Operating Instructions for failsafe unit LUS with SMARTCON control

1   General

The failsafe-unit LUS is a stretchable coupling which is mounted between valve and actuator (linear unit) in the line of the stem and moves the valve in case of a signal or a voltage failure into a safe end position.
The Failsafe-unit overlays the actuator and moves the valve thereby independently of the actuator position fast into the failsafe end position. In normal operation (actuator operated) the preloaded failsafe-unit works like a rigid coupling and does not affect the positioning characteristics of the actuator. This separation of normal and failsafe operation makes it possible to combine fast failsafe behaviour with simultaneous more slowly and therefore exact positioning in normal operation.
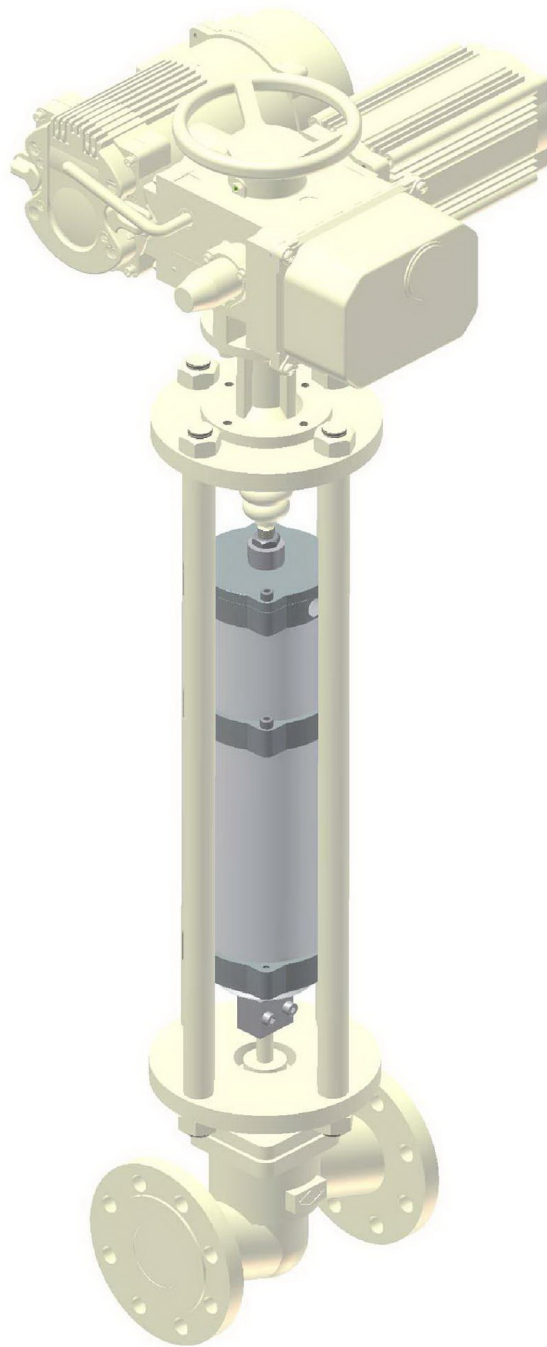

