



## Belimo ZoneTight™ QCV 2-way characterised control valves and 3-way change-over ball valves

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## Introduction

The valve-actuator combination QCV (= Quick Compact Valve) is a Belimo ZoneTight™ Room & Zone Solution. The QCV, comprised of the 2-way characterised control valves and the 3-way change-over ball valves of the nominal sizes DN 15 and DN 20 and the CQ... actuators, have impressive properties:

- Tight-sealing ball valve prevents circulation losses
- Minimum power consumption during operation and in standby mode
- Compact overall structure
- Lightning-fast manually adjustable flow rates with the 2-way characterised control valves
- Automatic adaption to the set  $k_v$  value
- Rotary valves protected against soiling and seizing thanks to form-fit valve-actuator connection
- Actuator installed without any tools
- Compatible with 24 V, 230 V, open-close/3-point, modulating control and MP-Bus.

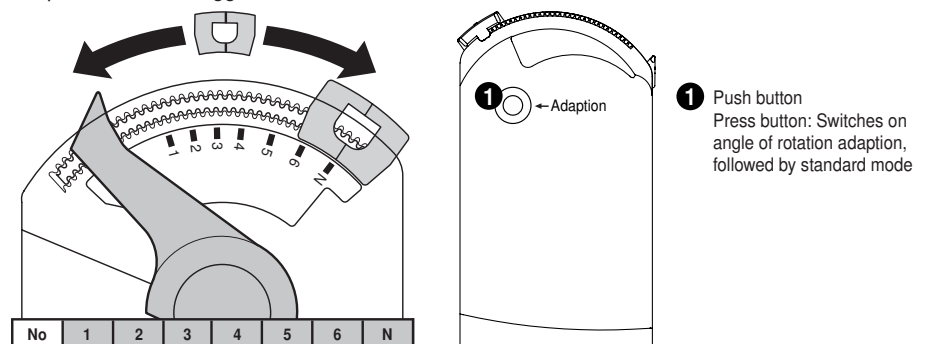
## Type code

Valve	Actuator
<p><b>C 2 15 Q - J</b></p> <ul style="list-style-type: none"> <li>C = Compact, internal thread</li> <li>2 = Internal thread, 2-way characterised control valves</li> <li>3 = Internal thread, 3-way change-over ball valves</li> <li>4 = External thread, 2-way characterised control valves</li> <li>5 = External thread, 3-way change-over ball valves</li> <li>15 = DN 15</li> <li>20 = DN 20</li> <li>Q = Actuator installed without any tools</li> <li>H = Flow rate value range 2.2...3.5 m<sup>3</sup>/h</li> <li>J = Flow rate value range 3.6...5.6 m<sup>3</sup>/h</li> <li>K = Flow rate value range 5.7...8.8 m<sup>3</sup>/h</li> <li>F = Flow rate range 0.1...1.3 m<sup>3</sup>/h</li> </ul>	<p><b>CQCK24A-SR-T</b></p> <ul style="list-style-type: none"> <li>CQ = Compact, low torque</li> <li>C = No details: running time 75 s</li> <li>C = Running time 35 s</li> <li>D = Running time 15 s</li> <li>K = Actuator with emergency control function (SuperCap)</li> <li>24 = AC/DC 24 V / 230 = AC 230 V</li> <li>A = New actuator generation</li> <li>SR = No details: open-close, 3-point</li> <li>SR = Modulating control, operating range 2...10 V</li> <li>SZ = Modulating control, operating range 0.5...10 V</li> <li>MPL = Belimo MP-Bus light</li> <li>T = Version with clamp</li> </ul>

## Product features

**Adjustable angle of rotation** The rotary actuator can be changed in 2.5° increments with the use of a clip. This is used to set the  $k_v$  value (maximum flow rate of the valve).

**$k_v$  setting** Remove end stop clip and put into desired position (without end stop clip  $k_{vs}$  value of the valve). Each time the  $k_v$  setting is changed using the end stop clip, with the modulating actuators an adaption has to be triggered.



