GESTRA Steam Systems

Product Range A4

Control Valve
ZK 313
With Radial Stage Nozzle and Tandem Shut-Off
DN 25, 50, 65, 80, 100, 125 mm (1, 2, 2½, 3, 4, 5")

ZK 313

Control valve for operation at very high differential pressures.

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

1. Injection-cooling valve
2. Warm-up valve
3. Drain valve
4. Start-up pot drain valve
5. Feedwater control valve
6. Leak-off valve for condensate pumps etc.

The pressure drop is decreased in the radial stage nozzle 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 excluded.

DN 25- 65 mm (1-2½"): Straight-through or angle valve
DN 80-125 mm (3-5"): Angle valve (precision-forged body)

The yoke permits the use of several actuator types:

Handwheel*)	ZK 313-.../02
Electric rotary actuator B0**)	ZK 313-.../11
Electric rotary actuator B1/2**)	ZK 313-.../12
Electric linear actuator	ZK 313-.../13
Pneumatic actuator	ZK 313-.../20
Lever actuator with mounted part-turn actuator	ZK 313-.../31
Electro-hydraulic linear actuator	ZK 313-.../40

D = Straight-through
E = Angle
O = Angle (precision-forged body)

*) Convertible for operation with electric rotary actuator B0.

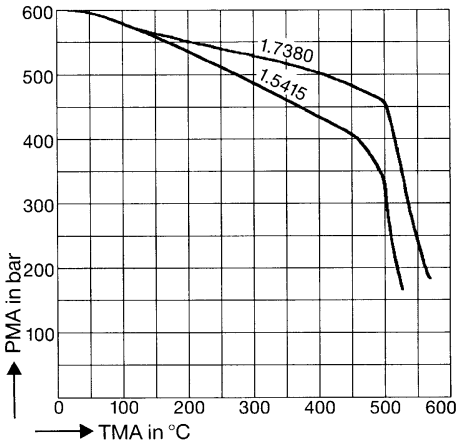
**) Flange size in acc. with DIN 3210, optionally DIN ISO 5210.

Internals completely exchangeable. Leak rates in accordance with DIN 3230 BN1.

Pressure/Temperature Rating with materials

1.5415 barg psig	1.5415 °C °F	1.7380 barg psig	1.7380 °C °F
535 7760	**200** 392	**550** 7980	**200** 392
485 7030	**300** 572	**530** 7690	**300** 572
433 6280	**400** 752	**503** 7290	**400** 752
335 4860	**500** 932	**461** 6680	**500** 932
165 2930	**530** 985	**326** 4725	**530** 985
–	–	**246** 3565	**550** 1020
–	–	**184** 2670	**570** 1060

Differential pressure
Δ PMX 300 bar (4350 psi) – 3 stages
370 bar (5365 psi) – 3 stages with additonal nozzle

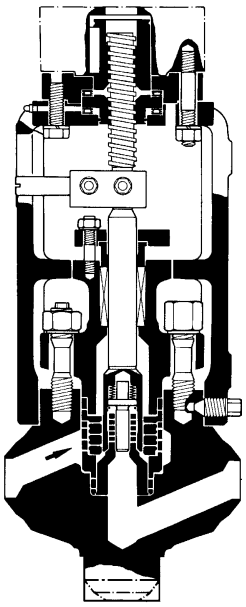


Materials

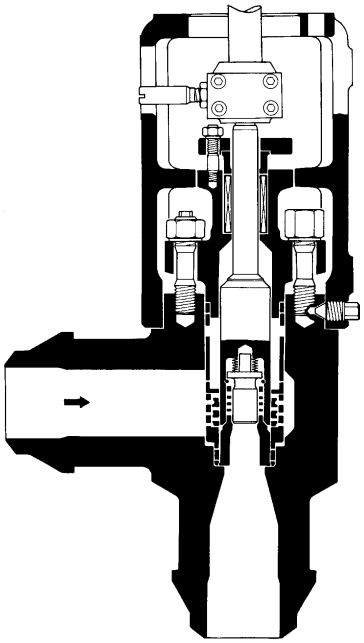
Body (optionally)	Forged alloy steel 15 Mo 3 (1.5415) or 10 CrMo 9 10 (1.7380)
Internals	s.s. X 35 CrMo 17 (1.4122) s.s. X 90 CrMoV 18 (1.4112) s.s. X 20 CrMoV 12 1 (1.4922)
Gland packing	Pure graphite

