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LDM valves
with Belimo actuators

Kv coefficient calculation

Calculation itself is carried out with respect to conditions of regulating circuit and operating medium according to equations mentioned below. Control valve must be designed to be able to regulate maximal flow quantity at given operating conditions. At the same time it is necessary to check whether minimal flow quantity can be even regulated or not.

Condition is the following ratio **$r > Kvs / Kv_{min}$**

Because of eventual minus tolerance 10% of Kv_{100} against Kvs and requirement for possible regulation within range of maximal flow (decrement and increase of flow), producer recommends to select Kvs value higher than maximal operating Kv value:

$Kvs = 1.1 \div 1.3\ Kv$

It is necessary to take into account to which extent Q_{max} involve "precautionary additions" that could result in valve oversizing.

Relations of Kv calculation

		Pressure drop $p_2 > p_1/2$ $\Delta p < p_1/2$	Pressure drop $\Delta p \geqq p_1/2$ $p_2 \leqq p_1/2$
Kv =	Liquid	$\frac{Q}{100}\sqrt{\frac{\rho_1}{\Delta p}}$	
	Gas	$\frac{Q_n}{5141}\sqrt{\frac{\rho_n . T_1}{\Delta p . p_2}}$	$\frac{2.Q_n}{5141.p_1}\sqrt{\rho_n . T_1}$
	Superh. steam	$\frac{Q_m}{100}\sqrt{\frac{v_2}{\Delta p}}$	$\frac{Q_m}{100}\sqrt{\frac{2v}{p_1}}$
	Sat. steam	$\frac{Q_m}{100}\sqrt{\frac{v_2 . x}{\Delta p}}$	$\frac{Q_m}{100}\sqrt{\frac{2v.x}{p_1}}$

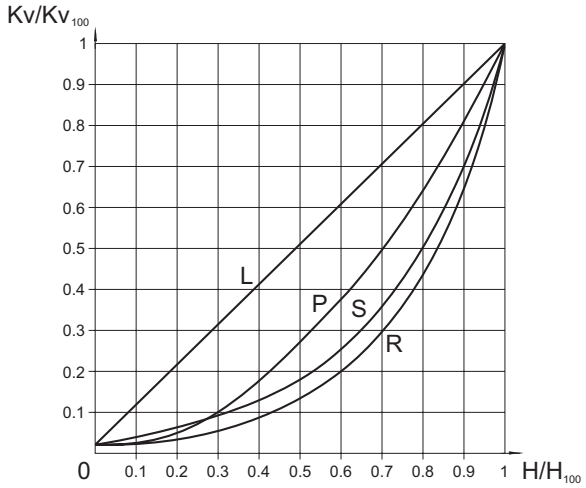
Above critical flow of vapours and gases

When pressure ratio is above critical ($p_2/p_1 < 0.54$), speed of flow reaches acoustic velocity at the narrowest section. This event can cause higher level of noisiness. Then it is convenient to use a throttling system ensuring low noisiness (multi-step pressure reduction, damping orifice plate at outlet).

Flow characteristic selection in regard of valve stroke

To make right selection of valve flow characteristic, it is suitable to carry out checking of what stroke values will be reached in different operation states. We recommend to carry out such checking at least for minimal, nominal and maximal flow rates. The principle for flow characteristic selection is to avoid, if possible, 5÷10% of the beginning and end of the valve stroke range.
To calculate valve stroke at different operating conditions with different types of flow characteristics is possible with the advantage of using LDM´s calculation programme VALVES. The programme serves for complete design of valve from Kv calculation to specification of a concrete valve with its actuator.

Valve flow characteristics



L - linear characteristic
$Kv/Kv_{100} = 0.0183 + 0.9817 . (H/H_{100})$

R - equal-percentage characteristic (4-percentage)
$Kv/Kv_{100} = 0.0183 . e^{(4 . H/H_{100})}$

P - parabolic characteristic
$Kv/Kv_{100} = 0.0183 + 0.9817 . (H/H_{100})^2$

S - LDM spline® characteristic
$Kv/Kv_{100} = 0.0183 + 0.269 . (H/H_{100}) - 0.380 . (H/H_{100})^2 + 1.096 . (H/H_{100})^3 - 0.194 . (H/H_{100})^4 - 0.265 . (H/H_{100})^5 + 0.443 . (H/H_{100})^6$

Dimensions and units

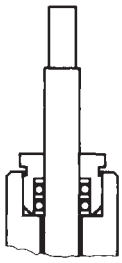
Marking	Unit	Name of dimension
Kv	$m^3.h^{-1}$	Flow coefficient under condition of units of flow
Kv_{100}	$m^3.h^{-1}$	Flow coefficient at nominal stroke
Kv_{min}	$m^3.h^{-1}$	Flow coefficient at minimal stroke
Kvs	$m^3.h^{-1}$	Valve nominal flow coefficient
Q	$m^3.h^{-1}$	Flow rate in operating conditions (T_1, p_1)
Q_n	$Nm^3.h^{-1}$	Flow rate in normal conditions (0°C, 0.101 Mpa)
Q_m	$kg.h^{-1}$	Flow rate in operating conditions (T_1, p_1)
p_1	MPa	Upstream absolute pressure
p_2	MPa	Downstream absolute pressure
p_s	MPa	Absolute pressure of saturated steam at given temperature (T_1)
Δp	MPa	Valve differential pressure ($\Delta p = p_1 - p_2$)
ρ_1	$kg.m^{-3}$	Process medium density in operating conditions (T_1, p_1)
ρ_n	$kg.Nm^{-3}$	Gas density in normal conditions (0°C, 0.101 Mpa)
v_2	$m^3.kg^{-1}$	Specific volume of steam when temperature T_1 and pressure p_2
v	$m^3.kg^{-1}$	Specific volume of steam when temperature T_1 and pressure $p_1/2$
T_1	K	Absolute temperature at valve inlet ($T_1 = 273 + t_1$)
x	1	Proportionate weight volume of saturated steam in wet steam
r	1	Rangeability

Principles for plug type selection

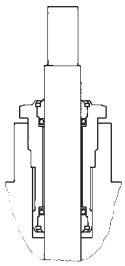
V-ported plugs should not to be used in above - critical differential pressures with inlet pressure $p_1 \geq 0,4$ MPa and for regulation of saturated steam. In these cases we recommend to use a perforated plug. The perforated plug should be also used always when cavitation may occur due to a high differential pressure value or valve ports erosion caused by high speed of process medium flow. If the parabolic plug is used (because of small Kvs) for pressures $p_1 \geq 1,6$ MPa and above - critical differential pressures, it is necessary to close both plug and seat with a hard metal overlay, i.e. stellited trim.

Packing - O -ring EPDM

Packing is designed for non-aggressive media with temperature from 0° to 140° C. Packing excels with its reliability and long time tightness. It has ability of sealing even if the valve stem is a bit damaged. Low frictional forces enables valve to be actuated with a low-linear-force actuator. Service life of sealing rings depends on operating conditions and it is more than 400 000 cycles on average.



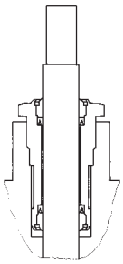
Applied to RV 102, RV 103



Applied to RV 2xx

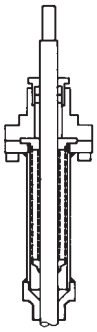
Packing - DRSpack® (PTFE)

DRSpack® (Direct Radial Sealing Pack) is a packing with high tightness at both low and high operating pressure values.
It is the most used type of packing suitable for temperatures ranging from 0° to 260°C. The pH range is from 0 to 14. The packing enables using of actuators with low linear force. The design enables an easy change of the whole packing. The average service life of DRSpack® is more than 500 000 cycles.



Packing - Bellows

Bellows packing is suitable for low and high temperatures ranging from -50° to 550°C. Bellows ensures absolute tightness to environment. Packing is equipped with safety PTFE packing as standard to prevent medium from leaking in case of damage to bellows. Intensive linear forces are not required.



Application of bellows packing

Bellows packing is suitable for applications with very aggressive, toxic or other dangerous media that require absolute tightness to environment. In such case, it is necessary to check compatibility of used body material as well as the valve inner parts material with process medium. It is recommended to use bellows with safety packing preventing medium from leaking in case of damage to bellows when there is an extremely dangerous process medium used.
Bellows is also a great solution to use of process medium either with temperature below zero when ice accretions cause premature damage to packing or with high temeperatures when bellows ensures medium cooling.

