

Actuators for Electric Control Valves



SMART IN FLOW CONTROL

OUR EXPERTISE FOR YOU

Competence in valve engineering

Founded in 1907, SAMSON has since become a worldwide leader in the manufacture of expertly engineered control valves.

SAMSON has over 50 subsidiaries, amongst them noted manufacturers of special valves, such as AIR TORQUE, CERA SYSTEM, LEUSCH, PFEIFFER, RINGO VÁLVULAS, STARLINE and VETEC.

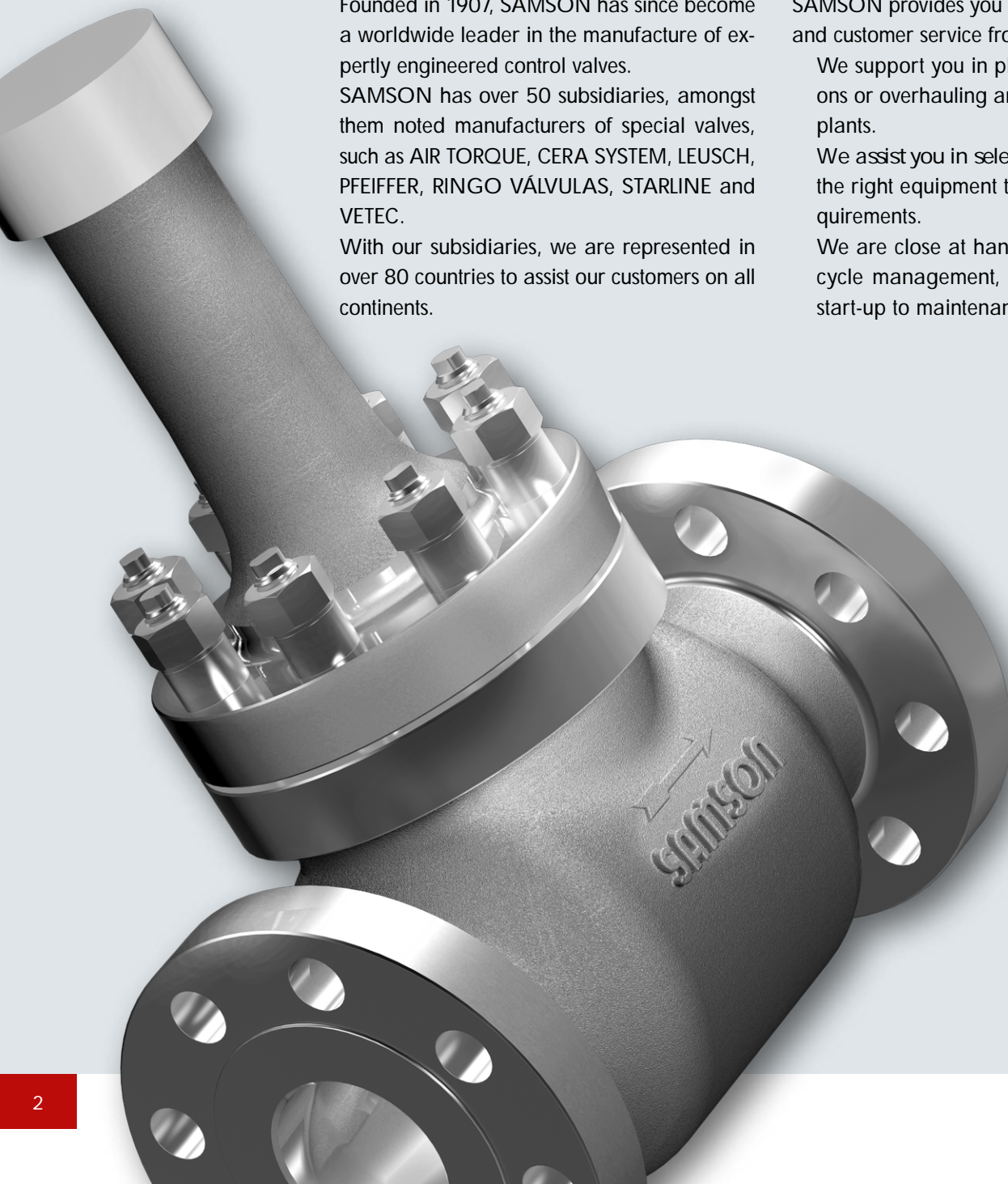
With our subsidiaries, we are represented in over 80 countries to assist our customers on all continents.

SAMSON provides you with valve engineering and customer service from a single source:

We support you in planning new installations or overhauling and expanding existing plants.

We assist you in selecting and configuring the right equipment to suit your control requirements.

We are close at hand to support your life cycle management, from installation and start-up to maintenance and service.





SAMSON develops and manufactures electric linear actuators for a wide variety of requirements. They are mainly used in industrial processes, HVAC applications as well as in district heating and cooling networks. Three basic actuator versions are available:

Three-step version

The actuator stem is reliably moved by an electric motor. Possible operating states are "Actuator stem extends", "Standstill", and "Actuator stem retracts". This basic actuator version is used in applications where only normal requirements are placed on the control accuracy of the electric control valve.

Version with positioner

The electric actuator comes with an integrated positioner. The movement of the actuator stem follows a continuous signal from 0/4 to 20 mA or 0/2 to 10 V. This allows a better control accuracy to be achieved compared to the three-step signal. Additional features (e.g. adjustable stroking speed, reversal of the direction of action, and blocking protection) allow the actuators with integrated positioner to be customized easily to your application.

Electric actuator with process controller

The functions of an electric actuator with integrated positioner and an input-connected digital controller have been combined into one unit in the TROVIS electric actuators with process controllers. Signals from the ready-wired sensors are processed directly in the actuator depending on the control function that has been configured. The actuators can be used in heating and cooling applications as well as in domestic hot water (DHW) systems.

Features of SAMSON electric actuators:

- Large number of different configurations (supply voltage, thrust, transit time, etc.)
- Easy installation
- Quick start-up
- Well thought-out operating scheme
- No maintenance required
- Torque-dependent limit switches
- Safety tested according to DIN EN 14597

ACTUATOR THRUST

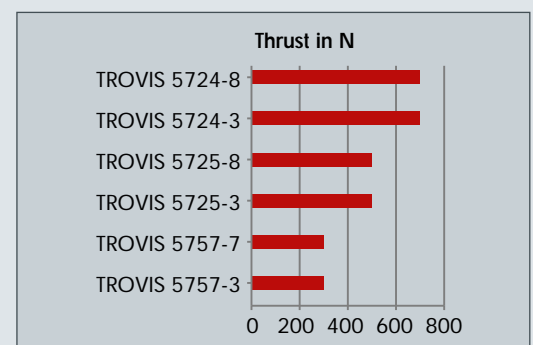
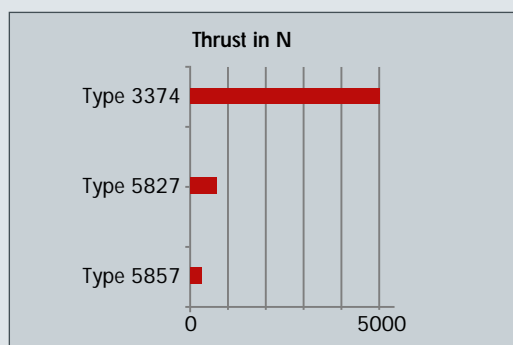
Optimal power for every valve

SAMSON offers different actuator types in different versions to match the wide valve range. Small valves in DN 15 as well as large valves in sizes up to DN 250 can be fitted with electric actuators. Small valve sizes with small rated travels require small actuator thrusts to hold the closure member in the closed position when the

valve is closed, for large valve sizes with large rated travels, large actuator thrusts are required. This is why SAMSON offers a wide variety of actuators, which generate the force needed to safely close a valve depending on its size but without deforming the actuator stem or damaging the closure member and valve seat.

