



Jalapeño Valve

HEATED VACUUM VALVES FOR CVD NITRIDE, TIN LPCVD AND OTHER SEMICONDUCTOR PROCESSES

The Jalapeño Valves are the highest temperature isolation valves offered by MKS and are designed for processes that require elevated temperatures such as nitride.

The Jalapeño Valves are specially designed to fit with MKS Series heaters. Each valve heater is designed for optimal temperature distribution and uniformity. The result is a fully engineered product match, which provides the highest level of performance for the silicone heater technology.

Features and Benefits

New Improved Heater Design

- Tighter temperature control enabled by microprocessor controlled thermocouple
- Improved reliability of heater control system due to no-arc relay circuit
- Improved temperature uniformity with optimized design of multiple heating zones
- Improved heater lifetimes and ease of installation with new clam-shell design of heaters
- Improved design of thermal fuse, eliminating nuisance failures caused by transient thermal spikes
- Special temperature settings available on request

Improved Process Performance - Yield, Uptime

- Isolates pump lines and traps downstream
- Reduces particle generation with slow pump downs
- Stops unwanted sublimation of process by-products, heaters keep valve clean
- Reported increase in time between maintenance cycles from 2 weeks to 12 weeks or 20 runs to 145 runs

Enhanced Heater Safety

- Outside temperature of heater 45-65°C, safe to touch
- Integral thermal fuse
- Ground Fault Equipment Leakage Circuit Interrupter power cord option eliminates shock hazard

Better Thermal Performance

- Reduced power consumption
- Improved temperature uniformity, prevents cold zones
- Patented design retains heat and improves thermal safety

Valve Features

- Formed bellows for reduced particle buildup and longer cycle life
- Heavy duty spring allows the valve to seal with contamination
- Second stage allows for soft pump down
- Adjustable orifice allows for controlled pump down
- Thumbscrew and micrometer actuators available for bypass valve
- Three stage valves available on request

Other Important Features

- May be used in vacuum forelines, or the exhaust side of the pump
- Fast delivery of standard heaters
- Controller LED confirms that the heater is operating properly and at pre-set operating temperatures
- Low temperature alert option warns when heater is cold
- Specially designed valves with heaters available



Applications

Semiconductor CVD and etch processes produce gaseous by-products that can readily be pumped out of the reaction chamber. However, they usually solidify in a vacuum pump line since the line temperature is lower than the reaction chamber. A clogged line means longer down time and lower product yield.

A common process is LPCVD silicon nitride. Since sublimation is temperature driven, use heat to maintain the by-products in the vapor phase and use cooling to intentionally sublimate the vapors in the trap.

Heaters have been used successfully in tungsten and oxide etch systems. Heating helps in TEOS CVD systems where a very tight temperature control is required. Some processes yield unintentional by-products. For example, diammonium hexafluorosilicate $(\text{NH}_4)_2\text{SiF}_6$ has been observed in a silicon nitride PECVD process due to the cross chemical reaction of the products formed in the deposition and etching processes. It is a sublimable material that lends itself to heating and cooling strategies. Please consult MKS application engineers for further assistance.

Description

Heaters and Insulators

The Jalapeño Valve heaters maintain a low external surface temperature while heating the standard Jalapeño Valves. They meet current strict safety standards.

The heaters can be daisy-chained with integral locking connectors. The heaters are wired in parallel. If one heater fails, the others will remain on. A power cord is required for every 12 amps drawn by a chain of heaters.

Heat is distributed with wire heating elements closely and evenly spaced. The Jalapeño Valve heater uses up to five heat control zones. Any potential for hot and cold spots is virtually eliminated because of improved, optimized heat distribution. Since each heater is designed to uniformly heat a component, there is no need for costly controllers or thermocouples with messy wires.

