

T 3972 EN**Type 7110 Water Bath Desuperheater**

For desuperheating superheated steam to saturated steam temperature

Application

Water bath desuperheater to cool superheated steam down to saturated steam temperature

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

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

The Type 7110 Water Bath Desuperheater is the only solution to safely generate steam at saturated steam temperature.

Steam conditioning valves (e.g. Type 3281) or spray nozzles (e.g. Type 7115 Spray Nozzle) 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

Versions of the Type 7110 Water Bath Desuperheater**Standard version**

Design pressure of vessel 11 bar · Design temperature 250 °C · Max. saturated steam temperature 184.1 °C at 10 bar · The pressure at the inlet of the upstream control valve can be higher · Standard pressure vessel sizing according to AD 2000 Code, PED 2014/68/EU and ASME · Pressure ves-



Skid-mounted water bath desuperheater



Water bath desuperheater on feet (up to DN 600)

Fig. 1: Versions of the Type 7110 Water Bath Desuperheater

sel 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

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 steam at saturated steam temperature:

- 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 steam at saturated steam temperature: 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 pressure of the saturated steam since saturated steam pressure 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 steam at saturated steam temperature. 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 cooling water in the bath to evaporate.

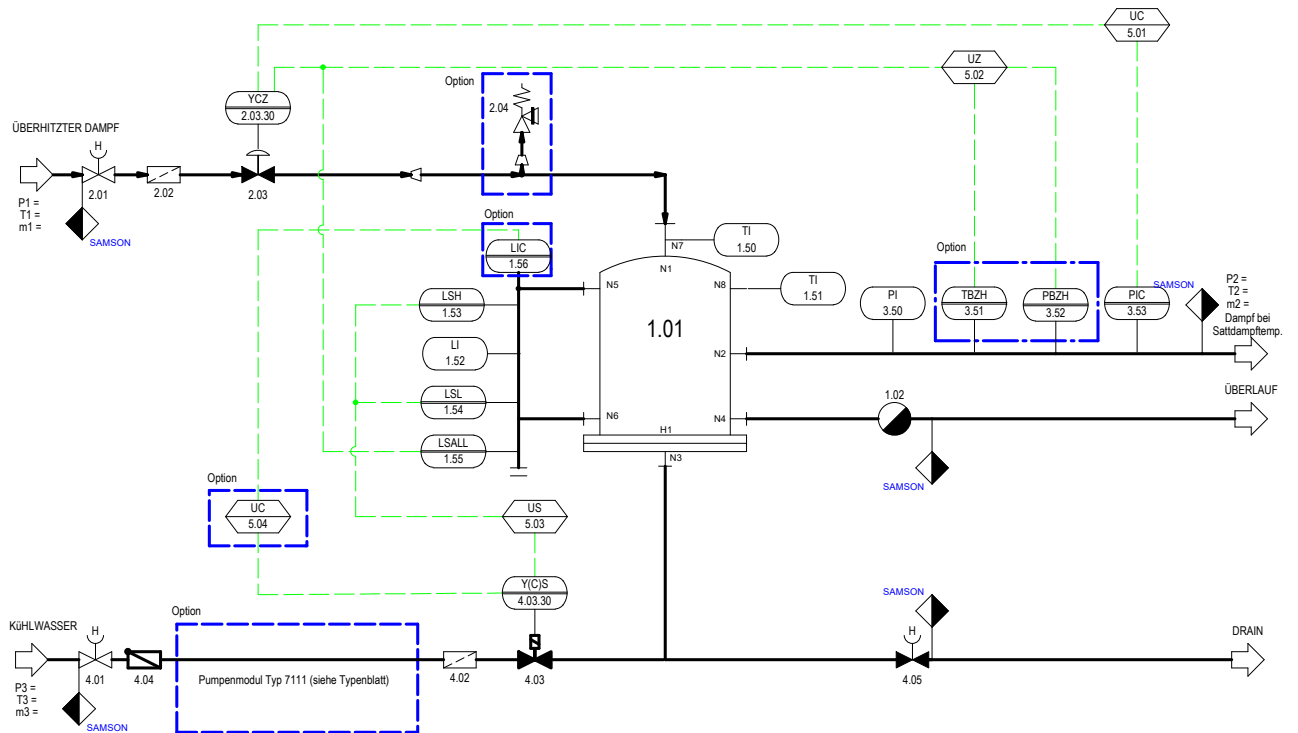
A bypass valve and two level switches (1.53/1.54) are used to control the water level.

