



# Control Valves with ZK Radial Stage Nozzle

For Power-Station and Plant Engineering



Engineering steam performance

## ZK Control Valves for Power-Station and Plant Engineering

### Overview

For many years now, GESTRA control valves of the type ZK have demonstrated 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.

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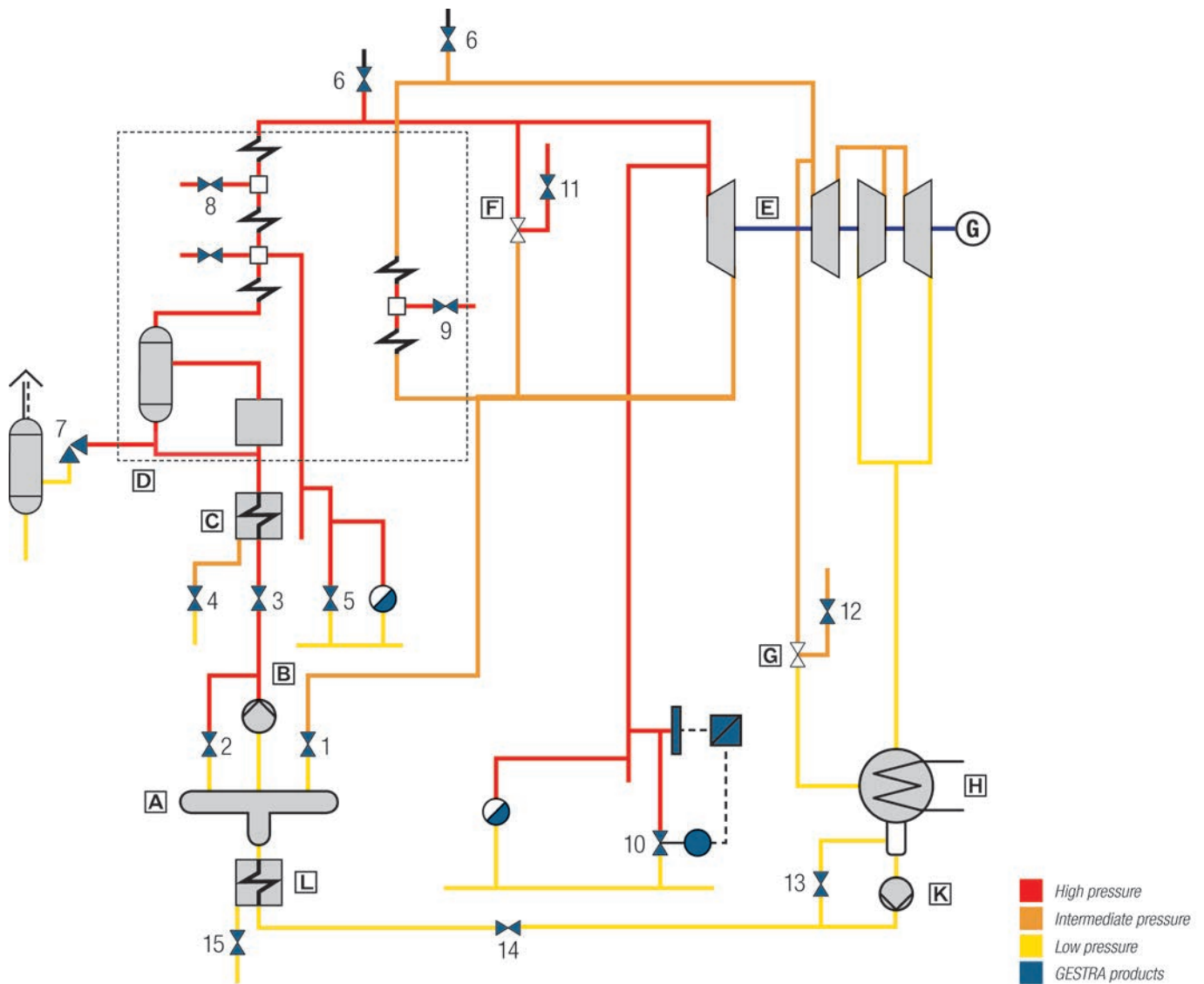
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Application	p [psi]	p [bar]	t [°F]	t [°C]	ZK valve type
<b>a Feedwater tank</b>					
1 Heating steam valve	~ 870	~ 60	~ 750	~ 400	29, 610
<b>b Main feedwater pump</b>					
2 Feedwater leak-off valve	to 8120	to 560	~ 430	~ 220	313, 213
3 Feedwater control valve	to 8120	to 560	~ 430	~ 220	610, 613
<b>c H.P. preheater</b>					
4 Condensate drain control valve	290-870	20–60	~ 570	~ 300	29, 210, 610
<b>d Boiler plant</b>					
5 Boiler drain valve	to 4785	to 330	~ 1150	~ 620	313, 213
Soot-blower warm-up valve	~ 725	~ 50	570-660	300–350	29, 210
Soot-blower steam valve	to 4785	to 330	1020	550	313
Boiler circulation control valve	2610-4785	180–330	~ 480	~ 250	313, 613
6 Boiler vent valve	to 4785	to 330	~ 1150	~ 620	313, 613
7 Start-up pot drain valve	2610-4785	180–330	~ 840	~ 450	613
8 H.P. spray attemperator valve	~ 4060	~ 280	~ 430	~ 220	313
9 I.P. spray attemperator valve	~ 725	~ 50	~ 430	~ 220	29, 210
<b>e Turbine plant</b>					
10 Live steam drainage	to 4785	to 330	~ 1150	~ 620	313, 213
I.P. drainage	~ 870	~ 60	~ 1150	~ 620	29, 210, 313
L.P. drainage	< 290	< 20	~ 860	~ 460	29
<b>f H.P. bypass station</b>					
11 Spray injection valve	to 5075	to 350	~ 430	~ 220	313, 213
<b>g I.P. bypass station</b>					
12 Spray injection valve	to 3625	to 250	~ 430	~ 220	29, 210
<b>h Condenser</b>					
<b>k Condensate pump</b>					
13 Condensate leak-off valve	145-290	10–25	~ 85	~ 30	29, 610
14 Condensate control valve	145-290	10–25	~ 85	~ 30	29, 610
<b>l L.P. preheater</b>					
15 Condensate drain valve	~ 6-75	~ 0.4–5	~ 85	~ 30	29, 610



# 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 rapid and reliable adaptation to the prevailing operating conditions.

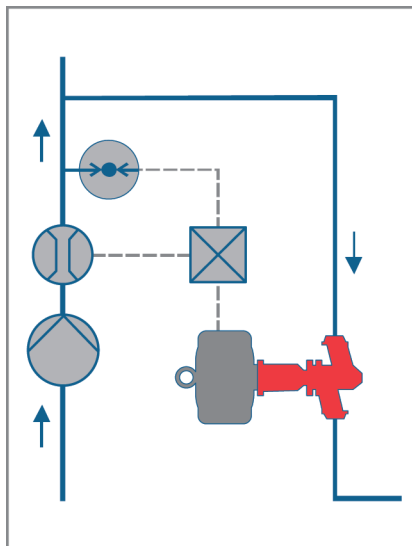
If the operating conditions in the plant change, the control valve can be adapted to the new situation by repositioning or changing the radial stage nozzle. There is no need to remove the valve from the line for this purpose!

A large number of references testifies to the high standard of GESTRA power station equipment.

