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Valves 200 line
with actuators LDM ANT40

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	$\frac{Q_m}{100}\sqrt{\frac{v_2 . x}{\Delta p}}$	$\frac{Q_m}{100}\sqrt{\frac{2v.x}{p_1}}$

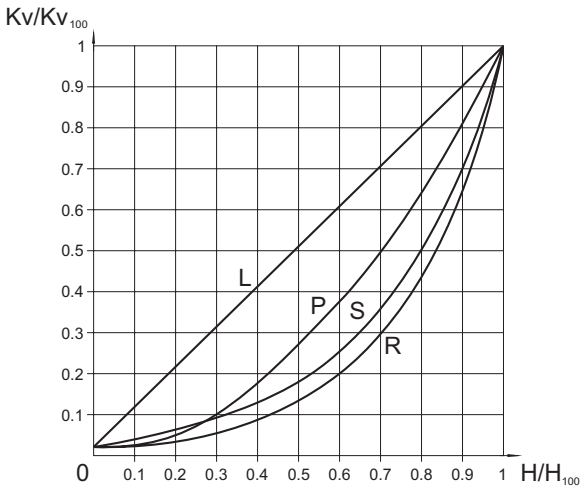
Above critical flow of vapours and gases

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

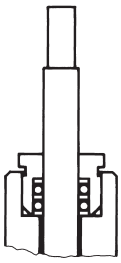
Marking	Unit	Name of dimension
Kv	$m^3.h^{-1}$	Flow coefficient under condition of units of flow
Kv_{100}	$m^3.h^{-1}$	Flow coefficient at nominal stroke
Kv_{min}	$m^3.h^{-1}$	Flow coefficient at minimal flow rate
Kvs	$m^3.h^{-1}$	Valve nominal flow coefficient
Q	$m^3.h^{-1}$	Flow rate in operating conditions (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

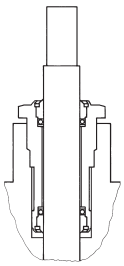
V-ported plugs should not to be used in above - critical differential pressures with inlet pressure $p_1 \geq 0,4$ MPa and for regulation of saturated steam. In these cases we recommend to use a perforated plug. The perforated plug should be also used always when cavitation may occur due to a high differential 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.



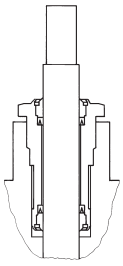
Applied to RV 102, RV 103



Applied to RV 2xx

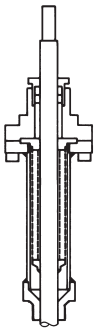
Packing - DRSpack® (PTFE)

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 (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

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

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, $\Delta p_{APPLIAN.\ QMIN}$=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

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

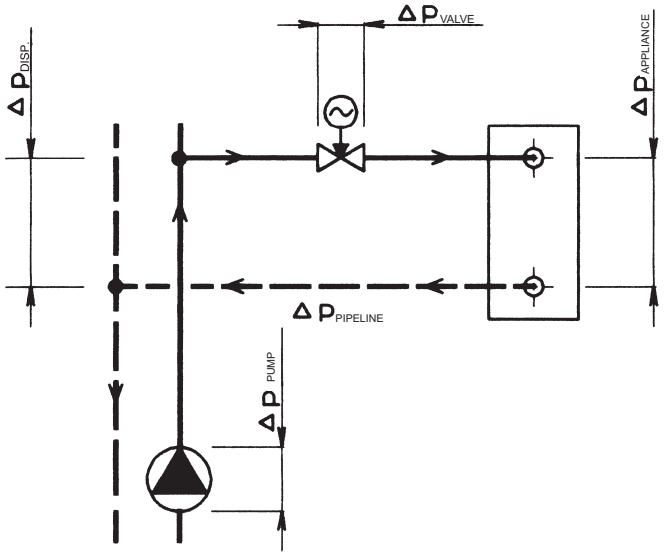
shall be lower than mentioned rangeability value of r = 50. Checking is then satisfactory.

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} = 95% h_{MIN} = 29% for equal-percentage characteristic. In that case, LDMspline® flow characteristic is more suitable (94% and 17% 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 original 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 $Q_{NOM} = 7\ m^3.h^{-1}$

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

$\Delta p_{VALVE} = \Delta p_{PUMP2} - \Delta p_{APPLIANCE} - \Delta p_{PIPELINE} = 40\text{-}20\text{-}10 = 10$ 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 16/140-32

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

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

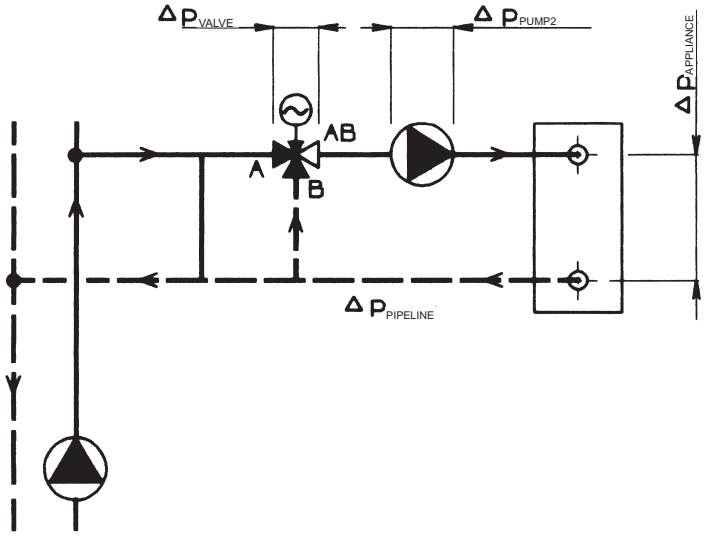
The control valve's real pressure drop calculated this way shall be taken into account in a hydraulic calculation of regulating circuit.

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 original calculation programme VALVES which is available on request free of charge.

200 line

RV / HU 2x1 V

Control valves and Fail-safe action valves DN 15 - 150, PN 16 and 40 with LDM actuators ANT 40

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 HU 2x1 have the same design as RV 2x1 with addition of increased seat sealing. Valves are equipped with fail-safe action actuators (valve closes or openes upon power failure).

Valves RV (HU) 2x1 are especially designed for LDM 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 the recommendation of ČSN-EN 1503-1 (1/2002) (steels) and ČSN-EN 1503-3 (1/2002) (cast). The maximal operating pressures in behaviour with a chosen material and process medium temperature are mentioned in the table on page 26 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 $x_1 \geq 0{,}98$) 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 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 150		
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 - 150	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	DN 80 - 150	1.4027 / 42 2906.5	1.4027 / 42 2906.5	1.4581 / 42 2941.4
Operating temperature range		-20 to 300°C	-20 to 300°C	-20 to 300°C
Face to face dimensions		Line 1 acc. to ČSN-EN 558-1 (3/1997)		
Connection 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 360 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}=260°C, Bellows t_{max}=300°C		

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)						ANT40.11		ANT40.11S, ANT40.11R	
		Marking						EVH		EVI	
		Linear force						2500 N		2000 N	
		Kvs [m³/h]						Δp_{max}		Δp_{max}	
DN	H	1	2	3	4	5	6	metal	PTFE	metal	PTFE
12	20	---	2.5[1]	1.6[1]	1.0[1]	0.6[1]	0.4[1]	4.00	---	4.00	---
15		4.0[1]	---	---	---	---	---	4.00	---	4.00	---
20		---	---	2.5[1]	1.6[1]	1.0[1]	0.6[1]				
20		---	4.0[1]	---	---	---	---	4.00	---	4.00	---
20		6.3[1]	---	---	---	---	---				
25		---	---	---	2.5[1]	1.6[1]	1.0[1]	3.98	4.00	3.07	3.48
25		10.0	6.3[2]	4.0[2]	---	---	---				
32		---	---	---	4.0[1]	---	---	2.33	2.65	1.78	2.10
32		16.0	10.0	6.3[2]	---	---	---				
40		25.0	16.0	10.0	---	---	---	1.44	1.70	1.09	1.34
50		40.0	25.0	16.0	---	---	---	0.82	1.01	0.61	0.80
65		63.0	40.0	25.0	---	---	---	0.46	0.61	0.33	0.48
80	40	100.0	63.0	40.0	---	---	---	0.29	0.42	0.20	0.33
100		160.0	100.0	63.0	---	---	---	0.16	0.27	0.11	0.21
125		250.0	160.0	100.0	---	---	---	0.09	0.17	0.05	0.13
150		360.0	250.0	160.0	---	---	---	0.05	0.12	0.02	0.09

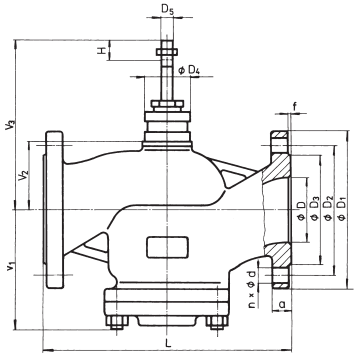
1) parabolic plug
2) V-ported plug with linear characteristic, parabolic plug with equal-percentage, LDMspline® and parabolic characteristic.