Electric actuator	Type		
	3374	5827	5857
Max. thrust	2500 N	700 N	300 N

Electric actuator with process controller	TROVIS					
	5757-3	5757-7	5724-3	5724-8	5725-3	5725-8
Max. thrust	300 N	300 N	700 N	700 N	500 N	500 N

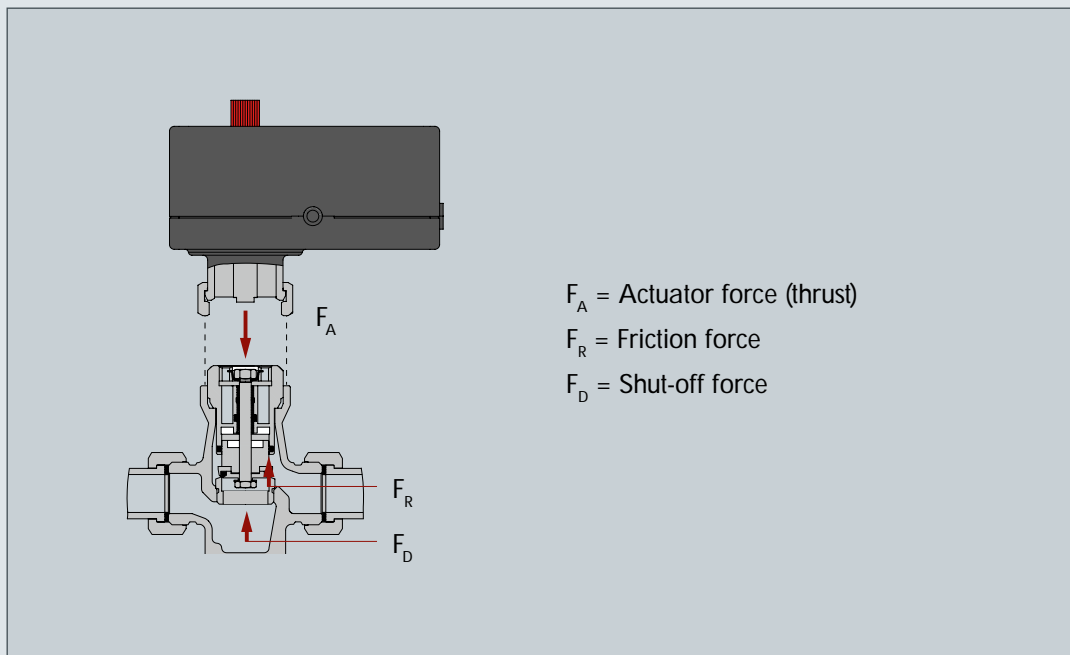




In detail: actuator thrust

The actuator's thrust acts on the valve's closure member through the actuator and valve stems and thus influences the flow rate across the valve. In valves with flow-to-open direction, the forces acting on the closure member are at their highest in the closed position. The medium pushes against the closure member, which only remains closed if the opposing thrust from the

actuator is high enough. As a result, the various SAMSON R&D departments cooperate closely in the development of electric actuators and valves. Actuators and valves are tailored perfectly to one another, which ensures that control valves shut off tightly at all times and that the leakage class demanded in the valve specifications is observed in the process.



TRANSIT TIME

Transit times tailored to every process

The requirements placed on how fast a valve opens and closes vary from process to process. The decisive factors that influence the time a valve needs to achieve the required control signal are the actuator's response time and the actuator stem's stroking speed. All SAMSON electric actuators come with fast response times. Only the stroking speeds can be selected: If fastest transit times are required for highest control accuracy or for immediate fail-close action, actuators versions that include a fast motor are the prime choice.

If the process does not require fast stroking speeds, there is no need for a fast, high-performance motor.

In some actuator versions, it is possible to adapt the transit time. It can be adjusted in several steps.

Electric actuator	Type		
	3374	5827	5857
Transit time	> 60 s	> 18 s	> 20 s
Adjustable	¹⁾	¹⁾	¹⁾
Transit time for fail-safe action	12 s	> 4 s	–

¹⁾ Version with positioner

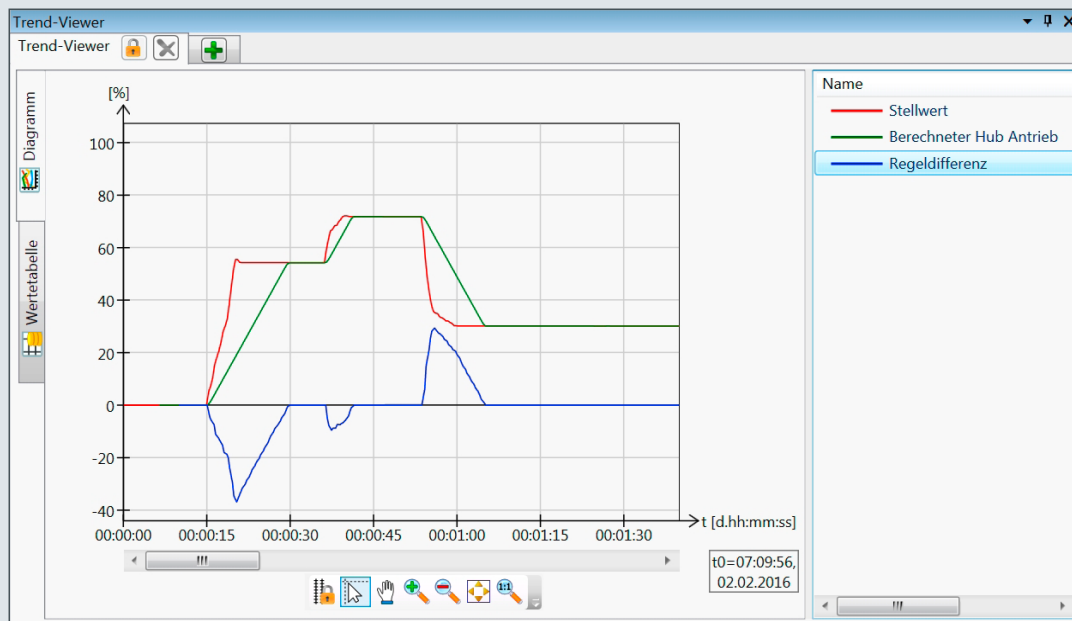
Electric actuator with process controller	TROVIS					
	5757-3	5757-7	5724-3	5724-8	5725-3	5725-8
Transit time	20 s	20 s	> 18 s	> 35 s	> 18 s	> 35 s
Transit time for fail-safe action	–	–	–	–	>4 s	> 4 s



In detail: control accuracy

Transit time and control accuracy are closely related. The faster the actuator reaches the required travel position, the higher the control accuracy of the entire process. SAMSON electric actuators have all it takes to achieve prime ratings in control accuracy:

The actuators are highly sensitive to even the smallest control signal changes and stroke the valve accordingly. The actuator versions and configurations can be selected to achieve the fastest transit times in the valve.



