DATA SHEET

T 3972 EN

Type 7110 Saturated Steam Generator (water bath desuperheater)

For desuperheating superheated steam to saturated steam temperature

Application

Saturated steam generator (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

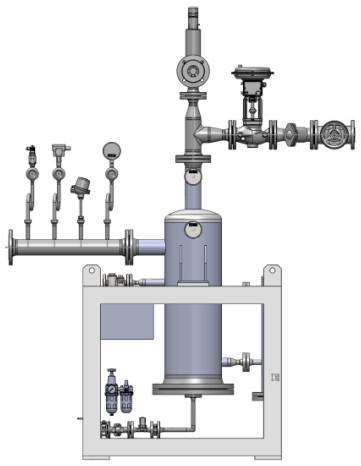

Fig. 1: *Type 7110 Saturated Steam Generator · Skid-mounted version*

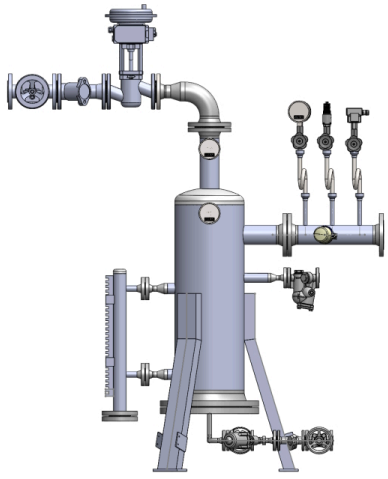

Fig. 2: *Type 7110 Saturated Steam Generator · Version mounted on feet (up to DN 600)*

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

The Type 7110 Saturated Steam Generator (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) can only cool down the steam to approx. 5 to 15 °C above the saturated steam temperature at the maximum.

The saturated steam generator 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 saturated steam generator 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 Saturated Steam Generator

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 vessel mate-

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rial 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

Design and function

The Type 7110 Saturated Steam Generator 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 tank and is condensed in a water bath through a special tank 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 3).

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 saturated steam generator 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 (PBZH, 3.52) and a safety temperature limiter (TBZH, 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.

