TROVIS 5725-7 Electric Actuator with Process Controller with fail-safe action

For heating and cooling applications

SAMSON

Mounting and Operating Instructions

EB 5725-7 EN

Firmware version 2.03

Edition September 2014

CE DIN

Definition of signal words

⚠ **DANGER!**
Hazardous situations which, if not avoided, will result in death or serious injury

⚠ **WARNING!**
Hazardous situations which, if not avoided, could result in death or serious injury

❗ **NOTICE**
Property damage message or malfunction

ⓘ **Note:**
Additional information

💡 **Tip:**
Recommended action

Contents

1 General safety instructions

For your own safety, follow these instructions concerning the mounting, start up, and operation of the device:

– The device is to be mounted, started up or operated only by trained and experienced personnel familiar with the product.
According to these mounting and operating instructions, trained personnel refers to individuals who are able to judge the work they are assigned to and recognize possible dangers due to their specialized training, their knowledge and experience as well as their knowledge of the applicable standards.

– Any hazards that could be caused in the valve by the process medium and the operating pressure or by moving parts are to be prevented by taking appropriate precautions.

– The device is designed for use in low voltage installations.
For wiring and maintenance, you are required to observe the relevant safety regulations. Only use protective equipment that can be protected against unintentional reconnection of the power supply.

– Before wiring the actuator, disconnect it from the power supply.

To avoid damage to any equipment, the following also applies:

– Proper shipping and storage are assumed.

Note:
Devices with a CE marking fulfill the requirements of the Directives 2004/108/EC and 2006/95/EC.
The Declaration of Conformity is available on request.

2 Design and principle of operation

The TROVIS 5725-7 is a combination of a linear actuator with fail-safe action and an integrated digital controller.
The combination is especially designed for heating applications as well as for fixed set point control of heating systems in small to medium-sized buildings. It is particularly suitable for mounting to SAMSON Types 3213, 3214, 3260, 3222, and 3226 Valves.
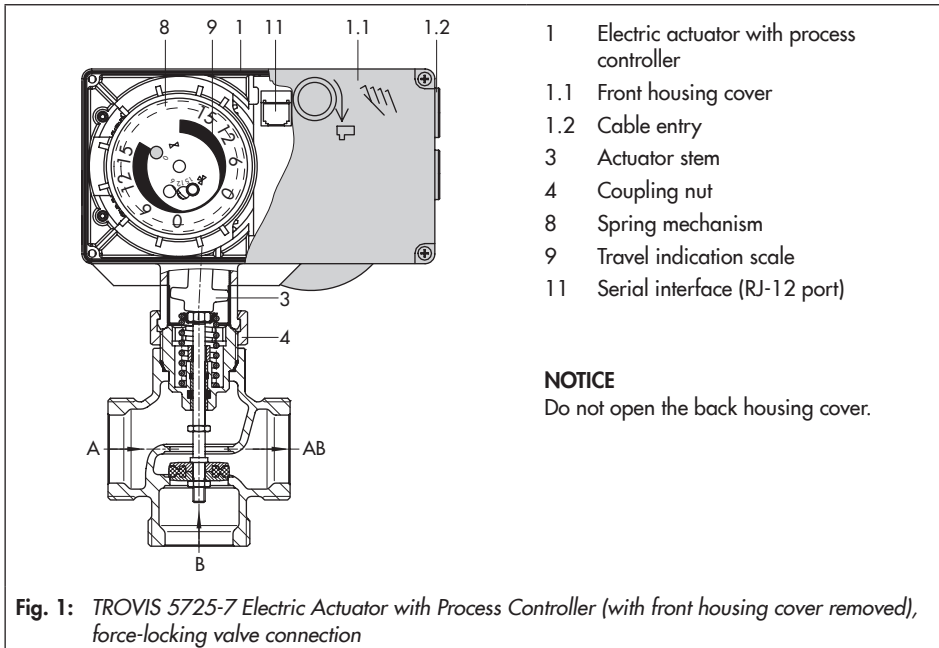
The digital controller is connected to a flow sensor on the input side, which can be optionally upgraded by a return flow, outdoor or room sensor.

In addition to the Pt 1000 input, the digital controller has a potentiometer input (1000 to 1100 Ω or 1000 to 2000 Ω) to measure the flow temperature. This input influences the heating characteristic in the case of outdoor-temperature-controlled control and the room temperature set point in the case of fixed set point control with room temperature influence.
The heating characteristic and set point can be changed over the TROVIS-VIEW configuration software.
The actuator contains a reversible synchronous motor and a maintenance-free gear.

1	Electric actuator with process controller
1.1	Front housing cover
1.2	Cable entry
3	Actuator stem
4	Coupling nut
8	Spring mechanism
9	Travel indication scale
11	Serial interface (RJ-12 port)

NOTICE
Do not open the back housing cover.

Fig. 1: *TROVIS 5725-7 Electric Actuator with Process Controller (with front housing cover removed), force-locking valve connection*

The force-locking version is connected directly to the valve using a coupling nut (4), whereas the form-fit version is connected to the valve using a stem connector.

The force of the electric motor is transmitted via gearing and crank disk to the actuator stem (3) and, as a result, to the plug stem of the mounted valve.
The motor is switched off by torque-dependent switches in the end positions or in case of overload.

The electric actuator also contains a spring mechanism (8) and an electromagnet. The actuator moves to the fail-safe position when the electromagnet is de-energized. This causes the coupling between gear and actuator motor to disengage. The actuator stem is completely extended by the spring mechanism. A mounted globe valve is closed (fail-safe position).

> **!** **NOTICE**
> *Do not use the magnet to control the valve position.*

Manual override of the actuator stem is possible, after removing the front cover, using a 4 mm Allen key (see section 5.1).

Typetesting

The force-locking version of the electric actuators with process controller with fail-safe action is tested by the German Technical Inspectorate (TÜV) according to DIN EN 14597.
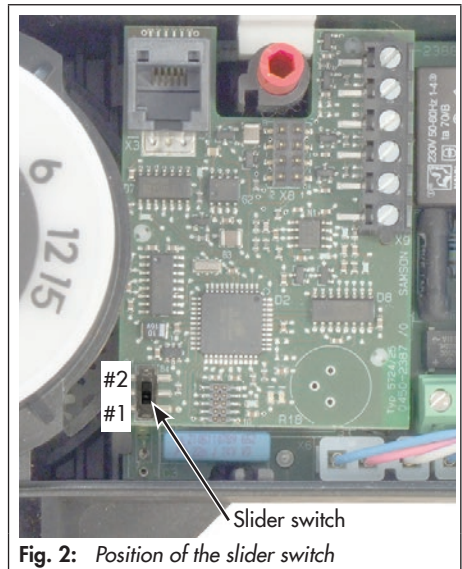The register number is written on the nameplate.

Slider switch

Fig. 2: *Position of the slider switch*

The slider switch inside the actuator allows you to switch between two different configurations and parameters #1 and #2.

In both levels #1 and #2, the functions described in section 7 can be activated and the associated parameter settings made. The default settings is the same for both levels #1 and #2, except for function block F13.

Changes to functions and parameters can be made over the TROVIS-VIEW software (see section 8).

The position of the slider switch determines which function and parameter settings (level #1 or #2) is used for closed-loop operation.

2.1 Accessories

Heating applications (see section 7)

– **Type 5267-2 Contact Sensor (Pt 1000)**
Permissible temperatures:
Medium   −20 to 120 °C
Ambient   −20 to 120 °C
Degree of protection IP 42

– **Type 5257-7 Room Panel (Pt 1000)
with potentiometer and mode selector
switch**
Permissible temperatures:
Medium   −20 to 60 °C
Ambient   −20 to 60 °C
Degree of protection IP 30

– **Type 5227-2 Outdoor Sensor (Pt 1000)**
Permissible temperatures:
Medium   −35 to 85 °C
Ambient   −35 to 85 °C
Degree of protection IP 44

Communication, see sections 8 and 9
– TROVIS-VIEW configuration software for
TROVIS 5725-7 Electric Actuator with
Process Controller, order no. 6661-1067
– **Hardware package** with accessories for
direct and indirect data transmission
(including memory pen (1400-9753),
connecting cable and modular adapter),
order no. 1400-9998
– **Memory pen–64** for indirect data
transmission and data logging, order no.
1400-9753

2.2 Technical data

TROVIS .... Electric Actuator with Process Controller	5725					
	-710	-715	-720	-725	-730	-735
Connection to valve	Force-locking				Form-fit	
Rated travel	6 mm		12 mm		15 mm	
Transit time for rated travel	35 s		70 s		90 s	
Transit time for fail-safe action	4 s		6 s		7 s	
Fail-safe action, stem	Extends	Retracts	Extends	Retracts	Extends	Retracts
Thrust	500 N				280 N	
Power supply	230 V (±10 %), 50 Hz					
Power consumption	Approx. 5 VA					
Manual override	Possible [1]					
Permissible temperatures [4]						
Ambient	0 to 50 °C					
Storage	−20 to 70 °C					
Degree of protection	IP 54 [2]					
Class of protection	II					
Electromagnetic compatibility	According to EN 61000-6-2, EN 61000-6-3 and EN 61326					
Weight	Approx. 1.3 kg					
Compliance	CE · EHC					

[1] Manual override using 4 mm Allen key (after removing the front cover); actuator always returns to fail-safe position after release.

[2] Up to device index **.03** only when the actuator is installed in the upright position. See last two figures of the configuration ID written on the nameplate (see page 43), e.g. Var.-ID xxxxxxx.**xx**, for the device index.