Visualization in the TROVIS-VIEW software: positioning value, travel, and set point deviation

High reliability in every plant

In control loops where higher safety requirements apply, the control valve must be fully closed or opened when a hazardous event occurs. This is why electric actuators are fitted with a mechanical spring mechanism, which retracts or extends the actuator stem when the springs are relieved of pressure to safely close or open the valve. This is the major difference between actuators with and without fail-safe

action: in actuators without fail-safe action, the actuator stem remains in its last position when the supply voltage fails. To guarantee that the valve reaches its fail-safe position in an emergency, the positioning force of the safety springs and the transit time for fail-safe action are perfectly tuned to one another.

Electric actuator	3374	Type 5827	5857
Fail-safe action ¹⁾	-/	-/	-

¹⁾ The version with fail-safe action "actuator stem extends" used in combination with SAMSON Types 42-36, 2488, 3213, 3214, 3222, and 3241 Valves is tested by TÜV according to DIN EN 14597.

Electric actuator with process controller	TROVIS					
	5757-3	5757-7	5724-3	5724-8	5725-3	5725-8
Fail-safe action ¹⁾	-	-	-	-		

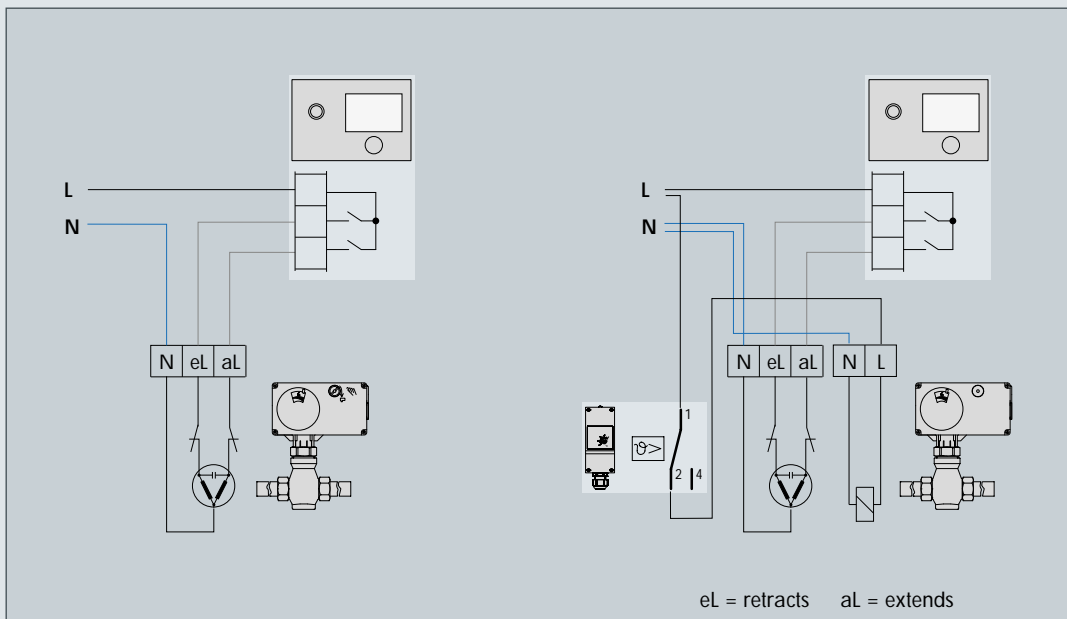
¹⁾ The version with fail-safe action "actuator stem extends" used in combination with SAMSON Types 42-36, 2488, 3213, 3214, 3222, and 3241 Valves is tested by TÜV according to DIN EN 14597.



In detail: district heating plants conforming to DIN 4747

The standard application in the district heating field includes a heating controller and electric control valve with a three-step actuator. Depending on the network parameters and domestic installations, it may be necessary to use a version with fail-safe action according to DIN 4747, which protects inhabitants and the system. For example, the highest priority has a safety temperature monitor (STM), which

ensures that the control valve tested according to DIN EN 14597 is closed when an excessive temperature occurs. A globe valve is closed on demand if it is used in combination with an actuator with fail-safe action „Actuator stem extends“.



Sample electrical wiring of a three-step actuator without (left) and with fail-safe action (right)

OPERATION

Easy-to-use operating controls for every action

SAMSON focuses on the operator. As a result, electric actuators offer maximum convenience in terms of operation:

The current actuator travel can be read off directly from the actuator, either from a scale or a display.

The manual override in actuators without fail-safe action is easily accessible.

Automatic initialization allows the actuator to be adapted to the valve quickly.

Actuators can be configured using a rotary pushbutton and codes on the display or conveniently using the SAMSON TROVIS-VIEW software.

Errors are clearly indicated either by an LED or on the display.

Electric actuator	Type		
	3374	5827	5857
Travel indicator			
Manual override		–/	
Automatic initialization	¹⁾	¹⁾	¹⁾
Rotary pushbutton and LCD	¹⁾	–	–
TROVIS-VIEW software	¹⁾	¹⁾	¹⁾
LEDs as status indicators	–	¹⁾	¹⁾

¹⁾ Version with positioner

Electric actuator with process controller	TROVIS					
	5757-3	5757-7	5724-3	5724-8	5725-3	5725-8
Travel indicator						
Manual override					–	–
Automatic initialization						
Operating keys and display	–	–	–		–	
TROVIS-VIEW software						
LEDs as status indicators						



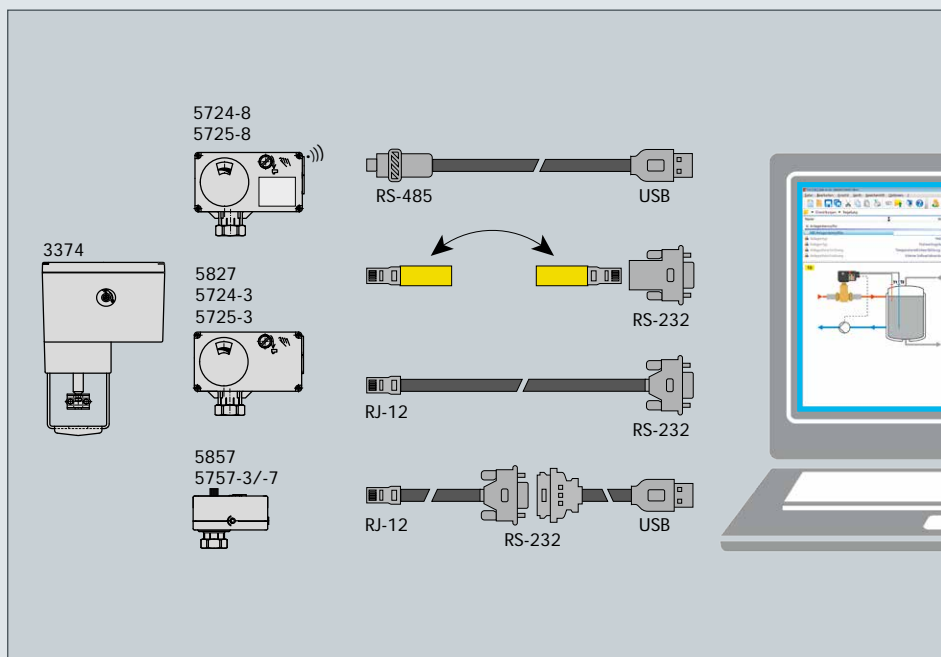
In detail: operation

TROVIS-VIEW provides a uniform user interface that allows users to configure and parameterize various SAMSON devices using device-specific database modules.

