System 6000

Electropneumatic Converters (proportional valves)
Electronic Process Controllers
Signal Converters

Edition May 2013

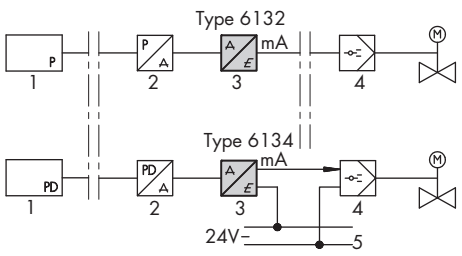
Information Sheet **T 6000 EN**

i/p Converters						
Type		**6111**	**6111**	**6116**	**6126**	**6127**
Housing version		Rail-mounting unit	Field unit	Field unit [6]	Field unit	19" rack-mounting unit, 7 HP [5]
Explosion protection		Ex ia ATEX	Ex ia ATEX	Ex ia, Ex d, ATEX, FM, CSA, Australian standard [1]	–	–
Degree of protection		IP 20	IP 20	IP 54, IP 65, NEMA 4	IP 54, IP 65	IP 00
Fieldbus		AS-Interface [4]				
Input	0 to 20 mA	•		•	•	
	4 to 20 mA	•		•	•	•
	0 to 10 V	• [3]	• [3]	• [3]	•	
	2 to 10 V	• [3]	• [3]	• [3]	•	
Output	0.2 to 1 bar	•	•	•	•	•
	0.4 to 2 bar	•	•	•	•	•
Special ranges	Up to 5 bar				•	
	Up to 8 bar	•	•	• [2]		
Supply air		0.4 bar above upper signal pressure range, maximum 10 bar			Max. 5.4 bar	Max. 2.4 bar
Electrical connection		Phoenix terminal or angle connector DIN EN 175301-803 A	M20 x 1.5	M20 x 1.5 ½-14 NPT	Angle connector DIN EN 175301-803 A	Electropneumatic connection strip Form F
Pneumatic connection		Hose connection for hose with 4 mm inside Ø and 6 mm outside Ø, G ⅛, ⅛ NPT	¼-18 NPT	¼ NPT; G ¼	¼ NPT; G ¼	Electropneumatic connection strip Form F
For further information see Data Sheet		T 6111 EN	T 6111 EN	T 6116 EN	T 6126 EN	T 6127 EN
						

[1] Others on request
[2] Ex d devices with max. 5.6 bar output (6 bar supply air)
[3] With Type 6151 u/I Module
[4] With Type 6150 AS-Interface Module
[5] Also available with two channels
[6] Special version for operation with natural gas on request

p/I Converters				
Type		**6132**	**6134**	
Housing version		Rail-mounting unit	Rail-mounting unit	Field unit
Explosion protection		–	–	Ex ia, Ex d
p/I converter unit		1	1 or 2	1
Degree of protection		IP 20	IP 20	IP 54, IP 65
Input	0.2 to 1 bar 3 to 15 psi	•	•	•
Output	0 to 20 mA	•		
	4 to 20 mA	•	•	•
	0 to 5 V	•		
	1 to 5 V	•		
	0 to 10 V	•		
	2 to 10 V	•		
Power supply		230 V AC, 115 V AC, 24 V AC, 24 V DC	24 V DC	
Electrical connection		Four-wire	Two-wire	
		Terminals for 0.5 to 2.5 mm² wires	Terminals for 0.5 to 2.5 mm² wires	M20 x 1.5; ½ NPT; Terminals for 0.5 to 2.5 mm² wires
Pneumatic connection		Hose connection for hose with 4 mm inside Ø and 6 mm outside Ø	Hose connection for hose with 4 mm inside Ø and 6 mm outside Ø	¼ NPT; G ¼
For further information see Data Sheet		T 6132 EN	T 6134 EN	
				

