

# Steam-Atomising Desuperheater



# Purpose & Advantages

Steam-atomising desuperheaters are cooling systems for controlling the temperatures of steam and hot gases. Their task is to reduce temperatures in pipelines, or to provide process steam with a precisely defined temperature. Steam-atomising desuperheaters are used to cool steam if customary desuperheaters are unsuitable or provide insufficient performance, due to difficult operating parameters. The steam-atomising desuperheaters are two-component nozzles in which the atomiser steam escapes from the nozzle orifice at a critical speed and atomises the injected cooling water into micro-fine droplets.



This results in the following advantages:

- ▶ Good heat exchange and low vaporisation time
- ▶ Excellent control performance at partial load
- ▶ Large rangeability possible
- ▶ Cooling to saturated steam temperature possible
- ▶ Lower amount of excess water than with injections
- ▶ Lower thermoshock hazard
- ▶ Short distance to temperature measurement
- ▶ Better mixing due to turbulence of the motive steam
- ▶ Good vaporisation even at low vapour pressures



Combined steam/gas power plant Bitterfeld-Wolfen, enviaTherm  
Photo: Michael Setzpfand

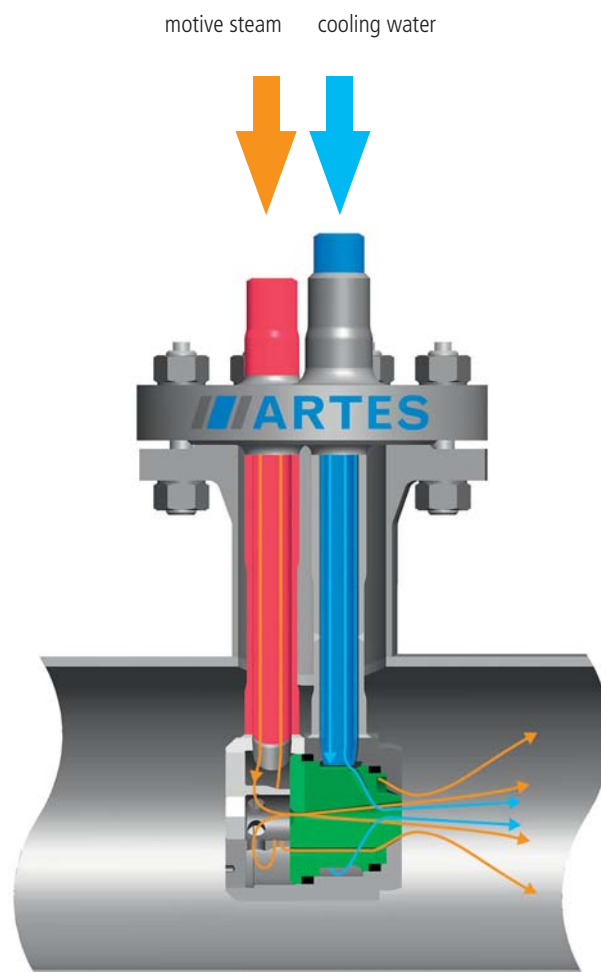
# Function

The ARTES steam-atomising desuperheater is an atomiser nozzle with inside mixing.

The cooling water is guided through the front lance pipe into the distribution area of the housing and is then injected into the Laval channel through various radial holes. The atomiser steam flows through the rear lance pipe into the steam distribution area of the nozzle housing and is fed into the steam-atomising nozzle through radial and axial bore holes. When there is a supercritical pressure ratio, the motive steam flows through the diameters in the

nozzle centre and exits at the outer diameter of the nozzle at the speed of sound.

The high kinetic energy causes the water jets to be atomised into minute water droplets. The jacket steam at the outer diameter of the nozzle envelopes this dual-phase mix of steam and water droplets. The residual larger water components are atomised into minute droplets through post-expansion and injector action. The jacket steam additionally protects the pressurised steam line against thermoshock.



# Design

Control of the volume of injected water is realised with an upstream ARTES control valve. With this valve, the flow rate of the cooling water from the injector nozzles is adjusted dependent on the load.