[3] Maximum 130 °C up to device index **.03**.
See last two figures of the configuration ID written on the nameplate (see page 43), e.g. Var.-ID xxxxxxx.**xx**, for the device index.

[4] The permissible medium temperature depends on the valve on which the electric actuator with process controller is mounted. The limits in the valve documentation apply.
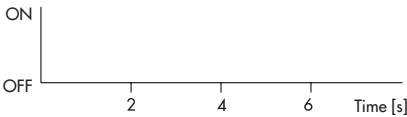
2.3 LED blinking pattern

The device has a red and a yellow LED which indicate the operating states of the device.
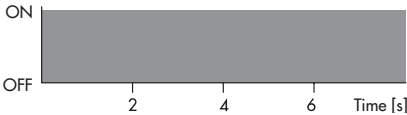
The LEDs are located underneath the front cover on top of the circuit board.

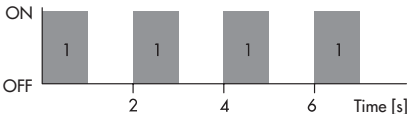**Blinking pattern of the yellow LED**

– Device switched off or command mode

– Device switched on or memory pen action completed.

– Active return flow temperature limitation or plausibility error in memory pen.

– Preparing to read data from memory pen.
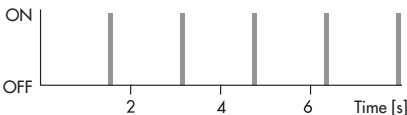
– Preparing to write data to memory pen.
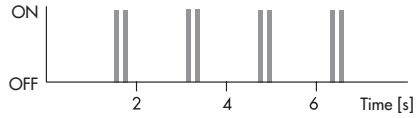
– Preparing data logging.
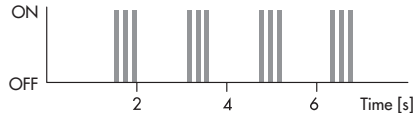
– Data logging in progress.
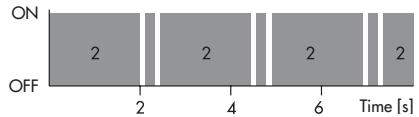
– EEPROM error in memory pen
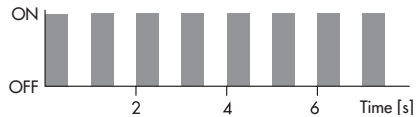
Blinking pattern of the red LED

– Device switched off, normal operation or command mode
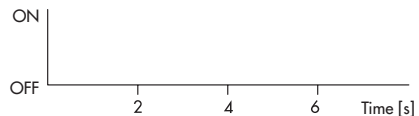
– Device is starting up or limit switch error
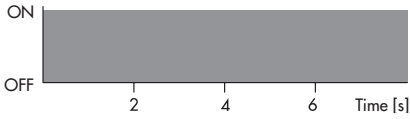
– Exceptional error or sensor line breakage
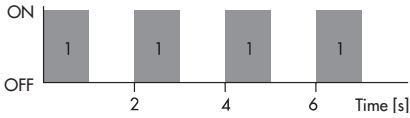
– EEPROM error in device
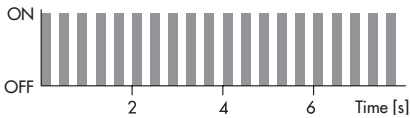
– Stem synchronization
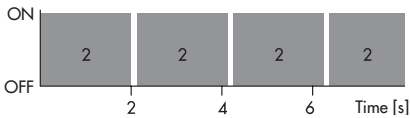
– Internal transit time measurement
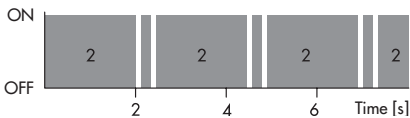
– Flow sensor defective
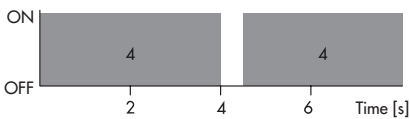
– Outdoor/room sensor defective
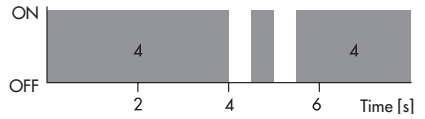
– Return flow sensor defective
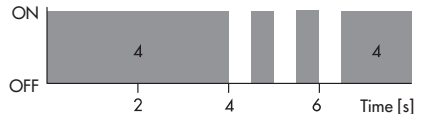
– Potentiometer defective
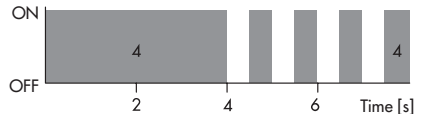
3 Attachment to the valve

The actuator is mounted either directly onto the valve (force-locking) or using a stem connector (form-fit) depending on the valve version used.

3.1 Force-locking attachment

Fail-safe action "actuator stem extends"

1. Unscrew front cover and place a 4 mm Allen key on the red actuating shaft.

2. Retract the actuator stem: Turn Allen key counterclockwise only and only as far as the end position which is at the point where the torque-dependent limit contact is activated (switching off the motor).

! **NOTICE**
Turning the actuator too far will destroy it.

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3. Hold Allen key in place and fasten valve and actuator together using the coupling nut (tightening torque 20 Nm). Remove Allen key and carefully refasten the front cover.

Fail-safe action "actuator stem retracts"

Place the actuator on the valve connection and tighten coupling nut (tightening torque 20 Nm).
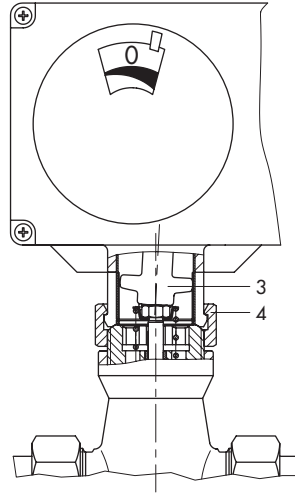
3 Actuator stem
4 Coupling nut

Fig. 3: *Force-locking attachment, e.g. to Type 3222 Valve*

3.2 Form-fit attachment

1. Place the actuator on the rod-type yoke (15) and tighten the coupling nut (4) (tightening torque 20 Nm).

2. Place actuator with rod-type yoke on the valve and tighten the nut (17) (min. tightening torque 150 Nm).

3. Pull up the plug stem until it contacts the actuator stem.

4. Position the clamps of the stem connector (16) included in the accessories on the ends of the actuator stem and plug stem and screw tight.

4   Coupling nut
15 Yoke
16 Stem connector
17 Nut

Fig. 4: *Form-fit attachment, e.g. to Type 3260 Valve, DN 50 and larger*
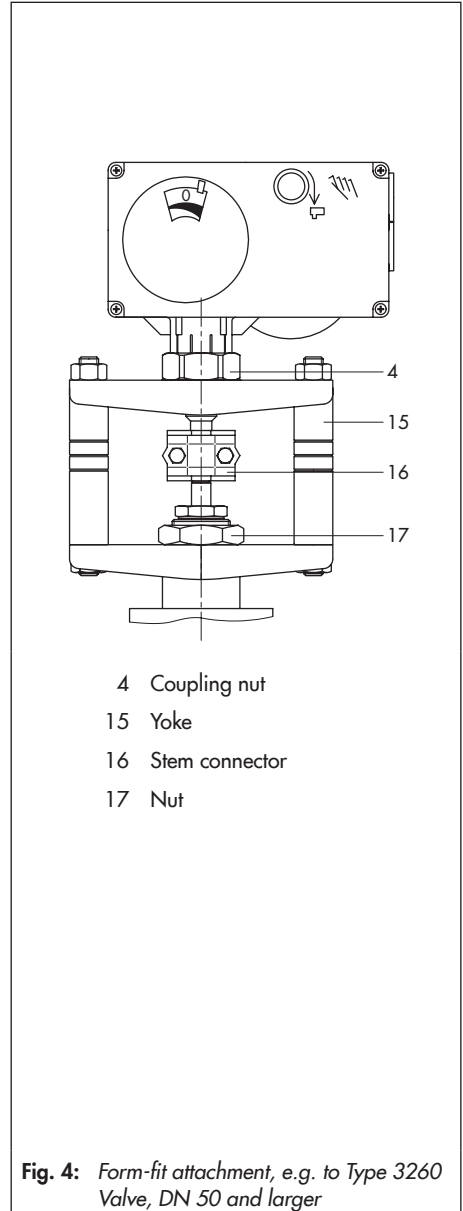
3.3 Mounting position

The control valve can be installed in the pipeline in any desired position. However, a suspended mounting position of the actuator is not permissible (see Fig. 5).
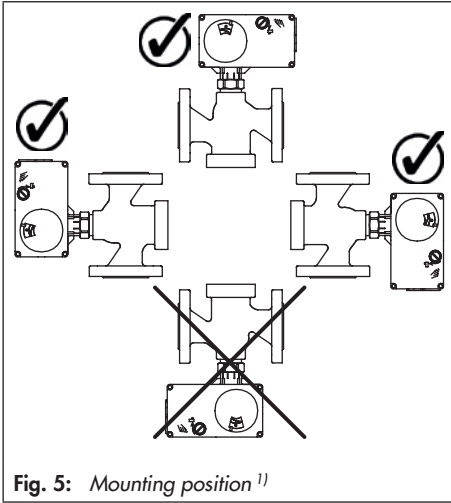
Fig. 5: *Mounting position [1]*

[1] The degree of protection IP 54 can only be achieved up to device index **.03** when the actuator is installed in the upright position. See last two figures of the configuration ID written on the nameplate (see page 43), e.g. Var.-ID xxxxxxx**.xx**, for the device index.