Service life of bellows packing

Bellows material	Temperature				
	200°C	300°C	400°C	500°C	550°C
1.4541	100 000	40 000	28 000	7 000	not applicable
1.4571	90 000	34 000	22 000	13 000	8 000

Values specified in the table above show minimal guaranteed number of cycles with the valve full stroke when the bellows is fully lenghtened and pressed. In regulation, when the valve moves only in a portion of the stroke range at the inner centre of the valve, the service life of the bellows is many times longer then depending on concrete operating conditions.

Procedure for designing of two-way valve

Given: medium water, 155° C, static pressure at piping spot 1000 kPa (10 bar), Δp_{DISP} = 80 kPa (0,8 bar), $\Delta p_{PIPELINE}$ =15 kPa (0,15 bar), $\Delta p_{APPLIANCE}$= 25 kPa (0,25 bar), nominal flow rate Q_{NOM}=8 $m^3.h^{-1}$, minimal flow rate Q_{MIN} =1,3 $m^3.h^{-1}$.

$\Delta p_{DISP} = \Delta p_{VALVE} + \Delta p_{APPLIANCE} + \Delta p_{PIPELINE}$

$\Delta p_{VALVE} = \Delta p_{DISP} - \Delta p_{APPLIANCE} - \Delta p_{PIPELINE} = 80 - 25 - 15 = 40$ kPa (0,4 bar)

$$Kv = \frac{Q_{NOM}}{\sqrt{\Delta p_{VALVE}}} = \frac{8}{\sqrt{0,4}} = 12,7 \ m^3.h^{-1}$$

Precautionary additions for process tolerances (provided that flow rate Q was not oversized):

$$Kvs = (1,1 \text{ to } 1,3) \,.\, Kv = (1,1 \text{ to } 1,3) \,.\, 12,7 = 14 \text{ to } 16,5 \ m^3.h^{-1}$$

Now we choose the nearest Kvs value from those available in our catalogue, i.e. Kvs = 16 $m^3.h^{-1}$. This value corresponds to nominal size of DN 32. Then if we choose flanged execution PN 16, body made of spheroidal cast iron, with metal - PTFE seat sealing, packing PTFE and equal-percentage flow characteristic, we will get the following specification No.:

RV 21x XXX 1423 R1 16/220-32

x in the valve code above (RV21x) stands for valve execution (direct or reverse) and depends on type of used actuator which should be chosen in respect to demands of regulating system (type, producer, voltage, type of control, necessary torque or linear force, etc.)

Determination of real pressure drop value of a chosen valve at fully open

$$\Delta p_{VENTIL\ H100} = \left(\frac{Q_{NOM}}{Kvs}\right)^2 = \left(\frac{8}{16}\right)^2 = 0,25 \text{ bar (25 kPa)}$$

The control valve's real pressure drop calculated this way shall be taken into account in a hydraulic calculation of regulating circuit.

Determination of valve´s real authority

$$a = \frac{\Delta p_{VALVEH100}}{\Delta p_{VALVEH0}} = \frac{25}{80} = 0,31$$

Value a should be at least equal to 0,3. A chosen valve checking is then satisfactory.

Caution: the valve's authority calculation should be related to a valve pressure difference in its closed position i.e. disposition pressure value in a branch $\Delta p_{AVAIL.}$ when flow rate is zero, not to a pressure value of a pump Δp_{PUMP} , because, due to pipeline circuit pressure drops up to the spot where the regulating branch is connected, the following equation applies: $\Delta p_{AVAIL.} < \Delta p_{PUMP}$. In such cases we consider for simplicity the following: $\Delta p_{AVAIL.H100} = \Delta p_{AVAIL.H0} = \Delta p_{DISP}$.

Checking of rangeability

We carry out the same checking for minimal flow rate Q_{MIN} =1,3 $m^3.h^{-1}$. The following differential pressure values correspond to the min. flow rate: $\Delta p_{PIPELINE\ QMIN}$=0,40 kPa, $\Delta p_{APPLIANCE\ QMIN}$=0,66 kPa. $\Delta p_{VALVE\ QMIN}$= 80 - 0,4 - 0,66 = 78,94 = 79 kPa.

$$Kv_{MIN} = \frac{Q_{MIN}}{\sqrt{\Delta p_{VALVE\ QMIN}}} = \frac{1,3}{\sqrt{0,79}} = 1,46 \ m^3.h^{-1}$$

Necessary rangeability value

$$r = \frac{Kvs}{Kv_{MIN}} = \frac{16}{1,46} = 11$$

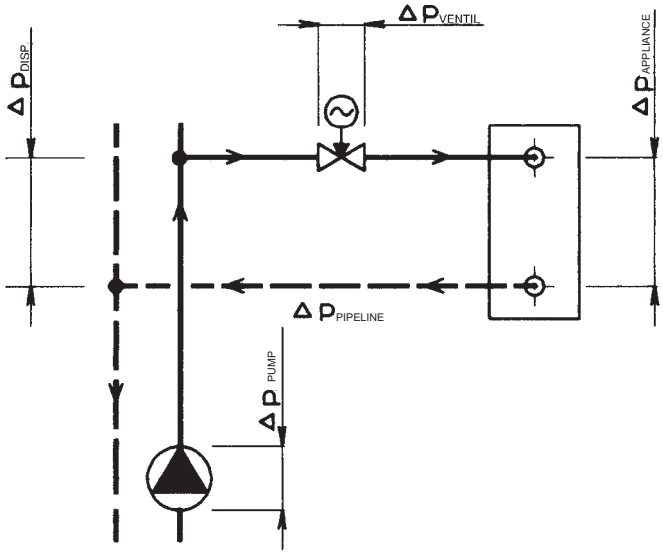
shall be lower than mentioned rangeability value of r = 50. Checking is then satisfactory.

Selection of suitable flow characteristic

On the basis of calculated values Kv_{NOM} and Kv_{MIN} , it is possible to read the appropriate stroke values from the graph for individual types of flow characteristics of the valve and choose the most suitable one accordingly. Here we have h_{NOM} = 96% h_{MIN} = 41% for equal-percentage characteristic. In that case, LDM- spline® flow characteristic is more suitable (93% and 30% of the stroke). It corresponds to the following specification code :

RV 21x XXX 1423 S1 16/220-32

Scheme of typical regulation loop with the application of two-way control valve



Remark: More detailed information on calculation and design of LDM control valves is mentioned in calculation instructions No. 01-12.0. Equations mentiened above apply in a simlified way to water. To reach optimum results, we recommend to use oroginal calculation programme VALVES which is available on request free of charge.

Procedure for designing of three-way valve

Given: medium water, 90 °C, static pressure at piping spot 1000 kPa(10 bar), Δp_{PUMP2}=40 kPa (0,4 bar), $\Delta p_{PIPELINE}$=10 kPa (0,1bar), $\Delta p_{APPLIANCE}$ =20 kPa (0,2 bar), flow rate průtok Q_{NOM}=7 $m^3.h^{-1}$

$\Delta p_{PUMP2} = \Delta p_{VALVE} + \Delta p_{APPLIANCE} + \Delta p_{PIPELINE}$

$\Delta p_{VALVE} = \Delta p_{PUMP2} - \Delta p_{APPLIANCE} - \Delta p_{PIPELINE}$ = 40-20-10 = 10 kPa (0,1bar)

$$Kv = \frac{Q_{NOM}}{\sqrt{\Delta p_{VALVE}}} = \frac{7}{\sqrt{0,1}} = 22,1\ m^3.h^{-1}$$

Precautionary additions for process tolerances (provided that flow rate Q was not oversized):

$Kvs = (1,1\ to 1,3) . Kv = (1,1\ to\ 1,3) . 22,1 = 24,3\ to\ 28,7\ m^3.h^{-1}$

Now we choose the nearest Kvs value from those available in our catalogue, i.e. Kvs = 25 $m^3.h^{-1}$. This value corresponds to nominal size of DN 40. Then if we choose flanged execution PN 16, body made of spheroidal cast iron, with metal - PTFE seat sealing, packing PTFE and equal-percentage flow characteristic, we will get the following specification No.:

RV 21x XXX 1413 L1 16/140-40

x in the valve code above (21x) stands for valve execution (direct or reverse) and depends on type of used actuator which should be chosen in respect to demands of regulating system (type, producer, voltage, type of control, necessary torque or linear force, etc.)

