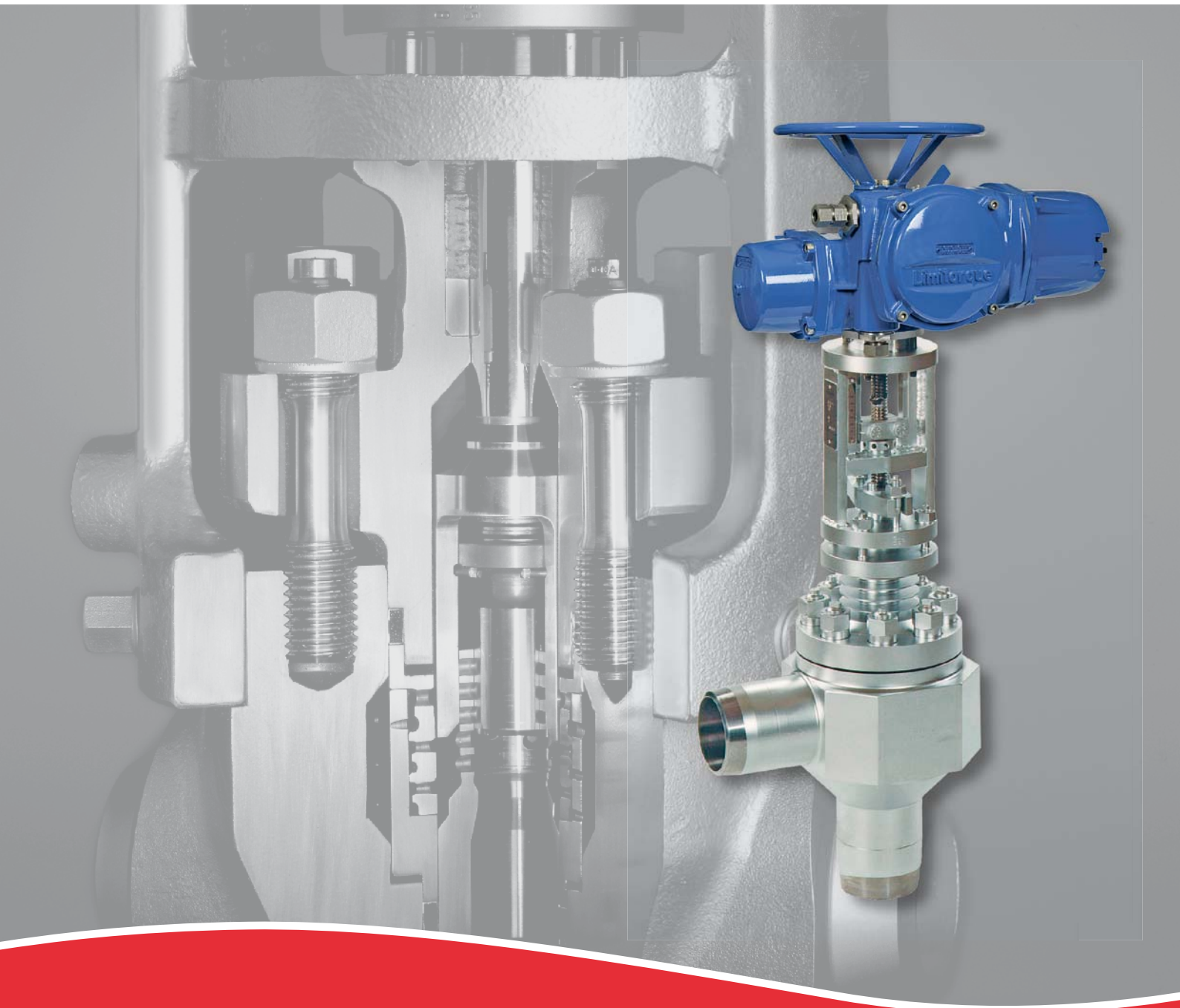
FLOWSERVE GESTRA

GESTRA

ZK Control Valves with Radial Stage Nozzle®

For power-station and plant engineering



Experience In Motion

FLOWSERVE GESTRA

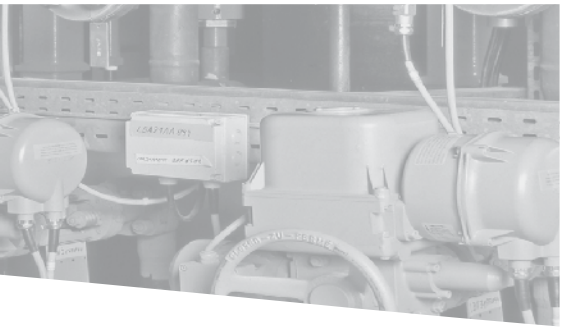
ZK Control Valves for Power-Station and Plant Engineering

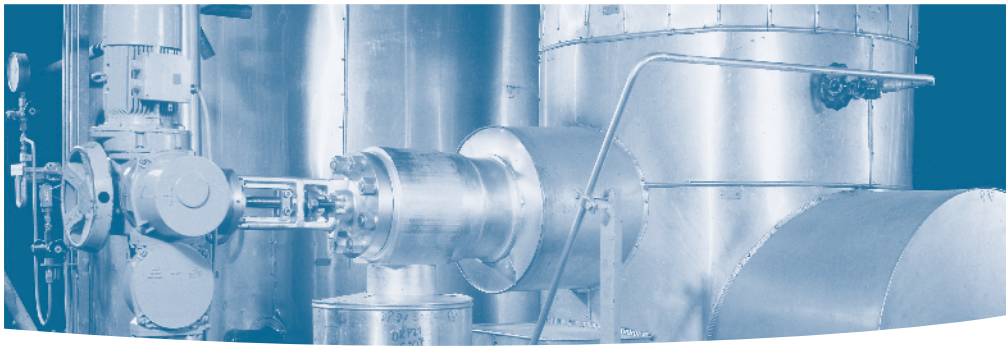
Overview

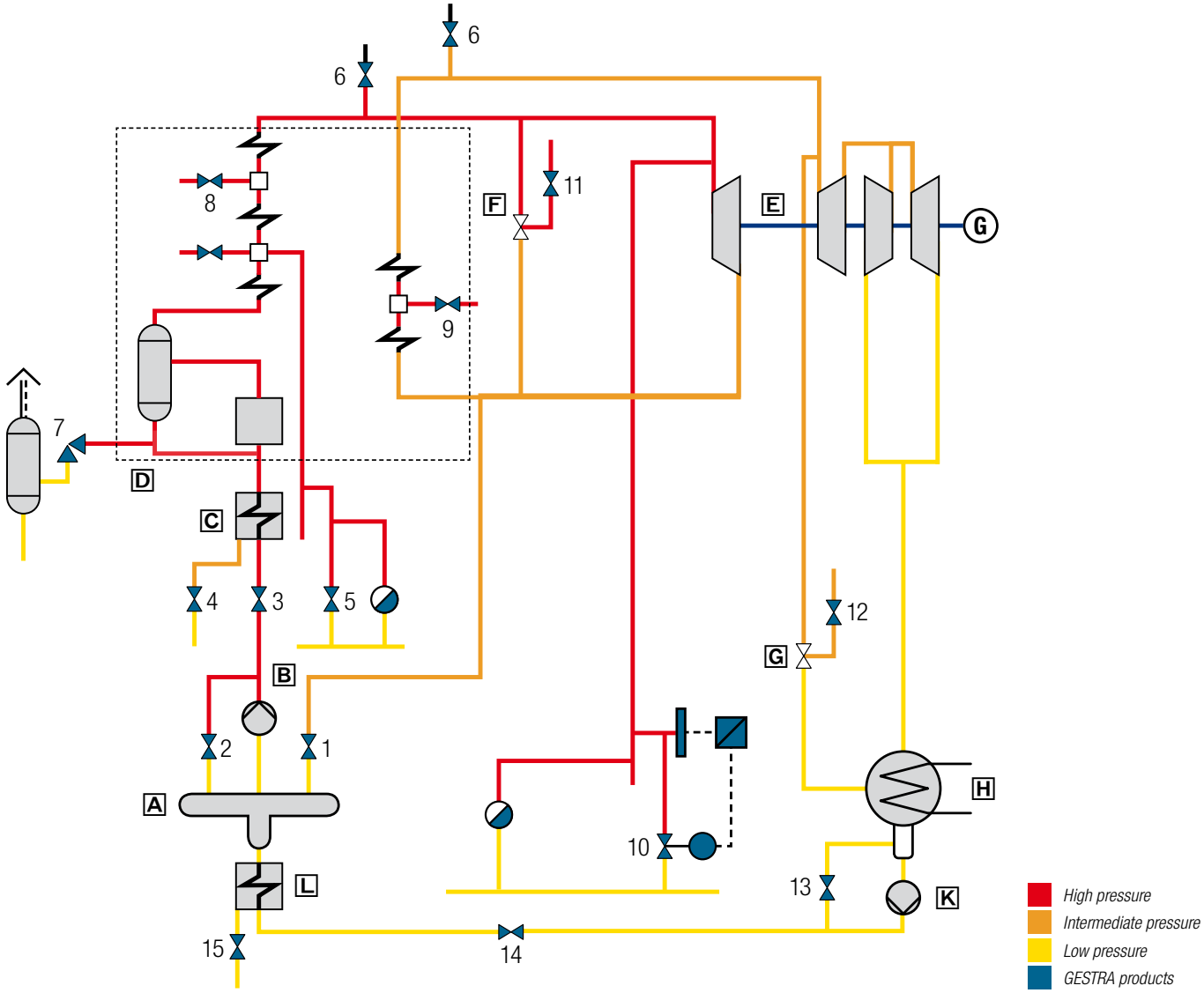
For many years now, GESTRA control valves of the type ZK have given proof of their reliability under extreme operating conditions. Long experience and know-how form the sound basis for a generation of efficient and tight-closing control valves for applications in power stations. Thanks to the easy maintenance and repair of the valves as well as the extremely high wear resistance afforded by the design, reliable operation is achieved together with a long service life.

Contents

Application	p [bar]	t [°C]	ZK valve type
A Feedwater tank			
1 Heating steam valve	~ 60	~ 400	29, 610
B Main feedwater pump			
2 Feedwater leak-off valve	to 560	~ 220	313, 213
3 Feedwater control valve	to 560	~ 220	610, 613
C H.P. preheater			
4 Condensate drain control valve	20–60	~ 300	29, 210, 610
D Boiler plant			
5 Boiler drain valve	to 330	~ 620	313, 213
Soot-blower warm-up valve	~ 50	300–350	29, 210
Soot-blower steam valve	to 330	550	313
Boiler circulation control valve	180–330	~ 250	313, 613
6 Boiler vent valve	to 330	~ 620	313, 613
7 Start-up pot drain valve	180–330	~ 450	613
8 H.P. spray attemperator valve	~ 280	~ 220	313
9 I.P. spray attemperator valve	~ 50	~ 220	29, 210
E Turbine plant			
10 Live steam drainage	to 330	~ 620	313, 213
I.P. drainage	~ 60	~ 620	29, 210, 313
L.P. drainage	< 20	~ 460	29
F H.P. bypass station			
11 Spray injection valve	to 350	~ 220	313, 213
G I.P. bypass station			
12 Spray injection valve	to 250	~ 220	29, 210
H Condenser			
K Condensate pump			
13 Condensate leak-off valve	10–25	~ 30	29, 610
14 Condensate control valve	10–25	~ 30	29, 610
L L.P. preheater			
15 Condensate drain valve	~ 0.4–5	~ 30	29, 610



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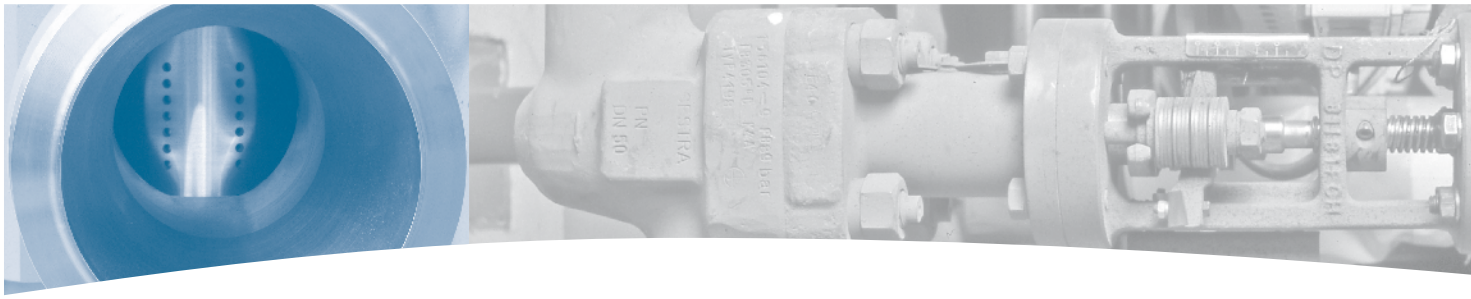
High pressure
Intermediate pressure
Low pressure
GESTRA products



Applications of the ZK Control Valves

ZK control valves are suited for various fundamental applications in industry and power stations:

- **Leak-off control (recirculation)**
- **Drainage and warm-up**
- **Level control**
- **Injection cooling**
- **Steam control**

GESTRA offers:

- **Complete solutions**
- **Subsystems with definite interfaces**

The ZK control valve consists of a valve body and the ZK RADIAL STAGE NOZZLE® with valve plug integrated into the body to act as the control unit.