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 devices

The maximum operating pressure of the desuperheater can optionally be limited to the permissible pressure by a safety valve (2.04). The following system can be protected using an electronic safety pressure limiter (SPL, 3.52) and a safety temperature limiter (STL, 3.51), if required. As soon as such a 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	3.50	Pressure gauge
1.02	Steam trap	3.51	Temperature limiter (optional)
1.50, 1.51	Thermometer	3.52	Pressure limiter (optional)
1.52	Level indicator	3.53	Pressure sensor
1.53, 1.54, 1.55	Magnetic switch	4.01	Shut-off valve
1.56	Level transmitter (optional)	4.02	Strainer
2.01	Shut-off valve	4.03	Cooling water valve
2.02	Strainer	4.04	Check valve
2.03	Control valve	4.05	Shut-off valve
2.04	Safety valve (optional)	Type 7111	Pump module to raise the pressure (optional)

Fig. 2: Desuperheater setup

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

Type 7110 Water Bath Desuperheater	
Design pressure (vessel)	11 bar ^{1) 3)}
Design temperature (vessel)	250 °C ²⁾
Conformity	PED 2014/68/EU · ASME

1) Higher pressure on request

2) Higher temperature on request

3) A vessel with maximum 10 bar can be used when a safety valve is installed.

Table 2: Mass flow rates and temperatures · All pressures in bar (gauge)

System pressure in bar	Temperature in °C	Nominal size DN					
		300	400	600	800	1000	1200
1	120.2	534 kg/h	981 kg/h	2,235 kg/h	3,942 kg/h	6,129 kg/h	8,794 kg/h
2	133.5	780 kg/h	1,434 kg/h	3,267 kg/h	5,764 kg/h	8,961 kg/h	12,859 kg/h
3	143.6	1,022 kg/h	1,878 kg/h	4,280 kg/h	7,552 kg/h	11,740 kg/h	16,846 kg/h
4	151.8	1,261 kg/h	2,317 kg/h	5,281 kg/h	9,317 kg/h	14,484 kg/h	20,783 kg/h
5	158.8	1,498 kg/h	2,752 kg/h	6,272 kg/h	11,065 kg/h	17,202 kg/h	24,684 kg/h
6	165.0	1,733 kg/h	3,184 kg/h	7,256 kg/h	12,802 kg/h	19,902 kg/h	28,558 kg/h
7	170.4	1,967 kg/h	3,614 kg/h	8,235 kg/h	14,530 kg/h	22,589 kg/h	32,412 kg/h
8	175.4	2,200 kg/h	4,042 kg/h	9,211 kg/h	16,251 kg/h	25,264 kg/h	36,252 kg/h
9	179.9	2,432 kg/h	4,469 kg/h	10,184 kg/h	17,967 kg/h	27,933 kg/h	40,080 kg/h
10	184.1	2,664 kg/h	4,895 kg/h	11,154 kg/h	19,680 kg/h	30,595 kg/h	43,901 kg/h

All specifications are approximate values and based on the SAMSON standard versions. The values for special versions may differ.

Table 3: Materials · Material numbers according to DIN EN

Type 7110 Water Bath Desuperheater	Non-alloy steel ^{1) 2)}	Stainless steel V2A ^{1) 2)}
Pressure vessel	1.0345/1.0425	1.4541
Cooling water pipeline	1.0345 / 1.0425 / 0.7043 / 1.4301	1.4301 / 1.4541 / 1.4408
Steam pipeline	1.0345 / 1.0425 / 0.7043 / 1.0619	

1) Other materials or material combinations on request

2) Or equivalent materials of the same grade or higher

Sample application:

Heating steam agers in the textile industry

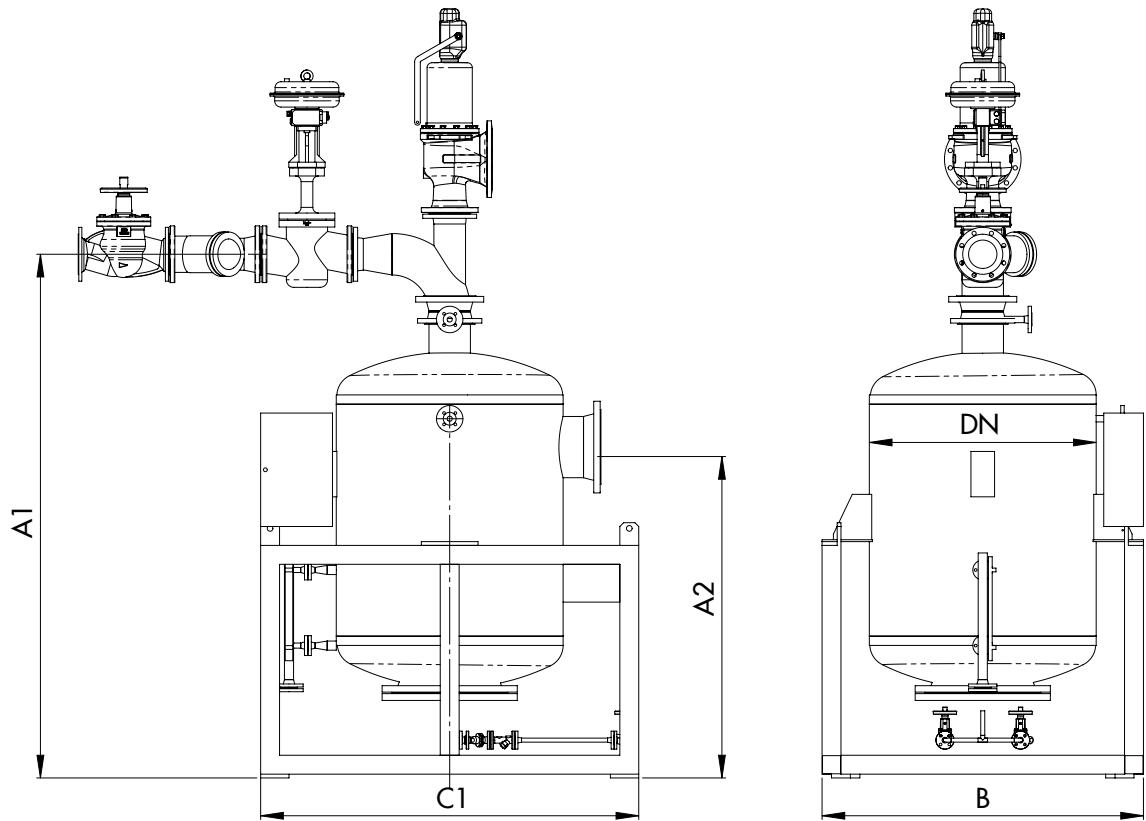
Task:

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.