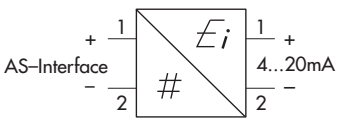
Example of an application

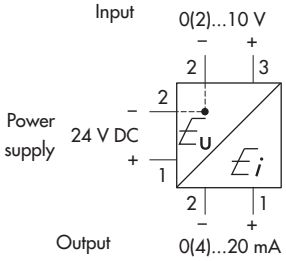


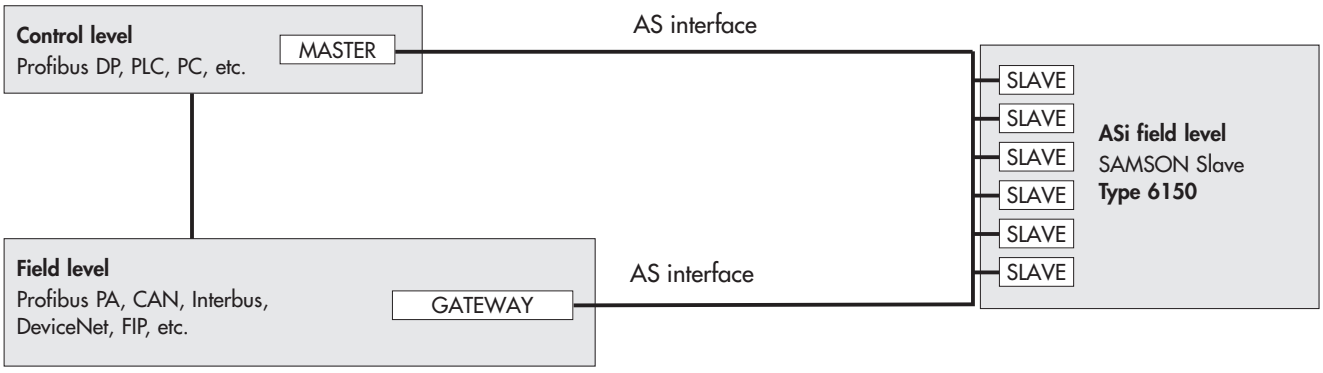
1 Transducer
2 Pneumatic converter
3 p/I converter
4 Controller
5 Two-wire network

Converter modules

Type		6150	6151
Designation		AS-Interface module	u/I module
Input	AS-Interface	•	
	0 to 10 V		•
	2 to 10 V		•
Output	0 to 20 mA		•
	4 to 20 mA	•	•
Power supply		Over ASi line	16 to 30 V DC
Electrical connection		Angle connector acc. to DIN EN 175301-803 A, M20 x 1.5 (adapter connector)	
Compatibility with SAMSON devices	Positioners	3725, 3730, 3760, 3761, 3767, 4763	
	V2001 valve	3321-IP, 3323-IP, 3531-IP, 3535-IP	
	i/p converter	6111, 6116, 6126	
Max. load at the output:		300 Ω	$R\ (k\Omega) = \frac{U_H - 10\,V}{20mA}$ e.g. 700 Ω with power supply U_H = 24 V
For further information, see Data Sheet		T 6150 EN	T 6151 EN







Electronic Process Controllers

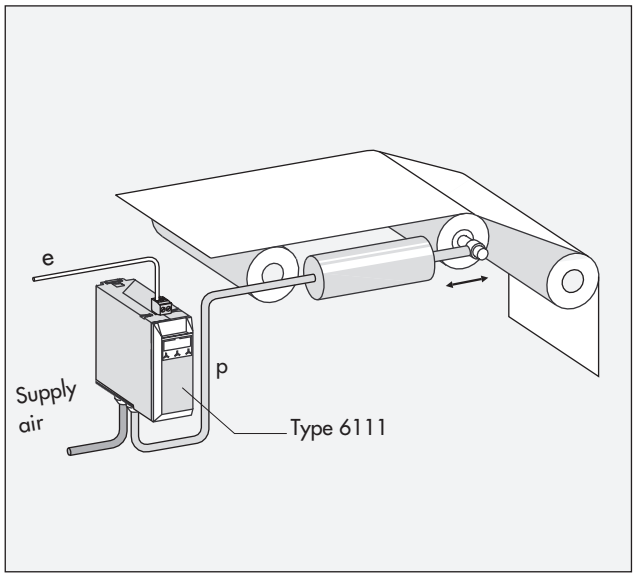
Controllers TROVIS		6493	6495-2
Style	Panel-mounting unit	•	•
	Front frame W x H (mm)	48 x 96	96 x 96
	Degree of protection (front)	IP 65	IP 65
	Display	LCD	Graphics
	Keys	6	9
Functions	Control loops	1	2
	P, PI, PD, PID control modes	•	•
	Fixed set point and follow-up control	•	•
	Ratio control		•
	Cascade control		•
	Override control		•
	Linking of input variables	•	•
Input	Analog inputs	2	4
	4 to 20 mA, 0 to 20 mA	•	•
	0 to 10 V, 2 to 10 V	•	•
	Pt 100 resistance thermometers	•	•
	Pt 1000 resistance thermometers	•	•
	Potentiometers	•	•
	Transmitter supply	•	•
	Binary inputs	1	4
Output	Analog outputs	1	3
	4 to 20 mA, 0 to 20 mA	•	•
	0 to 10 V, 2 to 10 V		•
	Relays	2	4
	Transistor outputs	1	3
	On/off, three-step signals	1	2
	Limit values	2	4
Communication			
Interface	Infrared	•	•
	USB		• [1]
	RS-232		• [1]
	RS-485		• [1]
Protocol	SSP (TROVIS-VIEW)	• [1]	• [1]
	RS-485 Modbus RTU		• [1]
Power supply	85 to 264 V AC, 50/60 Hz		•
	90 to 250 V AC, 50/60 Hz	•	
	24 V AC/DC, 50/60 Hz	•	•
For further information, see Data Sheet		T 6493 EN	T 6495-2 EN
			

[1] Optional

Application examples

Controlling a positioning cylinder in the paper and printing industry

The electric signal coming from a controller or a PLC is converted to a pneumatic signal (p) by the i/p converter. The pressure signal is used to position a cylinder which, in turn, moves a roller that keeps the paper under a certain tension.