3.4 Travel indication scale

The travel indication scale has two opposed scales. Which scale is to be used depends on the valve version (Fig. 6):

Globe valves and three-way <u>diverting</u> valves

The driving pin is in position 0 (delivered state).

Three-way <u>mixing</u> valves

Remove scale, turn it and replace it so that the pin is positioned over the appropriate hole (6, 12 or 15) corresponding to the rated travel (6, 12 or 15 mm travel).

Hole for driving pin with three-way **<u>mixing</u>** valve

Driving pin in position 0, location of scale with globe or three-way **<u>diverting</u>** valves (delivered state)
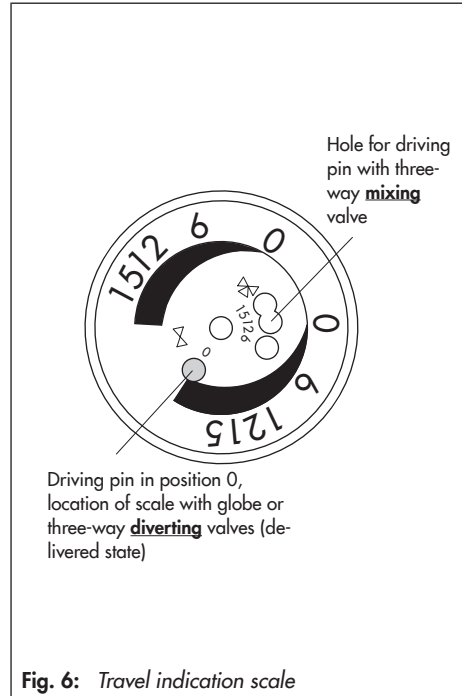
Fig. 6: *Travel indication scale*

4 Electrical connection

⚠ **DANGER!**
Upon installation of the electric cables, you are required to observe the regulations concerning low-voltage installations according to DIN VDE 0100 as well as the regulations of your local power supplier.
Use a suitable power supply which guarantees that no dangerous voltages reach the device in normal operation or in the event of a fault in the system or any other system parts. Connect the actuator to the electrical network only after the power supply is first switched off. Make sure the power cannot be switched on unintentionally.
The pump output L' is non-floating (230 V~).

The actuator requires a Pt 1000 temperature sensor (e.g. Type 5267-2) to be connected to measure the flow temperature.

Depending on the control task, an outdoor sensor (e.g. Type 5227-2) or room panel (e.g. Type 5257-7) can be connected. They can all be combined with a return flow sensor (e.g. Type 5267-2).

Additionally, the actuator has a potentiometer input 1000 to 1100 Ω (e.g. Type 5257-7) or 1000 to 2000 Ω. This input is used to correct the room set point (±5 K) in case of fixed set point control with room temperature influence (see section 7.2). On using an outdoor sensor, it can change the adjusted heating characteristic (see 7.1).

The non-floating switching output can alternatively be used as a binary output for a demand for an externally required signal.

The connected sensors are monitored for line breakages.

A fault in the line of a sensor is indicated by the red LED blinking (underneath the cover on top of the circuit board). Each sensor has its own blinking pattern (see section 2.3).

In the event that several sensors are defective, the LED blinks using the sequence for the sensor with the highest priority:

Highest priority	Flow sensor
↓	Outdoor sensor or room sensor
	Return flow sensor
Lowest priority	Potentiometer

Example: In the event that the flow sensor and outdoor sensor are defective, the LED initially blinks to indicate that the flow sensor is defective. When this fault is eliminated, the LED then blinks to indicate that the outdoor sensor is defective.

Perform the electrical connection depending on the application according to one of the following wiring diagrams (Fig. 7/Fig. 8). As soon as the actuator is connected to the power supply, the initialization procedure starts.

The actuator stem extends and the red and yellow LEDs are illuminated located under the front cover on top of the circuit board. As soon as the actuator stem has reached the final position, the red LED is turned off. The yellow LED remains illuminated and indicates that the actuator is ready to operate.

Application with flow sensor (VS), return flow sensor (RüS) and outdoor sensor (AS) and potentiometer functioning as set point adjuster

230 V, 50 Hz

NOTICE
Live wire.

Application with flow sensor (VS), return flow sensor (RüS) and outdoor sensor (AS) and binary input to switch between operating modes

230 V, 50 Hz

NOTICE
Live wire.

Fig. 7: *Electrical connections (part 1)*
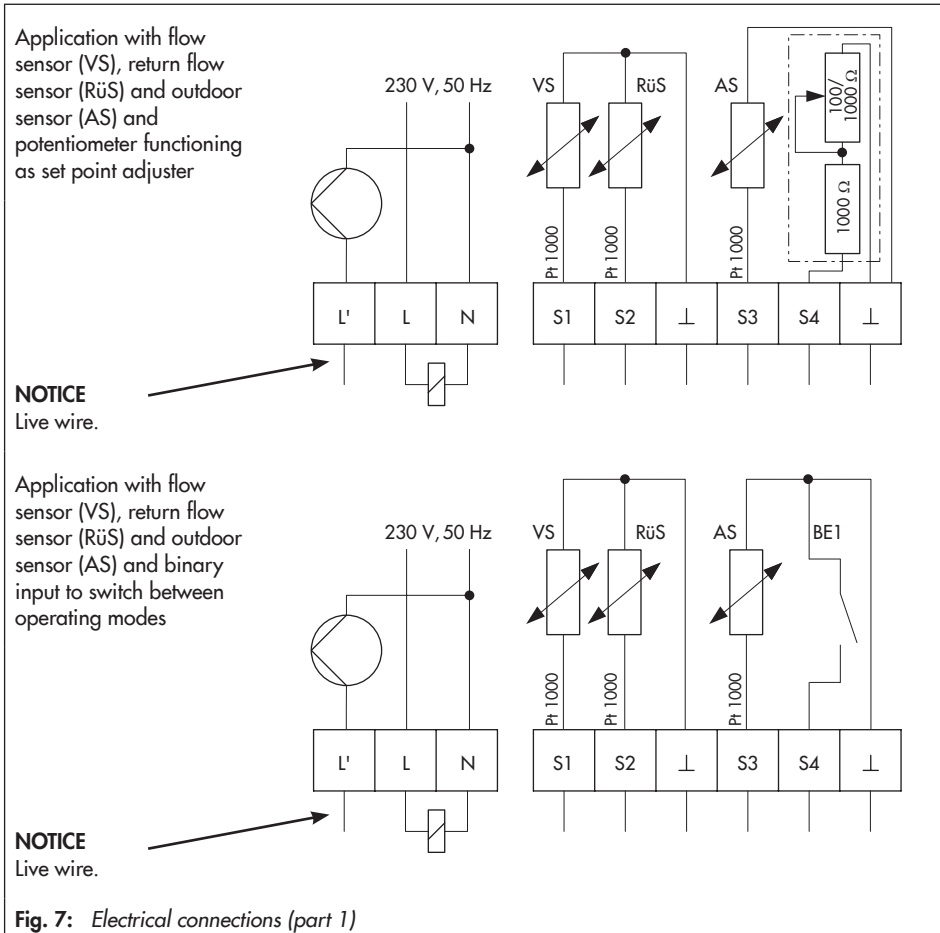
Application with flow
sensor (VS) and outdoor
sensor (AS)

230 V, 50 Hz   VS   BE2   AS   BE1

Pt 1000   Pt 1000

L'   L   N   S1   S2   ⊥   S3   S4   ⊥
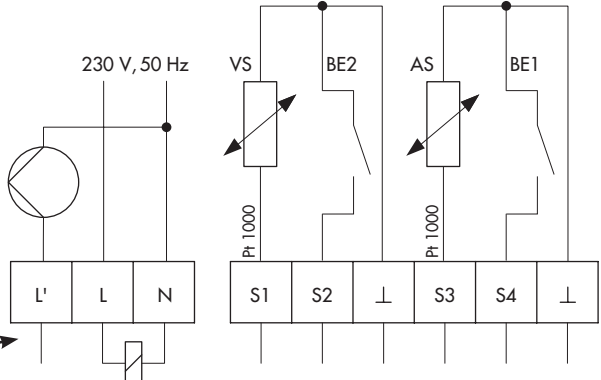
NOTICE
Live wire.

Application with flow
sensor (VS), return flow
sensor (RüS) and room
sensor with mode selector
switch and room set point
adjuster

230 V, 50 Hz   VS   RüS

Type 5257-7
Room Panel

1   2   3   4

Pt 1000   Pt 1000

L'   L   N   S1   S2   ⊥   S3   S4   ⊥
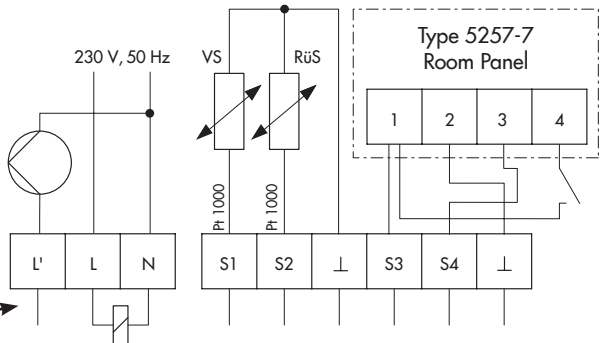
NOTICE
Live wire.

Fig. 8: *Electrical connections (part 2)*

5 Manual operation without TROVIS-VIEW

5.1 Changing the travel position

Travel and direction of action can be read off the scale of the travel indicator.

⚠️ **DANGER!**
Risk of electric shock due to energized device.