The heaters are made of a 1/2" or 3/4" thick silicone foam insulation bonded, using a patented technology, onto a reinforced silicone rubber mat. We have optimized the thickness of the insulation for the highest degree of temperature insulation, while still offering an easy fit into tight places. The heaters' elastic, conforming shape and new clam shell design make installation and removal fast and easy.

Flange insulators, made of the same material as the heaters; help to keep your system at a uniform inside and a safe outside temperature. They also restrict the rate of heat loss externally, reducing your power consumption.

All materials used in the heaters and insulators are suitable for clean room use.

Valves

The heated valves may have up to five different heat zones in the heater controlled by a microprocessor based electronic controller. This eliminates "cold zones" and maintains temperature uniformity in the valve. Minimum temperatures exceed 135°C (see Figure 1).

The valve uses a formed bellows made of 321 stainless steel. Formed bellows are easier to heat and prevent particle entrapment between the convolutions. This increases the valve cycle life.

The valve is air opened and spring closed. The heavy duty spring allows the valve to seal in the presence of contamination on the seat.

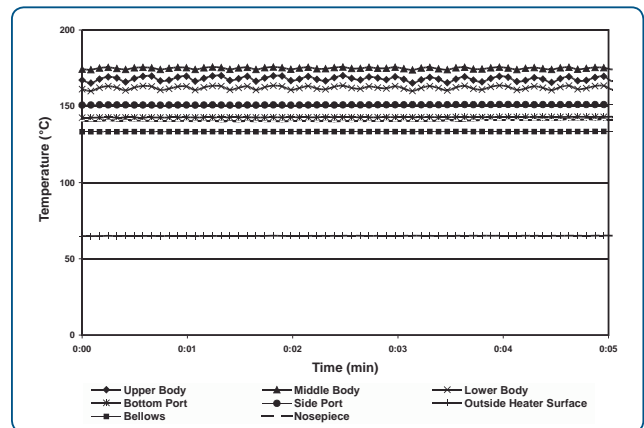


Figure 1 — Temperature Profile of a 46 Series NW 100 Single Stage Jalapeño Valve Heater

Two-Stage Valves

Traditionally, the best method to soft start a vacuum system has been to run a secondary bypass line with a small orifice valve around the main vacuum isolation valve.

We have designed the Jalapeño Two-Stage Valve specifically to accommodate your space constraints and to provide a heated soft start to your system in two effortless steps (Figure 2). In the first stage, the bypass valve pumps down slowly from atmospheric pressure to a user-specified vacuum pressure. In the second stage, the main valve opens, allowing use of full pumping speed.



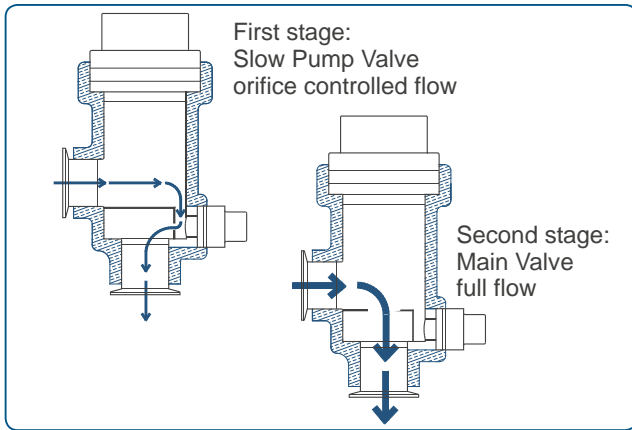


Figure 2 — *Two-Stage Valve Flow*

The Jalapeño Two-Stage Valve features a removable, interchangeable small orifice within the bypass valve to vary slow pump speeds. The standard bypass orifice diameter is 0.225 inches.

A normally closed, pneumatically actuated valve at both stages, the Jalapeño Two-Stage Valve is offered with an optional thumbscrew or micrometer head for the bypass valve. This allows for additional flow adjustment by limiting the stroke.

