



MA-II/MA-IIU MECHANICAL ATOMIZING DESUPERHEATER



Application

The MA-II/MA-IIU is a mechanical atomizing desuperheater that is generally used for applications which feature steady loads. It is particularly designed for rugged service and can maintain final temperature to within 20°F (11°C) of saturation. In addition to steady load service, it is often used for attemporating applications, and performs equally well for both.

Maximum cooling liquid capacity is 175,000 lb/hr (80,000 kg/hr) at a nozzle differential pressure of 400 psi (2760 kPa) when using 100°F (38°C) water.

Two Mounting Options

This model is available in two mounting options. The MA-II is designed for welding to the pipe line and the MA-IIU is flange mounted. The MA-IIU also offers mounting commonality with other 'U'-series desuperheaters (MA-IU, MNSD-V and SAMN-U).

Features

The MA-II /MA-IIU can be installed in pipe headers, elbows, tees, and similar fittings. It can be installed directly into the header without the need of flanges, and the main line suffers no appreciable pressure loss due to its restriction. No special supports are required for installation.

The higher the main fluid velocity the better the desuperheating, since with higher velocity, a shorter distance is required to achieve mixing. The temperature sensing element should be located approximately 40' (12m) downstream from the desuperheater.

Principle of Operation

The Copes-Vulcan MA Desuperheaters reduce steam or gas temperatures by introducing cooling liquids directly into the hot fluid. Temperature reduction is essentially a matter of heat transfer, where the cooling liquid is placed in direct contact with the hot fluid and receives the necessary heat for evaporation. After sufficient time, all of the liquid is vaporized, resulting in final fluid flow at the desired lower temperature.

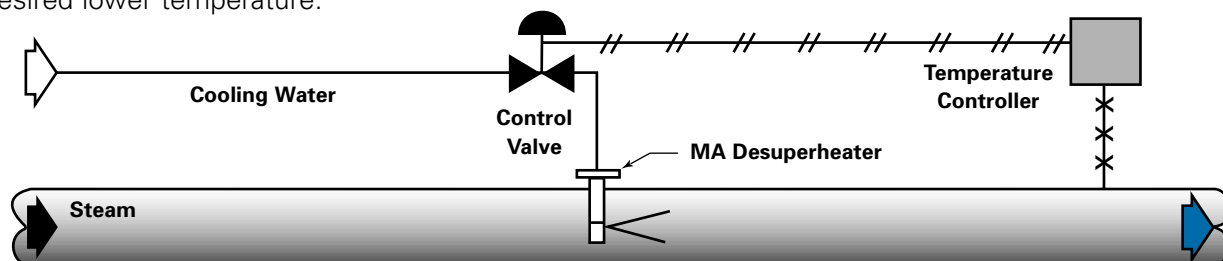
The operation is quite simple. Cooling liquid flow is controlled by a valve which responds to changes received from the temperature controller or temperature control system. This liquid then passes through the main tube of the desuperheater to the spray nozzle and discharges into the header as a fine spray. By controlling the flow through the spray nozzle and maintaining proper header velocities, good reliable temperature control is obtained. Speed of response is optimized by:

- (1) Proper range selection of the temperature controller
- (2) Placement of controller as close to the valve as possible
- (3) Use of a valve positioner
- (4) Precise throttling of cooling liquid valve

Function

The cross section of the MA's tube is designed to minimize problems of mechanical vibration associated with compressible fluid flow. For example, as the main fluid flows past the desuperheater, vortices are formed and dissipated at a frequency dependent on the velocity, viscosity, and diameter of pipe. The desuperheater has been designed to minimize problems associated with vibration so that tube failure will not occur.

Each nozzle is tailored to meet a specific set of operating conditions. In addition, the nozzle design optimizes the cooling liquid particle size so that quick evaporation can take place. If the liquid was merely pumped into the line without a spray, control problems and liquid fall-out might occur. If liquid falls out of the main fluid and settles on the pipe, thermal stress and cracking might occur. The MA Desuperheaters produce rapid absorption of the liquid by mechanically producing fine droplets. The surface area per unit volume of liquid exposed to the hot fluid is large, thereby producing quick evaporation.



