GESTRA Steam Systems

Product Range A4

ZK 213

Control Valve
With Radial Stage Nozzle ZK and Tandem Shut-Off
ZK 213
DN 80 – 250

Description

Control valve for operation at very high differential pressures.

Application, for example, in industrial plants and power stations as

- Leak-off valve for condensate pumps etc.
- Injection-cooling valve
- Start-up pot drain valve
- Feedwater control valve

The pressure drop is decreased in the radial stage nozzle ZK in several stages, so that the flow velocity is reduced leading to a considerable reduction in wear and noise (sound level ≤ 85 dB(A)).

The dual (tandem) shut-off combines the function of a conventional shut-off valve and a valve provided with regulating cone. At the beginning of the opening process first the main valve plug is lifted off the main seat, while the secondary valve plug remains closed until the main plug has reached a certain lift. At the moment of closing and at the beginning of opening the flow velocity at the valve seat is therefore zero so that wire drawing is exluced.

Angle-type or Z-type valve body.

The valve permits the use of several actuator types:

1. ZK 213-.../13
   Electric linear actuator
2. ZK 213-.../14
   Design with insert bush for fitting an electric rotary actuator or a handwheel
3. ZK 213-.../20
   Pneumatic diaphragm actuator
4. ZK 213-.../40
   Hydraulic linear actuator

Example: ZK 213-E2/14

E = angle version
(Z = Z-type version)

2 = size
see table "k_{VS}-value"

14 = type of actuator
(13, 14, 20, 40)

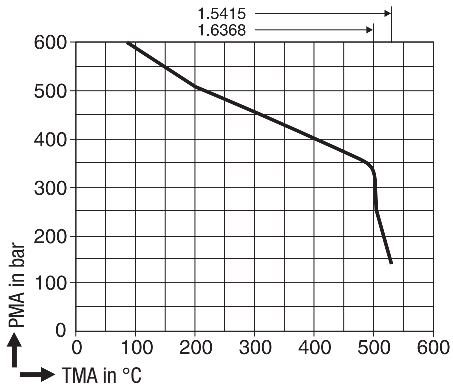
Internals completely exchangeable (incl. seat).

Leak rate acc. to DIN 3230 BN 1.

Pressure/Temperature Rating
with materials

1.5415		1.6368	
bar psig	**°C** °F	**bar** psig	**°C** °F
510 7400	**200** 392	**510** 7400	**200** 392
450 6530	**300** 572	**450** 6530	**300** 572
400 5800	**400** 752	**400** 5800	**400** 752
280 4060	**500** 932	**280** 4060	**500** 932
136 1970	**530** 985		

Differential pressure
ΔPMX 300 bar (4350 psi) – 4 stages
560 bar (8120 psi) – 6 stages

