DATA SHEET

T 3975 EN

Type 7115 Spray Nozzle or Type 7116 Steam Conditioning Unit

For desuperheating superheated steam by injecting condensate (cooling water)

Application

For desuperheating superheated steam by injecting condensate (cooling water)

Processes often entail the challenge that only superheated steam is available on site. Injection-type desuperheaters, such as the Type 7115 Spray Nozzle, can desuperheat the steam to approx. 5 to 10 °C above saturation temperature.

Special features

- Desuperheating of superheated steam to approx. 5 to 10 °C above saturation temperature
- Desuperheating upstream of the inlet of heat exchangers
- Desuperheating before steam comes into direct contact with a product
- Use as a turbine bypass for small and medium-sized power plant in combination with SAMSON Group valves

Type 7115 Spray Nozzle or Type 7116 Steam Conditioning Unit

Versions

Fixed orifice nozzle · Spring-loaded nozzle · Variable nozzle · Venturi-type nozzle · Design pressure up to max. PN 400 [1] · Design temperature up to max. 570 °C [1] · Type 7116 available as turnkey system · Unit mounted on feet or skid-mounted · With temperature and pressure control or with terminal box

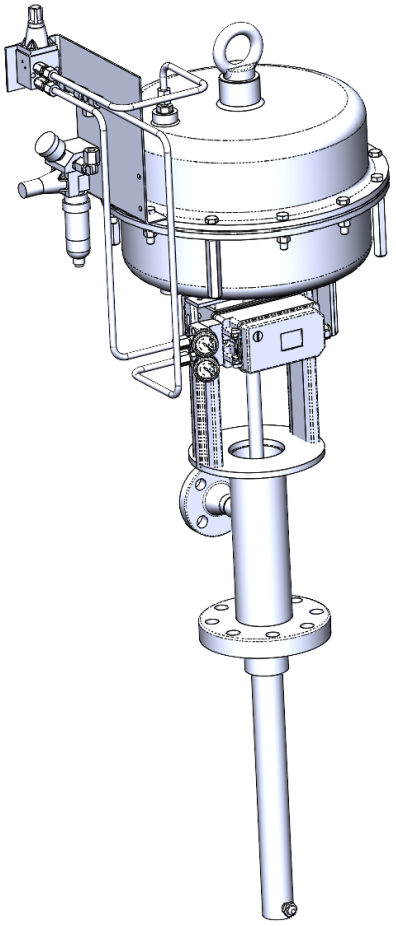

Fig. 1: *Type 7115 with variable nozzle*

[1] Depending on version

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Principle of operation (see Fig. 2)

The spray nozzles are designed to inject cooling water into a steam pipeline. The nozzles make use of the heat of evaporation in water to cool down the steam flow. This makes it possible to reduce the temperature to 5 to 10 Kelvin above saturation temperature. This principle can also be applied to cool down other media such as LNG, natural gas or air.

Various types of spray nozzles are available depending on the flow velocities in the pipeline and the amount of water that must be injected.

1. **Fixed orifice nozzle** for small water amounts and a small control range. It is primarily suitable for a constant operating point.
2. **Spring-loaded nozzle** for small water amounts and a small control range. It is primarily suitable for a constant operating point that only varies slightly. The spring loading of the nozzle widens the control range in comparison to simple fixed orifice nozzles.
3. **Variable nozzle** for large water amounts and a wide control range. The variable cooling nozzle has several nozzles. The required number of nozzles are released by the actuator stem of an pneumatic linear actuator (e.g. SAMSON Type 3271).
4. **Venturi-type nozzle** to inject water, suitable for small nominal sizes and low flow velocities in pipes. The Venturi effect causes the injected water to be drawn and distributes the water droplets more evenly.

Location of installation

To ensure fast and even evaporation, the water mist created must be fine as possible and thoroughly mixed with the superheated steam. This requires a straight pipe run at the outlet without pipe fittings, instruments or any other disturbances that may cause flow turbulence. The length of the pipe run at the outlet has considerable impact on the droplet size, turbulence and steam flow rate. The dead time of the temperature sensor to detect changes in temperature depends on the length of the straight pipe run at the outlet and the resulting duration of mixing. To meet a varying steam demand and high steam flow velocities, the pipe run at the outlet must also be protected against impingement erosion and include water drainage.

Temperature control

A downstream temperature transmitter is required for controlling the temperature. It monitors how much injected water is required. An upstream cooling water valve controls the amount of water that is supplied to the fixed orifice nozzle, spring-loaded nozzle or Venturi-type nozzle.

The installed actuator directly controls the variable nozzle.

Pressure control

The pressure in the steam pipeline cannot be reduced by a spray nozzle. An upstream pressure reducing valve (e.g. SAMSON Type 3241, 3251, 3321 or 3595 Valve) is required to control the pressure. Alternatively, a steam conditioning valve (spray nozzle and pressure reducing valve combined in one device, e.g. SAMSON Type 3281) can be used.

The Type 7110 Desuperheater must be used to generate saturated steam without superheating (ΔT in relation to Ts).

Condensate removal

Note that the injected water does not fully evaporate during start-up, when high load changes occur or when the installation situation is not ideal. As a result, sufficient condensate removal is essential.

Type 7116 Steam Conditioning Unit available as turnkey system

In addition to the Type 7115 Spray Nozzle itself, various valves, instrumentation and a control unit are required to achieve a functioning desuperheating unit. It is advisable to obtain all the components from a single source to ensure they work optimally together.

