

Regulating valves

636 series



Function

Regulating valves may be used in the closed circuits of heating and cooling systems, to control low rate (two-way valves) and to control temperature by mixing the primary circuit medium with the system return medium (three-way valves) in order to obtain the desired flow temperature to the utility.

They have one regulation port with an equal percentage characteristic and one by-pass port (three-way valves) with a linear characteristic. This adjustment characteristic guarantees the best possible system response to the various load conditions.

They can be used in conjunction with proportional actuators with a 0–10 V, or 2- or 3-point control signal, depending on the requirements of the thermal load to be controlled.

Reference documentation

- Instruction sheet Digital regulator with functional synoptic for heating and cooling, code 161010.
- Instruction sheet 18057 1520 series Optimiser® digital climate regulator for heating.
- Instruction sheet 18075 1520 series Optimiser® digital climate regulator for heating and heating/cooling.

Product range

Code 636.00	Two-way regulating globe valve with threaded connection _____ size DN 15–DN 50 (1/2"–2") F
Code 636.10	Three-way regulating globe valve with threaded connection _____ size DN 15–DN 50 (1/2"–2") F
Code 636004	Actuator for threaded regulating valves _____ 24 V electric supply; 2/3-point control signal, 0–10 V
Code 636002	Actuator for threaded regulating valves _____ 230 V electric supply; 2/3-point control signal
Code 636014	Actuator for threaded regulating valves _____ 24 V electric supply; 2/3-point control signal, 0–10 V
Code 636	Three-way regulating globe valve with flanged connection _____ size DN 15–DN 150
Code 636024	Actuator for flanged regulating valves _____ 24 V electric supply; 2/3-point control signal, 0–10 V / 4–20 mA
Code 636034	Actuator for flanged regulating valves _____ 24 V electric supply; 2/3-point control signal, 0–10 V / 4–20 mA

Valve technical specifications

THREADED VERSION

Materials

Body:	brass CC752S CR
Seat:	brass CC752S CR
Control stem:	stainless steel EN 10088-3 (AISI 303)

Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50 %
Max. working pressure:	16 bar
Working temperature range:	0–100 °C
Seepage class, main port:	≤ 0.05 % Kvs
Seepage class, by-pass:	≤ 1 % Kvs
Nominal stroke:	8 mm
Regulation characteristic, main port:	equal percentage
Regulation characteristic, by-pass:	linear
Connections:	Rp 1/2", 3/4", 1", 1 1/4", 1 1/2", 2" (EN10226-1) F with union

FLANGED VERSION

Materials

Body:	grey cast iron EN-GJL-250
Seat, main port:	grey cast iron EN-GJL-250
Seat, by-pass:	stainless steel EN 10088-3 (AISI 420)
Control stem:	stainless steel EN 10088-3 (AISI 420)

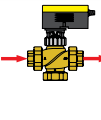
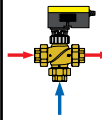
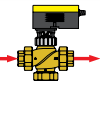
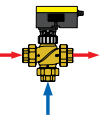
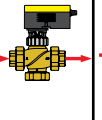
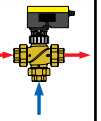
Performance

Medium:	water, glycol solutions
Max. percentage of glycol:	50 %
Max. working pressure:	16 bar
Working temperature range:	0–100 °C
Seepage class, main port:	≤ 0.1 % Kvs
Nominal stroke:	20 mm (DN 65–DN 80) 40 mm (DN 100–DN 150)
Regulation characteristic, main port:	equal percentage
Regulation characteristic, by-pass:	linear
Connections:	DN 65, 80, 100, 125, 150; PN 16 to be coupled with counterflange EN1092-1-GHISA

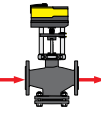
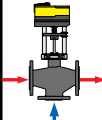
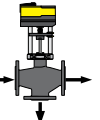
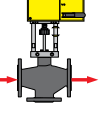
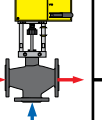
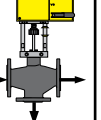
Actuator technical specifications

	636004	636002	636014	636024	636034
					
Type	Synchronous motor				
Electric supply	24 V (AC)/(DC)	230 V (AC)/(DC)	24 V (AC)/(DC)	24 V (AC)/(DC)	
Power consumption	4.8 W, 8.5 VA	2.0 W, 4.0 VA	4.9 W, 8.7 VA	3,5 VA	20 VA
Control signal	2/3-point, 0–10 V	2/3-point	2/3-point, 0–10 V	2/3-point, 0–10 V / 4–20 mA	
Nominal force	250 N	500 N	500 N	1000 N	2500 N
Protection class	IP 54 (horizontal)	IP 54 (horizontal)	IP 54 (horizontal)	IP 54	IP 66
Operating time	35/60/120 s	120 s	60/120 s	80/120 s	DN 65-DN 80: 40/80/120 s DN 100-DN 150: 80/160/240 s
Ambient temperature range	-10–55 °C	-10–55 °C	-10–55 °C	-10–55 °C	-10–55 °C

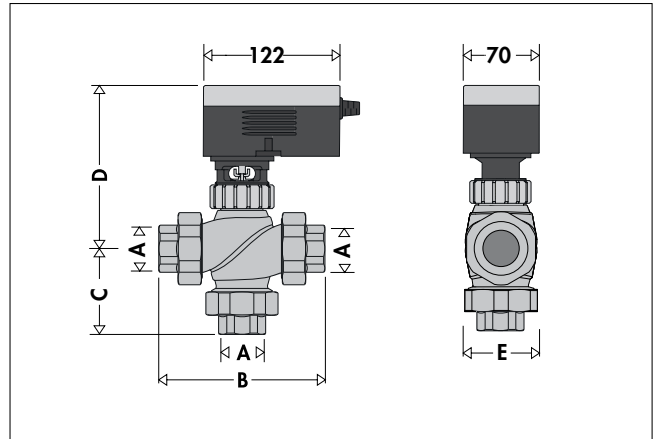
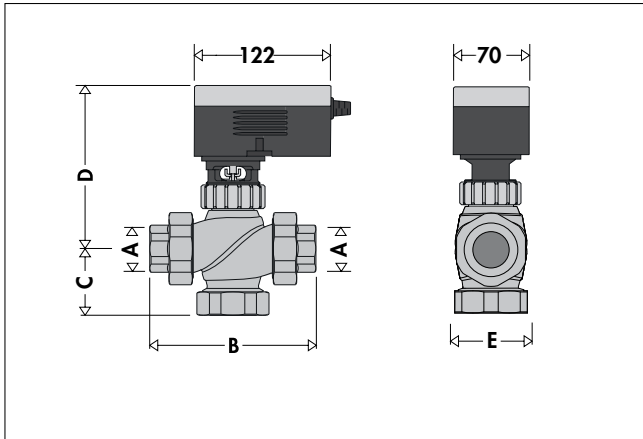
Maximum working differential pressure

Valve code	Kv	Δp max. con 636004 (250 N)		Δp max. con 636002 (500 N)		Δp max. con 636014 (500 N)	
							
6364.0	4	4 bar		6 bar		6 bar	
6365.0	6.3	4 bar		5 bar		5 bar	
6366.0	10	4 bar	3 bar	4 bar		4 bar	
6367.0	16	3 bar	2 bar	3,5 bar	3,7 bar	3,5 bar	3,7 bar
6368.0	22	1,9 bar	1,2 bar	3 bar	2,7 bar	3 bar	2,7 bar
6369.0	28	1 bar	0,8 bar	2,4 bar	1,8 bar	2,4 bar	1,8 bar

The Δp max value given in the table is the maximum working differential pressure at which the actuator fitted on the valve moves the obturator correctly. This value depends on the installation configuration.

Valve code	Kv	Δp max. with 636024 (1000 N)			ΔP max. with 636034 (2500 N)		
							
636060	63	2,5 bar		1 bar	3 bar		1 bar
636080	100	1,5 bar		0,7 bar	3 bar		0,8 bar
636100	160	-			2 bar		0,5 bar
636120	220	-			1,5 bar		
636150	320	-			1 bar		

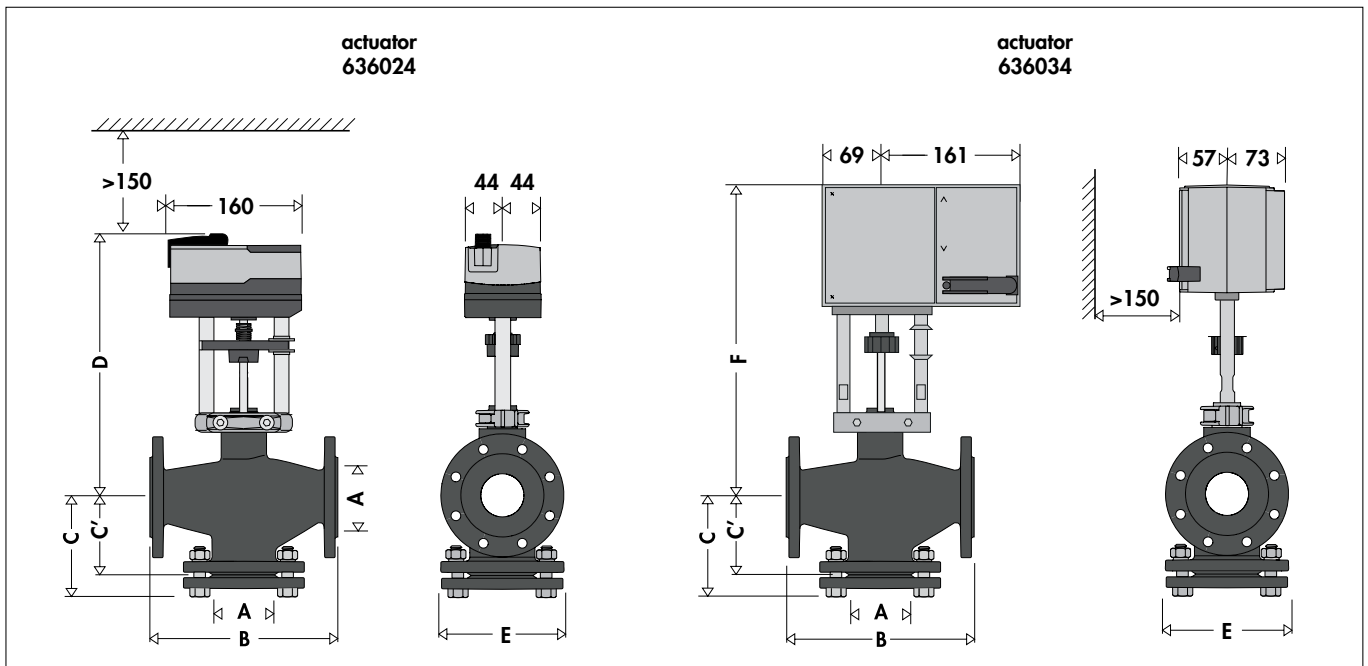
Dimensions



Code	A	B	C	D	E	Weight (kg)*
636400	1/2" Rp	138	58,5	153	48,5	1,7
636500	3/4" Rp	143	58	146	54,5	2,0
636600	1" Rp	156	61	150	59	2,4
636700	1 1/4" Rp	158	62,5	153	67	3,0
636800	1 1/2" Rp	196	75	166	83,5	4,0
636900	2" Rp	215	87	175	92	5,4

Code	A	B	C	D	E	Weight (kg)*
636410	1/2" Rp	138	69	153	48,5	1,8
636510	3/4" Rp	143	71	146	54,5	2,2
636610	1" Rp	156	78	150	59	2,6
636710	1 1/4" Rp	158	78,5	153	67	3,3
636810	1 1/2" Rp	196	98	166	83,5	4,5
636910	2" Rp	215	107,5	175	92	6,1

(*) with actuator 636002, 636004 o 636014



Code	A	B	C	C' (3-way)	D	E	F	Weight (kg)**	Weight (kg)***
636060	DN 65	290	149,5	145	343	185	391	31	29,4
636080	DN 80	310	161,5	155	353	200	401	37,4	35,8
636100	DN 100	350	181,5	175	368	220	416	-	46,9
636120	DN 125	400	233,5	200	401	250	449	-	67,6
636150	DN 150	480	246,5	240	422	285	470	-	94,6

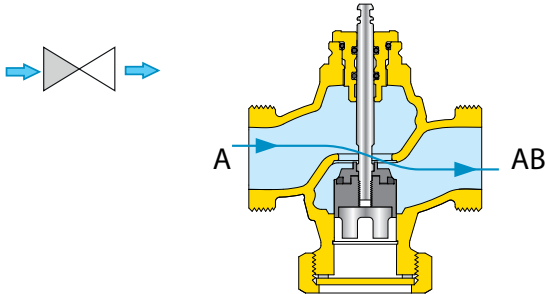
(**) with actuator 636024 (***) with actuator 636034

Operating principle

Two-way valve

These valves have two ports, so they have an inlet and an outlet. Conventionally the inlet is indicated with the letter "A" and the outlet with the letters "AB".