## 1. Leak-Off Control (recirculation)

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

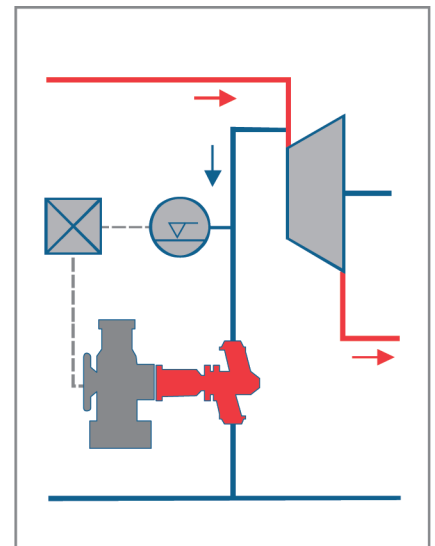
The control valve with ZK Radial Stage Nozzle, the actuator with quick-opening function, and the control unit are optimally adapted to the operating conditions prevailing in each case.



## 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.

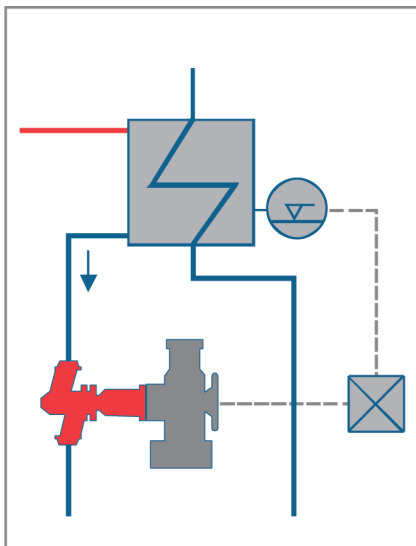
Even condensate flowrates with extreme fluctuations are discharged by this system without any problems. Specific warming-up of certain parts of the plant can be achieved with the aid of a temperature measuring system.



### 3. Level Control

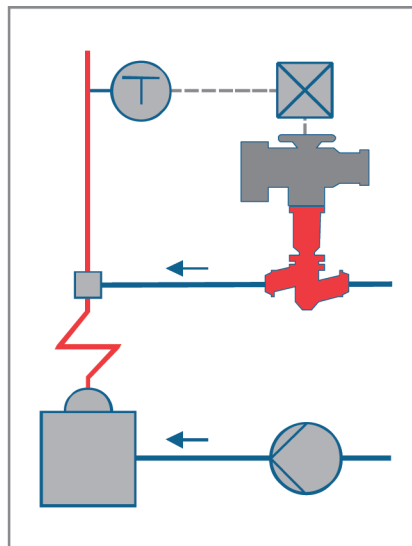
With the aid of the ZK control valve, level control systems can be realized under difficult technical conditions. The GESTRA level control system consists of a control valve with ZK Radial Stage Nozzle, an actuator, a level electrode and a control unit.

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

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



*Drain control station using ZK 29 valves with electrical actuator*

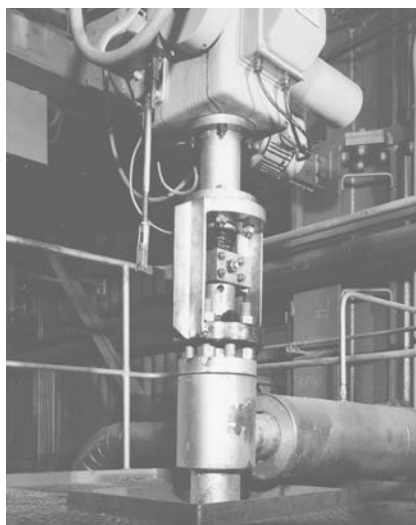


### **Leak-off control consisting of:**

- 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 store 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.

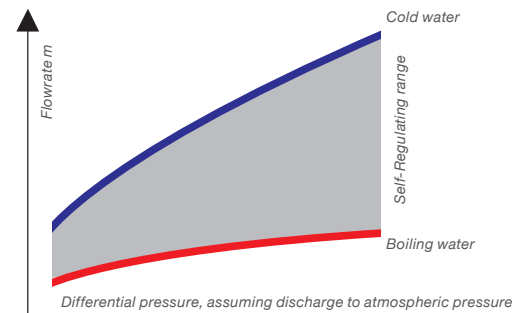
Various stage nozzles and valve plugs are available to account for the pressure drop in a particular application. For extremely high pressure gradients, control valves with tandem shut-off are applied.

Due to the special design of the ZK Radial Stage Nozzle, the noise 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) across the entire control range of the valve.

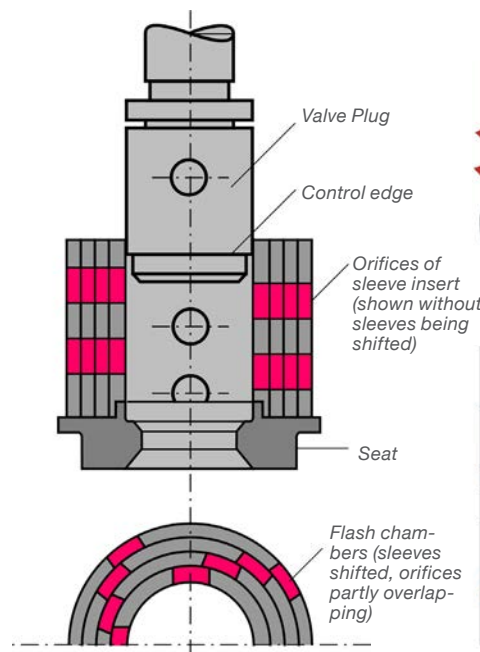
## Automatic Control

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.

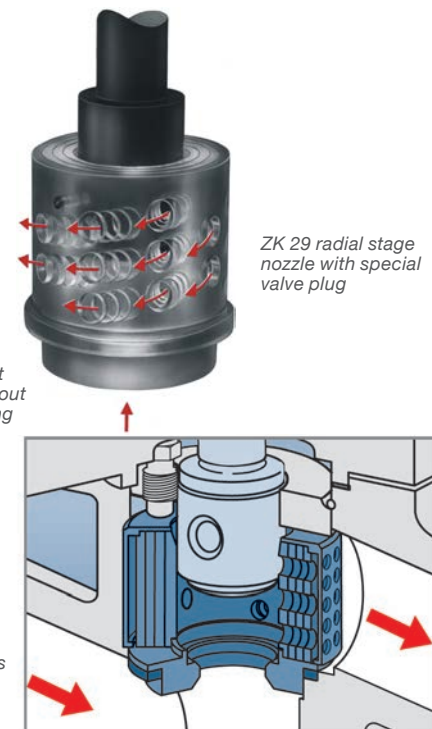
For this purpose, the control valve is adjusted manually once to the working point. From this time on, the condensate flowrate is determined by the thermal state of the condensate in the nozzle system (cold condensate / hot condensate) without any further modification of the cross-sectional area. The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



Regulating characteristic of the ZK 29 Radial Stage Nozzle



Sectional drawing of ZK 29 radial stage nozzle



Valve plug of ZK 29 in control position



# The ZK Radial Stage Nozzle

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### 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 changing 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 noise level**

The continuous reduction of the flow velocity in the radial stage nozzle ensures a low sound level, normally no more than 85 dB(A) across the valve's control range. For differential pressures up to  $\Delta p_{\max}$  1450 psi (100 bar), the sound level is even below 80 dB(A).

- **Different capacity ranges**

The Cv values can be adapted to the operating conditions by repositioning or changing the radial stage nozzle. Intermediate lift positions of the valve plug can thus be avoided.

The complete ZK product range offers Cv (Kvs) values from add 0,58 GPM to 1120 GPM (0.5 m³/h to 969 m³/h).

By changing the internals, it is possible to adjust ZK control valves to cater for changes in differential pressure.

- **Actuators**

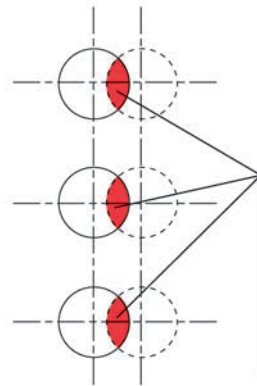
ZK control valves can be used with most types of actuators available on the market.