Figure 1

2   Working principle

working direction:
spindle moving out for failsafe close   **working direction:**
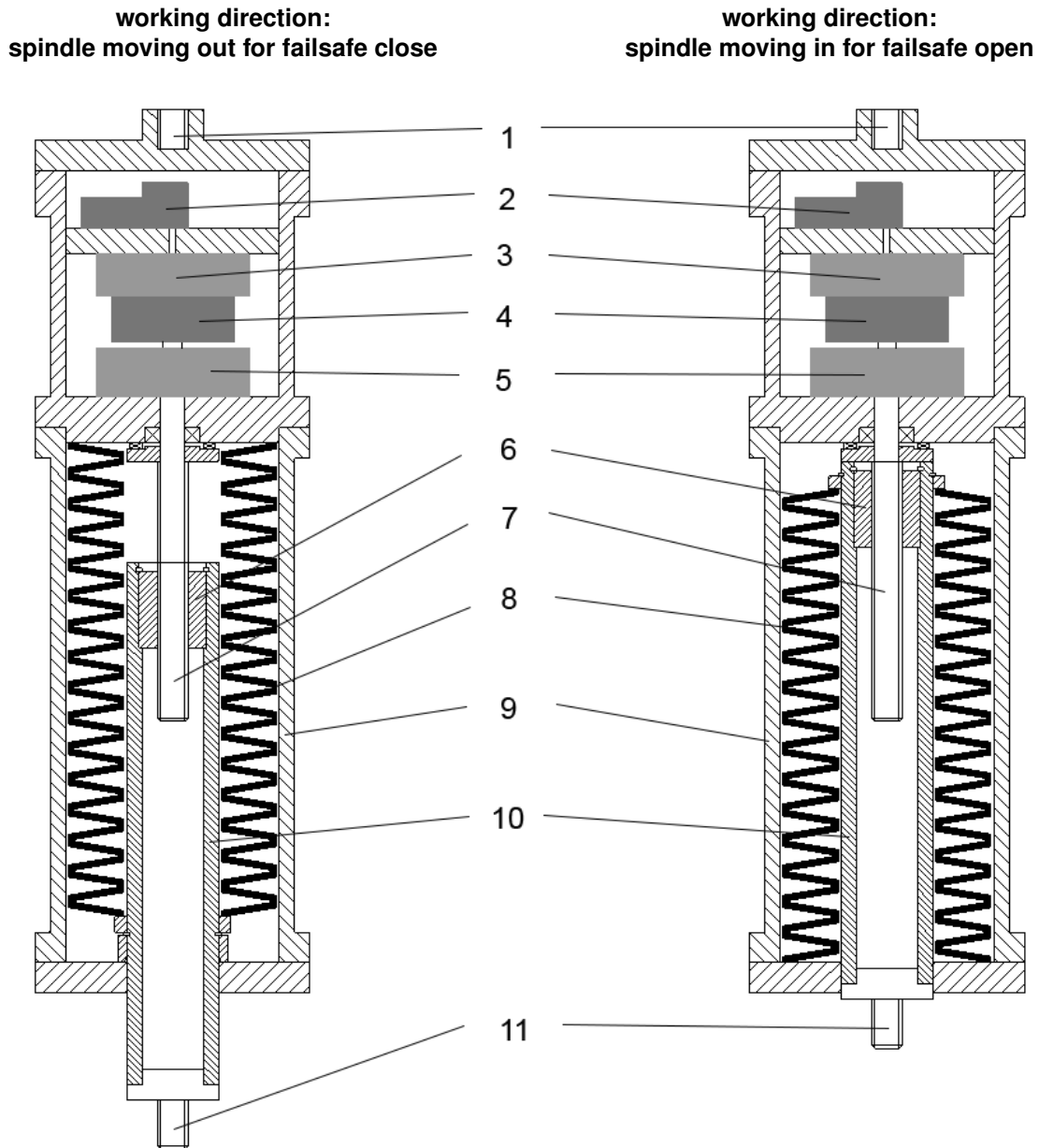**spindle moving in for failsafe open**

Figure 2: 1...Connection to the actuator, 2...Signaling device travel switch S6, 3...Eddy current brake, 4...Holding brake Yh, 5...Gearing, 6...Spindle nut, 7...threaded spindle, 8...disc springs, 9...housing, 10...stem, 11...Connection to the valve

2.1   Working principle - Failsafe mode

In failsafe mode the threaded spindle can turn freely (the retaining brake Yh is not active). Thus the disc springs can drive the stem with the not selflocking spindle nut. The eddy current brake prevents thereby to high rotational speeds. After a failsafe release the failsafe-unit must become loaded again by the external actuator, i.e. the actuator squeezes the springs together, the stem is moved and turns the not-selflocking spindle nut back. In the preloaded position the travel switch S6 closes and the retaining brake Yh has to be activated. The spindle cannot turn thereby any longer and the stem is held in this position. The failsafe-unit works now like a rigid coupling and the actuator can operate the valve as usual (open and close). In the positioning behaviour there is now no difference compared with an actuator without failsafe-unit.