Enhanced Safety

The heaters engineered for the Jalapeño Valve are the result of many years of continuous improvement directed at satisfying the demands of modern semiconductor facilities. They represent the highest standard of thermal and electrical safety on the market.

Low Outside Temperature Safe to Touch

One of the primary concerns of safety engineers is exposure to hot surfaces. Pipeline heaters in particular present substantial opportunity for accidental contact because of the vast array of vacuum piping typically found in a fab. Superior thermal insulation is key to holding the heat in near the pipe where it is needed, and away from the outside surface. A heater operating at 150°C requires a 0.5 inch thick layer of silicone foam in order to meet today's safety standard limits.

Integral Thermal Fuse

A secondary temperature limiting device is required by several safety standards organizations. Our thermal fuse is considered a critical safety component and has been certified by UL, CSA, and VDE testing agencies.

Ground Fault Equipment Leakage Circuit Interrupter (GFELCI)

Vacuum piping installations should be grounded. In the event that the ground connection is lost, the GFELCI power cord will maintain electrical safety even with a short circuit to ungrounded piping. If an operator touches the electrically "hot" piping, the GFELCI power cord will cut power off to the heaters within 25 msec upon sensing a current imbalance between power lines. The detection circuit is similar to those used in new residential construction.

New, Improved Thermal Performance

MKS Heaters use a patented insulation construction that is effective at maintaining heat levels required while remaining safe to touch on the outside. This allows for the following benefits:

- (1) Microprocessor-based control of thermocouple offers an extremely tight temperature control band.
- (2) No-arc relay circuit eliminates arcing of the power relays extending lifetime and improving reliability of the heater. Relay contact life exceeds 4 million cycles.
- (3) New optimized design of the heat zones within the valve heater improve temperature uniformity.
- (4) Improved design of thermal fuse configuration eliminates nuisance failures caused by transient thermal spikes.



- (5) When you touch the outside insulation, your finger acts as a heat sink. The insulation is so effective that the outside temperature of the heater where you are touching falls to 39°C. So the heaters are safe to touch. When you remove your finger, the silicone goes back to 65°C. See Figure 3.

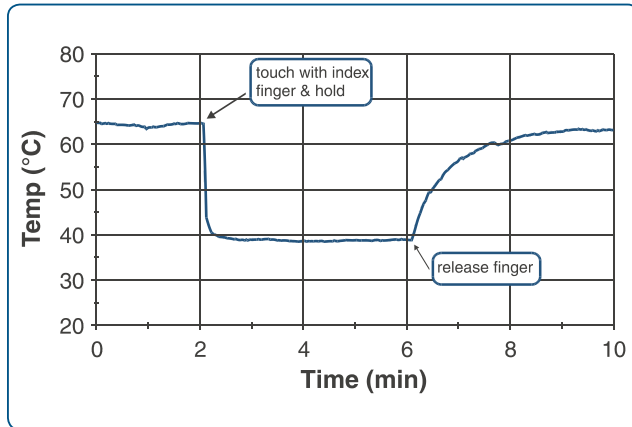


Figure 3 — MKS Heater “Heat-Sink” Graph

- (6) The 1/2” silicone foam insulation keeps the parts heated with less power. The power consumption should be 20-30% less than conventional 1/4” silicone heaters.
- (7) All surfaces of the component are heated uniformly to the temperature range required. The MKS heater’s patented molded design completely surrounds the valve body. Total coverage improves temperature uniformity two ways: by controlling heat loss from exposed gaps, and by actively heating what used to be a dead zone. Cold zones encountered in lace-type and mat-type heaters are eliminated. There is no danger from exposure to hot metal eyelets as there is on the lace-style heaters.
- (8) Each heater is equipped with a microprocessor based electronic controller that makes each heater its own control zone. Differences in heat transfer rate, like that between vertical and horizontal piping runs, are automatically accounted for.

