

HP Bypass Stations, IP/LP Bypass Stations and Reheater Safety Valves

for Bypass Stations and Process Applications



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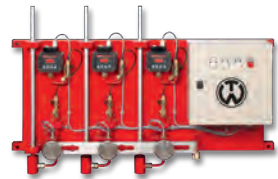
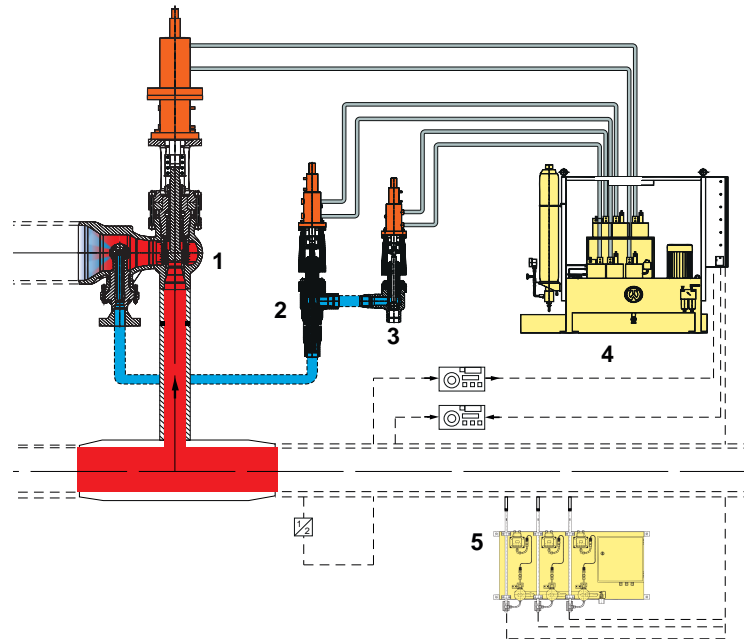
1. HP Safety Steam Converting Valve Type 700



