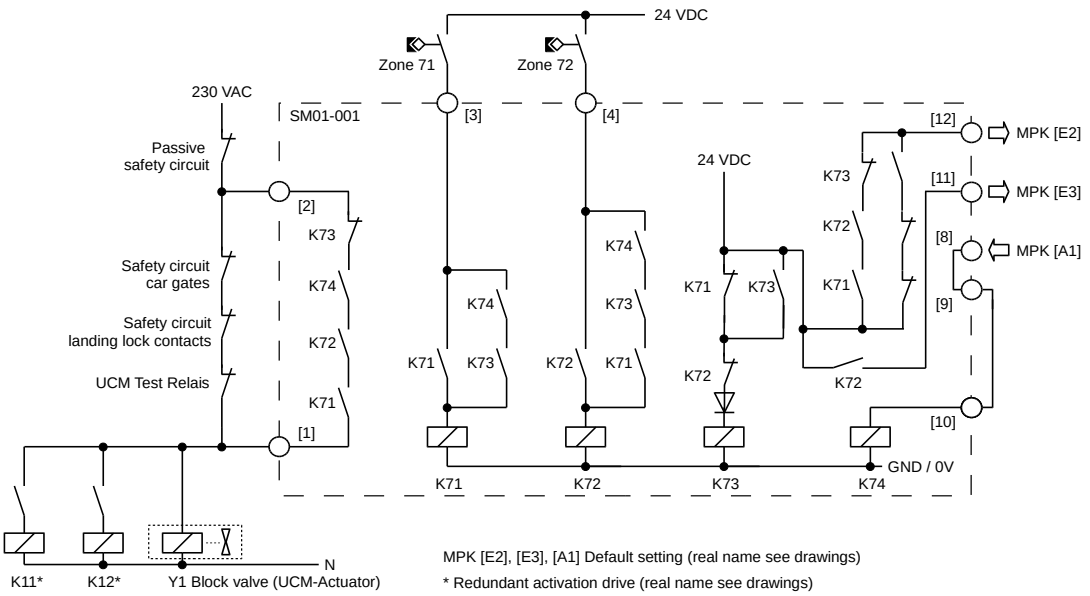
Two independent contact elements monitor resetting when the shaft and elevator car door is open.
The mutually independent S71 and S72 zone switches are monitored in the SM01-001 safety switch for fault-free function with the aid of the K71, K72 and K73 relays. The monitoring switch between clamp 7 and clamp 12 of the SM01-001 safety switch checks to see whether these relays are in are proper switching condition. If relays K71 and K72 are antivalent, the flow of current to clamp 12 is disconnected in conformity with EN 81 Part 1 and Part 2 Number 14.1.2.3.2 and EN 81-20 Part Number 5.11.2.3.3 (LED <<Status>> goes off). That means that the next start is hindered by the subsequent switch.
The circumvention path (clamps 1 and 2) is closed in the zone area when resetting.
When the doors are open, the contacts of the safety switch have an immediate effect on the travel contactors. If the elevator car leaves the zone area when resetting, the drive and UCM actuator are turned off immediately by interrupting the circumvention path (clamps 1 and 2).
The MPK control identifies the UCM and shuts the lift down. It can only return to normal operation by manual reset with the control menu.