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			95	65	45			15				130	68	47	---	143	---	16	4.5	5.5	---
20	105	75	58	14		105	75	58	14		20				150	68	47	---	143	---	18	5.5	6.5	---
25	115	85	68		4	115	85	68		4	25				160	85	52	250	148	346	18	6.5	8	3.5
32	140	100	78			140	100	78			32			10	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	18		50	2	44		230	117	72	270	168	366	20	14	21	3.5
65	185	145	122	18	4[1]	185	145	122		8	65				290	117	72	270	168	366	22	18	27	3.5
80	200	160	138			200	160	138			80				310	152	106	452	222	568	24	26	40	4.5
100	220	180	158		8	235	190	162	22		100			14	350	152	106	452	222	568	24	38	49	4.5
125	250	210	188			270	220	188	26		125				400	175	134	480	250	596	26	58	82	5
150	285	240	212	22		300	250	218			150				480	200	134	480	250	596	28	78	100	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 V

Control valves and Fail-safe action valves DN 25 - 150, PN 16 and 40 with LDM actuators ANT 40

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-actuator. Flow characteristics, Kvs values and leakage rates correspond to international standards.

Valves with a fail-safe action series HU 2x3 have the same design as RV 2x3 with addition of increased seat sealing. Valves are equipped with fail-safe action actuators (valve closes or openes upon power failure).

Valves RV 2x3 are especially designed for LDM 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 the recommendation of ČSN-EN 1503-1 (1/2002) (steels) and ČSN-EN 1503-3 (1/2002) (cast). The maximal operating pressures in behaviour with a chosen material and process medium temperature are mentioned in the table on page 26 of this catalogue.

Process media

Valves series RV / HU 2x3 are designed for regulation (RV 2x3) and for regulation and shut-off (HU 2x3)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 under-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, reverse, control valve with pressure-balanced plug		
Nominal size range		DN 25 to 150		
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 25 - 50	1.4028 / 17 023.6	1.4028 / 17 023.6	1.4571 / 17 347.4
DIN W.Nr./ČSN	DN 65 - 150	1.4027 / 42 2906.5	1.4027 / 42 2906.5	1.4581 / 42 2941.4
Plug material :	DN 25 - 65	1.4021 / 17 027.6	1.4021 / 17 027.6	1.4571 / 17 347.4
DIN W.Nr./ČSN	DN 80 - 150	1.4027 / 42 2906.5	1.4027 / 42 2906.5	1.4581 / 42 2941.4
Operating temperature range		-20 to 260°C	-20 to 260°C	-20 to 260°C
Face to face dimensions		Line 1 acc. to ČSN-EN 558-1 (3/1997)		
Connection 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, perforated		
Flow characteristic		Linear, equal-percentage, LDMspline®, parabolic		
Kvs value		4 to 360 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}=260°C, Bellows t_{max}=260°C		

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.

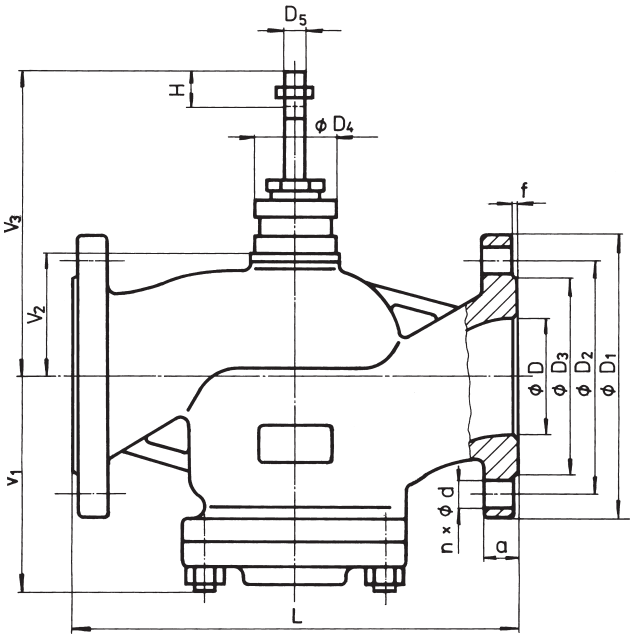
For further information on actuating, see actuators´ catalogue sheets		Actuating (actuator)			ANT40.11				ANT40.11S, ANT40.11R			
		Marking			EVH				EVI			
		Linear force			2500 N				2000 N			
		Kvs [m³/h]			Δp_{max}				Δp_{max}			
DN	H	1	2	3	metal		PTFE		metal		PTFE	
25	20	10	6.3 [1]	4.0 [1]	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)
32		16.0	10.0	6.3 [1]	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)
40		25.0	16.0	10.0	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)
50		40.0	25.0	16.0	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)
65		63.0	40.0	25.0	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)
80	40	100.0	63.0	40.0	4.00	(2.80)	4.00	(4.00)	4.00	(4.00)	4.00	(4.00)
100		160.0	100.0	63.0	4.00	(1.80)	4.00	(3.70)	4.00	(2.90)	4.00	(4.00)
125		250.0	160.0	100.0	4.00	(1.00)	4.00	(2.90)	4.00	(1.90)	4.00	(3.80)
150		360.0	250.0	160.0	4.00	(0.50)	4.00	(2.40)	4.00	(1.25)	4.00	(3.10)

1) linear 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 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.
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.

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	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
80	200	160	138		8	200	160	138			80			14	310	152	106	452	222	568	24	26	40	4.5
100	220	180	158			235	190	162	22		100				350	152	106	452	222	568	24	38	49	4.5
125	250	210	188			270	220	188	26		125				400	175	134	480	250	596	26	58	82	5
150	285	240	212	22		300	250	218			150				480	200	134	480	250	596	28	78	100	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 213
m_2 - for valves RV / HU 223 and RV / HU 233

200 line

RV 2x5 V

Control valves
DN 15 - 150, PN 16 and 40
with LDM actuators ANT 40

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 selected way upon power failure.

Valves RV 2x5 are especially designed for Siemens actuators LDM.

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 the recommendation of ČSN-EN 1503-1 (1/2002) (steels) and ČSN-EN 1503-3 (1/2002) (cast). The maximal operating pressures in behaviour with a chosen material and process medium temperature are mentioned in the table on page 28 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 215	RV 225	RV 235
Type of valve		Three-way, reverse, control valve		
Nominal size range		DN 15 to 150		
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 - 150	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	DN 80 - 150	1.4027 / 42 2906.5	1.4027 / 42 2906.5	1.4581 / 42 2941.4
Operating temperature range		-20 to 300°C	-20 to 500°C	-20 to 300°C
Face to face dimensions		Line 1 acc. to ČSN-EN 558-1 (3/1997)		
Connection 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, perforated		
Flow characteristic		Linear, equal-percentage in straight way		
Kvs value		1.6 to 360 m^3/hour		
Leakage rate in straight way		Class III. acc. to ČSN-EN 1349 (5/2001) (<0.1% Kvs) for c. valves with metal-metal seat sealing		
(Leakage rate in way B-AB is not guaranteed usually up to 2% Kvs)		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}=260°C, Bellows t_{max}=550°C		

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.