Temperature Controller sends signal to cooling water control valve, which in turn regulates flow of water to mechanical atomizing desuperheater.

Specifications

The MA-II desuperheaters are available in forged F-11 and F-22 steel in accordance with ANSI codes. Materials are of the highest quality and selected to minimize the effects of erosion and corrosion.

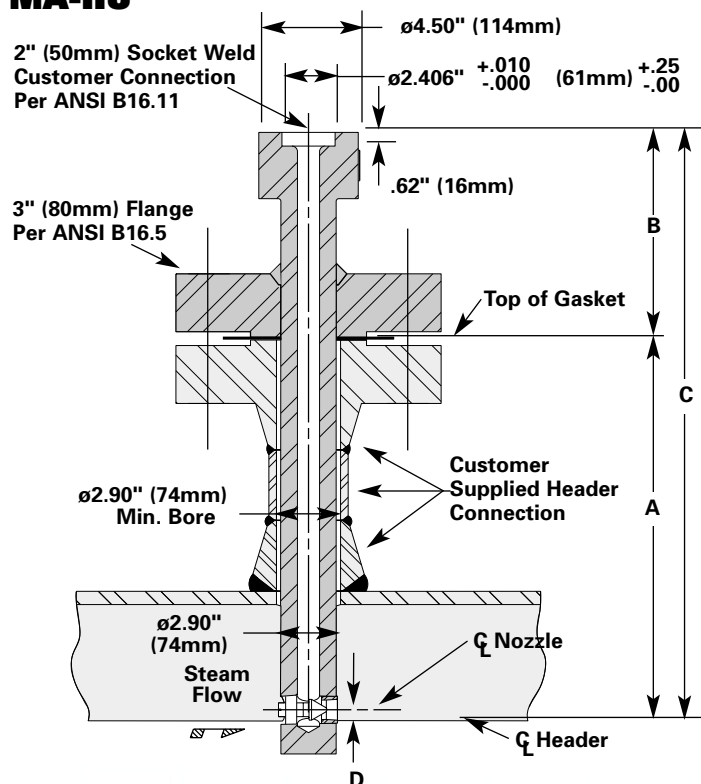
Desuperheating Station

A simple mechanical atomizing desuperheating station consists of a temperature controller, a cooling liquid control valve and the desuperheater. The desired temperature is obtained by the temperature controller fixing the amount of cooling liquid flow through the valve and desuperheater. The nozzle of the desuperheater provides the desired pressure drop to ensure that liquid particle size is sufficiently small for quick evaporation.

This simple type of desuperheating station is normally used for steady load applications and as a result, no atomizing fluid is required. However, this can be used when flow turndown requirements are not too high, in the order of 2 or 2.5 to one. The low limit of flow should be when the main fluid header velocity is 5,000' per minute (1525m per minute) or higher.

Dimensions

MA-IIU*



* Low temperature configuration.

150 Pressure Class MA-IIU

| Header Size | A | B | C | D |
|-------------|--------------|-------------|--------------|-----------|
| 8" 200mm | 13.06 332 | 5.56 141 | 18.62 473 | — |
| 10" 250mm | 14.12 359 | 5.56 141 | 19.69 500 | — |
| 12" 300mm | 15.12 384 | 5.56 141 | 20.69 526 | .56 14 |
| 14" 350mm | 15.75 400 | 5.56 141 | 21.31 541 | — |
| 16" 400mm | 16.75 425 | 5.56 141 | 22.31 567 | .1 25 |
| 18" 450mm | 17.75 451 | 5.56 141 | 23.31 592 | .38 10 |
| 20" 500mm | 18.75 476 | 5.56 141 | 24.31 618 | .62 16 |
| 22" 550mm | 19.75 502 | 5.56 141 | 25.31 643 | .5 13 |
| 24" 600mm | 20.75 527 | 5.56 141 | 26.31 666 | .12 3 |
| 30" 750mm | 23.75 603 | 5.56 141 | 29.21 745 | .12 3 |