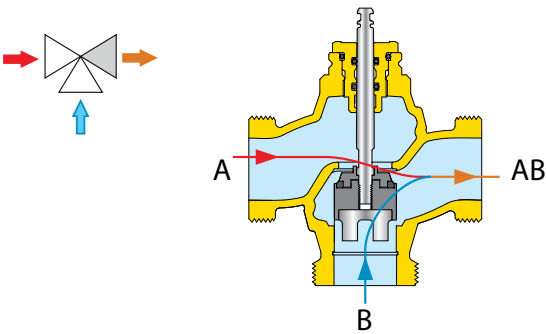
They consist of a valve body and an obturator, which varies the internal opening as it moves, thereby increasing or decreasing resistance to the flow. These characteristics make two-way valves suitable for controlling flow rate in plumbing circuits.



Three-way valve

These valves have three ports, of which one, known as common and generally indicated with the letters "AB", remains always open. The other two ports, "A" and "B", also known as independent, may be partially open or closed according to the obturator movement.

They are made so that as one of the two independent ports gradually opens, the other one closes, and vice versa.

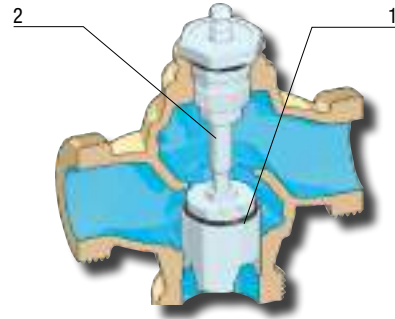


Construction details

Globe valve

The obturator (1) is connected mechanically to the stem (2), ensuring linear movement.

This characteristic gives the valve more accurate regulation, limited seepage and high resistance to static pressure.



Actuators

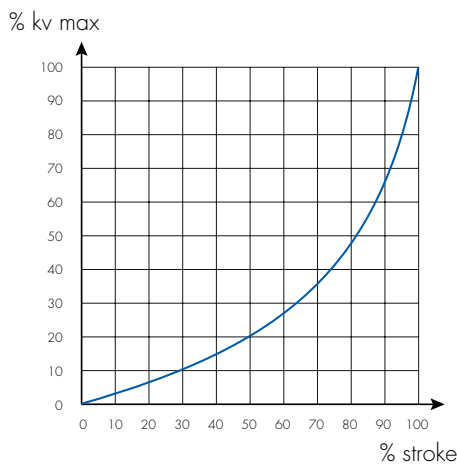
Actuators code 636..4 can be controlled by 1-point, 3-point or 0-10 V control signals, simply by varying the electrical connection configuration. Once wired correctly, they automatically recognise the control signal received from the control unit.

636 series actuators are available with a range of thrust force performances. This makes it possible to choose the most appropriate valve/actuator pairing for the maximum working differential pressure required by the application.

Two-way valve regulation characteristic

They have equal percentage regulation, with a characteristic curve that tends to flatten at low amounts of opening, but that becomes "steeper" towards maximum opening.

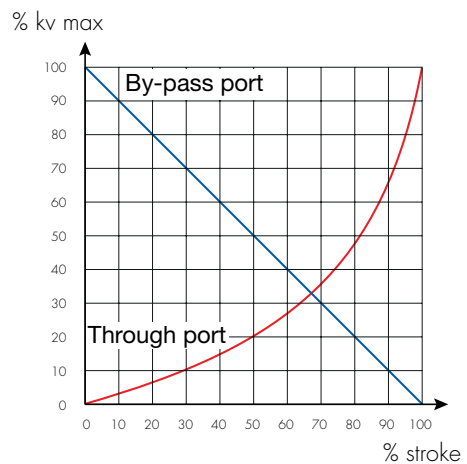
These valves make full use of the whole stroke in applications that require heat emission control.



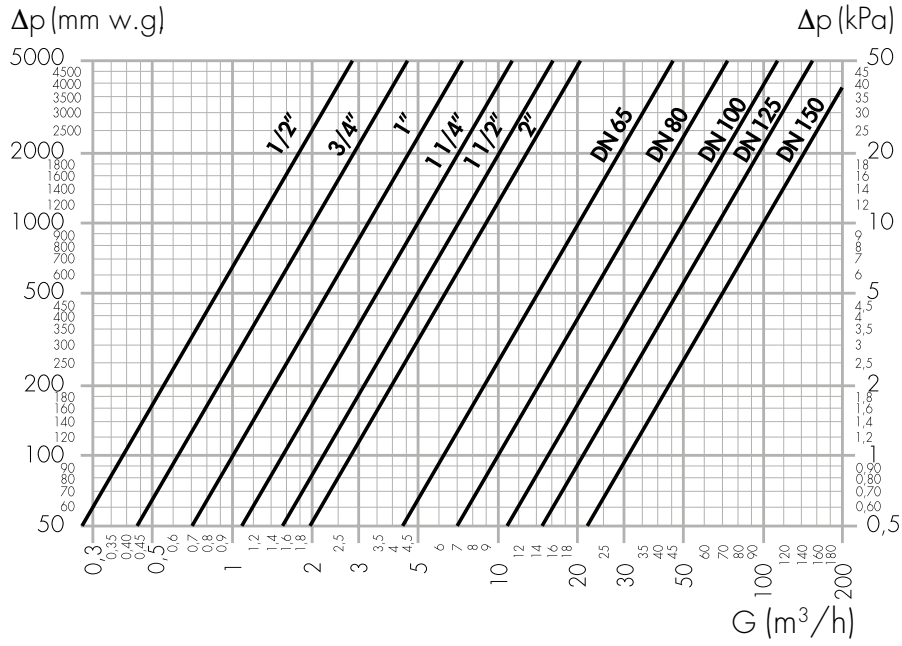
Three-way valve regulation characteristic

The three-way valve has equal percentage regulation on the main port, while the by-pass port has linear regulation.

This adjustment characteristic guarantees the best possible system response to the various load conditions.



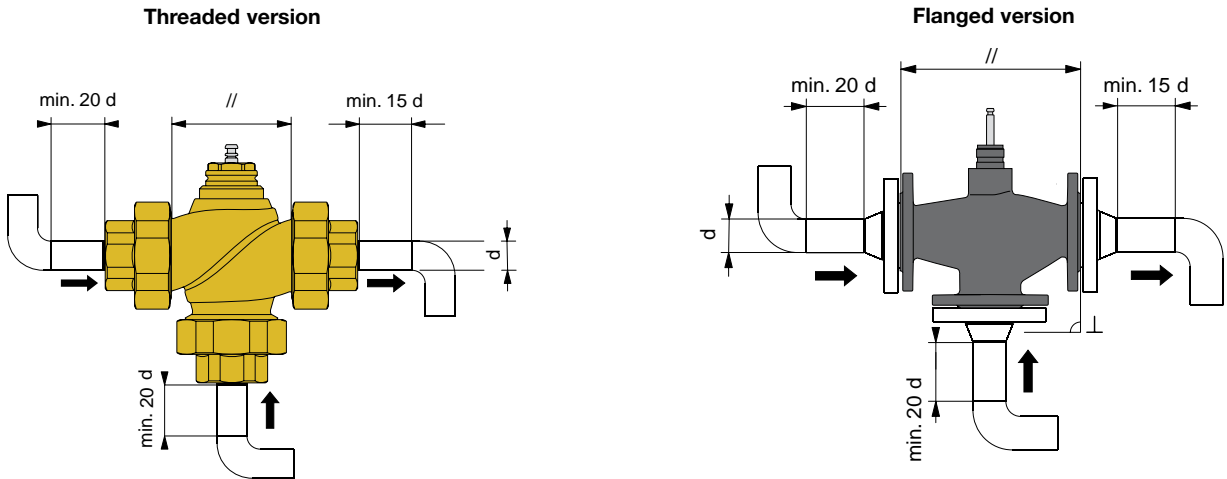
Hydraulic characteristics



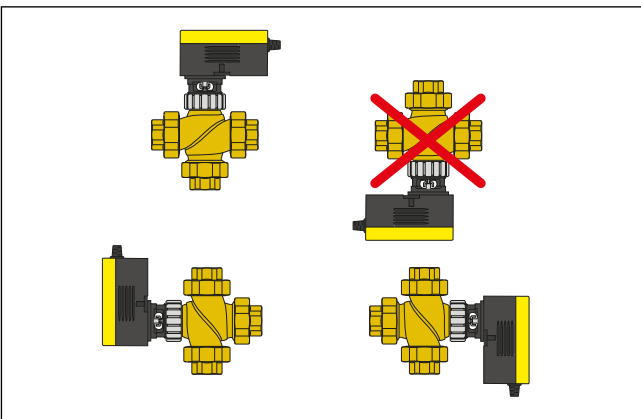
\emptyset	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Kv (m ³ /h)	4	6,3	10	16	22	28
\emptyset	DN 65	DN 80	DN 100	DN 125	DN 150	
Kv (m ³ /h)	63	100	160	220	320	

Installation

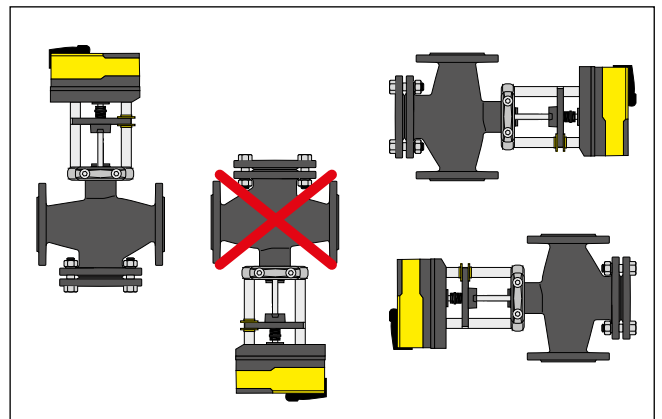
Recommended installation to prevent noisy water flow in the heating and cooling systems.



Do not install upside down.

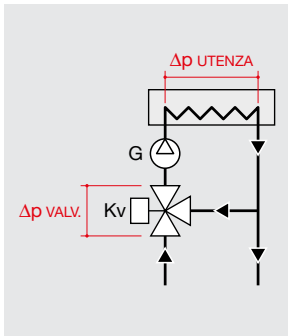


Do not install upside down.