Function and parameter settings can be saved to files, archived, and transmitted to the electric actuator over an interface adapter. In online mode, process data of the connected actuator and the device status can be displayed. Extensive documentation to monitor the valve's condition is achieved by logging actuator data. For example, the Trend-Viewer function tracks process data over time. The actuator is connecting using the serial interface or a USB port of a computer; the TROVIS 5724-8 and 5725-8 Electric Actuators with Process Controllers can also be connected using RS-485.

For almost all electric actuator versions with positioner and electric actuators with process controllers, data can be saved to a memory pen as well. The saved data can be imported into other actuators and standard computer programs. Depending on the configuration of the memory pen, process data can be recorded to assess them at a later stage.

In command mode, it is also possible to retract or extend the actuator stem with the memory pen.



OPTIONS

Optional accessories for every application

Electric actuators are subject to numerous requirements that vary considerably depending on the application. In cases where the standard actuator version cannot meet the control demands, SAMSON electric actuators can be fitted with an extensive range of optional accessories.

The SAMSON product range includes special control and sensor accessories for the electric actuators with process controllers that have proven reliable and useful in heating, cooling, and DHW applications. They make it significantly easier to engineer the control loop and start up the control valve.

Electric actuator		Type		
		3374	5827	5857
Limit contacts	Mechanical			-
	Electronic	¹⁾	-	-
Resistance transmitters				-
Modbus			-	-

¹⁾ Version with positioner

Electric actuator with process controller	TROVIS					
	5757-3	5757-7	5724-3	5724-8	5725-3	5725-8
Switching output						
Modbus	-	-	-		-	
Temperature sensors (Pt 1000)				¹⁾		¹⁾
Water flow sensor		-		-		-

¹⁾ Standard (ready wired on the electric actuator with process controller)



In detail: optional accessories

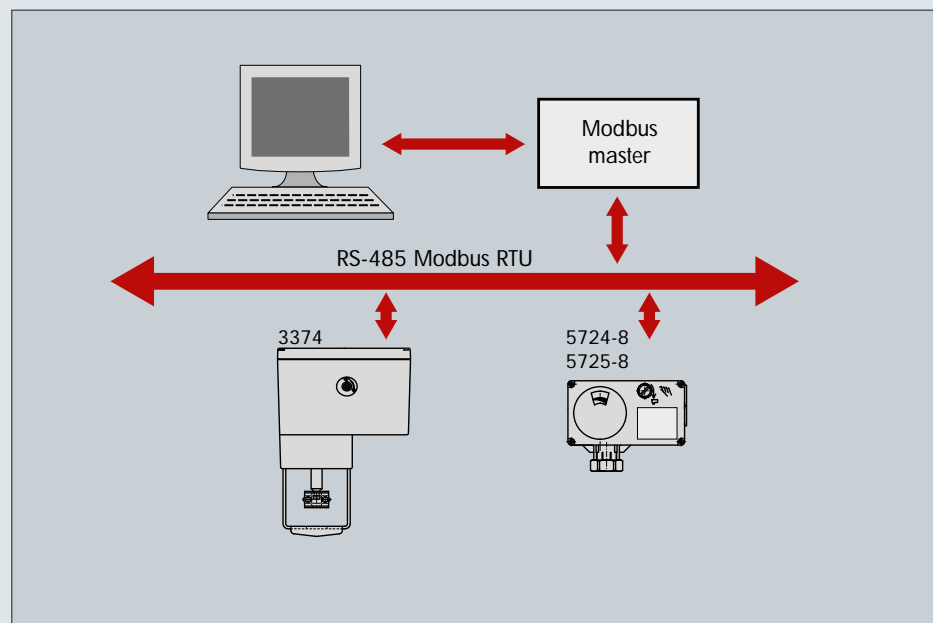
Limit contacts – Electronic and mechanical limit contacts issue a signal to the control system when the valve reaches one of two adjustable limits. Contrary to mechanical limit contacts, electronic limit contacts can easily be adjusted on the device or using the TROVIS-VIEW software.

Resistance transmitters – Resistance transmitters are used on three-step actuator versions. Since they are connected to the gearing, they can feed back the valve position as a resistance value between 0 and 1000 Ω , which is proportional to the travel.

Switching output – The switching output can be used as a pump output, a fault alarm output, or – in DHW applications – as an output to report when hot water is tapped.

Modbus – Modbus can be used to connect the actuator to the control station or a SAM DIGITAL business application. This turns the electric control valve into a unit suitable for Industry 4.0 environments, which is capable of receiving and transmitting data.

Temperature sensors and water flow sensor – Temperature sensors are available for all applications where electric actuators with process controllers are used. In DHW, the water flow sensor can detect when and how much hot water is tapped.



Modbus topology

ELECTRIC ACTUATORS FOR EVERY APPLICATION

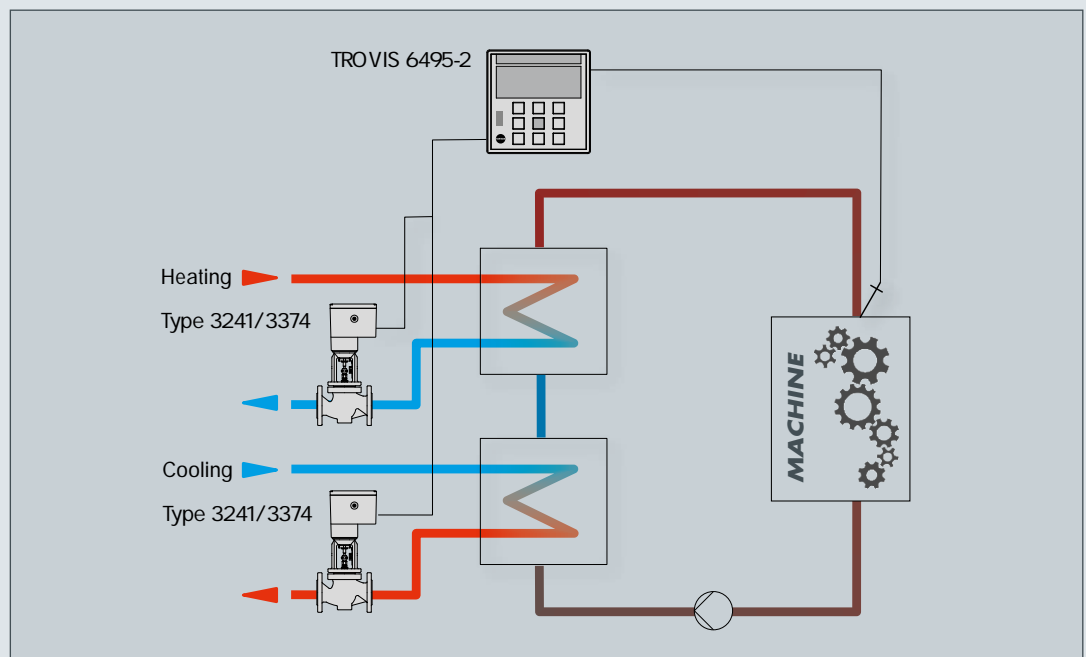
Continuous control

Heating and cooling in sequence

Plants or machines frequently used in HVAC applications with changing temperature processes (heating and cooling) must either be heated or cooled depending on the ambient temperature. This is where the split-range function comes in handy, which is provided by the positioner integrated into the actuator: a single

continuous control signal for the controller is fed to one actuator for heating and to a second actuator for cooling.