**Adaption** When the supply voltage is switched on for the first time, i.e. at the time of commissioning, the CQ24A-SR(-T), CQ24A-SZ(-T) and CQ24A-MPL(-T) actuators with modulating control carry out an adaption. This also has to be done when the end stop clip is adjusted.

## Product features

		Position number CQ.. actuators							
		1	2	3	4	5	6	N <sup>2)</sup>	1)
C215Q-F	$k_v$ [m <sup>3</sup> /h]	0.09	0.14	0.2	0.3	0.48	0.72	1	1.2
C215Q-J	$k_v$ [m <sup>3</sup> /h]	0.4	0.6	1	1.5	2	2.9	4	4.8
C220Q-K	$k_v$ [m <sup>3</sup> /h]	0.5	0.9	1.4	2.1	2.9	4	5.7	8
C415Q-J	$k_v$ [m <sup>3</sup> /h]	0.4	0.6	1	1.4	1.9	2.6	3.7	4.5
C420Q-K	$k_v$ [m <sup>3</sup> /h]	0.5	0.9	1.4	2.1	2.9	4	5.7	7.8

<sup>1)</sup> without end stop clip

<sup>2)</sup> factory setting

## Operating range

The ball valve has an operating range in its direction of opening of 15°...90° as a result of its design, which means that the air tight range with the ball valve is at 15°. A hysteresis of 4° also is obtained as a result of the design, which means that the ball valve is not air bubble tight in the direction of closing until it reaches 11°.

At the smallest  $k_v$  value that can be set (Position number 1), the angle of rotation of the ball valve is still 36.5°. This means that the actuator adapts to the angle 0...36.5°, 15° of which is the air tight range, meaning 41% at this flow value setting. If the actuator has the operating range 0.5...10 V (for 0...36.5°), then the effective operating range of the valve is between 4.4 and 10 V. The running time of the actuator is 75 s / 90°, i.e. this results in a running time of 30 s for the 36.5° at the Position number 1 setting.

The operating ranges of the valves with the respective position numbers are:

## Modulating control actuators

Position number CQ.. actuator	Completely open position at [°]	Running time [s]	CQ24A-SR(-T)		CQ24A-SZ(-T)	
			Operating range DC 2...10 V		Operating range DC 0.5...10 V	
			Combination operating range in the direction of opening [V]	Number of control steps	Combination operating range in the direction of opening [V]	Number of control steps
1	36.5	30	5.3...10	63	4.4...10	75
2	44	37	4.7...10	70	3.7...10	83
3	51.5	43	4.3...10	76	3.3...10	90
4	59	49	4.0...10	80	2.9...10	94
5	66.5	55	3.8...10	83	2.6...10	98
6	74	62	3.6...10	85	2.4...10	101
N	81.5	68	3.5...10	87	2.2...10	103
1)	90	75	3.3...10	89	2.1...10	106

<sup>1)</sup> without end stop clip

Calculation of actuator control steps:

- Operating range (e.g. 4.4 ... 10 V)    10 V – 4.4 V = 5.6 V
- Response sensitivity:                    75 mV = 0.075 V
- Actuator control steps:                 5.6 V / 0.075 V = 75 steps

Opening limit angle (tight – not tight):    approx. 15° in the direction of opening

Hysteresis combination:                    3.5...4°

Closing limit angle (not tight – tight):    approx. 11° in closing direction



Running time of actuators:                75 s / 90°

Recommendation for the smallest  $k_v$  values (Position numbers 1 and 2):

- The QCV should not be used with a P controller (persistent control deviation)
- The QCV should be used only in a closed control loop with PI or PID control
- In case of doubt, use the QCV only as an open-close unit

For special applications, the 230 V version of the open-close, 3-point actuator can be used with a running time of 35 s (CQC230A) or 15 s (CQD230A).