NOTE

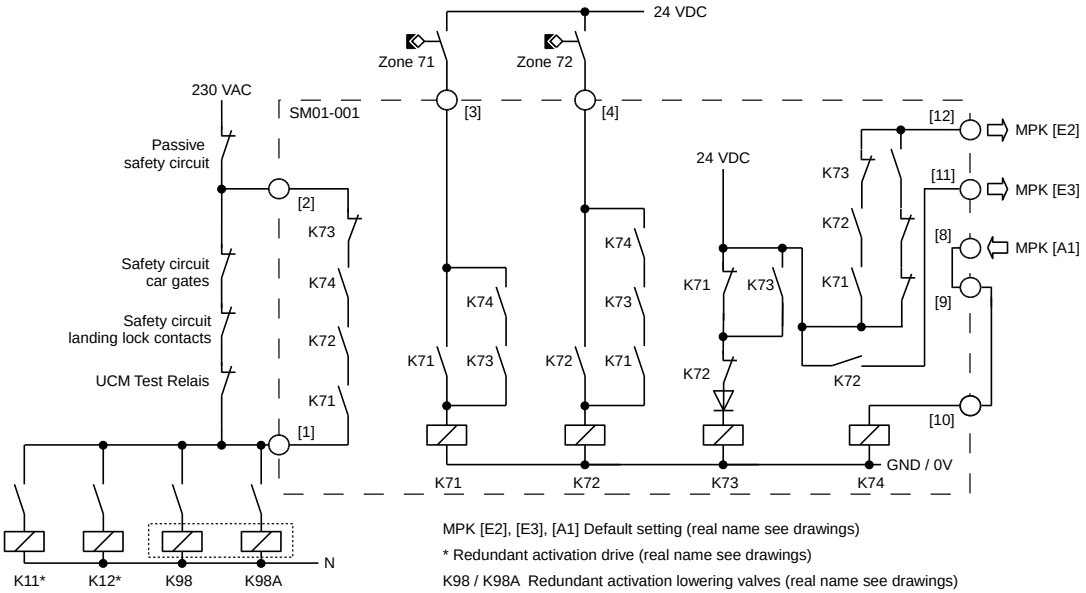
To safely turn off the drive, comply with the conditions required at start-up (refer to Chapter 5.6) as well as the data for testing (refer to Chapter 5.7).

The safety circuit also has the contact of the UCM test relay for testing purposes and this contact disconnects the safety circuit when testing with closed doors. Then the UCM test relay triggers the MPK control.

5.2 UCM Actuator Designed as a Block Valve



5.3 UCM Actuator Designed as Redundant Lowering Valves



5.4 SM01-001 Clamp Assignment

Term.	Bypass contacts, inputs zone
1, 2	Bypass safety circuit contacts door
3	Input zone switch S71
4	Input zone switch S72

Term.	Inputs, outputs, …
10	Input relevelling
11	Output zone safety module
12	Output fault safety module

5.5 Requirements from Using the UCM Actuator

the voltage supply for the actuator	...this means:
• through the safety circuit	it is not necessary to have redundant actuator triggering
• not through the safety circuit	redundant triggering needed with standstill monitoring in series to the standstill monitoring of the drive contactors

the function of the actuator in normal operation	...this means:
• no function, only if there are UCMs	not necessary to monitor the actuator
• function also in normal operation	monitoring necessary for opening and closing the actuator with the control/regulation software

5.6 Start-Up

NOTE

Please bear the fact in mind that

- you have to take the reaction and delay times into consideration for all protective equipment components (refer to Chapter 3) with UCMs to comply with the stop path from standard specifications
- there are other things that have an impact on the stop path such as the oil flowthrough quantity or drive acceleration. This is the reason why any stop path calculated from the manufacturer's data **has** to be checked locally on all levels and in both travel directions.
- you always have to observe the stop path based upon the worst-case assumptions such as by taking the drive's maximum acceleration and travel speed into account.

Example calculation for the distance if there are UCMs based upon reaction and delay times

distances and times	parameters	example fo v_{fast} = 0.8 m/s
door zone	0.05–0.2 m	0.2 m
reaction time for the magnetic switch (Schmersal BP 325 / 65)	2 ms	2 ms x 0.8 m/s = 0.0016 m
reaction time for the SM01-001 safety module	15 ms	15 ms x 0.8 m/s = 0.0120 m
reaction time for the valves	15 ms	15 ms x 0.8 m/s = 0.0120 m
delay time for the valves	45 ms	45 ms x 0.8 m/s = 0.0360 m
	result:	**0.2616 m**

Start-up sequence:

1. Carry out start-up according to the specifications of the operating instructions for the SM01-001 control and safety switch.
2. Check to see that the **presettings** are on the MPK control; select the <<UCM Assistance Commissioning>> function in the menu under <<Testing/Maintenance>> / <<Completion>> (refer to Chapter 4).

