



# Power Generation Industry

Solutions to improve your plant performance



Engineering steam performance

# Delivering value to you

GESTRA has more than 100 years of experience as a steam solution provider.

We focus daily on the customer needs by providing a high level of technical support and a comprehensive set of solutions and reliable products aimed to optimize your plant performance.

Our solutions are designed to maximize the profitability and competitiveness of your assets by delivering the following values:

### › Flexibility

State of the art solutions that allow your plant to adapt to variable and fluctuating conditions

### › Productivity

Extremely reliable solutions that will reduce downtime

### › Energy saving

Engineered solutions that will help reduce Opex and CO<sub>2</sub> footprint

### › Maintenance reduction and ease of maintainability

Highly robust and reliable solutions that can reduce your maintenance activities



**COAL**



**GAS**  
(Combined Cycle)



**NUCLEAR**  
(balance of plant)



**WASTE TO ENERGY**



**BIOMASS**

More than 45 years experience in trouble shooting of severe service applications in the steam and water cycles.

We comply with ISO 9001, ISO 14001, OHSAS and we can provide products according to:

- › ASME
- › Pressure Equipment Directive PED
- › AD2000-HP0
- › ATEX IECEx Management Systems
- › Functional Safety Management System SIL
- › EAC
- › CRN
- › KTA1401
- › 100% production product testing on all products



# How can we support you?

## Providing solutions

Our expert sales engineers will support you throughout the entire process of improving your water, steam, and condensate loop by selecting the best fit solution according to your needs and plant specifications.

## Outstanding quality, reliability, ease of maintenance

State of the art technology products and solutions not only will enhance the plant performance but will also reduce downtime and relevant maintenance activities.

## Engineered solutions and best in class products

Our products are engineered and manufactured in Germany. Close and effective relationships with universities and powergen associations grant continuous development and improvement of our products. With an extensive and proven record of successful installations operated for years without failures we can deliver high value to our customers.



# Delivering you value

### Flexibility

- › Fossil fuel power plants, designed for operating at base loads, are now called to generate adapting to **variable loads** and considerable fluctuations.
- › Power plants must be able to **start up** and **shut down** over short periods of time, run at minimum load and rapidly change generation output.
- › Quicker start ups require minimum boiler depressurization, **efficient** condensate drainage, and **reliable** spraywater control valves.
- › **Zero leakage tight shut-off** control valves with specifically engineered trims able to handle extremely severe conditions and **effective steam traps** become a must.



### Productivity

- › The increasing importance of renewables causes the electricity demand from conventional power plants to be quite **variable**.
- › Fossil fuel power plants are more and more called to **frequently start up** and **shut down**, hence effective operational hours are decreasing and the equipment is subject to more **stressful conditions**.
- › Power plants must be as **productive** as possible when called in operation hence **reducing downtime** due to equipment failures becomes critical.
- › **Zero leakage tight shut-off** and **wear resistant** desuperheating spraywater control valves **eliminate** the risk of **thermal shock** in the steam loop as well as allow proper steam temperature control.