1. Unscrew front cover and place a 4 mm Allen key on the red actuating shaft.

2. Turn Allen key counterclockwise only and only as far as the end position which is at the point where the torque-dependent limit switch is activated (switching off the synchronous motor).

❗ **NOTICE**
Turning the actuator too far will destroy it.

Once the magnet has been released, the spring mechanism pushes the actuator stem back to the fail-safe position.

3. Remove Allen key and carefully refasten the front cover.

Fig. 9: *Travel indication scale and handwheel*

Travel indication scale   Handwheel under front cover

6 Dimensions in mm

TROVIS 5725-710/-715/-720/-725

eL   Retracts
aL   Extends

TROVIS 5725-730/-735

Fig. 10: *TROVIS 5725-7 Electric Actuator with Process Controller*
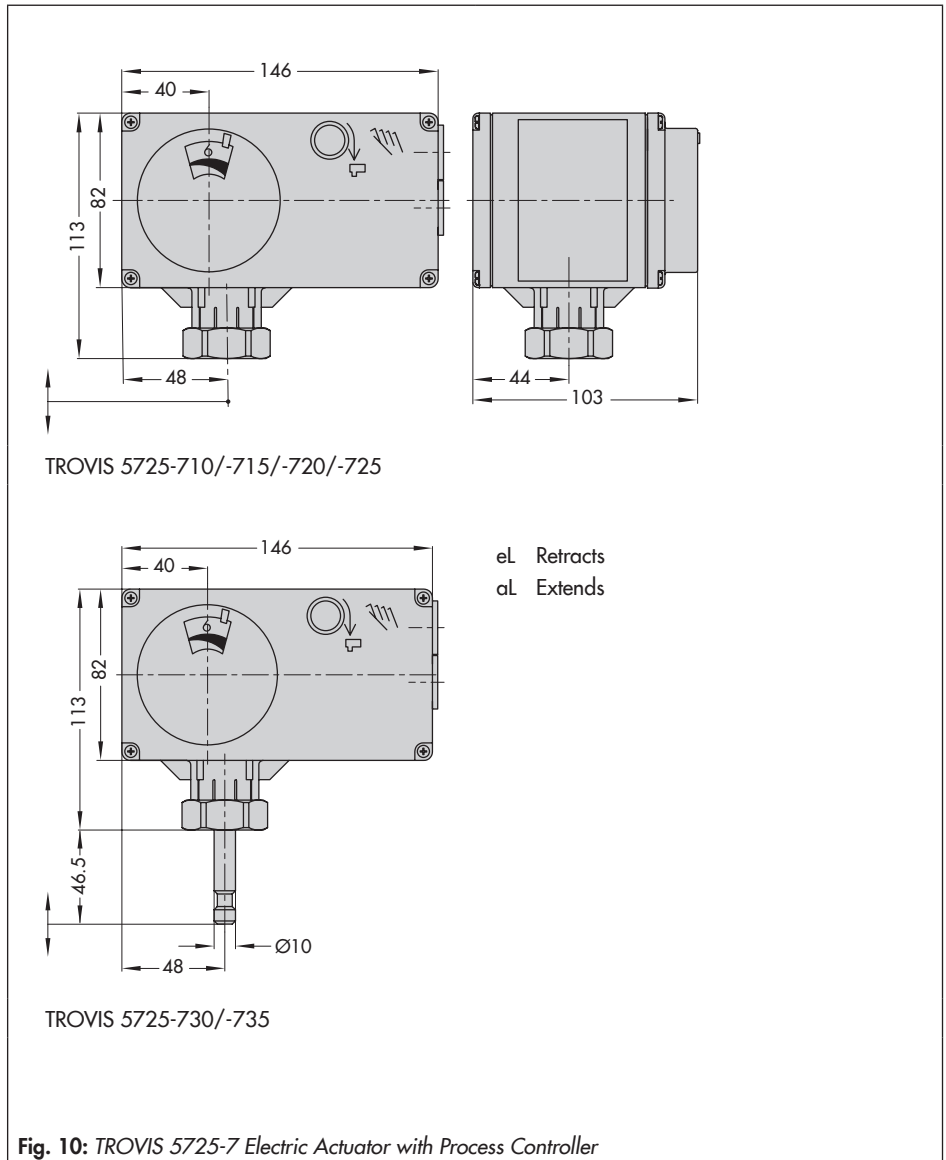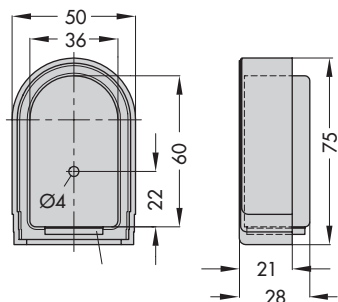
Type 5227-2 Outdoor Sensor (Pt 1000)
Color: RAL 9016

Type 5257-7 Room Panel (Pt 1000)

☀ Continuous day mode (rated operation)

☾ Continuous night mode (reduced operation)

❄ Off/frost protection
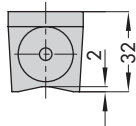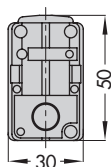
Type 5267-2 Contact Sensor (Pt 1000)
(flow and return flow temperature measurement)

Fig. 11: *Accessories for heating control*

7 Functions

Functions and parameters are entered in the TROVIS-VIEW Operator Interface separately for level #1 and level #2 (see section 8).

7.1 Outdoor-temperature-controlled control

When outdoor-temperature-controlled control is used, the flow temperature (t_A) is controlled according to the outdoor temperature. The heating characteristic in the controller defines the flow temperature set point as a function of the outdoor temperature (Fig. 12).

Basically, the following rule applies: a decrease in the outdoor temperature causes the flow temperature to increase. By varying the *Gradient* and *Level* parameters, the characteristic can be adapted to individual requirements: An increased *Gradient* causes an increase in flow temperature, whereas a reduced *Gradient* causes a lower flow temperature. The *Level* parameter shifts the heating characteristic parallel upwards or downwards.

In reduced operation, the flow temperature is reduced by the amount set in *Flow temperature set-back in reduced operation*.

The *Max. flow temperature* and *Min. flow temperature* parameters limit the flow temperature range. **Return flow temperature limitation** (see section 7.5) is an exception as it can reduce the flow temperature without restriction down to 20 °C flow temperature set point.
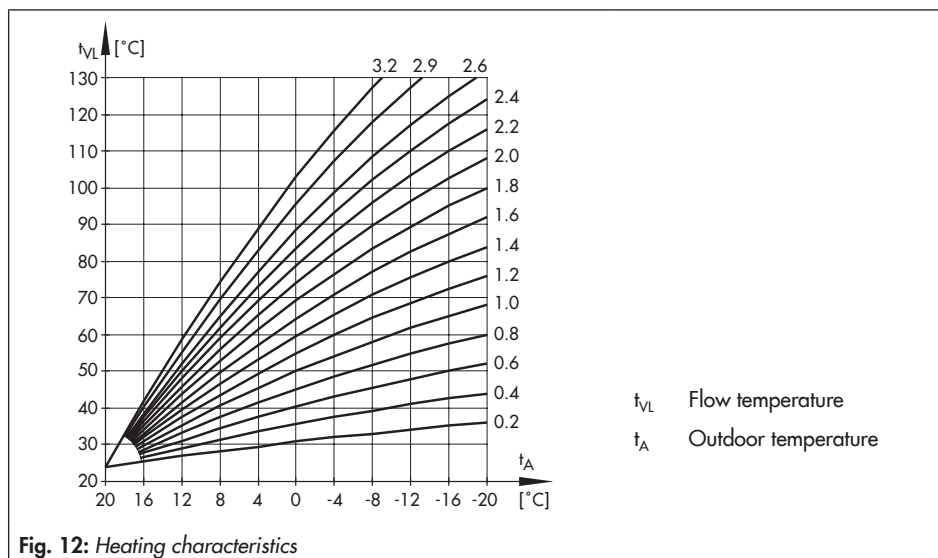
Fig. 12: *Heating characteristics*

Functions	WE	Configuration
F01 – Control mode	1	F01 - 1
F02 – Selecting the reference variable	0	F02 - 0

Parameters	WE	Value range
P02 – Flow temperature set-back in reduced operation	15 K	0 to 50 K
P03 – Min. flow temperature	20 °C	0 to 150 °C
P04 – Max. flow temperature	120 °C	0 to 150 °C
P05 – Heating characteristic gradient	1.6	0.2 to 3.2
P06 – Heating characteristic level	0 K	−30 to 30 K

Examples for adjusting the characteristic:

– Old building, radiator design 90/70:   Gradient approx. 1.8

– New building, radiator design 70/55:   Gradient approx. 1.4

– New building, radiator design 55/45:   Gradient approx. 1.0

– Underfloor heating depending on arrangement: Gradient smaller than 0.5

AS	Outdoor sensor	UP	Circulation pump (heating)
RüS	Return flow sensor	RL	District heating return flow
VS	Flow sensor	VL	District heating supply

Fig. 13: *Sample application: Outdoor-temperature-controlled flow temperature control with return flow temperature limitation; with binary contact (BI1) to switch between operating modes*
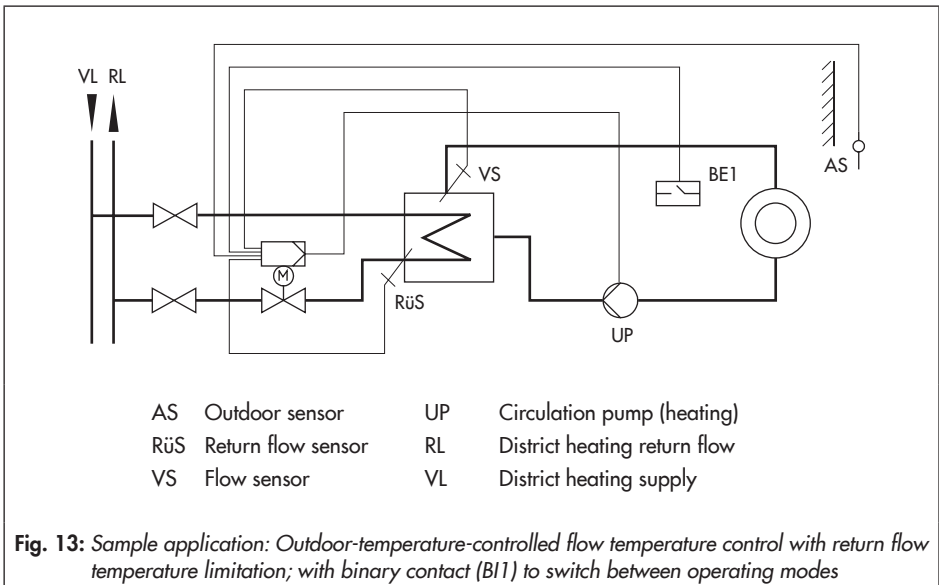
7.1.1 Override using potentiometer

The potentiometer input can change either the heating characteristic level or gradient, depending on the configuration. The *Gradient shift range via potentiometer* and *Level shift range via potentiometer* parameters are used to adjust the range (±) in which the override is to take place.