## Changing the valve characteristics using the ZK 29 as an example



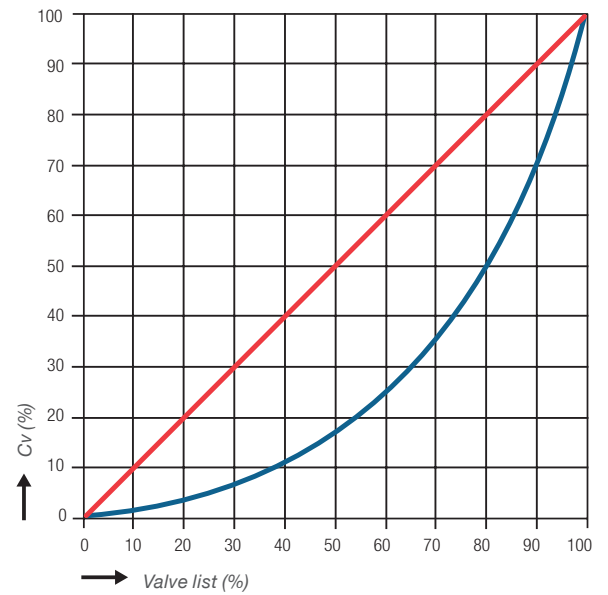
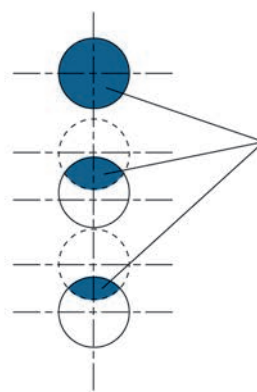
Position of the sleeves for linear characteristic



Cross-sectional flow area



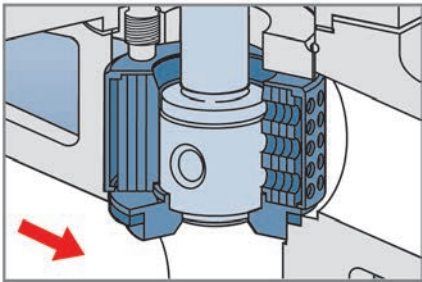
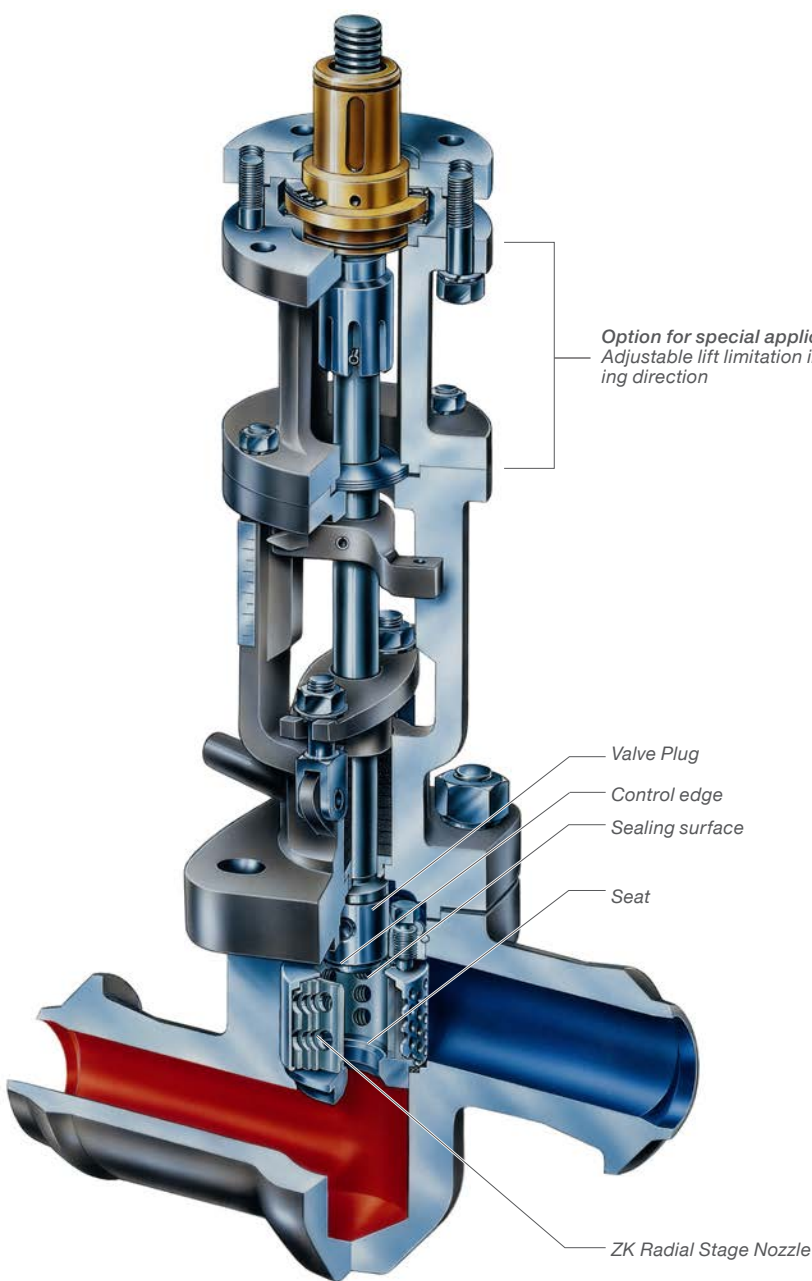
Position of the sleeves for equal percentage characteristic



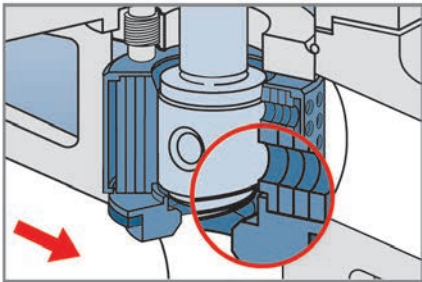
Linear Characteristic

Equal-percentage Characteristic

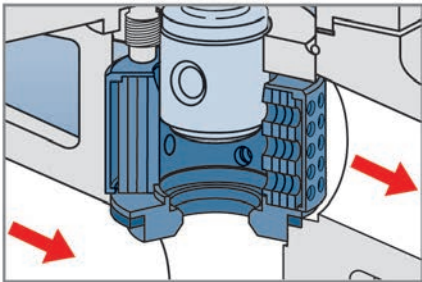
# Control Valve ZK 29, Valve Plug in Open Position



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**  
 **$\Delta p_{\max}$  100 bar (1450 psi)**  
**Kvs 0.7 – 130 m<sup>3</sup>/h**  
**Cv 0.8 – 150.3 GPM**

With its permissible differential pressure of 1450 psi (100 bar), the ZK 29 control valve covers a large range of Cv (Kvs) values.

The valve plug and control valve seat are as a rule subjected to very high flow velocities during opening and closing. To reduce this effect, the valve plug of the ZK control valve has 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 larger 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 opened 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 Cv (Kvs) 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.

The control valve ZK 29 is also available as an ASME version per B16.34. The leakage rates are in accordance with the highest EN and FCI classifications.