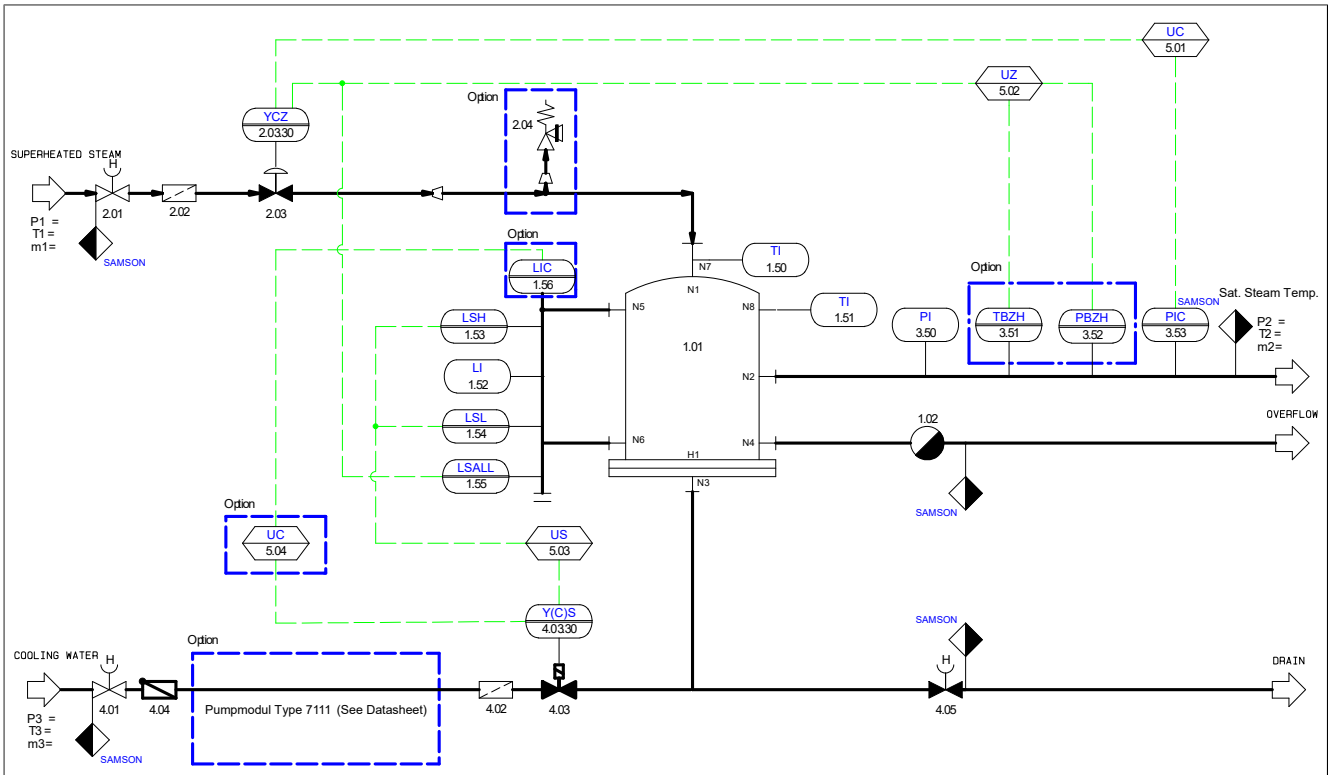


Fig. 3: *Design of the saturated steam generator*

1.01	Pressure vessel	2.02	Strainer	4.01	Shut-off valve
1.02	Steam trap	2.03	Control valve	4.02	Strainer
1.50, 1.51	Thermometer	2.04	Safety valve (optional)	4.03	Cooling water valve
		3.50	Pressure gauge	4.04	Check valve
1.52	Level indicator	3.51	Temperature limiter (optional)	4.05	Shut-off valve
1.53, 1.54, 1.55	Magnetic switch	3.52	Pressure limiter (optional)	Type 7111	Pump module to raise the pressure (optional)
		3.53	Pressure sensor		
1.56	Level transmitter (optional)				
2.01	Shut-off valve				

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

Type 7110 Saturated Steam Generator	
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: *Materials · Material numbers according to DIN EN*

Type 7110 Saturated Steam Generator	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 saturated steam generator (water bath 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 saturated steam generator are skid-mounted and ready for connection as a turnkey system.

Table 3: *Mass flow rates and temperatures · All pressures in bar (gauge)*

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

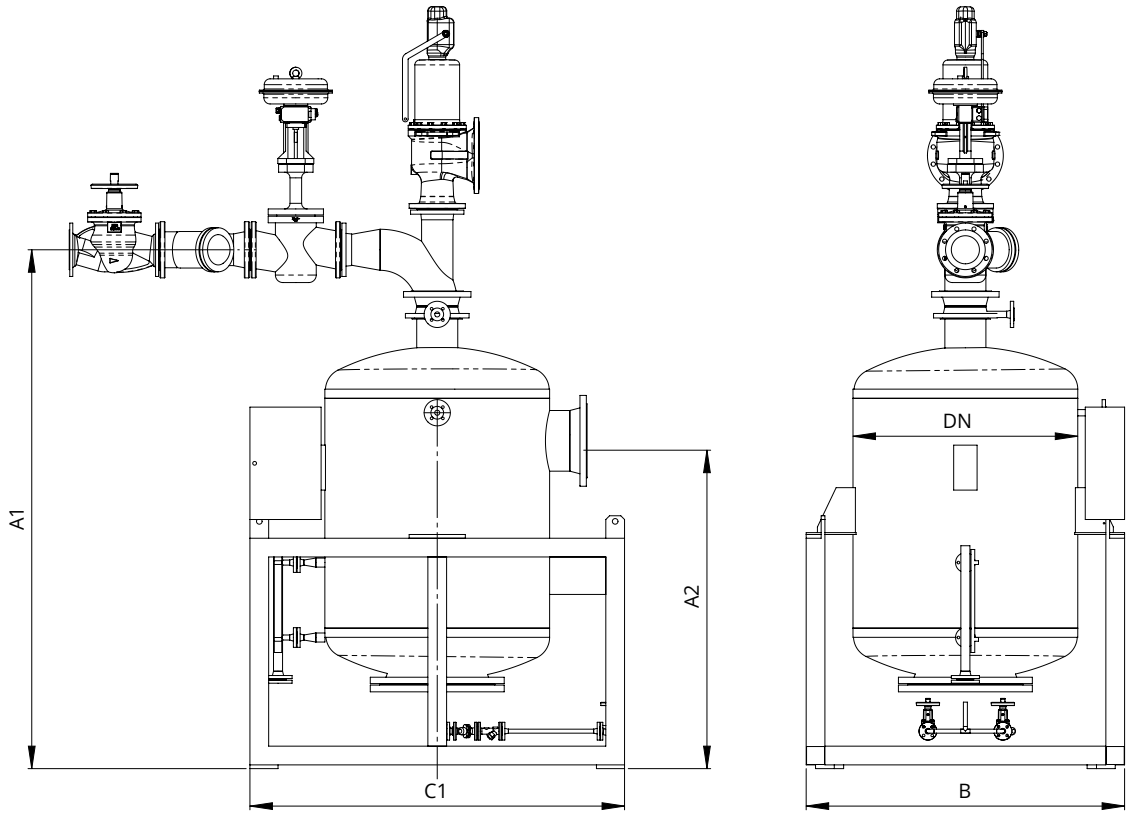
All specifications are approximate values and based on the SAMSON standard versions. The values for special versions may differ.

