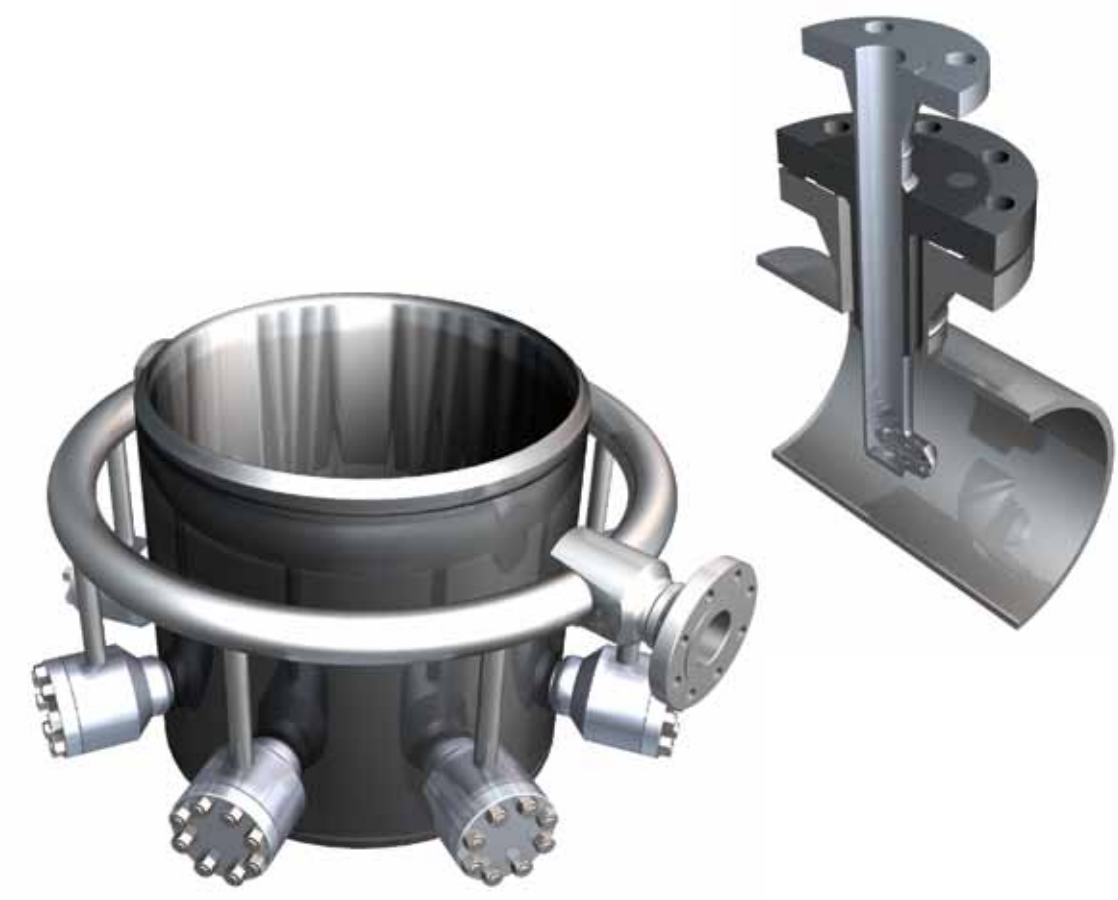
FLOWSERVE

TECHNICAL BULLETIN

Desuperheater

FCD VLENTB0115-00 – 09/11



Experience In Motion

This bulletin contains descriptions of the MaxCool MCX, VaporCool, and VaporCool MicroNozzle desuperheaters along with their basic principles of operation and characteristics.