<b>Connections</b>	Butt-weld ends, socket-weld ends, flanged ends (EN, ASME)
<b>Actuators</b>	Electric (rotary, linear or lever actuator), pneumatic, handwheel
<b>Body material</b>	1" - 2", A182 F12
	3" - 4", A217 WC6
	Other butt-weld ends and body materials on request

## Control Valve ZK 210

**PN 250**  
 **$\Delta p_{\max}$  100 bar (1450 psi)**  
**Kvs 0.7 – 28 m<sup>3</sup>/h**  
 **$\Delta p_{\max}$  180 bar (2610 psi)**  
**Kvs 0.5 – 5 m<sup>3</sup>/h**

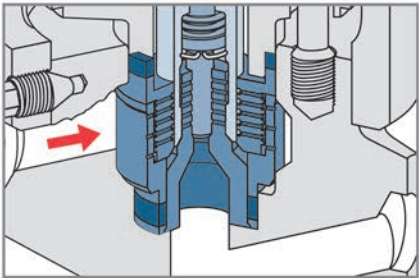
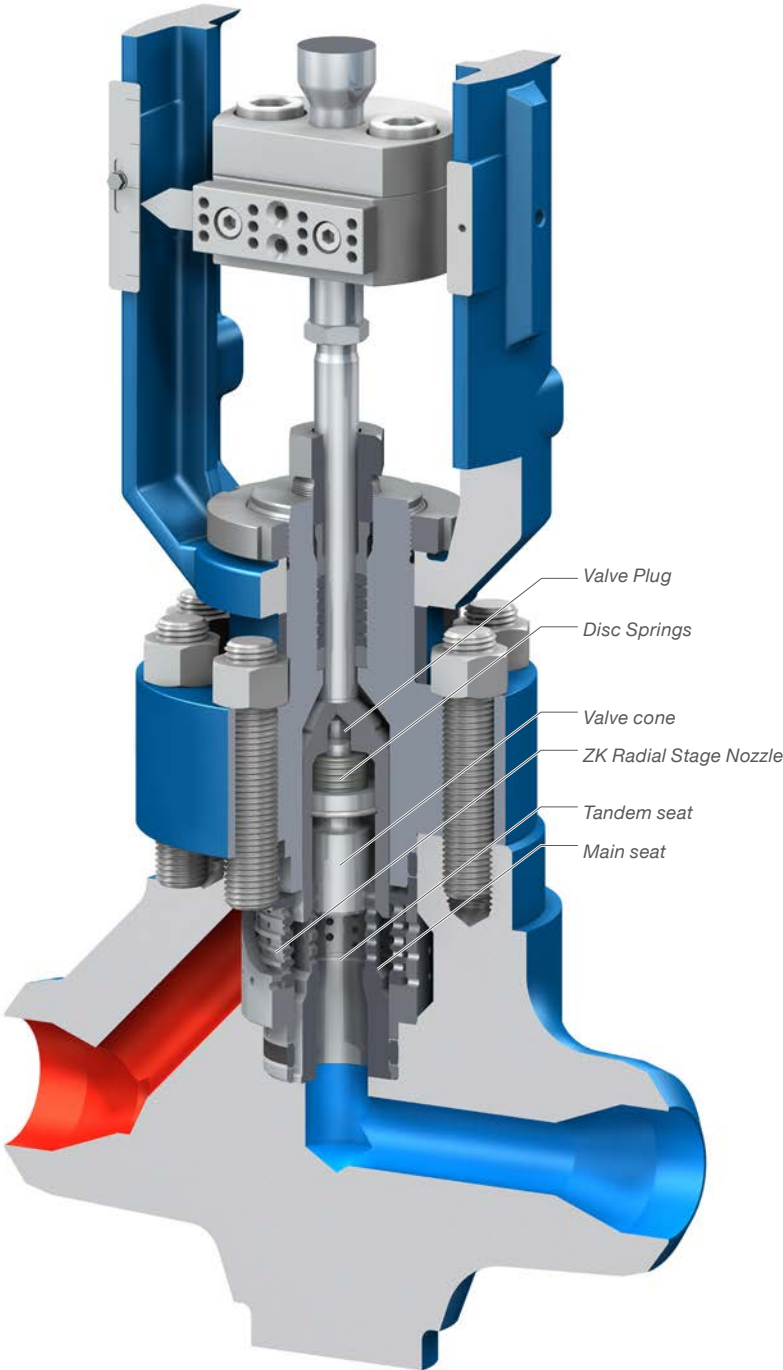
The control valve ZK 210 supplements the valve type ZK 29 primarily by extending the pressure rating to PN 250.

An additional radial stage nozzle arranged downstream makes it possible to overcome pressure differentials of up to  $\Delta p_{\max}$  2610 psi (180 bar), thus closing the gap to the existing high-pressure types. In comparison to the ZK 29, the required actuator forces are lower.

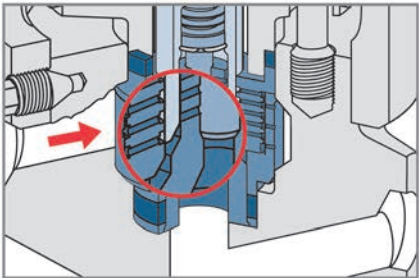
By changing the internals, pressure differentials of  $\Delta p_{\max}$  100 bar or  $\Delta p_{\max}$  =2610 psi (180 bar) can be achieved. The ZK 210 offers the possibility of adjusting for various Cv (Kvs) values and characteristics at a later time, by rotating the stage nozzle.

<b>Connections</b>	Butt-weld ends, socket-weld ends, flanged ends (EN, ASME)
<b>Actuators</b>	Electric (rotary or linear actuator), pneumatic, handwheel
<b>Body material</b>	13 CrMo 4 4 (1.7335) equal to A182 F12
	Other butt-weld ends and body materials on request

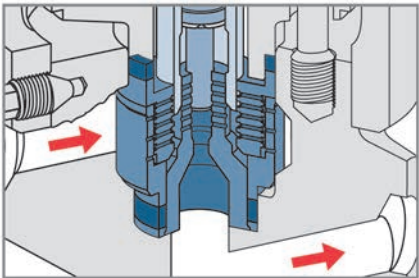
# Control Valve ZK 313 with Tandem Shut-Off



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 open any orifices



ZK 313: Valve plug in control position

## Control Valve ZK 313

### PN 630 & Class 2500

$\Delta p_{\max}$  40 bar (580 psi)

$k_{vs}$  20 – 46 m<sup>3</sup>/h (Cv 23 – 53 GPM)

$\Delta p_{\max}$  300 bar (4350 psi)

$k_{vs}$  1 – 17 m<sup>3</sup>/h (Cv 1.2 – 19.7 GPM)

$\Delta p_{\max}$  370 bar (5365 psi)

$k_{vs}$  4.5 – 9.5 m<sup>3</sup>/h (Cv 5.2 – 11 GPM)

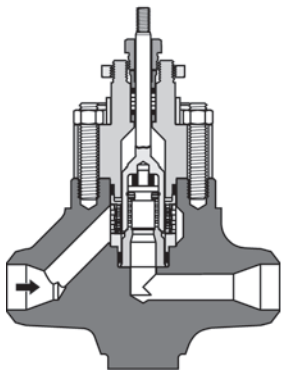
The control valve ZK 313 is also available as an ASME version as per ASME B 16.34. Due to the tandem shut-off, it combines the function of a conventional isolating valve and control valve, and offers long service lifetimes. The leakage rates are in accordance with the highest EN and FCI classifications.

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 (1150 °F). The ZK 313 valve with additional nozzle can be used for differential pressures up to  $\Delta p_{\max}$  370 bar (5365 psi).