The motive steam is fed unregulated in most applications. An option to shut-off the motive steam must exist or be installed.

The connections for the supply of motive steam and cooling water are realised with flanges or weld-on ends.

Example:  
ARTES control ball valve type G for cooling water regulation  
Nominal pipe size DN25 with electrical actuator



Motive steam connection

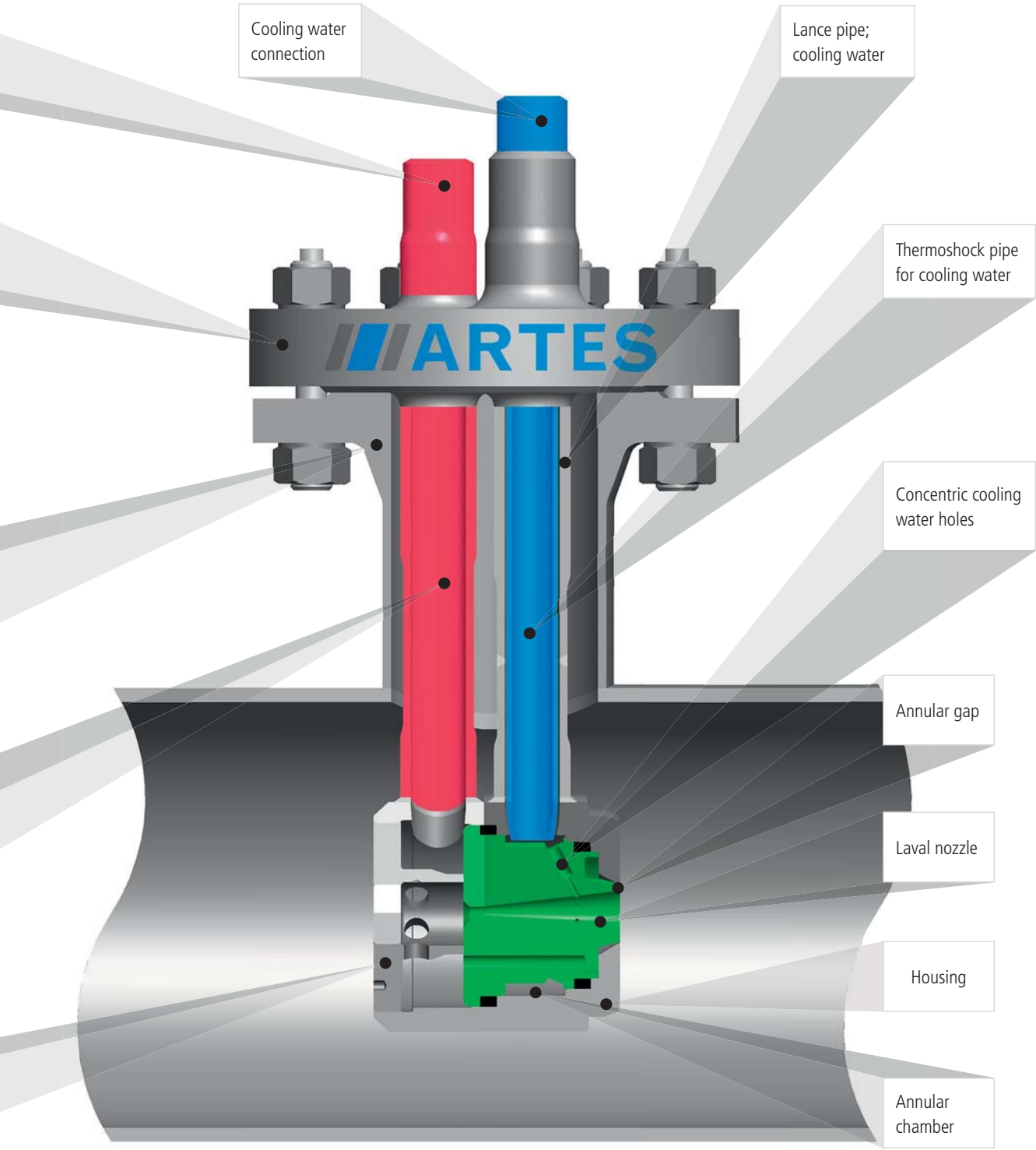
Flange cover of steam-atomising desuperheater