Dimensioning the mixing circuit

Typical diagram



In a mixing circuit, the portion upstream from the three-way valve is usually a zone with negligible Δp (and there is normally a hydraulic separator). Therefore the main pressure drop is due to the three-way valve, giving it regulating authority. For this reason, the three-way valve can be dimensioned by considering an acceptable pressure drop for the utility circuit pump, which indicatively may be from 5 % to 15 % of the pressure drop in the utility circuit:

$$\Delta p_{VALV} \cong 0,05-0,15 \cdot \Delta p_{UTILITY}$$

Expressing the valve pressure drop as a function of the flow rate G and flow coefficient Kv gives the valve dimensioning relationship:

$$Kv = 0,25-0,45 \cdot G / \sqrt{100 \cdot \Delta p_{UTILITY}}$$

where: G = flow rate, l/h

$\Delta p_{UTILITY}$ = pressure drop of all components in the circuit, excluding the valve, kPa

Kv = valve flow coefficient, m^3/h

Alternatively, the dimensioning criteria described above can be represented graphically on specific diagrams: each coloured band corresponds to a choice of valve with hydraulic characteristics that are optimal for the design data.

Example

Dimension a three-way valve for a mixing circuit in a radiant panel system with the following characteristics:

- Design flow rate: $G = 2.000$ l/h
- Utility pressure drop: $\Delta p_{UTILITY} = 23$ kPa

Analytical method:

Determine the flow coefficient Kv of the regulating valve:

$$Kv_{MIN} = 0,25 \cdot 2000 / \sqrt{100 \cdot 23} = 10,4 \text{ m}^3/h$$

$$Kv_{MAX} = 0,45 \cdot 2000 / \sqrt{100 \cdot 23} = 18,8 \text{ m}^3/h$$

Therefore the valve is chosen to be 1 1/4" with a coefficient Kv of 16 m^3/h

The valve pressure drop is:

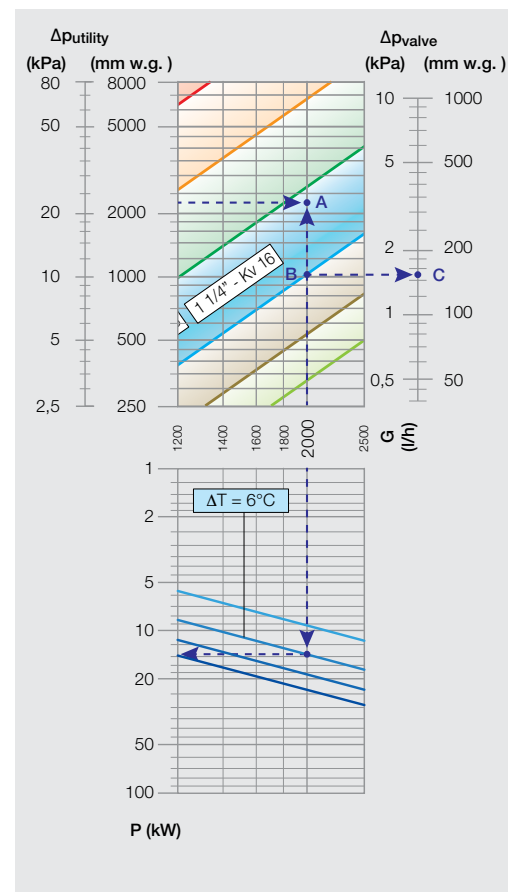
$$\Delta p_{VALV} = (0,01 \cdot G/Kv)^2 = (0,01 \cdot 2000/16)^2 = 1,5 \text{ kPa}$$

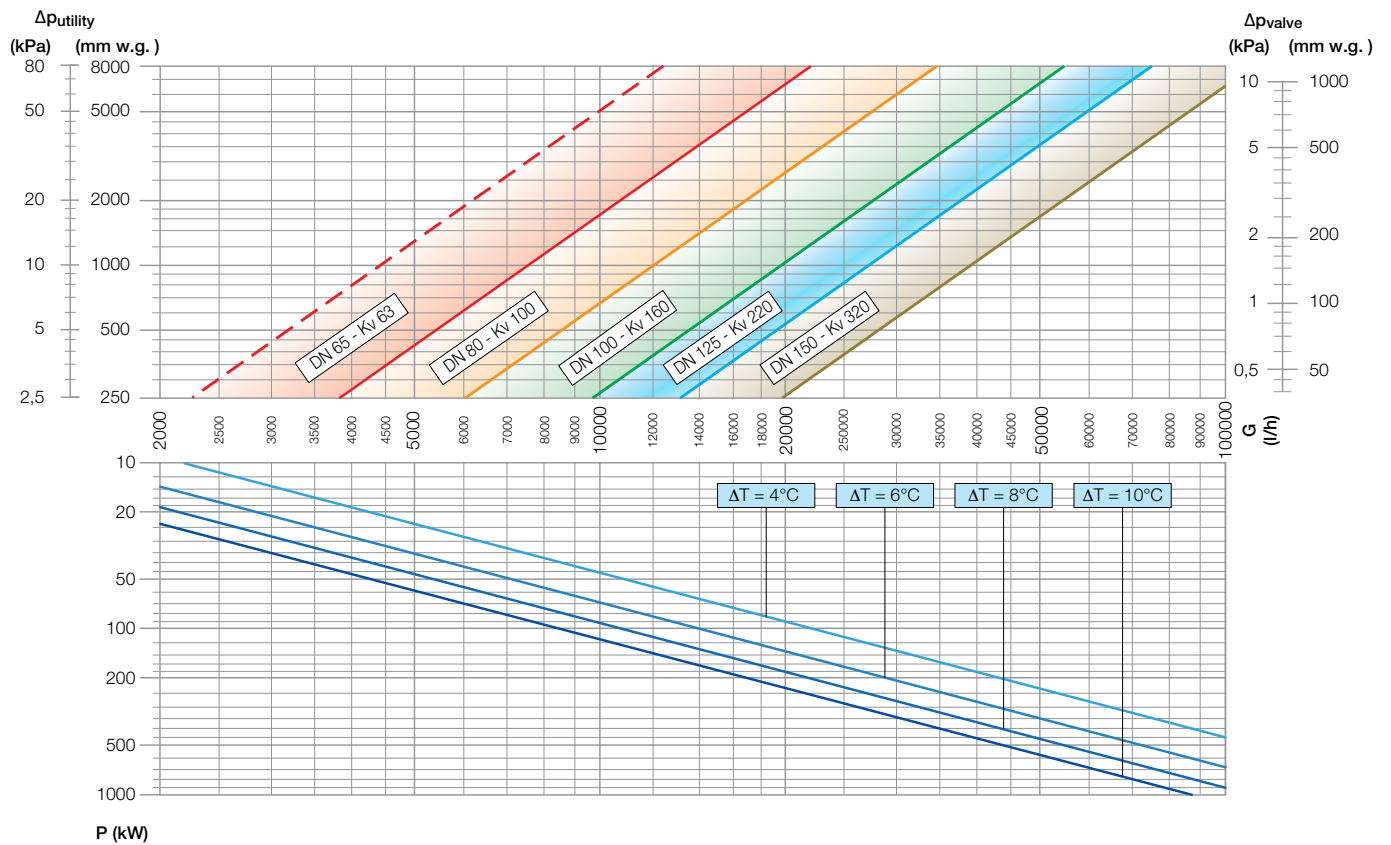
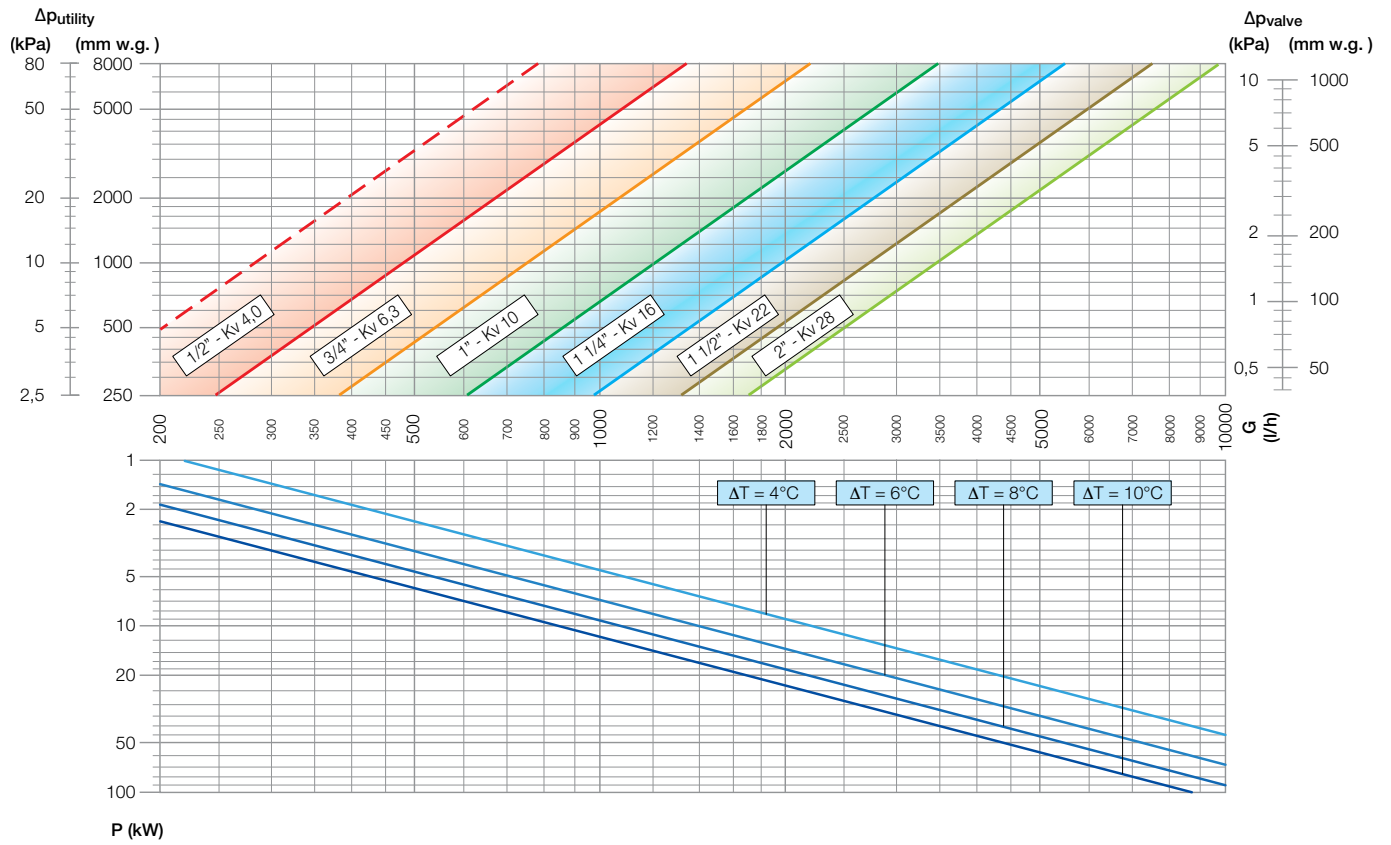
Graphical method:

Alternatively, the graphs on the facing page can be used.

Intersecting the flow rate G with the pressure drop $\Delta p_{UTILITY}$ gives point A, which is within the band for the 1 1/4" valve. The valve pressure drop can be obtained by starting from point B (where the flow rate G intersects the curve for the chosen valve) and reading the corresponding value at point C on the relative axis.

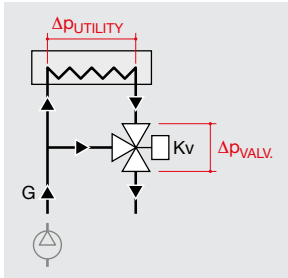
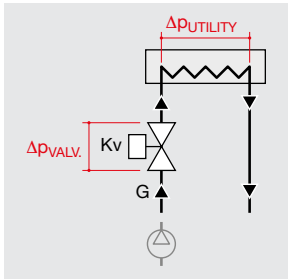
It is also possible to obtain the exchanged power from the graph below the chosen graph. In the example, assuming a temperature difference of 6 °C, we can estimate a power of 13,9 kW based on the design flow rate of 2000 l/h.