DESCRIPTION AND PRINCIPLES OF OPERATION

Desuperheaters are used to reduce steam temperature by injecting atomized water into the superheated steam flow. Desuperheater nozzles can be lance mounted as shown in Figure 1 or manifold mounted as shown in Figures 2 and 3. Lance mounted desuperheaters can be equipped with MaxCool MCX, VaporCool, or VaporCool MicroNozzle nozzles. Manifold mounted desuperheaters can be equipped with MaxCool MCX or VaporCool MicroNozzle nozzles.

Figure 1: Lance Mounted MaxCool MCX Desuperheater

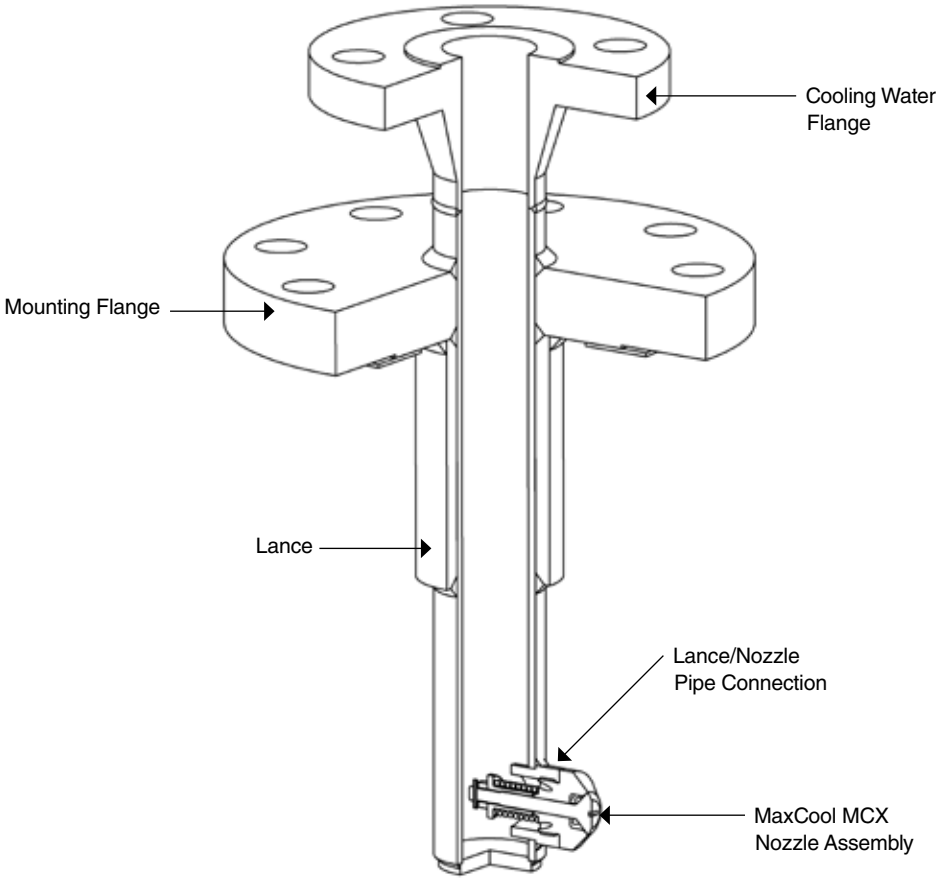


Figure 2: Manifold Mounted MaxCool MCX Desuperheater

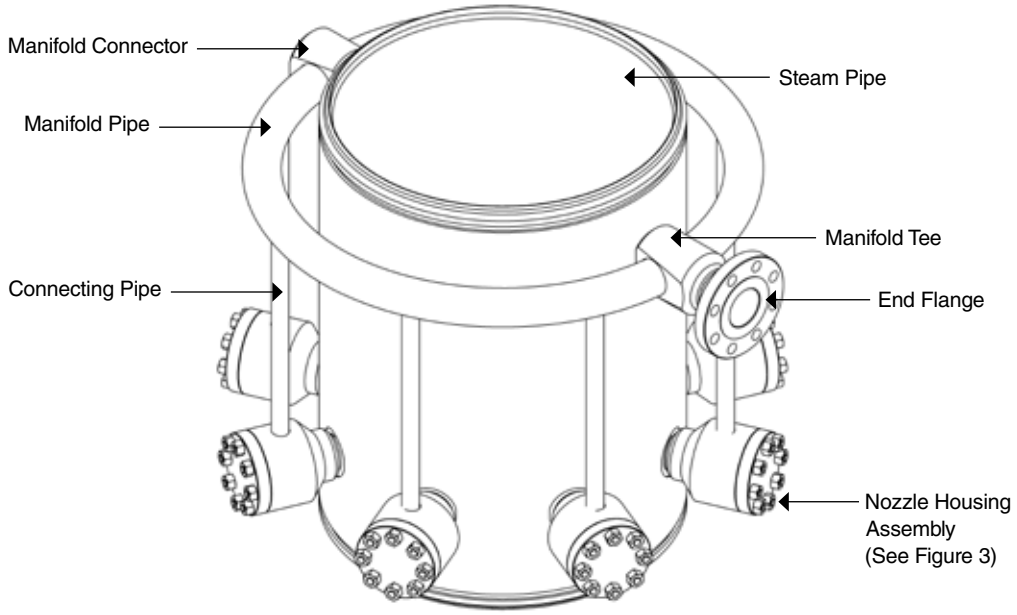
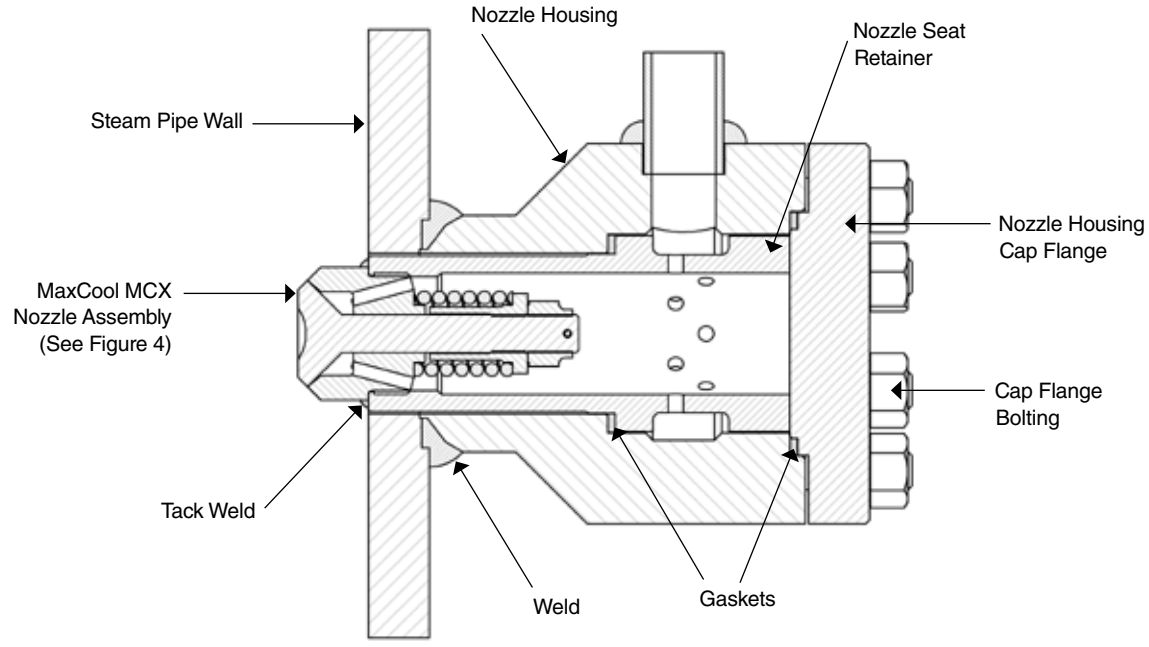


Figure 3: Nozzle Housing Assembly



MaxCool MCX Nozzle

The MaxCool MCX nozzle is a variable area hollow cone nozzle that produces a fine droplet spray mist. Figure 4 shows a cross-section of the nozzle assembly with the parts identified. The maximum range-ability for the MaxCool MCX nozzle is approximately 20:1.