Functions	WE	Configuration
F05 – Potentiometer input	0	F05 - 1
F06 – Resistance range of potentiometer	0	F06 - 0: 1000 to 1100 Ω
		F06 - 1: 1000 to 2000 Ω
F07 – Function of potentiometer	0	F07 - 0: Level shift
		F07 - 1: Gradient shift

Parameters	WE	Value range
P07 – Gradient shift range via potentiometer	1.0	0.0 to 1.5 (only with F07 - 1)
P08 – Level shift range via potentiometer	15 K	0 to 30 K (only with F07 - 0)

Examples:

– **Function of potentiometer F07 - 0**
  Heating characteristic gradient P05 = 1.6
  Gradient shift range via potentiometer P07 = 1.0
  $\Rightarrow$ The gradient can be shifted between 0.6 and 2.6 (±1.0).
– **Function of potentiometer F07 - 1**
  Heating characteristic level P06 = 0 K
  Level shift range via potentiometer P08 = 15 K
  $\Rightarrow$ The level can be adjusted between −15 K and +15 K (±15 K). The limits adjusted for the flow temperature still apply.

7.1.2 Summer mode

If the outdoor temperature exceeds the *Outdoor temperature limit value (rated operation/reduced operation)*, the controller switches off the heating, i.e. the valve is closed and the circulation pump is switched off after the *Pump lag time* (P23) has elapsed.
The heating is switched on again when the outdoor temperature falls below the *limit*.

Parameters	WE	Value range
P17 – Outdoor temperature limit value at rated operation	22 °C	0 to 50 °C
P18 – Outdoor temperature limit value at reduced operation	15 °C	0 to 50 °C
P23 – Pump lag time	5 min	1 to 999 min

7.1.3 Delayed outdoor temperature adaptation

The calculated outdoor temperature is used to determine the flow temperature set point. The heat response is delayed when the outdoor temperature either increases or decreases.
If the outdoor temperature varies by, for example, 12 °C within a very short period of time, the calculated outdoor temperature is adapted to the actual outdoor temperature in small steps. Assuming a *Delay time of outdoor temperature* of 3 °C/h, the linear adaptation would take t = $\frac{12\,°C}{3\,°C/h}$ = 4 h.

ⓘ **Note:**
The delayed outdoor temperature adaptation helps avoid unnecessary overloads of central heating stations in combination with either overheated buildings occurring, for example, due to warm winds, or temporarily insufficient heating due to the outdoor sensor being exposed to direct sunshine.

Functions	WE	Configuration
F04 – Delayed outdoor temperature	0	F04 - 1

Parameters	WE	Value range
P16 – Delay time for outdoor temperature	3 °C/h	1 to 6 °C/h

7.2 Fixed set point control

The flow temperature is controlled to the fixed value in Flow temperature set point. In reduced operation, the flow set point is used for the control reduced by the amount in *Flow temperature set-back in reduced operation*. A connected outdoor sensor does not have any affect on the control.

Functions	WE	Configuration
F01 – Control mode	1	F01 - 0

Parameters	WE	Value range
P01 – Flow temperature set point	70 °C	0 to 150 °C
P02 – Flow temperature set-back in reduced operation	15 K	0 to 50 K

ⓘ **Note:**
The return flow limitation and the potentiometer override are still active when configured correspondingly.

RS	Room sensor
RüS	Return flow sensor
VS	Flow sensor

UP	Circulation pump (heating)
RL	District heating return flow
VL	District heating supply

Fig. 14: *Sample application: Control with reference variable (room temperature) and return flow temperature limitation; switching between operating modes at room panel RS (Type 5257-7)*
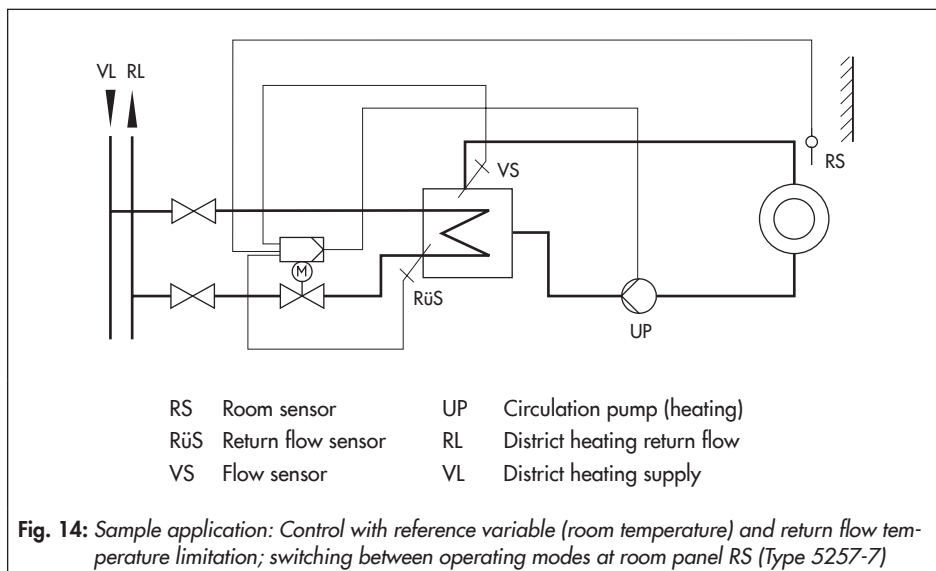
7.2.1 Control with reference variable (room temperature)

On connecting a **Type 5257-7 Room Panel**, the *Flow temperature set point* is influenced by the room temperature:

A permanently active flash adaptation adapts the supply of heat to the required demand. The room sensor is polled at regular intervals (*Time interval flash adaptation*). If the room temperature is lower than the *Room temperature set point at rated operation* or *Room temperature set point at reduced operation*, the flow temperature is raised based on the *Flow temperature set point*.

If the room temperature exceeds the room temperature set point (rated operation/reduced operation) by the amount in *Max. room temperature boost for switch-off*, the heating is switched off, i.e. the valve is closed and the circulation pump is switched off after the *Pump lag time* has elapsed.

The set point of the flow temperature is not affected when the P22 parameter (*Time interval flash adaptation*) is set to 0. The heating deactivation remains active when the room temperature exceeds the value in *Room temperature set point* (P19/P20) plus *Room temperature boost for switch-off* (P21).

> ⓘ **Note:**
> – *We recommend not to select a value that is too low for parameter P22. In particular, in cases where cooling loads, such as drafts or open windows, affect the control process, short cycles usually have a negative effect. The heating is directly switched off after the cooling stops.*
> – *The set points for room temperature entered in TROVIS-VIEW can be reduced or raised by 5 K at the room panel (F05 - 1).*

Functions	WE	Configuration
F01 – Control mode	1	F01 - 1
F02 – Selecting the reference variable	0	F02 - 1
F05 – Potentiometer input	0	F05 - 1

Parameters	WE	Value range
P01 – Flow temperature set point	70 °C	0 to 150 °C
P19 – Room temperature set point at rated operation	20 °C	10 to 40 °C
P20 – Room temperature set point at reduced operation	15 °C	10 to 40 °C
P21 – Room temperature boost for switch-off	2 K	1 to 6 K
P22 – Time interval for flash adaptation	10 min	0 to 100 min
P23 – Pump lag time	5 min	1 to 999 min

7.3 Changing the operating modes

7.3.1 Switchover using binary input

The electric actuator with process controller can be configured to allow one of two active binary inputs to determine which operating mode is used. Depending on the configuration, the following applies:

Binary input BI1:   F08 - 0   Open binary input BI1 – Rated operation
Closed binary input BI1 – OFF/Frost protection

F08 - 1   Open binary input BI1 – Rated operation
Closed binary input BI1 – Reduced operation

Binary input BI2   F12 - 0   Open binary input BI2 – Rated operation
Closed binary input BI2 – OFF/Frost protection

F12 - 1   Open binary input BI2 – Rated operation
Closed binary input BI2 – Reduced operation

ⓘ *Note:*
*A Type 5257-7 Room Panel **cannot** be connected when binary input BI1 is active (see section 7.3.3). The binary input BI2 can be used, provided a return flow sensor is not activated.*