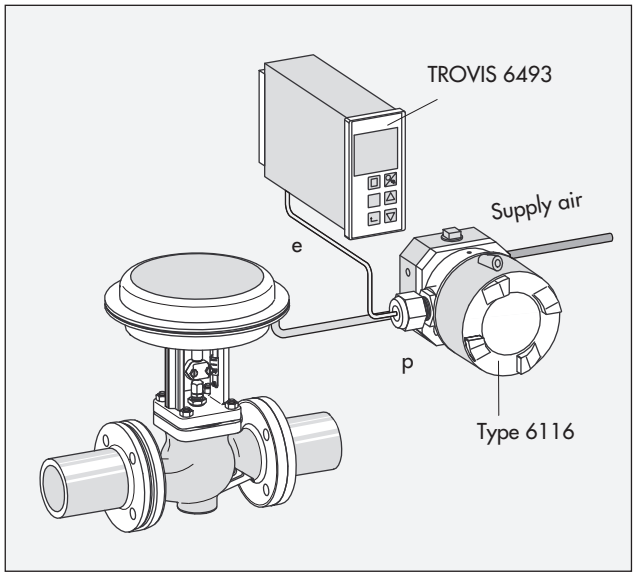


Controlling a valve

Valves equipped with small pneumatic actuators can be controlled directly by an i/p converter. The e/p converter receives the electric signal from a controller or a PLC.

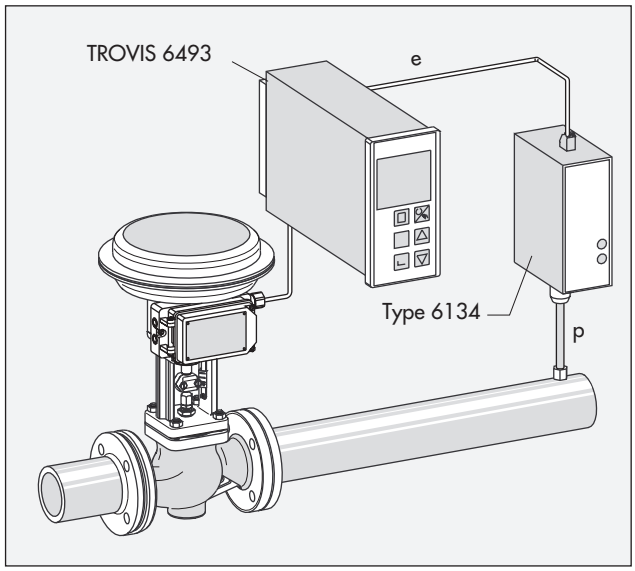
The i/p converter can also control a pneumatic positioner.

Field or industrial units can be mounted directly to a valve (attachment to rod-type yoke or according to NAMUR).



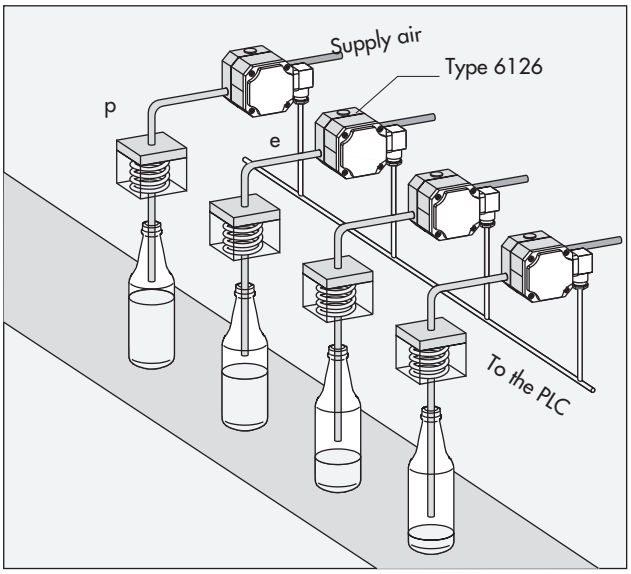
Pressure control

The p/I converter measures the pressure in the pipeline and converts it to an electric signal. The controller uses the electric signal to calculate the control signal which is passed on by the positioner to finally close or open the pneumatic control valve.