Determination of real pressure drop value of a chosen valve at fully open

$$\Delta p_{VALVE\ H100} = \left(\frac{Q_{NOM}}{Kvs}\right)^2 = \left(\frac{7}{25}\right)^2 = 0,08\ bar\ (8\ kPa)$$

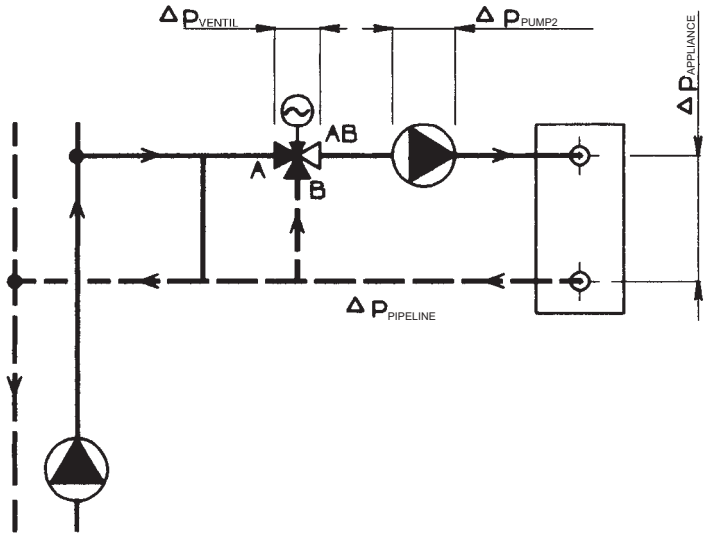
The control valve's real pressure drop calculated this way shall be taken into account in a hydraulic calculation of regulating circuit.

Caution: To ensure reliable function of three-way valves, the most important condition is to keep minimum available pressure difference between A and B ports. Three-way valves are capable to manage even high pressure difference between A and B ports but valve's flow characteristic deformates then and so regulation properties deteriorate. So if in doubt about pressure difference value between those two ports (e.g. when three-way valve is piped directly into primary side without pressure separation), we recommend to use a two-way valve in combination with a primary-secondary side short cut to ensure a reliable regulation. The authority of A-AB way of three-way valve is, providing a constant flow rate in appliance circuit, the following:

$$a = \frac{\Delta p_{VALVE\ H100}}{\Delta p_{VALVE\ H0}} = \frac{8}{8} = 1\ ,$$

which means that the behaviour of flow in A-AB way corresponds to ideal flow curve of the valve. In that case there are Kvs values in both ports the same with linear characteristic i.e. the total flow is nearly constant.
A combination of equal-percentage characteristic in A port and linear characteristic in B port shall be selected in those cases when loading of A port with differential pressure against B port cannot be avoided or when the primary side parametres are too high.

Scheme of a typical regulation loop with the application of a three-way mixing control valve



Remark: More detailed information on calculation and design of LDM control valves is mentioned in calculation instructions No. 01-12.0. Equations mentiened above apply in a simlified way to water. To reach optimum results, we recommend to use oroginal calculation programme VALVES which is available on request free of charge.

RV 102 B
RV 103 B

Control valves
DN 15 - 50, PN 16
with Belimo actuators

Description

Control valves series RV 102 are two-way or three-way valves with internal threaded connection. Valve body is made of brass. Control valves series RV 103 are two-way or three-way valves with flanged connection. Valve body is made of grey cast iron. Valves are optionally manufactured in the following executions:

- three-way control valve
- two-way, reverse control valve
- two-way, angular, control valve

Valves RV 102 B and RV 103 B are especially designed for Belimo actuators.

Application

Valves are designed for application in heating, ventilation or air conditioning systems for maximal temperature 150°C.
Maximal permissible working pressures according to ČSN 13 0010, see page 18 of this catalogue.

Process media

Valve series RV 102 and RV 103 are designed to regulate the flow and pressure of liquids, gases and vapours without abrasive particles e.g. water, low-pressure steam (it applies to RV 102 only), air and other media compatible with material of the valve inner parts. Medium acidity and alkalinity should not exceed range of pH 4.5 to 9.5 .
To ensure reliable regulation, producer recommends to pipe a strainer in front of the valve into pipeline.

Installation

The valve is to be piped the way so that the direction of medium flow will coincide with the arrows on the body (inlet ports A,B and outlet port AB).
In flow-diverting valves, the process medium flow is reversed (inlet port AB and outlet ports A, B).
Valve can be installed in any position except position when the actuator is under the valve body.

Technical data

Series	RV 102	RV 103
Type of valve	Three-way control valve Two-way, reversed control valve	
Nominal size range	DN 15 - 50	
Nominal pressure	PN 16	
Body material	Brass 42 3135	Grey cast iron EN-JL 1040
Plug material	Brass	
Operating temperature range	0 to 150°C	
Face to face dimensions	Section M4 Acc. to DIN 3202 (4/1982)	Section 1 acc. to ČSN-EN 558-1 (3/1997)
Connection	Internal threaded coupling Acc. to ČSN-ISO 229-1 (9/2003)	Type B1 (raised-faced) Acc. to ČSN-EN 1092-1 (4/2002)
Type of plug	V-ported plug	
Flow characteristic	Linear; equal-percentage	
Kvs values	0.6 to 40 m^3/hour	
Leakage rate	Class III. acc. to ČSN-EN 1349 (5/2001) (<0.01 % Kvs) in way A-AB	
Rangeability	50 : 1	
Packing	O - ring EPDM	

Kvs values and differential pressures

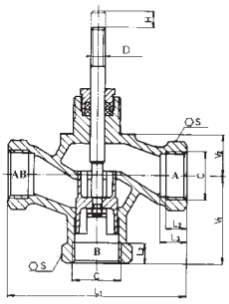
Δp_{max} value is the valve maximal differential pressure when reliable opening and closing can be guaranteed. Because of seat and plug service life, it is recommended so that permanent differential pressure would not exceed 0.6 MPa for valves RV 102 and 0.4 Mpa for valves RV 103.

For further information on actuating, see actuators´ catalogue sheets	Actuating (actuator)	NV24-3, NV230-3, NV24-MFT, NVF24-MFT, NVF24-MFT-E
	Marking in valve specification No.	EBK
	Linear force	800 N

		Kvs [m³/hour]					Δp_{max}
DN	H	1	2	3	4	5	MPa
15	10	4.0	2.5	1.6	1.0	0.6	1.60
20		6.3	4.0	2.5	---	---	1.60
25		10.0	6.3	4.0	---	---	1.18
32	16	16.0	10.0	6.3	---	---	0.73
40		25.0	16.0	10.0	---	---	0.47
50		40.0	25.0	16.0	---	---	0.28

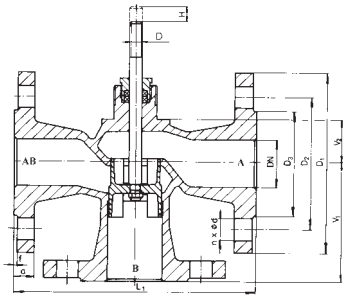
Dimensions and weights for the type RV 102

DN	C	L_1	L_2	L_3	V_1	V_2	S	H	D	m
		mm	mm	mm	mm	mm	mm	mm	mm	kg
15	G 1/2	85	9	12	43	25	27	10	8	0.55
20	G 3/4	95	11	14	48	25	32			0.65
25	G 1	105	12	16	53	25	41			0.80
32	G 1 1/4	120	14	18	66	35	50	16		1.40
40	G 1 1/2	130	16	20	70	35	58			2.00
50	G 2	150	18	22	80	42	70			2.95



Dimensions and weights for the type RV 103

DN	D_1	D_2	D_3	n x d	a	f	L_1	V_1	V_2	H	D	m
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg
15	95	65	45	4x14	16	2	130	65	25	10	8	3.2
20	105	75	58		18		150	75	25			4.3
25	115	85	68				160	80	25			5.5
32	140	100	78	4x18			180	90	35	16		7.7
40	150	110	88			3	200	100	35			8.5
50	165	125	102		20		230	115	42			11.9