300 Pressure Class MA-IIU

| Header Size | A | B | C | D |
|-------------|--------------|-------------|--------------|------------|
| 8" 200mm | 13.06 332 | 5.94 151 | 19 483 | .38 10 |
| 10" 250mm | 14.12 359 | 5.94 151 | 20.31 516 | .62 16 |
| 12" 300mm | 15.12 384 | 5.94 151 | 21.06 535 | .94 24 |
| 14" 350mm | 15.75 400 | 5.94 151 | 21.69 551 | .38 10 |
| 16" 400mm | 16.75 425 | 5.94 151 | 22.69 576 | 1.38 35 |
| 18" 450mm | 17.75 451 | 5.94 151 | 23.69 602 | — |
| 20" 500mm | 18.75 476 | 5.94 151 | 24.69 627 | .1 25 |
| 22" 550mm | 19.75 502 | 5.94 151 | 25.69 653 | .88 22 |
| 24" 600mm | 20.75 527 | 5.94 151 | 26.69 678 | .25 6 |
| 30" 750mm | 23.75 604 | 5.94 151 | 29.69 754 | .25 6 |

600 Pressure Class MA-IIU

| Header Size | A | B | C | D |
|-------------|--------------|-------------|--------------|------------|
| 8" 200mm | 13.06 332 | 6.31 160 | 19.38 492 | .75 19 |
| 10" 250mm | 14.12 359 | 6.31 160 | 20.44 519 | .75 19 |
| 12" 300mm | 15.12 384 | 6.31 160 | 21.44 545 | 1.31 33 |
| 14" 350mm | 15.75 400 | 6.31 160 | 22.06 560 | .75 19 |
| 16" 400mm | 16.75 425 | 6.31 160 | 23.06 586 | 1.75 44 |
| 18" 450mm | 17.75 451 | 6.31 160 | 24.06 611 | .38 10 |
| 20" 500mm | 18.75 476 | 6.31 160 | 25.06 637 | 1.38 35 |
| 22" 550mm | 19.75 502 | 6.31 160 | 26.06 662 | 1.25 32 |
| 24" 600mm | 20.75 527 | 6.31 160 | 27.06 687 | .62 16 |
| 30" 750mm | 23.75 603 | 6.31 160 | 30.06 763 | .62 16 |

All dimensions are Inch
Millimeter

900 Pressure Class MA-IIU

| Header Size | A | B | C | D |
|--------------|--------------|-------------|--------------|------------|
| 8" 200mm | 13.06 332 | 7.06 179 | 20.12 511 | — |
| 10" 250mm | 14.12 359 | 7.06 179 | 21.19 538 | .12 3 |
| 12" 300mm | 15.12 384 | 7.06 179 | 22.19 564 | .88 22 |
| 14" 350mm | 15.75 400 | 7.06 179 | 22.81 579 | .06 2 |
| 16" 400mm | 16.75 425 | 7.06 179 | 23.81 605 | .12 3 |
| 18" 450mm | 17.75 451 | 7.06 179 | 24.81 630 | — |
| 20" 500mm | 18.75 476 | 7.06 179 | 25.81 656 | 1 25 |
| 22" 550mm | 19.75 502 | 7.06 179 | 26.81 681 | .38 10 |
| 24" 600mm | 20.75 527 | 7.06 179 | 27.81 706 | 1.38 35 |
| 30" 750mm | 23.75 603 | 7.06 179 | 30.81 783 | 1.38 35 |