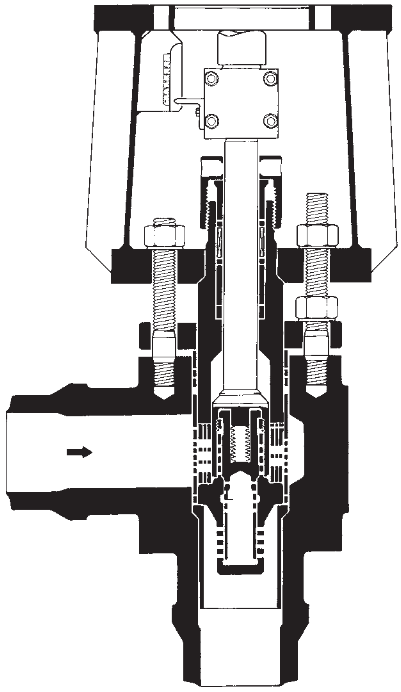


Materials

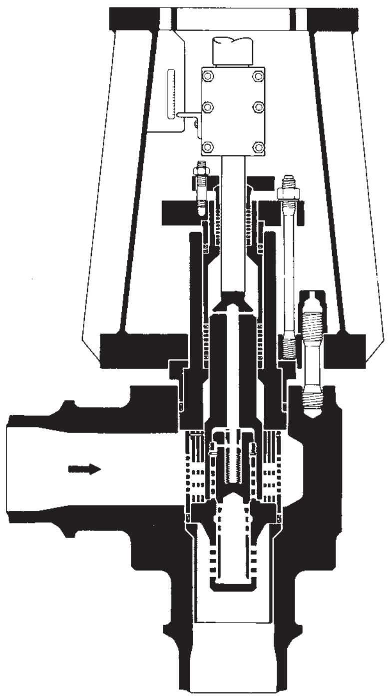
Body	Forged alloy steel 15 Mo3 (1.5415) or WB 36 (1.6368)
Internals	s.s. X 35CrMo 17 (1.4122) s.s. X90CrMoV 18 (1.4112) s.s. X20CrMoV 12 1 (1.4922)
Gland packing	Pure graphite

Connections

Butt-weld ends. Dimensions on request.