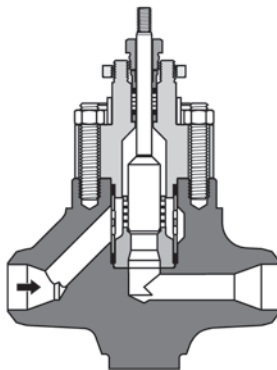
Connections	Butt-weld ends, socket-weld ends (EN, ASME)
Actuators	Electric (rotary, linear or lever actuator), hydraulic, pneumatic, handwheel
Body material	16 Mo 3 (1.5415), A 182 F1 10 CrMo 9 10 (1.7383), A 182 F 22 X10 CrMoVNb 9 1 (1.4903), A 182 F 91

### Nozzle Versions for ZK 313



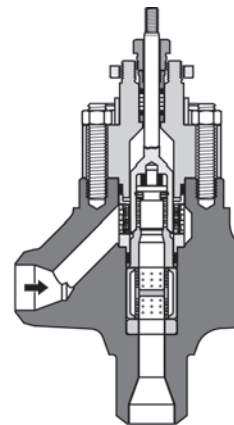
Standard nozzle

$\Delta p_{\max}$  300 bar / 4350 psi



Special nozzle

$\Delta p_{\max}$  40 bar / 580 psi  
(without tandem seat)

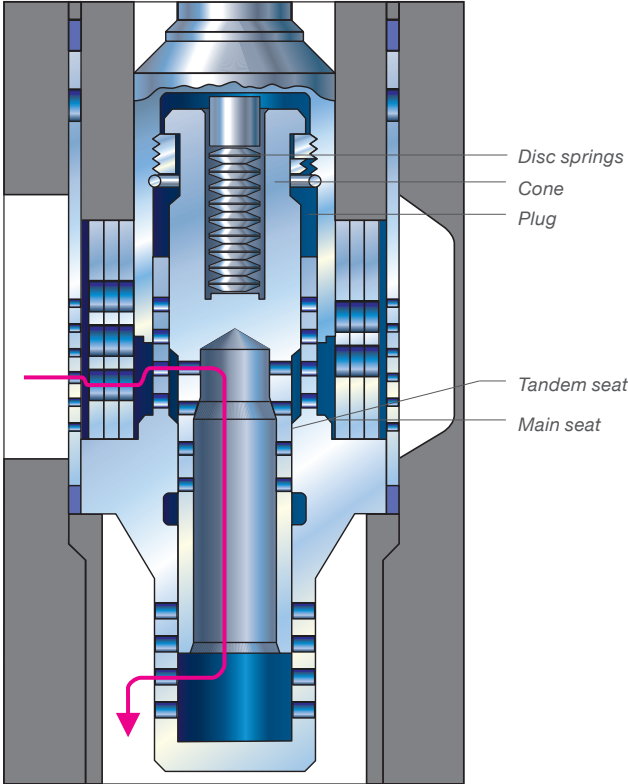
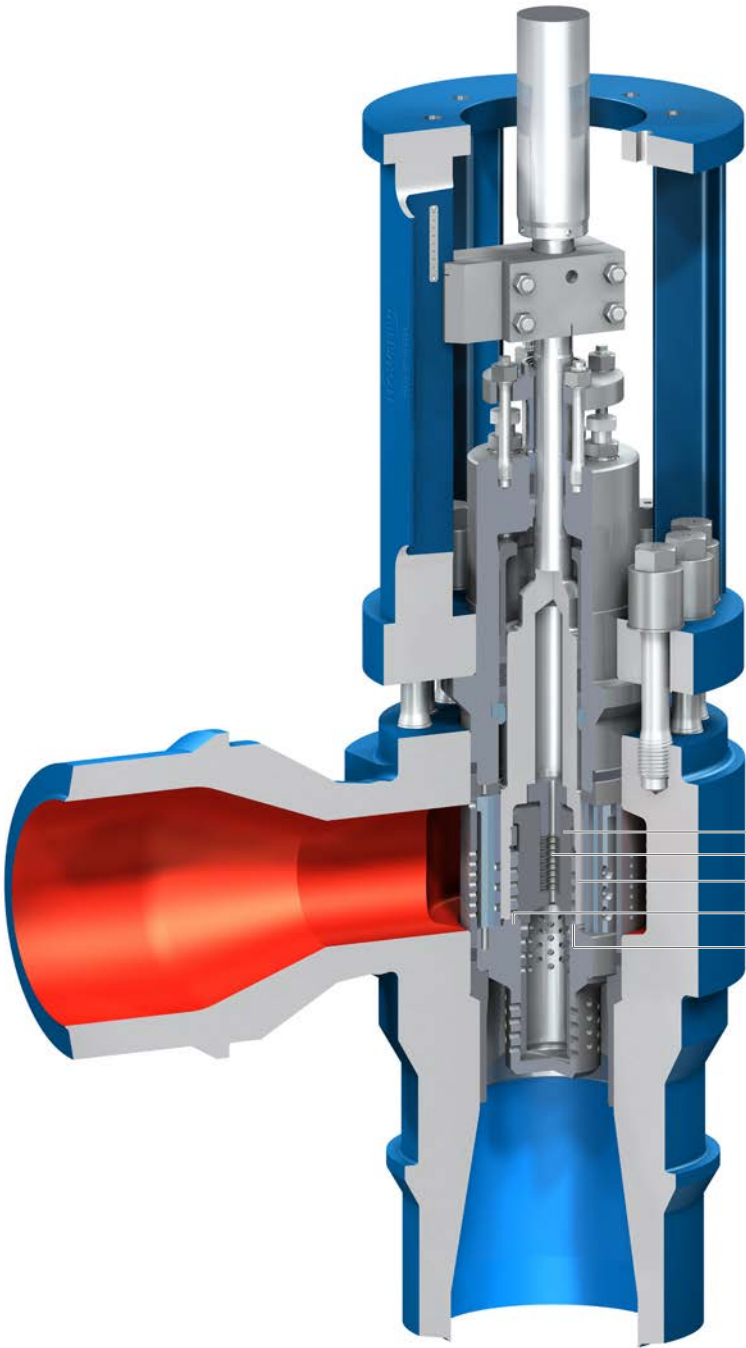


Special nozzle

$\Delta p_{\max}$  370 bar / 5365 psi  
(also in straight-through design)



# Control Valve ZK 213 with Tandem Shut-Off



6-stage nozzle with tandem shut-off,  $p_{max}$  8120 psi

## Control Valve ZK 213

$\Delta p_{\max}$  300 bar (4350 psi)  
 $k_{vs}$  10 – 90 m<sup>3</sup>/h (Cv 11.6 - 104 GPM)  
 $\Delta p_{\max}$  560 bar (8120 psi)  
 $k_{vs}$  10 – 70 m<sup>3</sup>/h (Cv 11.6 - 81 GPM)

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

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  $\Delta p_{\max}$  300 bar (4350 psi) or  $\Delta p_{\max}$  560 bar (8120 psi).

With this control valve, there is a choice of maximum differential pressures of  $\Delta p_{\max}$  300 bar (4350 psi) or  $\Delta p_{\max}$  560 bar (8120 psi) 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.