Dimension a limiting (2-way) and diversion (3-way) circuit

Typical diagram



In these two types of circuit, the two- or three-way regulating valve regulates the flow rate passing through the utility circuit. In such cases, it is important to have good authority by dimensioning the regulating valve to ensure that the pressure drop is not too low compared to that of the utility circuit. Recommended values for rapid dimensioning can be chosen considering:

$$\Delta p_{VALV} \cong 0,5 \div 1,0 \cdot \Delta p_{UTILITY}$$

Expressing the valve pressure drop as a function of the flow rate G and flow coefficient Kv gives the valve dimensioning relationship:

$$Kv = 0,10 \div 0,15 \cdot G / \sqrt{100 \cdot \Delta p_{UTILITY}}$$

where: G = flow rate, l/h

$\Delta p_{UTILITY}$ = pressure drop of all components in the circuit, excluding the valve, kPa.

Kv = valve flow coefficient, m^3/h

Alternatively, the dimensioning criteria described above can be represented graphically on specific diagrams: each coloured band corresponds to a choice of valve with hydraulic characteristics that are optimal for the design data.

Example

Dimension a two-way valve to control the power of a heat exchanger with the following characteristics:

- Heat exchanger capacity: $P = 500 \text{ kW}$
- Heat exchanger temperature difference: $\Delta T = 10 \text{ }^\circ\text{C}$
- Utility pressure drop: $\Delta p_{UTILITY} = 30 \text{ kPa}$

Analytical method:

Determine the nominal flow rate from the power and temperature difference:

$$G = P \cdot 860 / \Delta T = 500 \cdot 860 / 10 = 43000 \text{ l/h}$$

Determine the flow coefficient Kv of the regulating valve:

$$Kv_{MIN} = 0,10 \cdot 43000 / \sqrt{100 \cdot 30} = 78,5 \text{ m}^3/h$$

$$Kv_{MAX} = 0,15 \cdot 43000 / \sqrt{100 \cdot 30} = 117,7 \text{ m}^3/h$$

Therefore the valve is chosen to be DN 80 with a coefficient Kv of $100 \text{ m}^3/h$. The valve pressure drop is:

$$\Delta p_{VALV} = (0,01 \cdot G / Kv)^2 = (0,01 \cdot 43000 / 100)^2 = 18,5 \text{ kPa}$$

The authority can be calculated for the chosen regulating valve using the specific formula:

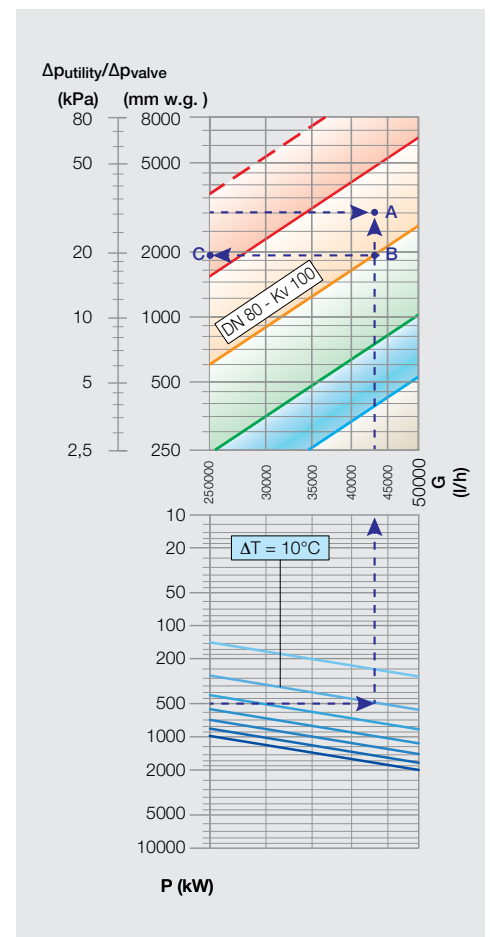
$$a = \Delta p_{VALV} / (\Delta p_{VALV} + \Delta p_{UTILITY})$$

$$a = 18,5 / (18,5 + 30) = 0,38$$

Graphical method:

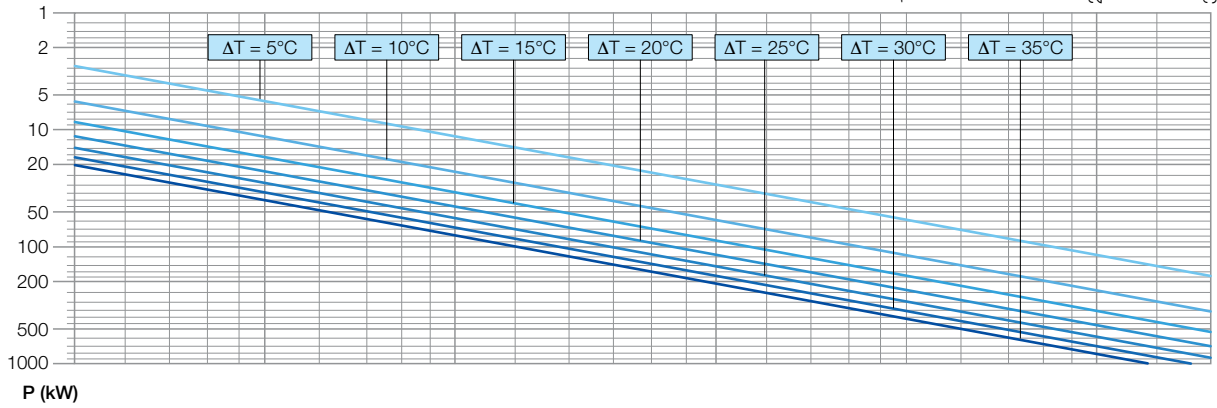
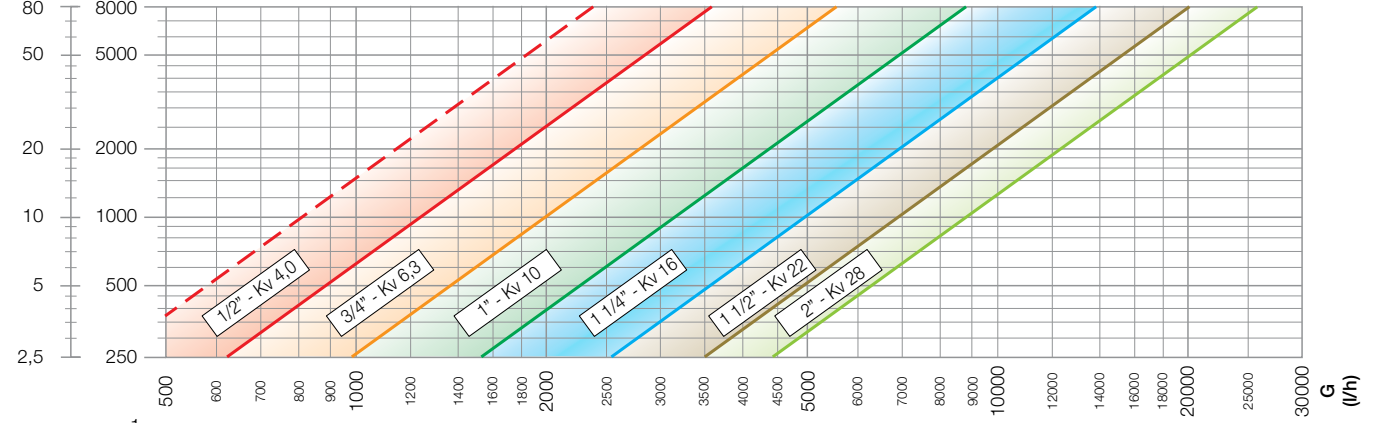
The design flow rate can be obtained from the graph below the dimensioning graph by finding the 500 kW heating capacity point on the line that corresponds to a temperature difference of $10 \text{ }^\circ\text{C}$. Then find point A that corresponds to the pressure drop $\Delta p_{UTILITY}$ within the band for the chosen DN 80 valve.

The valve pressure drop can be obtained from point B (where the flow rate G intersects the chosen valve) and reading the corresponding value at point C on the same axis.



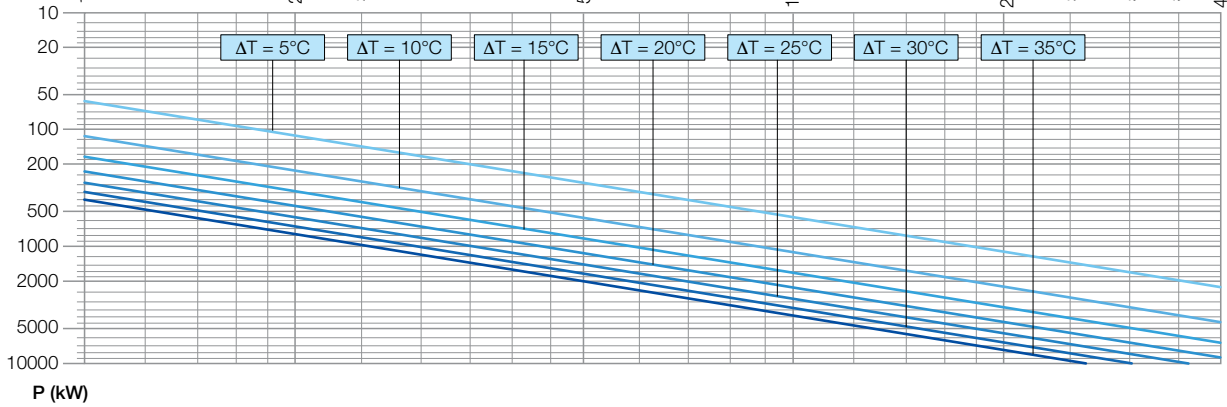
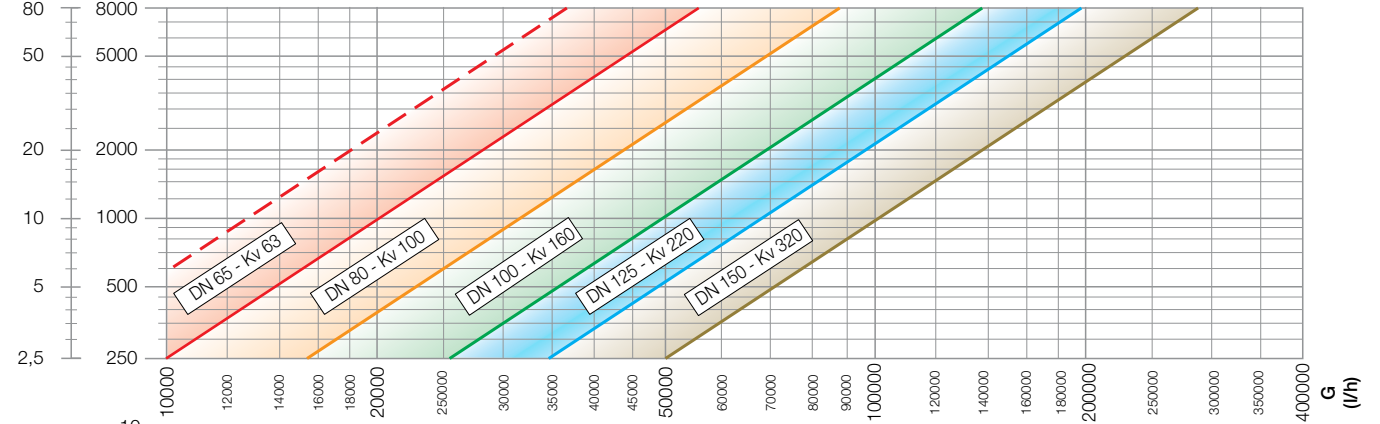
$\Delta p_{\text{utility}}/\Delta p_{\text{valve}}$

(kPa) (mm w.g.)