The plug is assembled through the seat and is biased against the seat with a spring. The spring is held in place with a retainer that is screwed onto the plug. The retainer limits the stroke of the plug to ensure proper water atomization. A castle nut with an expansion pin or a bent washer locks the assembly together.

The geometry of the nozzle assembly is optimized to provide efficient cooling by minimizing water droplet size. When the Δp between the cooling water and the steam is sufficient to overcome the preload of the spring, the plug moves away from the seat and cooling water circulates through the nozzle openings. As the water moves down the conical shaped plug and exits past the sharp edges of the narrow plug opening, the cooling water is atomized into a fine spray mist.

Figure 4: MaxCool MCX Nozzle Assembly Cross-Section

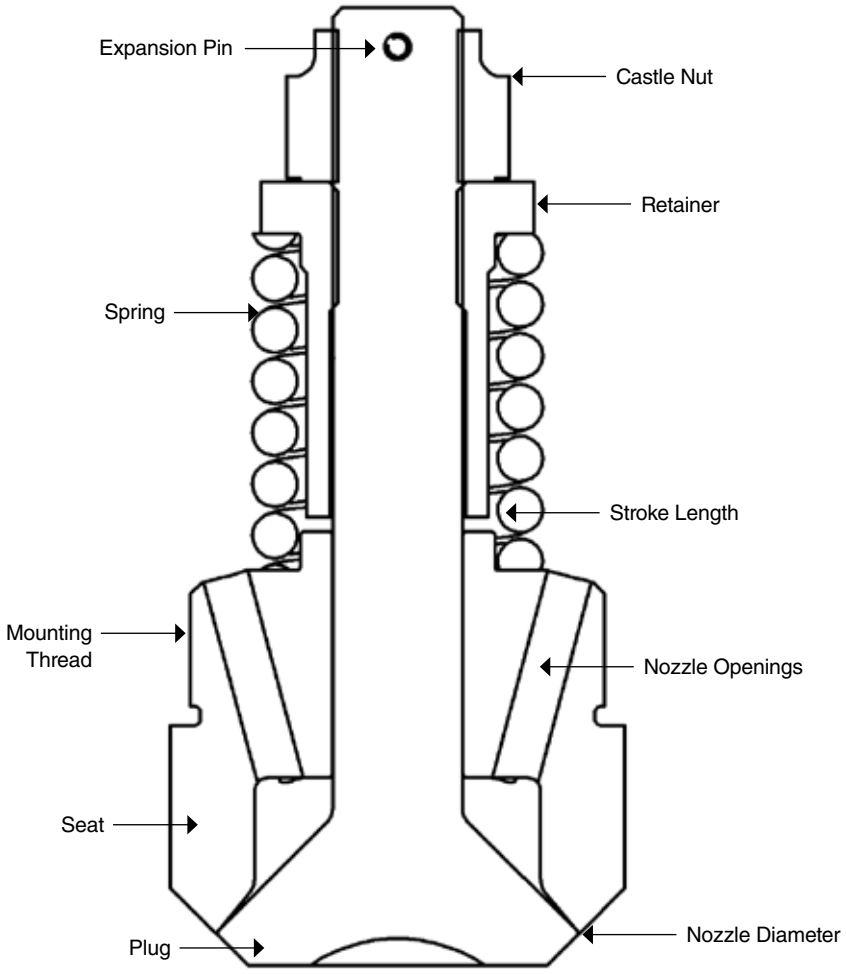


Table 1 shows the available MaxCool MCX desuperheater nozzle model numbers with their CV's, outer diameters, mounting thread sizes, and weights.