In the intermediate temperature range, none of the two actuators is active, both valves are closed.

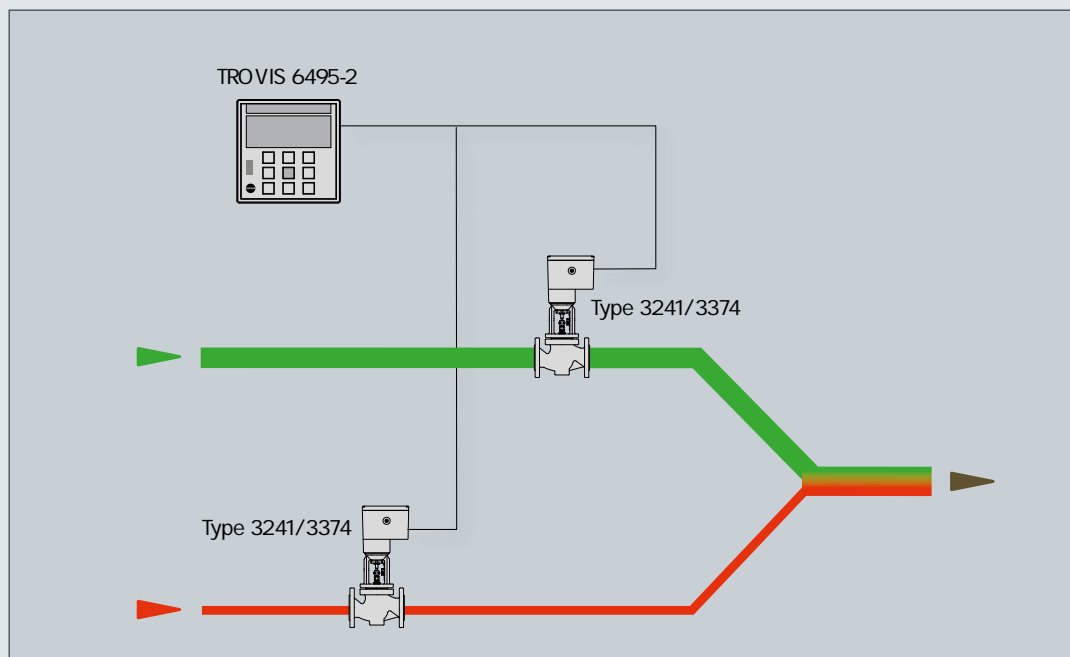




Split-range operation (small or rated load)

For systems operating across wide load ranges, it makes sense to connect a valve with a low K_v coefficient to handle small loads in parallel with a valve with high K_v coefficient to handle the rated load. The actuators are controlled by a single continuous control signal, which initially causes the valve with the low K_v coeff-

icient to stroke to its maximum travel. After that, the control signal is fed to the valve with the high K_v coefficient. To do so, the split-range function provided by the positioners in the two actuators is used.



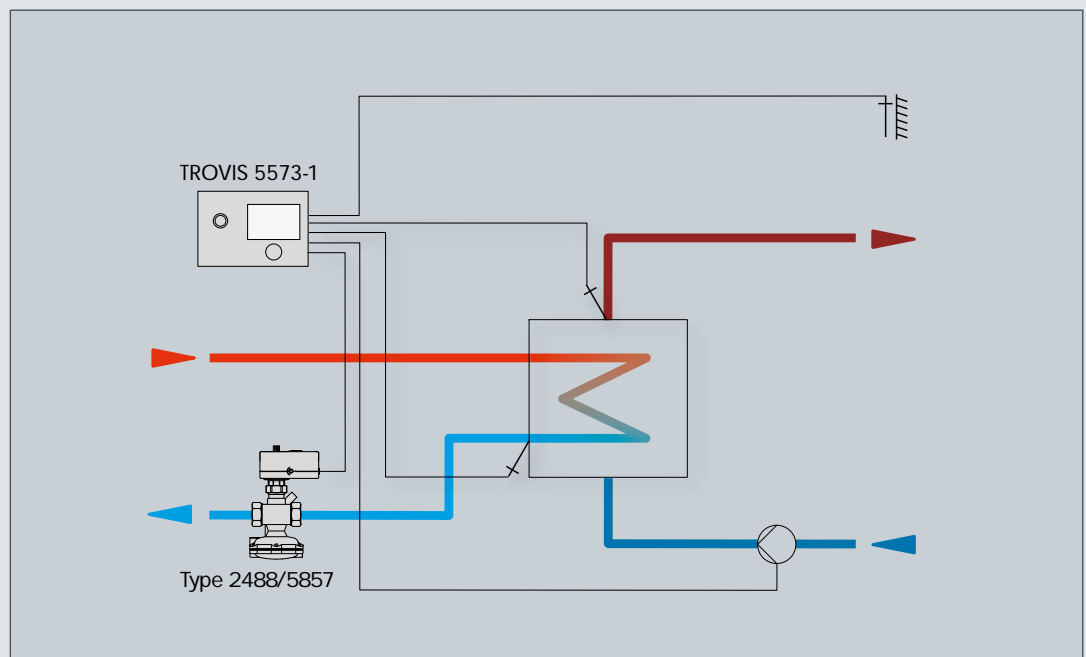
ELECTRIC ACTUATORS FOR EVERY APPLICATION

Heating control based on the outdoor temperature

Heating control using three-step actuators

Compact stations used in local heat supply or district heating applications need a district heating controller that regulates the flow temperature in the heating system depending on

the outdoor temperature. One of the essential requirements stipulated by district heating suppliers is that the return flow temperature fed back to the network is limited.