The ZK RADIAL STAGE NOZZLE® ensures a rapid and reliable adaptation to the prevailing operating conditions.

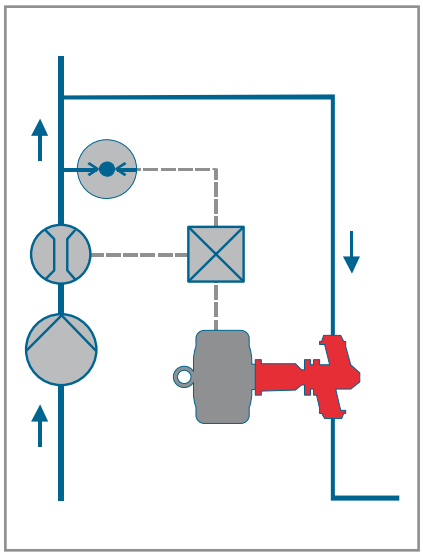
If the operating conditions in the plant are changed, the control valve can be adapted to the new situation by repositioning or exchanging the radial stage nozzle. There is no need to remove the valve from the line for this purpose!

The high standard of GESTRA power station equipment is confirmed by a large number of references.

1. Leak-Off Control (recirculation)

GESTRA leak-off controls for feedwater and condensate pumps represent complete systems for on/off or modulating control.

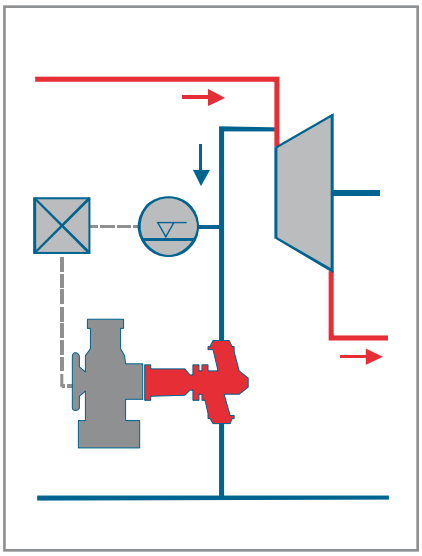
The control valve with ZK RADIAL STAGE NOZZLE®, the actuator with quick-opening function, and the control unit are optimally adapted to the operating conditions prevailing in each case.

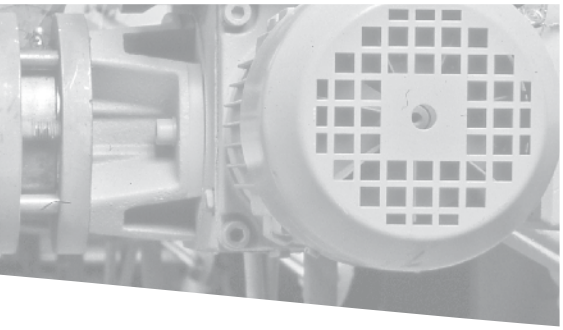


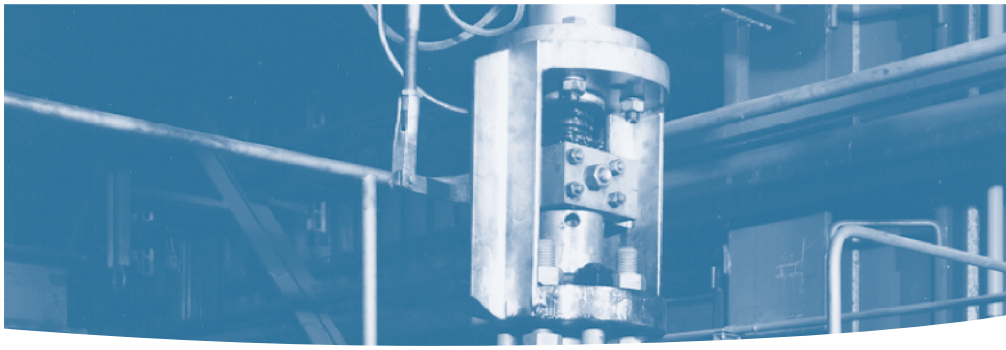
2. Drainage and Warm-Up

The control valve with ZK RADIAL STAGE NOZZLE®, actuator, level electrode and control unit together constitute a complete system which can be perfectly adapted to the operating conditions.

Even condensate flowrates with extreme fluctuations are discharged by this system without any problems. Specific warming-up of certain parts of the plant can be achieved with the aid of a temperature acquisition system.



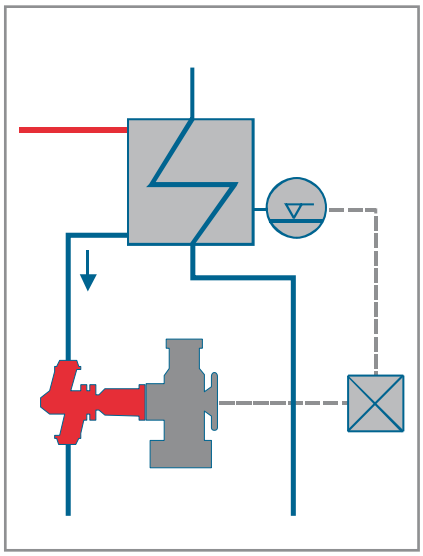




3. Level Control

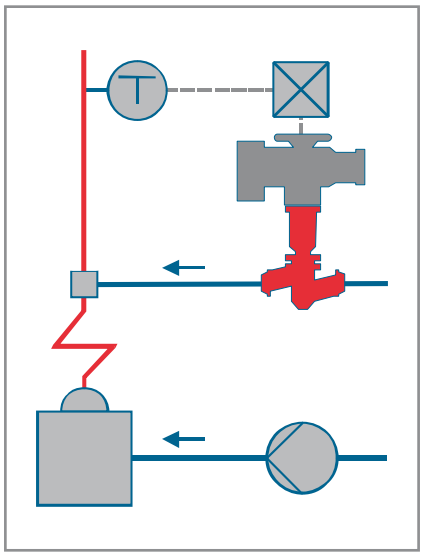
With the aid of the ZK control valve, level control systems can be realized under difficult technical conditions. The GESTRA level control system consists of a control valve with ZK RADIAL STAGE NOZZLE®, an actuator, a level electrode and a control unit.

The high-pressure probes NRG 211 and NRG 111 offer new possibilities for extreme temperatures and pressure ratings. Reliable operation of the system is ensured by the long life of the radial stage nozzle.

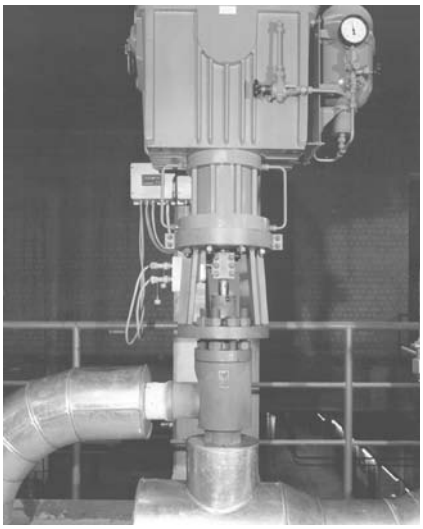


4. Injection Cooling

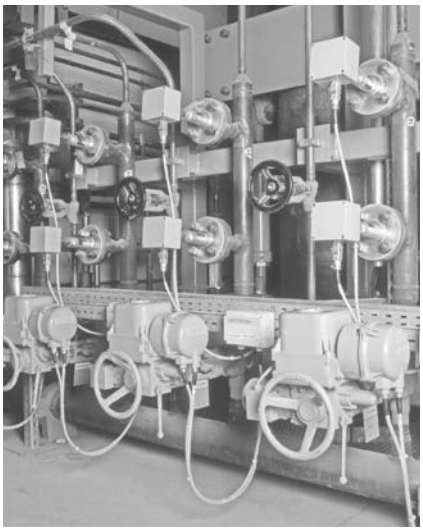
GESTRA injection cooling systems are offered as complete systems consisting of an injection-cooling valve with radial stage nozzle, an actuator, a temperature acquisition system, and the control unit. Injection cooling valves have to cope with high differential pressures, whilst ensuring extreme wear resistance and good regulating characteristics. The radial stage nozzle meets these high requirements and provides a perfect adaptation of the valve characteristic to the desired regulating characteristic. Thanks to the absolutely tight closure, thermal shock damage is prevented in injection coolers and combined steam pressure reducing and desuperheating valves.



Application Examples of the ZK Control Valves



Leak-off valve ZK 213 with compact electro-hydraulic actuator

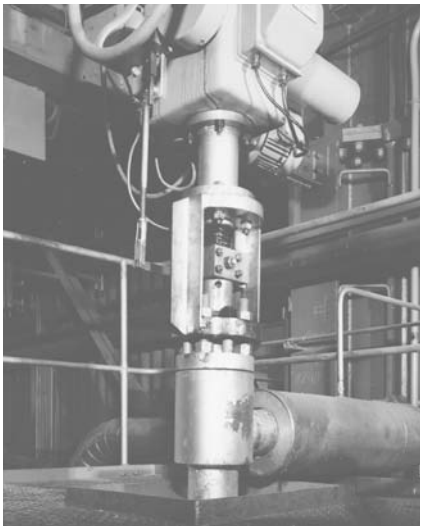


Drain control station using ZK 29 valves with electri33 actuator

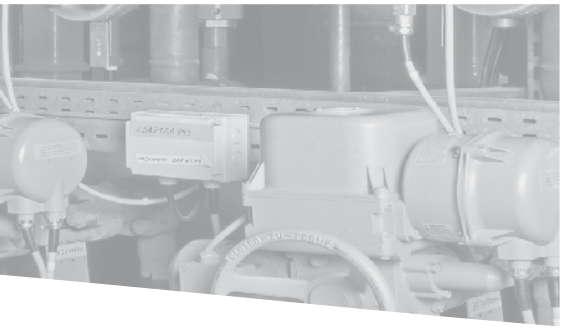
Leak-off control consisting of:

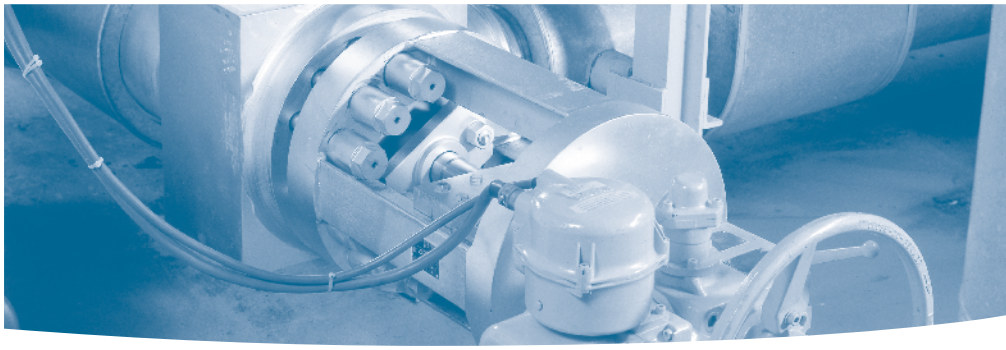
- *ZK 213-E4/40 DN 200 with 6-stage nozzle and tandem seat*
- *Hydraulic actuator with opening spring*
- *Control cabinet with SIEMENS S7 PLC*
- *GESTRA software with stored characteristic for leak-off valves*

H.P. preheater in a nuclear power station equipped with a condensate drain control valve type ZK 29



ZK 213 as spray injection valve in a high-pressure bypass station





The ZK RADIAL STAGE NOZZLE®

Operating Principle

Patented both in Germany and abroad, the ZK RADIAL STAGE NOZZLE® consists of several sleeves with a large number of radial orifices. The orifices are arranged in parallel, but are shifted from sleeve to sleeve so that they partly overlap, forming nozzles mounted in series with intermediate flash chambers.

