DATA SHEET

T 3972 EN

Water Bath Desuperheaters

For desuperheating superheated steam to saturated steam temperature

Application

Water bath desuperheater to convert superheated steam into saturated steam

Steam conditioning with extremely precise temperature control during steam output over the entire load range

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Operators who run processes heated with saturated steam are often faced with the challenge that only superheated steam exists on site.

The water bath desuperheater is the only solution to safely generate saturated steam conditions.

Steam conditioning valves or spray nozzles can only cool down the steam to approx. 5 to 15 °C above the saturated steam temperature at the maximum.

The water bath desuperheater can additionally be fitted with a pressure control unit if the steam has a higher pressure or a controllable saturated steam pressure is required.

Processes heated with saturated steam often require small amounts of steam at varying output between 0 % and 100 %. In this case, the water bath desuperheater is ideally suited since it guarantees perfect desuperheating over the entire load range.

Special features

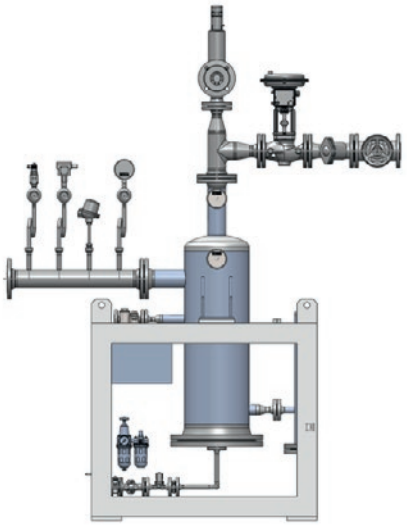
- Desuperheating of superheated steam to saturated steam temperature
- Extremely precise temperature control (< 0.1 K in steady-state operation)
- Steam mass flow control range from 0 to 100 %
- No outlet section required
- No steam hammering even at high load changes

Water bath desuperheater versions

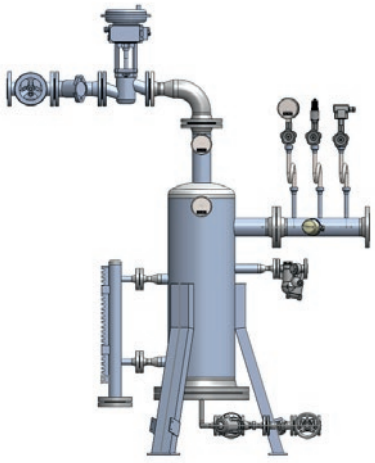
Standard version

Design pressure 11 bar · Design temperature 210 °C · Max. saturated steam temperature 184.1 °C · Standard pressure vessel sizing according to AD 2000 Code and PED 2014/68/EU

Pressure vessel material made of non-alloy steel or stainless steel · Version as turnkey system ready for connection · Unit mounted on feet (up to DN 600) or skid-mounted unit · Version with liquid level and pressure control or with terminal box



Skid-mounted water bath desuperheater



Water bath desuperheater on feet (up to DN 600)

Fig. 1: *Water bath desuperheater versions*

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Edition March 2019

Special versions

– Higher design pressure on request
– Higher design temperature or saturated steam temperature on request
– Pressure vessel sizing according to other standards or directives on request

Fields of application

The process medium comes into **direct contact** with the saturated steam:

- Steam agers and decatizing vessels in the textile industry
- Pasteurizers in the food industry
- Sterilizers in the chemical industry
- Steam boxes in the pulp and paper industry
- Slaughterhouses

The process medium has **indirect contact** with the saturated steam. Heat exchangers are used to heat the medium to avoid overheating.

- Heat exchangers for pasteurizers and sterilizers in the food industry
- Heating systems for dry rolls in the paper industry
- Heating systems for reaction vessels and pipelines in the chemical industry
- Temperature limitation in hazardous areas

Principle of operation (see Fig. 2)

The water bath desuperheater makes use of the correlation between the saturated steam's temperature and pressure. The temperature is controlled based on the saturated steam pressure since the pressure of the saturated steam is related to a certain saturated steam temperature. As a result, an extremely precise and dynamic temperature control can be achieved.