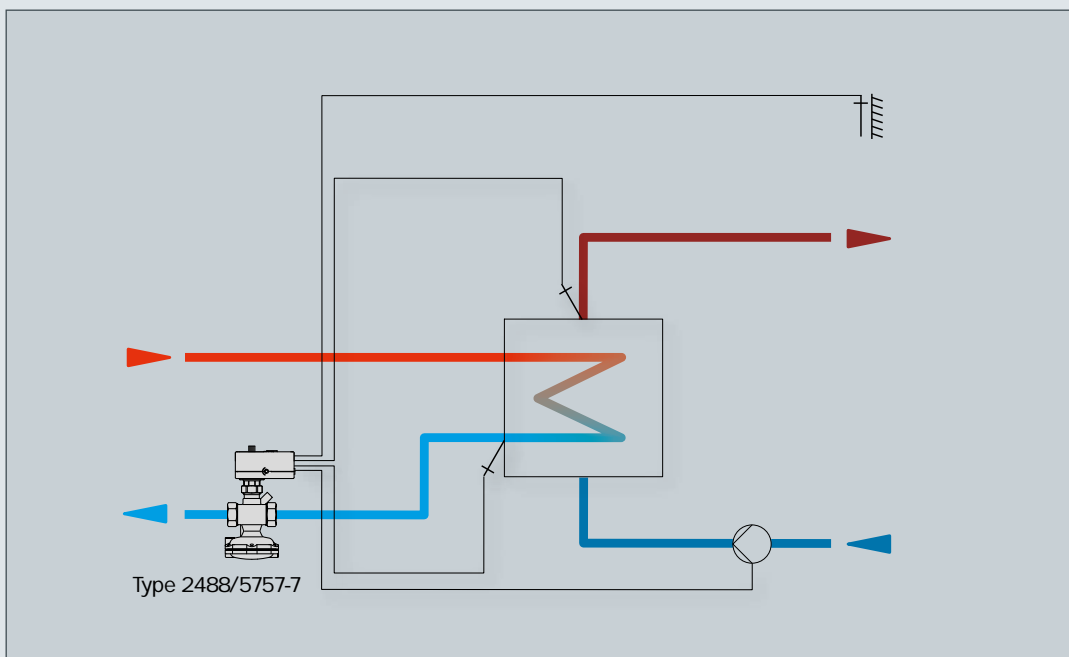




Heating control using electric actuators with process controllers

The application is as described on the previous page. In this application, however, the district heating controller and electric actuator are replaced by an electric actuator with process controller (e.g. TROVIS 5757-7) for heating and cooling applications. The controller has func-

tions for outdoor temperature compensated control and return flow temperature limitation already implemented. In addition, it can directly switch a pump on and off.



ELECTRIC ACTUATORS FOR EVERY APPLICATION

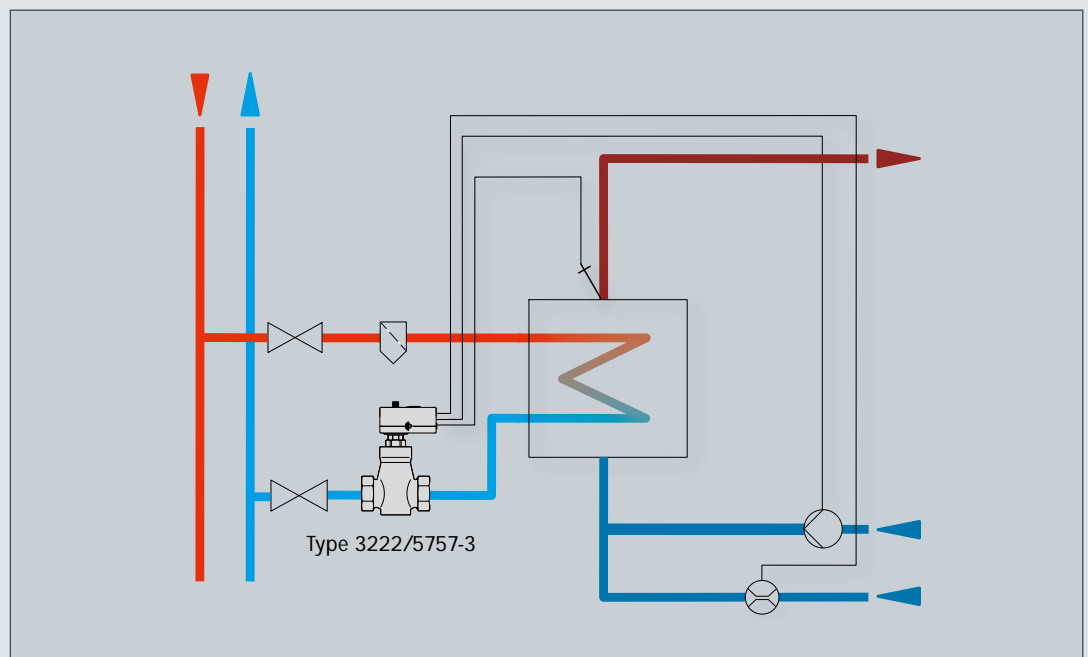
Process control applications

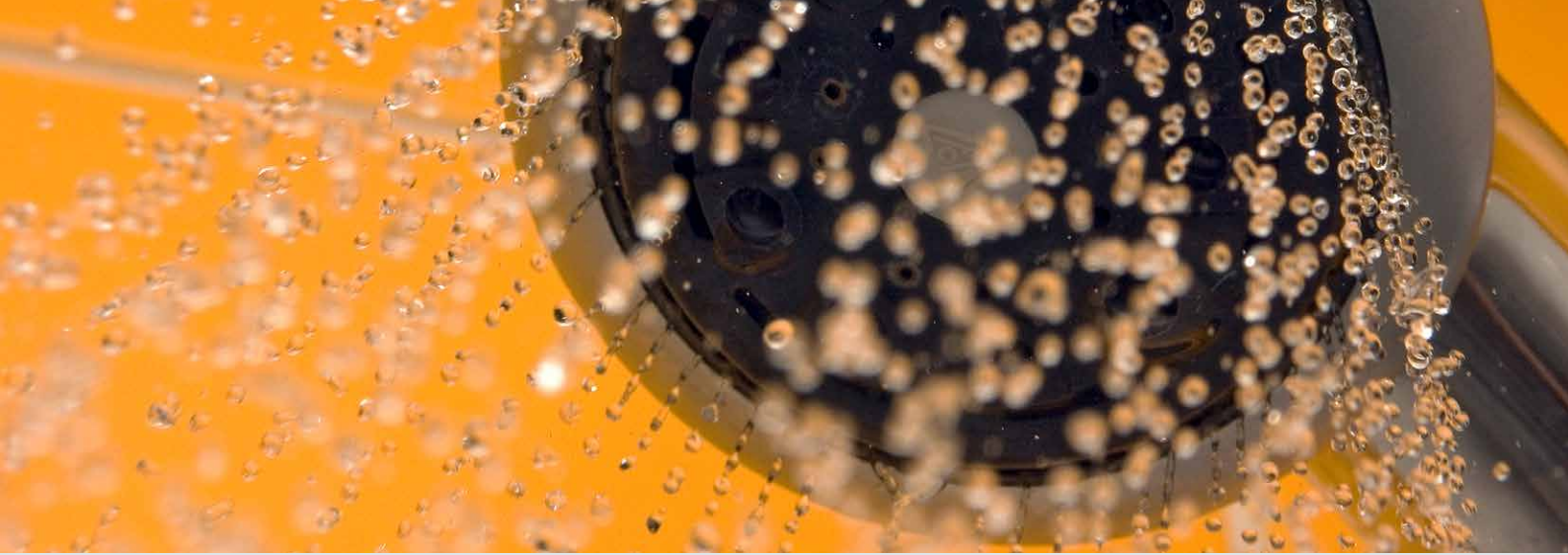
DHW in instantaneous heating systems

Domestic hot water using instantaneous heating systems is the state-of-the-art way of supplying hot water for domestic use.

This type of control has two main requirements: quick measurement of the DHW temperature in the secondary flow pipe of the heat exchanger using quick-response sensors and a high stroking speed of the actuator.

