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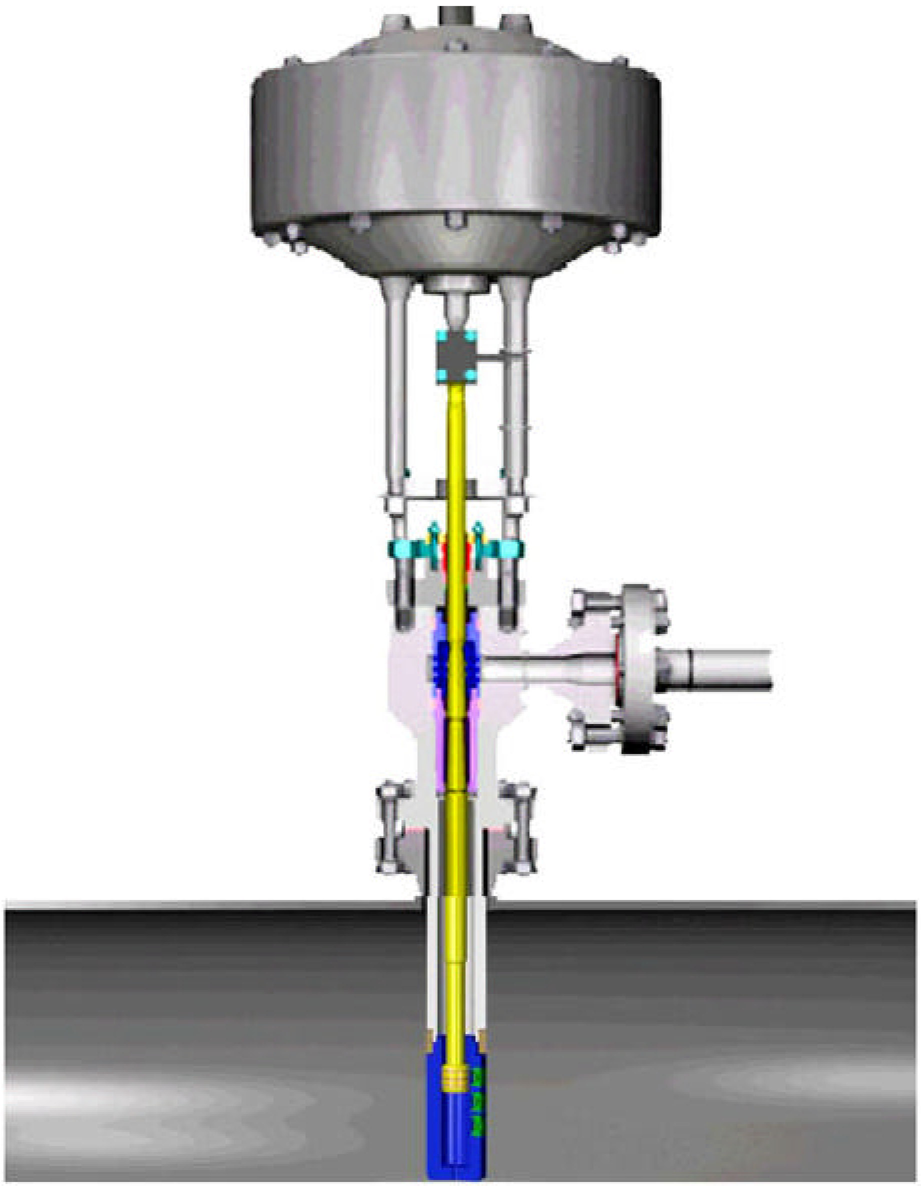
Multi-Nozzle
Mechanical Spray Desuperheater
(MNSD)



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Multi-Nozzle Spray Desuperheater (MNSD)

Early mechanical direct injection desuperheaters were based on a design principle similar to that of a needle disc globe throttling valve. While meeting the need for system simplification relative to, then commonly used steam atomized desuperheaters (Figure 1). this design fell short in offering equivalent turndown. High pressure cooling water throttled across the seat also presented erosion challenges for this desuperheater, often requiring the addition of a pressure reducing valve at the water inlet. Demand for a better solution was answered with the introduction of the Multi-Nozzle Spray Desuperheater (MNSD). The MNSD became widely accepted by industries for it's simplistic design, reliable and cost effective solution to steam cooling.

A typical MNSD installation is shown in Figure 2.