The flow through the radial stage nozzle is determined by the valve plug. Depending on its position, the individual stage nozzles are either partially or completely set free. The valve plug and the seat together form the shut-off unit of the radial stage nozzle. Due to the successive expansion in the flash chambers, the pressure differential across the cross-sectional flow area of the valve is reduced to a minimum.

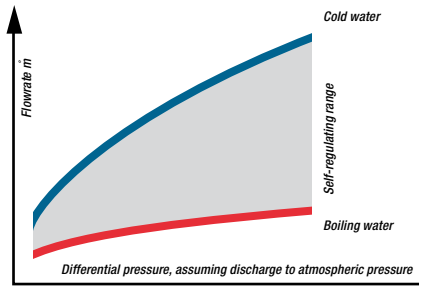
Various stage nozzles and valve plugs are available to account for the pressure drop in a particular application. For extremely high pressure gradients, control valves with tandem shut-off are applied.

Due to the special design of the ZK RADIAL STAGE NOZZLE®, the sound level is reduced to a minimum. As a result of the expansion through a multitude of individual nozzles, the sound level is normally below 85 dB(A) within the entire control range of the valve.

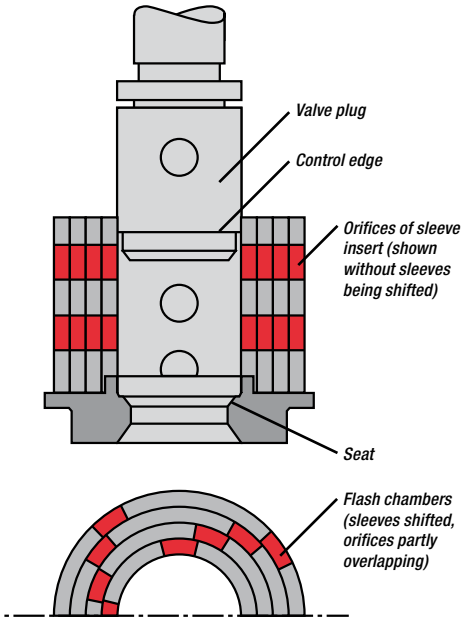
Automatic Control

For drainage purposes, the valve can alternatively be used as a hand control valve. In this case, the radial stage nozzle not only acts as a throttling unit, but also provides the function of thermodynamic control.

For this purpose, the control valve is adjusted manually once to the working point. From this time on, the condensate flowrate is determined by the thermal state of the condensate in the nozzle system (cold condensate / boiling hot condensate) without any further modification of the cross-sectional area. The valve is therefore also suitable for varying operational conditions.

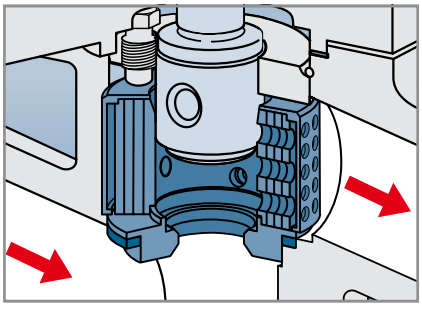


Regulating characteristic of the ZK RADIAL STAGE NOZZLE®



Sectional drawing of ZK 29 radial stage nozzle

ZK 29 radial stage nozzle with special valve plug



Valve plug of ZK 29 in control position

The ZK RADIAL STAGE NOZZLE®

Technical Properties

ZK control valves are designed to meet the highest operational requirements. They offer a number of special features in comparison with conventional control valves.

Extreme wear resistance
The successive expansion of the fluid in the throttling sleeves of the radial stage nozzle produces a considerable reduction in pressure drop across the cross-sectional flow area. Special design details at the seating surfaces ensure safe and reliable valve operation. In addition, the mass flow is split up into many partial flows.

Leakage rates
FCI 70-2-2006, class VI (test procedure C) and EN 12266-1, leakage rate A

Variable valve characteristics
For the ZK control valves, stage nozzles are available with linear or equal-percentage characteristics. A subsequent change is possible by repositioning throttling sleeves (orifices) or by exchanging the complete nozzle insert.

Easy installation and inspection
The entire nozzle insert, including seat, can be completely dismantled without the need for any specialist work and without removing the valve body from the line.

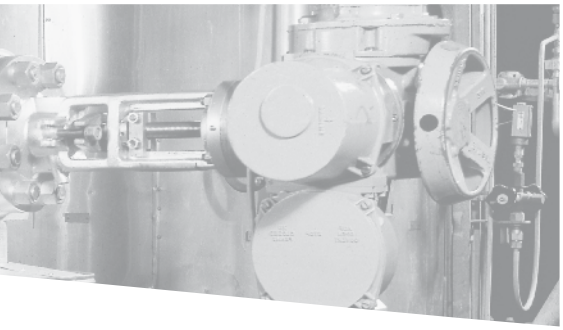
Tandem shut-off
Control valves for an extremely high pressure gradient are provided with a tandem shut-off (dual seat). In this way, the ZK control valve combines the functions of a conventional shut-off valve and a control valve, even for very high pressures.

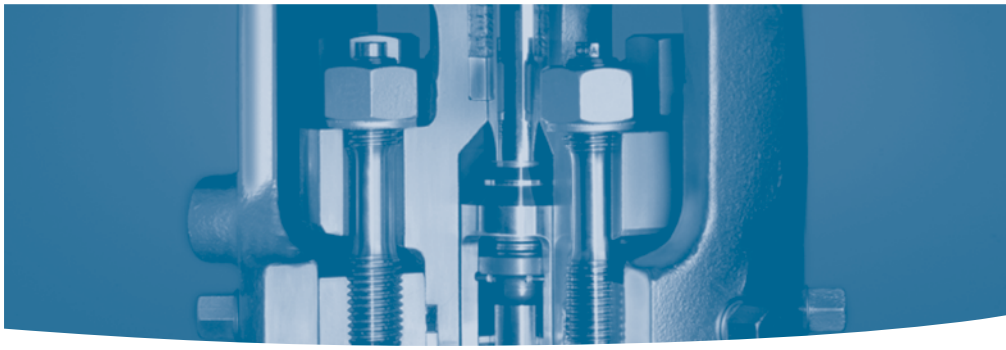
Low sound level
The continuous reduction of the flow velocity in the radial stage nozzle ensures a low sound level, usually a maximum of 85 dB(A) within the valve's control range. For differential pressures up to Δp_{max} 100 bar, the sound level is even below 80 dB(A).

Different capacity ranges
The k_{vs} values can be adapted to the operating conditions by repositioning or exchanging the radial stage nozzle. Intermediate lift positions of the valve plug can thus be avoided.

The complete ZK product range offers k_{vs} values from 0.5 m³/h to 969 m³/h.
By exchanging the internals, it is possible to adjust ZK control valves to account for changes in differential pressure.

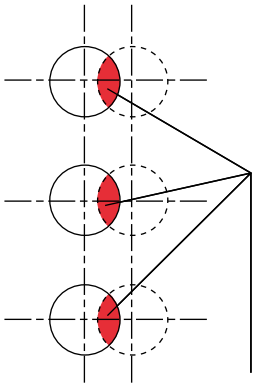
Actuators
ZK control valves can be used with most types of actuators available on the market.





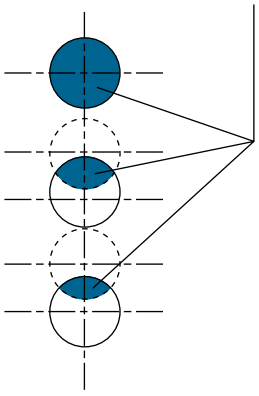
Changing the valve characteristics using the ZK 29 as an example

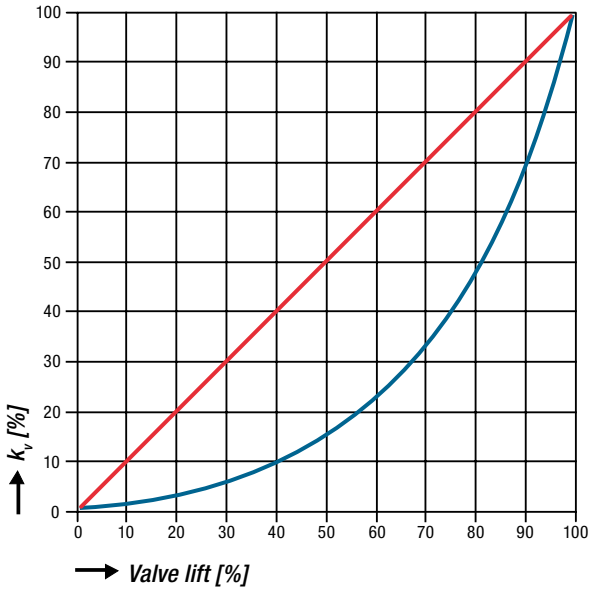
Position of the sleeves for linear characteristic



Cross-sectional flow area

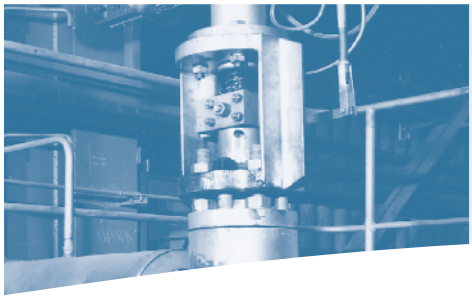
Position of the sleeves for equal-percentage characteristic