Další informace o ovládání viz katalogové listy pohonů		Ovládání (pohon)						ANT40.11		ANT40.11S, ANT40.11R	
		Označení v typovém čísle						EVH		EVI	
		Osová síla						2500 N		2000 N	
		Kvs [m³/hod]						Δp_{max}		Δp_{max}	
DN	H	1	2	3	4	5	6	kov	PTFE	kov	PTFE
12	20	---	2.5[1]	1.6[1]	1.0[1]	0.6[1]	0.4[1]	4.00	---	4.00	---
15		4.0[1]	---	---	---	---	---	4.00	---	4.00	---
20		---	---	2.5[1]	1.6[1]	1.0[1]	0.6[1]	4.00	---	4.00	---
20		---	4.0[1]	---	---	---	---				
20		6.3[1]	---	---	---	---	---				
25		---	---	---	2.5[1]	1.6[1]	1.0[1]	3.98	4.00	3.07	3.48
25		10.0	6.3[2]	4.0[2]	---	---	---				
32		---	---	---	4.0[1]	---	---	2.33	2.65	1.78	2.10
32		16.0	10.0	6.3[2]	---	---	---				
40		25.0	16.0	10.0	---	---	---	1.44	1.70	1.09	1.34
50		40.0	25.0	16.0	---	---	---	0.82	1.01	0.61	0.80
65		63.0	40.0	25.0	---	---	---	0.46	0.61	0.33	0.48
80	40	100.0	63.0	40.0	---	---	---	0.29	0.42	0.20	0.33
100		160.0	100.0	63.0	---	---	---	0.16	0.27	0.11	0.21
125		250.0	160.0	100.0	---	---	---	0.09	0.17	0.05	0.13
150		360.0	250.0	160.0	---	---	---	0.05	0.12	0.02	0.09

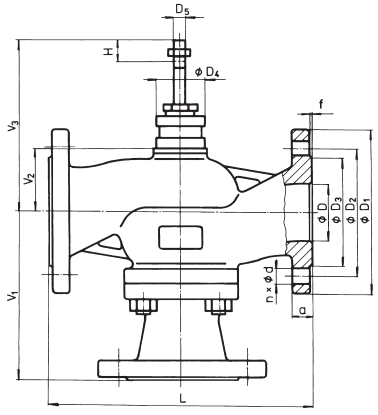
1) parabolic plug in straight way, V-ported plug in angle way
2) V-ported plug in angle way, in straight way for linear characteristic V-ported plug and for equal-percentage characteristic parabolic plug.

metal - version with metal - metal seat sealing
PTFE - version with metal - PTFE seat sealing (does not apply to contoured plugs)

Max. differential pressures specified in table apply to PTFE and O-ring packing. Δp 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
80	200	160	138		8	200	160	138			80			14	310	220	106	452	222	568	24	31	43	4.5
100	220	180	158			235	190	162	22		100				350	230	106	452	222	568	24	44	55	4.5
125	250	210	188			270	220	188	26		125				400	260	134	480	250	596	26	65	90	5
150	285	240	212	22		300	250	218			150				480	290	134	480	250	596	28	94	120	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

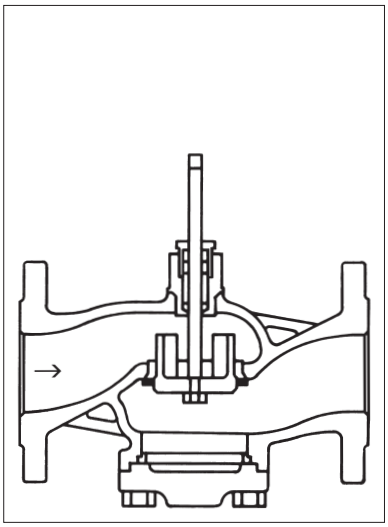
Valve complete specification No. for ordering RV / HU 2x1, RV / HU 2x3, RV 2x5

		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		2 1									
	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) Fail-safe action actuators	ANT40.11			E V H								
	ANT40.11S 1)			E V I								
	ANT40.11R 1)			E V I								
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	Stainless 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 2)				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® 3)					S						
	Parabolic 3)					P						
	Linear - perforated plug 3)					D						
	Equal-percentage - perforated plug 3)					Q						
	Parabolic - perforated plug 3)					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), bellows									220		
	DRSpack® (PTFE), bellows									260		
	Bellows 4)									300		
12. Nominal size DN	DN											XXX

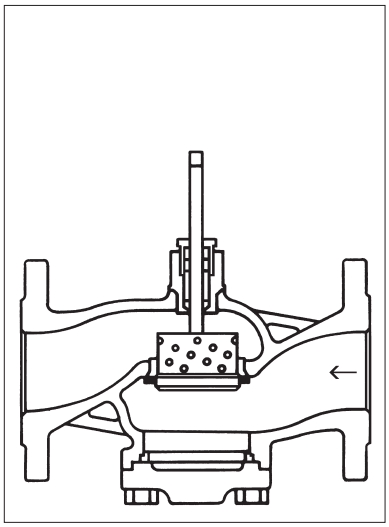
Ordering example: Two-way control valve DN 65, PN 40, with Siemens actuator (Landis & Staefa) SKB 32.50, body material: spheroidal cast iron, flange with raised face, metal-metal seat sealing, PTFE packing, linear characteristic, Kvs = 63 m^3/hour is specified as follows: **RV 211 HLD 1413 L1 40/220-65**

Valves RV / HU 2x1

Section of valve with V-ported plug

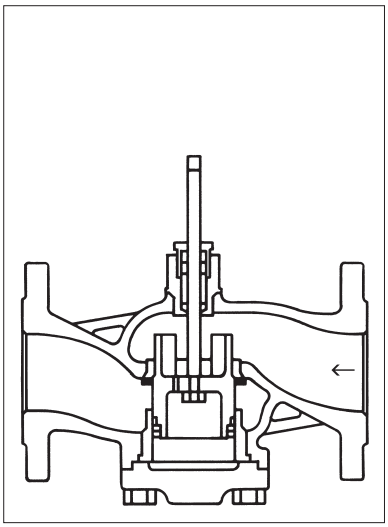


Section of valve with perforated plug

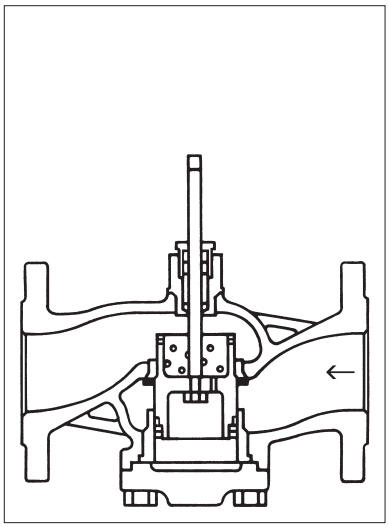


Valves RV / HU 2x3

Section of pressure-balanced valve with V-ported plug

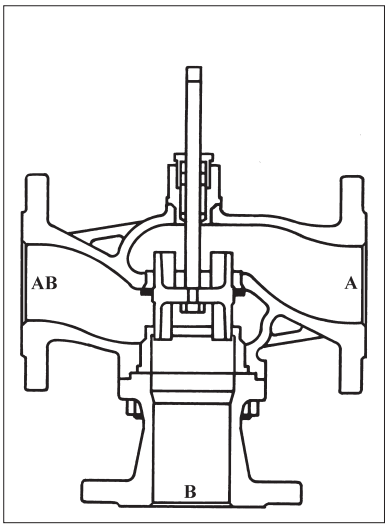


Section of pressure-balanced valve with perforated plug



Valves RV 2x5

Section of three-way valve with V-ported plug



Electric actuators ANT40.11 LDM

Description

The actuators are designed for regulators with continuous or contact output. They are suitable to actuate two-way and three-way valves series RV 113 and RV 2xx. The actuator consists of cover made of self-extinguishing plastic housing a stepping motor, control unit with SUT technology, signalisation LEDs and no-maintenenance gear made of sintered steel. The connection to its valve is provided by stainless steel columns and yoke made of light metal alloy. Electric connection (max. 2,5 mm2) is provided with the aid of screw clamps. There are three self-breaking openings for cable gands M20x1,5 (2x) and M16x1,5. One cable gland M20x1,5 is a part of standard delivery.

Application

Based on a connection variant (see wiring diagram), the actuator can be used as floating (0...10 V or 4...20 mA), or 2-position (open-closed) or 3-position (open-stop-closed). Manual operating is available with outer handle. The motor is disconnected when the hand crank is folded back. When the handle is positioned back, the actuator resumes into required position (without initialization). If the hand crank remains folded out, the actuator keeps its set position.

Installation position

Upright, vertical, max. horizontal.

SUT Technology

The actuator can be controlled by regulators with continuous (0...10 V and/or 4...20 mA) or contact (2-position or 3-position) output. The actuator feeding is optional. The running speed and output characteristic is also optional.