Depending on the working direction two different designs are used:

- Driven out stem in failsafe mode (most for failsafe close applications).To load the failsafe-unit again the unit has to be squeezed together. (The stem of the actuator is driving out (in most cases "closing")).
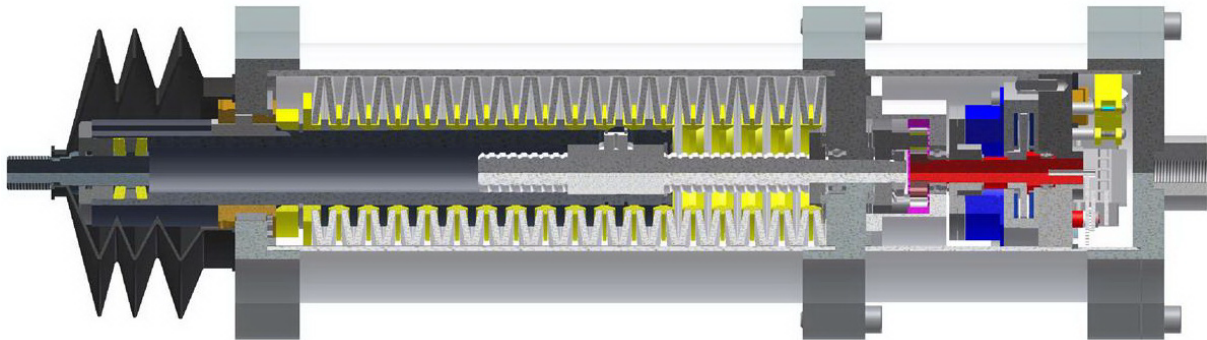

Figure 3

- Driven in stem in failsafe mode (most for failsafe open applications). To load the failsafe-unit again the unit has to be pulled apart. (The stem of the actuator is driven in (in most cases "opening")).
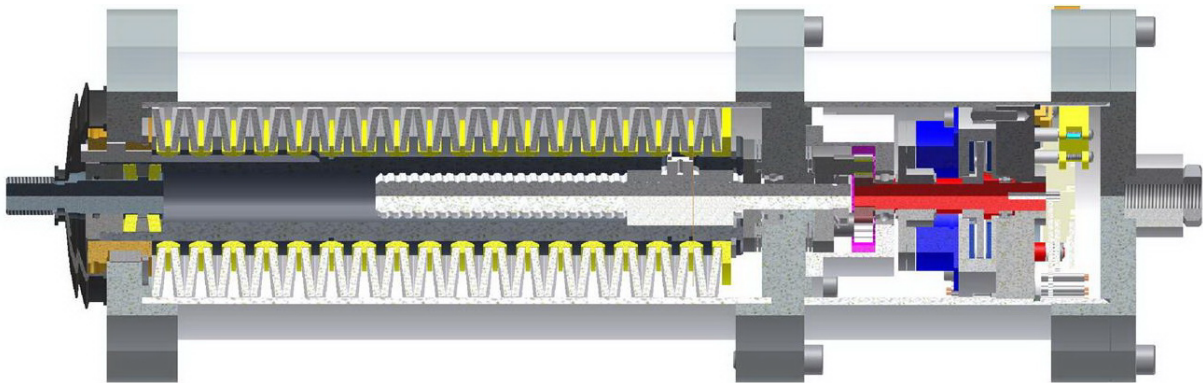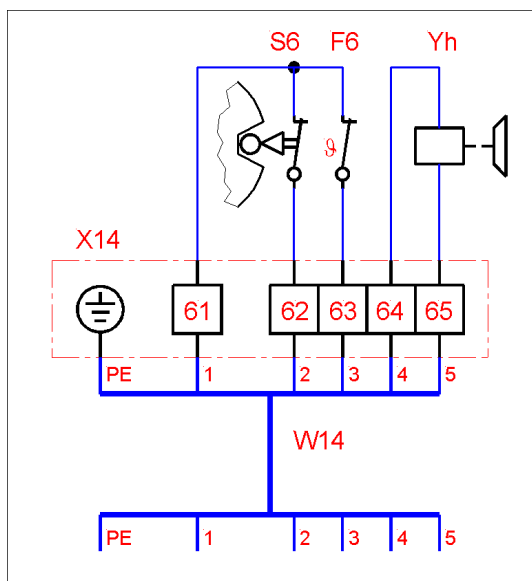