Table 1: MaxCool MCX Nozzle Data

Model Number	Nozzle Diameter (in)	CV	Outer Diameter (in)	Mounting Thread Size	Nozzle Assembly Weight (Lb)
MCX 025	0.25	0.24	0.81	0.63-18UNF	0.07
MCX 050	0.50	0.90	0.94	0.75-16UNF	0.13
MCX 075	0.75	1.80	1.38	1.00-12UNF	0.36
MCX 100	1.00	3.10	1.63	1.25-12UN	0.62
MCX 125	1.25	4.50	2.00	1.50-12UN	1.1
MCX 150	1.50	6.50	2.25	1.75-12UN	1.6
MCX 175	1.75	8.10	2.56	2.00-12UN	2.5
MCX 200	2.00	10.50	2.81	2.25-12UN	3.3

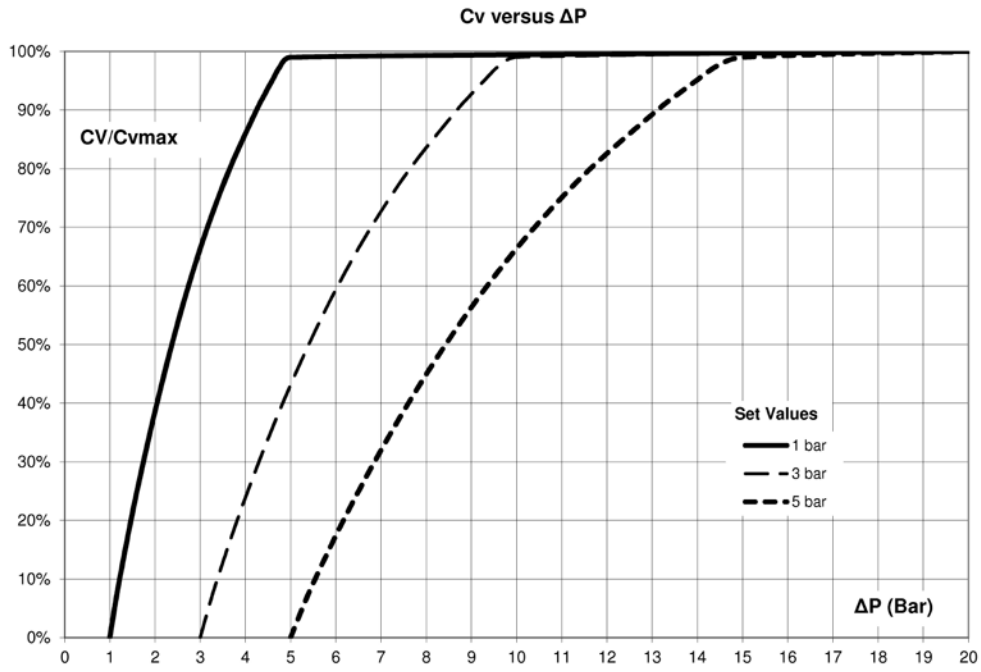
Table 2 shows the materials of construction for the MaxCool MCX nozzle assembly:

Table 2: MaxCool MCX Materials of Construction

Components of Nozzle Assembly	Material of Construction
Plug	416 SS HT
Seat	416 SS
Retainer	416 SS
Spring	Inconel X-750
Castle Nut	Stainless Steel
Expansion Pin	Stainless Steel

Each MaxCool MCX nozzle assembly is available in 1, 3, and 5 bar set pressures. Figure 5 shows the CV versus Δp for each set pressure value.

Figure 5: MaxCool MCX CV vs Δp



The minimum ΔP for the MaxCool MCX nozzle is 2 Bar for a nozzle with a 1 Bar cracking pressure spring, 4 Bar for a nozzle with a 3 Bar cracking pressure spring, and 6 Bar for a nozzle with a 5 Bar cracking pressure spring. The maximum ΔP is 30 Bar.