## Selection table for 2-way characterised control valves

Permissible working pressure $p_s$	1600 kPa																
Max. differential pressure $\Delta p_{max}$	280 kPa																
Medium temperature	2...90 °C																
Valve design	Valve characteristic curve	Valve					Actuator										
		C215Q-F	C215Q-J	C220Q-K	C415Q-J	C420Q-K	Position No. CQ.. actuator	CQ24A-SR(-T)	CQ24A-SZ(-T)	CQ24A(-T)	CQ230A(-T)	CQ24A-IMPL(-T)	CQK24A(-O)	CQK24A-SR(-O)	CQC230A	CQD230A	
		$k_v$	$k_v$	$k_v$	$k_v$	$k_v$											
		0.09	0.4	0.5	0.4	0.5	1										
		0.14	0.6	0.9	0.6	0.9	2										
		0.2	1	1.4	1	1.4	3										
		0.3	1.5	2.1	1.4	2.1	4										
		0.48	2	2.9	1.9	2.9	5										
		0.72	2.9	4	2.6	4	6										
		1	4	5.7	3.7	5.7	N										
1.2	4.8	8	4.5	7.8	1)												
DN		15	15	20	15	20											
internal thread		ISO 7-1			-												
external thread		-			ISO 228-1												

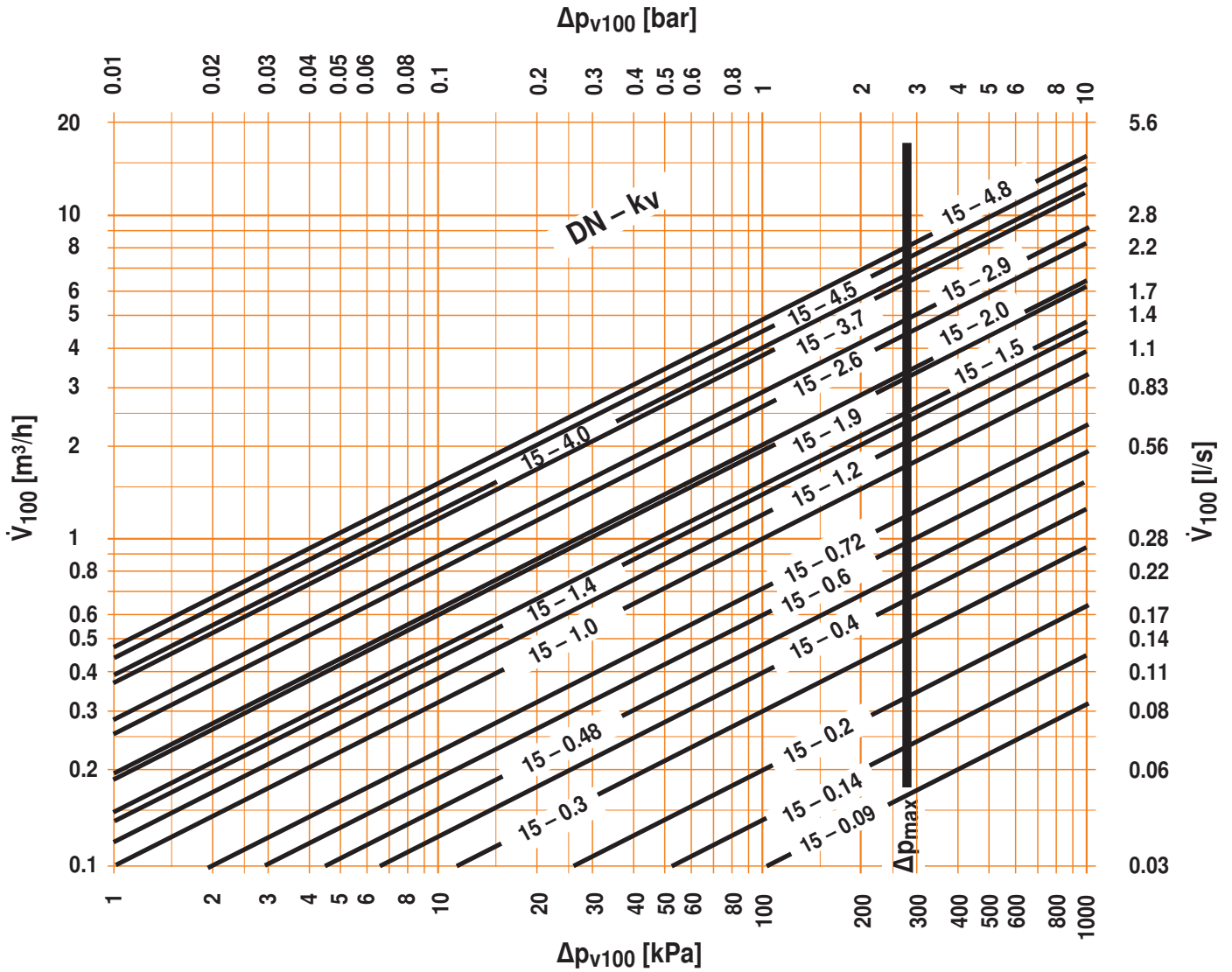
1) without end stop clip

Calculation diagram for 2-way characterised control valves DN 15

**Application** These characterised control valves are used in closed cold and hot water systems for modulating water-side control of air handling units and heating systems.

**Media** Cold and hot water, water with glycol up to max. 50% vol.

**Medium temperatures** 2...90°C



**$\Delta p_{max}$**   
Maximum permissible differential pressure for long service life across control path A – AB, with reference to the whole opening range.

**$\Delta p_{v100}$**   
Differential pressure for ball valve opened up to  $k_v$  value setting

**$\dot{V}_{100}$**   
Nominal flow rate with  $\Delta p_{v100}$

**Formula  $k_v$**

$k_v$  [m<sup>3</sup>/h]  
 $\dot{V}_{100}$  [m<sup>3</sup>/h]  
 $\Delta p_{v100}$  [kPa]