Valve complete specification No. for ordering

			XX	X X X	X X X	X X	X X	-	XX	/	XXX	-	XX
1. Type of valve	Control valve		RV										
2. Series	Valves made of brass			1 0 2									
	Valves made of grey cast iron			1 0 3									
3. Actuating	Electric actuator NV24-3	(24 V, 3-position control)			E B K								
1) *Actuators with a fail-safe function*	Electric actuator NV230-3	(230 V, 3-position control)			E B K								
	Electric actuator NV24-MFT	(24 V, Multi-functional)			E B K								
	Electric actuator NVF24-MFT 1)	(24 V, Multi-functional)			E B K								
	Electric actuator NVF24-MFT-E 1)	(24 V, Multi-functional)			E B K								
4. Design	Straight, two-way, threaded valves	Applicable to RV 102				1							
	Angle, two-way, threaded valves					2							
	Mixing (diverting), three-way, threaded valves					3							
	Straight, two-way, flanged valves	Applicable to RV 103				4							
	Angle, two-way, flanged valves					5							
	Mixing (diverting), three-way, flanged valves					6							
5. Body material	Grey cast iron					3							
	Brass					5							
6. Flow characteristic	Linear						1						
	Equal-percentage 1)						2						
7. Nominal Kvs value	Column No. acc. to Kvs values table						X						
8. Nominal pressure PN	PN 16								16				
9. Max. operating temperature °C											150		
10. Nominal size	DN												XX

Ordering example : Three-way control valves DN 25, PN 16 with electric actuator SQX 32.00, body material: brass, connection: internal thread G 1, linear flow characteristic, Kvs = 10 m³/hour is specified as follows : **RV 102 ELA 3511 16/140-25**

200 line

RV / HU 2x1 B

Control valves and Fail-safe action valves DN 15 - 65, PN 16 and 40 with Belimo actuators

Description

Control valves RV 211, RV 221 and RV 231 (further in text RV 2x1) are single-seated valves designed for regulation and shut-off of process medium flow. In regard of used actuators, the valves are suitable for regulation at lower differential pressures. Flow characteristics, Kvs values and leakage rates correspond to international standards.
Valves with a fail-safe action series HU 2x1 B have the same design as RV 2x1 with addition of increased seat sealing. Valves are equipped with fail-safe action actuators (valve closes or opens upon power failure).
Valves RV 2x1 B are especially designed for Belimo actuators.

Application

These valves have a wide range of application in heating, ventilation, power generation and chemical processing industries. Valve body can be optionally made of spheroidal cast iron, cast steel and austenitic stainless steel according to operating conditions.
The materials selected correspond to recommendations stipulated by ČSN-EN 1503-1 (1/2002) (steels) and ČSN-EN 1503-3 (1/2002) (cast). The maximum operating pressures for different materials are specified in the table on page 18 of this catalogue.

Process media

Valves series RV / HU 2x1 are designed for regulation (RV 2x1) and for regulation and shut-off (HU 2x1)of flow and pressure of liquids, gases and vapours without abrasive particles e.g. Water, steam, air and other media compatible with material of the valve inner parts. The application of valves made of spheroidal cast iron (RV 211) for steam is limited by the following parametres: Steam must be superheated (its dryness $x \geq 0{,}98$) and inlet pressure $p_1 \leq 0{,}4$ MPa when differential pressure is above-critical or $p_1 \leq 1{,}6$ MPa when differential pressure is unde-critical. In case these values are exceeded, it is necessary to use valve made of cast steel (RV 221).To ensure reliable regulation, producer recommends to pipe a strainer in front of the valve or ensure in any other way that medium will not contain abrasive particles or impurities.

Installation

The valve is to be piped the way so that the direction of medium flow will coincide with the arrows on the body.
The valve can be installed in any position except position when the actuator is under the valve body. When medium temperature exceeds 150 °C, it is necessary to protect the actuator against glowing heat from the pipeline e.g. by the means of proper insulating of the pipeline and valve or by tilting the valve away from the heat radiation.

Technical data

Series		RV / HU 211	RV / HU 221	RV / HU 231
Type of valve		Two-way, single-seated, reverse, control valve		
Nominal size range		DN 15 to 65		
Nominal pressure		PN 16, PN 40		
Body material		Spheroidal cast iron EN-JS 1025 (EN-GJS-400-10-LT)	Cast steel 1.0619 (GP240GH) 1.7357 (G17CrMo5-5)	Stainless steel 1.4581 (GX5CrNiMoNb19-11-2)
Seat material :	DN 15 - 50	1.4028 / 17 023.6	1.4028 / 17 023.6	1.4571 / 17 347.4
DIN W.Nr./ČSN	DN 65	1.4027 / 42 2906.5	1.4027 / 42 2906.5	1.4581 / 42 2941.4
Plug material :	DN 15 - 65	1.4021 / 17 027.6	1.4021 / 17 027.6	1.4571 / 17 347.4
DIN W.Nr./ČSN				
Operating temperature range		-20 to 180°C	-20 to 180°C	-20 to 180°C
Face to face dimensions		Line 1 acc. to ČSN-EN 558-1 (3/1997)		
Flanges		Acc. to ČSN-EN 1092-1 (4/2002)		
Flange face		Type B1 (raised-faced) or Type F (female) acc. to ČSN-EN 1092-1 (4/2002)		
Type of plug		V-ported, parabolic, perforated		
Flow characteristic		Linear, equal-percentage, LDMspline®, parabolic		
Kvs value		0.4 to 63 m^3/hour		
Leakage rate		Class III. acc. to ČSN-EN 1349 (5/2001) (<0.1% Kvs) for c. valves with metal-metal seat sealing		
		Class IV. acc. to ČSN-EN 1349 (5/2001) (<0.01% Kvs) for c. valves with metal-PTFE seat sealing		
Rangeability r		50 : 1		
Packing		O - ring EPDM t_{max}=140°C, DRSpack® (PTFE) t_{max}=150°C, Bellows t_{max}=180°C		

Remark: For low operating temperatures (-200 to +180°C), it is possible to supply the valve RV / HU 231 with body material made of 1.4308 (cast stainless steel)

Kvs values and differential pressures

Δp_{max} value is the valve max. differential pressure when open--close function is always guaranteed. In regard of service life of seat and plug, it is recommended so that permanent differential pressure would not exceed 1.6 MPa. Otherwise it is suitable to use perforated plug or sealing surfaces of seat and plug with a hard metal overlay.

For further information on actuating, see actuators´ catalogue sheets		Actuating (actuator)						NV24-3, NV230-3, NV24-MFT, NV24-MFT-E	
		Marking in valve spec. No.						EBK	
		Linear force						800 N	
		Kvs [m³/hour]						Δp_{max}	
DN	H	1	2	3	4	5	6	metal	PTFE
15	20	---	2.5[1]	1.6[1]	1.0[1]	0.6[1]	0.4[1]	4.00	---
15		4.0[1]	---	---	---	---	---	3.40	---
20		---	---	2.5[1]	1.6[1]	1.0[1]	0.6[1]	4.00	---
20		---	4.0[1]	---	---	---	---	3.40	---
20		6.3[1]	---	---	---	---	---	1.56	---
25		---	---	---	2.5[1]	1.6[1]	1.0[1]	4.00	--
25		10.0	6.3[2]	4.0[2]	---	---	---	0.88	1.29
32		---	---	---	4.0[1]	---	---	3.40	---
32		16.0	10.0	6.3[2]	---	---	---	0.45	0.77
40		25.0	16.0	10.0	---	---	---	0.23	0.49
50		40.0	25.0	16.0	---	---	---	0.10	0.29
65		63.0	40.0	25.0	---	---	---	0.02	0.17

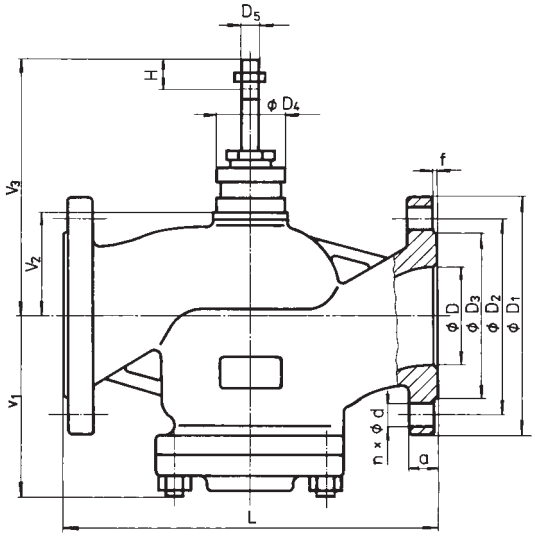
1) parabolic plug
2) V-ported plug with linear characteristic, parabolic plug with equal-percentage, LDMspline® and parabolic characteristic.

Perforated plug available only with Kvs values in shadowed frames ▭ with the following restrictions:
- Kvs values 2.5 to 1.0 m³/hour available with linear characteristic only.
- Perforated plug with Kvs value acc. to column No. 2 available with linear or parabolic characteristic only.

metal - version with metal - metal seat sealing
PTFE - version with metal - PTFE seat sealing
Bellows packing can be used with V-ported plug only.
Equal-percentage, LDMspline® and parabolic characteristic available on condition : Kvs value ≧ 1.0
Max. differential pressure Δ p for valves PN 16 must be 1.6 MPa.
Max. differential pressures specified in table apply to PTFE and O-ring packing. Δp_{max} for bellows must be consulted with the producer.