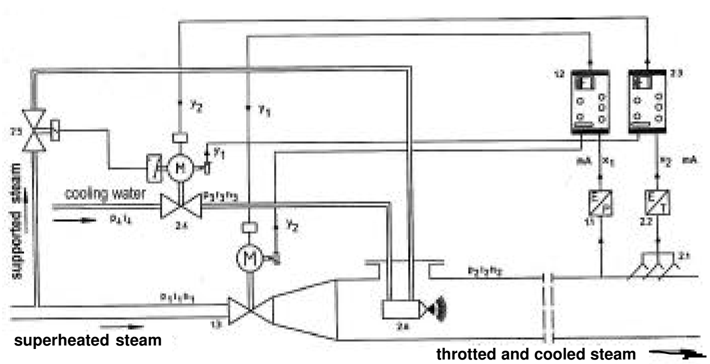

Fig. 1

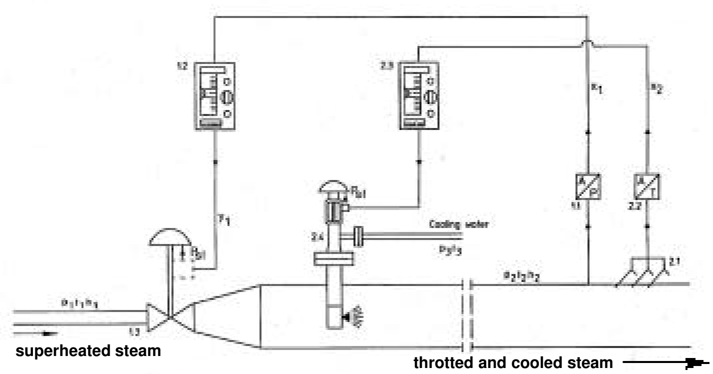

Fig. 2

Hora Advances the Technology

The Hora MNSD offers advancements in design demonstrating rugged construction for prolonged maintenance free operation. Listening to power plant customers and learning of critical failure areas experienced with other desuperheaters, Hora engineers developed a MNSD desuperheater to overcome identified operations and maintenance issues.

Flange Weld Upgrade - In high temperature steam applications the main body mounting flange weld is prone to failure due to stresses caused by thermal cycling. Hora designers responded to this challenge with a forged machined body that includes the mounting flange in a single component.

Integral Pressure Reduction - Typical MNSD overhaul usually involves replacement of the seat and costly nozzle spray head due to erosion failure caused by excessive cooling water pressure. The Hora desuperheater limits nozzle delta P to 50 psi by utilizing a multi-stage pressure drop design. In the 2 and 3 stage versions, regulation is provided by parabolic contoured stem sections by means of a characterized curve adjusted to the nozzles. This design improvement significantly extends spray head service life and reduces plant maintenance costs.

For more information please contact us at sales@armourvalve.com
Tel: (416) 299-0780 Fax (416) 299-0394

Improved Seat Design

Leakage across an MNSD seat at low load conditions can result in steam line water accumulation and thermal stresses to piping caused by unequal expansion. To prevent leakage, the Hora MNSD seat limits seal area and positions the seat well above the high temperature zone. This greatly reduces the potential for thermal deformation and prolongs tight shut-off.

Hora MNSD Function

High pressure cooling water is introduced at the side inlet to the desuperheater and is throttled through one or two variable orifices before reaching the spray head. At a delta P no greater than 50 psi, fine atomization is assured. The desuperheater controller receives it's signal via a downstream temperature sensor transmitter and the piston is positioned, engaging into service the correct number of nozzles to ensure precise cooling.

The water enters each nozzle via a series of small orifices and flows into a vortex chamber that gives the liquid rotational motion. By narrowing the chamber cross-section, static energy is converted to kinetic energy, thereby increasing fluid velocity. The axial and tangential speed components in the turbulent flow of water breaks up the liquid into extremely small droplet particles providing fine atomization and optimal evaporation. With a selection of different nozzle sizes, the spray formation, liquid distribution and shaping of droplets is designed for the complete range of load conditions. This enables HORA desuperheaters to achieve a high rangeability in cooling water flow.

Basic System Design Criteria

To ensure complete and rapid evaporation of the cooling water, it is necessary to design steam piping with adequate straight run upstream and downstream of the desuperheater. As a rule of thumb, this distance should be 10 X pipe diameter and no less than 12 feet downstream of the desuperheater.