Features

- electronic switch off based on the running force registered by stops inside appliance or valve.
- automatic adapting to the valve stroke
- code switch for characteristic and running time selection
- hand crank for manual operating with swithing the motor off as a start for new initiation
- possibility of direction change of control signal (feeding voltage at terminal 2a or 2b)

Technical data

Type	ANT40.11	
Specification code	EVH	
Execution	Electric actuator with SUT technology	
Voltage	24 V AC, 24 V DC	230 V AC
Frequency	50 Hz	
Power consumption	18 VA	
Control	0 - 10 V, 4 - 20 mA, 3-pos., 2-pos.	3-position
Open-close running time	Adjustable 2, 4, 6 $s.mm^{-1}$	
Nominal force	2500 N	
Travel	20 a 40 mm	
Enclosure	IP 65	
Process medium max. temperature	200°C, with a mid piece up to 240°C	
Ambient temperature range	-10 to 55°C	
Ambient humidity range	< 95 % relative humidity	
Weight	4,5 kg	

Accessories

0313529 001	Split range unit to set sequences
0372332 001	Module, plug-in type, for 230 V ± 15% voltage supply and 3-point activation, additional power 2 VA
0372333 001	2 auxiliary changeover switches, continuously adjustable, additional load 5(2) A, 12 - 250 V, 3(1) A, 12 - 250 V AC [1)]
0372333 002	2 auxiliary changeover contacts with gold-plated contacts for low currents from 1 mA, max. 30 V, 3(1) A, 12 - 250 V AC [1)]
0372334 001	Potentiometer 2000 Ω, 1 W, 24 V [1)]
0372334 002	Potentiometer 130 Ω, 1 W, 24 V [1)]
0372334 006	Potentiometer 1000 Ω, 1 W, 24 V [1)]
0372336 910	Mid piece (required for medium above 200 up to 240°C)
0386263 001	Screwed cable gland M16 x 1,5
0386263 002	Screwed cable gland M20 x 1,5 (1 piece of cable gland is standard part of actuator delivery)

[1)] one option of accessory can be used only

Operation

Initialisation and feedback signal

When used as a continuous drive, the device initialises itself automatically. As soon as voltage is applied to the drive for the first time, it moves to the lower limit stop on the valve, thus enabling automatic connection with the valve spindle. Then it moves to the upper limit stop and the value is recorded and saved with the help of a path measurement system. The control signal and the feedback signal are adjusted to this effective stroke. There is no re-initialisation if the voltage is interrupted or if the voltage supply is removed. The values remain saved.
To re-initialise, the drive must be connected to the voltage. To trigger an initialisation, fold the hand crank out and back in again twice within 4 seconds. Both the LEDs will then flash red.
During initialisation, the feedback signal is inactive, or it corresponds to a value of "0". Initialisation uses the shortest run time. The re-initialisation is only valid once the entire procedure has been completed. Folding the hand crank out again will interrupt the procedure.
If the valve drive detects a blockage, it will report this by setting the feedback signal to 0 V after approx. 90 s. However, the drive will try to overcome the blockage during this time. If it is possible to overcome the blockage, the normal control function is activated again and the feedback signal is resumed.
No initialisation is performed with a 2-position or 3-position control. The feedback signal is inactive.

Connection as a 2-position valve drive (24 V)

This activation (OPEN/CLOSED) can take place via two cables. The voltage is applied to terminals 1 and 2a. Applying the voltage (24 V) to terminal 2b opens the valve's control passage. After this voltage has been switched off, the drive moves to the opposite end position and closes the valve. The electronic motor switch-off responds in the end positions (valve limit stop, or when maximum stroke is reached) or in case of overload (no limit switches).
The coding switch can be used to set the run times. The characteristic curve cannot be selected in this case (resulting in the characteristic curve for the valve). Terminals 3i, 3u and 44 must not be connected.

Connection as a 3-position valve drive (24 V)

Applying voltage to terminal 2a (or 2b) makes it possible to move the valve to any desired position. If voltage is applied to terminals 1 and 2b, the valve shaft moves out and opens the valve. It moves in and closes the valve when the electrical circuit is closed over terminals 1 and 2a.
In the end positions (at the valve stop, or when the maximum stroke is reached) or in case of an overload, the electronic motor switch-off responds (no limit switches). The direction of the stroke can be changed by transposing the connections.
The coding switch is used to set the run times. In this case, the characteristic curve cannot be selected (resulting in the characteristic curve for the valve). Terminals 3i, 3u and 44 must not be connected.

Connection as a 3-position valve drive with 230 V

The accessory module is plugged on in the connection area and is then connected for 3-position mode. If this accessory is used, only control in 3-position mode is available. The coding switch on the baseboard can be used to select the run times. The characteristic curve cannot be selected; the characteristic curve for the valve is applicable.
The module has a built-in switch which is automatically moved into the correct position when the module is installed. On this drive (which has no spring return action) the switching lever is in the lower position.
The accessory module is not suitable for 2-position activation.

Connection to a control voltage (0...10 V and/or 4...20 mA)

The built-in positioner controls the drive depending on the controller output signal y.
The control signal used is a voltage signal (0...10 V–) at terminal 3u, or a current signal at terminal 3i. If a control signal is present at both terminals (3u (0...10 V) and 3i (4...20 mA)) simultaneously, the input with the higher value takes priority.

Mode of action 1 (mains voltage to internal connection 2a):
as the output signal increases, the valve shaft moves out and opens the valve (control passage).
Mode of action 2 (mains voltage to internal connection 2b):
as the output signal increases, the valve shaft moves in and closes the valve (control passage).
The starting point and the control span are fixed. To set partial ranges (and only for voltage input 3u), a split range unit is available as an accessory (see the split range unit function); this unit is intended for installation in the drive.
After the voltage supply is applied and after initialisation, the drive moves to each valve stroke between 0% and 100%, depending on the control signal. The electronics and the path measurement system ensure that no stroke is lost, and the drive does not require re-initialisation at intervals. When the end positions are reached, the position is checked, corrected as necessary and stored again. This ensures parallel running of several drives of the same SUT type. Feedback signal y0 = 0...10 V corresponds to the effective valve stroke of 0 to 100%.
If the 0...10 V control signal is interrupted in direction of action 1, the spindle retracts completely and the valve is closed. So that the valve can be opened (direction of action 1), a voltage

of 10 V must be connected between terminals 1 and 3u, or it is necessary to switch over to direction of action 2.
The coding switch can be used to set the characteristic for the valve. Equal-percentage and square characteristics can only be produced if the device is used as a continuous-action drive. Further switches can be used to select the run-times (can be used for the 2-position, 3-position or continuous functions).

LED display

Both LEDs flashing red: initialisation procedure
Upper LED lit red: upper limit stop or "CLOSED" position reached
Lower LED lit red: lower limit stop or "OPEN" position reached
Upper LED flashing green: drive running, moving towards "CLOSED" position
Upper LED lit green: drive stationary, last direction of running "CLOSED"
Lower LED flashing green: drive running, moving towards "OPEN" position
Lower LED flashing green: drive stationary, last direction of running "OPEN"
Both LEDs are lit green: waiting time after switching on, or after emergency function
No LED lit: no voltage supply (terminal 2a or 2b)
Both LEDs are flashing red and green: drive is in manual mode

Accessories application

Split range unit

This accessory can be built into the drive or can be accommodated externally in an electrical distribution box. The starting point Uo and the control span ΔU can be set with the help of a potentiometer. This makes it possible to operate several regulating units in sequence or in a cascade with the control signal from the controller. The input signal (partial range) is converted into an output signal of 0...10 V.

Auxiliary changeover switch

Auxiliary changeover switch double 0372333 001
- Switching capacity max. 250 V~, min. current 250 mA at 12 V (or 20 mA at 20 V)
- Switching capacity max. 12...30 V=, max. current 100 mA

Auxiliary changeover switch double gold 0372333 002
- Switching capacity max. 250 V~, min. current 1 mA at 5 V
- Switching capacity max. 0.1...30 V=, current 1...100 mA

Even if used only once above 10 mA or up to 50 V, the gold coating will be destroyed. The switch can then be used only for higher switching outputs.

Engineering and installation notes

Penetration of condensate or dripping water, etc. along the valve spindle into the drive should be avoided.
The valve is plugged directly onto the drive and is fixed with screws (no further settings are needed). The drive is automatically connected to the valve spindle. When the device is delivered, the drive spindle is in the middle position.
The housing contains three breakthrough-type cable leadthroughs which are broken open automatically when the cable leadthrough is screwed in. The stepping motor/ electronics concept guarantees parallel running of several valve drives of the same type. The cross-section of the connecting cable should be selected according to the line length and the number of drives. With five drives connected in parallel and a line length of 50 m, we recommend using a cable cross-section of 1.5 mm^2 (power consumption of the drive × 5).
The drive can be assembled with a maximum of one 230 V module, one additional accessory component (auxiliary switch or potentiometer) and the split range unit.