Connections

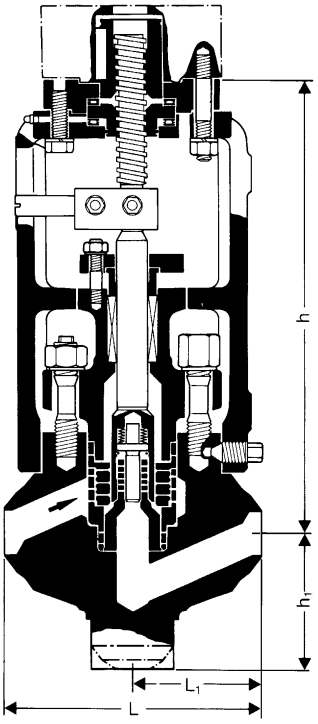
Butt-weld ends. Dimensions on request.



ZK 313-D/11
DN 25-65 mm (1-2½")



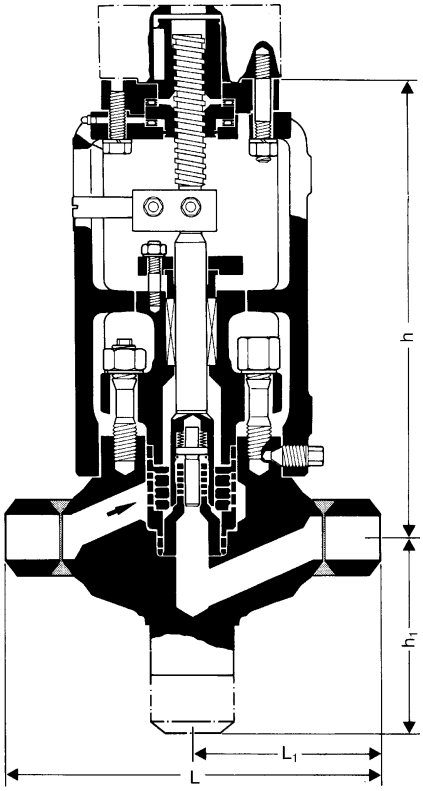
ZK 313-0/13
DN 80-125 mm (3-5")



ZK 313-D/11

DN mm in	25 1	50 2	65 2½
h	410	410	410
h_1	125	125	125
L	250	250	250
L_1	125	125	125
Weight kg	70	70	70

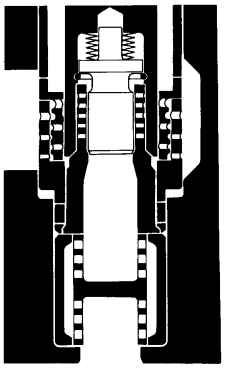
Body material: 1.5415



ZK 313-D/11

DN mm in	25 1	50 2	65 2½
h	410	410	410
h_1	175	175	175
L	350	350	350
L_1	175	175	175
Weight kg	71	71	71

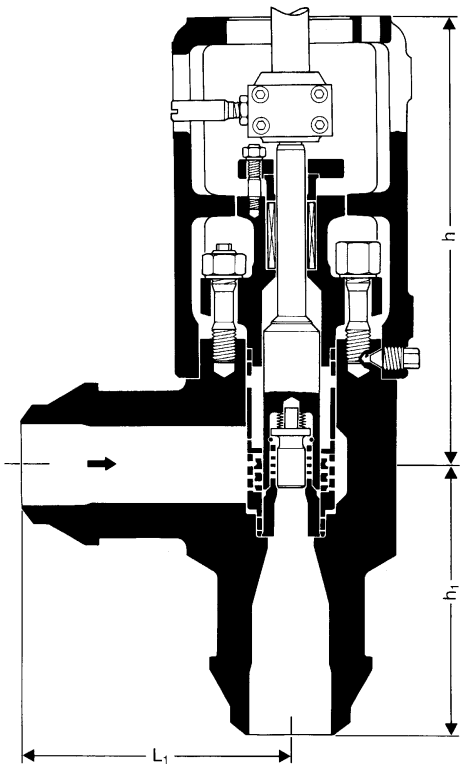
Body material: 1.7380
complete with transition pieces



ZK 313
3 stages
with additional nozzle

DN mm in	80 3	100 4	125 5
h	432	432	432
h_1	260	260	260
L	–	–	–
L_1	260	260	260
Weight kg	125	125	125

Body material $\begin{matrix}1.5415\\1.7380\end{matrix}$ precision-forged



ZK 313-0/13

Calculation of Required k_v value *)