Pipe connecting piece with flange

Lance pipe; motive steam

Screw plug

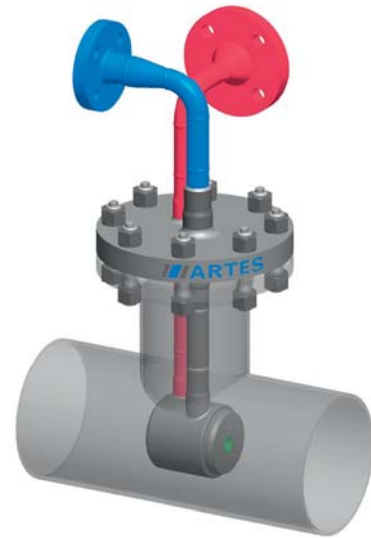
# Design



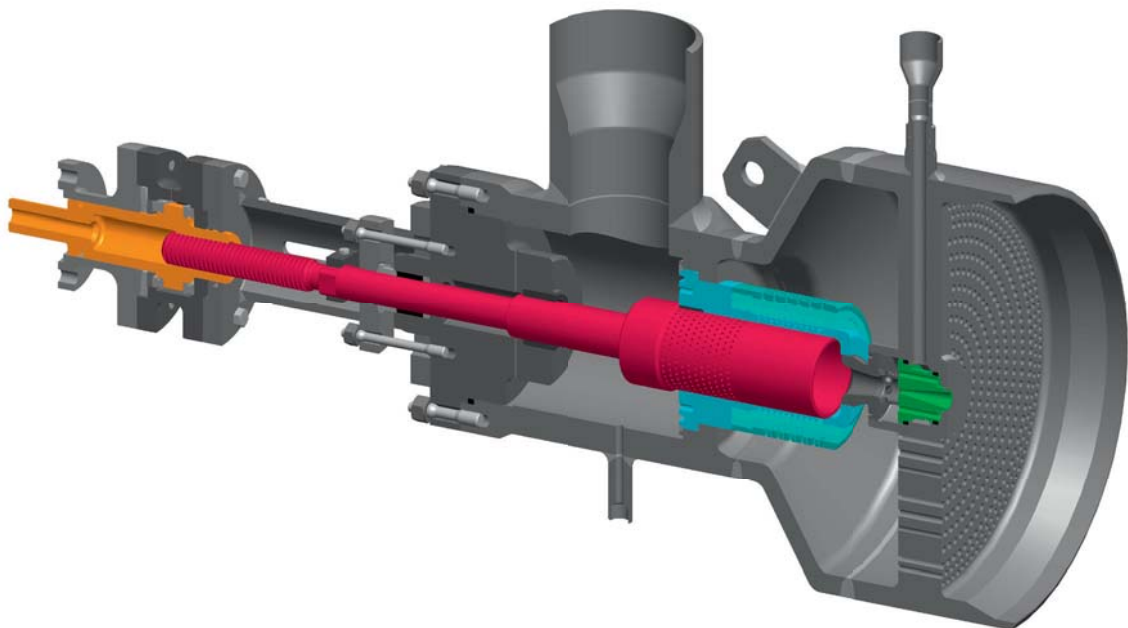
# Examples / Applications



Steam-atomising desuperheater with weld ends



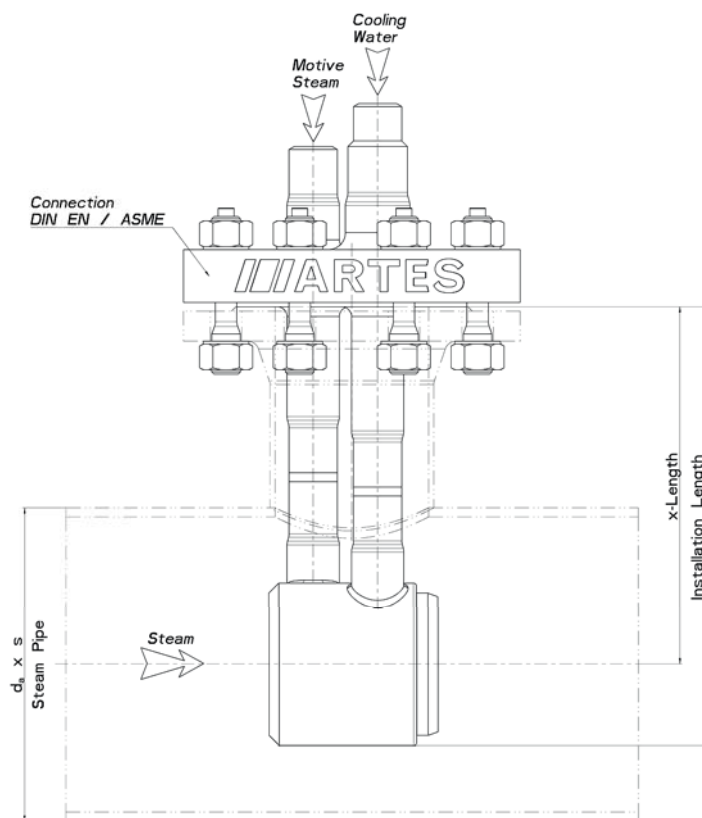
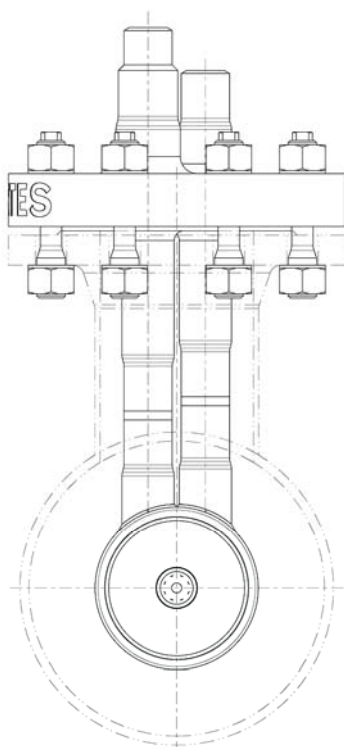
Steam-atomising desuperheater with flange ends



In the outlet of a steam converting station integrated steam-atomising desuperheater

# Facts

<b>Flange connection to steam pipe:</b>	DN150 or 6"
<b>Nominal pressure class:</b>	up to PN400 or ANSI-class 2500
<b>Temperatures:</b>	up to 600 °C
<b>Materials:</b>	1.0460, 1.5415, 1.7335, 1.7380, 1.4903 or equivalent international materials
<b>Connection to cooling water and motive steam:</b>	flanges (EN1092-1, ASME B16.5 and others), weld ends



# ARCA Flow Group



## ARTES VALVE & SERVICE GmbH

[www.artes-valve.de](http://www.artes-valve.de)

- ▶ Control ball valves
- ▶ Desuperheaters
- ▶ Motive steam coolers
- ▶ Steam conversion stations
- ▶ Differential pressure transmitters
- ▶ Three-way valves

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## ARCA-Regler GmbH

[www.arca-valve.com](http://www.arca-valve.com)

- ▶ Valves
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- ▶ Steam conversion valves
- ▶ Hygiene valves
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## WEKA AG

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## von Rohr Armaturen AG

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- ▶ Corrosion-resistant control valves
- ▶ Electrical regulator actuators



## Feluwa Pumpen GmbH

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- ▶ Hose diaphragm piston pumps
- ▶ MULTISAFE hose diaphragm piston pumps, for instance with metal diaphragm
- ▶ Sludge drainage facilities for mines
- ▶ Pump stations for pressure drainage
- ▶ Wastewater lifting facilities with cutter
- ▶ Separated sewage transfer facilities
- ▶ Homogenizing ducted-impeller pumps with cutter