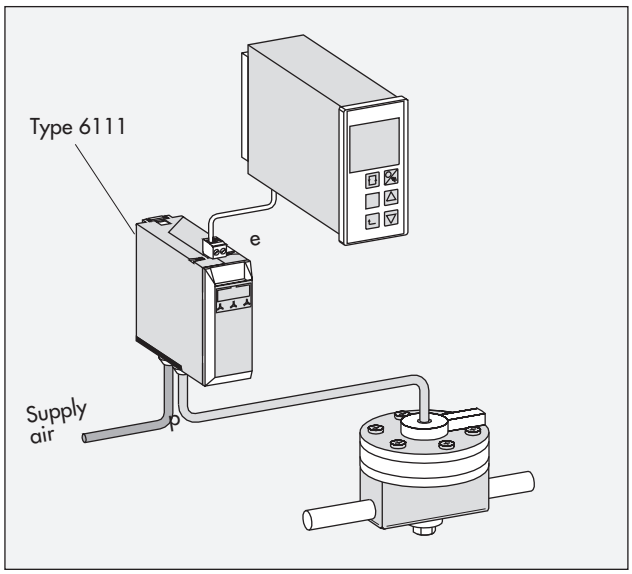
Filling of liquids in the beverage industry and breweries

The i/p converter converts an electric signal to a pneumatic signal. The pneumatic signal controls cylinders which insert filling tubes more or less deep, depending on the liquid level, into bottles, filling them with beverages or detergents.



Booster control

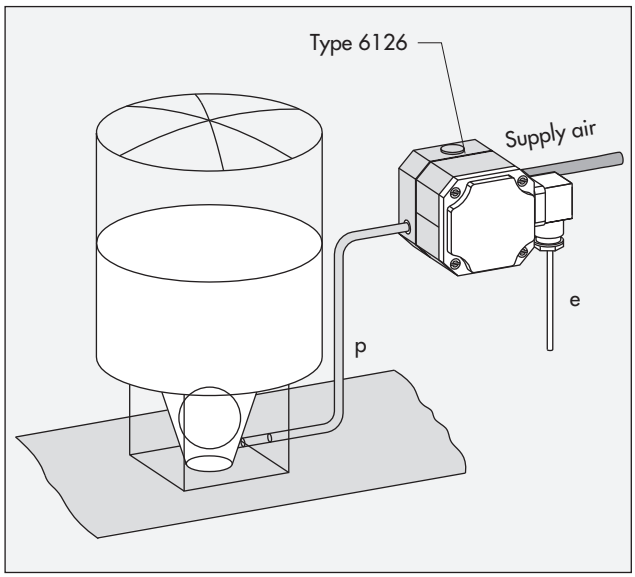
Boosters are used to amplify the flow rate of compressed air. To control boosters, you can use, apart from adjusters, also i/p converters which receive an electric signal from a controller or a PLC.



Applying adhesive or glue

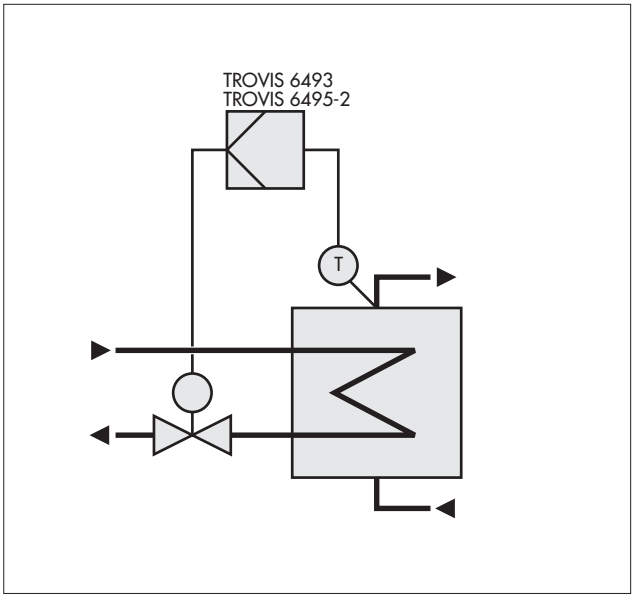
Glue or adhesive is to be applied on different bases.

Depending on the speed of the conveyor belt, varying quantities must be applied. The i/p converter receives an electric signal, which changes with the belt speed, and converts it to a pressure signal. The pressure causes the ball of a dispenser to adapt the outlet to the required amount of glue or adhesive. This ensures uniform application.