Figure 4

3   Electrical connection

Legend:
S6: travel switch "Failsafe-unit ready" = closed contact
F6: thermo switch
Yh: holding brake
X14: terminal strip
W14: connection wire to the actuator

Figure 5: electrical connection

4 Selection references

For the selection of a failsafe-unit the following has to be considered:

- The stroke of the failsafe-unit has to be longer than required by the valve.

- The stroke of the actuator has to be longer than the stroke of the failsafe-unit plus the stroke of the valve.

- The mechanical end stop of the valve (in failsafe working direction) must be at least designed for the maximum failsafe force.

5 Commissioning

The failsafe unit is basically pre-set and ready to use. The opening of the upper cover is not necessary for start-up. Changing the setting of the switch can have a negative impact on the function of the failsafe unit!

Attention: All information in this manual refer to a valve that is closed when retracted valve stem (end position).

5.1 Failsafe unit with extended torque tube in the energized state

5.1.1 Mounting

The valve stem must be fully retracted (valve CLOSE).
Mount the actuator with the mounted failsafe-unit on the lantern. Then the spindle of the actuator must be fully retracted (actuator OPEN). Move the actuator with the handwheel in direction CLOSE until the stem of the failsafe unit almost touch the spindle of the valve (distance 1-2 mm). Finally couple the fail-safe unit and the valve stem.

5.1.2 Setting of parameters

Supply the electric actuators.
Set the following parameters: (see Section Control unit - parameterization, in the general Smartcondocumentation.)

P1.4 End position, Terminating CLOSE
Setting **1** (torque): The end position is approached via torque.

P6.4 Control, failsafe
Setting **2** (Close): Failsafe unit available for active extension direction: No automatic clamping function.

5.1.3 Adjustment of end positions

Set selector switch to LOCAL and move the actuator with the control switch in direction CLOSE (failsafe unit is tensioned). Once the limit switch S6 has reached "Clamped" position in the failsafe unit, the SMARTCON control unit activates the holding brake Yh. From this point the spring in the failsafe unit is no longer tensioned. Therfore the force increases rapidly and the actuator switches off by reaching the torque.
Check the mechanical setting of the potentiometer for position sensing and correct if necessary.
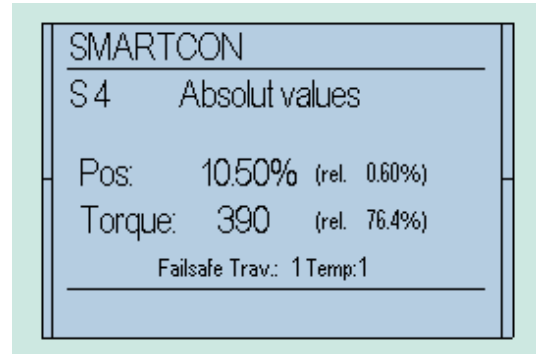
Figure 6: *Logik 1*

Figure 7: *Logik 2*

The value from **Pos:** should range between 5 ... 15 %, but not more than 5 % (see Section Commisising - Mechanical default in the general Smartcondocumentation).