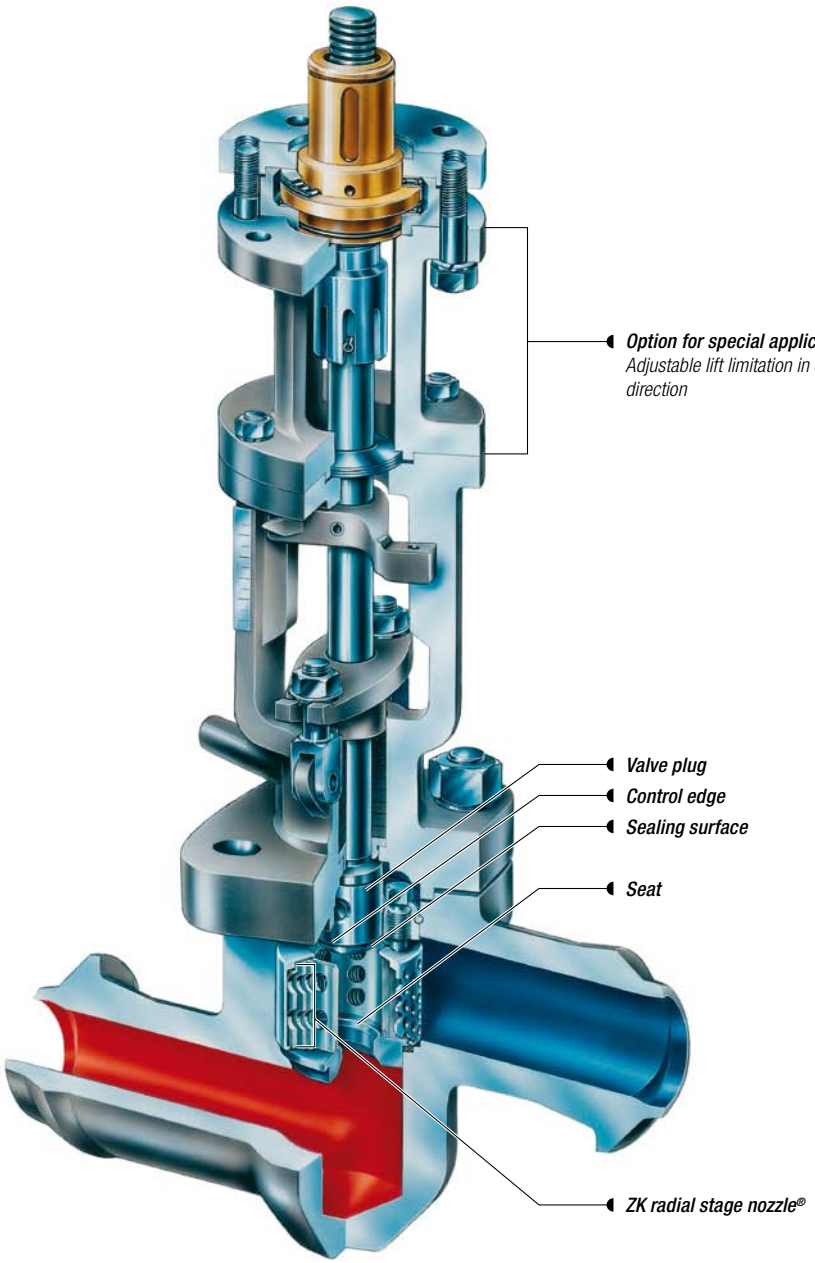


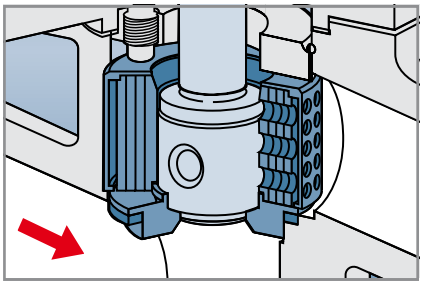
Linear characteristic

Equal-percentage characteristic

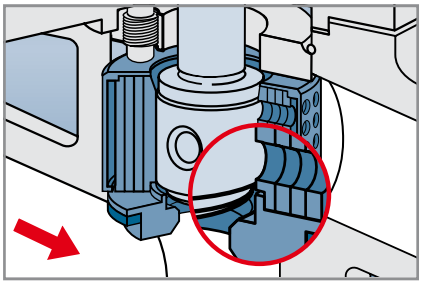


Control Valve ZK 29, Valve Plug in Open Position

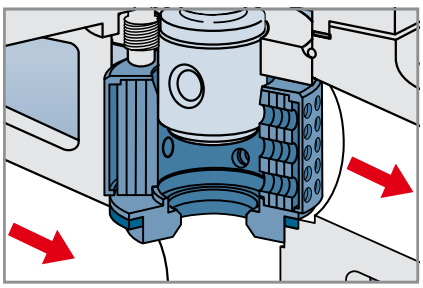




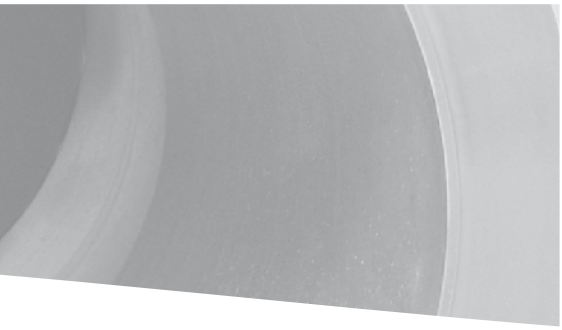
ZK 29: Valve plug in closed position

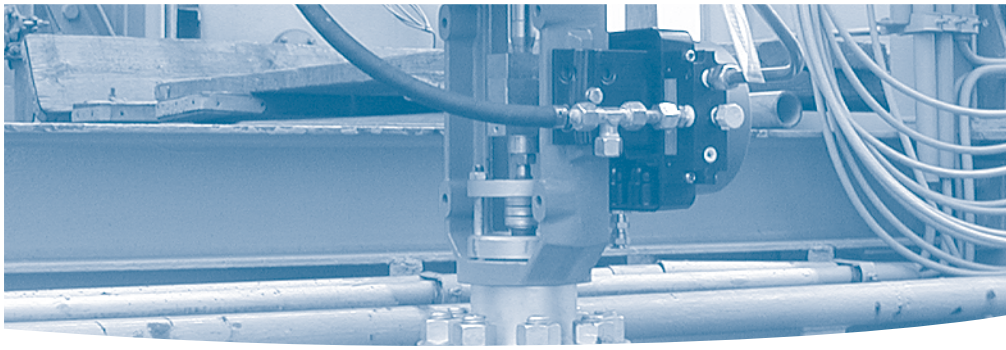


ZK 29: Valve plug no longer in closed position; control edge does not yet set free any orifices



ZK 29: Valve plug in control position





Control Valve ZK 29

PN 160 and class 900
Δp_{max} 100 bar (1450 psi)
k_{vs} 0.7 – 130 m³/h

With its permissible differential pressure of 100 bar, the ZK 29 control valve covers a large range of k_{vs} values.

The valve plug and seat of a control valve are as a rule subjected to very high flow velocities during the opening and closing processes. To reduce this effect, the valve plug of the ZK control valve is provided with a special control edge above the seating surface.

At the beginning of the opening process, the plug lifts off the seat, yet the flow admitted is very low. Only once a certain lift has been reached, and hence a large annular channel has been opened between the seat of the valve and the sealing surface of the plug, are the annular rings of the radial stage nozzle set free one after the other by the control edge.

During the closing process, the flow is first considerably reduced by the control edge and then the sealing surface of the plug reaches the seat to close the valve completely.

The ZK 29 offers the possibility of adjusting for various k_{vs} values and characteristics at a later time, by rotating the stage nozzle.

This series of valves is available in overall lengths according to EN and to ISA.

Connections	Butt-weld ends, socket-weld ends, flanged ends (EN, ASME)
Actuators	Electric (rotary, linear or lever actuator), pneumatic, handwheel
Body material	DN 25-50: 13 CrMo 4 4 (1.7335), A182 F12
	DN 80-150: GS-17 CrMo 5 5 (1.7357), A217 WC6
	Other butt-weld ends and body materials on request

Control Valve ZK 210

PN 250
Δp_{max} 100 bar (1450 psi))
k_{vs} 0.7 – 28 m³/h
Δp_{max} 180 bar (2610 psi)
k_{vs} 0.5 – 5 m³/h

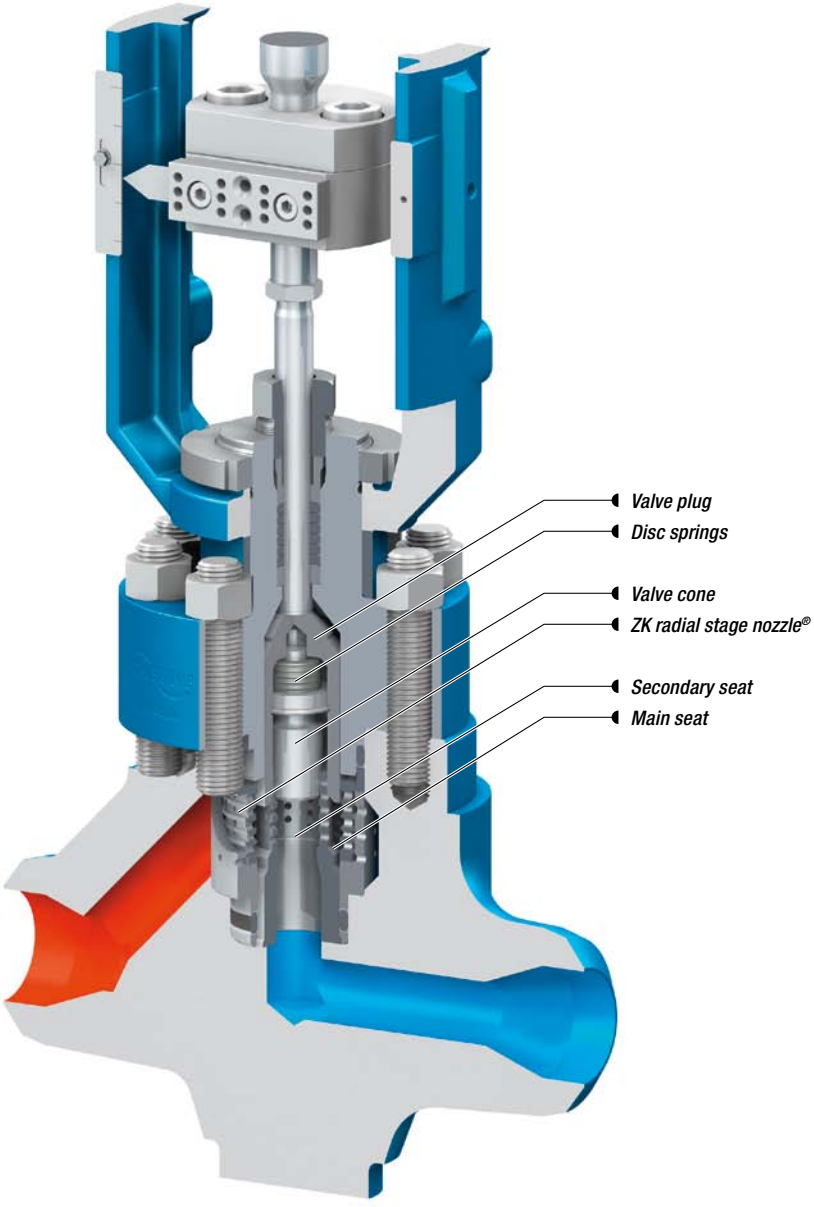
The control valve ZK 210 supplements the valve type ZK 29 primarily by extending the pressure rating to PN 250.

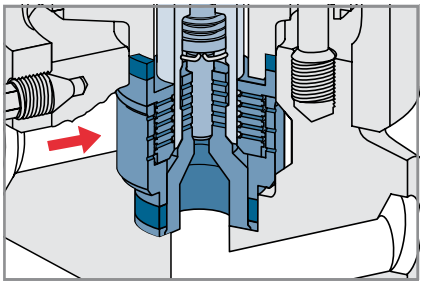
An additional radial stage nozzle arranged downstream makes it possible to overcome pressure differentials Δp_{max} of up to 180 bar, thus closing the gap to the existing high-pressure types. In comparison to the ZK 29, the required actuator forces are lower.

By exchanging the internals, pressure differentials of Δp_{max} = 100 bar or Δp_{max} = 180 bar can be achieved. The ZK 210 offers the possibility of adjusting for various k_{vs} values and characteristics at a later time, by rotating the stage nozzle.

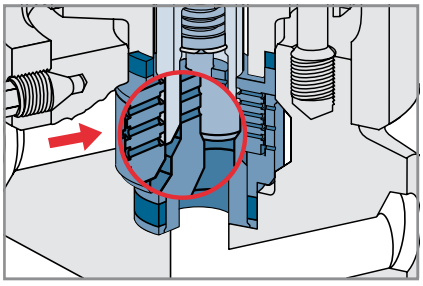
Connections	Butt-weld ends, socket-weld ends, flanged ends (EN, ASME)
Actuators	Electric (rotary or linear actuator), pneumatic, handwheel
Body material	13 CrMo 4 4 (1.7335)
	Other butt-weld ends and body materials on request

Control Valve ZK 313 with Tandem Shut-Off

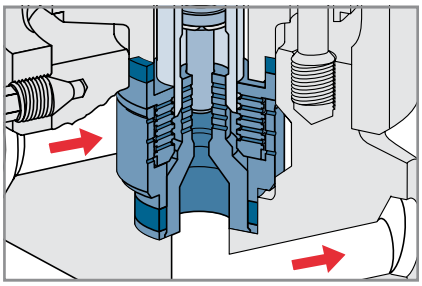




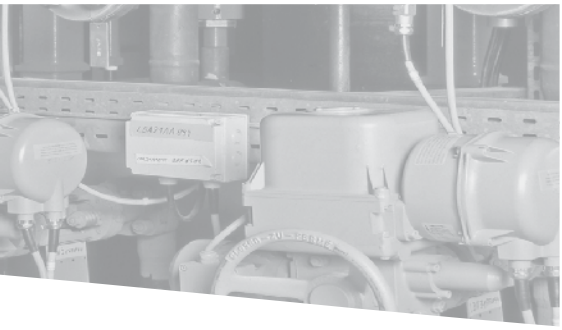
ZK 313: Valve plug in closed position

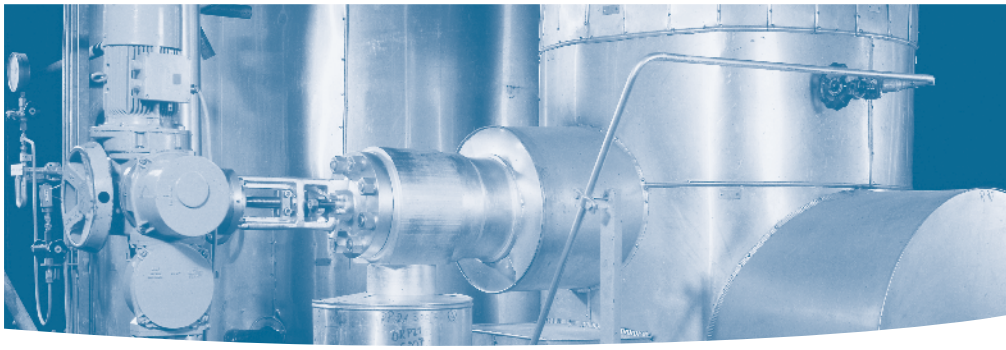


ZK 313: Valve plug no longer in closed position; valve cone still in closed position, control edge does not yet set free any orifices