2. Cooling Water Control Valve



3. Shut-off Valve



5. Steam Pressure Test Device



4. Hydraulic Station



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SIL3-Certificate

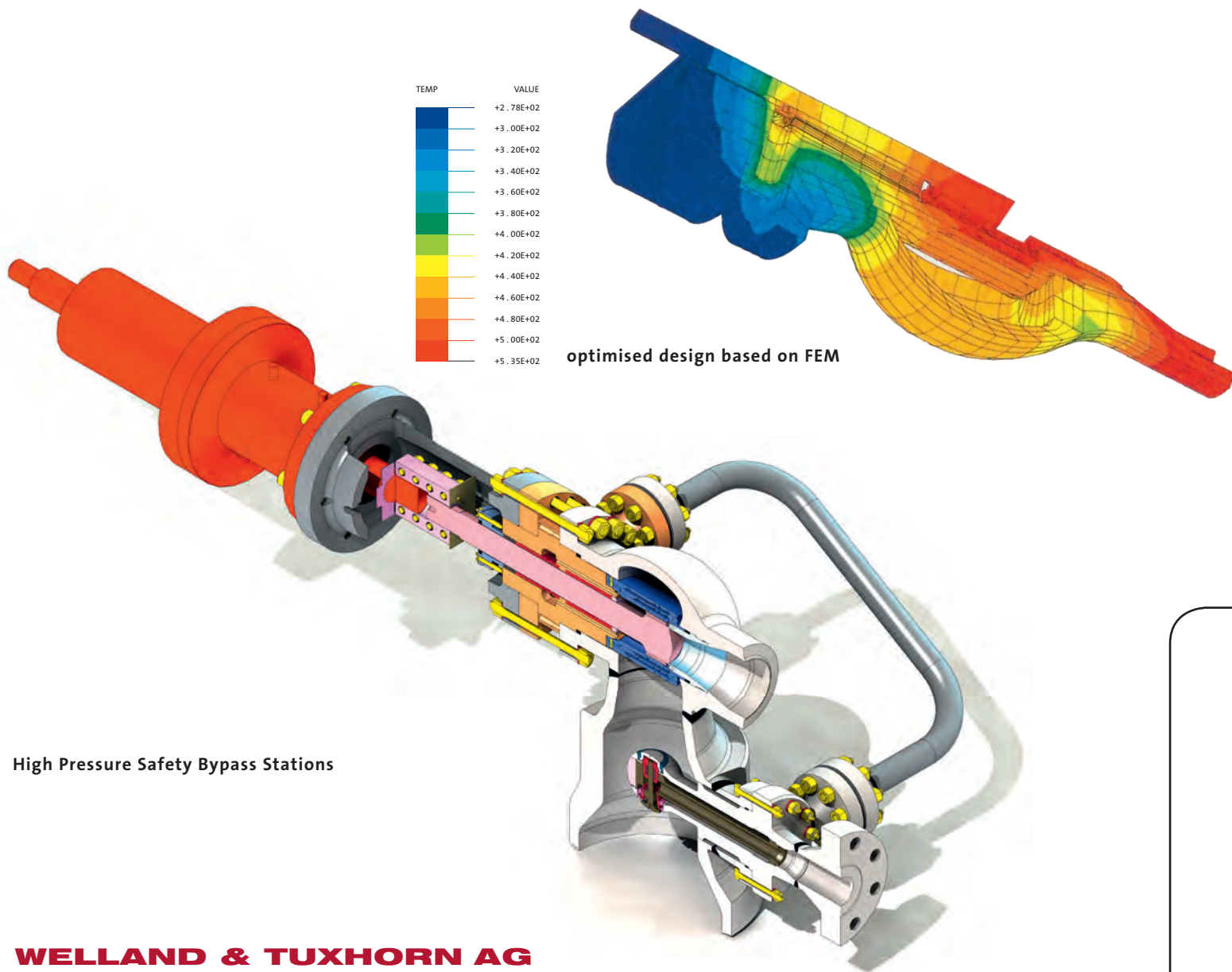
High Pressure Safety Bypass Stations

Components / Functional Diagrams

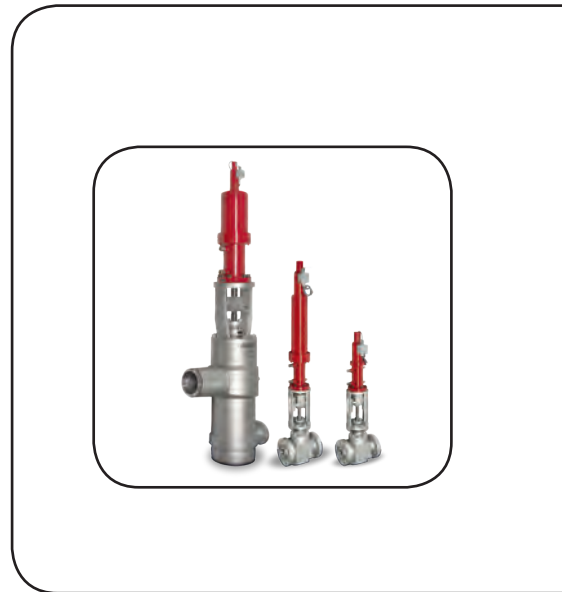


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High Pressure Safety Bypass Stations



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High Pressure Safety Bypass Stations

Functioning Principle

The station performs the following tasks

1. Function as HP overflow station
2. Function as safety valve
3. Function as steam converting valve

As an **HP overflow station**, it ensures a safe current flow through the reheater and the independent operation of the steam generator, even when the turbine inlet is closed. In addition, during start-up and shut-down operations, as well as load dropping or load failure incidents, it regulates the live steam pressure.

As a **safety valve** it prevents the pressure quota for the boiler design from being exceeded. The safety function is also maintained when the system is operated with variable pressure with reduced live steam pressure.

The station functions as a **steam converting valve** by ensuring that both the steam pressure and the steam temperature are already set to the parameters for the signal converter line just after the injection point.

The following is the (recommended) distribution for the various block sizes:

< 300 MW	: 1 HD - Station
≥ 300 MW - 500 MW	: 2 HD - Stationen á 50%
600 MW - 1200 MW	: 4 HD - Stationen á 25%



	Inlet	Outlet
Nominal width	DN 100 to 400 / 4" to 16"	DN 250 to 800 / 10" to 32"
Materials	WN 1.7335 / SA 182 F12 · WN 1.7383 / SA 182 F22 WN 1.4903 / SA 182 F91 · WN 1.4901 / SA182 F92	
Process connection	Welding ends of all types	
Nominal pressure	PN 16 to 800 / Class 150 to 4500	PN 16 to 250 / Class 150 to 900
Seat - Ø	80 - 165	
Seat and cone	WN 1.4122, > 560 °C on request	
Seat-cone seal	Metallic / ANSI V / DIN EN 12266-1	
Guide bushing	WN 1.7383 nitrified or stellite	
Stuffing box	Pure graphite	
Characteristic	Equal percentage / linear	
Pressure Reduction	1-stage control by control piston in perforated cylinder, additionally throttle cylinder	
Rangeability	> 1:30	