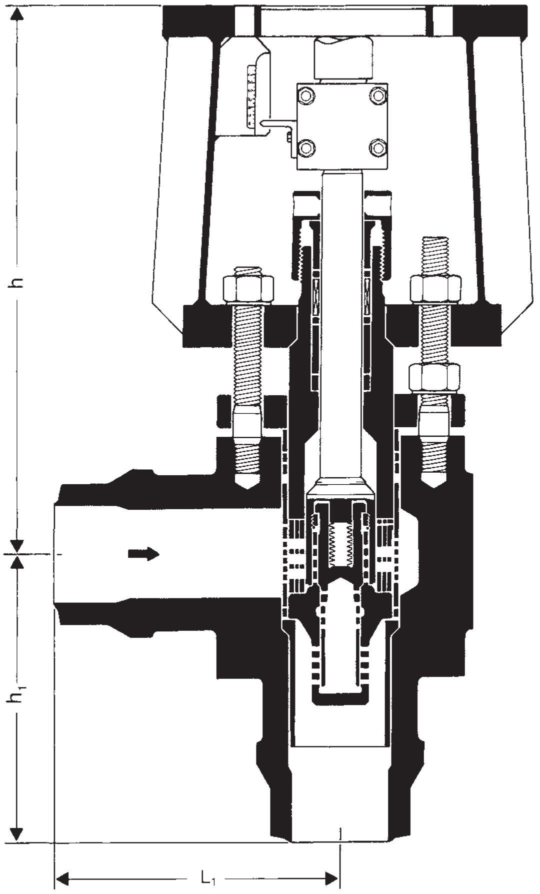


ZK 213
Sizes 1 and 2

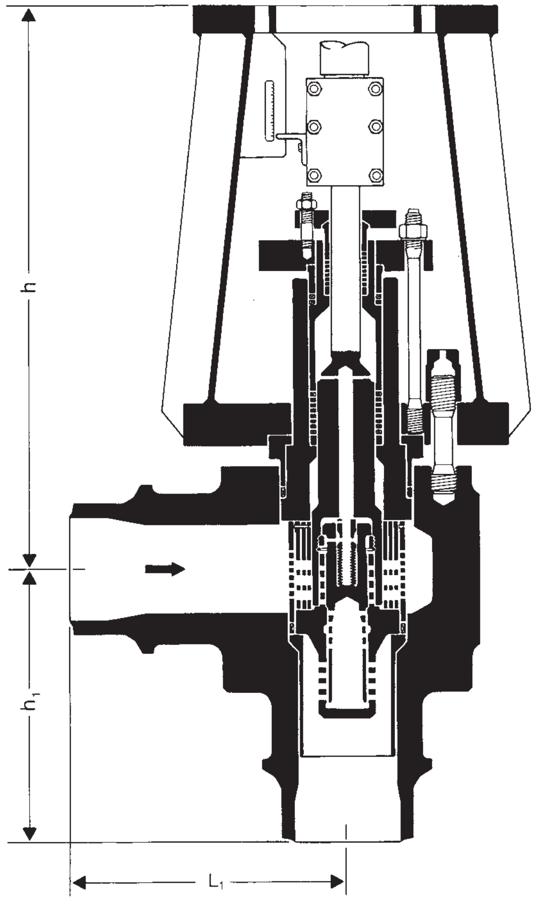


ZK 213
Sizes 3 and 4,
partially balanced

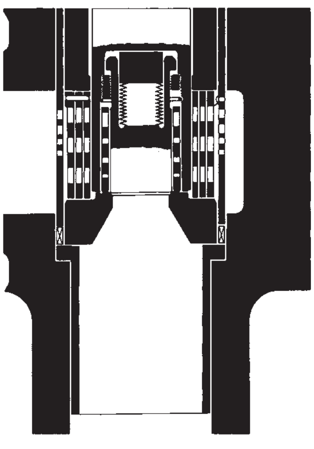
Dimensions



ZK 213 -E.../...
Sizes 1 and 2
6 stages



ZK 213 -E.../...
Sizes 3 and 4
6 stages,
partially balanced



ZK 213
4 stages

Size	1	2	3	4
DN mm (in)	180 (3) 100 (4) 125 (5)	100 (4) 125 (5) 150 (6)	125 (5) 150 (6) 200 (8)	150 200 250
h	635	735	890	910
h_1	260	350	400	400
L_1	260	350	400	400
Weight [kg]	210	370	540	600

Calculation of required k_v value*)

1. For water flowrates within temperature ranges where flashing because of pressure drop is not to be expected (e.g. leak-off and injection-cooling valves) the calculated k_v value has to be multiplied by a correction factor taken from the chart below due to the successive expansion. The chart includes a safety factor of 1.2.
2. If, due to the pressure drop, flashing is to be expected, the formulae below should not be used to calculate the k_v value. In this case see overleaf for hot water capacity charts. If $p_2/p_1 > 0.5$ multiply the chart reading by the correction factor K taken from the back pressure chart below. The safety factor of 1.2 must always be taken into consideration.
3. For steam the calculated k_v value has to be multiplied by a safety factor of 1.2.

Pressure drop	k_v	for liquids		for gas, temperature-corrected	for vapours	for saturated and wet steam
$\Delta p < \frac{p_1}{2}$ $\left(p_2 > \frac{p_1}{2}\right)$	k_v	$= \frac{\dot{V}}{31.6}\sqrt{\frac{\rho_1}{\Delta p}}$	$= \frac{\dot{m}}{31.6\sqrt{\rho_1 \cdot \Delta p}}$	$= \frac{\dot{V}_N}{514}\sqrt{\frac{\rho_N \cdot T_1}{\Delta p \cdot p_2}}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{v}{\Delta p}}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{v \cdot x}{\Delta p}}$
$\Delta p > \frac{p_1}{2}$ $\left(p_2 < \frac{p_1}{2}\right)$	k_v			$= \frac{2\dot{V}_N}{514 \cdot p_1}\sqrt{\rho_N \cdot T_1}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{2v}{p_1}}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{v \cdot x \cdot 2}{p_1}}$

*) Conversion Factors: C_v (U.S.) = $1.17 \cdot k_v$ C_v (U.K.) = $0.98 \cdot k_v$

Nomenclature:

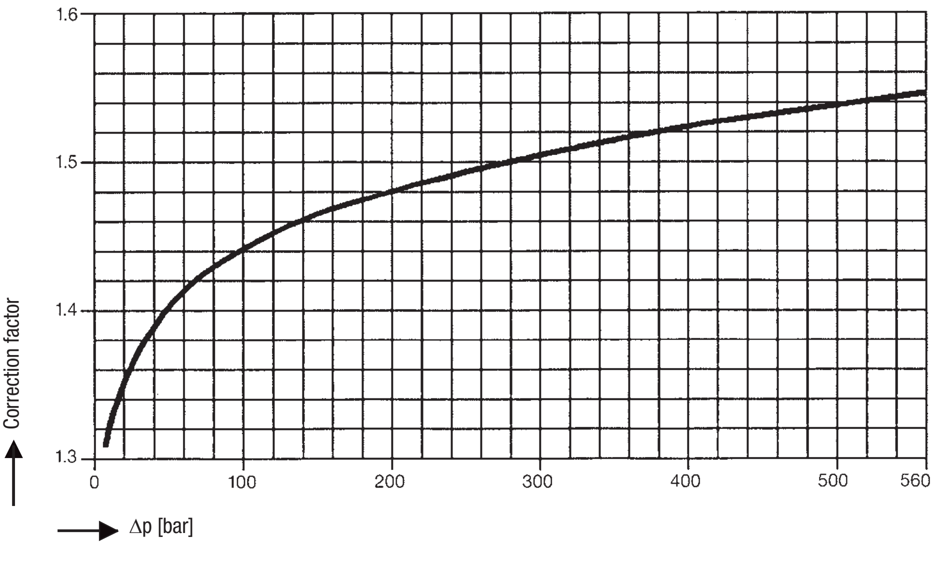
k_v	Value flow coefficient for fully open valve within control range	[m³/h]
$\dot{V}$	Flowrate	[m³/h]
$\dot{m}$	Flowrate	[kg/h]
$\dot{V}_N$	Volume flowrate for gases at standard state (0 °C, 1013 mbar)	[m³/h]
p_1	Upstream pressure	[bar a]
p_2	Downstream pressure	[bar a]
Δp	Pressure drop $p_1 - p_2$	[bar]
ρ_1	Density of fluid with operating condition at T_1 and p_2	[kg/m³]
ρ_N	Density of gases at standard state (0 °C, 1013 mbar)	[kg/m³]
v	Specific steam volume at T_1 and p_2 or – if $\Delta p > \frac{p_1}{2}$ – at $\frac{p_1}{2}$	[m³/kg]
T_1	Absolute inlet temperature of fluid	[K]
x	Content of dry saturated steam in wet steam	$(0 < x \leq 1)$

K_v Values at Control Stroke H_{100}

See page 4: The characteristic lines in the upper part of the chart indicate simultaneously the k_v values.

	DN	k_v values [m³/h] 4 stages Δp_{max} 300 bar (4350 psi)	k_v values [m³/h] 6 stages Δp_{max} 560 bar (8120 psi)	Control stroke H_{100} [mm]
ZK 213-...1/...	80 – 125 mm (3 – 5")	13	10	50
ZK 213-...2/...	100 – 150 mm (4 – 6")	26	20	60
ZK 213-...3/...	125 – 200 mm (5 – 8")	39	30	70
ZK 213-...4/...	150 – 250 mm (6 – 10")	60	46	70

Correction factor for water flowrates (without flashing)



Control Valve
With Radial Stage Nozzle ZK and Tandem Shut-Off
ZK 213
DN 80 – 250

Order and Enquiry Specifications

Control valve with radial stage nozzle ZK and tandem shut-off ZK 213.

Design data: p = . . . bar t =...°C

Operational data: Load Conditions (1 – 3)

	1	2	3
p_1 [bar]			
t_1 [°C]			
p_2 [bar]			
Δp [bar]			
ṁ [t/h]			

Please enter data in this table.

Fluid: ....

Actuators: Electric (make)
On-off or modulating control
Voltage/Hz... /...
Control voltage/Hz... /...

for electro-hydraulic linear actuators indicate on-off or modulating control

Δp max in bar for sizing of actuator

The following test certificates can be issued on request, at extra cost:

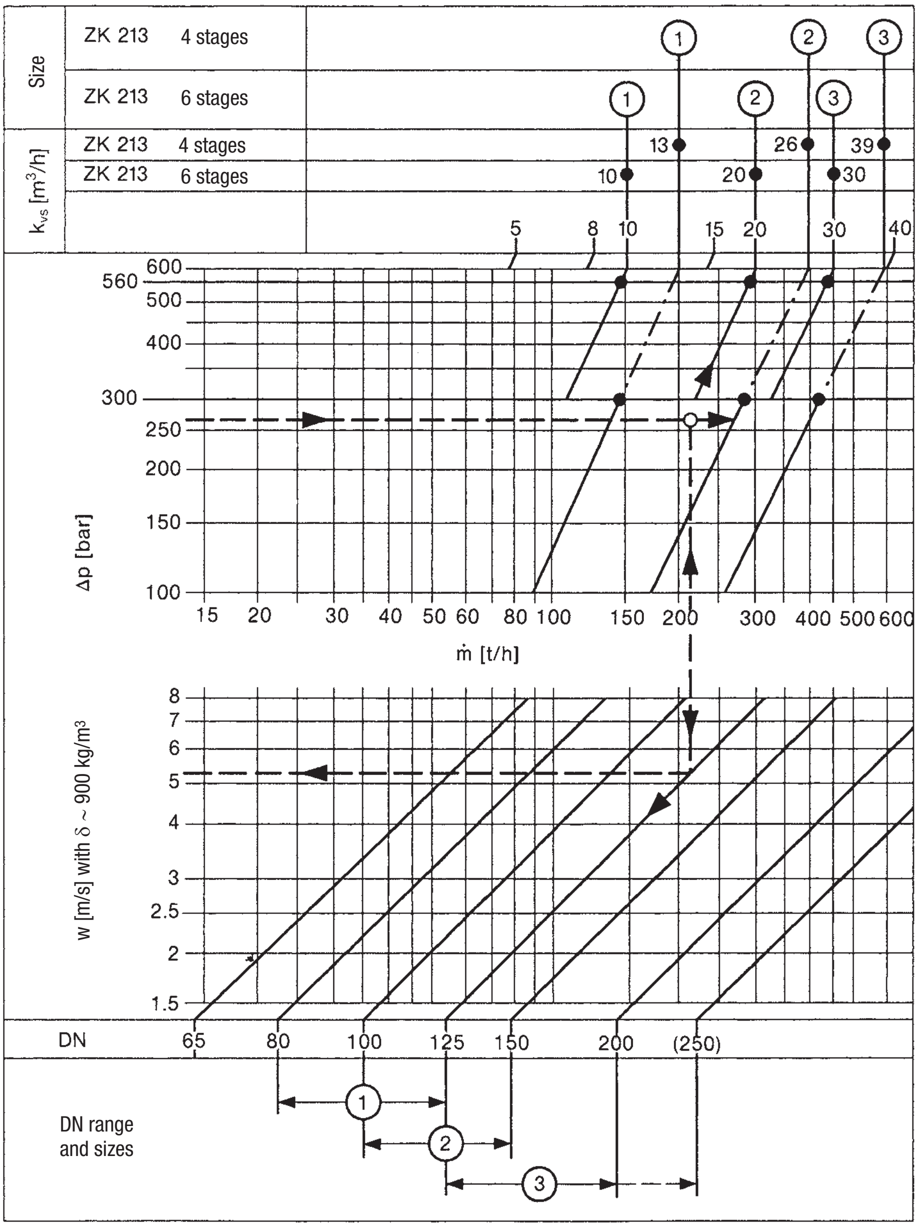
In accordance with EN 10204/-2.1, -2.2, -3.1A, -3.1B and -3.1C.

All inspection requirements have to be stated with the order. After supply of the equipment certificates can no longer be established. Charges and extent of the above mentioned certificates as well as the different tests confirmed therein are listed in our leaflet "Test and Inspection Charges for Standard Equipment". For other tests and inspections than those listed above, please consult us.

Supply in accordance with our general terms of business.

Leak-off valves ZK 213

Chart for determination of size, nominal size and flow velocity v in the pipe



Example: Sizing of a leak-off valve.

Operating conditions:

Upstream pressure p_1 = 285 bar — Feedwater temperature t = 210 °C
Back pressure p_2 = 15 bar — Flowrate ṁ = 210 t/h

Differential pressure across the leak-off valve Δp = 270 bar (upstream pressure minus back pressure)

In accordance with the above chart, the required k_v value for a flowrate of 210 t/h is 20 m³/h.

Since the differential pressure Δp is lower than 300 bar, the ZK 213 with 4 stages, size 2, with a k_v value of 26 m³/h is selected.

For each valve size 3 different nominal sizes are available;
for **size 2** these are **DN 100, 125** and **150 (4, 5** and **6"**).

For leak-off lines we recommend flow velocities between 4 and 8 m/s.

From the lower part of the chart indicating the flow velocities we can read a velocity of 5.4 m/s for DN 125, i.e. DN 125 mm should be selected.

GESTRA AG

P. O. Box 10 54 60, D-28054 Bremen
Münchener Str. 77, D-28215 Bremen
Telephone +49 (0) 421 35 03 - 0, Fax +49 (0) 421 35 03-393
E-Mail gestra.ag@flowserve.com, Internet www.gestra.de

FLOWSERVE® GESTRA