Functions	WE	Configuration
Binary input BI1:		
F05 – Potentiometer input	0	F05 - 0
F08 – Function of binary input BI1	0	F08 - 0: Rated operation and OFF/Frost protection
		F08 - 1: Rated and reduced operation
Binary input BI2		
F11 – Return flow temperature sensor	1	F11 - 0
F12 – Function of binary input BI2	0	F12 - 0: Rated operation and OFF/Frost protection
		F12 - 1: Rated and reduced operation

7.3.2 Switchover using room panel

The operating mode is determined at the mode selector switch on the Type 5257-7 Room Panel:

☀ Rated operation (day mode)

☾ Reduced mode (night mode)

❄ OFF/frost protection

Functions	WE	Configuration
F05 – Potentiometer input	0	F05 - 1
F06 – Resistance range of potentiometer	0	F06 - 0 (Type 5257-7 Room Panel)

7.3.3 Switchover using binary input in room panel

The terminals 1 and 4 of the Type 5257-7 Room Panel can be bridged by means of an external floating contact (e.g. by a time switch with downstream contactor relay with floating make or break contact). This enables the controller to switch to the rated operation mode ☾ when the mode selector switch is set to reduced operation ❄ or OFF/Frost protection ☼. The following applies:

– BI break contact Operating mode is the same as the mode set at the mode selector switch

– BI make contact Operating mode is rated operation, regardless of the mode set at the mode selector switch

Functions	WE	Configuration
F05 – Potentiometer input	0	F05 - 1
F06 – Resistance range of potentiometer	0	F06 - 0 (Type 5257-7 Room Panel)

7.4 Frost protection

If the controller is in the operating mode OFF/Frost protection (see section 7.3), frost protection measures are initiated if the following applies:

– Outdoor temperature <3 °C (outdoor-temperature-controlled control)
The flow set point is set to 20 °C. The binary output remains activated until the outdoor temperature rises above 3.5 °C.

– Flow temperature <15 °C (control with reference variable (room temperature))
The flow set point is set to 20 °C. The binary output remains activated for 5 minutes. After that, the heating is deactivated when the flow temperature is higher than 15° C.

7.5 Return flow temperature limitation

The temperature difference between the flow and return flow in a network indicates how well the energy is used. A return flow sensor is sufficient to evaluate the temperature difference when the flow temperatures are predefined.
The return flow temperature can be limited either to a value depending on the outdoor temperature (variable) or to a fixed set point. The *Flow temperature set point* is reduced when the temperature measured at the return flow sensor exceeds the *Max. return flow temperature*. The reduction amount is calculated from the deviation of the return flow temperature multiplied by the factor *Kp return flow temperature limitation*. The rate at which the return flow

temperature is reduced by the calculated amount is determined by *Tn return flow temperature limitation*.

The yellow LED blinks slowly if the flow temperature is reduced due to the **Return flow temperature limitation** function

Functions	WE	Configuration
F11 – Return flow temperature sensor	1	F11 - 1

Parameters	WE	Value range
P13 – Max. return flow temperature	50 °C	10 to 90 °C
P14 – Kp return flow temperature limitation	1.0	0.1 to 50.0
P15 – Tn return flow temperature limitation	400 s	0 to 999 s

7.6 Pump forced operation

A deactivated circulation pump is forced-operated every 24 hours for one minute. This function is deactivated by selecting F10 - 0 or F09 - 1.

Functions	WE	Configuration
F09 – Function of switching output	0	F09 - 0
F10 – Anti-block protection of pump	1	F10 - 1

7.7 External heat demand

The electric actuator can issue a heat demand to a higher-level controller over the switching output in rated or reduced operation. In this case, a coupling relay (contactor relay with floating contact) must be used to adapt the electrical connection.

This function is only possible when the switching output is not configured as a pump output.

Functions	WE	Configuration
F09 – Function of switching output	0	F09 - 1

7.8 Control principle

The electric actuator functions with a PI algorithm (three-step control). The valve reacts to pulses which the actuator receives from the integrated digital controller when a system deviation occurs. In particular, the length of the first pulse depends on the system deviation and the selected gain *Kp flow temperature control* (P09) (the pulse length increases as the Kp rises). Pulse lengths and intervals change until the system deviation is zero again. The interval be-

tween individual pulses is influenced considerably by the reset time *Tn flow temperature control* (P10) (the interval time increases as the Tn rises).

The valve transit time *Ty actuator transit time for valve travel* (P11) reflects the time that the valve needs to move through the range from 0 to 100 % without stopping. The default setting is 35 s.

Travel	Transit time
6 mm	35 s
12 mm	70 s
15 mm	90 s

ⓘ **Note:**
The default setting is based on a travel of 6 mm. The transit time must be adjusted for the required travel range. Alternatively, it can be determined (see section 8.1.2).

The Dead band (P12) determines the reaction in steady state, i.e. the actuator is not active if the controlled variable moves within the dead band.

Parameters	WE	Value range
P09 – Kp flow temperature control	2.0	0.1 to 50.0
P10 – Tn flow temperature control	120 s	0 to 999 s
P11 – Ty actuator transit time for valve travel	35 s	10 to 240 s
P12 – Dead band (switching range)	2.0 %	0.5 to 5.0 %

7.9 Direction of action

Increasing/increasing (F03 - 0)

– Actual value < Set point: actuator stem retracts
– Actual value < Set point: actuator stem extends

Increasing/decreasing (F03 - 1)

– Actual value < Set point: actuator stem extends
– Actual value > Set point: actuator stem retracts

Actuator stem extends

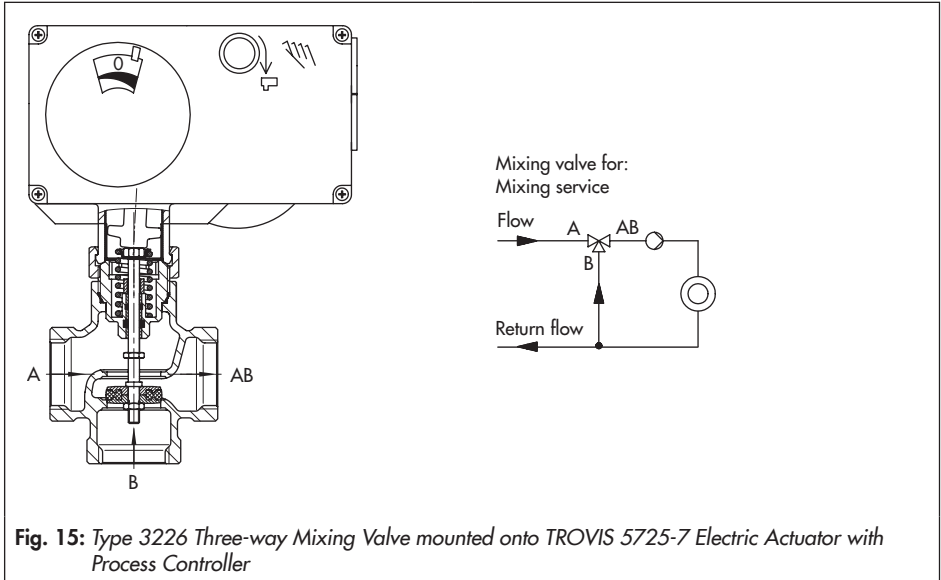|	
With globe valves:	Valve closed
For three-way mixing valves:	Port A -> AB open, B -> AB closed (see Fig. 15)
For three-way diverting valves:	Port AB -> A closed, AB -> B open

Fig. 15: *Type 3226 Three-way Mixing Valve mounted onto TROVIS 5725-7 Electric Actuator with Process Controller*

Actuator stem retracts

With globe valves: Valve open

For three-way mixing valves: Port A -> AB closed, B -> AB open (see Fig. 15)

For three-way diverting valves: Port AB -> A open, AB -> B closed

Functions	WE	Configuration
F03 – Direction of stem action	0	F03 - 0: Increasing/increasing >>
		F03 - 1: Increasing/decreasing <>

7.10 Manual mode

## 7.10.1 Handwheel

See section 5.1.

7.10.2 Command mode

A memory pen can be configured in TROVIS-VIEW to be a command pen. The command pen allows the actuator stem to be moved to the open and closed positions.

ⓘ *Note:*
The action of retracting/extending the actuator stem on inserting the command pen has absolute priority. The input signal is overridden.

The configuration of the memory pen is explained in ▶ EB 6661.

7.10.3 Function block F13 for manual mode

The electric actuator can be transferred into the manual operation mode while the actuator is closed loop operation over function block F13. In manual operation mode, the switching output (with F09 - 0) can be switched to "I" (ON) and the position of the actuator stem can be controlled, depending on the configuration of function block F05 over the binary input BI1 or over the potentiometer.

Open loop control with binary input BI1 (F05 - 0)

– Increasing/increasing (F03 - 0):	BI make contact	The actuator stem retracts.
	BI open	The actuator stem extends.
– Increasing/decreasing (F03 - 1):	BI make contact	The actuator stem extends.
	BI open	The actuator stem retracts.

Open loop control with potentiometer (F05 - 1)

– Increasing/increasing (F03 - 0):	0 %	The actuator stem extends.
	100 %	The actuator stem retracts.
– Increasing/decreasing (F03 - 1):	0 %	The actuator stem retracts.
	100 %	The actuator stem extends.

ⓘ *Note:*
If just one level is used for closed loop control, the slider switch (section 2) can be used to switch over to manual operation mode, provided the setting of function F13 varies in level #1 and level #2. For example, if the function block F13 - 0 is configured for level #1, the closed loop control is performed according to the specifications in level #1 when the slider switch is positioned at #1. When the slider switch is positioned at #2, the electric actuator moves to manual operation, provided the function block F13 - 1 is configured in level #2.