ZK 213 internals when new

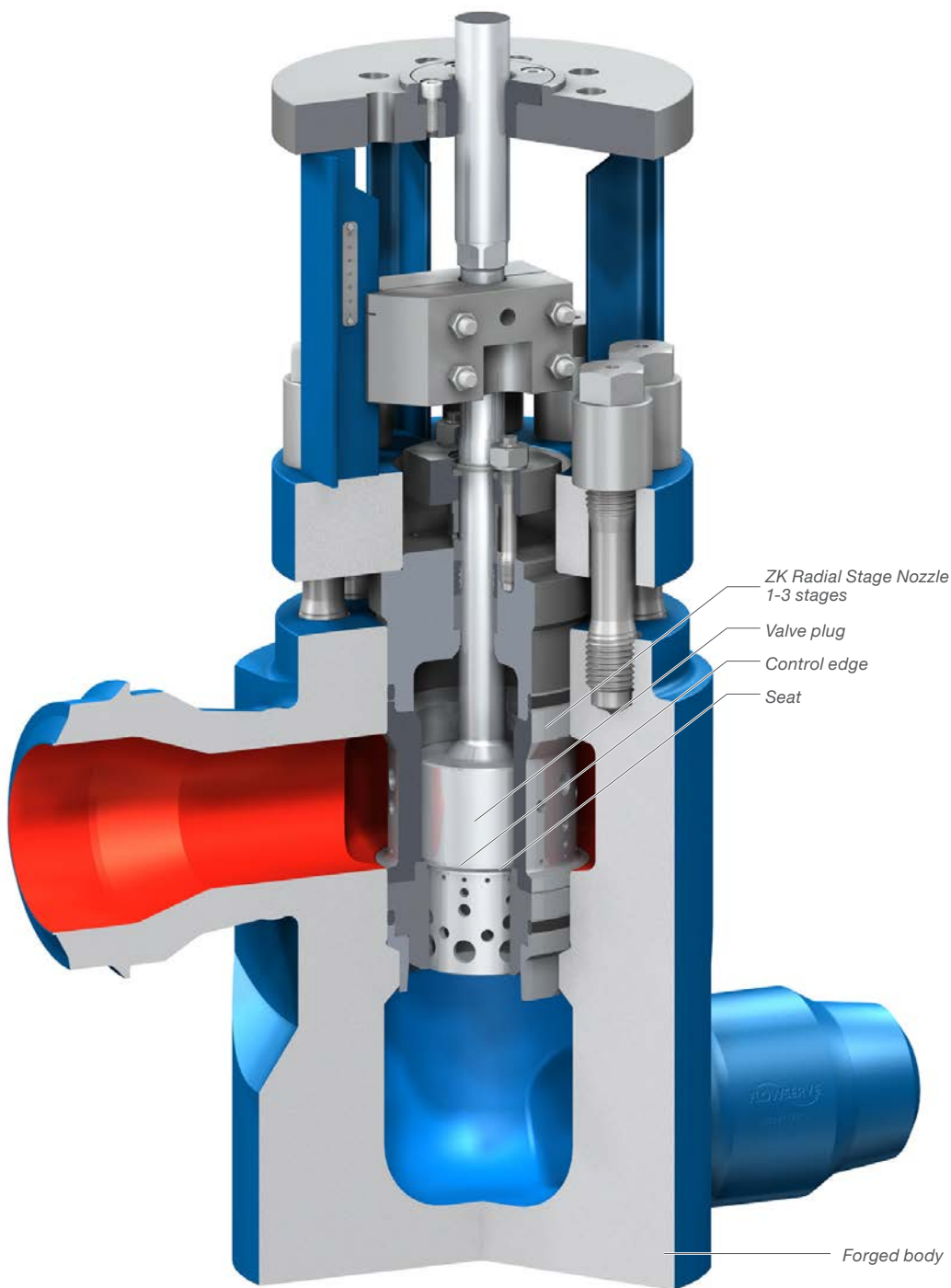


Internals of a leak-off valve ZK 213,  
 DN 100, after 13 years of operation with  
 $p_1 = 374$  bar (5420 psi),  $p_2 = 11$  bar (159.5 psi),  
 $t = 172$  °C (342 °F),  $\dot{m} = 35$  kg/s (277800 lbs/h)



# Control Valve ZK 610 and ZK 613

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## Control Valve ZK 610, ZK 613

**ZK610, PN 250**

**ZK613, PN 630**

$\Delta p_{\max}$  **40 bar (580 psi) –  $\Delta p_{\max}$  250 bar (3625 psi)**

$k_{vs}$  **13 – 969 m<sup>3</sup>/h (Cv 32 - 1120 GPM)**

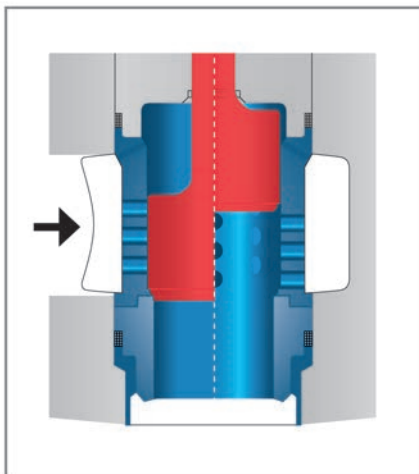
The control valve types ZK 610 and ZK 613 round off the ZK valve range with large  $k_{vs}$  (Cv) values. Thanks to the modular design, it is possible to adapt the throttling units optimally to the operating conditions. In addition, leakage-free pressure balancing can be used to reduce the actuating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

Connections	Butt-weld ends (EN, ASME)
Actuators	Electric (rotary or linear actuator), hydraulic, pneumatic
Body material	C22.8 (1.0460) equal to A 105
	16 Mo 3 (1.5415)
	10 CrMo 9 10 (1.7383) equal to F22
	<i>Other body materials on request</i>

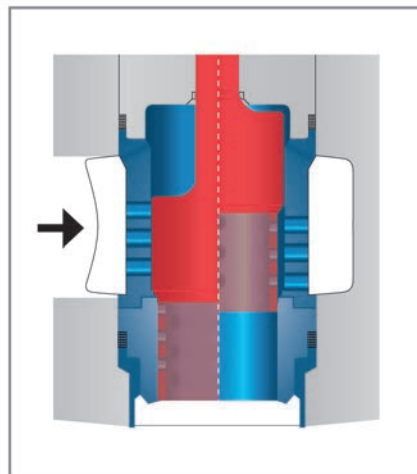
As with the ZK 29, the seating surfaces are protected against high flow velocities by means of a control edge at the valve plug. This design feature achieves the highest leakage-rate classifications according to EN and FCI with long service lifetimes. The entire ZK Radial Stage Nozzle including seat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

### Modular System of the ZK Radial Stage Nozzle for ZK 610, ZK 613

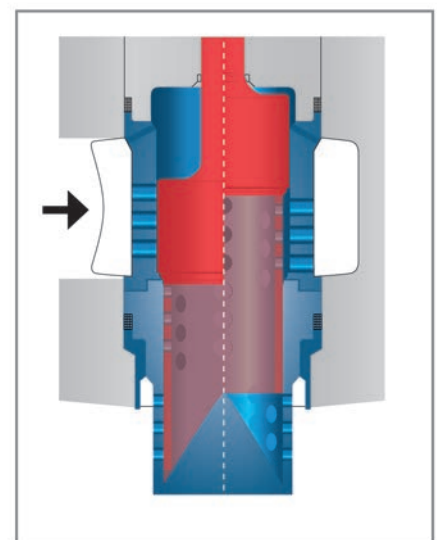
The multi-stage pressure drop is adapted precisely to suit the operating conditions.