## Energy saving

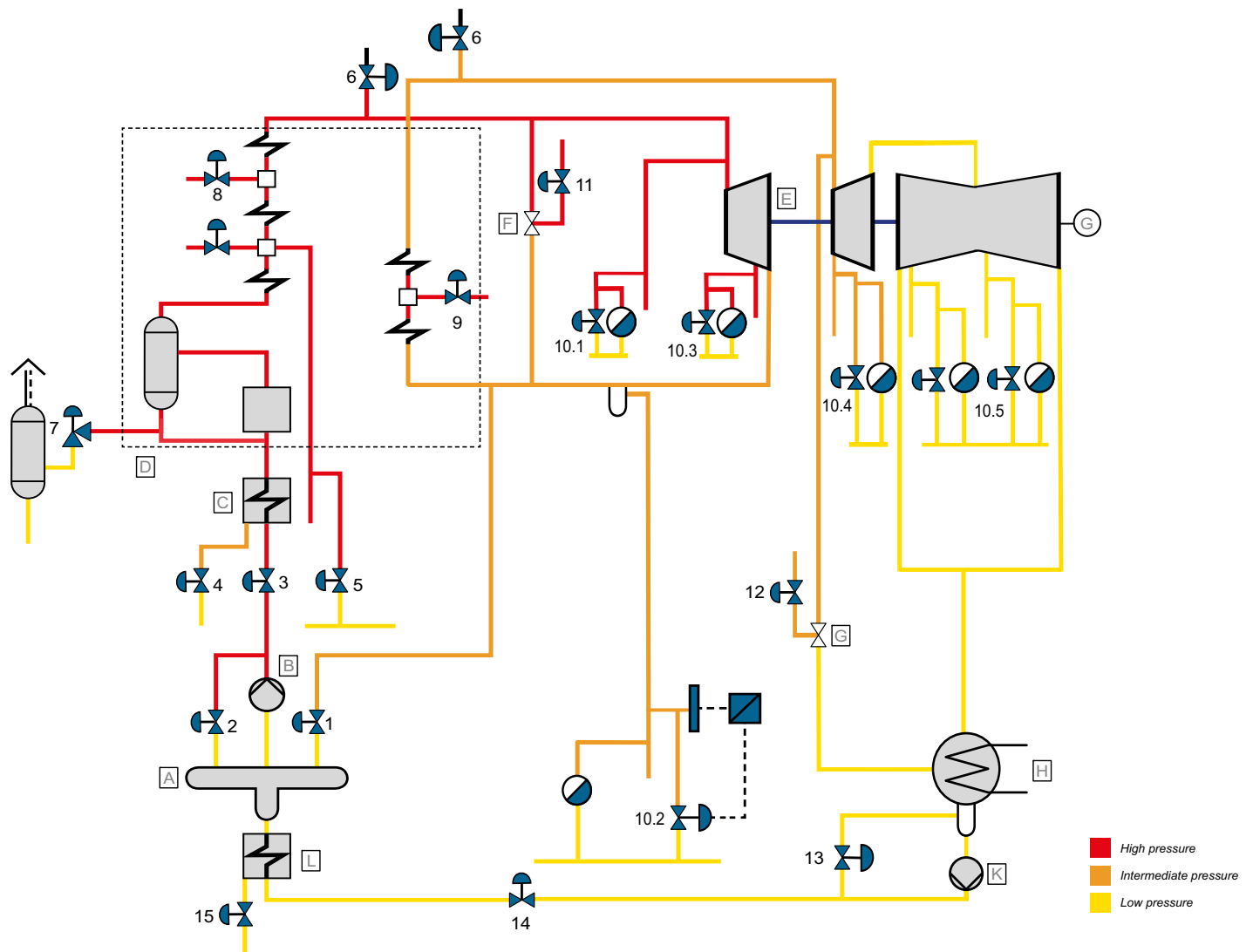
- › The increased number of start ups requires a strict **control of the losses** in the steam-water loop.
- › **Minimizing** high value steam losses such as flash steam to atmosphere not only will reduce **water makeup** and relevant treatment **costs** but will also have a positive impact on the **CO<sub>2</sub> footprint** and enhance plant **efficiency**.
- › **Zero leakage tight shut-off** drain valves and effective steam traps become a must.



## Maintenance reduction and ease of maintainability

- › Power plants flexibility and productivity are highly influenced by equipment **reliability**.
- › **High degree of reliability** reduces **maintenance costs** and avoids unforeseen **downtime**.
- › **Robust and wear resistant valves** require **less maintenance** and at the same time a quick change trim design reduces maintenance time.