Retract the actuator about one second in direction OPEN and save this position as End limit CLOSE in Teach mode (with parameter P1.2, see chap. Commisioning - End limit OPEN in the general Smartcondocumentation).

Afterwards move the actuator to the end position OPEN and save this position as End limit OPEN in Teach mode (parameter P1.1, see chap. Commisioning - End limit CLOSE in the general Smartcondocumentation).

The setting of all other parameters according to the general Smartcondocumentation.

5.2 Failsafe unit with retracted thrust tube in the energized state

5.2.1 Mounting

The valve stem must be fully retracted (valve OPEN).
Mount the actuator with the mounted failsafe-unit on the lantern. Then the spindle of the actuator must be fully retracted (actuator OPEN). Move the actuator with the handwheel in direction CLOSE until the stem of the failsafe unit almost touch the spindle of the valve (distance 1-2 mm). Finally couple the fail-safe unit and the valve stem.

5.2.2 Setting of parameters

Supply the electric actuators.
Set the following parameters: (see Section Control unit - parameterization, in the general Smartcondocumentation.)

P1.3 End position, Terminating OPEN
Setting **1** (torque): The end position OPEN is approached via torque.

P6.4 Control, failsafe
Setting **1** (Open): Failsafe unit for effective direction retracting available: No automatic clamping function.

5.2.3 Adjustment of end positions

Set selector switch to LOCAL and move the actuator with the control switch in direction OPEN (failsafe unit is tensioned). Once the limit switch S6 has reached "Clamped" position in the failsafe unit, the SMARTCON control unit activates the holding brake Yh. From this point the spring in the failsafe unit is no longer tensioned. Therfore the force increases rapidly and the actuator switches off by reaching the torque.
Check the mechanical setting of the potentiometer for position sensing and correct if necessary.
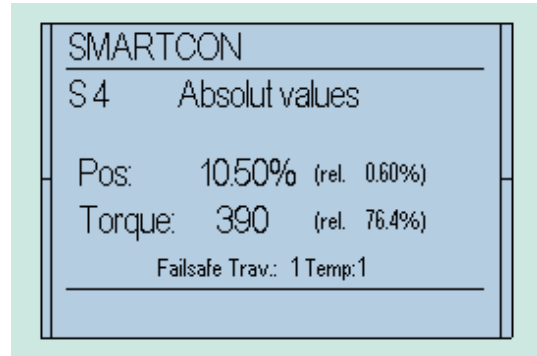
Figure 8: *Logik 1*

Figure 9: *Logik 2*

The value from **Pos:** should range between 85 . . . 95 %, but not more than 95 % (see Section Commisioning - Mechanical default in the general Smartcondocumentation).

Retract the actuator about one second in direction CLOSE and save this position as End limit OPEN in Teach mode (with parameter P1.1, see chap. Commisioning - End limit OPEN in the general Smartcondocumentation).

Afterwards move the actuator to the end position CLOSE and save this position as End limit CLOSE in Teach mode (parameter P1.2, see chap. Commisioning - End limit CLOSE in the general Smartcondocumentation).

The setting of all other parameters according to the general Smartcondocumentation.

6 Enhancements in Smartconmenü

6.1 Parameter

6.1.1 Parametergroupe: motor control

	Menu item	subitem	poss. Once.	Notes / Comments
P6.4	Motor control	fail-safe function	0: off	No failsafe unit available
			1: Open	Failsafe unit for effective direction retracting available. **No automatically tensioning.**
			2: Close	Failsafe unit for effective direction extension abailable. **No automatically tensioning.**
			3: Open+	Failsafe unit for effective direction retracting available. The failsafe unit is in the operating mode**REMOTE automatically tensioned** (Actuator runs in direction OPEN as long as until the limit switch in the fail-safe unit switches) unless otherwise REMOTE queue commands.
			4: Close+	Failsafe unit available for active extension direction. The failsafe unit is in the textbf REMOTE mode automatically tensioned (Actuator runs in direction CLOSE long until the limit switch in the fail-safe unit switches) if no other pending REMOTE commands.