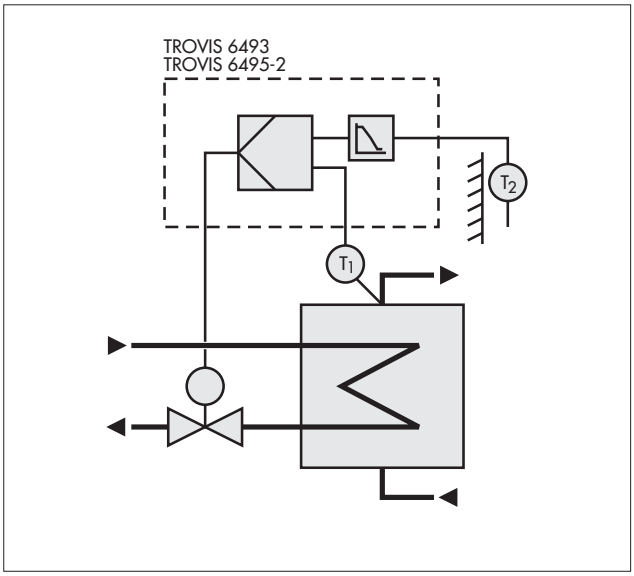
Control of the flow temperature in a heat exchanger

The TROVIS 6493 or TROVIS 6495-2 Controller logs the flow temperature T in the secondary circuit and positions the valve in the primary circuit to regulate the flow temperature.



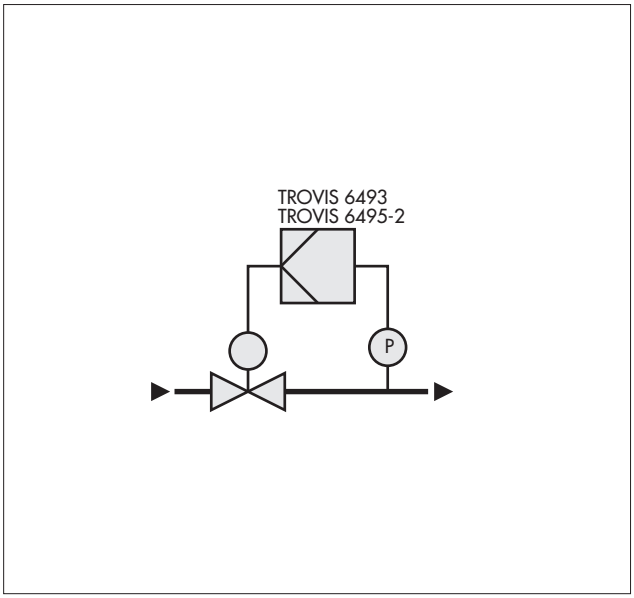
Control of the flow temperature in a heat exchanger based on the outdoor temperature

The TROVIS 6493 or TROVIS 6495-2 Controller logs the flow temperature T_1 in the secondary circuit and positions the valve in the primary circuit to regulate the flow temperature. The set point for the flow temperature is adjusted over a characteristic curve based on the outdoor temperature T_2.



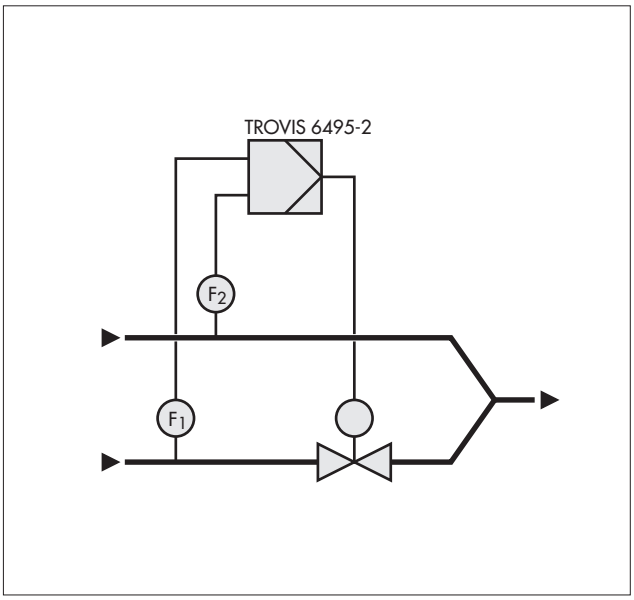
Pressure control

The TROVIS 6493 or TROVIS 6495-2 Controller logs the pressure downstream of the valve received from a pressure transmitter and positions the valve accordingly to regulate the pressure.



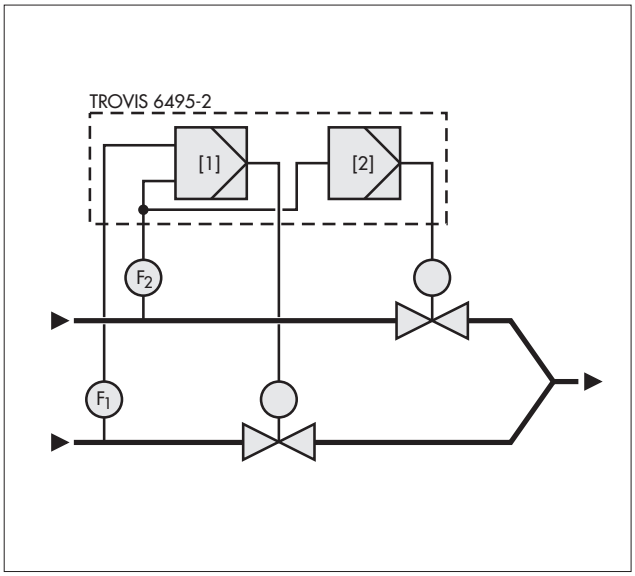
Control of the mixing ratio of two fluids