Warnings

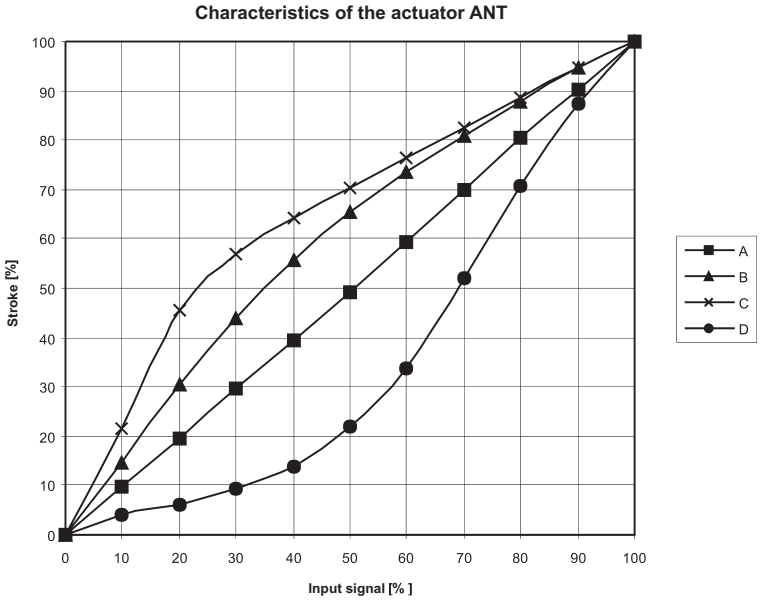
If the temperature of the medium in the valve is high, the drive columns and the shaft may also reach high temperatures. It is necessary to ensure that the maximum ambient temperauture be max. 55°C during operation. If the temperature exceeds this limit, it is recommended to insulate the valve (eg. IKA insulation, see catalogue sheet 01-09.6).
If a failure of the final control element could cause damage, additional protective precautions must be taken.

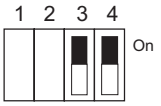
CE - Conformity

EMV Directive 89/336/EWG	Machinery Directive 98/37/EWG/I/B	Low Voltage Directive 73/23/EWG
EN 61000-6-1	EN 1050	EN 60730 1
EN 61000-6-2		EN 60730-2-14
EN 61000-6-3		Over-voltage category III
EN 61000-6-4		Degree of pollution III

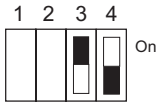
Switch coding

Actuator characteristic (switches 3 and 4)
- optional for actuators with floating control only

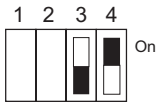




A (Linear)



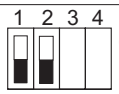
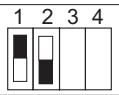
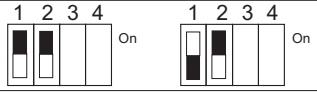
B (Quadratic)



C (Logarithmic)

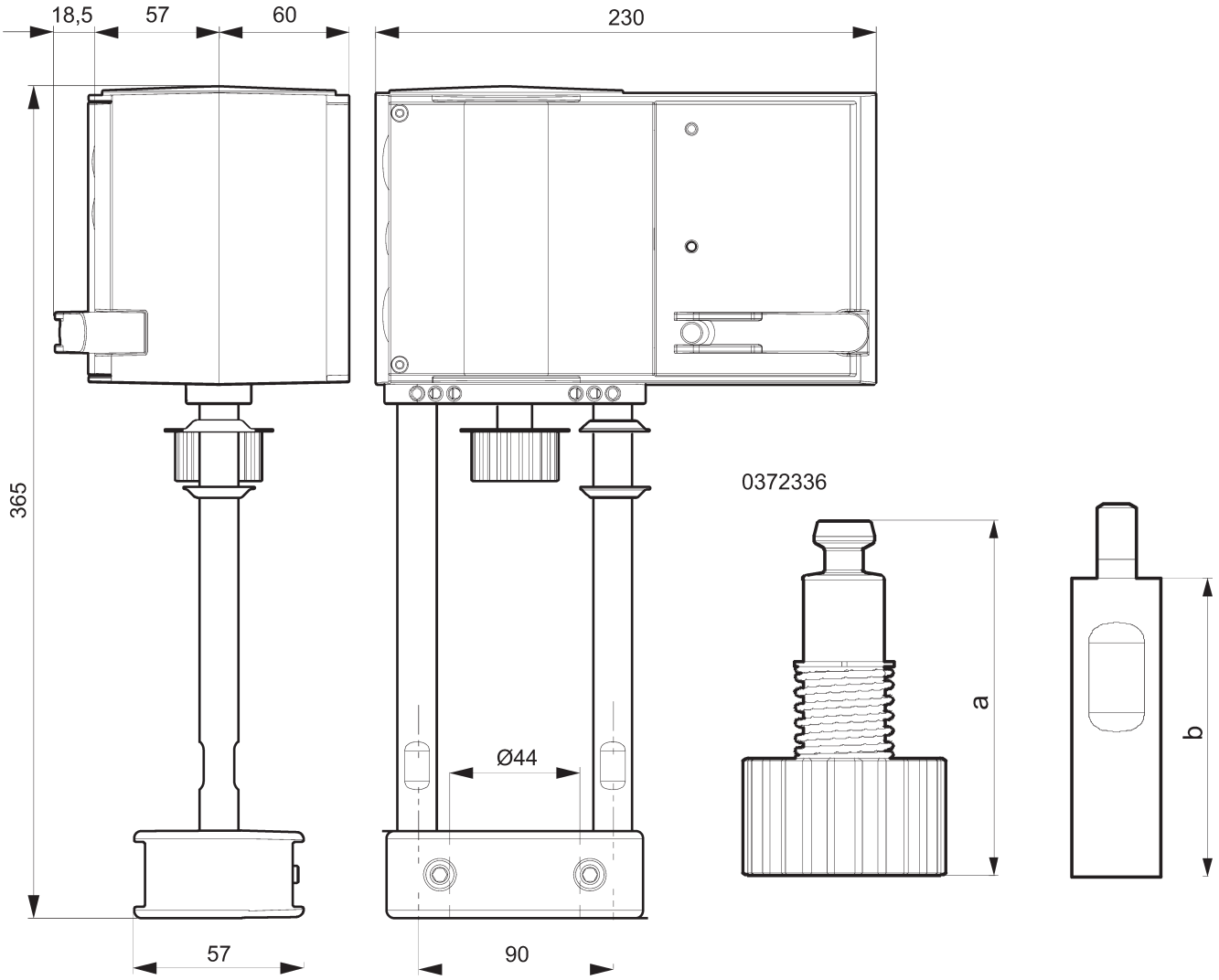
D (Equal percentage)

Run time (switches 1 and 2)
- optional for all types of control of the actuator

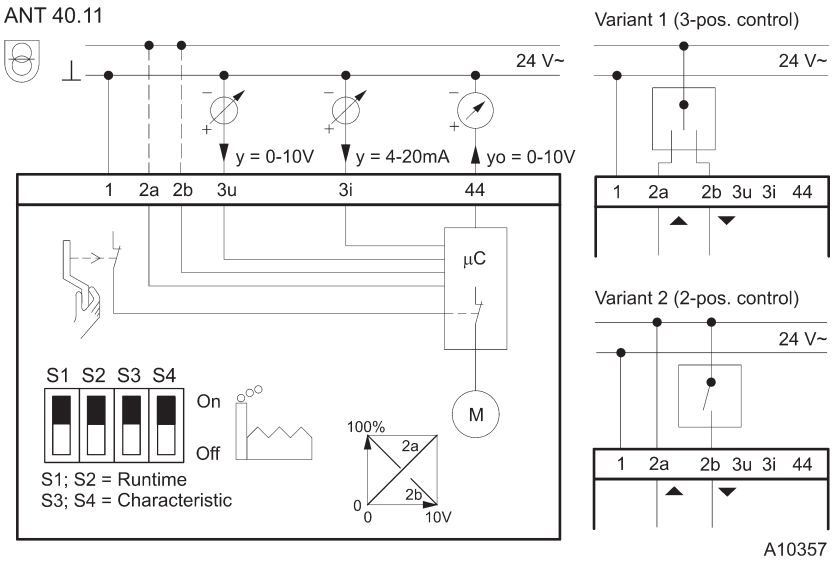
Run time per mm	Switch coding	Run time for 20 mm stroke	Run time for 40 mm stroke
2 s / mm		40 s ± 1	80 s ± 2
4 s / mm		80 s ± 2	160 s ± 4
6 s / mm		**120 s ± 4**	**240 s ± 8**