1. 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 the capacity charts should be used and the capacities multiplied by a safety factor of 1.2.
2. 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.
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	$= \frac{\dot{V}}{31.6}\sqrt{\frac{\varrho_1}{\Delta p}}$	$= \frac{\dot{m}}{31.6\sqrt{\varrho_1 \cdot \Delta p}}$	$= \frac{\dot{V}_N}{514}\sqrt{\frac{\varrho_N \cdot T_1}{\Delta p \cdot p_2}}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{v}{\Delta p}}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{v \cdot x}{\Delta p}}$
$\Delta p > \frac{p_1}{2}$ $\left(p_2 < \frac{p_1}{2}\right)$	k_v			$= \frac{2\ \dot{V}_N}{514 \cdot p_1}\sqrt{\varrho_N \cdot T_1}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{2\ v}{p_1}}$	$= \frac{\dot{m}}{31.6}\sqrt{\frac{v \cdot x \cdot 2}{p_1}}$

***) Conversion Factors:** C_v (U.S.) = 1.17 · k_v
C_v (U.K.) = 0.98 · k_v

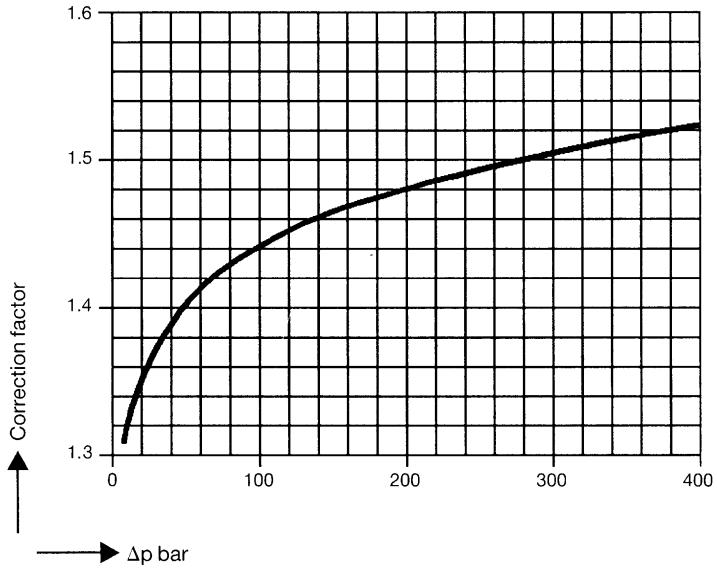
Nomenclature:

k_v	Valve flow coefficient for fully open valve within control range	m^3/h	Δp	pressure drop p_1–p_2	bar
$\dot{V}$	Flowrate	m^3/h	ϱ_1	density of fluid with operating condition at T_1 and p_2	kg/m^3
$\dot{m}$	Flowrate	kg/h	ϱ_N	density of gases at standard state (0 °C, 1013 mbar)	kg/m^3
$\dot{V}_N$	Volume flowrate for gases at standard state (0 °C, 1013 mbar)	Nm^3/h	v	specific steam volume at T_1 and p_2 or – if $\Delta p > \frac{p_1}{2}$ – at $\frac{p_1}{2}$	m^3/kg
p_1	upstream pressure	bar a	T_1	absolute inlet temperature of fluid	K
p_2	downstream pressure	bar a	x	Content of dry saturated steam in wet steam	$(0 < x \leq 1)$

k_v Values at Control Stroke H_{100} = 35 mm

DN 25- 65 mm (1-2½")	3 stages	2.3	5.5	8	11
DN 80-125 mm (3-5")		–	–	8	11
DN 80-125 mm (3-5")	3 stages with additional nozzle	–	–	–	9.5

Correction factor for water flowrates (without flashing)



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Capacity Charts

The charts indicate the maximum capacities of hot and cold condensate.

Within their control range the valves (in all sizes) have a linear or equal-percentage characteristic, as ordered and indicated on the name plate. A later modification from linear to equal-percentage or vice versa is possible by exchanging the complete nozzle insert.