A pressure control valve (2.03) reduces the pressure of the superheated steam entering the pressure vessel to the pressure corresponding to the saturated steam temperature (3.53) required at the outlet. The superheated steam enters the vessel and is condensed in a water bath through a special vessel design. The thermal energy generated causes the cooling water in the bath to evaporate, creating saturated steam. The saturated steam temperature corresponds to the related saturated steam pressure (see Table 2).

Water must be added regularly since the superheated steam causes some of the cooling water in the bath to evaporate.

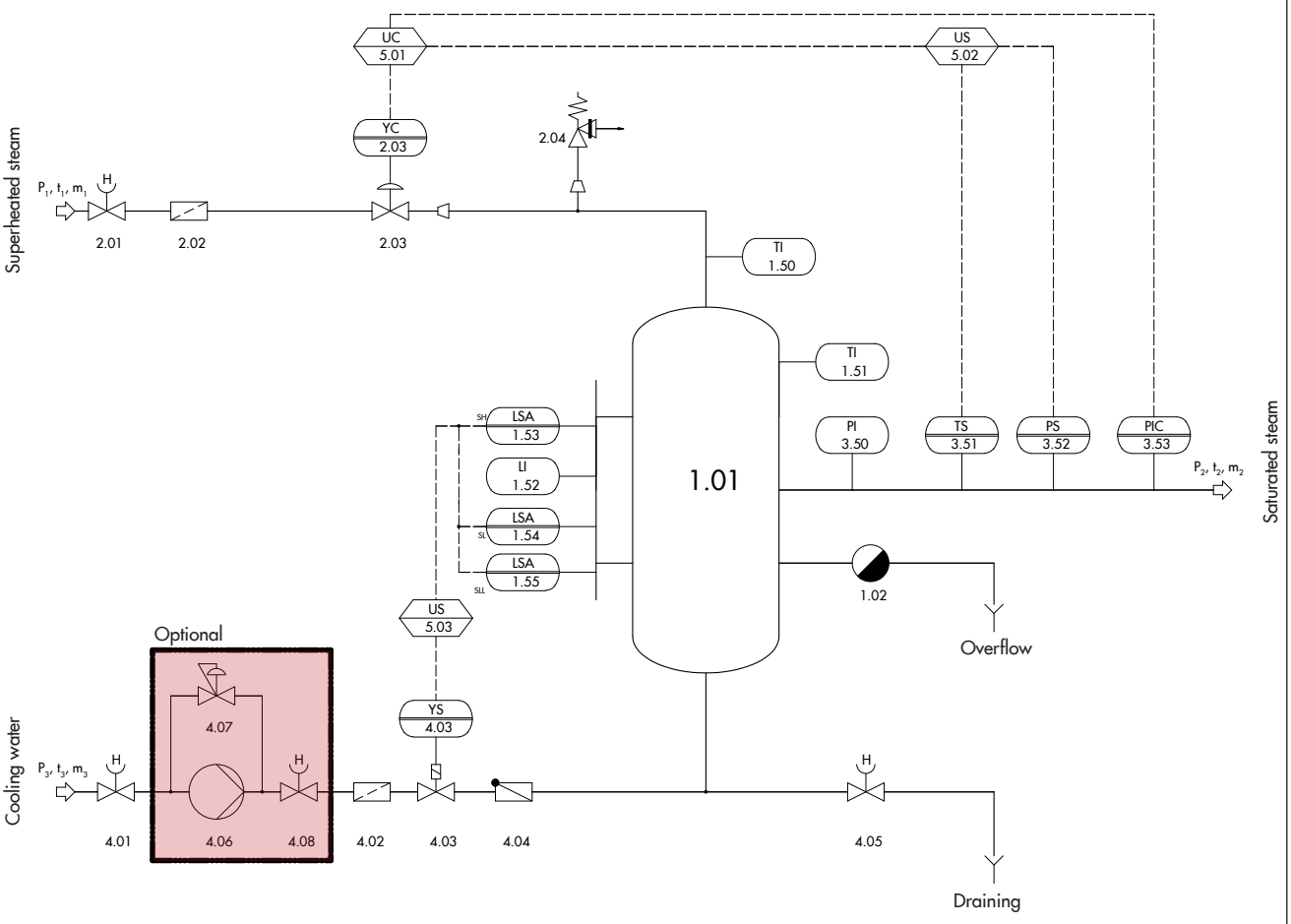
A bypass valve and two level switches (1.53/1.54) are used to control the water level.