Low Temperature Alerts

Each heater’s electronic controller is equipped with a pair of operational status LEDs, one on each side of the controller. These LEDs are visible through the controller’s plastic shell when illuminated. When the LEDs are on, this indicates that the heater is operating properly and within $\pm 20^{\circ}\text{C}$ of nominal operating temperature.

Heaters equipped with the LTA option (LTA monitor required) contain a normally open switch that closes when the heater has achieved normal operating temperature. The thermal switches are designed to be daisy chained in series to permit monitoring several heaters with a single LTA monitor. If any one of the switches fails to close, then one of the heaters has gone cold and the LTA monitor will signal a fault via a flashing red LED. When all heaters are operating within their normal operating temperature range, the monitor’s green LED will be on. The monitor also includes a relay with normally open and normally closed contacts. The relay can be hard wired into a user supplied computer or other instrumentation to provide remote notification of heater status. The combination of these two features provides both remote and local confirmation of heater status.

Other Important Features

These heaters are much easier to install, since they are premolded in the shape of the part. The new clam shell design for the valve body heaters improves ease of installation. The snaps will not get hot and the arduous lacing process is eliminated.

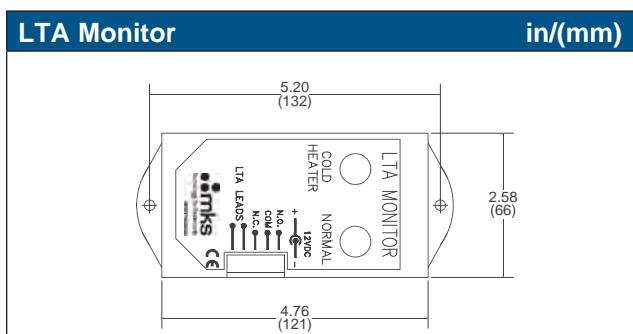
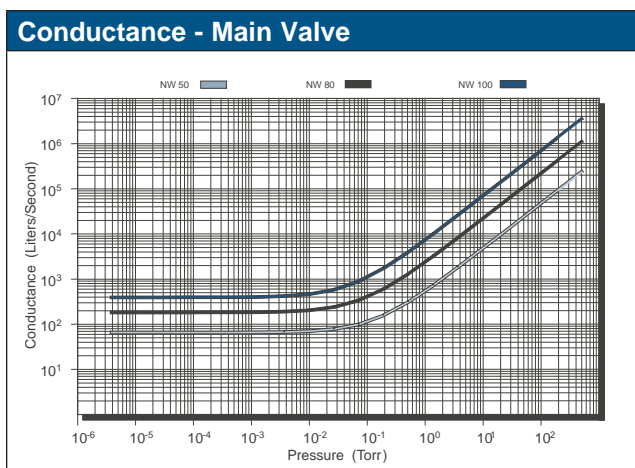


Specifications

Specifications												
Port Size in. (NW)	Weight lb. / (kg)				Heater Current at 120V (amps)				Actuator Cylinder Volume in. ³ (cm ³)	Actuation Time (msec) Opening (Closing)	Blow By Pressure psia	Maximum Internal Spring Closing Pressure psia
	Single Stage		Two-Stage		Angle		Inline (body and port heaters)					
	Angle	Inline	Angle	Inline	Single Stage	Two Stage	Single Stage	Two Stage				
2.0 (50)	13.0 (5.9)	16.5 (7.5)	13.8 (6.3)	17.5 (8.0)	.9	1.2	1.3	1.6	13.3 (218)	1,000 (2,000)	45	38
3.0 (80)	19.6 (8.9)	27.5 (12.5)	20.4 (9.3)	28.5 (13.0)	1.4	1.7	1.8	2.7	27.6 (453)	2,000 (2,000)	38	40
4.0 (100)	25.5 (11.6)	37.5 (17.0)	26.3 (11.9)	38.5 (17.5)	1.7	2.4	2.7	3.6	27.6 (453)	2,000 (2,000)	30	30