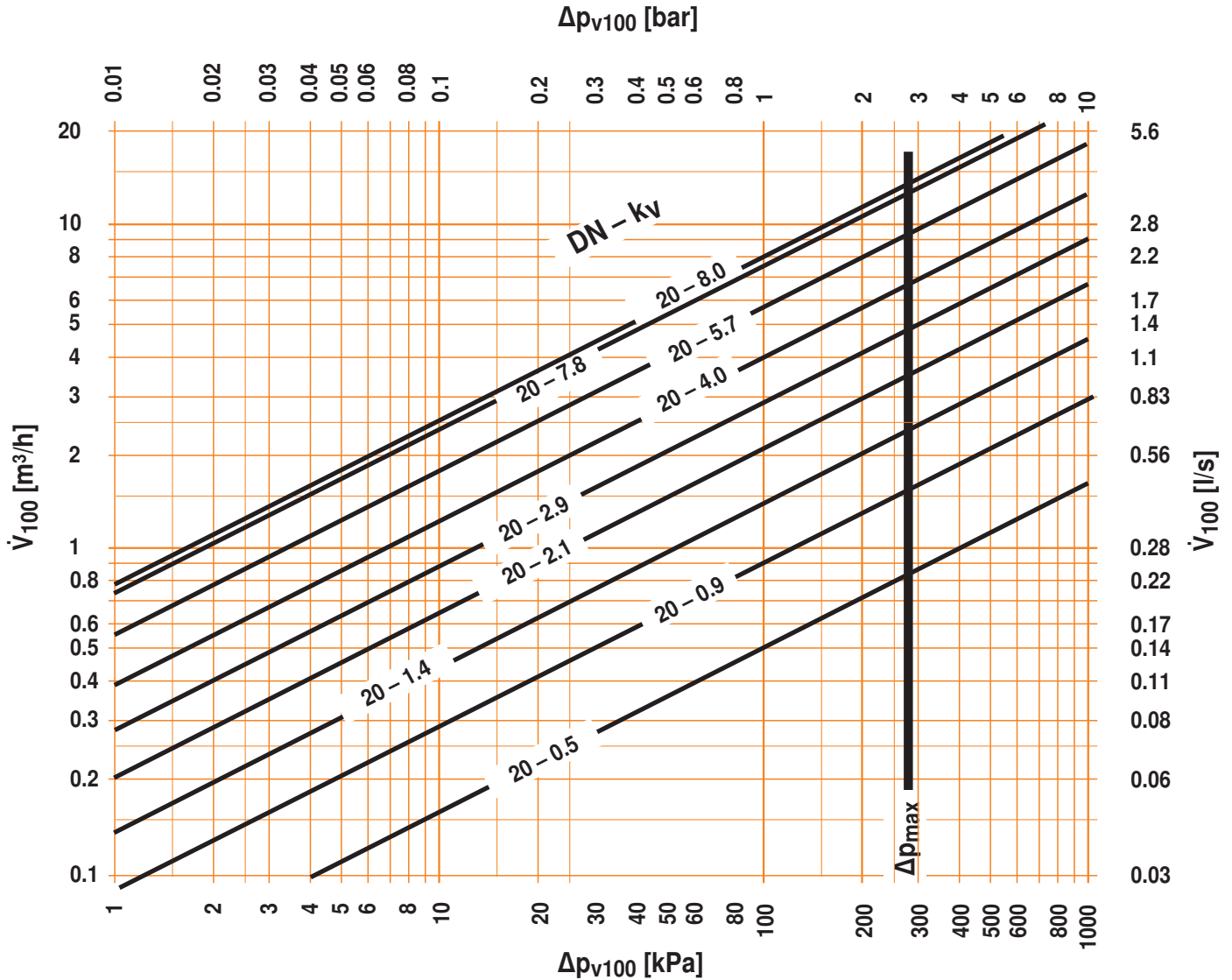
$$k_v = \frac{\dot{V}_{100}}{\sqrt{\frac{\Delta p_{v100}}{100}}}$$

Calculation diagram for 2-way characterised control valves DN 20

**Application** These characterised control valves are used in closed cold and hot water systems for modulating water-side control of air handling units and heating systems.

**Media** Cold and hot water, water with glycol up to max. 50% vol.

**Medium temperatures** 2...90°C



**Δp<sub>max</sub>**  
Maximum permissible differential pressure for long service life across control path A – AB, with reference to the whole opening range.