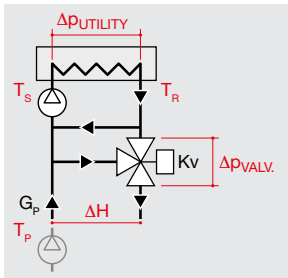
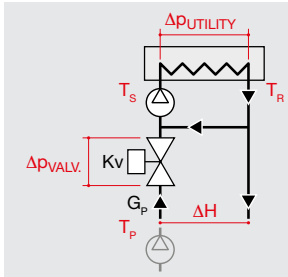
$\Delta p_{\text{utility}}/\Delta p_{\text{valve}}$

(kPa) (mm w.g.)



Dimensioning an injection circuit

Typical diagram



In an injection circuit, the by-pass line separates the utility circuit from the primary circuit in which the two- or three-way regulating valve is installed. Moreover, this circuit must always have an upstream pump in order to work. The correct authority value must be considered when dimensioning in order to ensure effective temperature regulation of the flow to the utility circuit. The valve pressure drop must therefore not be too low compared to the available head ΔH upstream from the circuit. Recommended values for rapid dimensioning can be chosen considering:

$$\Delta p_{VALV} \cong 0,5-1,0 \cdot \Delta H$$

Expressing the valve pressure drop as a function of the flow rate G_p and flow coefficient Kv_{VALV} gives the valve dimensioning relationship:

$$Kv = 0,10-0,15 \cdot G_p / \sqrt{100 \cdot \Delta H}$$

where: G_p = flow rate in the primary circuit, l/h

ΔH = available head upstream from the circuit, kPa

Kv = valve flow coefficient, m^3/h

Alternatively, the dimensioning criteria described above can be represented graphically on specific diagrams: each coloured band corresponds to a choice of valve with hydraulic characteristics that are optimal for the design data.

Example

Dimension a three-way valve to control the flow temperature for an injection circuit with the following characteristics:

- Primary circuit flow temperature: $T_p = 70 \text{ }^\circ\text{C}$
- Secondary circuit flow temperature: $T_s = 50 \text{ }^\circ\text{C}$
- Heating capacity: $P = 90 \text{ kW}$
- Available head: $\Delta H = 35 \text{ kPa}$
- Return temperature: $T_r = 45 \text{ }^\circ\text{C}$

Analytical method:

Determine the temperature difference on the primary circuit:

$$\Delta T = T_p - T_r = 70 - 45 = 25 \text{ }^\circ\text{C}$$

Determine the flow rate in the primary circuit:

$$G_p = P \cdot 860 / \Delta T = 90 \cdot 860 / 25 = 3096 \text{ l/h}$$

Determine the flow coefficient Kv of the regulating valve:

$$Kv_{MIN} = 0,10 \cdot 3096 / \sqrt{100 \cdot 35} = 5,2 \text{ m}^3/h$$

$$Kv_{MAX} = 0,15 \cdot 3096 / \sqrt{100 \cdot 35} = 7,8 \text{ m}^3/h$$

Therefore the valve is chosen to be 3/4" with a coefficient Kv of 6.3 m^3/h

The valve pressure drop is:

$$\Delta p_{VALV} = (0,01 \cdot G / Kv)^2 = (0,01 \cdot 3096 / 6.3)^2 = 24,1 \text{ kPa}$$

The authority can be calculated for the chosen regulating valve using the specific formula:

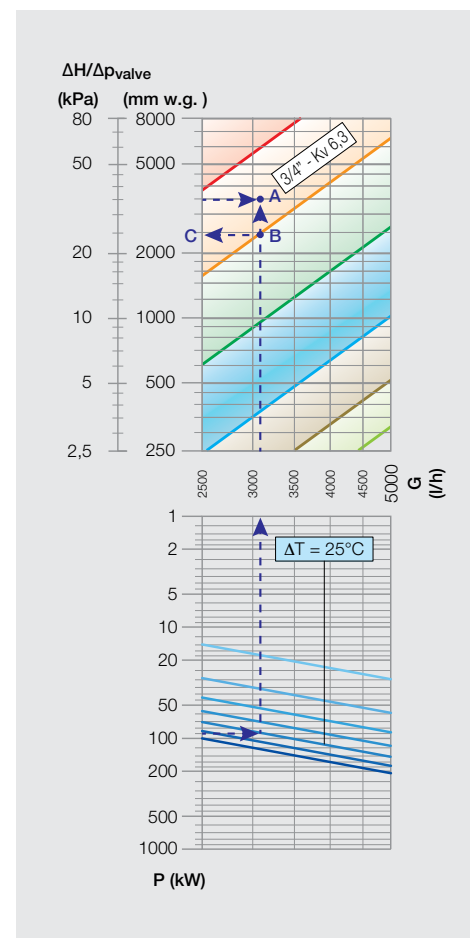
$$a = \Delta p_{VALV} / (\Delta p_{VALV} + \Delta H)$$

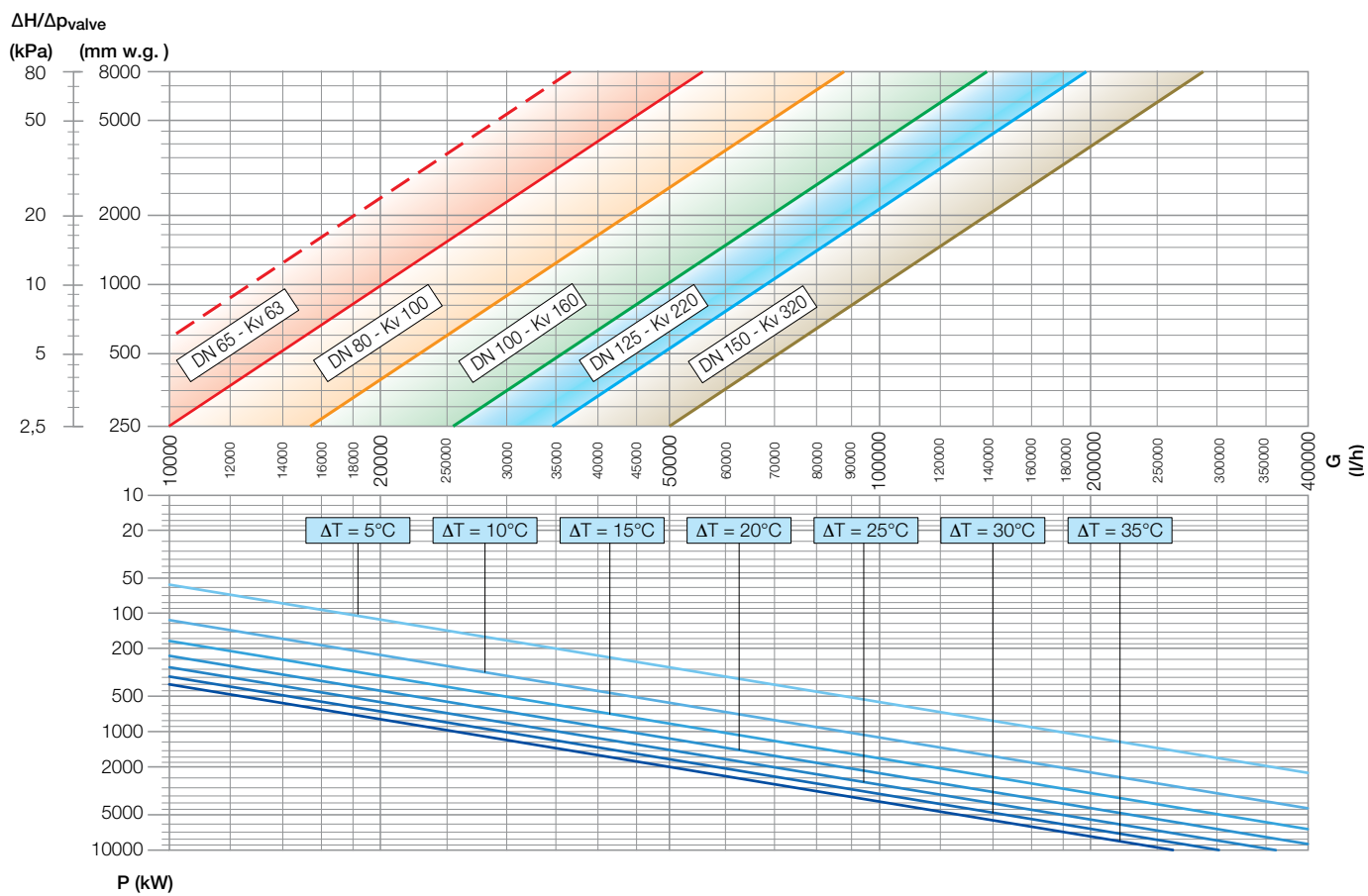
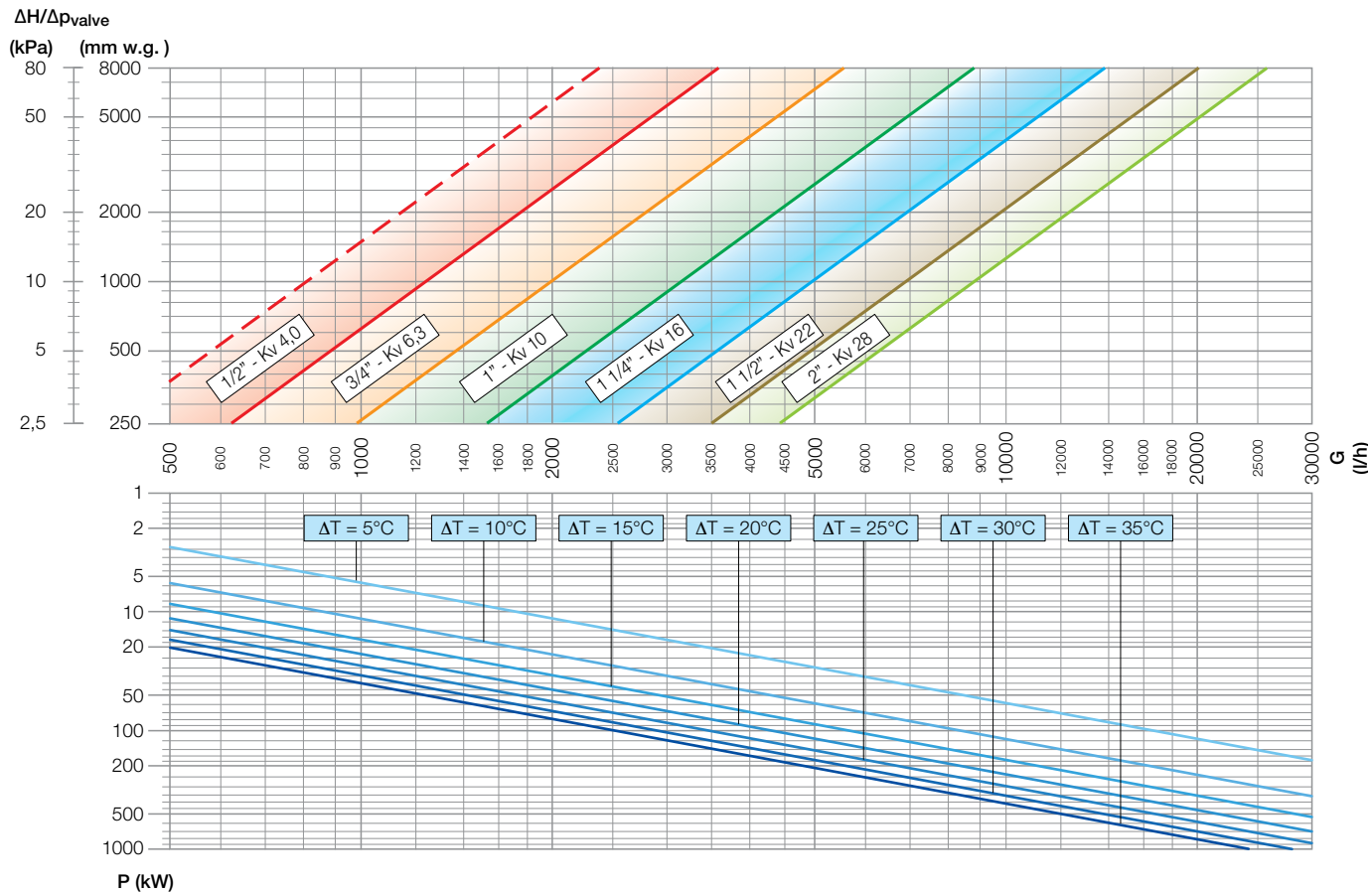
$$a = 24,1 / (24,1 + 35) = 0,40$$

Graphical method:

The design flow rate can be obtained from the graph below the dimensioning graph by finding the 90 kW heating capacity point on the line that corresponds to a temperature difference of 25 $^\circ\text{C}$. Then find point A that corresponds to the pressure drop ΔH within the band for the chosen 3/4" valve.