   Start the test in the function by pressing the <<DOWN>> arrow button.

   Any conditions not met are shown in the menu during the test and should be provided.

5.7 The Test

5.7.1 General Description of the Sequence

The test starts from the flush position of the highest level in the downward direction and follows this sequence:

the action of the control		the reaction of the lift
the doors close	➡	the safety circuit is closed
activate SM01 safety switch	➡	safety circuit circumvention is active
activate the UCM test relays	➡	the safety circuit is opened
start the drive at rated speed	➡	the elevator car leaves the zone area
SM01 safety switch trips	➡	safety circuit circumvention opens
drive and valves switch off	➡	the control stores the fault fail-safe

5.7.2 Test Instruction

Preparation:

1. Move the elevator car into the flush position of the **highest** level.
2. Set the <<Door blocking>> function to <<YES>> in the menu of the control under <<Testing/Maintenance>> / <<Presetting>>.
3. Connect the <<Completion testing>> input with +24V (such as clamp 200).

Completion UCM TEST:

1. Select the <<UCM test nomi. speed>> function in the menu of the control under <<Testing/Maintenance>> / <<Completion>>.
2. Press the <<Down>> arrow key to give the travel command in the downward direction and hold the arrow key down until the UCM case triggers.
3. The <<UCM test nomi. speed>> function keeps you informed on the travel path travelled.
4. Check the travel path travelled in the level (the test was successful if the requirements from the standard EN 81-1 and EN 81-20 are met).
5. Reset the block of the control under <<Settings>> / <<travel monitor>> / <<UCM monitor fault clear?>>.

   Please remember that you have to reset downstream units.

NOTE

The following actuator tests (Part 1 and Part 2) are only necessary if a Manifold Blk Monitor is used.

Completion actuator test part 1:

1. Select the <<UCM test automatic self test>> function in the menu of the control under <<Testing/Maintenance>> / <<Completion>>.
2. Control carries out 10 trips independently and tests valve feedback. Calling is blocked for the duration of the test.
3. The test was successful if no fault is reported during the 10 trips.

Completion actuator test part 2:

1. Select the <<UCM test automatic self test>> function in the menu of the control under <<Testing/Maintenance>> / <<Completion>>.
2. Control starts a trip independently and tests valve feedback. Calling is blocked for the duration of the test.
3. Release the connection to a clamp of Manifold Blk Monitor as soon as control has started the drive.
4. The test was successful if the lift shut is down on the next level and it cannot make another trip.
5. Restore the connection to the clamp of the Manifold Blk Monitor.
6. Reset the control with RESET.

Final actions:

1. Release the <<Completion testing>> input from +24V (clamp 200).
2. Set the <<Door blocking>> function to <<NO>> in the menu of the control under <<Testing/Maintenance>> / <<Presetting>>.