Emergency shutdown

Based on the safety-related SIL data available for SAMSON control valves (e.g. Type 3241 and Type 3251), it is possible to implement a temperature-based emergency shutdown with SIL data.

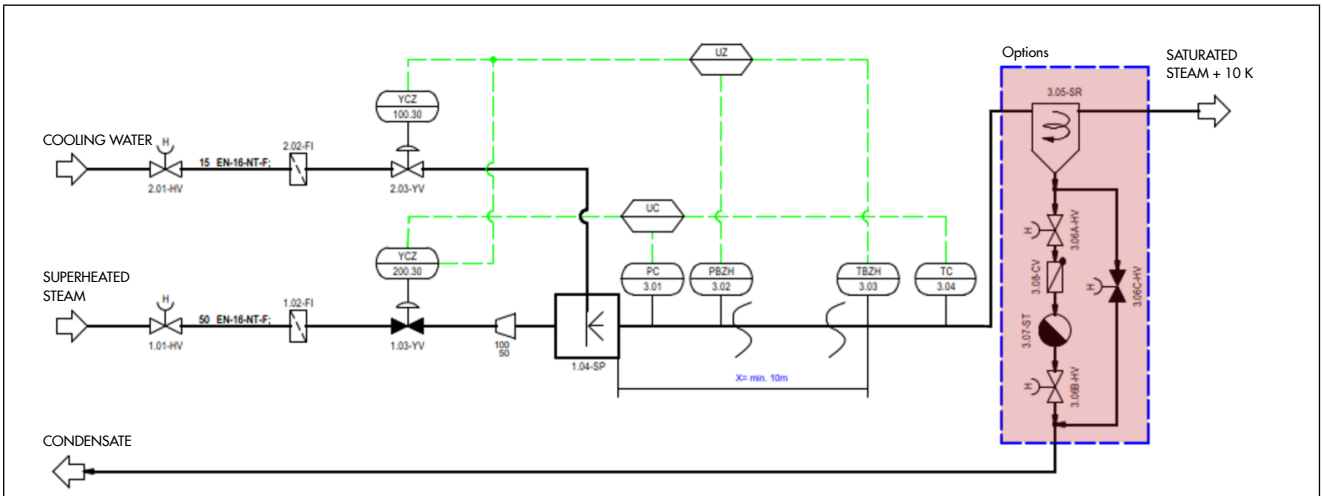

Fig. 2: *Sample installation of Type 7116 Steam Conditioning Unit*

Table 1: *The nozzles are supplied by a trusted SAMSON business partner. DIN and ANSI version available*

		Venturi-type nozzle	Fixed orifice nozzle	Spring-loaded nozzle	Variable nozzle with pneumatic actuator
Application		For low steam velocities	For a small control range	For a medium-sized control range	For a large control range
Max. temperature		570 °C (steam side)			
Nozzle version		Variable · Cryogenic applications	Fixed	Spring-loaded control	Multiple nozzle controlled by an actuator
Fail-safe position		Fail-open, fail-close or fail-in-place			
Stroking speed		1 to 17 s [1]			<30 s
Pressure rating	DIN	≤PN 100 (PN 400)	≤PN 400		
Nominal size of steam line	Min.	DN 50	DN 100		DN 150
	Max.	DN 500	DN 1000		DN 600
Temperature sensor distance		5 to 10 m	10 to 15 m	10 to 20 m	10 to 20 m
Control valves		SAMSON water control valve with SAMSON Type 3730 Positioner			SAMSON Type 3271 Pneumatic Actuator with SAMSON Type 3730 Positioner including Type 4708 Air Set
Accessories		SAMSON lock-up valve/volume booster/solenoid valve			

[1] Depending on the actuator size

RFQ Form for Type 7115 Spray Nozzle or Type 7116 Steam Conditioning Unit

Customer data	
Company	
Address	
Name	
Phone number	
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 = $\dot{m}_1$ = t_1 = With pressure reducing valve when $p_1 > p_2$
Steam outlet (min. 5-10 K above saturation)	p_2 = $\dot{m}_2$ = t_2 =
Cooling water	☐ = Deionized water ☐ Boiler feedwater/condensate p_3 = **Note:** (p_3 min. 5 bar > p_2. If this is not the case, the SAMSON Type 7111 Pump Assembly is required ▶ T 3973) t_3 =
Available energy supply	☐ Instrument air P_{air} = ☐ Voltage U =
Equipped with	
Spray nozzle including actuator or cooling water valve	☐ Yes ☐ No
Options (upgrade to Type 7116 Steam Conditioning Unit)	
Instrumentation	☐ Temperature/pressure transmitter ☐ Safety pressure limiter ☐ Safety temperature limiter
Condensate removal	☐ Steam trap unit ☐ Cyclonic-type separator unit
Valves	☐ Hand-operated shut-off valve (steam line) ☐ Strainer (steam line) ☐ Hand-operated shut-off valve (cooling water) ☐ Strainer (cooling water)
Closed-loop control including switching cabinet	☐ Yes ☐ No
Standard switching cabinet	☐ SAMSON TROVIS 6495 Controller ☐ Switching cabinet S7-1200 with 7" TFT touch screen
Special requirements	☐ Temperature-based shutdown with SIL data ☐ Fulfillment of customer specifications
Notes	