ZK 313: Valve plug in control position





Control Valve ZK 313

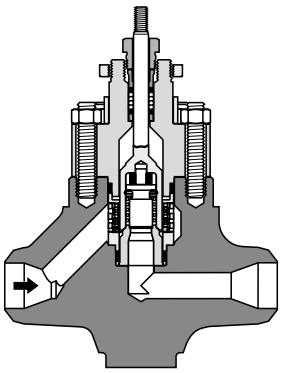
PN 630 & Class 2500
Δp_{max} 40 bar
k_{vs} 20 – 46 m³/h
Δp_{max} 300 bar
k_{vs} 1 – 17 m³/h
Δp_{max} 370 bar
k_{vs} 4.5 – 9.5 m³/h

The control valve ZK 313 is also available as an ASME version as per ASME B 16.34. Due to the tandem shut-off, it combines the function of a conventional isolating valve and control valve, and offers long service lifetimes. The leakage rates are in accordance with the highest EN and FCI classifications.

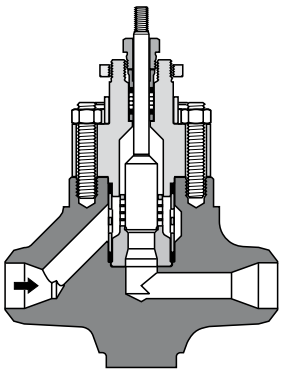
At the beginning of the opening process, first the valve plug is lifted off the main seat, but the valve cone follows only after a certain lift. At the moment of closing and at the beginning of opening, the flow velocity at the valve seat is therefore zero, which means that wire drawing is prevented. Through the use of the steel type 1.4903 / A 182 F91 and special seat materials, the ZK 313 permits a maximum temperature of 620 °C. The ZK 313 valve with additional nozzle can be used for differential pressures up to Δp_{max} 370 bar.

Connections	Butt-weld ends, socket-weld ends (EN, ASME)
Actuators	Electric (rotary, linear or lever actuator), hydraulic, pneumatic, handwheel
Body material	C 22.8 (1.0460), A 105
	16 Mo 3 (1.5415)
	10 CrMo 9 10 (1.7383), A 182 F 22
	X10 CrMoVNb 9 1 (1.4903), A 182 F 91

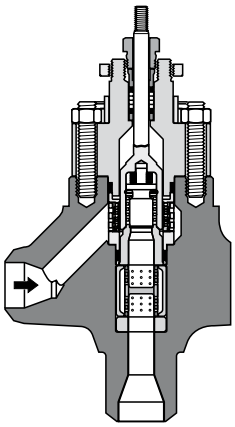
Nozzle Versions for ZK 313



Standard nozzle Δp_{max} 300 bar / 4350 psi

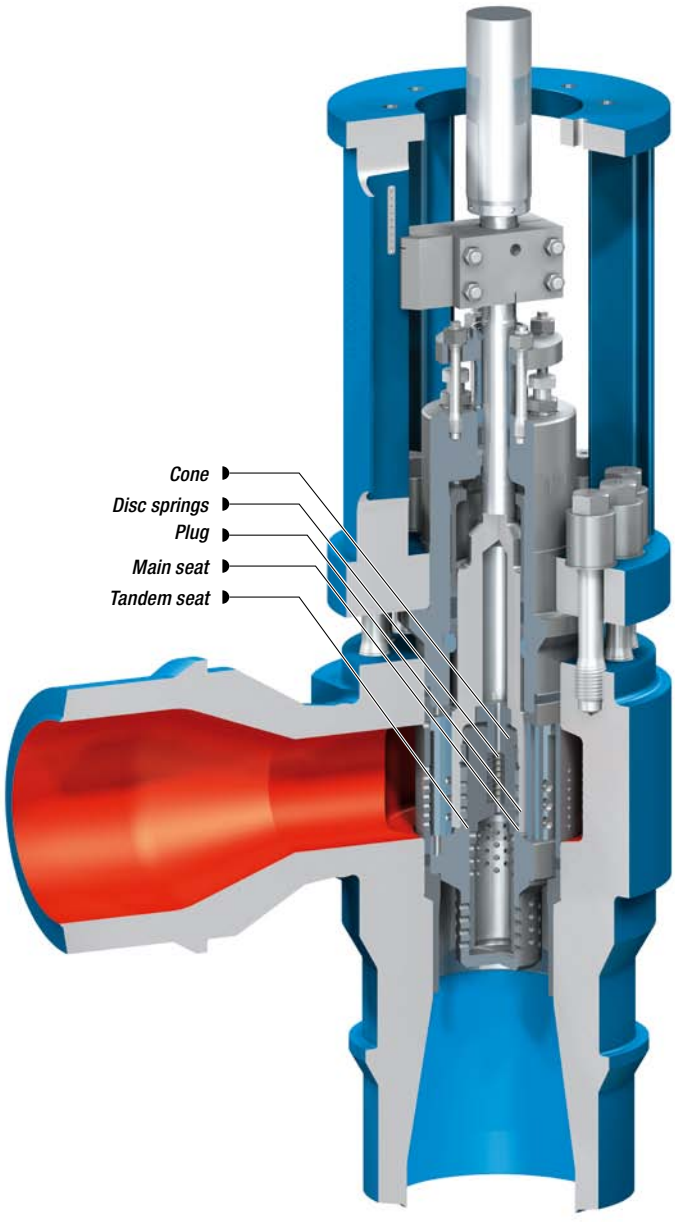


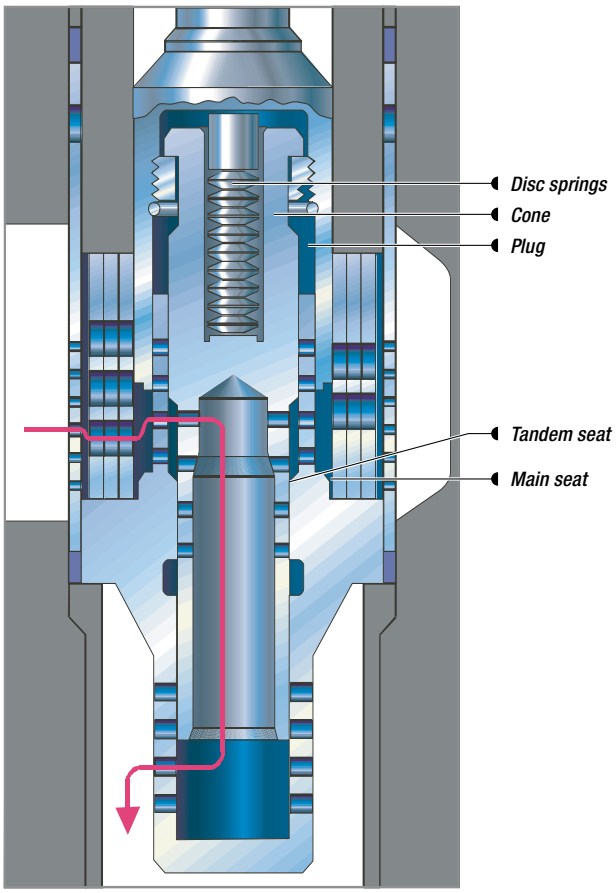
Special nozzle Δp_{max} 40 bar / 580 psi (without tandem seat)



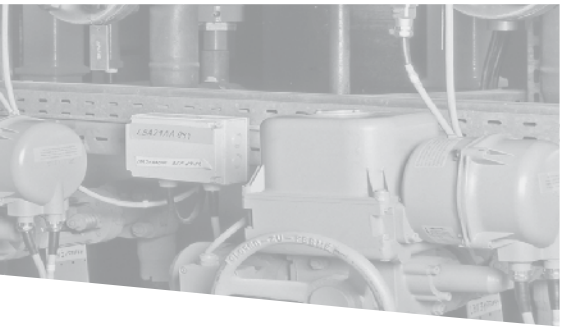
Special nozzle Δp_{max} 370 bar / 5365 psi (also in straight-through design)

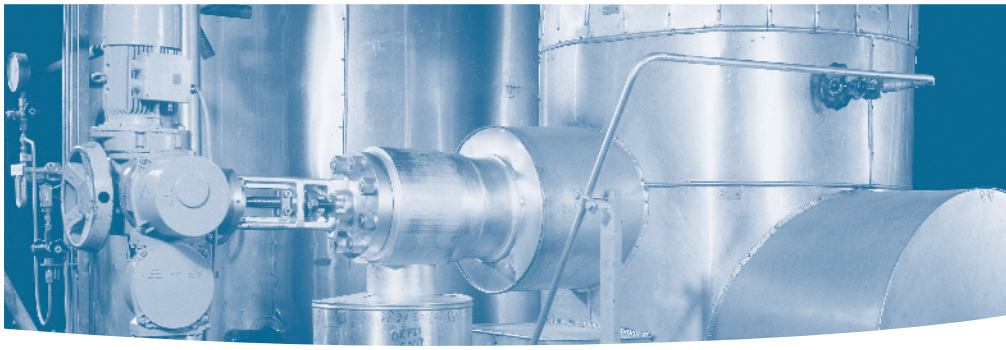
Control Valve ZK 213 with Tandem Shut-Off





6-stage nozzle with tandem shut-off, Δp_{max} 560 bar (8120 psi)





Control Valve ZK 213

Δp_{max} 300 bar (4350 psi)
k_{vs} 10 – 90 m³/h
Δp_{max} 560 bar (8120 psi)
k_{vs} 10 – 70 m³/h

The tandem shut-off of the control valve type ZK 213 ensures stable and low-wear operation as a control and shut-off valve for a pressure drop of Δp_{max} 300 bar or Δp_{max} 560 bar.