Note: Data in bold mean factory settings

Dimensions of actuator and a mid piece for higher temperatures



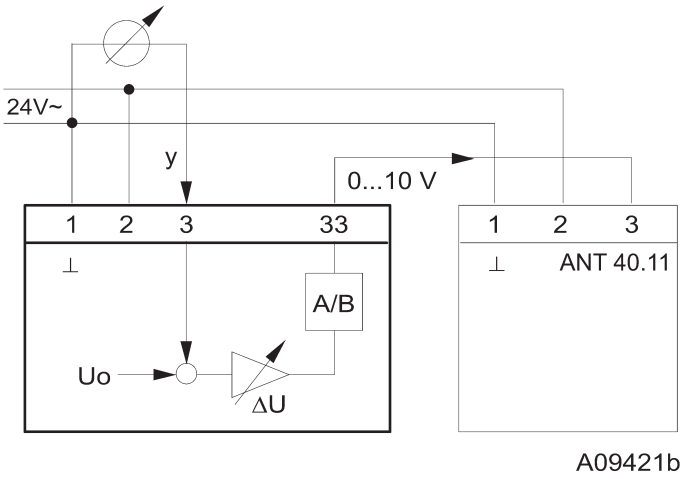
Wiring diagram of actuators



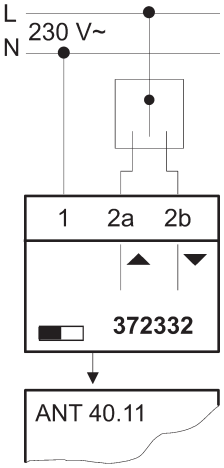
A10357

Wiring diagram of accessories

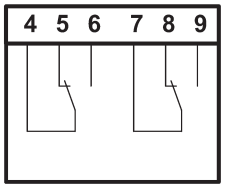
313529



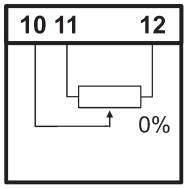
372332

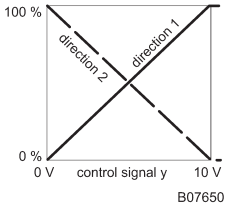


372333



372334





Electric actuators ANT40.11S ANT40.11R LDM

Description

The actuator is designed for regulators with continuous or contact output. They are suitable for actuating two-way or three way valves series RV 113 and RV 2xx. The actuator is equipped with a spring ensuring the actuator runs into its defined end position in case of power supply failure or when the sensor of limit value is activated. The actuator consists of a cover made of self-extinguishing plastic housing stepping motor, control unit with SUT technology, signalisation LEDs and no-maintenance gear made of sintered steel and spring roll. The connection to its valve is provided by stainless steel columns and yoke made of light metal alloy. Electric connection (max. 2,5 mm2) is provided with the aid of screw clamps. There are three self-breaking openings for cable gands M20x1,5 (2x) and M16x1,5. One cable gland M20x1,5 is a part of standard delivery.

Application

Based on a connection variant (see wiring diagram), the actuator can be used as floating (0...10 V or 4...20 mA), or 2-position (open-closed) or 3-position (open-stop-closed). Manual operating is with outer hand crank. The motor is disconnected when the hand crank is folded out. When the hand crank is folded back, the actuator resumes into required position (without initialization). If the hand crank remains folded out, the actuator keeps its set position.

Installation position

Upright, vertical, max. horizontal.

SUT Technology

The actuator can be controlled by regulators with continuous (0...10 V and/or 4...20 mA) or contact (2-position or 3-position) output. The actuator feeding is optional. The running speed and output characteristic is also optional.

Features

- electronic switch off based on the running force registered by stops inside apliance or valve.
- automatic adapting to the valve stroke
- code switch for characteristic and running time selection
- hand crank for manual operating with swithing the motor off as a start for new initiation
- possibility of direction change of control signal (feeding voltage at terminal 2a or 2b)

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.

Technical data

Type	ANT40.11S		ANT40.11R	
Specification code	EVI			
Execution	Electric actuator with spring return action and SUT technology			
Voltage	24 V AC, 24 V DC	230 V	24 V AC, 24 V DC	230 V
Frequency	50 Hz			
Powe consumption	20 VA in operation mode, 7 VA out of operation			
Control	0-10 V, 4-20 mA, 3-pos., 2-pos.	3-position	0-10 V, 4-20 mA, 3-pos., 2-pos.	3-position
Open-close running time	Adjustable 2, 4, 6 $s.mm^{-1}$			
Running time for fail-safe function	Acc. to stroke 15 - 30 s			
Fail-safe function	Indirect (NC)		Direct (NO)	
Nominal force	2000 N			
Stroke	20 a 40 mm			
Enclosure	IP 66			
Process medium max. temperature	200°C, with a mid piece up to 240°C			
Ambient temperature range	-10 to 55°C			
Ambient humidity range	< 95 % relative humidity			
Weight	6,1 kg			

Accessories

0313529 001	Split range unit to set sequences
0372332 001	Module, plug-in type, for 230 V ± 15% voltage supply and 3-point activation, additional power 2 VA
0372333 001	2 auxiliary changeover switches, continuously adjustable, additional load 5(2) A, 12 - 250 V, 3(1) A, 12 - 250 V AC [1]
0372333 002	2 auxiliary changeover contacts with gold-plated contacts for low currents from 1 mA, max. 30 V, 3(1) A, 12 - 250 V AC [1]
0372334 001	Potentiometer 2000 Ω, 1 W, 24 V [1]
0372334 002	Potentiometer 130 Ω, 1 W, 24 V [1]
0372334 006	Potentiometer 1000 Ω, 1 W, 24 V [1]
0372336 910	Intermediate piece (required for medium above 200 up to 240°C)
0386263 001	Screwed cable gland M16 x 1,5
0386263 002	Screwed cable gland M20 x 1,5 (1 piece of cable gland is standard part of actuator delivery)

[1] one option of accessory can be used only

Operation

After a new start, or after a start following activation of the reset (terminal 21), up to 45 s of waiting time will pass before the drive is available again. Depending on the type of connection (see the wiring dia-gram), the device can be used as a continuous-action drive (0...10 V and/or 4...20 mA), a 2-point drive (open-closed) or a 3-position drive (open-stop-closed).

Initialisation and feedback signal

The drive initialises itself automatically, whether it is used in continuous-action, 2-position or 3-position mode. As soon as voltage is applied to the drive for the first time and the waiting period has elapsed, the drive moves to the lower limit stop on the valve, thus enabling automatic connection with the valve spindle. Then it moves to the upper limit stop, and the value is recorded and saved with the help of a path measurement system. The control signal and the feedback signal are adjusted to this effective stroke. After an interruption to the voltage or a spring return action, no re-initialisation is performed and the values are saved.
To re-initialise, the drive must be connected to the voltage. To trigger an initialisation, fold the hand crank out and back in again twice within 4 seconds. Both the LEDs will then flash red.
During initialisation, the feedback signal is inactive, or it corresponds to a value of "0". Initialisation uses the shortest run time. The re-initialisation is only valid once the entire procedure has been completed. Folding the hand crank out again will interrupt the procedure.
If the valve drive detects a blockage, it will report this by setting the feedback signal to 0 V after approx. 90 s. However, the drive will try to overcome the blockage during this time. If it is possible to overcome the blockage, the normal control function is activated again and the feedback signal is resumed.

Spring return

If the voltage supply fails or is switched off, or if a monitoring contact responds, the brushless DC mo-tor releases the gear and the drive is moved into the respective end position (depending on the design version) by the pre-tensioned spring. As this happens, the control function of the drive is disabled for 45 s (both LEDs flash green) so that the end position can be reached in every case. The reset speed is controlled with the help of the motor so that there are no pressure surges in the line. The brushless DC motor has three functions: as a magnet to hold the position, as a brake (by acting as a generator) and as a motor for the control function. After a spring return function, the drive does not re-initialise itself.