Temperature stability in a steam cooling control loop is enhanced by correctly positioning the temperature sensor a sufficient distance downstream of the desuperheater. Refer to Fig. 3 for assistance in determining this.

Orientation of the MNSD body in relation to steam flow and cooling water will be needed when ordering. Refer to Fig. 4 to determine the configuration that suits your requirement.

Given information listed on the back page of this bulletin, your Hora representative will be pleased to size and propose a MNSD desuperheater for your steam cooling needs.

Dimension Sheet

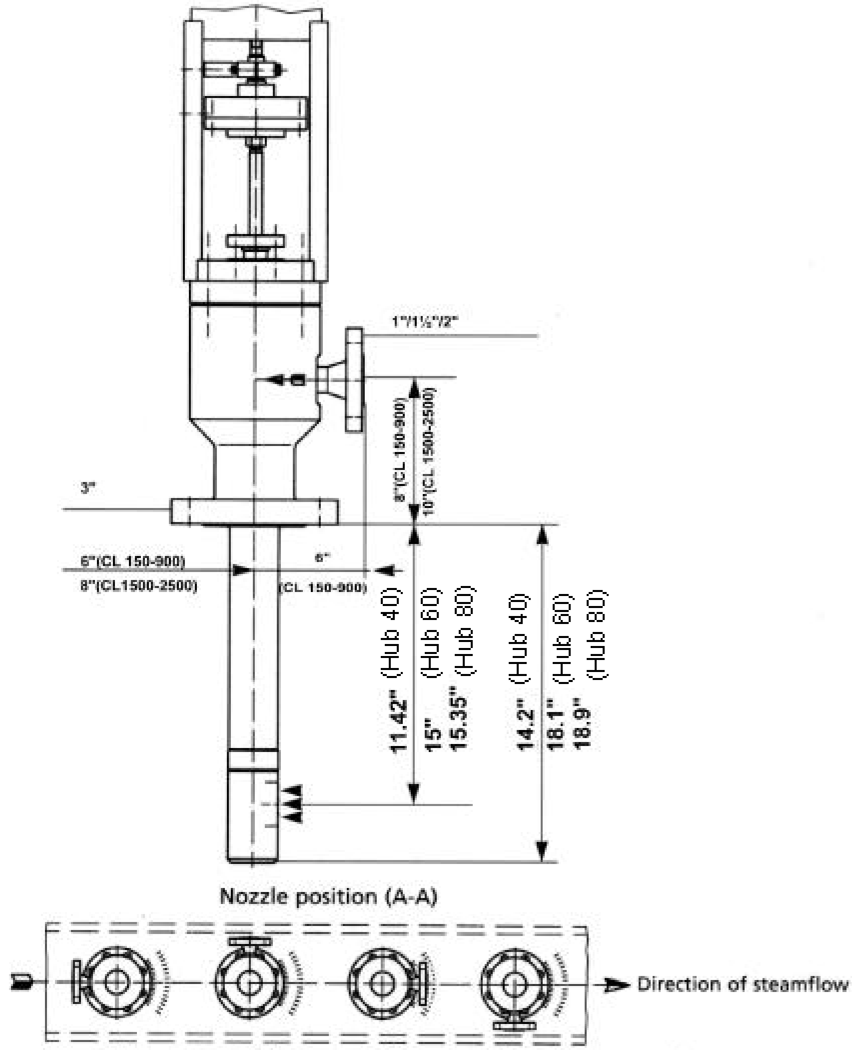

Fig.4

A ☐ B ☐ C ☐ D ☐

The following nozzles are available:
(combination of nozzles is only possible within one thread size)

Thread M16 nozzle type	Cv/Nozzle	Cv/4 Nozzles stroke = 40mm	Cv/6 Nozzle stroke = 60mm	Cv/6 Nozzle stroke=60mm	Thread M24 nozzle type	Cv/Nozzle	Cv/5 Nozzles stroke = 80mm	Cv/4 Nozzles stroke = 80mm
1600	0.0116	0.047	0.069	0.103	2411	0.029	0.145	0.223
1601	0.0133	0.053	0.079	0.12	2412	0.058	0.29	0.465
1602	0.0181	0.072	0.109	0.163	2413	0.116	0.58	0.93
1603	0.0291	0.116	0.174	0.262	2414	0.233	1.16	1.86
1604	0.0581	0.233	0.349	0.523	2415	0.349	1.74	2.79
1605	0.116	0.465	0.698	1.047	2416	0.486	2.420	3.88
1606	0.233	0.93	1.4	2.09	2417	0.776	3.880	6.2
					2418	1.22	6.100	9.77
					2419	1.55	7.750	12.4