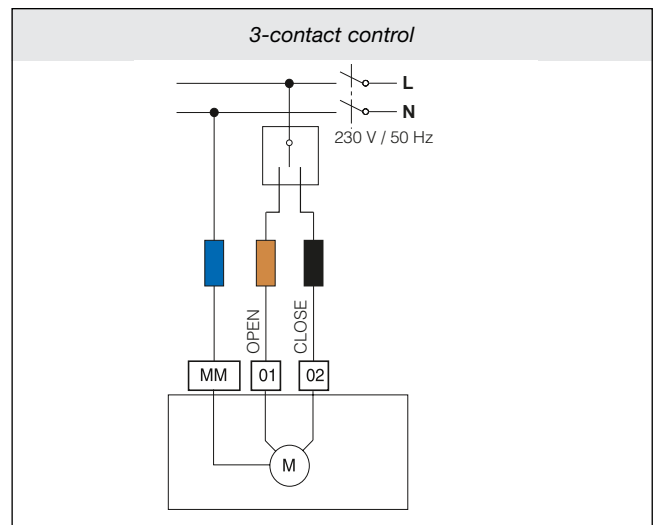
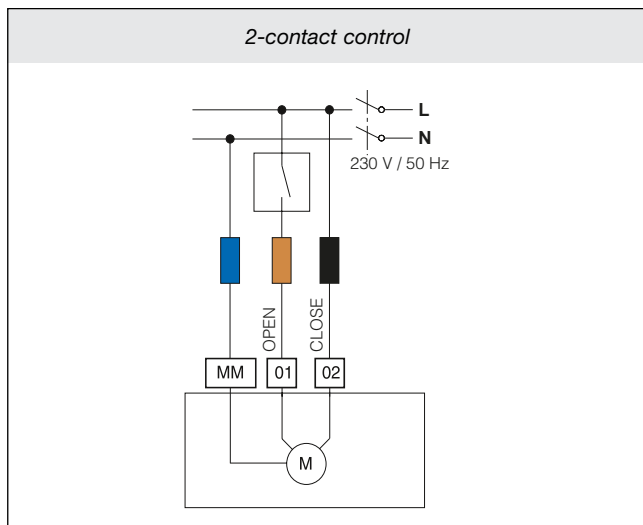
The valve pressure drop can be obtained from point B (where the flow rate G_p intersects the chosen valve) and reading the corresponding value at point C on the same axis.



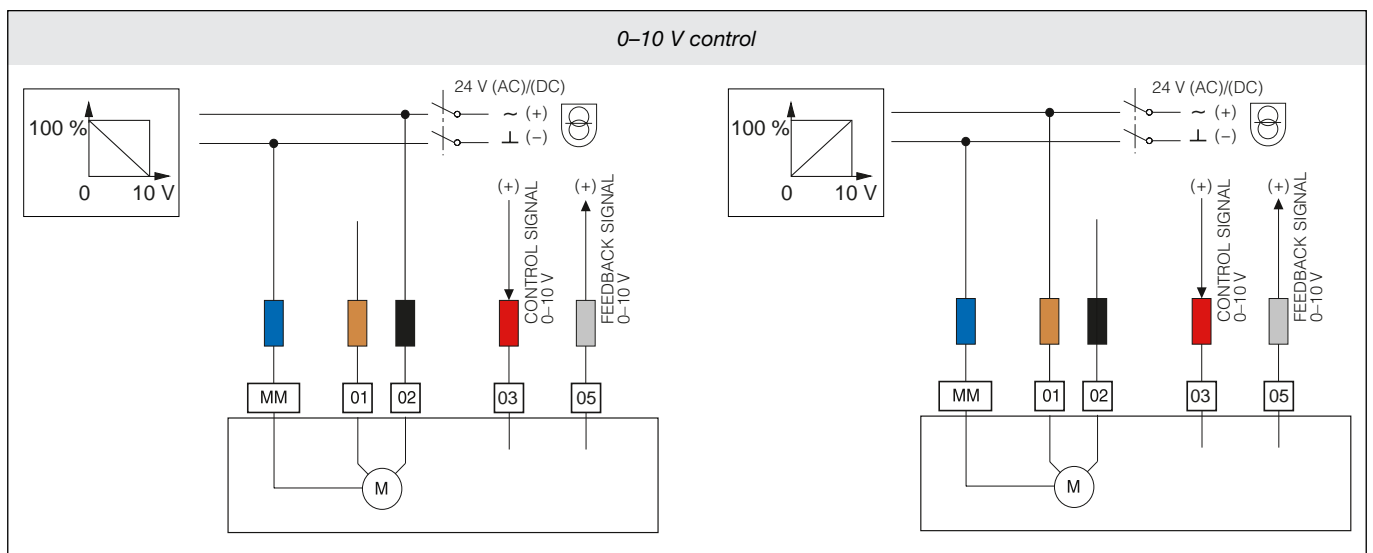
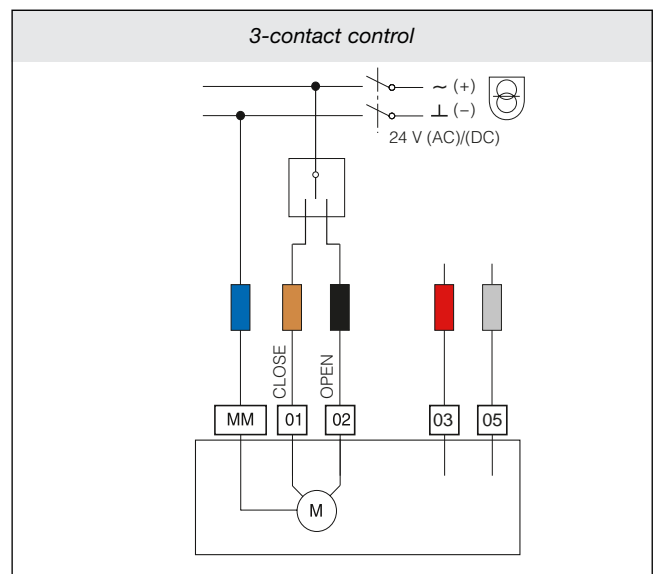
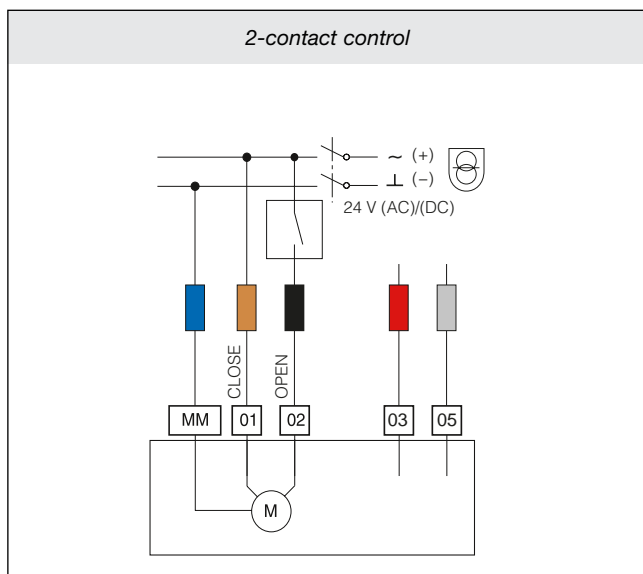


Wiring diagrams

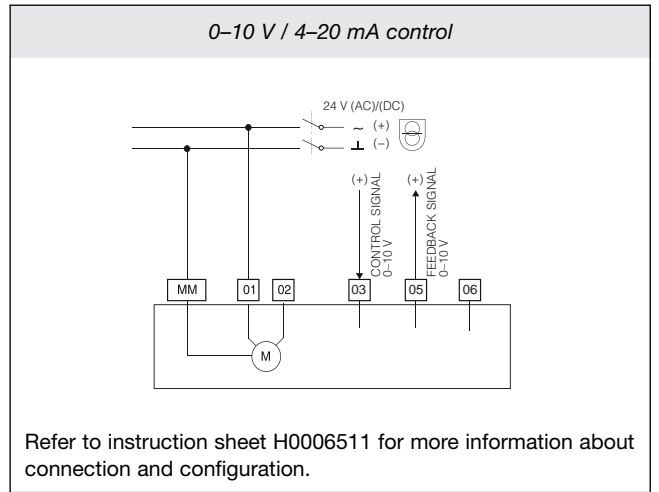
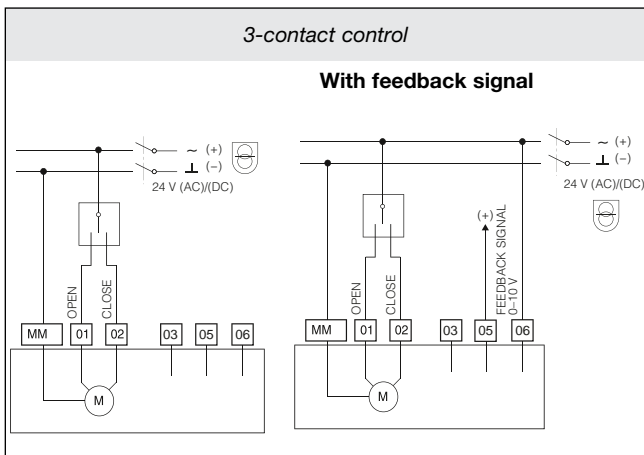
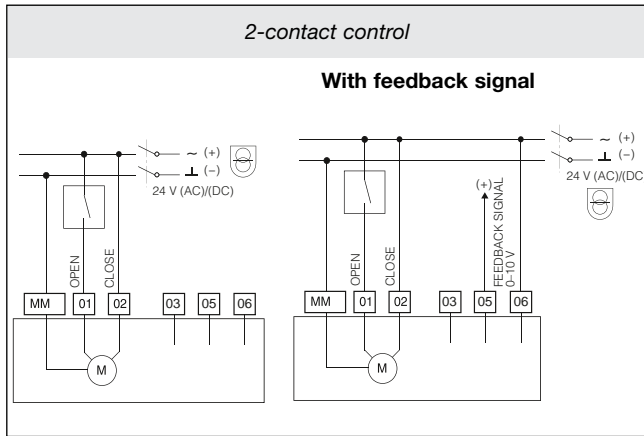
**Actuator
(code 636002)**