1-stage expansion

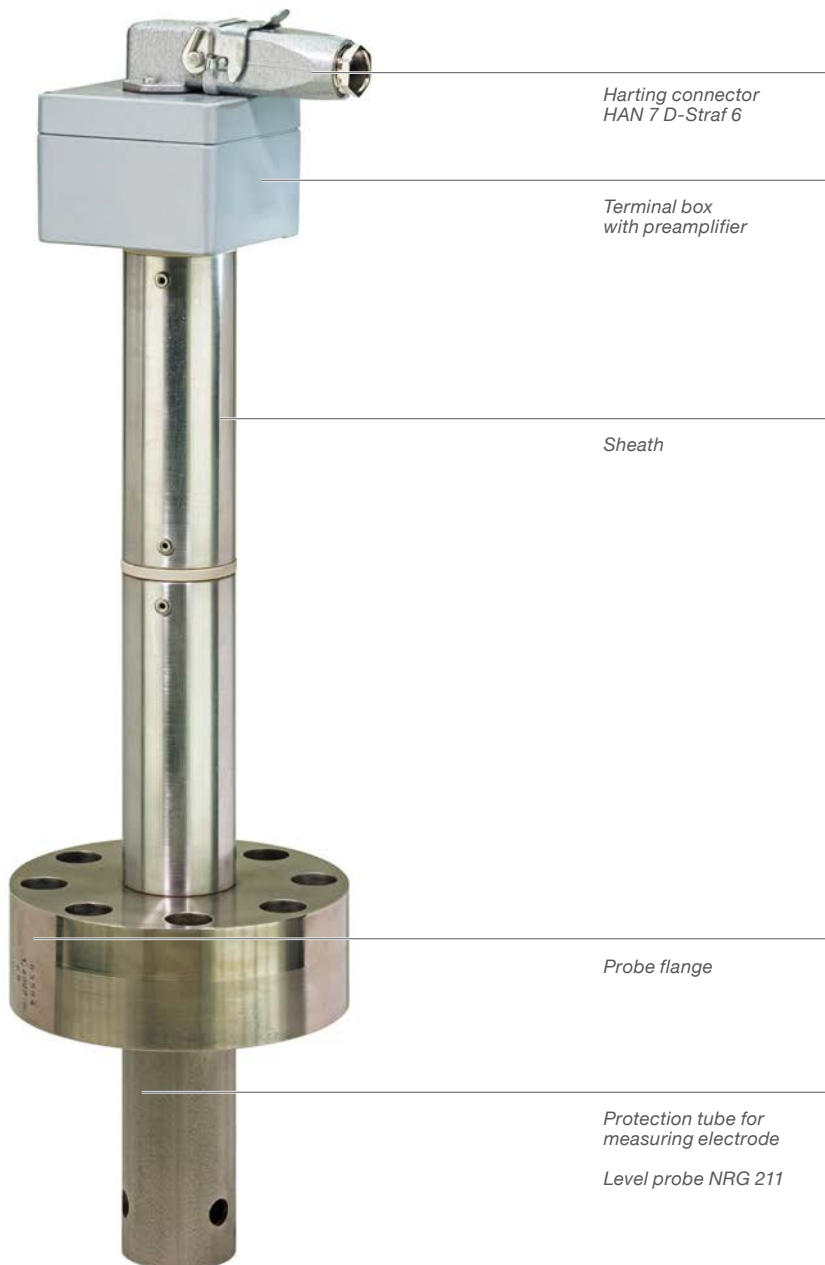


2-stage expansion



3-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. Regardless 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.

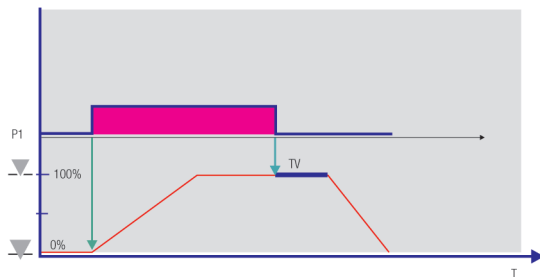
For this control and actuation, a distinction is made between one-stage and two-stage arrangements.

### Level probe NRG 211:

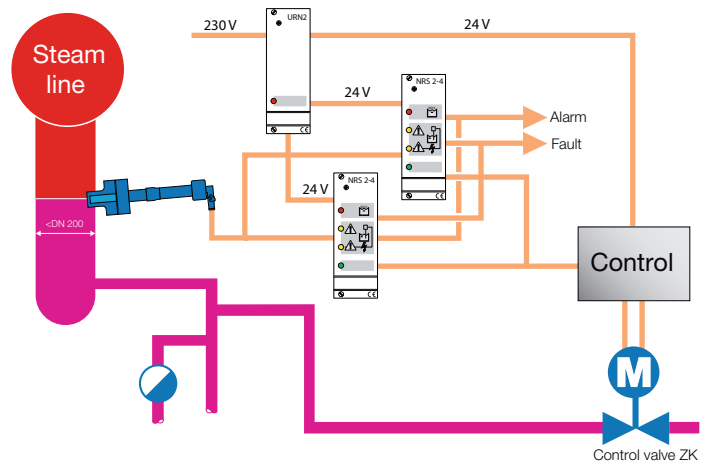
- PN 320 (4640 psi), up to 550 °C (1020 °F)
- Capacitive measurement system, works regardless of the conductivity ( $< 0.5 \mu\text{S/cm}$ )
- No moving control elements
- Ceramic insulation resistant to thermal shock
- Self-monitoring for short-circuits
- Cable lengths up to 500 m (1640 ft)

### 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

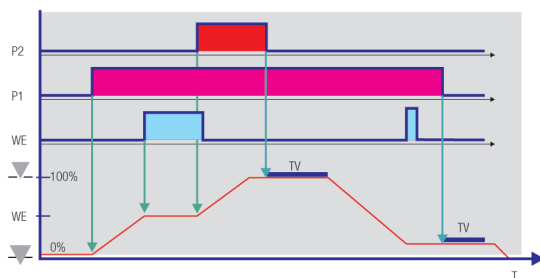


Controlled drainage using one probe and an optional steam trap

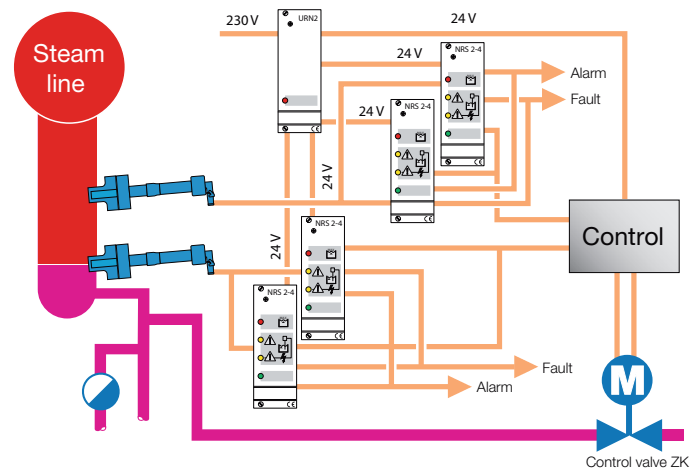
### Timing diagram for drainage using two probes

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 is 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 regulators for the toughest operating conditions (unaffected by water hammer 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 as 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 (3987 psi)

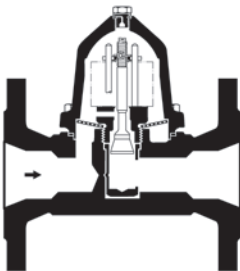


BK 212, DN 25, PN 630

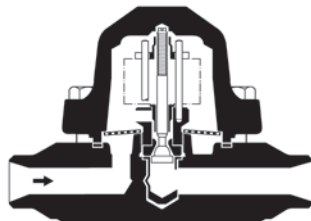
### Thermostatic Steam Trap BK from PN 63

Type	PN / Class	$\Delta$ PMX [bar]	[psi]	Materials		Connections
				EN	ASTM	
BK 37	PN 63/100	45	652	1.5415	A182-F1 <sup>1)</sup>	Flanged, socket-weld ends, butt-weld ends
BK 27N DN40, 50	PN 63	45	652	1.5415	A182-F1 <sup>1)</sup>	Flanged, socket-weld ends, butt-weld ends
BK 28	PN 100	85	1232	1.5415	A182-F1 <sup>1)</sup>	Flanged, socket-weld ends, butt-weld ends
BK 29	PN 160	110	1595	1.7335	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 212	PN 630	250	3987	1.7383	A182-F22	Flanged, socket-weld ends, butt-weld ends
BK 212-F91	—	250	3987	1.4903	A182-91	Flanged, socket-weld ends, butt-weld ends
BK 37-ASME	Class 400/600	45	652	—	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 28-ASME	Class 600	85	1232	—	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 29-ASME	Class 900	110	1595	—	A182-F12	Flanged, socket-weld ends, butt-weld ends
BK 212-ASME	Class 2500	250	3987	—	A182-F22	Flanged, socket-weld ends, butt-weld ends