6 Lifts with Frequency-Regulated Rope Drive

6.1 Description of their Function

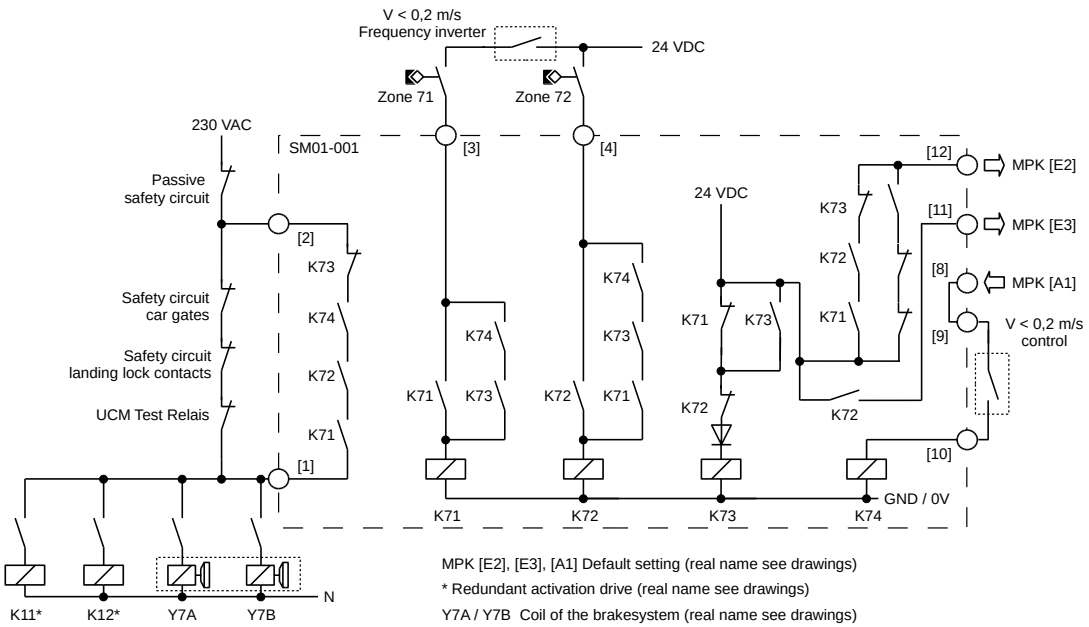
Two independent contact elements monitor resetting when the shaft and elevator car door are open.
The mutually independent S71 and S72 zone switches are monitored for fault-free function in the SM01-001 safety switch with the aid of the K71, K72 and K73 relays. The monitoring switch between clamp 7 and clamp 12 of the SM01-001 safety switch checks to see whether these relays are in are proper switching condition. If relays K71 and K72 are antivalent, the flow of current to clamp 12 is disconnected in conformity with EN 81 Part 1 and Part 2 Number 14.1.2.3.2 and EN 81-20 Part Number 5.11.2.3.3 (the <<Status>> LED goes off) which means that the next start is hindered by the subsequent switch.
The circumvention path (clamps 1 and 2) is closed in the zone area when resetting.
When the doors are open, the contacts of the safety switch have an immediate impact on the travel contactors. If the elevator car leaves the zone area during resetting, the drive and UCM actuator are turned off immediately by interrupting the circumvention path (clamps 1 and 2).
The MPK control identifies UCMs and shuts the lift down and it can only return to normal operation by manual reset in the control menu.

NOTE

Bear the conditions required at start-up in mind for safely turning off the drive (refer to Chapter 6.5) as well as the data for testing (refer to Chapter 6.6).

The safety circuit also has the contact of the UCM test relay for testing purposes and this contact disconnects the safety circuit when testing with closed doors. Then the UCM test relay triggers the MPK control.

6.2 UCM Actuator Designed as an Intrinsically Safe Service Brake



6.3 SM01-001 Clamp Assignment

Term.	Bypass contacts, inputs zone
1, 2	Bypass safety circuit contacts door
3	Input zone switch S71
4	Input zone switch S72

Term.	Inputs, outputs, …
10	Input relevelling
11	Output zone safety module
12	Output fault safety module

6.4 Requirements from Using the UCM Actuator

the voltage supply of the actuator	...this means:
• through the safety circuit	it is not necessary to have redundant actuator triggering
• not through the safety circuit	redundant triggering needed with standstill monitoring in series to the standstill monitoring of the drive contactors

the function of the actuator in normal operation	...this means:
• no function, only if there are UCMs	not necessary to monitor the actuator
• function also in normal operation	monitoring necessary for opening and closing the actuator with the control/regulation software

6.5 Start-Up

NOTE

Please remember that

- you have to comply with the reaction and delay times of all components of the protective equipment (refer to Chapter 3) if there are UCMs for meeting the stop path from the standard specifications
- other things have an impact on the stop path such as the drive acceleration. This is the reason why any stop path calculated from the manufacturer's data **has** to be checked locally on all levels and in both travel directions.
- you always have to observe the stop path based upon the worst-case assumptions such as by taking the drive's maximum acceleration and travel speed into account.