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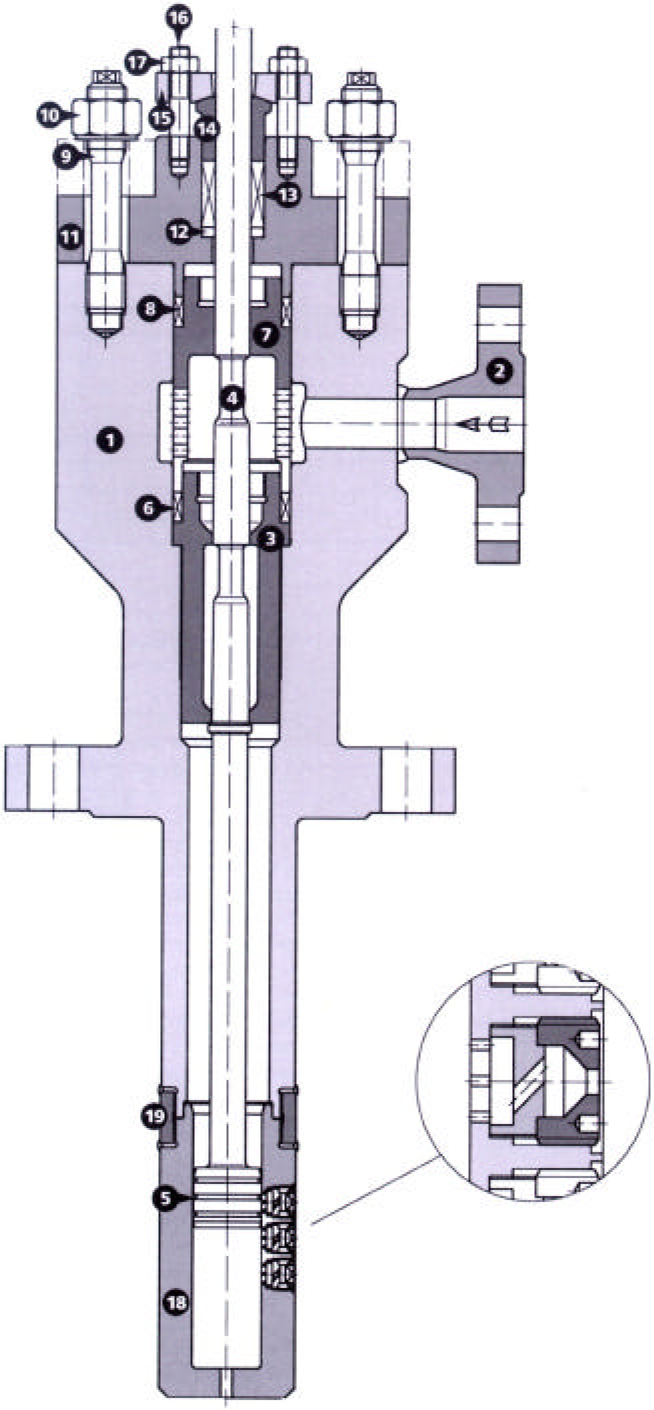
Parts and Materials List



Pos.	Designation	Mat. Spec.	*2
1	Housing	*1	*
2	Flange	*1	*
3	Seat	A276-431	*
4	Valve Stem	X22CrMoV121	*
5	Piston ring	X35CrMO17	
6	Stuffing box packing	Graphite	*
7	Cage	A276-431	
8	Stuffing box packing	Graphite	
9	Bottom ring	A193-B7M	
10	Stuffing box packing	A193-B7M	
11	Stuffing box housing	*1	*
12	Bottom ring	A276-431	
13	Stuffing box packing	Graphite	
14	Stuffing box	A193-B7M	
15	Stuffing box flange	*1	
16	Stud Bolt	A193-B7M	*
17	Hexagonal nut	A193-B7M	
18	Nozzle head/nozzles	X22Cr MoV121	
19	Threaded ring	A276-431	

*1 Materials: A204 Gr.A, or A182 F22

*2 Recommended spare parts.