Dimensions and weights for the type RV 2x1

	PN 16					PN 40					PN 16, PN 40													
DN	D_1	D_2	D_3	d	n	D_1	D_2	D_3	d	n	D	f	D_4	D_5	L	V_1	V_2	$^{\#}V_2$	V_3	$^{\#}V_3$	a	m_1	m_2	$^{\#}m_v$
	mm	mm	mm	mm		mm	mm	mm	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	kg	kg
15	95	65	45	14	4	95	65	45	14	4	15	2	44	10	130	68	47	---	143	---	16	4.5	5.5	---
20	105	75	58			105	75	58			20				150	68	47	---	143	---	18	5.5	6.5	---
25	115	85	68			115	85	68			25				160	85	52	250	148	346	18	6.5	8	3.5
32	140	100	78	18		140	100	78	18		32				180	85	52	250	148	346	20	8	9.5	3.5
40	150	110	88			150	110	88			40				200	85	52	250	148	346	20	9	11	3.5
50	165	125	102			165	125	102			50				230	117	72	270	168	366	20	14	21	3.5
65	185	145	122		4[1]	185	145	122		8	65				290	117	72	270	168	366	22	18	27	3.5



[1] with regard of the standard previously in force, there is an option to have the number of connection bolts as stipulated in ČSN-EN 1092-1
[#] - for valve with bellows packing
m_v - weight to be added to weight of valve equipped with bellows packing
m_1 - for valves RV / HU 211
m_2 - for valves RV / HU 221 and RV / HU 231

200 line

RV / HU 2x3 B

Control valves and Fail-safe action valves DN 25 - 65, PN 16 and 40 with Belimo actuators

Description

Control valves RV 213, RV 223 and RV 233 (further in text RV 2x3) are single-seated valves with pressure-balanced plug designed for regulation and shut-off of process medium flow. Its design enables the valve to be applicable to regulation at high differential pressures with low-linear-force actuators. Flow characteristics, Kvs values and leakage rates correspond to international standards.
Valves with a fail-safe action series HU 2x3 B have the same design as RV 2x3 with addition of increased seat sealing. Valves are equipped with fail-safe action actuators (valve closes or opens upon power failure).
Valves RV 2x3 B are especially designed for Belimo actuators.

Application

These valves have a wide range of application in heating, ventilation, power generation and chemical processing industries. Valve body can be optionally made of spheroidal cast iron, cast steel and austenitic stainless steel according to operating conditions.
The materials selected correspond to recommendations stipulated by ČSN-EN 1503-1 (1/2002) (steels) and ČSN-EN 1503-3 (1/2002) (cast). The maximum operating pressures for different materials are specified in the table on page 18 of this catalogue.

Process media

Valves series RV 2x3 are designed for regulation of flow and pressure of liquids, gases and vapours without abrasive particles e.g. Water, steam, air and other media compatible with material of the valve inner parts. The application of valves made of spheroidal cast iron (RV 213) for steam is limited by the following parametres: Steam must be superheated (its dryness $x_1 \geq 0{,}98$) and inlet pressure $p_1 \leq 0{,}4$ Mpa when differential pressure is above-critical or $p_1 \leq 1{,}6$ MPa when differential pressure is unde-critical. In case these values are exceeded, it is necessary to use valve made of cast steel (RV 223). To ensure reliable regulation, producer recommends to pipe a strainer in front of the valve or ensure in any other way that medium will not contain abrasive particles or impurities.

Installation

The valve is to be piped the way so that the direction of medium flow will coincide with the arrows on the body.
The valve can be installed in any position except position when the actuator is under the valve body. When medium temperature exceeds 150°C, it is necessary to protect the actuator against glowing heat from the pipeline; e.g. by the means of proper insulating of the pipeline and valve or by tilting the valve away from the heat radiation.

Technical data

Series		RV / HU 213	RV / HU 223	RV / HU 233
Type of valve		Two-way, single-seated control valve with pressure-balanced plug		
Nominal size range		DN 15 to 65		
Nominal pressure		PN 16, PN 40		
Body material		Spheroidal cast iron EN-JS 1025 (EN-GJS-400-10-LT)	Cast steel 1.0619 (GP240GH) 1.7357 (G17CrMo5-5)	Stainless steel 1.4581 (GX5CrNiMoNb19-11-2)
Seat material :	DN 15 - 50	1.4028 / 17 023.6	1.4028 / 17 023.6	1.4571 / 17 347.4
DIN W.Nr./ČSN	DN 65	1.4027 / 42 2906.5	1.4027 / 42 2906.5	1.4581 / 42 2941.4
Plug material : DIN W.Nr./ČSN	DN 15 - 65	1.4021 / 17 027.6	1.4021 / 17 027.6	1.4571 / 17 347.4
Operating temperature range		-20 to 180°C	-20 to 180°C	-20 to 180°C
Face to face dimensions		Line 1 acc. to ČSN-EN 558-1 (3/1997)		
Flanges		Acc. to ČSN-EN 1092-1 (4/2002)		
Flange face		Type B1 (raised-faced) or Type F (female) acc. to ČSN-EN 1092-1 (4/2002)		
Type of plug		V-ported, parabolic, perforated		
Flow characteristic		Linear, equal-percentage, LDMspline®, parabolic		
Kvs value		1.6 to 63 m^3/hour		
Leakage rate		Class III. acc. to ČSN-EN 1349 (5/2001) (<0.1% Kvs) for c. valves with metal-metal seat sealing		
		Class IV. acc. to ČSN-EN 1349 (5/2001) (<0.01% Kvs) for c. valves with metal-PTFE seat sealing		
Rangeability r		50 : 1		
Packing		O - ring EPDM t_{max}=150°C, DRSpack (PTFE) t_{max}=150°C, Bellows t_{max}=180°C		

Remark: For low operating temperatures (-200 to +180°C), it is possible to supply the valve RV / HU 231 with body material made of 1.4308 (cast stainless steel)

Kvs values and differential pressures

Δp_{max} value is the valve max. differential pressure when open--close function is always guaranteed. In regard of service life of seat and plug, it is recommended so that permanent differential pressure would not exceed 1.6 MPa. Otherwise it is suitable to use perforated plug or sealing surfaces of seat and plug with a hard metal overlay.

For further information on actuating, see actuators´ catalogue sheets		Actuating (actuator)			NV24-3, NV230-3, NV24-MFT, NV24F-MFT, NVF24-MFT-E	
		Marking in valve spec. No.			EBK	
		Linear force			800 N	
		Kvs [m³/hour]			Δp_{max}	
DN	H	1	2	3	metal	PTFE
25	20	10	6.3 [1]	4.0 [1]	1.60 (1.60)	1.60 (1.60)
32		16.0	10.0	6.3 [1]	1.60 (1.60)	1.60 (1.60)
40		25.0	16.0	10.0	1.60 (1.60)	1.60 (1.60)
50		40.0	25.0	16.0	1.60 (0.94)	1.60 (1.60)
65		63.0	40.0	25.0	1.60 (0.25)	1.60 (1.60)

1) linear characteristic only

Perforated plug available only with Kvs values in shadowed frames ▭ with the following restrictions:

- Perforated plug with Kvs value acc. to column No. 2 available with linear or parabolic characteristic only.

metal - version with metal - metal seat sealing

PTFE - version with metal - PTFE seat sealing

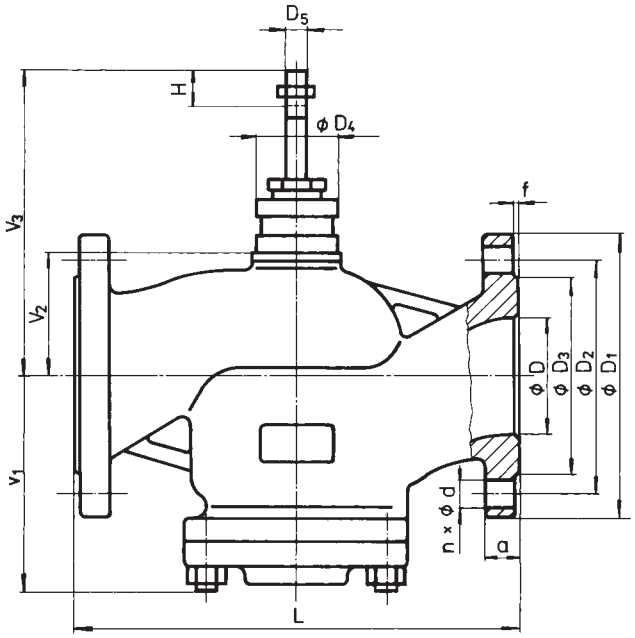
(xx) - Δp_{max} values specified in parentheses apply to perforated plug

Max. differential pressures specified in table apply to PTFE and O-ring packing. Δp_{max} for bellows must be consulted with the producer.