# Optimizing your plant performance



Application		Pressure		Temperature	
		(psi)	(bar)	[°F]	(°C)
A	<b>Feedwater tank</b>				
	1 Heating system valve	~725	~50	~750	~400
B	<b>Main feedwater pump</b>				
	2 Feedwater leak-off valve	up to 8120	up to 560	~430	~220
	3 Feedwater control valve	up to 8120	up to 560	~430	~220
C	<b>High pressure pre-heater</b>				
	4 Condensate drain control valve	290-870	20-60	~570	~300
D	<b>Boiler plant</b>				
	5 Boiler drain valve	up to 4785	up to 330	up to 1150	up to 620
	Soot-blower warm-up valve	~725	~50	570-660	300-350
	Soot-blower steam valve	up to 4785	up to 330	1020	550
	Boiler circulation control valve	2610-4785	180-330	~250	~250
	6 Boiler vent valve	up to 4785	up to 330	up to 620	up to 620
	7 Start-up pot drain valve	2610-4785	180-330	~840	~450
	8 High pressure spray attemperator valve	~4060	~280	~430	~220
	9 Intermediate pressure spray attemperator valve	~725	~50	~430	~220
E	<b>Turbine plant</b>				
	10.1 Live steam drainage	up to 4785	up to 330	up to 1150	up to 620
	10.2 Cold reheat line drainage	~725	~50	~750	~400
	10.3 High pressure turbine drainage	up to 4785	up to 330	up to 1150	up to 620
	10.4 Intermediate pressure turbine drainage	~870	~60	up to 1150	up to 620
	10.5 Low pressure turbine drainage	<290	<20	<750	<400
F	<b>High pressure bypass station</b>				
	11 Spray injection valve	up to 5075	up to 350	~430	~220
G	<b>Intermediate pressure bypass station</b>				
	12 Spray injection valve	up to 3625	up to 250	~430	~220
H	<b>Condenser</b>				
K	<b>Condensate pump</b>				
	13 Condensate leak-off valve	145-290	10-25	~85	~30
	14 Condensate control valve	145-290	10-25	~85	~30
L	<b>Low pressure preheater</b>				
	15 Condensate drain control valve	~6-75	~0.4-5	~85	~30