The TROVIS 6495-2 Industrial Controller logs the flow rates F_1 and F_2 received two flow transmitters. It positions the control valve for the medium to be added to achieve the required mixing ratio F_1/F_2 (ratio control).



Control of the mixing ratio of two fluids and the control of the main flow rate

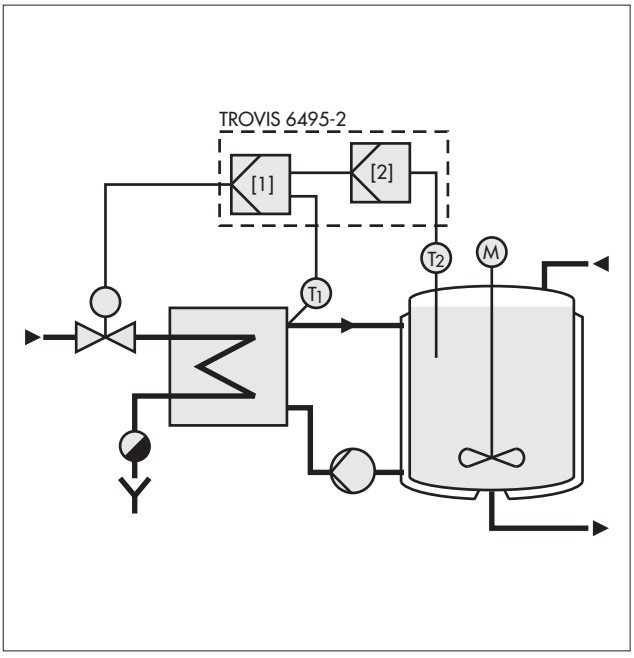
The TROVIS 6495-2 Industrial Controller logs the flow rates F_1 and F_2 received two flow transmitters. The internal controller [1] positions the control valve for the medium to be added to achieve the required mixing ratio F_1/F_2 (ratio control). The internal controller [2] positions the control valve for the other medium to achieve the flow rate F_2.



Temperature cascade control

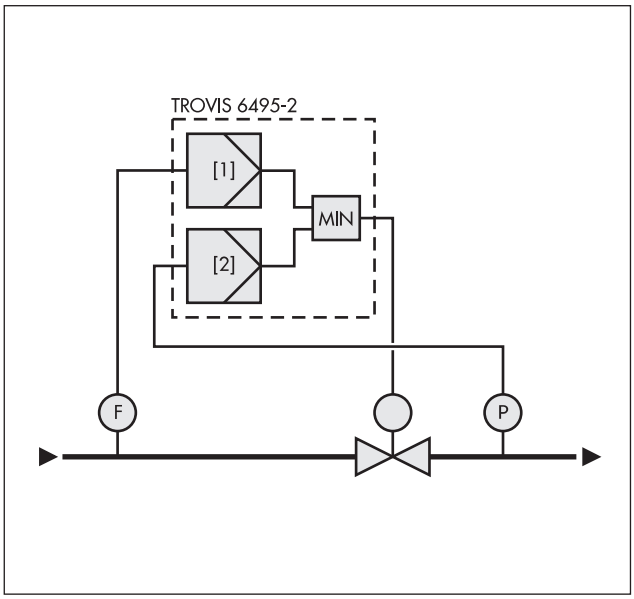
The TROVIS 6495-2 Industrial Controller regulates the product temperature in a vessel and limits the flow temperature of the heat exchanger with the cascade control mode.

The temperature in the vessel is generated by steam, which is produced by a heat exchanger and a fluid circulation system. The master controller [2] receives the product temperature T2 in the vessel and provides its output variable as the set point for the slave controller [1]. The slave controller [1] logs the flow temperature T1 of the heat exchanger and positions the control valve to regulate the flow temperature and the product temperature. To prevent overheating the product, the set point for flow temperature is limited to a maximum temperature. Additionally, the pressure and temperature fluctuations in the steam network can be eliminated faster by the slave controller before they cause a noticeable temperature change in the boiler due to the shorter delays in the heat exchanger circuit. This improves the control accuracy. The steam heat exchanger can alternatively be controlled using a steam pressure control in the condensate circuit. In this case, the control valve is installed in the condensate pipe instead of the steam pipe.