Connection as a 2-position valve drive (24 V)

This activation (OPEN/CLOSED) can take place via two cables. The voltage is applied to terminals 1 2a and 21. Applying the voltage (24 V) to terminal 2b causes the coupling rod to extend and opens the valve. After this voltage has been switched off, the drive moves to the opposite end position and closes the valve. The electronic motor switch-off responds in the end positions (valve limit stop, or when maximum stroke is reached) or in case of overload (no limit switches).
The coding switch can be used to set the run times. The characteristic curve cannot be selected in this case (resulting in the characteristic curve for the valve). The feedback signal is active as long as the initialisation is performed and there is voltage present at terminal 21. Terminals 3i, 3u and 44 must not be connected.

Connection as a 3-position valve drive (24 V)

Applying voltage to terminal 2a (or 2b) makes it possible to move the valve to any desired position. If voltage is applied to terminals 1 and 2b, the valve shaft moves out and opens the valve. It moves in and closes the valve when the electrical circuit is closed over terminals 1 and 2a.
In the end positions (at the valve stop, or when the maximum stroke is reached) or in case of an overload, the electronic motor switch-off responds (no limit switches). The direction of the stroke can be changed by transposing the connections.
The coding switch is used to set the run times. In this case, the characteristic curve cannot be selected (resulting in the characteristic curve for the valve). The feedback signal is active as long as the initialisation is performed and there is voltage present at terminal 21. Terminals 3i, 3u must not be connected

Connection as a 3-position valve drive with 230 V

The accessory module is plugged on in the connection area and is then connected for 3-position mode. If this accessory is used, only control in 3-position mode is available. The coding switch on the baseboard can be used to select the run times. The characteristic curve cannot be selected; the characteristic curve for the valve is applicable.
The module has a built-in switch which is automatically moved into the correct position when the module is installed. With this application, the switching lever is in the upper position.
The accessory module is not suitable for 2-position activation.

Connection to a control voltage (0...10 V and/or 4...20 mA)

The built-in positioner controls the drive depending on the controller output signal y.
The control signal used is a voltage signal (0...10 V–) at

is present at both terminals (3u (0...10 V) and 3i (4...20 mA)) simultaneously, the input with the higher value takes priority.

Mode of action 1 (mains voltage to internal connection 2a): as the output signal increases, the valve shaft moves out and opens the valve (control passage).

Mode of action 2 (mains voltage to internal connection 2b): as the output signal increases, the valve shaft moves in and closes the valve (control passage).

The starting point and the control span are fixed. To set partial ranges (and only for voltage input 3u), a split range unit is available as an accessory (see the split range unit function); this unit is intended for installation in the drive.
After the voltage supply is applied and after initialisation, the drive moves to each valve stroke between 0% and 100%, depending on the control signal. The electronics and the path measurement system ensure that no stroke is lost, and the drive does not require re-initialisation at intervals. When the end positions are reached, the position is checked, corrected as necessary and stored again. This ensures parallel running of several drives of the same type. Feedback signal y0 = 0...10 V corresponds to the effective valve stroke of 0 to 100%.
If the control signal 0...10 V is interrupted in mode of action 1, the spindle moves in completely and the valve is closed. So that the valve can be opened (direction of action 1), a voltage of 10 V must be connected between terminals 1 and 3u, or it is necessary to switch over to direction of action 2.

The coding switch can be used to set the characteristic curve for the valve: linear, equal percentage or quadratic. This characteristic curve can only be generated if the drive is used as a continuous drive. Additional switches can be used to select the run times (applicable for 2-position, 3-position or continuous function).

LED display

Both LEDs flashing red: initialisation procedure
Upper LED lit red: upper limit stop or "CLOSED" position reached
Lower LED lit red: lower limit stop or "OPEN" position reached
Upper LED flashing green: drive running, moving towards "CLOSED" position
Upper LED lit green: drive stationary, last direction of running "CLOSED"
Lower LED flashing green: drive running, moving towards "OPEN" position
Lower LED flashing green: drive stationary, last direction of running "OPEN"
Both LEDs are lit green: waiting time after switching on, or after emergency function
No LED lit: no voltage supply (terminal 2a or 2b)
Both LEDs are flashing red and green: drive is in manual mode

Accesories application

Split range unit

This accessory can be built into the drive or can be accommodated externally in an electrical distribution box. The starting point Uo and the control span ΔU can be set with the help of a potentiometer. This makes it possible to operate several regulating units in sequence or in a cascade with the control signal from the controller. The input signal (partial range) is converted into an output signal of 0...10 V.

Auxiliary changeover switch

Auxiliary changeover switch double 0372333 001
- Switching capacity max. 250 V~, min. current 250 mA at 12 V (or 20 mA at 20 V)
- Switching capacity max. 12...30 V=, max. current 100 mA

Auxiliary changeover switch double gold 0372333 002
- Switching capacity max. 250 V~, min. current 1 mA at 5 V
- Switching capacity max. 0.1...30 V=, current 1...100 mA

Even if used only once above 10 mA or up to 50 V, the gold coating will be destroyed. The switch can then be used only for higher switching outputs.

Engineering and installation notes

Penetration of condensate or dripping water, etc. along the valve spindle into the drive should be avoided.
The valve is plugged directly onto the drive and is fixed with screws (no further settings are needed). The drive is automatically connected to the valve spindle. When the device is delivered, the drive spindle is in the middle position.
The housing contains three breakthrough-type cable leadthroughs which are broken open automatically when the cable leadthrough is screwed in. The stepping motor/ electronics concept guarantees parallel running of several valve drives of the same type. The cross-section of the connecting cable should be selected according to the line length and the number of drives. With five drives connected in parallel and a line length of 50 m, we recommend using a cable cross-section of 1.5 mm^2 (power consumption of the drive × 5).
The drive can be assembled with a maximum of one 230 V module, one additional accessory component (auxiliary switch or potentiometer) and the split range unit.

Warnings

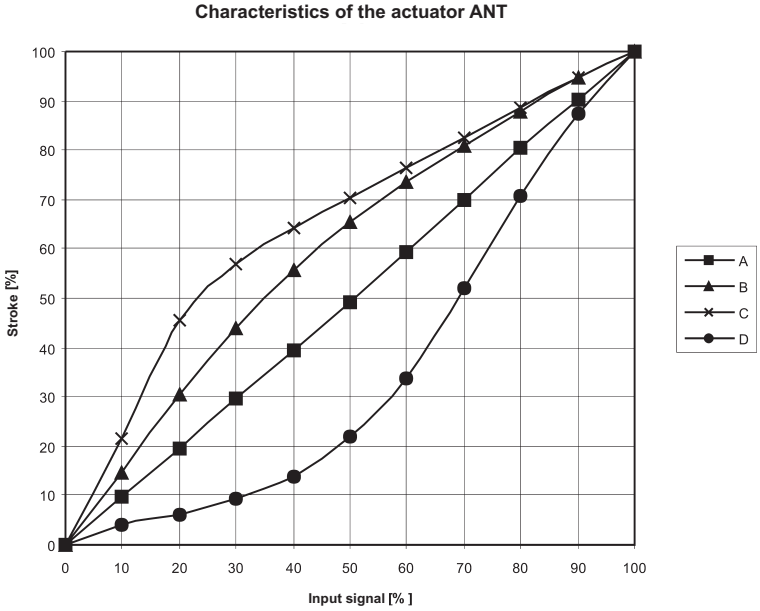
If the temperature of the medium in the valve is high, the drive columns and the shaft may also reach high temperatures. It is necessary to ensure that the maximum ambient temperauture be max. 55°C during operation. If the temperature exceeds this limit, it is recommended to insulate the valve (e.g. IKA insulation, see catalogue sheet 01-09.6).
If a failure of the final control element could cause damage, additional protective precautions must be taken.