Fortsetzung der Tabelle

	Menu item	subitem	poss. Once.	Notes / Comments
			5: Open++	Failsafe unit for effective direction retracting available. The failsafe unit is in the textbf mode LOCAL and REMOTE automatically tensioned (actuator runs as long in direction until the limit switch in the fail-safe unit switches) if present, no other commands.
			6: Close++	Failsafe unit for effective direction extension available. The failsafe unit is in the textbf mode LOCAL and REMOTE automatically tensioned (actuator runs as long in direction until the limit switch in the fail-safe unit switches) if present, no other commands.

6.1.2   Parameter group: Binary outputs

Additional signals are available:

	Menu item	subitem	poss. Once.	Notes / Comments
P10.x	Bin. output	output x	40: Failsafe OK1	Failsafe-unit is ready
			41: Failsafe OK2	Failsafe unit and actuator are ready.
			42: Failsafe OK3	Failsafe unit and actuator are ready and the actuator is in the REMOTE mode

6.2   Status - absolute values

In addition to the display of the absolute values of the torque and displacement sensors also switch states in the failsafe unit are displayed.

Figure 10: Logik 1
  1 ...absolute value of the position unit, 2 ...value for the torque alignment (is adjusted in the factory), 3 ...Temperature switch the holding brake: 1 ...OK, 4 ...limit switch in the Failsafe unit: 1 ...excited
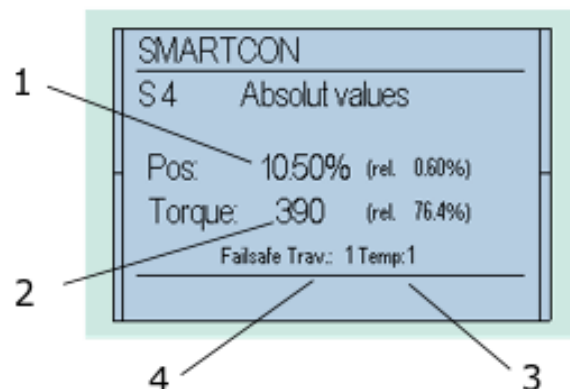

Figure 11: Logik 2
  1...absolute value of the position unit, 2...value for the torque alignment (is adjusted in the factory), 3...Temperature switch the holding brake: 1...OK, 4...limit switch in the Failsafe unit: 1...excited

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7   Maintenance

The failsafe unit is basically maintenance free. It is advisable to pull the bellows at intervals of 1-2 years, to clean the torque tube and regrease. If the bellow is damaged it must be replaced.

8   Dangerous operating errors

Attention!
The fail-safe unit is a mechanically biased resources.
This means there is improper use or handling of injury!

8.1   Disassembly of the valve

Attention!
In principle, assembly work may only be carried out with a pressureless and de-energized actuator

During disassembly of the valve, the spindle of the failsafe unit must be located in the failsafe position (ensured with a de-energized actuator).

Furthermore, the actuator must be moved by hand wheel until the valve stem moves from the failsafe position.

- In Failsafe CLOSE toward opening
- In Failsafe OPEN toward closing

Only then it is guaranteed that drive and valve stem are strainless.

As next step, the coupling between the valve and the Failsafe-unit can be removed.

8.2   Dismantling the failsafe unit

Attention!
The fail-safe unit is a mechanically biased resources.
Improper disassembly may cause serious injury.

Before disassembly contact:

Schiebel Antriebstechnik Gesellschaft mbH
A-1230 Wien, Josef Benc-Gasse 4
Tel +43 1 66 108/0
Fax +43 1 66 108/4
E-mail: info@schiebel-actuators.com
http://www.schiebel-actuators.com