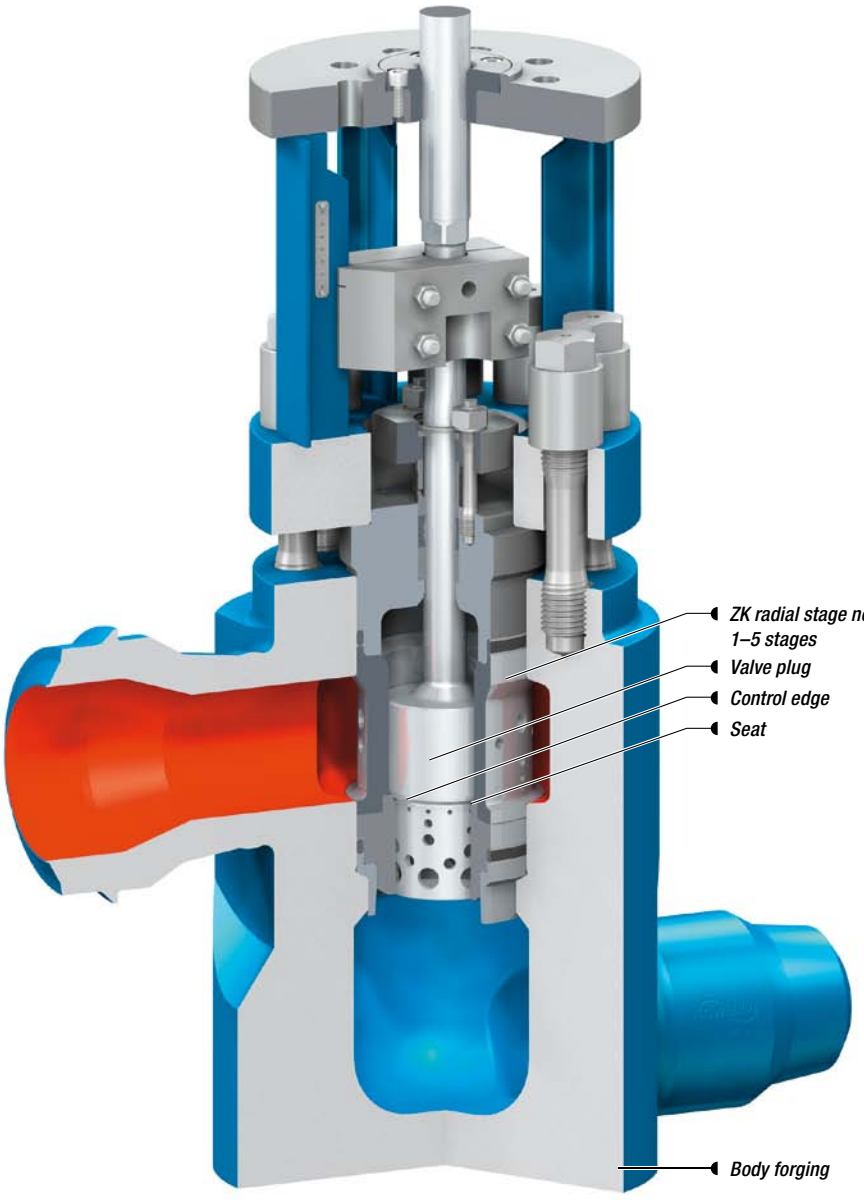
For this control valve, the maximum differential pressures of Δp_{max} 300 bar or Δp_{max} 560 bar depend on the design. A subsequent change is possible by exchanging the internals. The two additional throttling elements fitted in the high-pressure version provide effective protection against wear. Due to the tandem shut-off, it combines the functions of a conventional isolating valve and control valve, and offers long service lifetimes. The leakage rates are in accordance with the highest EN and FCI classifications.

Connections	Butt-weld ends (EN, ASME)
Actuators	Electric (rotary, linear or lever actuator), hydraulic
Body material	16 Mo 3 (1.5415)
	15 NiCuMoNb 5 (1.6368, WB 36)
	Other body materials on request

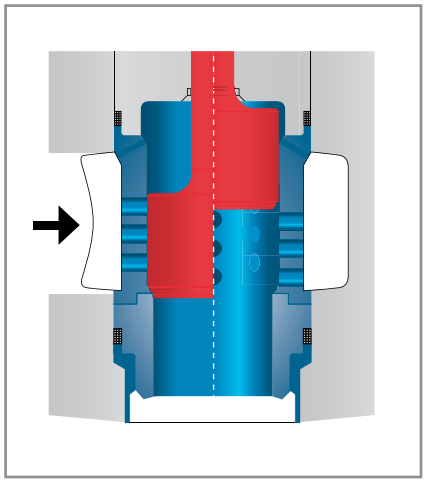
ZK 213 internals when new

Internals of a leak-off valve ZK 213, DN 100, after 13 years of operation with p_1 = 374 bar (5420 psi), p_2 = 11 bar (159.5 psi), t = 172 °C, $\dot{m}$ = 35 kg/s

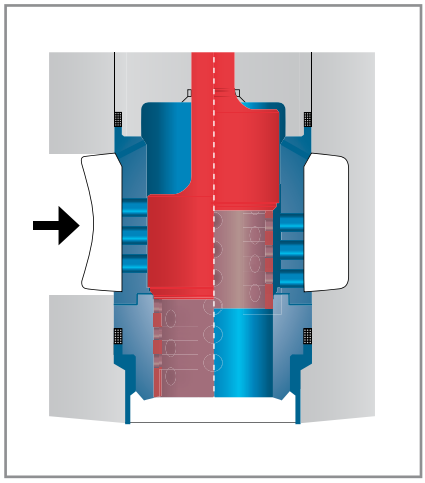
Control Valve ZK 610 and ZK 613



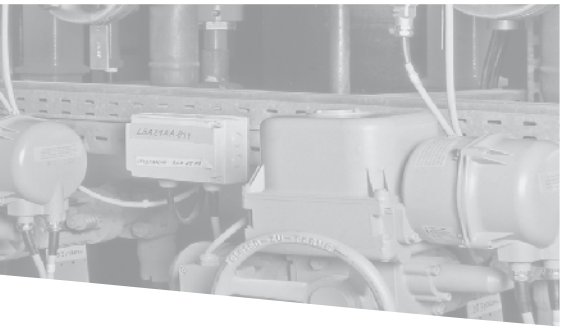
Modular System of the ZK Radial Stage Nozzle® for ZK 610, ZK 613
The multi-stage pressure drop is adapted precisely to suit the operating conditions.

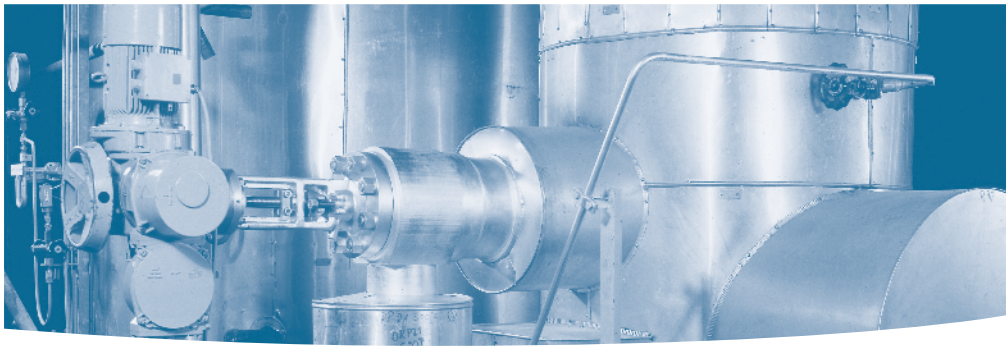


1-stage expansion



2-stage expansion





Control Valve ZK 610, ZK 613

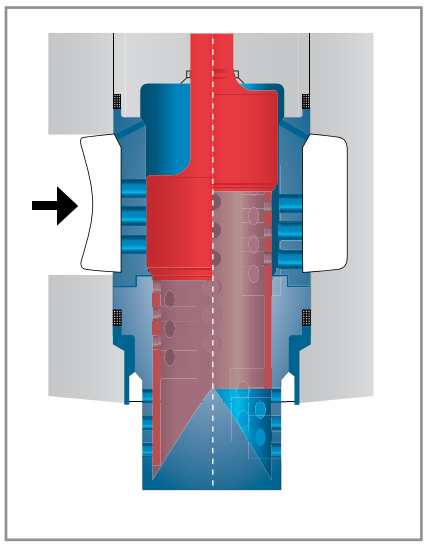
ZK610, PN 250
ZK613, PN 630

Δp_{max} 40 bar – Δp_{max} 250 bar (3625 psi)
k_{vs} 13 – 969 m³/h

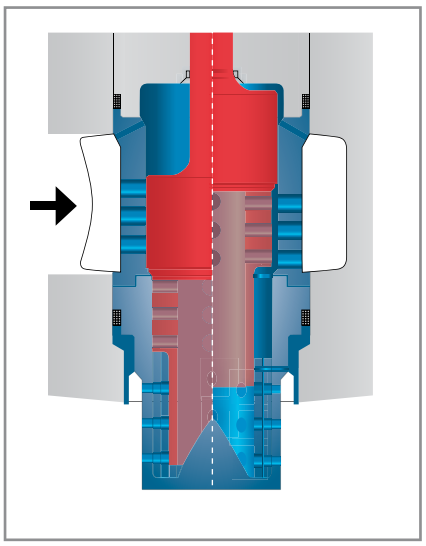
The control valve types ZK 610 and ZK 613 round off the ZK valve range with large k_{vs} values. Thanks to the modular design, it is possible to adapt the throttling units optimally to the operating conditions. In addition, leakage-free pressure balancing can be used to reduce the actuating forces.

As for the ZK 29, the seating surfaces are protected against high flow velocities by means of a control edge at the valve plug. This design measure achieves the highest leakage-rate classifications according to EN and FCI with long service lifetimes. The entire ZK radial stage nozzle® including seat is easy to exchange, ensuring the highest level of availability.

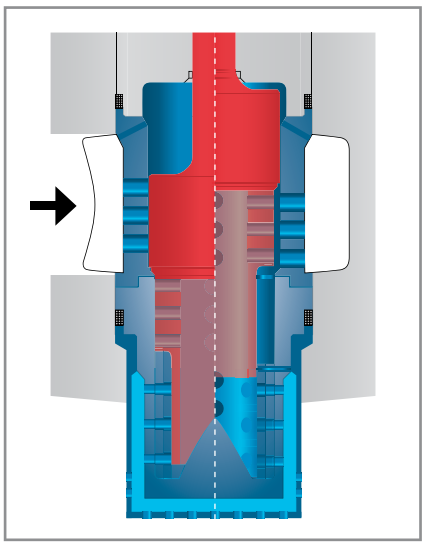
Connections	Butt-weld ends (EN, ASME)
Actuators	Electric (rotary or linear actuator), hydraulic, pneumatic
Body material	C22.8 (1.0460)
	16 Mo 3 (1.5415)
	10 CrMo 9 10 (1.7383)
	Other body materials on request



3-stage expansion



4-stage expansion



5-stage expansion

Controlled Drainage using Probes

Drainage of Turbines and Steam Lines

Controlled drainage is ensured with the aid of the self-monitoring level probes NRG 211 and the corresponding level switches NRS 2-4. Independently of the conductivity, the NRG 211 supplies precise signals about any condensate which may be present.

The level switches NRS 2-4 connected to the NRG 211 detect whether the probe is immersed or exposed and whether any malfunction/alarm messages are being sent by the probe. In addition, the electrode's supply cable is monitored and, if applicable, any fault is reported.

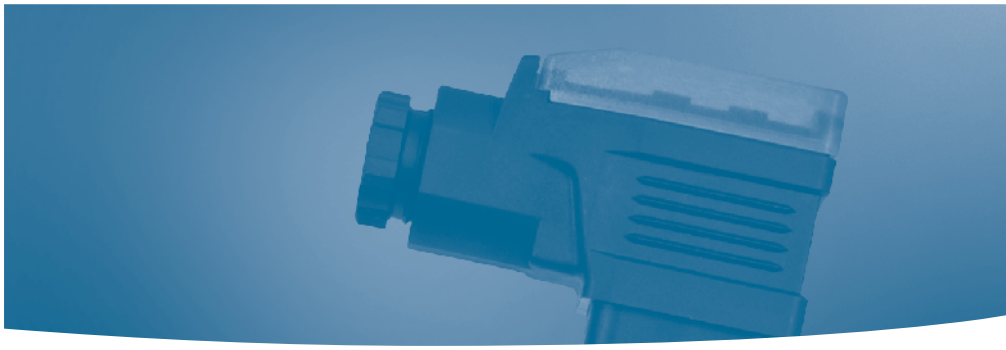
The signals evaluated by NRS 2-4 units in a redundant configuration are passed on to the local control or the main control system, which handles the actuation of the ZK valves.

For this control and actuation, a distinction is made between one-step and two-step arrangements.