Max. differential pressure Δp for valves PN 16 must be 1.6 MPa.

Dimensions and weights for the type RV 2x3

	PN 16					PN 40					PN 16, PN 40													
DN	D_1	D_2	D_3	d	n	D_1	D_2	D_3	d	n	D	f	D_4	D_5	L	V_1	V_2	#V_2	V_3	#V_3	a	m_1	m_2	#m_v
	mm	mm	mm	mm		mm	mm	mm	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	kg	kg
25	115	85	68	14	4	115	85	68	14	4	25	2	44	10	160	85	52	250	148	346	18	7	8.5	3.5
32	140	100	78	18		140	100	78	18		32				180	85	52	250	148	346	18	8.5	10	3.5
40	150	110	88			150	110	88			40				200	85	52	250	148	346	18	8.5	10	3.5
50	165	125	102			165	125	102			50				230	117	72	270	168	366	20	14.5	21	3.5
65	185	145	122		4 [1]	185	145	122		8	65				290	117	72	270	168	366	22	18.5	27	3.5



[1] with regard of the standard previously in force, there is an option to have the number of connection bolts as stipulated in ČSN-EN 1092-1

#) - for valve with bellows packing

m_v - weight to be added to weight of valve equipped with bellows packing

m_1 - for valves RV / HU 211

m_2 - for valves RV / HU 221 and RV / HU 231

200 line

RV 2x5 B

Control valves DN 15 - 65, PN 16 and 40 with Belimo actuators

Description

Control valves RV 215, RV 225 and RV 235 (further only RV 2x5) are three-way valves with mixing or flow-diverting function. In regard of used actuators, the valves are suitable for regulation at lower differential pressures. Flow characteristics, Kvs values and leakage rates correspond to international standards.
When assembled with a fail-safe action actuator, it closes straight way upon power failure.
Valves RV 2x5 B are especially designed for Belimo actuators.

Application

These valves have a wide range of application in heating, ventilation, power generation and chemical processing industries. Valve body can be optionally made of spheroidal cast iron, cast steel and austenitic stainless steel according to operating conditions.
The materials selected correspond to recommendations stipulated by ČSN-EN 1503-1 (1/2002) (steels) and ČSN-EN 1503-3 (1/2002) (cast). The maximum operating pressures for different materials are specified in the table on page 18 of this catalogue.

Process media

Valves series RV 2x5 are designed for regulation of flow and pressure of liquids, gases and vapours without abrasive particles e.g. water, steam, air and other media compatible with material of the valve inner parts. The application of valves made of spheroidal cast iron (RV 215) for steam is limited by the following parametres: Steam must be superheated (its dryness $x_1 \geq 0,98$) and inlet pressure $p_1 \leq 0,4$ MPa when differential pressure is above-critical or $p_1 \leq 1,6$ MPa when differential pressure is under-critical. In case these values are exceeded, it is necessary to use valve made of cast steel (RV 225). To ensure reliable regulation, producer recommends to pipe a strainer in front of the valve or ensure in any other way that medium will not contain abrasive particles or impurities.

Installation

When the valve is used as mixing, it must be piped the way so that direction of process medium flow will coincide with the arrows on the body (inlet ports A, B and outlet port AB). When the valves is used as diverting, process medium flows through common valve port AB and split streams leave through valve ports A and B.). The valve can be installed in any position except position when the actuator is under the valve body. When medium temperature exceeds 150°C, it is necessary to protect the actuator against glowing heat from the pipeline; e.g. by the means of proper insulating of the pipeline and valve or by tilting the valve away from the heat radiation.

Technical data

Series		RV / HU 215	RV / HU 225	RV / HU 235
Type of valve		Three-way reversed control valve		
Nominal size range		DN 15 to 65		
Nominal pressure		PN 16, PN 40		
Body material		Spheroidal cast iron EN-JS 1025 (EN-GJS-400-10-LT)	Cast steel 1.0619 (GP240GH) 1.7357 (G17CrMo5-5)	Stainless steel 1.4581 (GX5CrNiMoNb19-11-2)
Seat material :	DN 15 - 50	1.4028 / 17 023.6	1.4028 / 17 023.6	1.4571 / 17 347.4
DIN W.Nr./ČSN	DN 65	1.4027 / 42 2906.5	1.4027 / 42 2906.5	1.4581 / 42 2941.4
Plug material : DIN W.Nr./ČSN	DN 15 - 65	1.4021 / 17 027.6	1.4021 / 17 027.6	1.4571 / 17 347.4
Operating temperature range		-20 to 180°C	-20 to 180°C	-20 to 180°C
Face to face dimensions		Line 1 acc. to ČSN-EN 558-1 (3/1997)		
Flanges		Acc. to ČSN-EN 1092-1 (4/2002)		
Flange face		Type B1 (raised-faced) or Type F (female) acc. to ČSN-EN 1092-1 (4/2002)		
Type of plug		V-ported, parabolic, perforated		
Flow characteristic		Linear, equal-percentage in AB - B way		
Kvs value		1.6 to 63 m^3/hour		
Leakage rate		Class III. acc. to ČSN-EN 1349 (5/2001) (<0.1% Kvs) for c. valves with metal-metal seat sealing		
		Class IV. acc. to ČSN-EN 1349 (5/2001) (<0.01% Kvs) for c. valves with metal-PTFE seat sealing		
Rangeability r		50 : 1		
Packing		O - ring EPDM t_{max}=150°C, DRSpack® (PTFE) t_{max}=150°C, Bellows t_{max}=180°C		

Remark: For low operating temperatures (-200 to +180°C), it is possible to supply the valve RV / HU 231 with body material made of 1.4308 (cast stainless steel)

Kvs values and differential pressures

Δp_{max} value is the valve max. differential pressure when open--close function is always guaranteed. In regard of service life of seat and plug, it is recommended so that permanent differential pressure would not exceed 1.6 MPa. Otherwise it is suitable to use perforated plug or sealing surfaces of seat and plug with a hard metal overlay.

For further information on actuating, see actuators´ catalogue sheets		Actuating (actuator)			NV24-3, NV230-3, NV24-MFT, NV24-MFT-E	
		Marking in valve spec. No.			EBK	
		Linear force			800 N	
		Kvs [m³/hour]			Δp_{max}	
DN	H	1	2	3	metal	PTFE
15	20	---	2.5 [1]	1.6 [1]	4.00	---
15		4.0 [1]	---	---	3.40	---
20		---		2.5 [1]	4.00	---
20		---	4.0 [1]	---	3.40	---
20		6.3 [1]	---	---	1.56	---
25		10.0	6.3 [2]	4.0 [2]	0.88	1.29
32		16.0	10.0	6.3 [2]	0.45	0.77
40		25.0	16.0	10.0	0.23	0.49
50		40.0	25.0	16.0	0.10	0.29
65		63.0	40.0	25.0	0.02	0.17

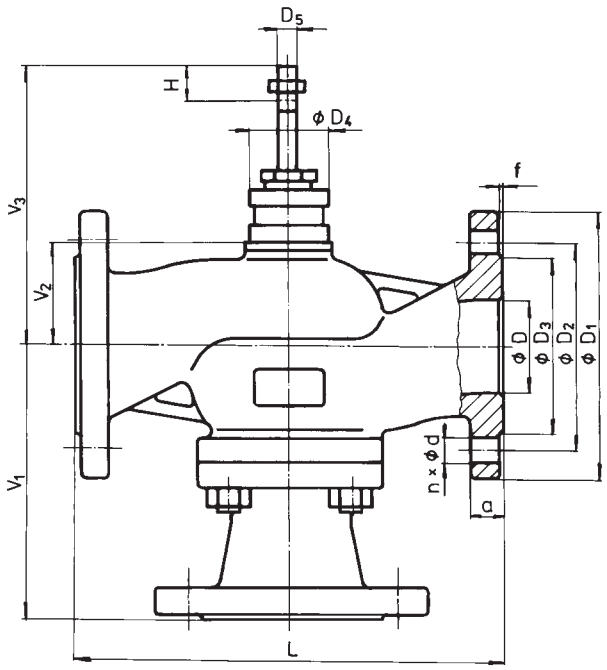
1) parabolic plug in straight way, V-ported plug in angle way
2) V-ported plug in angle way, in straight way for linear characteristic V-ported plug and for equal-percentage characteristic parabolic plug.

metal - version with metal - metal seat sealing
PTFE - version with metal - PTFE seat sealing

Max. differential pressures specified in table apply to PTFE and O-ring packing. Δp_{max} for bellows must be consulted with the producer.
Bellows packing can be used with V-ported plug only.
Max. differential pressure Δp for valves PN 16 must be 1.6 MPa.