If insufficient cooling water pressure exists for topping up with water (1 bar above the saturated steam pressure), the delivery pressure of the pump must be raised.

Safety equipment

The maximum operating pressure of the desuperheater can optionally be limited to the permissible pressure by a safety valve (2.04). An electronic safety pressure limiter (3.52) and a safety temperature limiter (3.51) additionally ensure that the permissible pressures and temperatures are not exceeded at the outlet of the desuperheater. As soon as either limit is exceeded, a solenoid valve is triggered causing the steam pressure control valve to close.

A steam trap is installed as standard to safeguard against overfilling. A level switch (LOW, 1.55) ensures that the bath does not run dry.



Legend			
1.01	Pressure vessel	3.51	Temperature limiter (optional)
1.02	Steam trap	3.52	Pressure limiter
1.50, 1.51	Thermometer	3.53	Pressure sensor
1.52	Level indicator	4.01	Shut-off valve
1.53, 1.54, 1.55	Magnetic switch	4.02	Strainer
		4.03	Cooling water valve
2.01	Shut-off valve	4.04	Check valve
2.02	Strainer	4.05	Shut-off valve
2.03	Control valve	4.06	Booster pump
2.04	Safety valve (optional)	4.07	Excess pressure valve
3.50	Pressure gauge	4.08	Shut-off valve

Fig. 2: *Desuperheater design*

Table 1: *Technical data · All pressures in bar (gauge)*

Water bath desuperheaters	
Design pressure	11 bar [1]
Design temperature	210 °C [2]
Compliance	PED 2014/68/EU

[1] Higher pressure on request
[2] Higher temperature on request

Table 2: *Flow rates and temperatures · All pressures in bar (gauge)*

System pressure in bar	**Temperature in °C**	**Valve size in DN**					
		300	**400**	**600**	**800**	**1000**	**1200**
1	**120.3**	300 kg/h	500 kg/h	1200 kg/h	2000 kg/h	3200 kg/h	4600 kg/h
2	**133.6**	600 kg/h	1000 kg/h	2200 kg/h	3900 kg/h	6200 kg/h	8900 kg/h
3	**143.7**	900 kg/h	1400 kg/h	3200 kg/h	5700 kg/h	9100 kg/h	13000 kg/h
4	**151.9**	1200 kg/h	1900 kg/h	4300 kg/h	7500 kg/h	11900 kg/h	17000 kg/h
5	**158.9**	1400 kg/h	2300 kg/h	5200 kg/h	9200 kg/h	14700 kg/h	21000 kg/h
6	**165.0**	1700 kg/h	2700 kg/h	6200 kg/h	11000 kg/h	17400 kg/h	24900 kg/h
7	**170.5**	2000 kg/h	3200 kg/h	7200 kg/h	12700 kg/h	20100 kg/h	28900 kg/h
8	**175.4**	2200 kg/h	3600 kg/h	8200 kg/h	14400 kg/h	22900 kg/h	32700 kg/h
9	**179.9**	2500 kg/h	4000 kg/h	9100 kg/h	16100 kg/h	25600 kg/h	36600 kg/h
10	**184.1**	2800 kg/h	4400 kg/h	10100 kg/h	17800 kg/h	28300 kg/h	40500 kg/h

Table 3: *Materials · Material numbers according to DIN EN*

Water bath desuperheater [1]	**Type 1 (non-alloy steel)**	**Type 2 (stainless steel V2A)**	**Type 3 (stainless steel V4A)**
Pressure vessel	1.0345/1.0425	1.4307	1.4571
Cooling water pipeline	1.4307	1.4307	1.4571
Steam pipeline	1.0345/1.0425	1.4307	1.4571