Level probe NRG 211

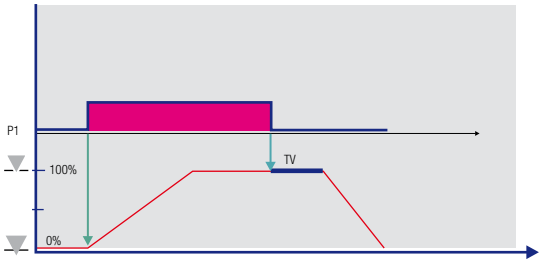
Level probe NRG 211:

- PN 320, up to 550 °C
- Capacitive measurement system, functioning independently of the conductivity (< 0.5 µS/cm)
- No moving control elements
- Ceramic insulation resistant to thermal shock
- Self-monitoring for short-circuits
- Cable lengths up to 500 m

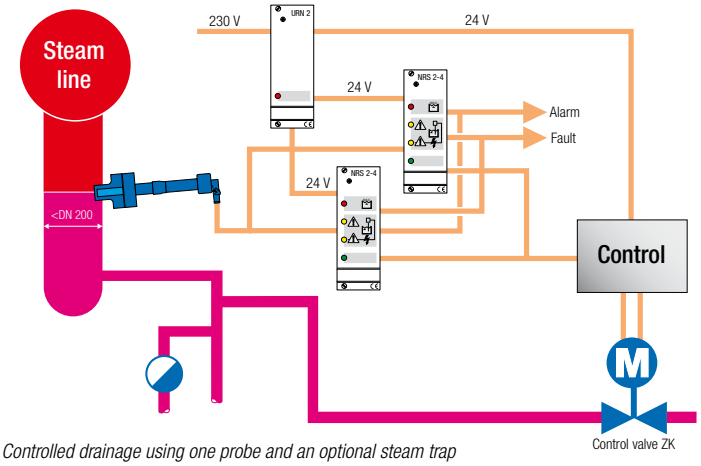


Timing diagram for drainage using one probe

As long as probe P1 is immersed, the ZK valve opens. After the probe is exposed, there is a time delay TV before the valve closes again. In the case of low condensate flowrates, an optional steam trap can be used for continuous drainage.



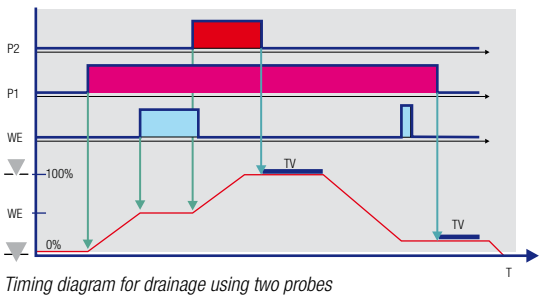
Timing diagram for drainage using one probe



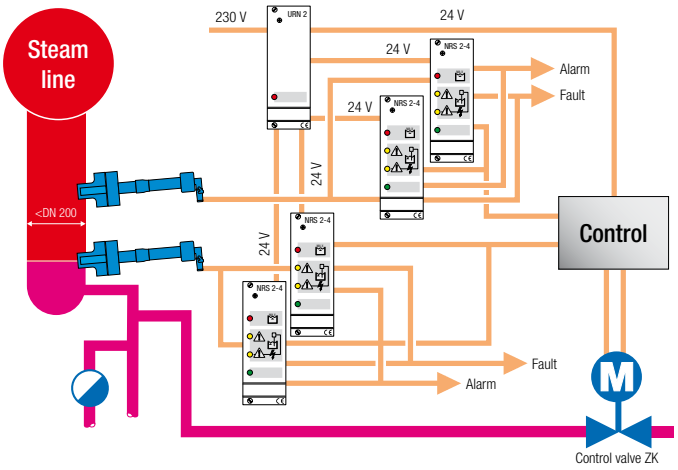
Controlled drainage using one probe and an optional steam trap

Timing diagram for drainage using two probes

If the lower probe P1 is immersed, the ZK valve moves to a defined intermediate position. When the level drops, the probe signals “exposed” and the ZK valve closes again. If the second probe P2 also becomes immersed as a result of large condensate flowrates, the ZK valve in driven to the 100% open position. After P2 is exposed again, the ZK valve is first moved to a defined intermediate position after a certain time delay. After the lower probe P1 is exposed, there is a time delay TV before the valve closes again. In the case of low condensate flowrates, an optional steam trap can be used for continuous drainage.



Timing diagram for drainage using two probes



Controlled drainage using two probes and an optional steam trap

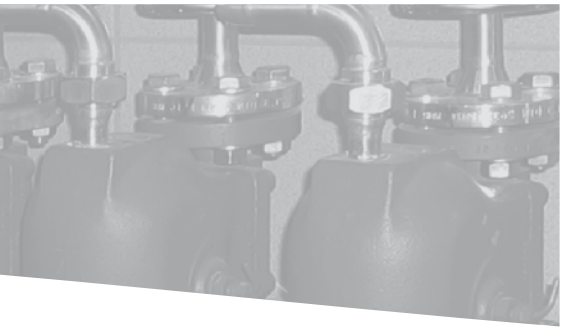
Steam Traps for High-Pressure Applications

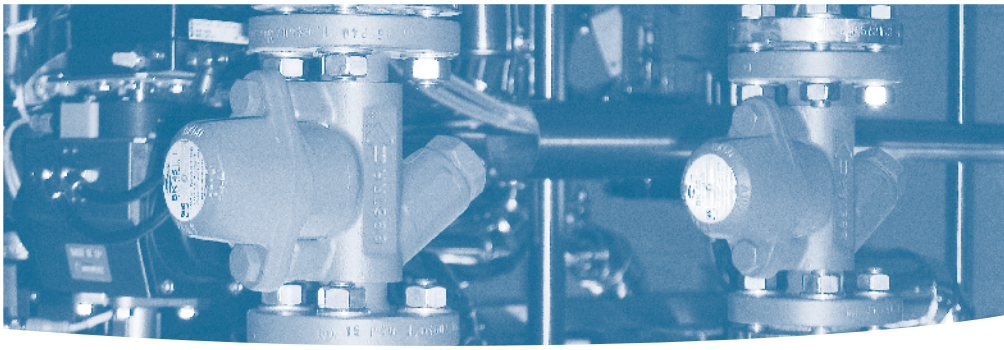
Thermostatic Steam Trap BK with Thermovit Regulator up to PN 630 and Cl. 2500

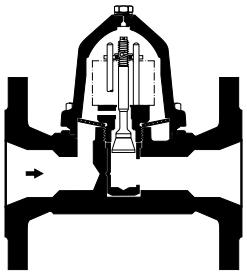
Features of the BK Series

- Robust control valve for the toughest operating conditions (unaffected by waterhammer and freezing)
- Suitable for superheated steam
- Automatic air-venting (the steam trap can also be used as a thermostatic air vent for steam systems)
- Can be mounted in any position (installation in horizontal or vertical pipes)
- Stage nozzle acts an a non-return valve
- Internals made of corrosion-resistant stainless steels
- Easy in-line maintenance (without removing the body from the pipe)
- Seal between body and regulating element achieved by a metallic base bushing
- Complete series available up to differential pressures of 275 bar

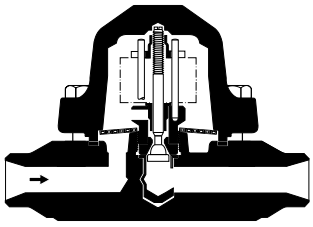
BK 212, DN 25, PN 630



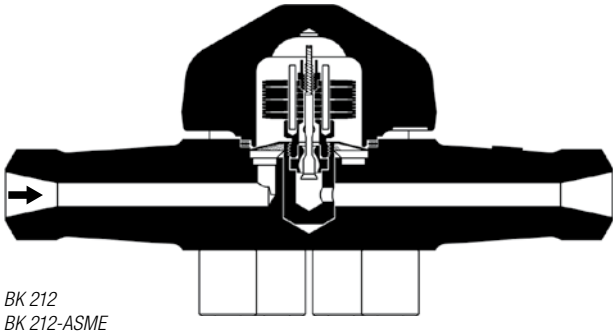




BK 27 N
DN 40, 50
1½", 2"



BK 37, BK 28, BK 29
BK 37-ASME, BK 28-ASME, BK 29-ASME
DN 15, 20, 25
½", ¾", 1"



BK 212
BK 212-ASME
DN 15, 20, 25
½", ¾", 1"

Thermostatic Steam Trap BK from PN 63

Type	PN / Class	Δ PMX [bar]	Materials EN	Materials ASTM	Connections
BK 37	PN 63/100	45	1.5415	A182-F1[1])	Flanged, socket-weld ends, butt-weld ends
BK 27N DN40, 50	PN 63	45	1.5415	A182-F1[1])	Flanged, socket-weld ends, butt-weld ends
BK 28	PN 100	85	1.5415	A182-F1[1])	Flanged, socket-weld ends, butt-weld ends
BK 29	PN 160	110	1.7335	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 212	PN 630	275	1.7383	A182-F22	Flanged, socket-weld ends, butt-weld ends
BK 212-F91	–	275	1.4903	A182-91	Flanged, socket-weld ends, butt-weld ends
BK 37-ASME	Class 400/600	45	–	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 28-ASME	Class 600	85	–	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 29-ASME	Class 900	110	–	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 212-ASME	Class 2500	275	–	A182-F22	Flanged, socket-weld ends, butt-weld ends

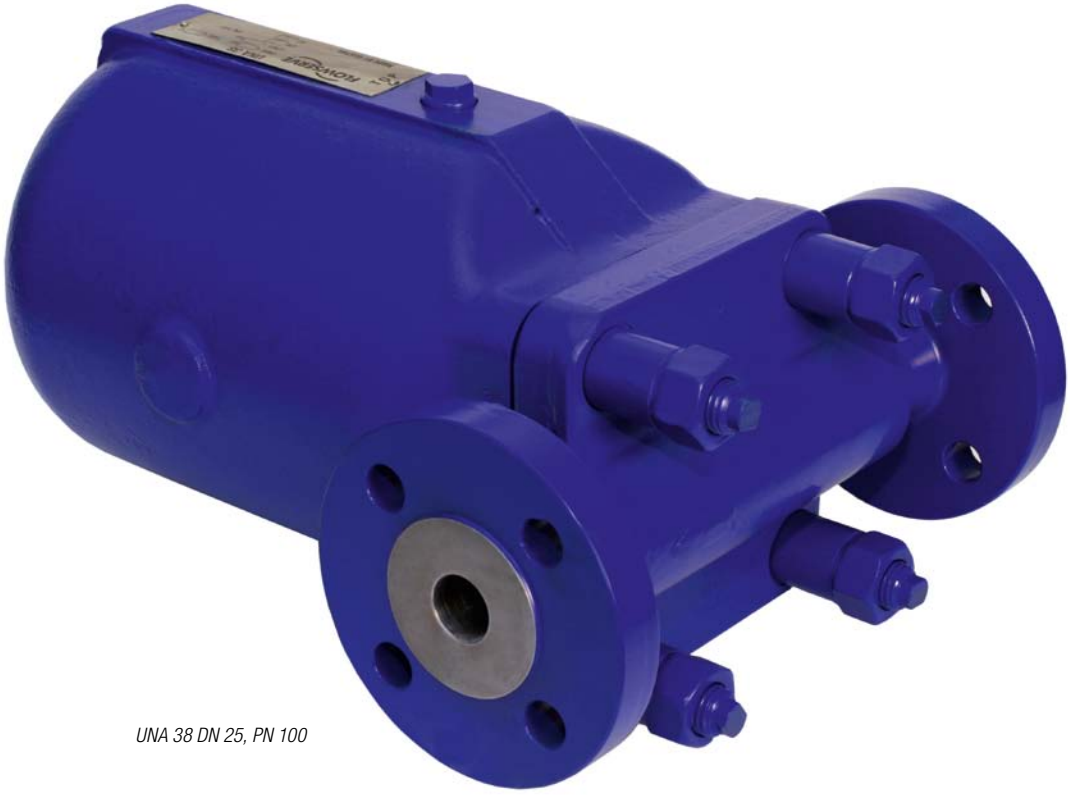
[1]) ASTM material comparable to EN material

Steam Traps for High-Pressure Applications

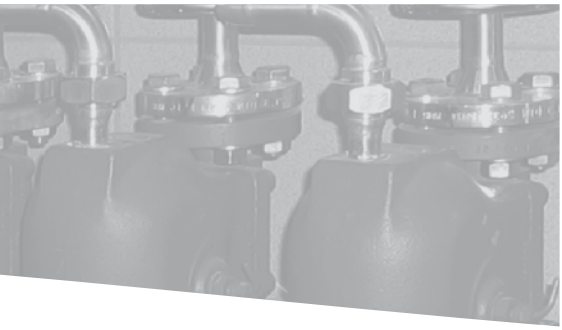
Steam Trap UNA with Ball Float up to PN 160