**Δp<sub>V100</sub>**  
Differential pressure for ball valve opened up to k<sub>v</sub> value setting

**V̇<sub>100</sub>**  
Nominal flow rate with Δp<sub>V100</sub>

**Formula k<sub>v</sub>**  $k_v = \frac{V_{100}}{\sqrt{\frac{\Delta p_{V100}}{100}}}$

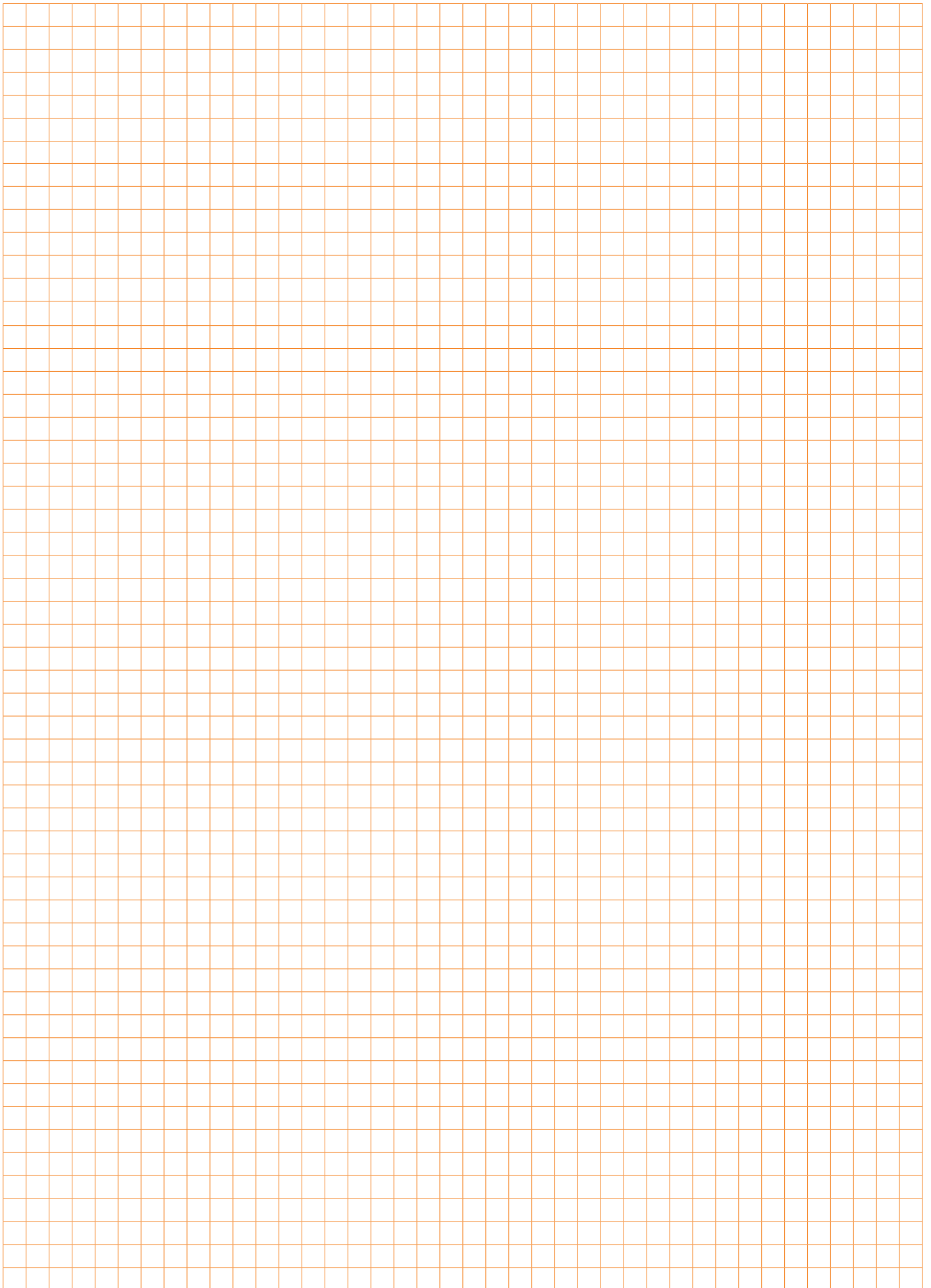
k<sub>v</sub> [m³/h]  
V̇<sub>100</sub> [m³/h]  
Δp<sub>V100</sub> [kPa]

Table of dimensions for 3-way change-over ball valves

Differential pressure Δp <sub>max</sub> [kPa]	0.1	1.0	3.0	10.0	k <sub>vs</sub> [m³/h]	DN [mm]		connection
Flow rate V̇ <sub>100</sub> [m³/h]	0.08	0.25	0.43	0.8	2.5	15	C315Q-H	internal thread
	0.13	0.4	0.69	1.3	4	20	C320Q-J	internal thread
	0.07	0.23	0.4	0.73	2.3	15	C515Q-H	external thread
	0.1	0.36	0.62	1.14	3.6	20	C520Q-J	external thread

**Formula V̇<sub>100</sub>**  $V_{100} = k_{vs} \sqrt{\frac{\Delta p_{V100}}{100}}$

k<sub>vs</sub> [m³/h]  
V̇<sub>100</sub> [m³/h]  
Δp<sub>V100</sub> [kPa]



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