[1] Other materials or material combinations on request

Sample application:

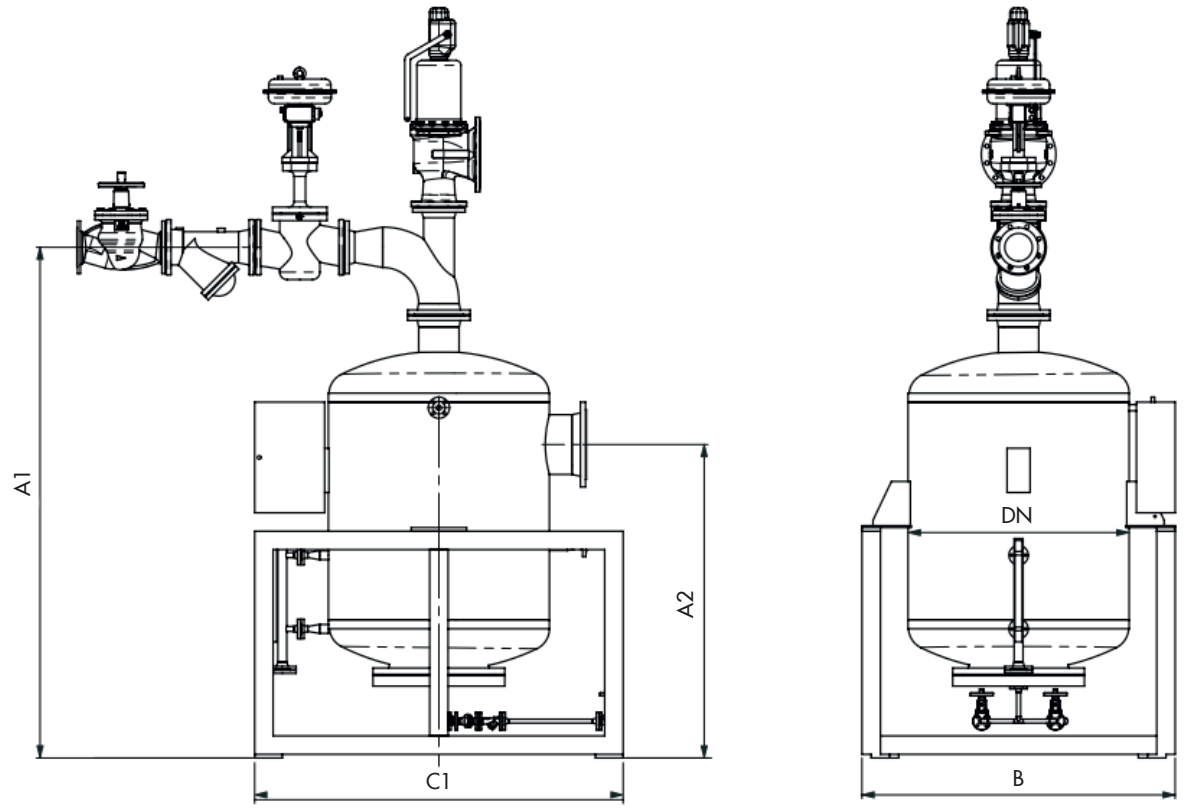
Heating steam agers in the textile industry

Task:

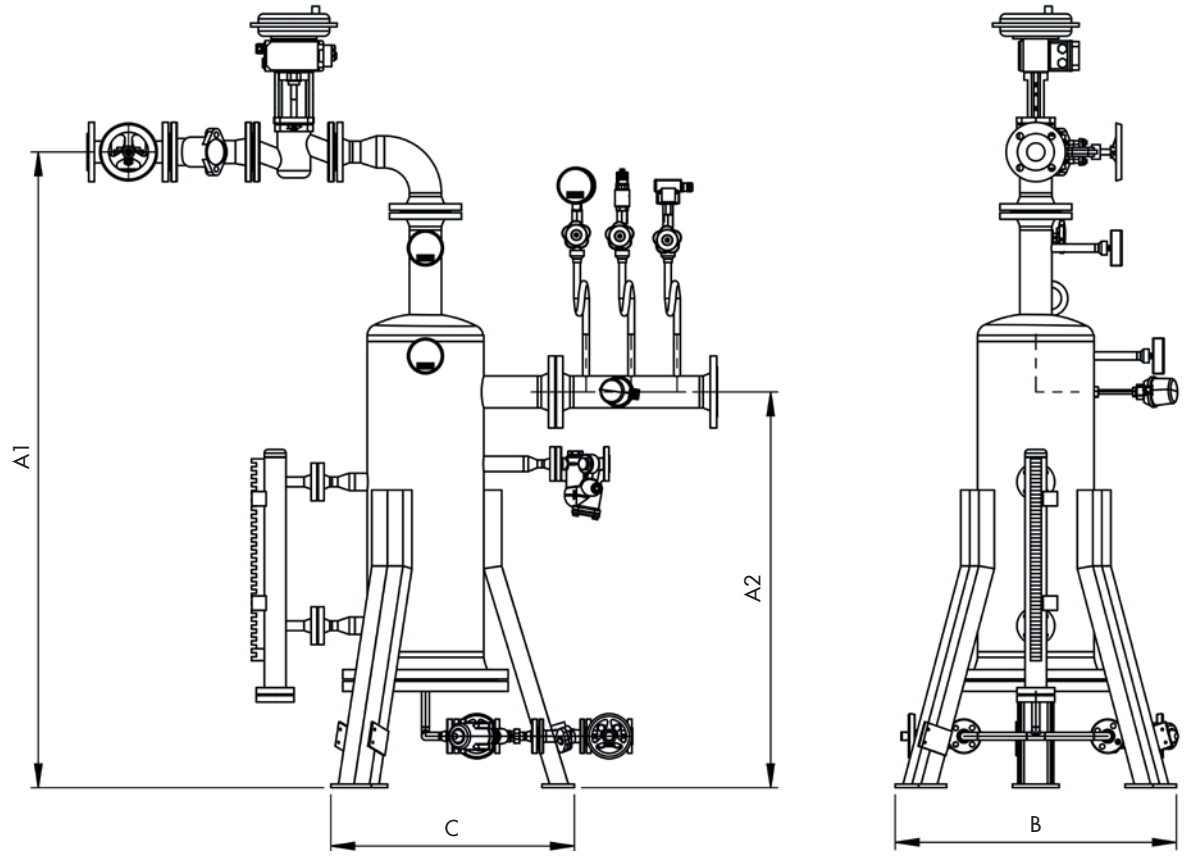
A steam ager for colored fabric is to be heated with steam in a temperature range of 100 to 110 °C. The steam may only be slightly overheated in order to avoid stains forming on the fabric at the place where it enters the ager. In addition, the steam must be dry to ensure no water stains can arise.

Engineering solution:

The pressure of superheated steam is reduced in a desuperheater with liquid level control and electropneumatic pressure control to reach saturated steam temperature. The cooling water is fed directly into the pressure vessel from a separate water network. The temperature of the ager is kept constant even when the load changes (e. g. changing throughput rate or changing specific weight of the fabric) by a process temperature control unit. The maximum temperature of the ager is limited by the saturated steam pressure setting. In order to avoid overheating of the ager in the event of the malfunction, the temperature control valve is designed for a slight pressure drop to ensure the saturated steam temperature is as close as possible to the ager temperature being controlled. The components of the water bath desuperheater are skid-mounted and ready for connection as a turnkey system.



Water bath desuperheater including skid



Water bath desuperheater including feet

Fig. 3: *Dimensional drawings · Water bath desuperheater including skid · Water bath desuperheater including feet*

Table 4: *Dimensions in mm and weights*

Water bath desuperheater including …		**Skid** [1]						**Feet** [1]		
Valve size	**DN**	**300**	**400**	**600**	**800**	**1000**	**1200**	**300**	**400**	**600**
A1	mm	1830	2200	2300	2400	2700	3000	1770	2180	2080
A2	mm	1200	1400	1400	1450	1600	1800	1100	1500	1300
B	mm	850	900	1100	1300	1600	1700	780	970	750
C1	mm	1125	1200	1350	1550	1800	2000	680	850	670
Weight	kg	370	430	680	950	1300	1600	100	140	230