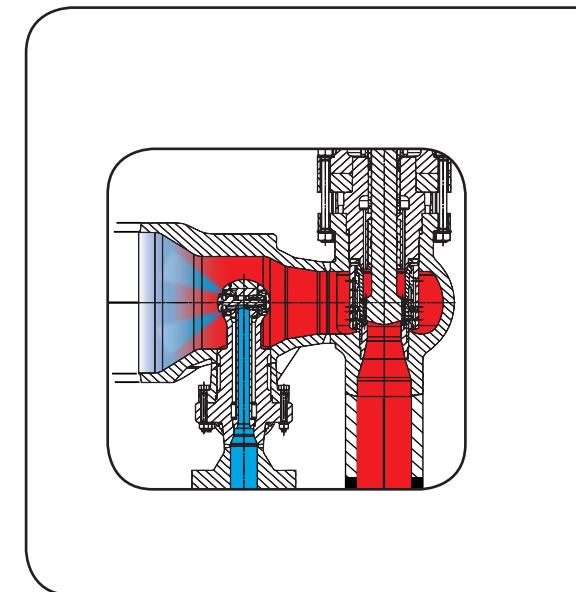
Technical modifications reserved

You will find more information in our detailed technical paper

HP Bypass Stations
LP Bypass Stations
Reheater Safety Valves - a complete system



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High Pressure Safety Bypass Stations

Technical Information

High Availability

- For universal use
- Optimum steam conversion over the entire load range due to integrated motive steam nozzle
- Optimum water/steam mixing already just after the injection point
- Low-delay steam cooling, in particular in the event of partial loads
- Low-noise and low-vibration operation
- All wear parts can be replaced on site





LP-Bypass Station



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Intermediate Pressure / Low Pressure Bypass Stations

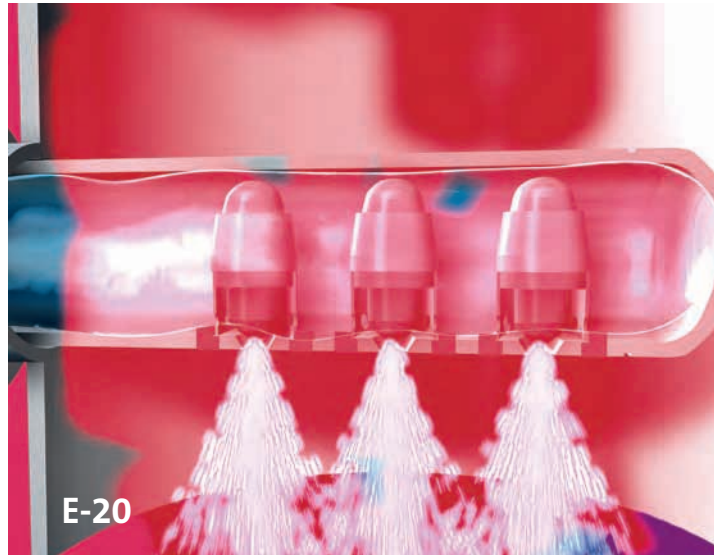
Tasks

The IP/LP bypass station connects the hot reheat line in the bypass to the IP/LP turbine with the condenser.