# Severe service applications for water and steam

## Spray water control (8, 9, 11, 12)

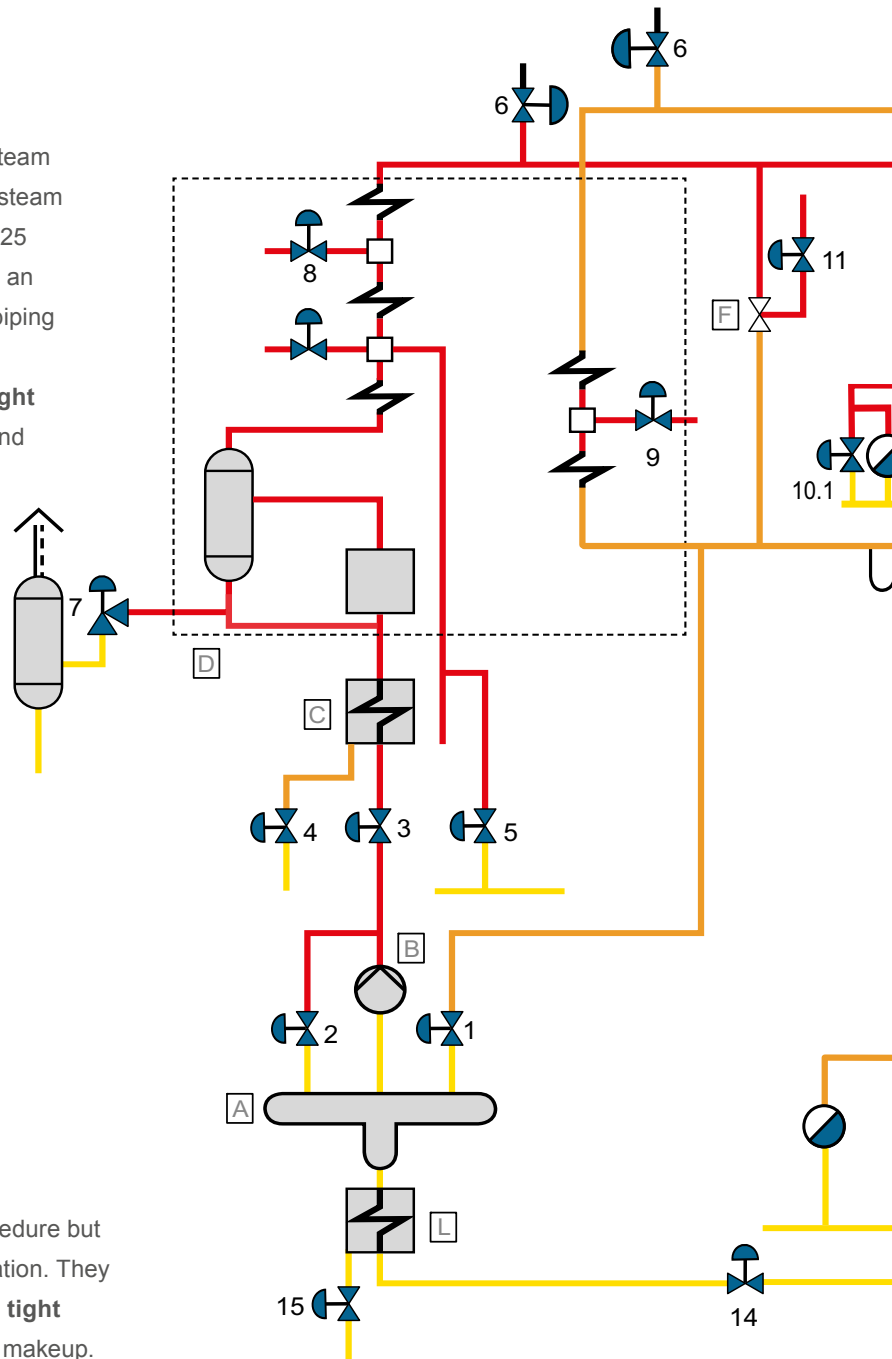
These valves control the water flow required to keep the steam temperature of the superheater/reheater at the requested steam turbine set point. Fed from the feedwater pump between 725 to 4060 psi / 50 to 80 bar, this high pressure drop requires an anti-cavitation trim for proper operation and downstream piping longevity. Additionally, accurate flow control is required to maintain the steam temperature setpoint. **Zero leakage tight shut-off** valves avoid thermal shock in the steam piping and turbine bypass stations.