Generally, smaller nozzles and higher cracking pressures produce smaller water droplet sizes.

VaporCool Nozzle

The VaporCool nozzle is a fixed area full cone nozzle that produces a fine droplet spray mist. There are 7 small fixed area hollow cone nozzles mounted in the nozzle face. The interactions of the multiple hollow cone sprays produce a full cone spray pattern. These multi-orifice nozzles produce a finer spray than standard full cone nozzles of comparable size. Figures 6 and 7 show views of the VaporCool Nozzle. The VaporCool nozzle material of construction is 316 SS. The maximum rangeability of the VaporCool nozzle is 5:1.

Figure 6: VaporCool Nozzle

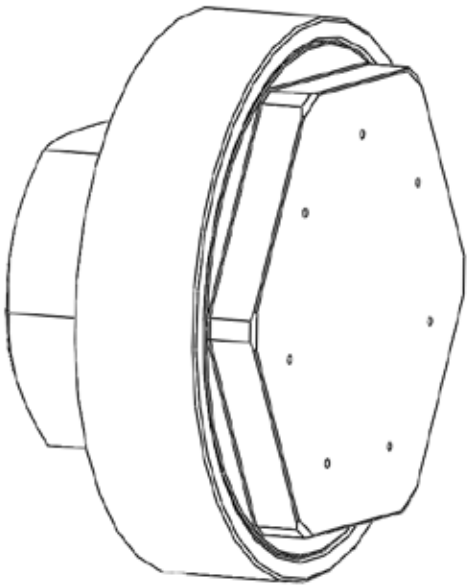


Figure 7: Cross-Section of VaporCool Nozzle

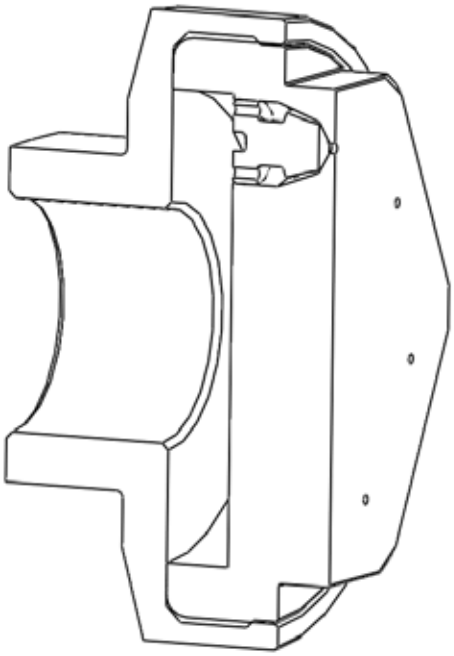


Table 3 shows the available VaporCool nozzle model numbers with mounting thread sizes, CV's, outer diameters, and minimum operating ΔP's. The nozzle maximum optimum ΔP is 10 Bar. The maximum ΔP is 20 Bar.

Table 3: VaporCool Nozzle Data

Model Number with Female NPT Mounting Thread Size	CV	OD (in)	Min ΔP (Bar)
CAS 1153 1/2"	0.062	1.97	2.0
CAS 1274 1/2"	0.111	1.97	1.0
CAS 1343 3/4"	0.139	2.83	0.5
CAS 1551 3/4"	0.223	2.83	0.5
CAS 1870 3/4"	0.353	2.83	0.5
CAS 2116 3/4"	0.470	2.83	0.5
CAS 2145 3/4"	0.588	2.83	0.5
CAS 2184 3/4"	0.746	2.83	0.5
CAS 2220 3/4"	0.894	2.83	0.5
CAS 2342 3/4"	1.390	2.83	0.5
CAS 2434 3/4"	1.762	2.83	0.5
CAS 2551 3/4"	2.234	2.83	0.5
CAS 2728 3/4"	2.951	2.83	0.5
CAS 2385 1"	1.564	5.51	0.5
CAS 2489 1"	1.986	5.51	0.5
CAS 2685 1"	2.780	5.51	0.5
CAS 3130 2"	5.269	7.28	0.5
CAS 3184 2"	7.458	7.28	0.5
CAS 3245 2"	9.930	7.28	0.5