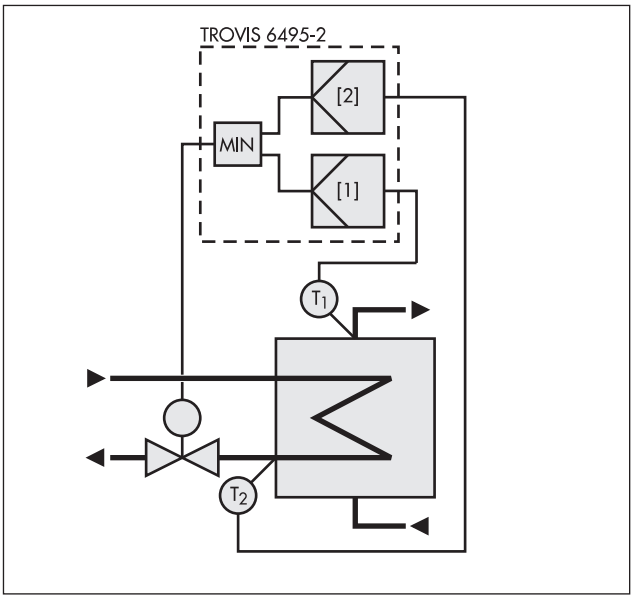
Flow rate control with pressure limitation

The TROVIS 6495-2 Industrial Controller controls the flow rate with the override control mode, without allowing the pressure to exceed a certain limit. In this case, control signals of two internal controllers influence the control valve by selection of a minimum value (MIN). The main controller [1] regulates the flow rate F and the override (limiting) controller [2] limits the pressure P to a maximum pressure. The controller with the smallest output value is used to position the valve. If the controller [1] is actively positioning the control valve, the control signal of controller [2] is larger than that of controller [1] by the adjustable limitation band at the maximum. This limitation causes controller [2] to take over control more quickly when the pressure exceeds a certain limit.



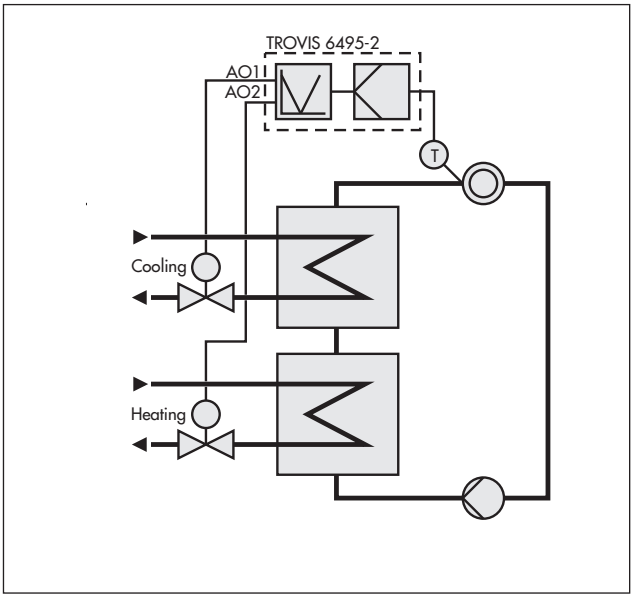
Flow temperature control with return flow temperature limitation

The TROVIS 6495-2 Industrial Controller controls the flow temperature of the heat exchanger in the secondary circuit with the override control mode, without allowing the return flow temperature in the primary circuit to exceed a certain limit. In this case, control signals of two internal controllers influence the control valve by selection of a minimum value (MIN). The main controller [1] regulates the flow temperature T_1 and the override (limiting) controller [2] limits the return flow temperature T_2 to a maximum temperature. The controller with the smallest output value is used to control the valve. If the controller [1] is actively positioning the control valve, the control signal of controller [2] is larger than that of controller [1] by the adjustable limitation band at the maximum. This limitation causes controller [2] to take over control more quickly when the return flow temperature T_2 exceeds a certain limit.



Temperature control with two control valves for heating and cooling (split-range control)

The TROVIS 6495-2 Industrial Controller logs the coolant temperature T of a machine and positions one control valve for heating and one control valve for cooling over two analog outputs to regulate the coolant temperature. In split-range operation, the working range is assigned to two analog outputs to allow the cooling valve to close first and then the heating valve to open as the control signal rises.



Explosion protection

Some of the SAMSON electropneumatic converters are suitable for use in hazardous areas as they are frequently found in the chemical and petrochemical industry.

Important factors of the explosion protection relevant for such applications are listed in the following. For details, please refer to the standards indicated.

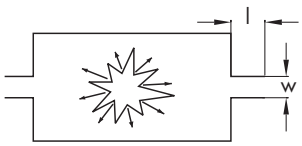
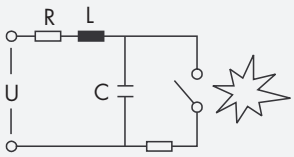
Zone classification

Hazardous areas are grouped into zones to indicate the danger of explosion. Each zone prescribes particular measures which ensure explosion protection.