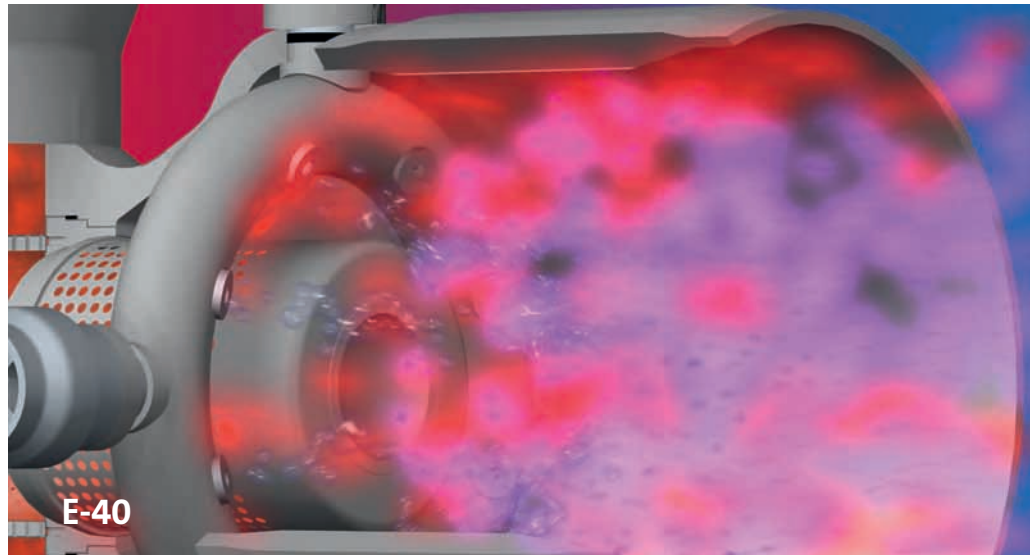
The following tasks are performed by the IP/LP bypass valves:

- Normal control during the start-up and shut-down processes.
- Fast opening in the case of a turbine failure.
- Fast closing if condenser must be protected for pressure and/or temperature reasons.
- Bypass operation if turbine is not operating.





Lance with pressure-controlled nozzles



Ring nozzle

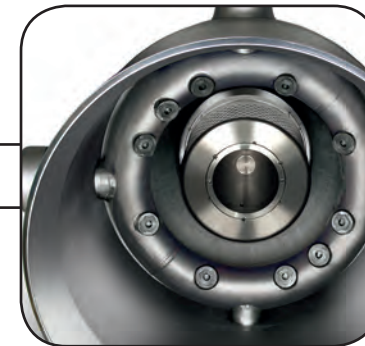


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Intermediate Pressure / Low Pressure Bypass Stations

Structure and design



Structure/Design

IP/LP bypass stations consist of the main valve with integrated cooling water injection, the cooling water control valve, the cooling system, the positioning cylinders and the hydraulic supply unit.

The main valve, as a steam pressure reduction valve, is usually designed with additional pressure- and noise-reduction units.

The relatively low steam pressure often requires a large seat diameter. Due to the condenser vacuum on the outflow side, a shut-off valve is often installed in front of the main valve.

Thus the double-shut-off before the vacuum side enables loss of effectiveness to be avoided efficiently.

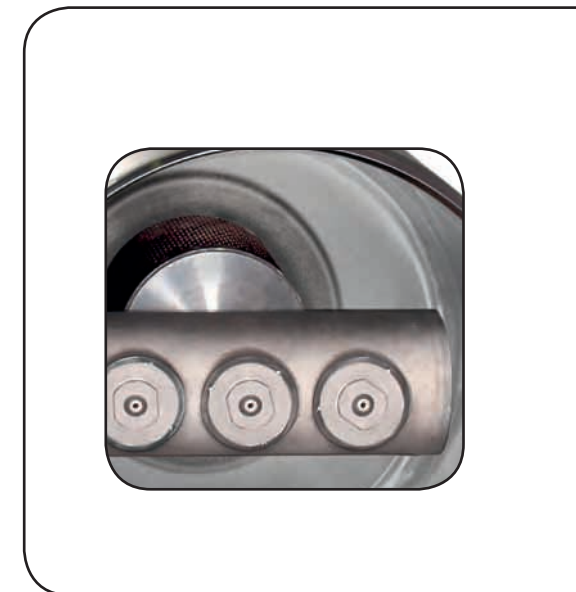
The valve assembly, consisting of shut-off and control valve, can be produced as a complete unit.