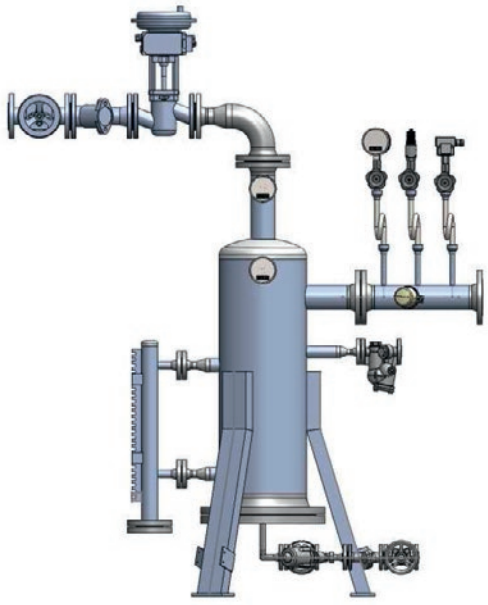
[1] All dimensions and weights stated are approximate. The weight depends on the material selected and the sizing parameters. The specified weight does not include any mounted components.

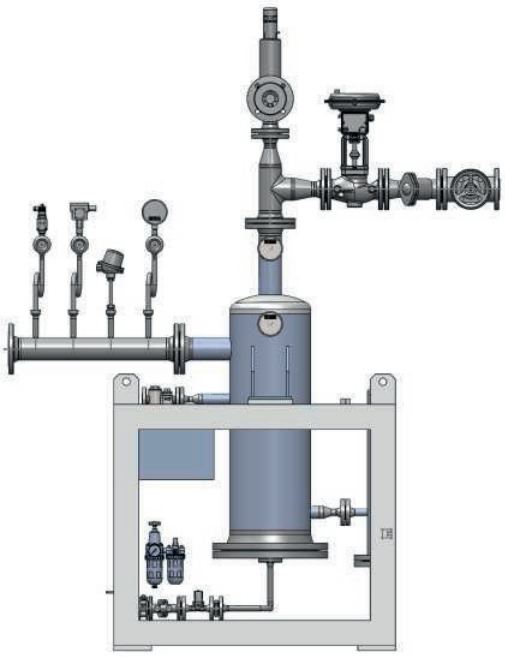
REQUEST SHEET

Water Bath Desuperheater

Customer data:	
Company	
Name	
Phone	
E-mail address	

SAMSON sales dept.





Water Bath Desuperheater

Operating data		
Pressure specifications	☐ absolute	☐ relative
Steam inlet (superheated steam)	p_1 =…… t_1 =…… $\dot{m}_1$ =……	
Steam outlet (saturated steam):	p_2 =…… t_2 =…… $\dot{m}_2$ =……	
Cooling water	☐ Potable water quality ☐ Boiler feedwater p_3 =……(pressure increase necessary when ($p_3 \leq p_2$)) t_3 =……	
Available energy supply	☐ Instrument air p_{air} = …… ☐ Voltage U = ……	
Equipped with		
Basic model		
☑ Vessel including fittings ☑ Liquid level indicator ☑ Overflow protection	☑ Cooling water system ☑ Thermometer/pressure gauge	
Material	☐ Non-alloy steel P265GH	☐ Stainless steel 1.4301
Options		
☐ Vessel insulation		
☐ Skid	☐ Vessel feet (up to WBK 600)	
☐ Pressure control at inlet (necessary when $p_1 > p_2$)		
☐ Safety valve on vessel (necessary when $p_1 > 11\ bar_g$)		
☐ Cooling water system with pressurization ($p_3 \leq p_2$)		
☐ Safety functions at outlet	☐ Safety pressure limiter ☐ Safety temperature limiter	
☐ Closed-loop control including switching cabinet	☐ Liquid level ☐ Mounted and wired	☐ Pressure ☐ Provided (not mounted or wired)
Notes		