Zone	Meaning	Example
0	Dangerous, potentially explosive atmospheres occur **permanently or for a long time**.	Inside of reaction tanks containing flammable gases
1	Dangerous, potentially explosive atmospheres occur **sometimes**.	In the proximity of Zone 0, immediate area around stuffing boxes that are not sufficiently sealed.
2	Dangerous, potentially explosive atmospheres occur **seldom and for a short time** (< 2 h).	Areas surrounding the Zones 0 and 1

Type of protection

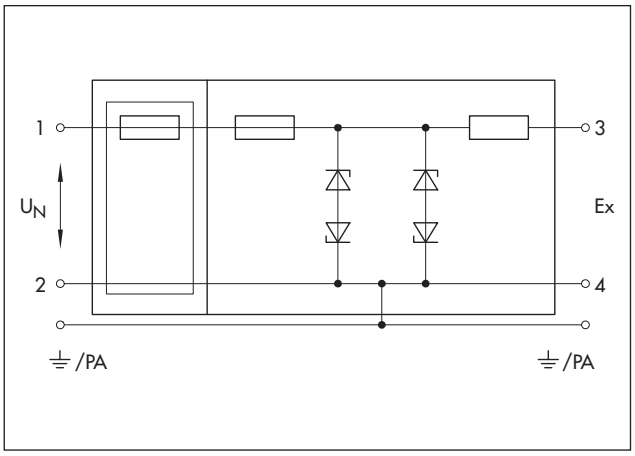
The type of protection describes the measures to be taken to prevent electrical appliances from igniting explosive atmospheres.

Type of protection	Basic principle	Standard or regulation
d Flameproof enclosure 	Parts which can ignite an explosive atmosphere are placed in an enclosure which can withstand the pressure caused by an explosion inside the housing and prevents the transmission of the explosion to the surrounding explosive atmosphere. Flameproof enclosures are suitable for Zones 0, 1 and 2.	IEC 60079-1
I Intrinsic safety 	An electrical device is intrinsically safe when all circuits are intrinsically safe. A circuit is intrinsically safe when it does not produce sparks or thermal effects whose energy suffices to ignite an explosive atmosphere.	DIN EN 50020 VDE 0170/0171 Part 7
Category ia	Devices of this category are suitable for Zones 0, 1 and 2. Zone 0 must be certified separately.	
Category ib	Devices of this category are suitable for Zones 1 and 2.	

Temperature classes

The temperature classes group electrical appliances according to their max. permissible surface temperature. It must be smaller than the ignition temperature of the explosive material.

Temperature class	Maximum permissible **surface temperature** of the appliance	**Ignition temperature** of the flammable material
T1	450 °C	> 450 °C
T2	300 °C	> 300 ≤ 450 °C
T3	200 °C	> 200 ≤ 300 °C
T4	135 °C	> 135 ≤ 200 °C
T5	100 °C	> 100 ≤ 135 °C
T6	85 °C	> 85 ≤ 100 °C



Safety barriers

according to IEC 60079-0 and DIN EN 50020 Section 8

Safety barriers are passive networks which separate intrinsically safe and not intrinsically safe circuits without isolating them electrically. The output circuits of the safety barriers meet the requirements of the intrinsic safety "ia" and "ib".

Safety barriers are always installed outside the hazardous area.

IP degree of protection

The IP code characterizes an electrical appliance's protection against accidental contact and foreign particles as well as its protection against water. The code consists of two code numbers whose meanings are listed in the table below.

IP code	IP	6	5
First code number (0 to 6) Prot. ag. contact and foreign particles			
Second code number (0 bis 8) Protection against water			

Code number	First code number		Second code number
	Protection against accidental contact	Protection against foreign particles	Protection against water
0	None	None	None
1	Protection against contact with the back of the hand	Protection against penetration of foreign particles > 50 mm	Protection against water drops
2	Protection against contact with the finger	Protection against penetration of foreign particles > 12.5 mm	Protection against water drops when the device is tilted by up to 15° from the vertical position
3	Protection against contact with tools	Protection against penetration of foreign particles > 2.5 mm	Protection against spray water hitting the device, at an angle of 60° from the vertical position
4	Protection against contact with a wire	Protection against penetration of foreign particles > 1.0 mm	Protection against spray water from all directions
5	Protection against contact with a wire	Protection against dust built-up which could impair the functioning of the device	Protection against a water jet from all directions
6	Protection against contact with a wire	Dust-tight	Protection against a strong water jet from all directions
7	–	–	Protection against water when immersed under standardized time and pressure conditions
8	–	–	Protection against water when permanently immersed under conditions which are agreed upon by the manufacturer and the customer.

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