	Inlet	Outlet
Nominal width	DN 200 to 800 / 8" to 32"	DN 500 to 1600 / 20" to 64"
Materials	WN 1.0460 / SA 105 · WN 1.5415 · WN 1.7335 / SA 182 F12 · WN 1.7383 / SA 182 F22 WN 1.4903 / SA 182 F91 · WN 1.4901 / SA 182 F92	
Process connection	Welding ends on all models	
Nominal pressure	PN 16 to 250 / Class 150 to 1500	PN 16 to 100 / Class 150 to 900
Seat and cone	WN 1.4122, > 560 °C on request	
Seat-cone seal	Metallic / leakage class ANSI IV and V / DIN EN 12266-1	
Guide bushing	WN 1.7383 nitrified or stellite	
Stuffing box	Pure graphite	
Characteristic	20% equal percentage, 80% linear	
Pressure Reduction	1-stage control by control piston in the perforated cylinder, additionally 2nd stage with perforated cylinder on seat	
Rangeability	> 1:30	

Technical modifications reserved



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Intermediate Pressure / Low Pressure Bypass Stations

Technical Information



High Availability

- Best cooling over the entire load area by sequential opening of pressure-controlled nozzles (E20) and conceptual consideration of larger outlet sizes by the use of radial nozzle arrangement (E40)
- Optimised spray angle and minimised drop size, taking into account the latest research results
- Compact design due to steam pressure reduction by control piston or flow restrictor
- Suitable for high-temperature applications
- Can be delivered in combination with customer specified dump tube
- Low-noise and low-vibration operation



Dump Tube

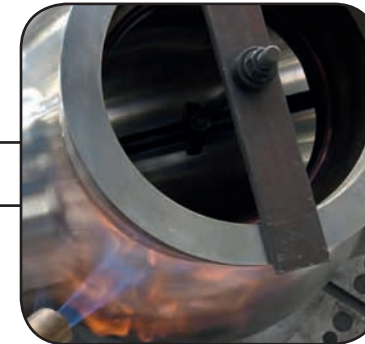


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Dump Tube

Tasks



Due to the type of injection, E20 / E40 steam converting valves are intended for use as medium- and low-pressure bypass stations. The outlet of these valves, for example, is often close to or directly in front of the condenser. Diversion and surplus production steam is to be set to the required condenser parameters on a piping section between the valve outlet and condenser, which is as short as possible. The steam enters the condenser,

relieved in several stages, by means of perforated cones and cylinders.

The use of so called dump tubes reduces the investment costs for these relieving stages:

- Reduction of pipe length and diameter between bypass valve and condenser
- Optimised and coordinated design of bypass valve and dump tube

- Special design of dump tubes for the respective application by selecting an adjusted perforation distribution to avoid damage caused by droplet impact* on the condenser pipes.

*Droplet impact erosion on the condenser pipes occurs when the water drops incidental to the wet steam impact directly on the pipes at high speeds ($v > 200$ m/s).



Reheater Safety Station



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Reheater Safety Station

Tasks

Reheater safety valves are used to protect against overpressure at the reheater. When the valve opens, the hot reheater steam is blown off via the connected rising pipe and an attached exhaust box, over the roof into the atmosphere. Thus the valves interrupt the otherwise closed water-steam circuit. Steam cooling is not implemented here, as in the HP safety steam converting valve or the IP/LP bypass station.



Precise Planning

Steam converting stations consist of the actual steam converting valve and the related cooling water control valve, the two coordinated with each other. For the system to function optimally, it is very important that the installation with each other is performed correctly.

Steamlines

Do not plan any bends immediately before or after the valve!

- Reference values for straight pipe lengths:
 - Incoming pipe ca. 5 x DN IN
 - Outgoing pipe ca. 10 x DN OUT, at least ~ 3 - 5 m, depending on the nominal width and the tasks to be performed
- Lay incoming pipe if possible with incline against the direction of flow: implement the drainage unit at the lowest point and do not use drainage nozzles that are too small.
- Be sure to avoid condensate accumulations! (Risk for pipes from water impact and erosion).



Precise Planning

Individualised installation instructions for the high availability

Condensate can accumulate if the valve is not operated for longer periods.

- Warming-up and heating lines prevent the formation of condensation and reduce critical thermal stresses during start-up and shut-down.
- Adhere to the recommended start-up curves (risk of excess stress situations). Length expansions should only occur slowly.
- The steam converting valve and the cooling water control valve must be installed on a platform, not too far from each other, with the cooling water control valve on the same level or slightly lower than the injection point of the steam converting valve.

- Vertical positioning of the spindle enables problem-free maintenance and shortens the installation time.
- Implement the supply of the cooling water with symmetrical, ascending installed cooling water pipes. This ensures a continuous, delay-free water supply to the injection point of the steam converting valve and prevents idle flow when operation is interrupted.