Functions	WE	Configuration
F13 Manual operation	0 [1]	F13 - 1

[1] The default setting F13 - 1 applies for level #2.

7.10.4 Manual level in TROVIS-VIEW

The manual level can only be entered when "Specialist" is selected as the user level. See ▶ EB 6661.

You can switch the actuator to the manual mode using the TROVIS-VIEW Configuration and Operator Interface if the manual level is enabled in online mode (Release of manual level parameter = ON (◆ icon)).
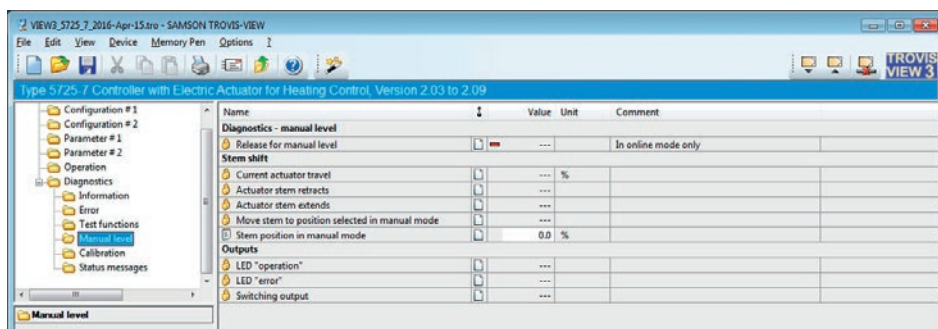
The following actions are possible in the manual level:

– Retract actuator stem
– Extend actuator stem
– Move the stem to position selected in manual mode
  (first enter the required value in Stem position in manual mode)
– LED operation
– Switching output

The electric actuator leaves the manual operation mode as soon as you exit the manual level or the online mode in TROVIS-VIEW.

8 Device-specific readings and functions of the TROVIS-VIEW software

The TROVIS-VIEW software is explained in detail in the Operating Instructions ▶ EB 6661. Select [?] menu in the software to access these instructions or download them from the SAMSON website (www. samson.de).

This section describes the device-specific readings and functions which are not covered in the Operating Instructions ▶ EB 6661.

8.1 Operating values

Operation values (for example, the flow temperature or the switching output state) can be read in the Operation values folder in the TROVIS-VIEW software

ℹ️ *Note:*
– The user level is set to "Customer" by default in TROVIS-VIEW. The current user level is displayed on the status bar. When the user level is set to "Specialist", additional data points are displayed in the Operation and Diagnostics folders as well as in the Test functions, Calibration and Status messages subfolders.
– Change the user level to "Specialist" by selecting User Level in Device menu. See ▶ EB 6661.
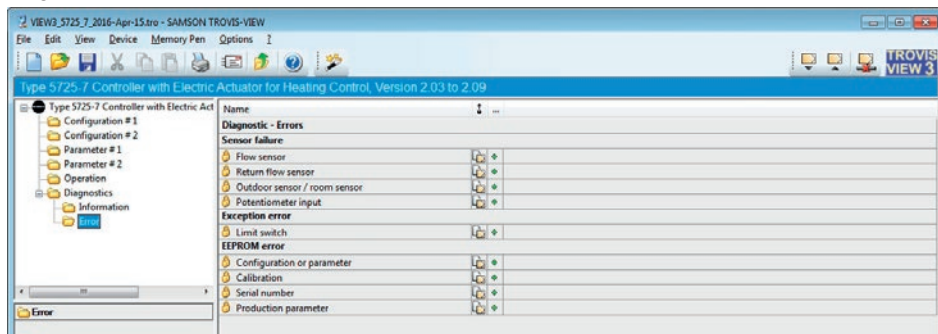
8.1.1 Diagnostics

The Diagnostics folder contains the Information and Error subfolders.

Information
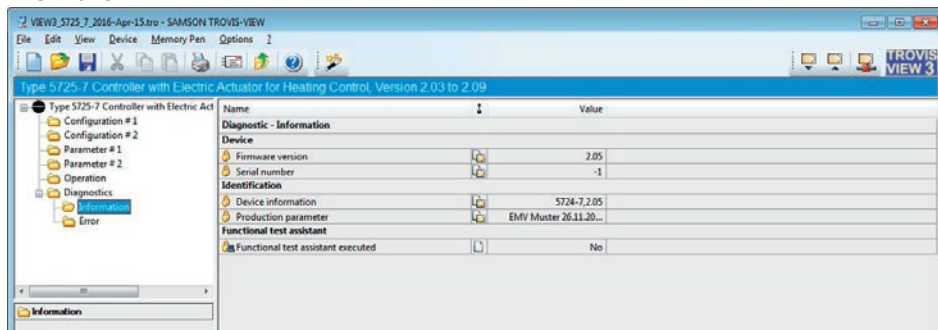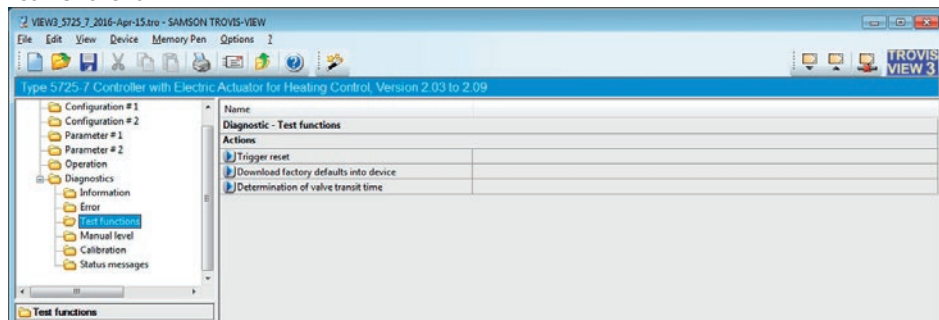

Error

ⓘ *Note:*
In the "Specialist" user level, the EEPROM error, Motor data and Elapsed hours meter are additionally displayed.
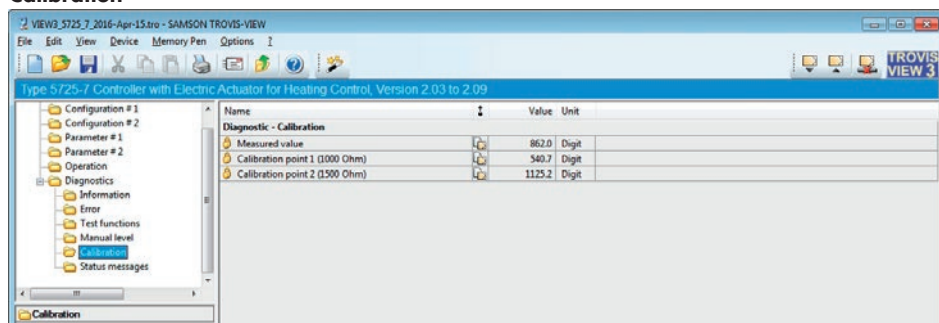
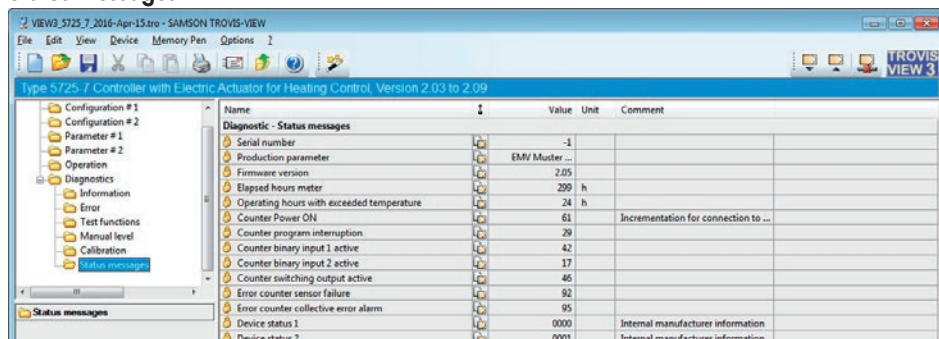## 8.1.2   Additional diagnostics folders in the "Specialist" user level

Test functions

Manual level: see section 7.10.4 for description.

Calibration

Status messages

8.2 SAMSON memory pen

The SAMSON memory pen serves as a data carrier and is able to load and save data in its non-volatile memory.

Used in conjunction with the TROVIS 5725-7 Electric Actuator with Process Controller, various functions of the memory pen are available:

- **Read data from the memory pen**
- **Write data to the memory pen**
- **Command mode** (retract actuator stem, extend actuator stem, manual operation using potentiometer or binary input)
- **Data logging** to save the following data:
  - Flow temperature
  - Return flow temperature
  - Binary input state
  - Switching output state
  - Position of the slider switch
  - Flow temperature set point
  - Set point reduction
  - Operating state
  - Cause for operating status
  - Remaining time for pump lag
  - Remaining time until anti-block protection of pump
  - Limit switch status
  - Current position of the actuator stem
  - Current correction value for closed loop control
  - P component from closed loop control
  - I component from closed loop control
  - Temperature inside device

The data are logged until the memory capacity of the memory pen is full.

Data in the memory pen can be saved as a data logging file using the TROVIS-VIEW software.

The configuration of the memory pen is explained in ▶ EB 6661.

8.3 Functional test assistant

To establish communication, the serial interface of the computer must be connected to the serial interface port of the electric actuator using the SAMSON connecting cable.