Dimensions and weights for the type RV 2x5

	PN 16					PN 40					PN 16, PN 40												
DN	D_1	D_2	D_3	d	n	D_1	D_2	D_3	d	n	D	f	D_4	D_5	L	V_1	V_2	#V_2	V_3	#V_3	a	m_1	m_2	#m_v
	mm	mm	mm	mm		mm	mm	mm	mm		mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	kg	kg	kg
15	95	65	45	14	4	95	65	45	14	4	15	2	44	10	130	110	47	---	143	---	16	5.5	6	---
20	105	75	58			105	75	58			20				150	115	47	---	143	---	18	6.5	7	---
25	115	85	68			115	85	68			25				160	130	52	250	148	346	18	8.3	9.5	3.5
32	140	100	78	18		140	100	78	18		32				180	135	52	250	148	346	20	10.5	12	3.5
40	150	110	88			150	110	88			40				200	140	52	250	148	346	20	12	13.5	3.5
50	165	125	102			165	125	102			50				230	175	72	270	168	366	20	17	24	3.5
65	185	145	122		4 [1]	185	145	122		8	65				290	180	72	270	168	366	22	22	31	3.5



[1] with regard of the standard previously in force, there is an option to have the number of connection bolts as stipulated in ČSN-EN 1092-1
[#] - for valve with bellows packing
m_v - weight to be added to weight of valve equipped with bellows packing
m_1 - for valves RV 215
m_2 - for valves RV 225 and RV 235

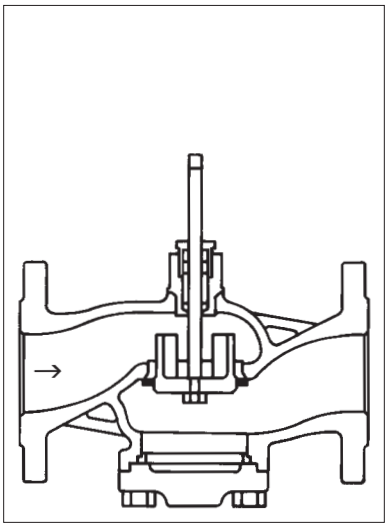
Valve complete specification No. for ordering RV / HU 2x1, RV 2x3, RV 2x5

			XX	X X X	X X X	X X X X	X X	-	XX	/	XXX	-	XXX
1. Valve	Control valve		RV										
	Fail-safe action valve		HU										
2. Series	Valves made of sph. cast iron EN-JS 1025												
	Valves made of cast steel 1.0619, 1.7357			2 2									
	Valves made of stainless steel 1.4581			2 3									
	Reverse valve			1									
	Pressure-balanced, reverse valve			3									
	Mixing (diverting), reverse valve			5									
3. Actuating	Electric actuator				E								
[1] *Actuators with a fail-safe function*	NV24-3	(24 V, 3-position)			E B K								
	NV230-3	(230 V, 3-position)			E B K								
	NV24-MFT	(24 V, Multi-functional)			E B K								
	NVF24-MFT [1]	(24 V, Multi-functional)			E B K								
	NVF24-MFT-E [1]	(24 V, Multi-functional)			E B K								
4. Connection	Raised flange					1							
	Female flange					2							
5. Body material	Cast steel 1.0619	(-20 to 400°C)				1							
	Sphr. cast iron EN-JS 1025	(-20 to 300°C)				4							
	CrMo steel 1.7357	(-20 to 500°C)				7							
(Operating temperature ranges	Stained steel 1.4581	(-20 to 400°C)				8							
are specified in parentheses)	Other material on request					9							
6. Seat sealing	Metal - metal					1							
[3] *from DN 25; t_{max} = 260°C*	Soft sealing (metal - PTFE) in straight way[3]					2							
	Hard metal overlay on sealing surfaces					3							
7. Packing	O - ring EPDM					1							
	DRSpack® (PTFE)					3							
	Bellows					7							
	Bellows with safety PTFE packing					8							
8. Flow characteristic	Linear						L						
[4] *Not applicable to RV 2x5*	Equal-percentage in straight way						R						
	LDMspline® [4]						S						
	Parabolic [4]						P						
	Linear - perforated plug [4]						D						
	Equal-percentage - perforated plug [4]						Q						
	Parabolic - perforated plug [4]						Z						
9. Kvs	Column No. acc. to Kvs values table						X						
10. Nominal pressure PN	PN 16								16				
	PN 40								40				
11. Max. operating temp. ° C	O - ring EPDM										140		
[5] *Not applicable to RV / HU 2x3*	DRSpack® (PTFE)										150		
	Bellows										180		
12. Nominal size DN	DN												XXX

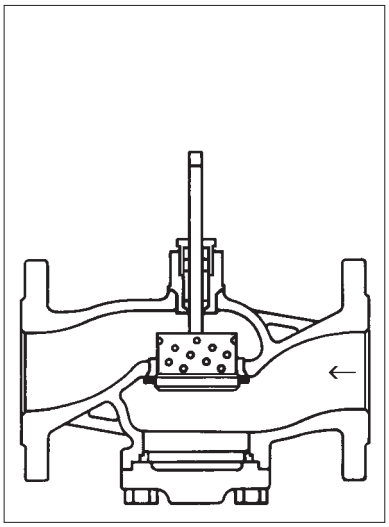
Ordering example: Two-way control valve DN 65, PN 40, with electric actuator NV230-3, body material: spheroidal cast iron, flange with raised face, metal-metal seat sealing, PTFE packing, linear characteristic, Kvs = 63 m^3/hour is specified as follows: **RV 211 EBK 1413 L1 40/150-65**

Valves RV / HU 2x1

Section of valve with V-ported plug

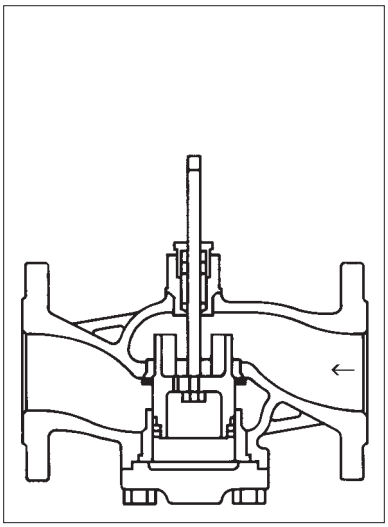


Section of valve with perforated plug

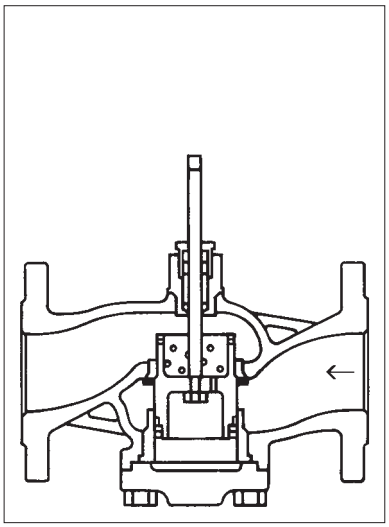


Valves RV / HU 2x3

Section of pressure-balanced valve with V-ported plug

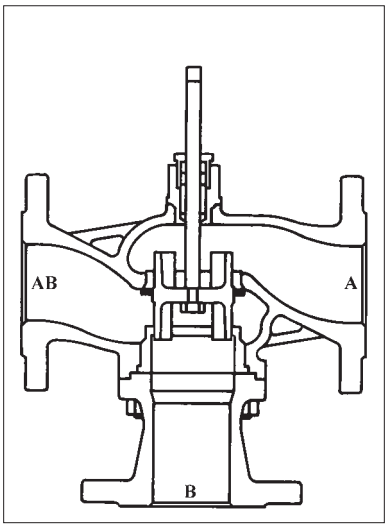


Section of pressure-balanced valve with perforated plug



Valves RV 2x5

Section of three-way valve with V-ported plug



EBK

Electric actuators
NV...
Belimo

Technical data

Type	NV24-3	NV230-3	NV24-MFT	NVF24-MFT	NVF24-MFT-E
Marking in valve specification No.	EBK				
Voltage	AC/DC 24 V	AC 230 V	AC/DC 24 V		
Frequency	50...60 Hz				
Motor power	3 W		5 W	5,5 W	
Control	3 - position		0 - 10 V (3 - position, ON - OFF)		
Running time	150 s (90 s)		150 s (95 to2000 s)		
Fail-safe mode	---			30 s	
Fail-safe function	---			indirect	direct
Nominal force	800 N				
Travel	2 to 20 mm				
Enclosure	IP 54				
Process medium max. temperature	+5 ... 150°C (with bellows 180°C)				
Ambient temperature range	0 to 50°C				
Ambient humidity limit	5 ... 95 %				
Weight	1,5 kg				