Cooling water lines

Implement cooling water lines with sufficient elasticity to allow for relative movements between the steam pipe system and the cooling water line system.

It is well-known that not all of these points can always be realized in practice. Shortage of available space frequently means that compromises must be made. Therefore contact our engineers in time to develop the best solution for your needs.



Cooperating to achieve our goals

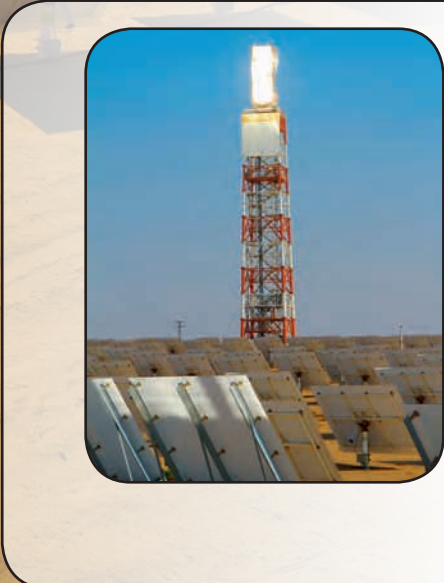
Fine-tuning in all areas

Single-unit and limited-lot production requires up-to-date technology and highly-qualified personnel. Our customer-friendly service, consistent with theory and practice, is based on working closely together with planners and operators, and research projects at renowned technical colleges and institutes, and is the result of decades of experience worldwide. Innovative solutions are developed by our experienced employees, and in cooperation with universities and scientific institutions. Thus the high technological standard at Welland & Tuxhorn is continually improved.

Welland & Tuxhorn guarantees the best possible consultancy, expert knowledge and ideas, system-specific solutions, first-class raw materials, know-how, expertise and commitment from a highly-motivated team. An experienced team of trained and highly-specialised service personnel is continually at work all over the world, cooperating closely with the operating companies, in carrying out commissioning tasks, required inspections and maintenance work. This ensures the best possible customer support. Our maintenance department inspects the parts and fittings to check whether they are still fit for use



and maintains them expertly, thereby gathering new information that is integrated into the design and material technology areas. Individual situations require expertly tailored solutions. We provide you with expert support for complex tasks. Talk to our engineers and technicians and find the solution that is best for you!



Our Contribution to Climate Protection

Environmentally-conscious products for the future

Our contribution

Using resources sparingly is our sustainable contribution to climate and environmental protection.

Our high development and quality standards also apply to protecting nature and society. Already in the design phase of our operating processes we ensure that energy and fresh water consumption is kept as low as possible. Precise planning, forward-thinking organisation and detailed fine-tuning ensure that all processes from the development to the actual product are checked and opti-

mised with regard to ecological saving potential. From products which boost efficiency for high-efficiency power plants to solar thermal systems, we are assuming responsibility for the climate. And we are investing in high-temperature research and CO₂ minimisation for the benefit of the coming generation. And with our products we make a contribution to meeting the increasing worldwide energy requirement in an efficient, ecological and socially acceptable way.

Since time immemorial: Less consumption means more for everyone.



Certificate Water Resources Law



WELLAND & TUXHORN AG



Made In Germany

You will get a top product made by German valve specialists

Our philosophy

A high level of precision, processing quality and durability have distinguished the development and production processes at Welland & Tuxhorn for over 100 years. Continuously working together with renowned power station planners and operators and with technical and scientific institutes, we have gathered theoretical and practical experience and applied this to consistently optimise our products. The proof is in our success - special regulating valves from Welland & Tuxhorn are operating all over the world!

Our quality

Our consistently high product quality is the result of a well-thought-out concept: we implement a range of quality assurance measures and comply with all the requirements of DIN EN, VdTÜV, AD-2000, TRD, as well as ASME, ANSI, IBR and RTN. Our quality assurance system is approved by the following regulations: DIN EN ISO 9001:2000, Directive 97/23 EG (DGRL), KTA 1401 and ASME. We have our products inspected and evaluated by recognised authorities.

Our service

After a product is delivered, an experienced team of service technicians is available for consultation during the start-up phase, or to carry out routine inspection work. Maintenance is integrated into our production process. Inspections as to continued usability and expert maintenance in the light of the latest expertise in material technology and design, are carried out by our highly qualified personnel.

Contact us – our engineers and technicians will provide you with individual and expert advice.





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And finally

We look forward to working with you



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