Example calculation for the distance if there are UCMs based upon reaction and delay times

distances and times	parameters	example fo v_{fast} = 1.6 m/s
door zone	0.05 – 0.2 m	0.2 m
reaction time for the magnetic switch (Schmersal BP 325 / 65)	2 ms	2 ms x 1.6 m/s = 0.0032 m
reaction time for the SM01-001 safety switch	15 ms	15 ms x 1.6 m/s = 0.024 m
reaction time for the brake protection	15 ms	15 ms x 1.6 m/s = 0.024 m
reaction time for the regulation v< 0.2, m/s	15 ms	15 ms x 1.6 m/s = 0.024 m
	result:	**0.2752 m**

Start-up sequence:

1. Carry out start-up according to the specifications of the operating instructions for the SM01-001 control and safety switch.
2. Check to see that the **presettings** are on the MPK control; select the <<UCM Assistance Commissioning>> function (refer to Chapter 4) in the menu under <<Testing/Maintenance>> / <<Completion>>.

   Start the test in the function by pressing the <<DOWN>> arrow button.

   Any conditions not met are shown in the menu during the test and should be provided.

6.6 The Test

6.6.1 General Description of the Sequence

The test starts from the flush position of the highest level in the downward direction and follows this sequence:

the action of the control		the reaction of the lift
doors close	➡	the safety circuit is closed
activate SM01 safety switch	➡	safety circuit circumvention is active
activate UCM test relays	➡	the safety circuit is opened
start the drive at rated speed	➡	the elevator car leaves the zone area
the SM01 safety switch trips	➡	safety circuit circumvention opens
the drive and brake switch off	➡	the control stores the fault fail-safe

6.6.2 Test Instruction

Preparation:

1. Move the elevator car into the flush position on the **highest** level.
2. Set the <<Door blocking>> function to <<YES>> in the menu of the control under <<Testing/Maintenance>> / <<Presetting>>.
3. Connect the <<Completion testing>> input with +24V (such as clamp 200).

Completion UCM TEST:

1. Select the <<UCM test nomi. speed>> function in the menu of the control under <<Testing/Maintenance>> / <<Completion>>.
2. Press the <<Down>> arrow key to give the travel command in the downward direction and hold the arrow key down until the UCM case triggers.
3. The <<UCM test nomi. speed>> function keeps you informed on the travel path travelled.
4. Check the travel path travelled in the level (the test was successful if the requirements from the standard EN 81-1 and EN 81-20 are met).
5. Reset the block of the control under <<Settings>> / <<travel monitor>> / <<UCM monitor fault clear?>>.

   Please bear the fact in mind that you have to reset downstream units.

NOTE

The following actuator tests (Part 1 and Part 2) are only necessary if brake monitoring is used.

Completion actuator test part 1:

1. Select the <<UCM test automatic self test>> function in the menu of the control under <<Testing/Maintenance>> / <<Completion>>.
2. The control carries out 10 trips independently and tests brake feedback. Calling is blocked for the duration of the test.
3. The test was successful if no fault is reported during the 10 trips.

Completion actuator test part 2:

1. Select the <<UCM test automatic self test>> function in the menu of the control under <<Testing/Maintenance>> / <<Completion>>.
2. Control starts a trip independently and tests brake feedback. Calling is blocked for the duration of the test.
3. Loosen the connection to a clamp of brake monitoring as soon as control has started the drive.
4. The test was successful if the lift is shut down on the next level and it cannot make another trip.
5. Restore the connection to the clamp of brake monitoring.
6. Reset the control with the <<Settings>> / <<travel monitor>> / <<brake monitor fault clear?>> menu function.

Final actions:

1. Release the <<Completion testing>> input from +24V (clamp 200).
2. Set the <<Door blocking>> function to <<NO>> in the menu of the control under <<Testing/Maintenance>> / <<Presetting>>.