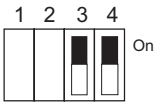
CE - Conformity

EMV Directive 89/336/EWG	Machinery Directive 98/37/EWG/I/B	Low Voltage Directive 73/23/EWG
EN 61000-6-1	EN 1050	EN 60730 1
EN 61000-6-2		EN 60730-2-14
EN 61000-6-3		Over-voltage category III
EN 61000-6-4		Degree of pollution III

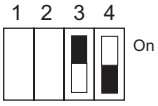
Switch coding

Actuator characteristic (switches 3 and 4)
- optional for actuators with floating control only

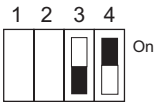




A (Linear)



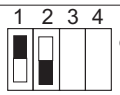
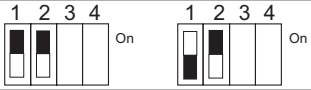
B (Quadratic)



C (Logarithmic)

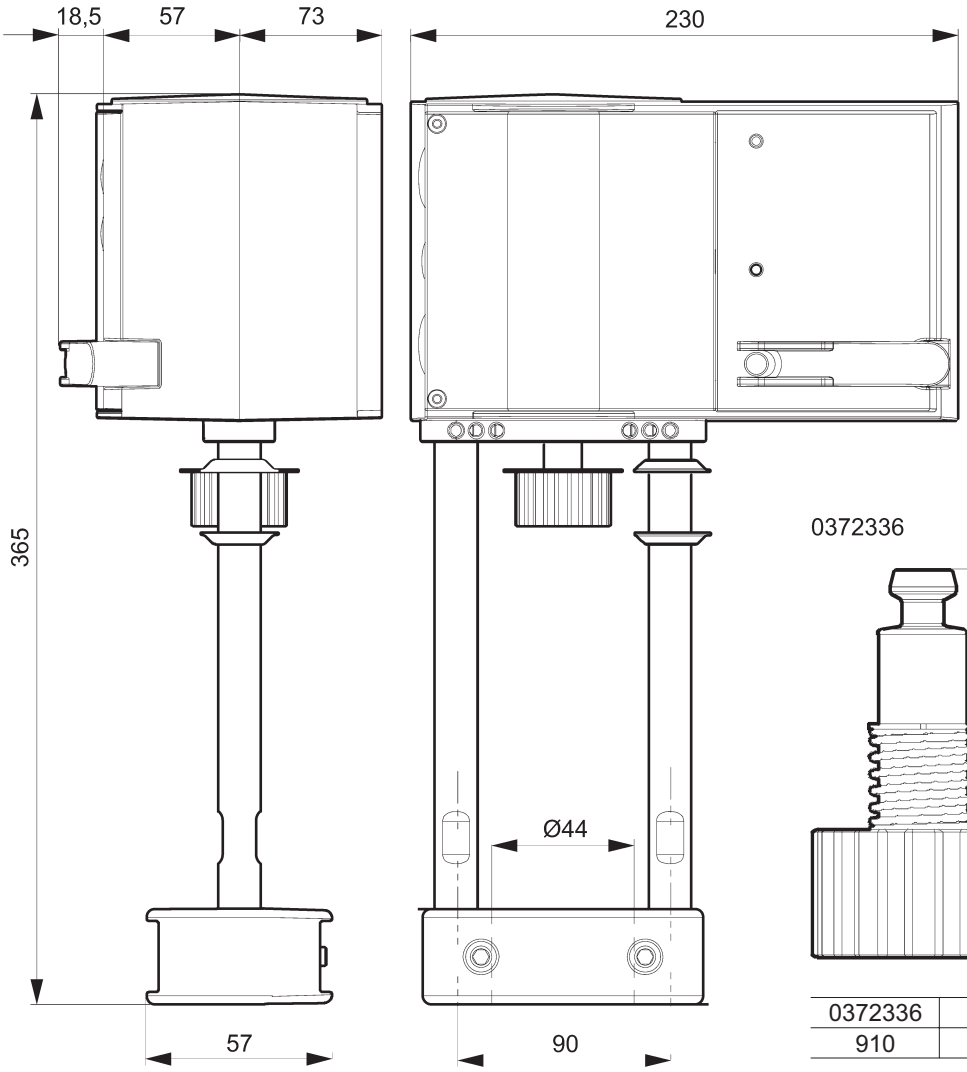
D (Equal percentage)

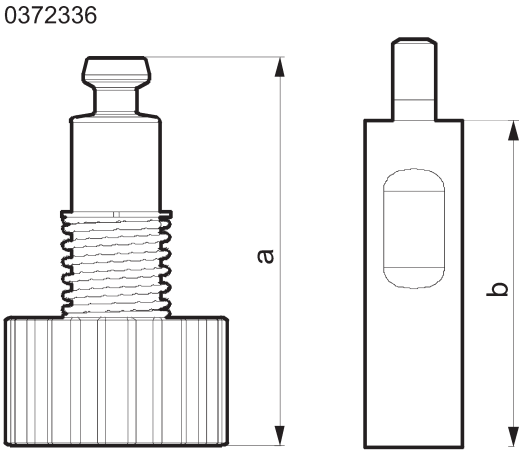
Run time (switches 1 and 2)
- optional for all types of control of the actuator

Run time per mm	Switch coding	Run time for 20 mm stroke	Run time for 40 mm stroke
2 s / mm		40 s ± 1	80 s ± 2
4 s / mm		80 s ± 2	160 s ± 4
6 s / mm		**120 s ± 4**	**240 s ± 8**

Note: Data in bold mean factory settings.

Dimensions of actuator and a mid piece for higher temperatures

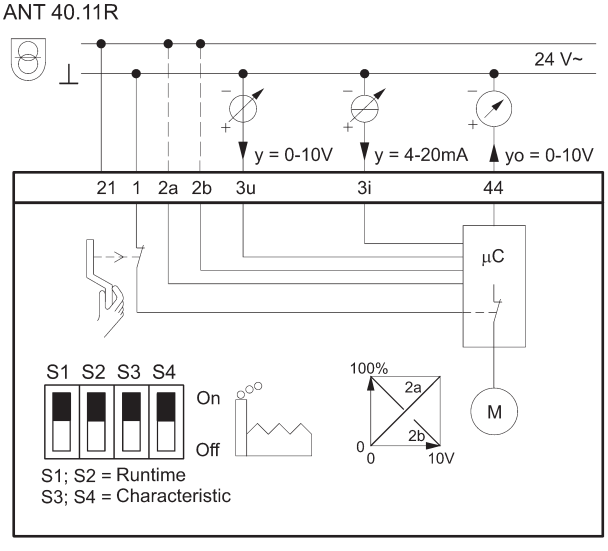




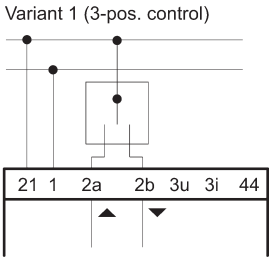
0372336	T (°C)	a (mm)	b (mm)
910	240	71	60

Wiring diagram of actuators

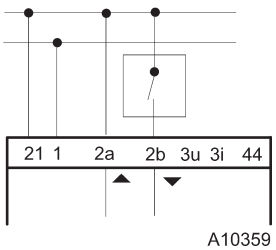
ANT 40.11S
ANT 40.11R



Variant 1 (3-pos. control)



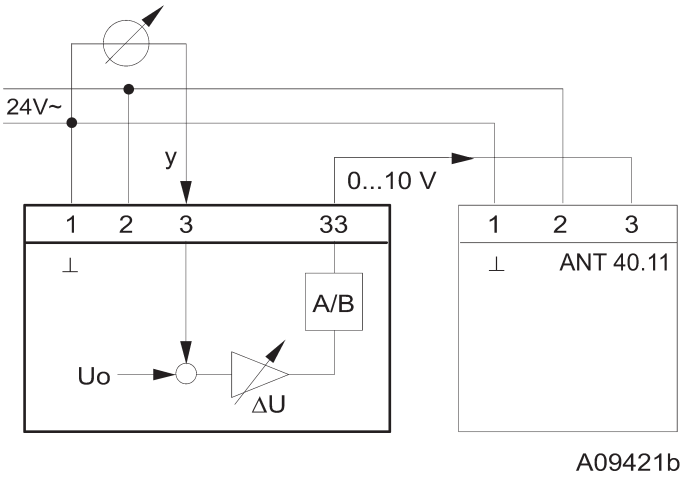
Variant 2 (2-pos. control)



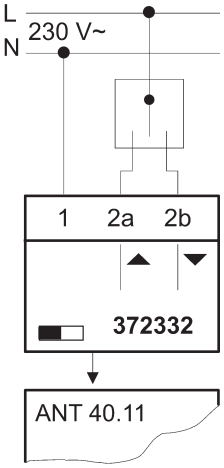
A10359

Wiring diagram of accessories

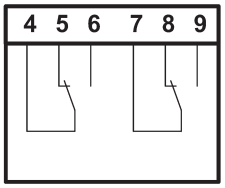
313529



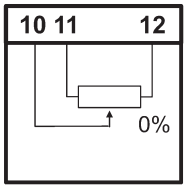
372332

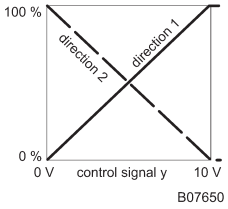


372333



372334





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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