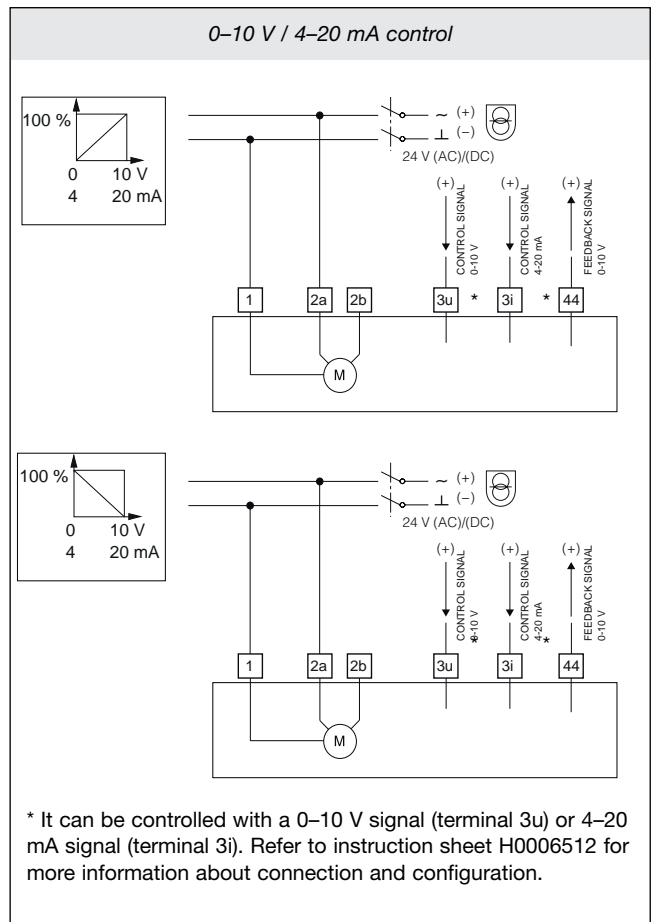
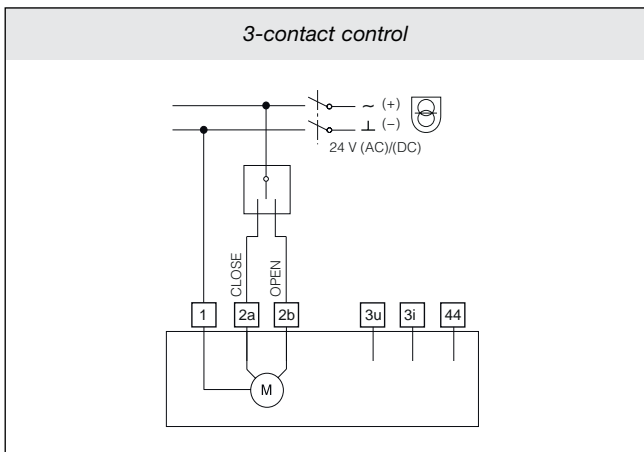
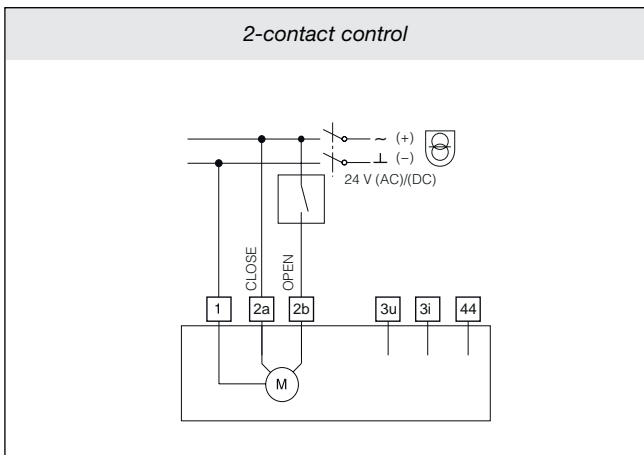
**Actuator
(code 636004 - code 636014)**



**Actuator
(code 636024)**

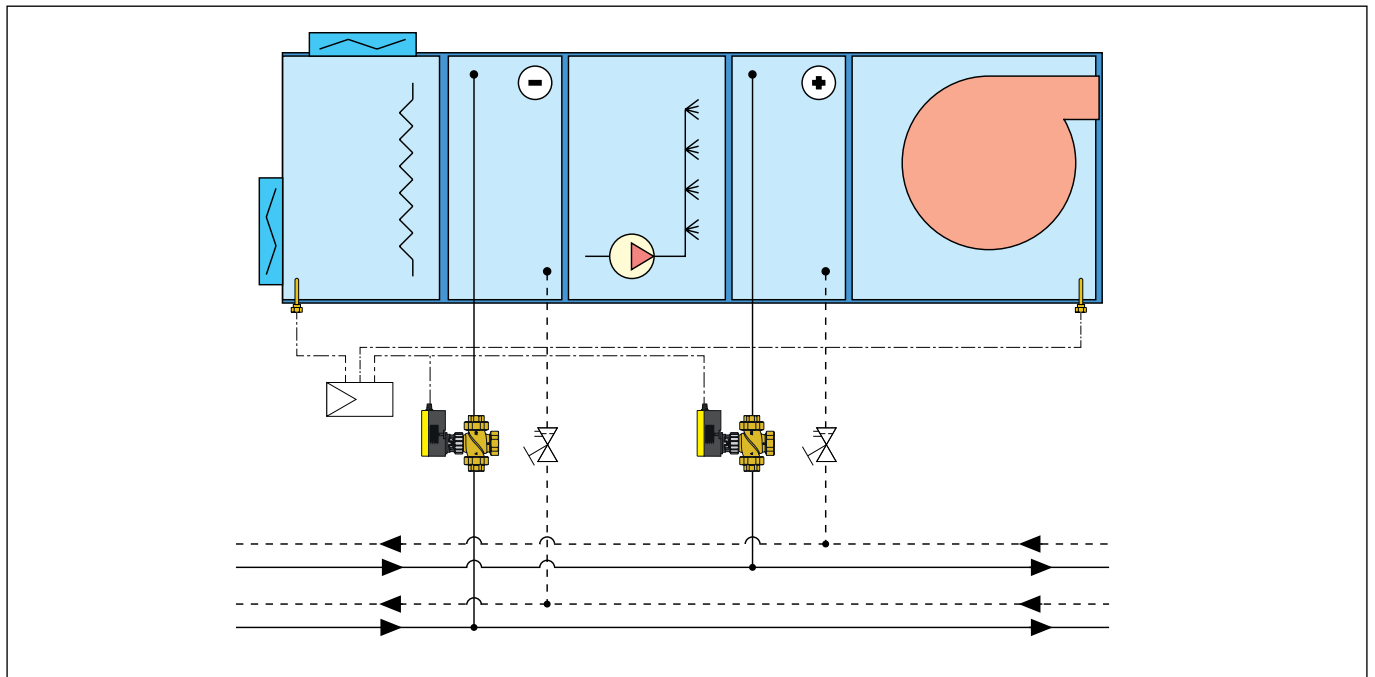


**Actuator
(code 636034)**

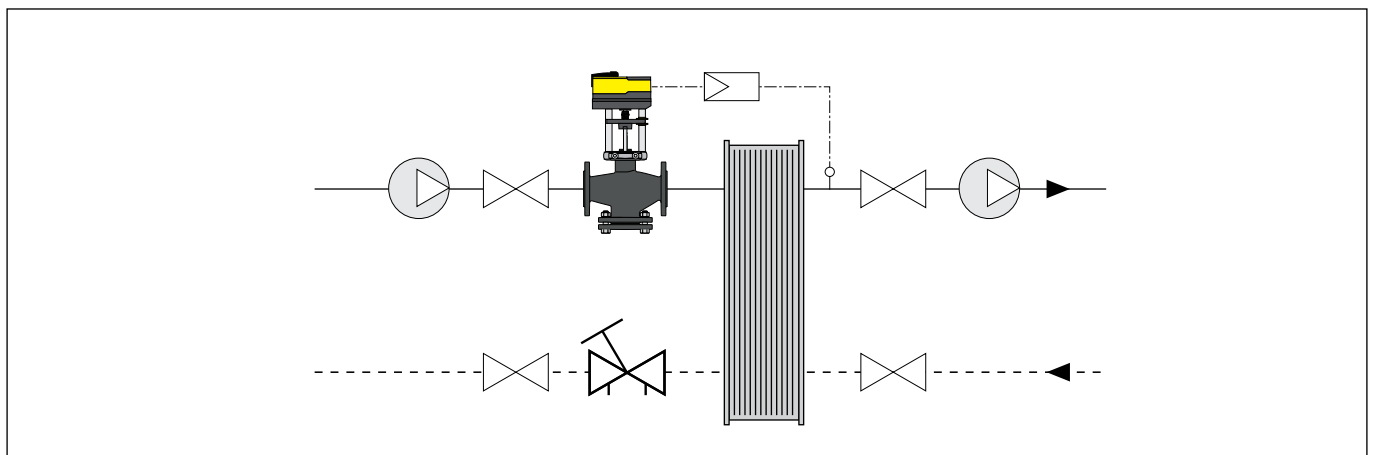


Application diagrams

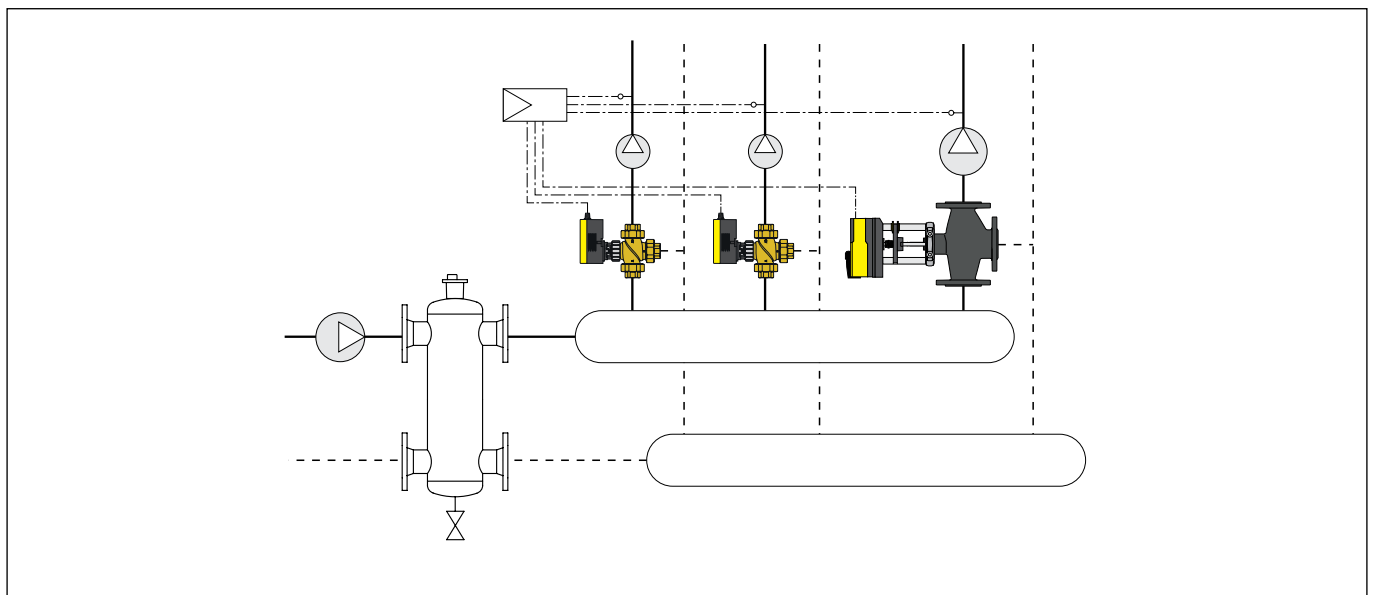
Air treatment coil regulation with two-way valves.