The functional test is performed with the help of an online wizard.
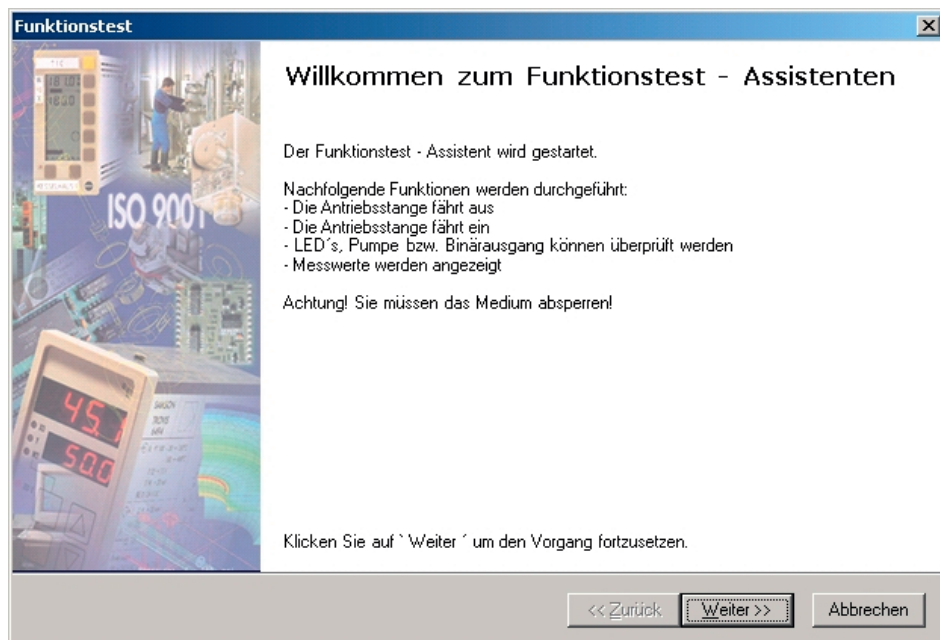
The following functions can be executed by selecting Functional test in Device menu or by clicking in the device toolbar:

– The actuator stem extends.

– The actuator stem retracts.

– LEDs, pump or switching output can be checked

– Measured data are shown.

9 Configuration lists and customer data

9.1 Function block list

ⓘ *Note:*
There are separate two configuration levels #1 and #2. Both configuration levels contain the functions F01 to F13 with the specified default settings and meanings.

The function blocks F01 to F13 have the following listed functions:
F = Function block · WE = Default setting · 0 = OFF, 1 = ON

F	Function	WE	Meaning
01	Control mode	1	0 – Fixed set point control → Section 7.2
			1 – Control with reference variable → Section 7.1
02	Selecting the reference variable (only effective when F01 - 1)	0	0 – Outdoor sensor → Section 7.1
			1 – Room sensor → Section 7.2.1
03	Direction of stem action	0	0 – Increasing/increasing >> → Section 7.9
			1 – Increasing/decreasing <> → Section 7.9
04	Delayed outdoor temperature (only effective when F01 - 1 and F02 - 0)	0	0 – Without delay
			1 – With delay → Section 7.1.3
05	Potentiometer input	0	0 – Inactive, binary input 1 active → Section 7.3.1
			1 – Active → Sections 7.1.1, 7.3.2, and 7.3.3
06	Resistance range of potentiometer (only effective when F05 - 1)	0	0 – Type 5257-7 Room Panel (1000-1100 ohm) → Sections 7.3.2 and 7.3.3
			1 – Remote adjuster (1000-2000 ohm) → Section 7.1.1
07	Function of potentiometer (only effective when F02 - 0 and F05 - 1)	0	0 – Heating characteristic level shift → Section 7.1.1
			1 – Gradient shift → Section 7.1.1
08	Function of binary input BI1 (only effective when F05 - 0)	0	0 – BI1 short-circuited: OFF with frost protection → Section 7.3.1
			1 – BI1 short-circuited: Reduced operation → Section 7.3.1
09	Function of switching output	0	0 – BO as circulation pump control → Section 7.7
			1 – BO as heat demand → Section 7.7

F	Function	WE	Meaning
10	Anti-block protection of pumps (only effective when F09 - 0)	1	0 – No anti-block protection
			1 – When pumps are deactivated: switched on every 24 h for 1 min. → Section 7.6
11	Return flow temperature sensor	1	0 – Inactive, binary input 2 active → Section 7.3.1
			1 – Active, with return flow temperature limitation → Section 7.5
12	Function of binary input BI2 (only effective when F11 - 0)	0	0 – BI2 short-circuited: OFF with frost protection → Section 7.3.1
			1 – BI2 short-circuited: Reduced operation → Section 7.3.1
13	Manual mode	0 [1]	0 – Inactive, closed-loop operation
			1 – Manual mode (absolute priority)

[1]   The default setting F13 - 1 applies for level #2.

9.2 Parameter list

ⓘ *Note:*
There are separate two parameter levels #1 and #2. Both parameter levels contain the functions P01 to P23 with the specified default settings and setting ranges.

The parameters have the setting ranges as listed below.
P = Parameter · WE = Default setting

P	Parameters	WE	Adjustment range		
01	Flow temperature set point	70 °C	0	to	150 °C
02	Flow temperature set-back in reduced operation	15 K	0	to	50 K
03	Min. flow temperature	20 °C	0	to	150 °C
04	Max. flow temperature	120 °C	0	to	150 °C
05	Heating characteristic gradient	1.6	0.2	to	3.2
06	Heating characteristic level	0 K	−30	to	30 K
07	Gradient shift range via potentiometer	1.0	0.0	to	1.5
08	Level shift range via potentiometer	15 K	0	to	30 K
09	Kp flow temperature control	2.0	0.1	to	50.0

P	Parameters	WE	Adjustment range		
10	Tn flow temperature control	120 s	0	to	999 s
11	Ty actuator transit time for valve travel	35 s	10	to	240 s
12	Dead band (switching range)	2.0 %	0.5	to	5.0 %
13	Max. return flow temperature	50 °C	10	to	90 s
14	Kp return flow temperature limitation	1.0	0.1	to	50.0
15	Tn return flow temperature limitation	400 s	0	to	999 s
16	Delay time for outdoor temperature	3.0 °C/h	1.0	to	6.0 °C/h
17	Outdoor temperature limit value at rated operation	22 °C	0	to	50 °C
18	Outdoor temperature limit value at reduced operation	15 °C	0	to	50 °C
19	Room temperature set point at rated operation	20 °C	10	to	40 °C
20	Room temperature set point at reduced operation	15 °C	10	to	40 °C
21	Max. room temperature boost for switch-off	2 K	1	to	6 K
22	Time interval for flash adaptation	10 min	0	to	100 min
23	Pump lag time	5 min	1	to	999 min

9.3   Customer setting

Function blocks			
		Performed setting	
F	**WE**	**#1**	**#2**
01	1		
02	0		
03	0		
04	0		
05	0		
06	0		
07	0		
08	0		
09	0		
10	1		
11	1		
12	0		
13	0 [1]		

[1]   The default setting F13 -
1 applies for level #2.

Parameters				
		Performed setting		
P	**WE**	**#1**	**#2**	**Adjustment range**
01	70 °C			0 to 150 °C
02	15 K			0 to 50 K
03	20 °C			0 to 150 °C
04	120 °C			0 to 150 °C
05	1.6			0.2 to 3.2
06	0 K			−30 to 30 K
07	1.0			0.0 to 1.5
08	15 K			0 to 30 K
09	2.0			0.1 to 50.0
10	120 s			0 to 999 s
11	35 s			10 to 240 s
12	2.0 %			0.5 to 5.0 %
13	50 °C			10 to 90 °C
14	1.0			0.1 to 50.0
15	400 s			0 to 999 s
16	3.0 °C/h			1.0 to 6.0 °C/h
17	22 °C			0 to 50 °C
18	15 °C			0 to 50 °C
19	20 °C			10 to 40 °C
20	15 °C			10 to 40 °C
21	2 K			1 to 6 K
22	10 min			0 to 100 min
23	5 min			1 to 999 min

10 Nameplate

	SAMSON 5725 - 1 CE 2 0062
samson	Controller with Electric Actuator
Var.-ID. 3	Model 4
Serial-No. 5	6
F: 7 s: 8 t: 9	13
U: 10 f: 11 P: 12	
Firmware-Version: 14	

Made in Germany

1 Type designation
2 Year
3 Configuration ID
4 Model designation
5 Serial no.
6 DIN register number
7 Thrust
8 Rated travel
9 Nominal transit time
10 Power supply
11 Rated frequency
12 Power consumption
13 Fail-safe action
     ⇂⧨ Extends   ⧩↿ Retracts
14 Firmware version
15 Inputs
16 Outputs

11 Customer inquiries

Please submit the following details:

– Type designation
– Configuration ID
– Serial no.
– Firmware version

12 Appendix

12.1 Resistance values with Pt 1000 resistors

°C	−35	−30	−25	−20	−15	−10	−5	0	5	10
Ω	862.5	882.2	901.9	921.6	941.2	960.9	980.4	1000.0	1019.5	1039.0

°C	15	20	25	30	35	40	45	50	55	60
Ω	1058.5	1077.9	1097.3	1116.7	1136.1	1155.4	1174.7	1194.0	1213.2	1232.4

°C	65	70	75	80	85	90	95	100	105	110
Ω	1251.6	1270.7	1289.8	1308.9	1328.0	1347.0	1366.0	1385.0	1403.9	1422.9

°C	115	120	125	130	135	140	145	150		
Ω	1441.7	1460.6	1479.4	1498.2	1517.0	1535.8	1554.5	1573.1		

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2018-05-17 · English