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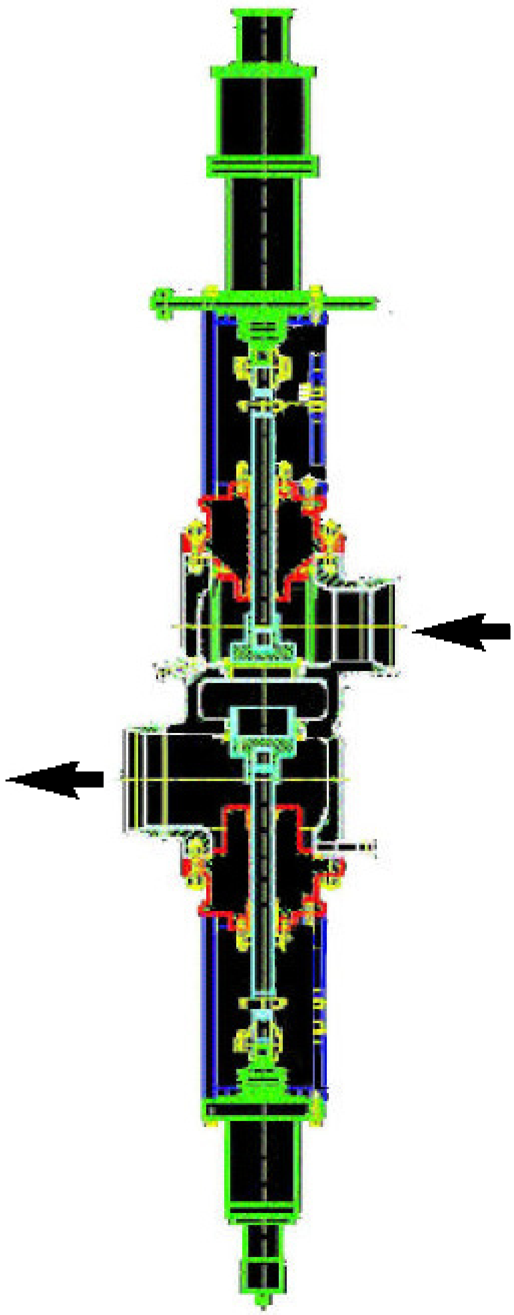
Special Design

Example: Turbine-bypass
Control Valve



Quality Management

With Emphasis on Assuring Safety

At HORA, quality is not the result of rigorous testing, but is built into every HORA product from the start by highly qualified personnel. "Measuring what is measurable and making measurable what is not measurable", Gaileo's precept, has become engrained into the fibers of all people at HORA. Qualification in accordance with DIN EN ISO 9001 and KTA 1401 has certified HORA as an approved sub- supplier of valves to the Nuclear Industry. The quality management system is in compliance with the various approvals required worldwide that include: TRD, TRB, AD-HPO, ASME, ANSI, Stoomwezen, Indian Boiler Rules (IBR), British Standards (BS) and GOST.

Monitoring dimensions "D" is at the heart of quality testing for which systematic and cyclical inspection of all measuring and testing instruments is an important precondition.

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Information Required for Sizing

Steam Flow -	Maximum	------------------------------------
	Normal	------------------------------------
	Minimum	------------------------------------
Steam Pressure		------------------------------------
Inlet Steam Temperature		------------------------------------
Cooling Steam Temperature		------------------------------------
Cooling Water Temperature		------------------------------------
Desuperheating Water Pressure		------------------------------------
Inlet Line Size and Schedule		------------------------------------
Outlet Line Size and Schedule		------------------------------------
Minimum Air Pressure:		------------------------------------
Type Actuator (Pneumatic, Electric, Hydraulic)		------------------------------------

For more information, please feel free to contact your local Armour Valve representative for assistance.

Armour Valve Ltd.

Calgary, Alberta
1801-10th Avenue S.W.
Calgary, Alberta
T3C 0K2

Tel: 403-229-3171
Fax: 403-245-9297

Edmonton, Alberta
Tel: 403-229-3171
Fax: 403-245-9297

Head Office
126 Milner Avenue
Scarborough, ON
M1S 3R2
ISO 9001 Registered
Tel: 416-299-0780
Fax: 416-299-0394

British Columbia
Tel: 403-229-3171
Fax: 403-245-9297

Atlantic Canada
1-800-268-3508
Fax: 416-299-0394

Quebec
1-800-268-3508
Fax: 416-299-0394

e-mail: ***sales@armourvalve.com***
Web-site: ***www.armourvalve.com***

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