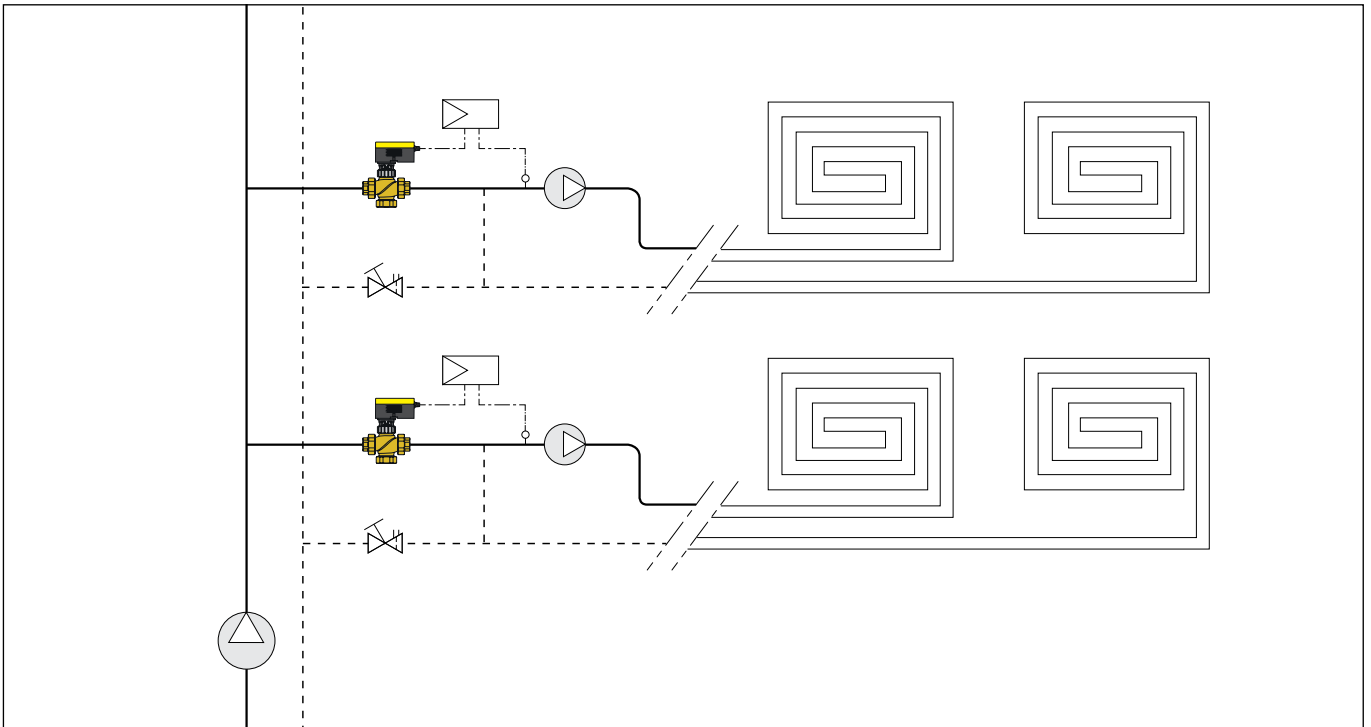
Secondary circuit temperature regulation with a two-way valve.



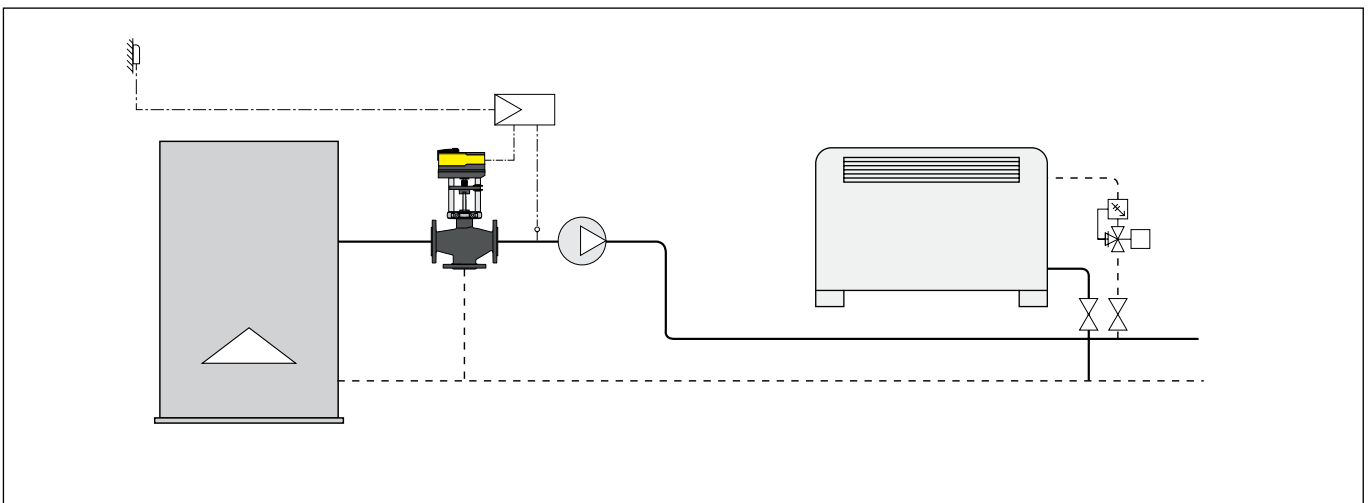
Regulation with a three-way valve in the central heating system.



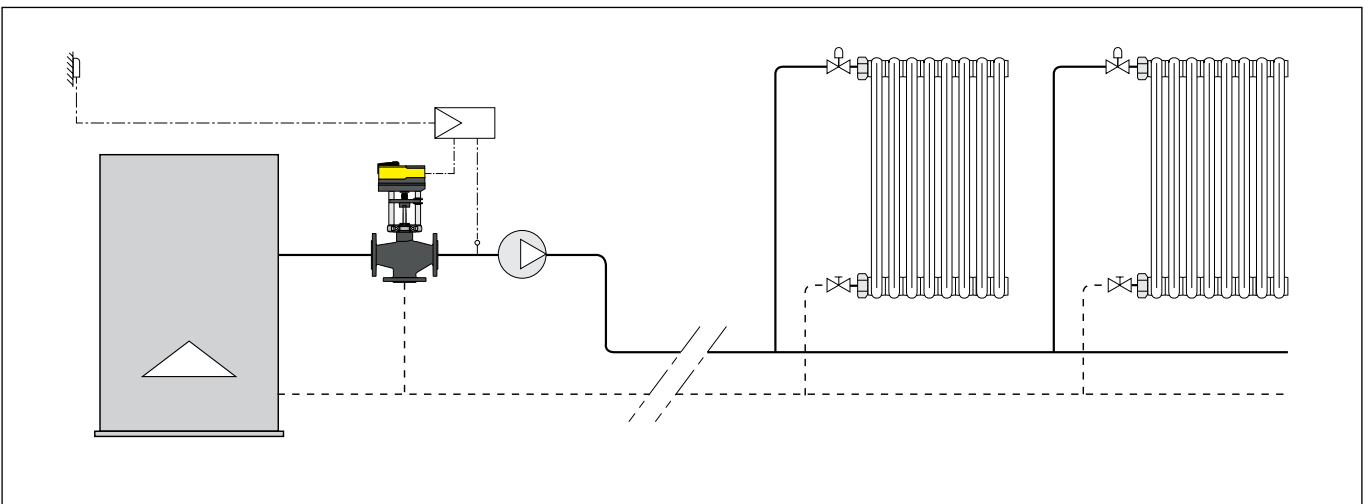
Temperature regulation with a two-way valve in utilities with radiant panel systems.



Outside compensated temperature regulation with a two-way valve in a central heating system.



Outside compensated temperature regulation with a three-way valve in a central heating system for radiator systems.



SPECIFICATION SUMMARY

636 Series

Two-way regulating globe valve with threaded connection. Size DN 15 (from DN 15 to DN 50). Connections 1/2" (from 1/2" to 2") F (EN 10226-1) with union. Equal percentage regulation. **CR** dezincification resistant alloy body. Water and glycol solutions medium; max. percentage of glycol 50 %. Maximum working pressure 16 bar. Maximum differential pressure 10 bar (from 3/4" to 1 1/4"), 5 bar (1 1/2"-2"). Working temperature range 0–100 °C. Seepage class, main port ≤ 0,05 % Kvs, by-pass ≤ 1 % Kvs. Nominal stroke 8 mm.

636 Series

Three-way regulating globe valve with threaded connection. Size DN 15 (from DN 15 to DN 50). Connections 1/2" (from 1/2" to 2") F (EN 10226-1) with union. Main port regulation: equal percentage By-pass regulation: linear **CR** dezincification resistant alloy body. Water and glycol solutions medium; max. percentage of glycol 50 %. Maximum working pressure 16 bar. Maximum differential pressure 10 bar (from 3/4" to 1 1/4"), 5 bar (1 1/2"-2"). Working temperature range 0–100 °C. Seepage class, main port ≤ 0,05 % Kvs, by-pass ≤ 1 % Kvs. Nominal stroke 8 mm.

Code 636004

Actuator for 636 series threaded control valves. Electric supply 24 V (ac). Power consumption 8,5 VA. Nominal force 250 N. Control signal: 2-point, 3-point, 0–10 V. Protection class IP 54. Operating time 35 s, 60 s, 120 s. Supply cable length 1,2 m. Ambient temperature range -10–55 °C; maximum humidity 95 %.

Code 636002

Actuator for 636 series threaded control valves. Electric supply 230 V. Power consumption 4 VA. Nominal force 500 N. Control signal: 2-point, 3-point. Protection class IP 54. Operating time 120 s. Supply cable length 1,2 m. Ambient temperature range -10–55 °C; maximum humidity 95 %.

Code 636014

Actuator for 636 series threaded control valves. Electric supply 24 V. Power consumption 8.7 VA. Nominal force 500 N. Control signal: 2-point, 3-point, 0–10 V. Protection class IP 54. Operating time 60 s, 120 s. Supply cable length 1,2 m. Ambient temperature range -10–55 °C; maximum humidity 95 %.

636 Series

Two/three-way regulating globe valve with flanged connection. Size DN 65 (from DN 65 to DN 150). Flanged connections, PN 16, coupling with counterflange EN 1092-1 (617 series). Main port regulation: equal percentage By-pass regulation: linear Grey cast iron body. Water and glycol solutions medium; max. percentage of glycol 50 %. Maximum working pressure 16 bar. Working temperature range -15–100 °C. Seepage class, main port ≤ 0,1 % Kvs, by-pass ≤ 1 % Kvs. Nominal stroke 20 mm (DN 65–DN 80), 40 mm (DN 100–DN150).

Code 636024

Actuator for flanged regulating valves, codes 636060 and 636080. Electric supply 24 V. Power consumption 3.5 VA. Nominal force 1.000 N. Control signal: 2-point, 3-point, 0–10 V. Protection class IP 54. Operating time 80 s, 120 s. Ambient temperature range -10–55 °C; maximum humidity 85 % without condensation; transportation: -40–80 °C.

Code 636034

Actuator for 636 series flanged control valves. Electric supply 24 V. Power consumption 20 VA. Nominal force 2.500 N. Control signal: 2-point, 3-point, 0–10 V. Protection class IP 66. Operating time 40 s / 80 s / 120 s (DN 65–80); 80 s / 160 s / 240 s (DN 100–150). Ambient temperature range -10–55 °C; maximum humidity 95 % without condensation:

We reserve the right to make changes and improvements to our products and the related data in this publication, at any time and without prior notice.