Table 4: *Dimensions in mm and weights*

Type 7110 Saturated Steam Generator with …	Skid[1)]					Feet[1)]	
	DN 400	DN 600	DN 800	DN 1000	DN 1200	DN 400	DN 600
A1	2200	2300	2400	2700	3000	2180	2080
A2	1400	1400	1450	1600	1800	1500	1300
B	900	1100	1300	1600	1700	970	750
C1	1200	1350	1550	1800	2000	850	670
Weight, approx. kg	430	680	950	1300	1600	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.

Skid-mounted saturated steam generator



Saturated steam generator mounted on feet

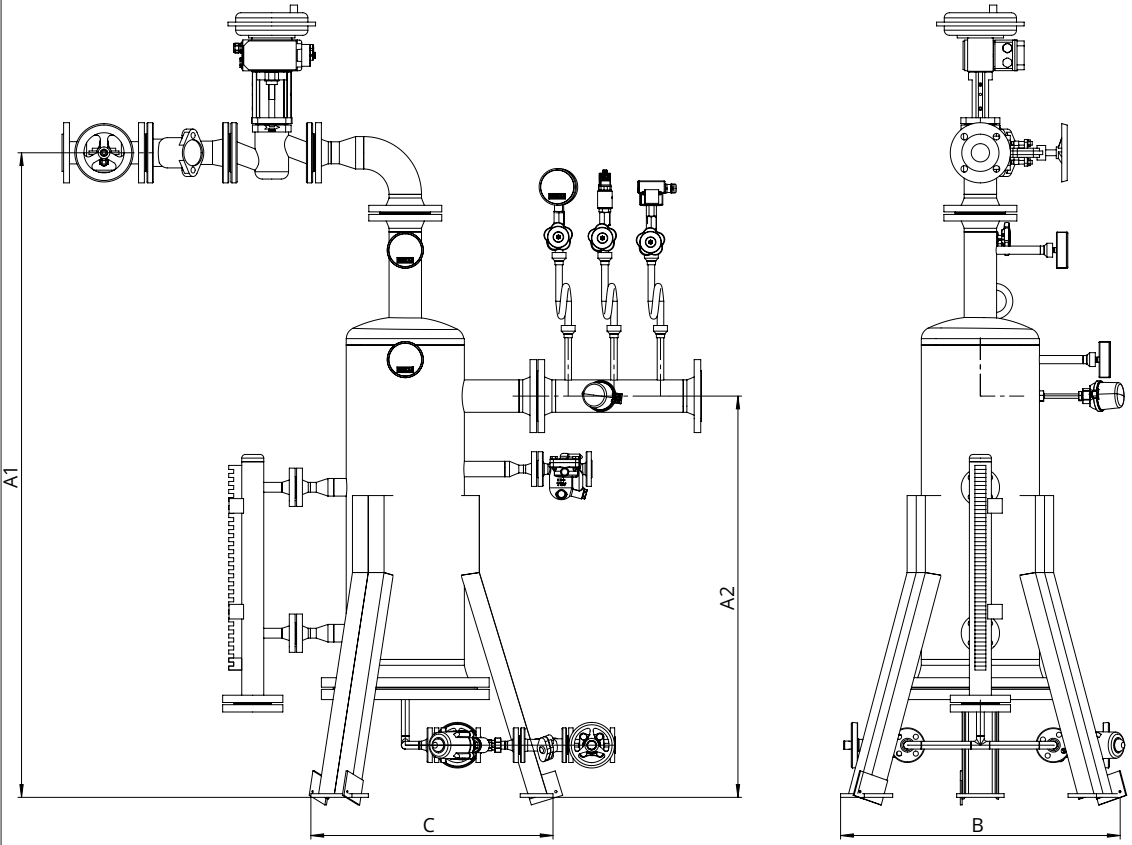


Fig. 4: *Dimensional drawings: Skid-mounted Type 7110 · Type 7110 mounted on feet*

RFQ Form

Type 7110 Saturated Steam Generator (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 = t_3 =	(raised pressure necessary when ($p_3 \leq p_2$))
		Available energy supply	☐ Instrument air ☐ Voltage	P_{air} = U =
Equipped with	Basic model		☒ Vessel including fittings ☒ Liquid level indicator with level control ☒ Overflow protection	☒ Cooling water system ☒ Thermometer/pressure gauge ☒ Safety valve (when p1 > 11 barg)
		Material	☐ Non-alloy steel P265GH	☐ Stainless steel
	Options		☐ 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 chains (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 incl. switching cabinet	☐ SAMSON Type 7400/Type 7415 ☐ SAMSON Type 7410 (PLC) ☐ Devices/parts provided by the customer ☐ Mounted and wired

Notes