## Feedwater pump recirculation (2)

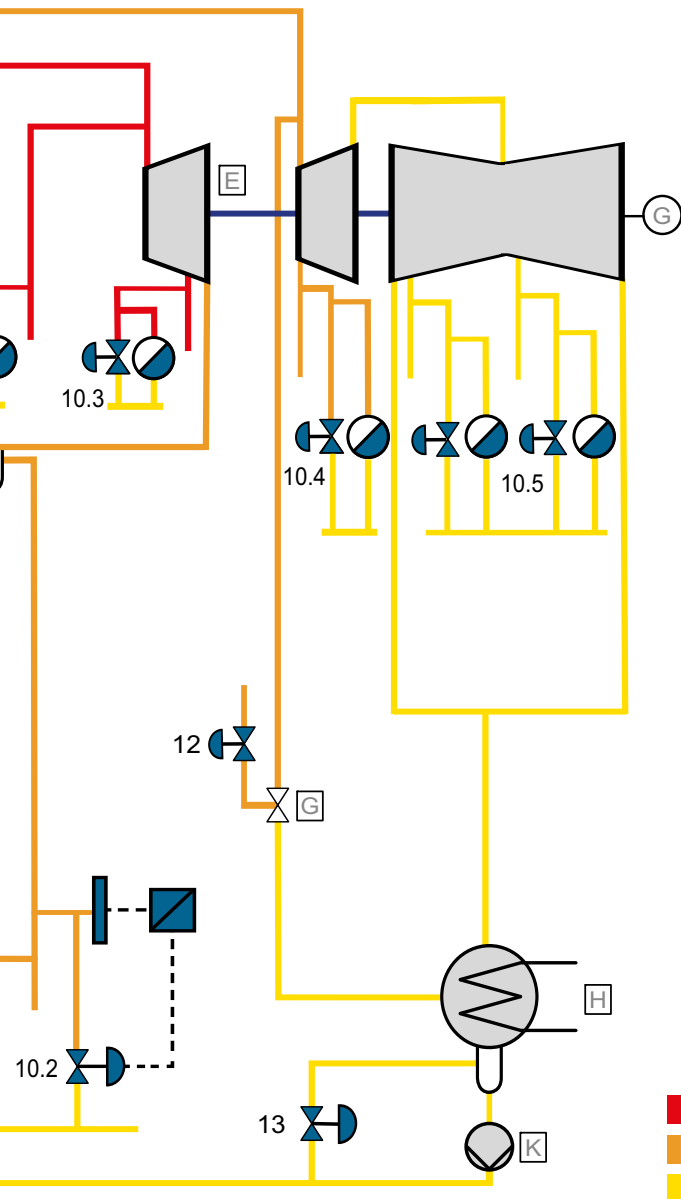
This is one of the toughest and most important applications in a power plant: This valve operates mostly during the boiler start up to protect the feed pump against cavitation damage. Differential pressure can reach 7250 psi / 500 bar hence a special anti-cavitation trim is required. Additionally, a **zero leakage tight shut-off valve** avoids energy losses.

## Boiler vent valves (6)

These valves operate mostly during the plant start up procedure but also have a safety function in case of boiler overpressurization. They handle high steam flow rates hence must be **zero leakage tight shut-off** in order to avoid energy losses and reduce water makeup.



# Severe service applications for flashing water



## Blow down, drain, and warm up (4, 5, 7, 10, 15)

These valves operate during the plant start up procedure. They handle flashing condensate coming from the boiler, steam lines, and the turbine. Specific trim design and special erosion proof materials are used to handle the 2-phase flow at high differential pressures (up to 3200 psi / 220 bar). **Zero leakage tight shut-off valves** avoid energy losses, reduce water makeup and allow quicker hot start ups. Effective steam traps contribute to energy saving drainage.

## Controlled drainage with probes (10)

In nuclear power stations drain valves are continuously in operation since handling saturated/wet steam. In fossil fuel power stations cold reheat lines must be completely drained in order to avoid waterhammer and damage to reheaters. Level probes detect condensate and provide the signal to open and close the drain valves. They can also provide a fail safe function in order to ensure drainage. Specific trim design and special erosion proof materials are needed to handle the 2-phase flow during operation.

# GESTRA solutions for severe service applications

## ZK valves

### ZK valves with radial multi-stage nozzle

- › Pressure rating up to ASME Class 2500
- › Max. differential pressure up to 8120 psi / 560 bar
- › Materials A105 up to F91
- › Metal to metal zero leakage tight shut-off  
(Tested to EN12266-1 Leakage Rate A, which has a lower allowable leakage than ANSI FCI 70-2-2006 Class VI)
- › Combined isolation and control valve
- › Quick change trim
- › Suitable for electric, pneumatic and hydraulic actuators
- › Adjustable Cv values and characteristics ensure high flexibility
- › Low noise



## Steam traps

### BK thermostatic steam traps



- › No steam losses
- › Energy efficient
- › High reliability

### UNA float steam traps



## Non-return valves

### Wafer type RK and BB dual plate

- › Energy efficient
- › High reliability
- › Minimum pressure losses
- › Long service life



## Level probes

### NRG level probes

- › Up to PN 320 (4640 psi)
- › Max. temp. up to 1020°F / 550°C
- › Capacitive measurement system - SIL 2 safety rating according IEC61508
- › Small HMI for easier setup and calibration
- › Plug and socket connection and preconfigured cable available for faster installation





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