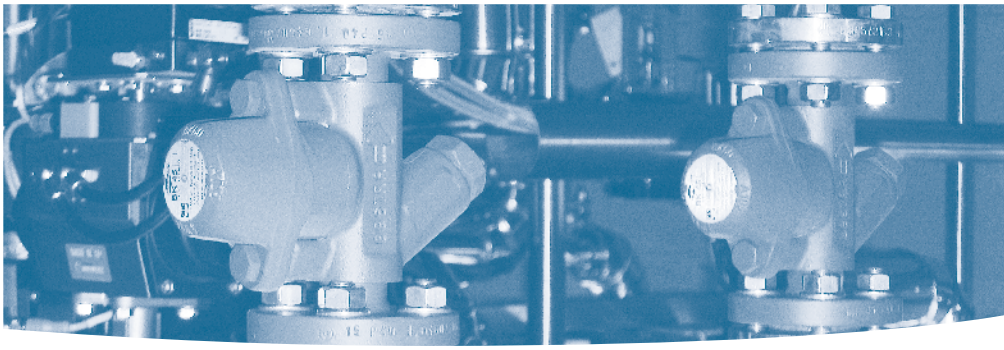
Features of the UNA Series

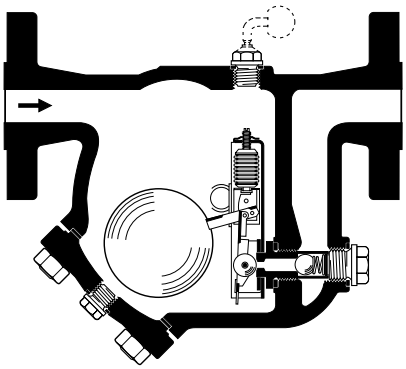
- Function independent of back pressure and condensate temperature
- Operation free of steam loss, thanks to formation of a water pocket
- Drainage without any banking-up, even with fluctuations in pressure and flowrate
- Unaffected by dirt
- Automatic air-venting by thermostat (Duplex control)
- Easy in-line maintenance (without removing the body from the pipe)
- Internals made of corrosion-resistant stainless steels



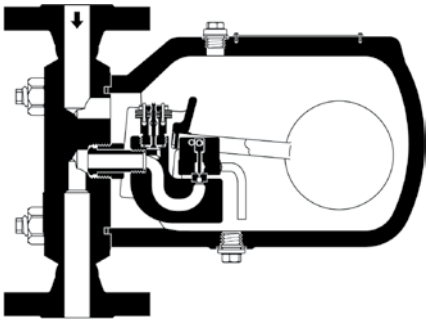
UNA 38 DN 25, PN 100



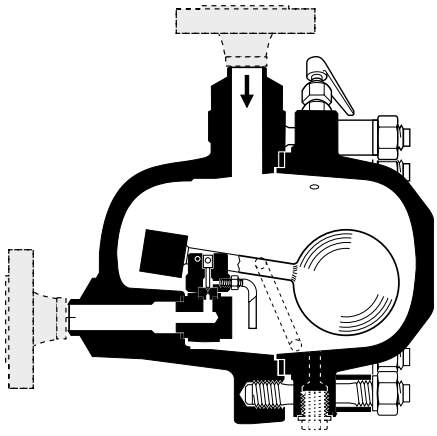




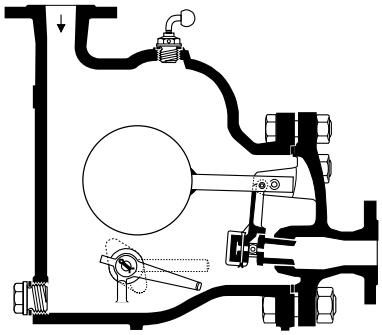
UNA 27h
DN 15, 25, 40, 50
½", 1", 1½", 2"



UNA 38
DN 15, 25, 40, 50
½", 1", 1½", 2"



UNA 39
DN 15, 25, 50
½", 1", 2"



UNA Special
DN 35, 80, 100
2½", 3", 4"

Steam Trap Type UNA from PN 63

Type	PN	Δ PMX [bar]	Materials EN	Materials ASTM	Connections
UNA 27h[1])	PN 63	45	1.5419	A217-WC1[2])	Flanged, socket-weld ends, butt-weld ends
UNA 38	PN 100	80	1.5415/ 1.7357	A182-F1[2])/ A217-WC6	Flanged, socket-weld ends, butt-weld ends
UNA 38 High-temperature	PN 100	80	1.7335/ 1.7357	A182-F12/ A217-WC6	Flanged, socket-weld ends, butt-weld ends
UNA 39	PN 160	140	1.7335	A182-F12	Flanged, socket-weld ends, butt-weld ends
UNA Special	PN 63	45	1.5419	A217-WC1[2])	Flanged, socket-weld ends, butt-weld ends

[1]) Only available for installation in horizontal pipes

[2]) ASTM material comparable to EN material

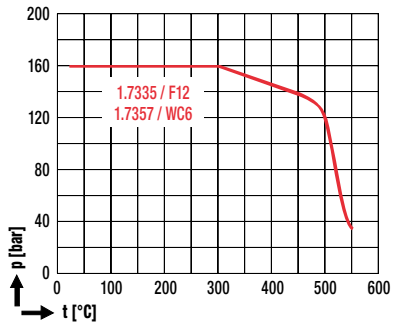
Overview of the Product Range

k_{VS} values [m³/h] (Linear Characteristics, Design, Pressure/Temperature Ratings)

ZK 29

DN	Δ p 100 bar		
25	0.7	1.4	2.1
50	3	6	9
65			
80	14	21	28
100	20	33	46
125			
150	70	100	130
200			
250			
300			
350			
400			

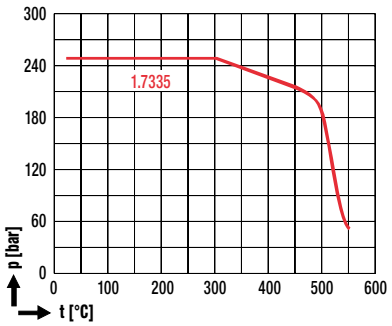
Straight-through / angle



ZK 210

DN	Δ p 100 bar			Δ p 180 bar
25	0.8	1.5	2.3	0.5
50	3.3	6.5	10	2
65				
80	9.5	18	28	5
100				
125				
150				
200				
250				
300				
350				
400				

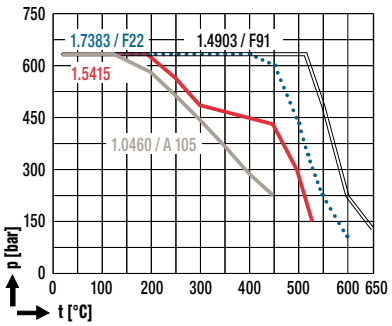
Straight-through / angle



ZK 313

DN	Δ p 300 bar								Δ p 370 bar	
25	1	1.5	2.3	3.6	5.5				4.5	9.5
50	1	1.5	2.3	3.6	5.5	8	11	13	4.5	9.5
65	1	1.5	2.3	3.6	5.5	8	11	13	4.5	9.5
80	1	1.5	2.3	3.6	5.5	8	11	13	4.5	9.5
100			2.3	3.6	5.5	11	14.5	17	4.5	9.5
125			2.3	3.6	5.5	11	14.5	17	4.5	9.5
150			2.3	3.6	5.5	11	14.5	17	4.5	9.5
200										
250										
300										
350										
400										

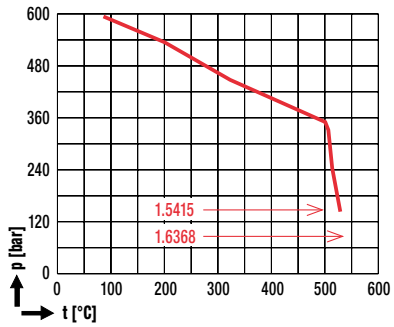
Straight-through / angle



ZK 213, sizes 1–5

DN / Bg.	Δ p 300 bar					Δ p 560 bar				
	1	2	3	4	5	1	2	3	4	5
50										
65										
80	20					12				
100	20	40				12	30			
125	20	40	50			12	30	40		
150		40	50	65			30	40	46	
200			50	65	90			40	46	70
250				65	90				46	70
300					90					70
350										
400										

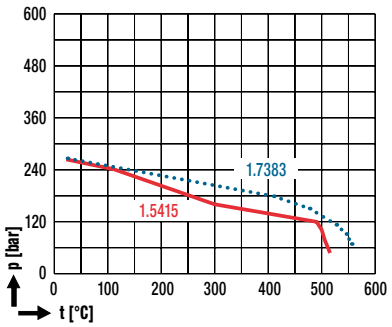
Angle / Z-pattern



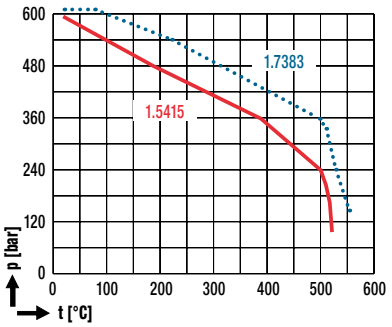
ZK 610 und ZK 613

DN	Δ p 40 bar	Δ p 80 bar	Δ p 120 bar	Δ p 150 bar	Δ p >150 bar
25					
50					
65					
80					
100	44 – 98	38 – 54	33 – 47	14 – 19	13 – 18
125	71 – 154	61 – 85	51 – 74	22 – 31	20 – 29
150	112 – 243	95 – 134	81 – 117	35 – 48	32 – 46
200	177 – 385	150 – 212	128 – 185	55 – 76	50 – 73
250	281 – 611	238 – 336	216 – 294	86 – 121	78 – 116
300*	446 – 969	378 – 533	322 – 465	137 – 191	125 – 184
350					
400					

ZK 610 Angle / Z-pattern



ZK 613 Angle / Z-pattern



Adaptation of nominal sizes is possible

**ZK 610 only*

GESTRA Stands for Quality

Quality is our Strength

For GESTRA, the concept of “Quality” not only includes the product itself, but applies equally to planning, handling and service. It is our aim to recognize and eliminate the sources of potential errors during all phases of order processing by means of comprehensive internal strategies.
The ideal basis for this is a quality management system in accordance with EN ISO 9000. Of the three possible levels, our quality assurance system achieved certification according to EN ISO 9001.
The high quality standard of GESTRA products has been confirmed time and time again through a large number of recognized type-approvals issued by TÜV (German Technical Supervisory Association), Germanischer Lloyd, Lloyd’s Register of Shipping and many other classification societies.
The company thus also fulfils the conditions of the new Pressure Equipment Directive.

Extract from our List of References

Loy Yang B Power Station	Australia
Collie Power Station	Australia
Energy Brix Australia	Australia
AUSTRIAN ENERGY	Austria
Electrabel	Belgium
JP Elektroprivreda	Bosnia
Tractebel	Brazil
Becancour Power Plant	Canada
Methanex	Chile
BASF YPC Project Nanjing	China
Shanghai Turbine	China
Waigaoqiao	China
INA Raffinerie	Croatia
Vasilikos	Cyprus
ČEZ	Czechia
Škoda	Czechia
Dong Energy	Denmark
Teollisuuden Voima Oy	Finnland
EDF	France
ALSTOM	Germany
BASF	Germany
Bayer	Germany
BEWAG	Germany
Clariant	Germany
E.ON	Germany
EnBW	Germany
Hitachi Power Europe	Germany
KSB Pumps	Germany
RWE Power AG	Germany
SIEMENS PG	Germany
STEAG	Germany
Sulzer Pumps	Germany
SWB	Germany
Vattenfall	Germany
Volkswagen	Germany
Weller Pumps	Germany
BHEL	India
Tjiwi Kimia	Indonesia
Ansaldo	Italy
ENEL	Italy
Incheon Power Plant	Korea
Panglima Power	Malaysia
EPZ	Netherlands
Elektrownia Kozienice	Poland
Ribatejo Power Plant	Portugal
AL Shuweihat	Saudi Arabia
Eskom	South Africa
Campo de Gibraltar	Spain
Kernkraftwerk Trillo	Spain
Sagunto	Spain
C4 ENERGI AB	Sweden
SSAB	Sweden
Kernkraftwerk Leibstadt	Switzerland
Kuo Kuang Power	Taiwan
Wang Noi	Thailand
British Energy	UK
Alabama Power	USA
Ameren UE	USA
Con Edison	USA
Electric Energy	USA
TVA	USA
Phu My	Vietnam

On request, we will gladly provide references for other countries and customers.

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With Energy into the Future