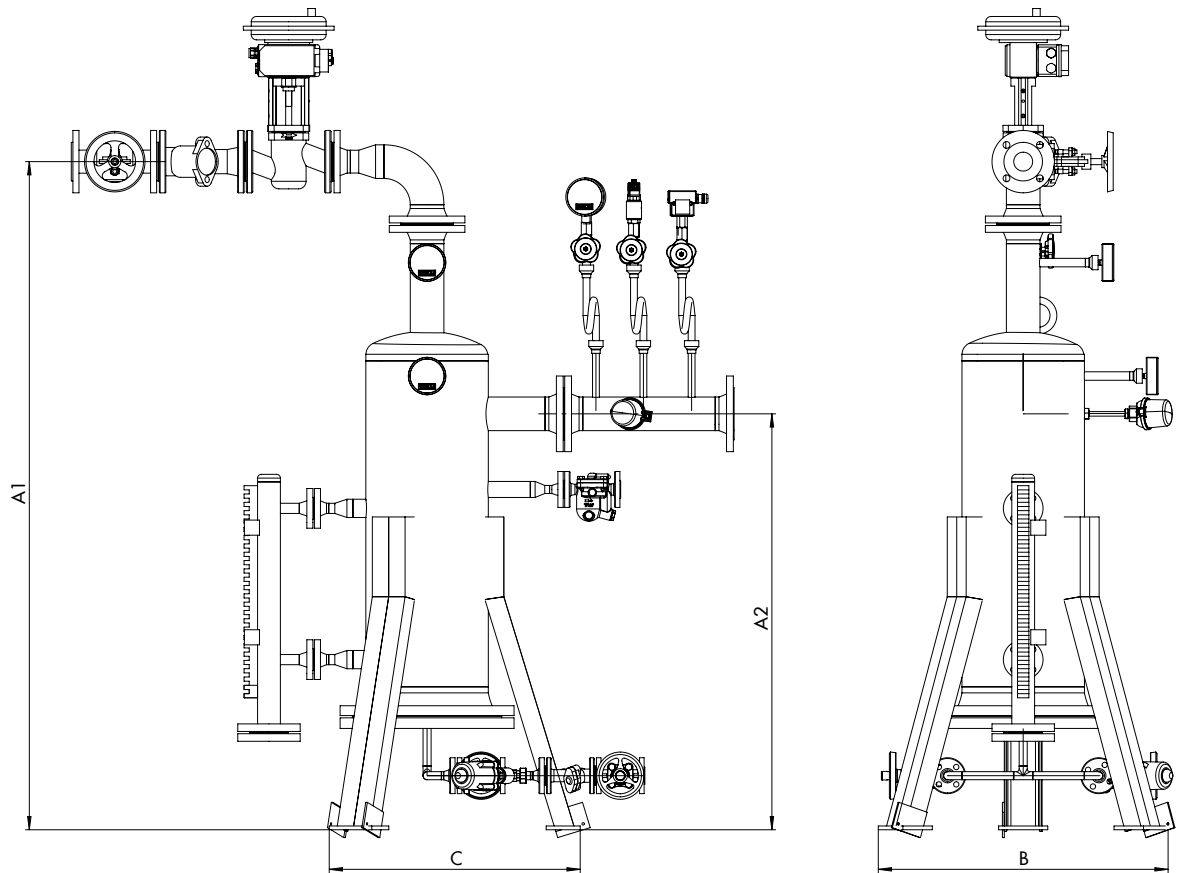
Troubleshooting:

The pressure of superheated steam is reduced in a desuperheater with liquid level control and 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 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 · Type 7110 Water Bath Desuperheater including skid · Type 7110 Water Bath Desuperheater including feet

Table 4: Dimensions in mm and weights

Water bath desuperheater with ...		Skid ¹⁾						Feet ¹⁾		
Nominal 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	200	300	350

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.



RFQ Form for Type 7110 Water Bath Desuperheater

Customer data	
Company	
Address	
Name	
Phone	
E-mail	
Send your inquiry to your regional SAMSON contact or e-mail it to ► systems-de@samsongroup.com .	

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		
	$p_3 =$	(raised pressure necessary when $p_3 \leq p_2$)		
Available energy supply	Instrument air	$P_{air} =$		
	Voltage	$U =$		
Equipped with	Basic model	<input checked="" type="checkbox"/> Vessel including fittings	<input checked="" type="checkbox"/> Cooling water system	
		<input checked="" type="checkbox"/> Liquid level indicator with level control	<input checked="" type="checkbox"/> Thermometer/pressure gauge	
		<input checked="" type="checkbox"/> Overflow protection	<input checked="" type="checkbox"/> Safety valve (when $p_1 > 11$ barg)	
	Options	Material	Non-alloy steel P265GH	Stainless steel
		Vessel insulation		
		Skid		Vessel feet (up to WBK 600)
		Pressure control at inlet (necessary when $p_1 > p_2$)		
		Liquid level control with ...	Reed switches or	Reed chain (4 to 20 mA)
		Cooling water system with pressurization ($p_3 \leq p_2$, Type 7111 Pump Assembly ► T 3973)		
		Safety-instrumented functions to protect the downstream system	Safety pressure limiter Safety temperature limiter	SIL 2/3 shutdown, Type 7315/Type 7316 Safety valve with response pressure: bar
Closed-loop control including switching cabinet	SAMSON Type 7400/Type 7415 SAMSON Type 7410 (PLC)	Devices/parts provided by the customer Mounted and wired		
Notes				