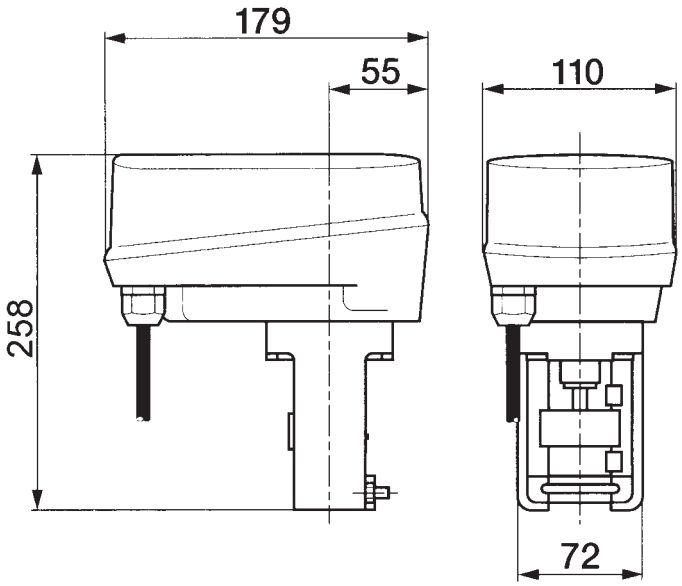
Direct and indirect function of actuator

Direct function ensures that actuator stem extends (the valve opens) upon power supply failure.
Indirect function ensures that actuator stem retracts (the valve closes) upon power supply failure.

Multi-functional technology MFT

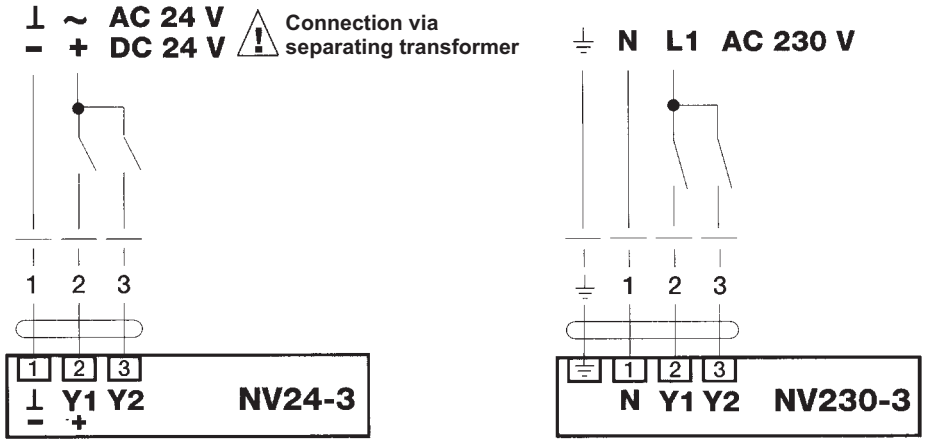
Due to a built-in microprocessor, some of the actuator´ s parameters can be set by the user, e.g.: type of control signal, running time, tripping torque value, etc. The configuration is carried out with PC or a special programming device.

Dimensions of actuator

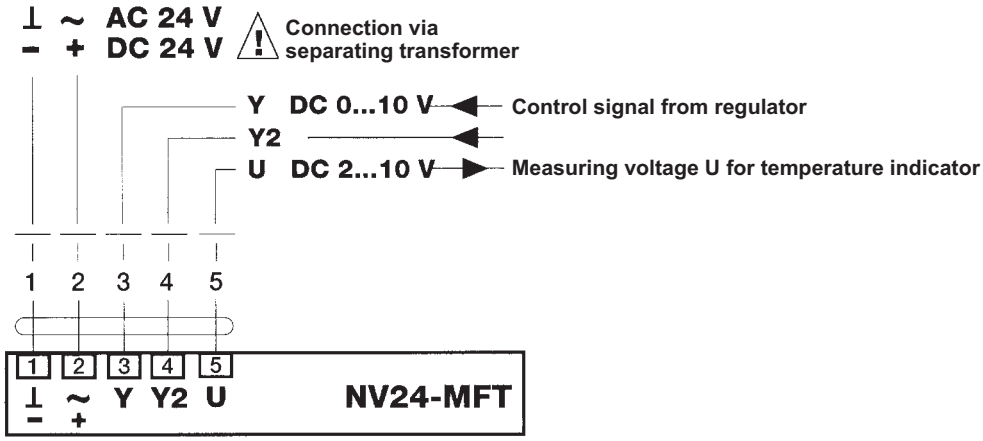


Wiring diagrams of actuators

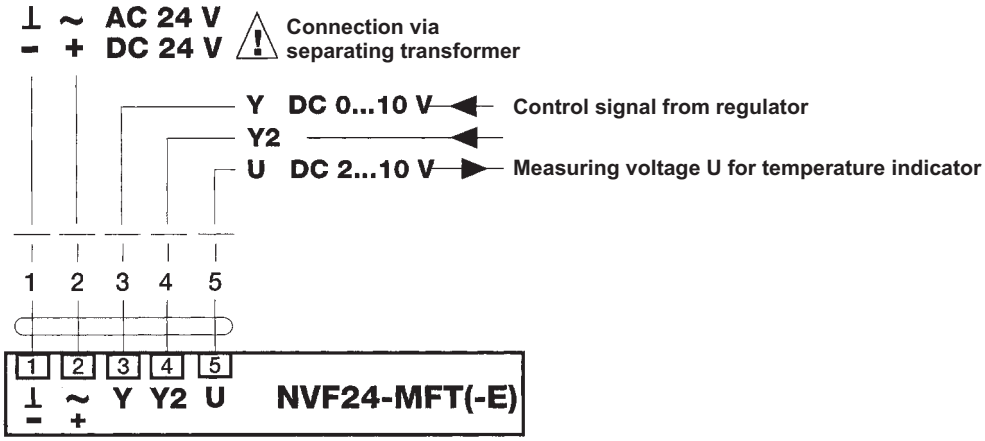
NV24-3 and NV230-3



NV24-MFT



NVF24-MFT and NVF24-MFT-E



Maximal permissible operating pressures [MPa]

Material	PN	Temperature [°C]										
		120	150	200	250	300	350	400	450	500	525	550
Brass	16	1,60	1,14	---	---	---	---	---	---	---	---	---
42 3135		---	---	---	---	---	---	---	---	---	---	---
Grey cast iron EN-JL 1040	16	1,60	1,44	---	---	---	---	---	---	---	---	---
(EN-GJL-250)		---	---	---	---	---	---	---	---	---	---	---
Spher.cast iron EN-JS 1025	16	1,50	1,40	1,40	1,30	1,10	---	---	---	---	---	---
(EN-GJS-400-18-LT)	40	4,00	3,88	3,60	3,48	3,20	---	---	---	---	---	---
Cast steel 1.0619	16	1,60	1,50	1,40	1,30	1,10	1,00	0,80	---	---	---	---
(GP240GH)	40	4,00	4,00	3,90	3,60	3,20	2,70	1,90	---	---	---	---
Chrommolybden steel		---	---	---	---	---	---	---	---	---	---	---
1.7357 (G17CrMo5-5)	40	4,00	4,00	4,00	4,00	4,00	4,00	3,90	3,10	1,80	---	---
Stainless steel 1.4581	16	1,60	1,50	1,40	1,30	1,30	1,20	1,20	---	---	---	---
(GX5CrNiMoNb19-11-2)	40	4,00	3,80	3,50	3,40	3,30	3,10	3,00	---	---	---	---

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