VaporCool MicroNozzle

The VaporCool MicroNozzle is a low flow fixed area hollow cone nozzle that produces very fine atomized sprays. These nozzles are made from 316 SS and have ¼" NPT male mounting threads. Figure 8 shows a view of this nozzle. Table 4 shows the nozzle model numbers, CV's and minimum operating ΔP's. The maximum operating ΔP is 40 Bar. The maximum rangeability of the VaporCool MicroNozzle is 5:1.

Figure 8: VaporCool MicroNozzle

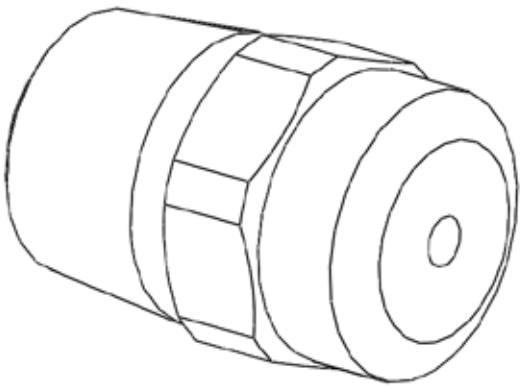
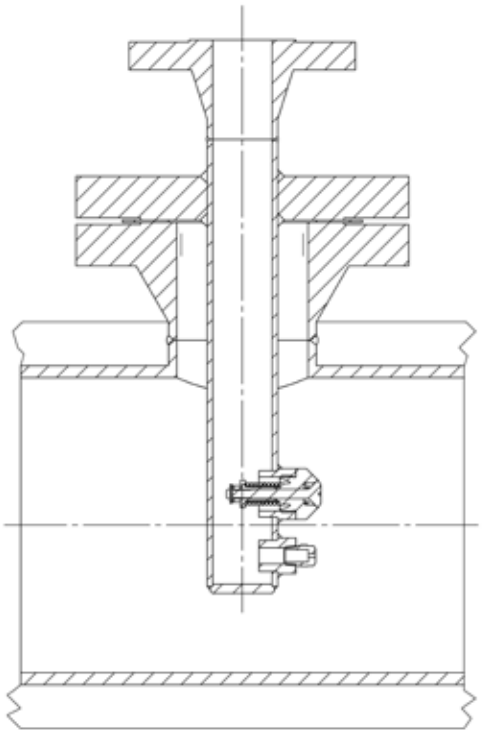


Table 4: VaporCool MicroNozzle Data

Nozzle Model No.	CV	Min ΔP (Bar)
1/4M-316SS .60	0.0016	5.0
1/4M-316SS 1	0.0027	3.0
1/4M-316SS 1.5	0.004	2.5
1/4M-316SS 2	0.005	2.0
1/4M-316SS 3	0.008	1.5
1/4M-316SS 4	0.011	1.5
1/4M-316SS 6	0.016	1.5
1/4M-316SS 8	0.021	1.5
1/4M-316SS 10	0.026	1.0
1/4M-316SS 12	0.032	1.0
1/4M-316SS 14	0.037	1.0
1/4M-316SS 16	0.042	1.0
1/4M-316SS 18	0.047	1.0
1/4M-316SS 20	0.053	1.0
1/4M-316SS 22	0.058	1.0
1/4M-316SS 26	0.068	1.0

Multiple nozzles can be mounted on one lance to increase rangeability. See Figure 9.

Figure 9: View of MaxCool MCX nozzle and VaporCool MicroNozzle combined on one lance for increased rangeability



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