The control system, which has a constant flow temperature, detects when hot water is being tapped and quickly controls the temperature on demand. The required controls are integrated into the SAMSON electric actuators with process controllers specifically designed for DHW, such as the TROVIS 5757-3.

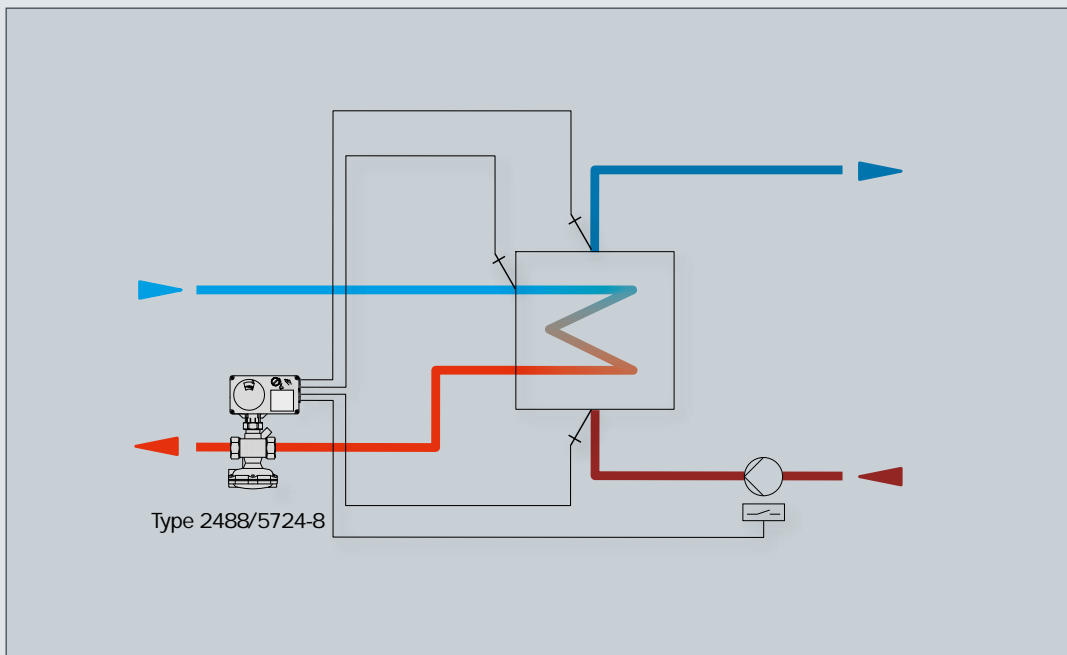




District cooling transfer stations

In district cooling networks, the very compact TROVIS 5724-8 Electric Actuator with Process Controller can be used to control consumers in valve sizes up to DN 50. The associated, ready-wired application is configured such that the secondary flow temperature is controlled to a

fixed set point, which also takes into account disturbances resulting from the primary flow (or network) temperature or the secondary return flow temperature.

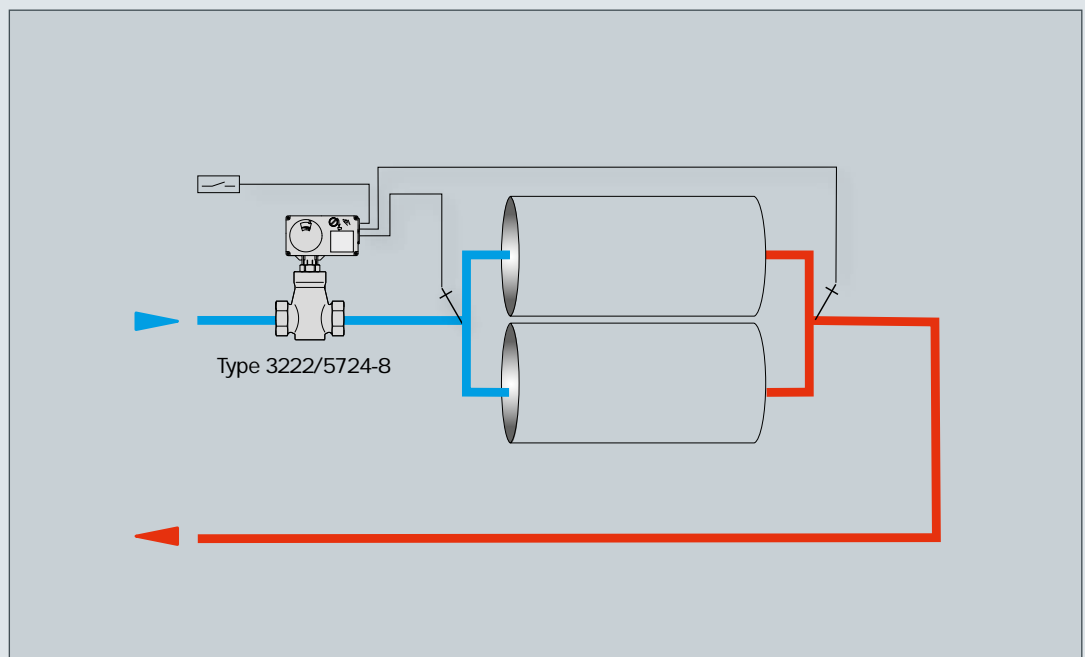


ELECTRIC ACTUATORS FOR EVERY APPLICATION

Cooling water control

In industrial cooling processes, e.g. in calendars or machines with cooling rolls, the cooling water is often fed in at the full flow rate the whole time. To improve the energy efficiency of this process, a control unit comprising a TROVIS 5724-8 Electric Actuator with Process Controller and a suitable valve can be used. The flow

rate is increased only when there is an actual cooling demand or when the measured temperature difference between the return flow and flow temperatures deviates from the rated temperature difference. At the same time, the return flow temperature can be monitored for excessive values and restricted as required.