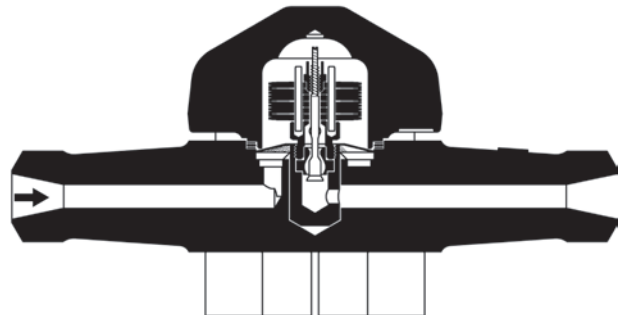
<sup>1)</sup> ASTM material comparable to EN material



BK 27N  
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



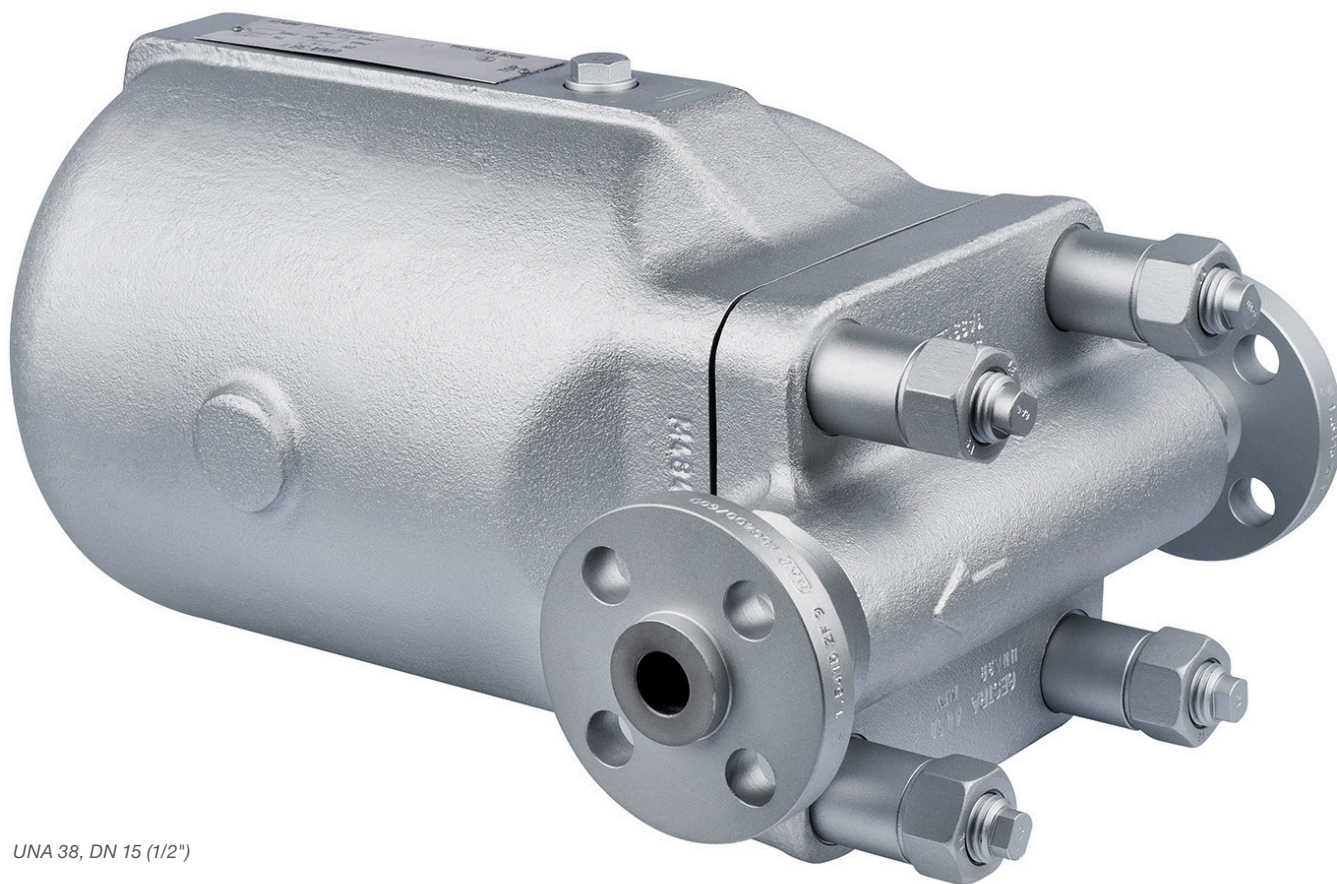
## Steam Traps for High-Pressure Applications

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### Steam Trap UNA with Ball Float up to PN 160 (Cl. 900)

#### 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 15 (1/2")

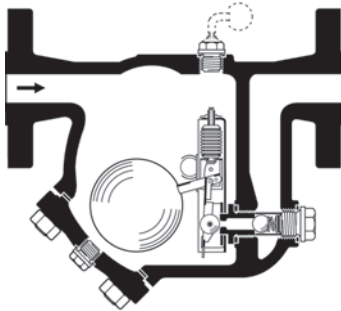


## Steam Trap Type UNA from PN 63

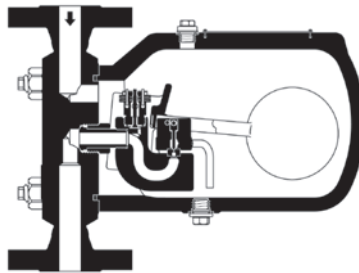
Type	PN	$\Delta$ PMX [bar]	$\Delta$ PMX [psi]	Materials		Connections
				EN	ASTM	
UNA 27h <sup>1)</sup>	PN 63	45	652	1.5419	A217-WC1 <sup>2)</sup>	Flanged, socket-weld ends, butt-weld ends
UNA 38	PN 100	80	1160	1.5415/ 1.7357	A182-F1 <sup>2)</sup> / A217-WC6	Flanged, socket-weld ends, butt-weld ends
UNA 38 High-temperature	PN 100	80	1160	1.7335/ 1.7357	A182-F12/ A217-WC6	Flanged, socket-weld ends, butt-weld ends
UNA 39	PN 160	140	2030	1.7335	A182-F12	Flanged, socket-weld ends, butt-weld ends
UNA Special	PN 63	45	652	1.5419	A217-WC1 <sup>2)</sup>	Flanged, socket-weld ends, butt-weld ends

<sup>1)</sup> Only available for installation in horizontal pipes

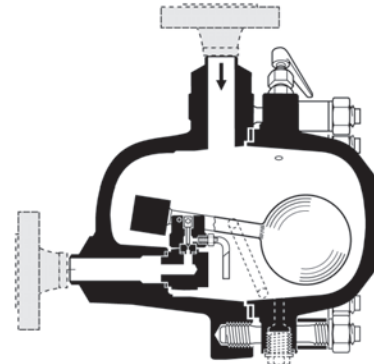
<sup>2)</sup> ASTM material comparable to EN material



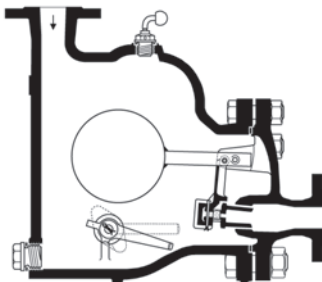
UNA 27h  
DN 25, 40, 50  
1", 1½", 2"



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



UNA 39  
DN 15, 25, 50  
½", 1", 2"



UNA Special  
DN 65, 80, 100



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