1500 Pressure Class MA-IIU

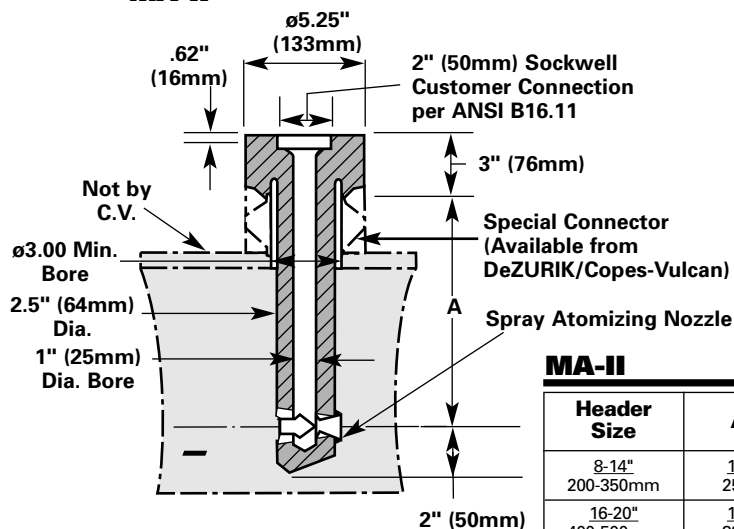
| Header Size | A | B | C | D |
|--------------|--------------|-------------|--------------|------------|
| 8" 200mm | 13.06 332 | 7.69 195 | 20.75 527 | .62 16 |
| 10" 250mm | 14.12 359 | 7.69 195 | 21.81 554 | .5 13 |
| 12" 300mm | 15.12 384 | 7.69 195 | 22.81 579 | 1.5 38 |
| 14" 350mm | 15.75 400 | 7.69 195 | 23.44 595 | .69 18 |
| 16" 400mm | 16.75 425 | 7.69 195 | 24.44 621 | .75 19 |
| 18" 450mm | 17.75 451 | 7.69 195 | 25.44 646 | .62 16 |
| 20" 500mm | 18.75 476 | 7.69 195 | 26.44 672 | 1.62 41 |
| 22" 550mm | 19.75 502 | 7.69 195 | 27.44 697 | 1 25 |
| 24" 600mm | 20.75 527 | 7.69 195 | 28.44 722 | 2 51 |
| 30" 750mm | 23.75 603 | 7.69 195 | 31.44 799 | 2 51 |

All dimensions are Inch
Millimeter

2500 Pressure Class MA-IIU

| Header Size | A | B | C | D |
|--------------|--------------|-------------|--------------|------------|
| 8" 200mm | 13.06 332 | 9.69 246 | 22.75 578 | — |
| 10" 250mm | 14.12 359 | 9.69 246 | 23.81 605 | 1.06 27 |
| 12" 300mm | 15.12 384 | 9.69 246 | 24.81 630 | — |
| 14" 350mm | 15.75 400 | 9.69 246 | 25.44 646 | .62 16 |
| 16" 400mm | 16.75 425 | 9.69 246 | 26.44 672 | 1.62 41 |
| 18" 450mm | 17.75 451 | — | — | — |
| 20" 500mm | 18.75 476 | — | — | — |
| 22" 550mm | 19.75 502 | — | — | — |
| 24" 600mm | 20.75 527 | — | — | — |
| 30" 750mm | 23.75 603 | — | — | — |

MA-II



MA-II

| Header Size | A |
|---------------------|-----------|
| 8-14" 200-350mm | 10 250 |
| 16-20" 400-500mm | 13 330 |
| 22-30" 550-750mm | 18 450 |

MA-II and MA-IIU Nozzle Sizes

| Orifice Diameter | Code Letter | Gage Wire Diameter |
|------------------|-------------|--------------------|
| .5 | A | .046 |
| .5 | B | .089 |
| .875 | C | .063 |
| .875 | D | .089 |
| .875 | E | .116 |
| .875 | F | .140 |
| .875 | H | .180 |
| .875 | J | .290 |
| .875 | K | .375 |

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