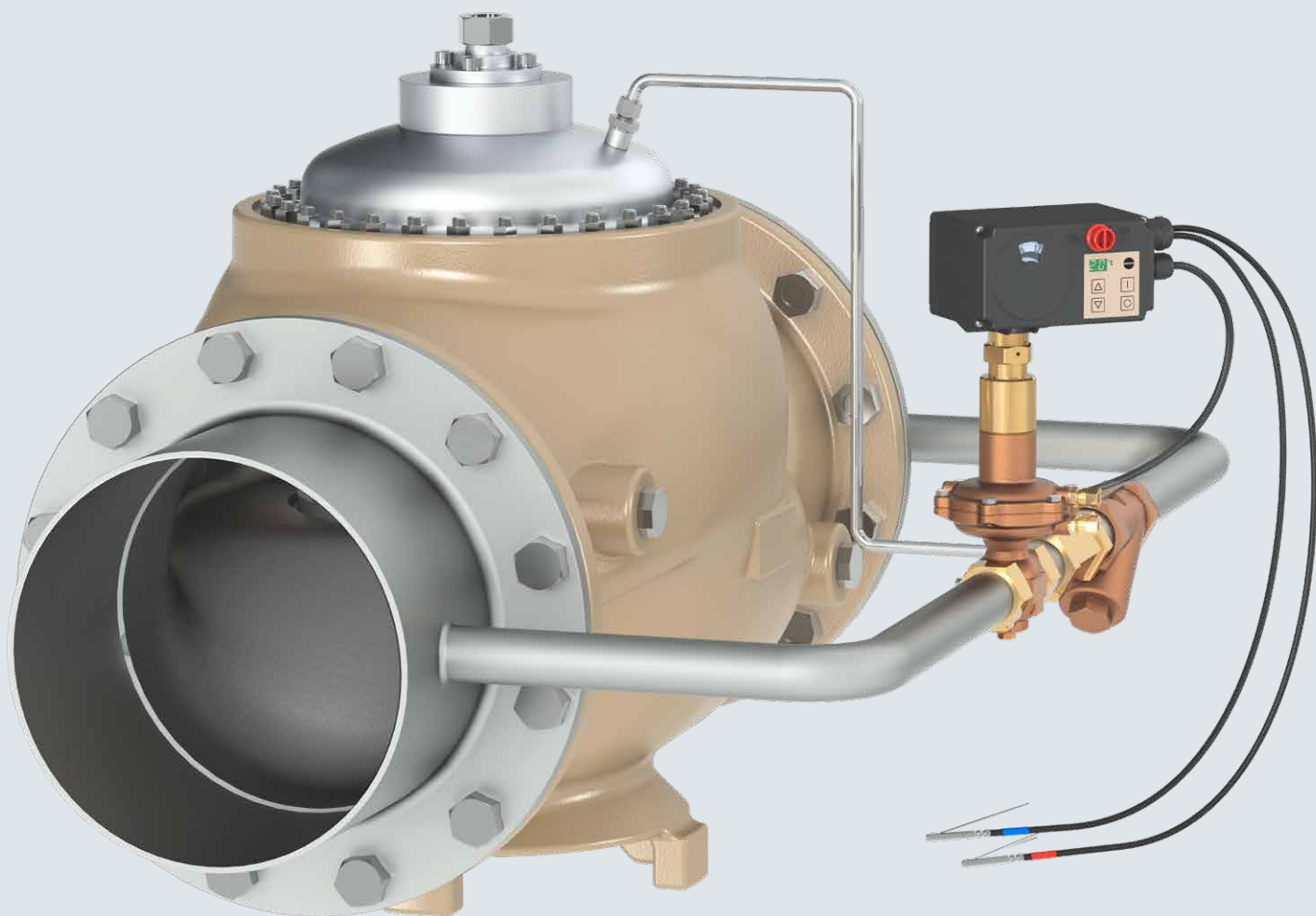




Energy efficiency for large valves

Large-sized valves (up to DN 400) often work with a small-sized pilot valve. If, for example, a TROVIS 5724-8 Electric Actuator with Process Controller takes over the control of the pilot valve, all the functions for heating and cooling

applications can be used indirectly for the large-sized valve as well.



MODELS

Type 3374 – With 15 to 30 mm rated travel, the actuator is suitable for mounting on medium to large-sized valves. In addition to HVAC applications and district heating and cooling networks, these actuators can also be used in industrial processes. The cable glands they are fitted with make them dust tight and protect them against water jets.



Types 5857/5827 – Even these „small” SAMSON actuators come with a huge range of functions. It takes but a few steps to mount them on the valve with a force-locking or form-fit connection. The versions with integrated positioner include automatic calibration to the valve, blocking protection, and further actuator functions that can be customized using the TROVIS-VIEW software.





TROVIS 5757-3/5724-3/5725-3/5757-7 – The actuators have specifically been designed for use in DHW and heating systems, their design benefiting from several decades of expertise SAMSON has acquired in developing firmware for heating and district heating controllers. The electric process controllers can control the temperature in a heating or DHW circuit. Ease of operation is also a major factor. For example, the electric actuators with process controllers for DHW detect when hot water is being tapped, they maintain the heat exchanger at a constant temperature, and initiate thermal disinfection. As standard, the actuators for heating applications come with control depending on the outdoor temperature or the room temperature.



TROVIS 5724-8/5725-8 – They are the all-rounders among the electric actuators with process controllers and can considerably reduce the energy consumption in heating and cooling applications. Fixed set point, follow-up, override or cascade control can easily be implemented using preconfigured plant schemes. The set points and operating mode can conveniently be adjusted on the control panel on site. Devices with RS-485 interface can be connected to the SAM DISTRICT ENERGY interface. Patent pending (DE 10 2014 012 621 A1)

OVERVIEW: ACTUATORS FOR ELECTRIC CONTROL VALVES

Actuator functions	Type ... Electric Actuator			TROVIS ... Electric Actuator with Process Controller							
	3374	5827	5857	5757-3	5757-7	5724-3	5724-8	5724-8	5725-3	5725-8	5725-8
	Rev. 3						Rev. 1	Rev. 2		Rev. 1	Rev. 2
Attachment up to valve size DN ¹⁾	250	50	25	25	25	50	50	50	50	50	50
Thrust up to ... N	2500	700	300	300	300	700	700	700	500	500	500
Min. stroking speed ... mm/s	0.125	0.3	0.6	0.3	0.3	0.3	0.18	0.18	0.3	0.18	0.18
Fail-safe action	-/	-/	-	-	-	-	-	-	*	*	*
Version											
Three-step control	*	*	*	-	-	-	-	-	-	-	-
Positioner	*	*	*	*	*	*	*	*	*	*	*
Heating or cooling	* ²⁾	-	-	*	*	*	*	*	*	*	*
DHW heating	-	-	-	*	-	*	-	-	*	-	-
Operation											
Travel indicator	*	*	*	*	*	*	*	*	*	*	*
Manual override	*	*	*	*	*	*	*	*	-	-	-
Automatic initialization	* ²⁾	* ²⁾	* ²⁾	*	*	*	*	*	*	*	*
Rotary pushbutton	* ²⁾	-	-	-	-	-	-	-	-	-	-
Operating keys	* ²⁾	-	-	-	-	-	*	*	-	*	*
Display	* ²⁾	-	*	-	-	-	*	*	-	*	*
LEDs as status indicators	-	* ²⁾	-	*	*	*	*	*	*	*	*
RJ-12 communication interface	* ²⁾	* ²⁾	-	*	*	*	*	*	*	*	*
TROVIS-VIEW	* ²⁾	* ²⁾	* ²⁾	*	*	*	*	*	*	*	*
TROVIS-VIEW adapter	8812-2001, 1400-7699	8812-2001, 1400-7699	8812-2001, 1400-7699	8812-2001, 1400-7699	8812-2001, 1400-7699	8812-2001, 1400-7699	-	1402-1300	8812-2001, 1400-7699	-	1402-1300
Options											
Mechanical limit contacts	*	*	-	-	-	-	-	-	-	-	-
Electronic limit contacts	* ²⁾	-	-	-	-	-	-	-	-	-	-
Resistance transmitters	*	*	-	-	-	-	-	-	-	-	-
Switching output	-	-	-	*	*	*	*	*	*	*	*
Communication using Modbus RS-485	*	-	-	-	-	-	-	*	-	-	*
Temperature sensor(s) Pt 1000	* ²⁾	-	-	*	*	*	* ⁴⁾	* ⁴⁾	*	* ⁴⁾	* ⁴⁾
Water flow sensor	-	-	-	*	-	*	-	-	*	-	-

¹⁾ Depending on the valve used

²⁾ Version with positioner

⁴⁾ Standard (ready wired on the electric actuator with process controller)