Order and Enquiry Specifications

Control valve with radial stage nozzle and tandem shut-off ZK 313
Design data: p = ... bar t = ...°C
Operational data: Load Conditions

	Min.	Normal	Max.
	within control range		
p_1 [bar]			
t_1 [°C]			
p_2 [bar]			
Δp [bar]			
$\dot{m}$ [t/h]			

Fluid: .....
Actuators: Electric (make)
on-off or modulating control
Voltage/Hz . . . / . . .
Control voltage/Hz . . . / . . .
for rotary actuators indicate
insert bush B0
or B½ to DIN 3230
or
B1 – F10 or B1 – F14
to DIN ISO 5210

Pneumatic (make)
Spring to open ☐
Spring to close ☐
Positioner yes/no
Handwheel yes/no
Δp max in bar for sizing of actuator

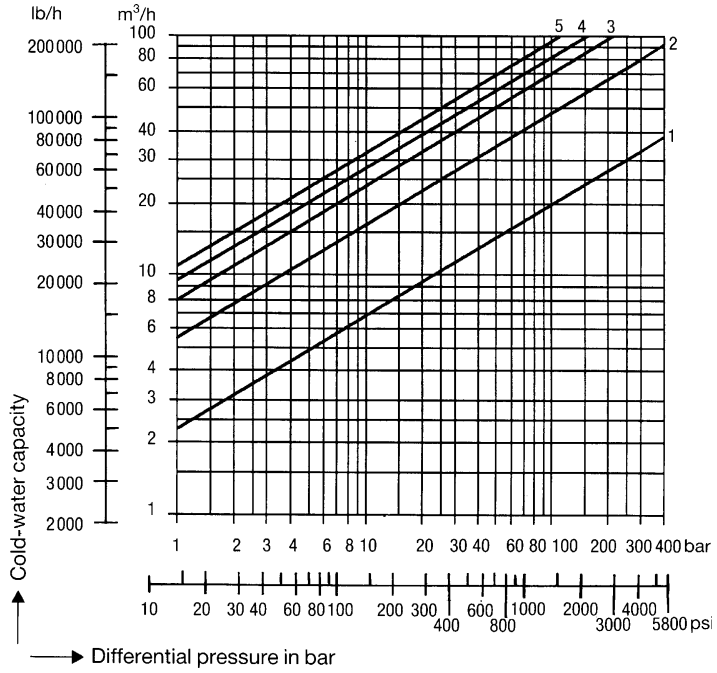
The following test certificates can be issued on request, at extra cost:
In accordance with DIN 50049-2.1, -2.2, -3.1A, 3.1B and -3.1C.

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.

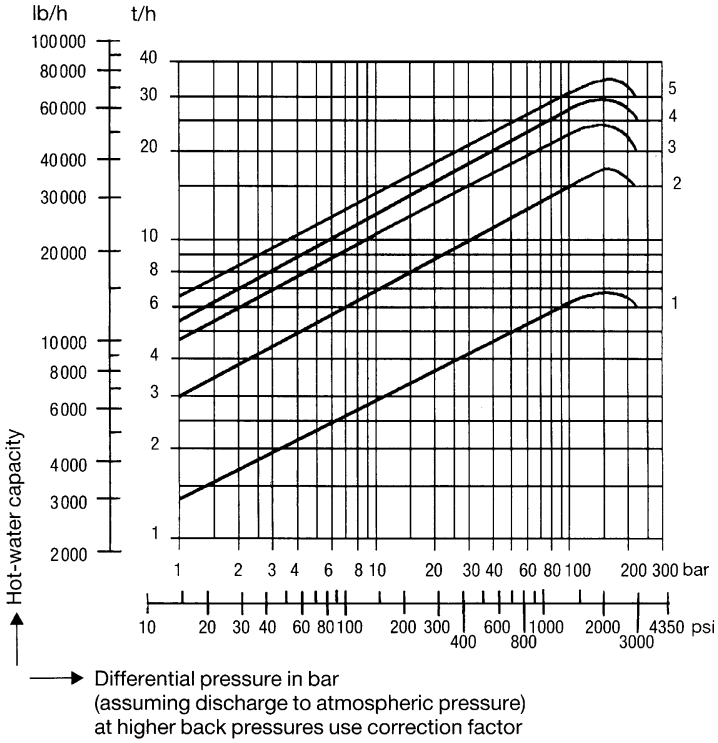
Supply in accordance with our general terms of business.

Cold water

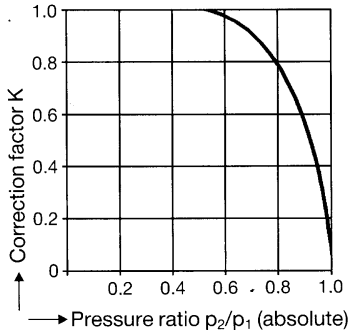
Curve	k_v value in m^3/h
1	2.3
2	5.5
3	8
4	9.5
5	11



Hot water t_s = 5 K



Back-pressure chart



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