Specifications - Main Valve	
Vacuum Range	Atmosphere to below 10 ⁻⁹ Torr
Helium Leak Rate	Less than 1.0 x 10 ⁻⁹ std cc/sec
Cylinder Air Pressure	60 to 100 psig
Limit Switch Rating	5A - 250VAC
Single Pole, Double Throw	5A - 30VDC

Heater Specifications	
Temperature	
Nominal Set Point	150°C (302°F)
Exterior Range	60°- 70°C (140°-158°F)
Interior Range	130°-190°C (266°-374°F)
Electrical Duty Cycle	100 volts 72% 120 volts 50%
Power Cord Current	12 A maximum
Materials	Molded silicone foam, fiberglass reinforced silicone, Teflon insulated wire
Connectors	Midget Twist-Lock, nylon, NEMA ML-1
Compliance	CE, UL E52951 2JR, SEMI S9-95

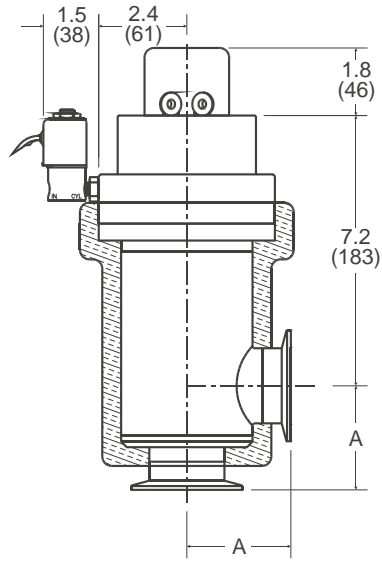


Specifications - Bypass Valve	
Vacuum Range	Atmosphere to below 10 ⁻⁹ Torr
Helium Leak Test	Less than 1.0 x 10 ⁻⁹ std cc/sec
Cylinder Air Pressure	60 to 120 psig
Pneumatic Cylinder Displacement Volume	0.25 in. ³ (4.1 cm ³)
Approximate Pneumatic Closing Time	100 msec
Blow-By Pressure	47 psia
Maximum Internal Spring Closing Pressure	40 psia

LTA Monitor Specifications	
Enclosure	Black plastic
Power Requirements	90-130 VAC input, 12 VDC +/-3 VDC output
Power Consumption	0.3 W
Relay Contact Rating	SPDT, 2 A @ 50 VAC resistive, 1 A @ 30 VDC
Input/Output Wiring	1 Thermal switch line IN 2 Thermal switch line OUT 3 Normally closed 4 Common 5 Normally open
Dimensions (L x H x D)	2.58" x 4.76" x 1.46" (inches) 66 x 121 x 37 (mm)
Compliance	CE

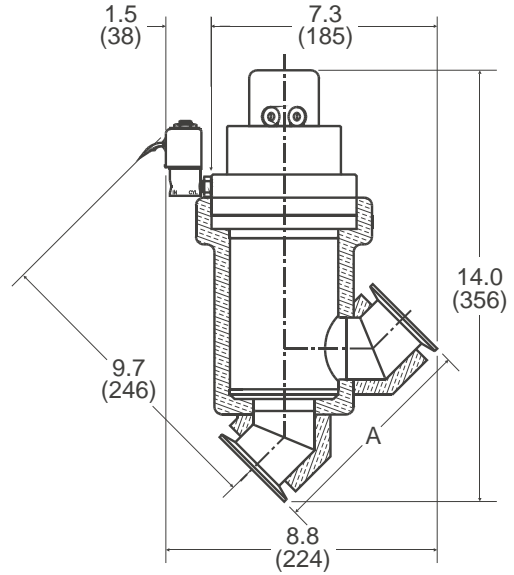


NW 50 Angle Dimensions in./(mm)



A KF Tube
 2.8 (71) 3.0 (76)

NW 50 Inline Dimensions in./(mm)



A KF Tube
 7.0 (178) 7.2 (183)

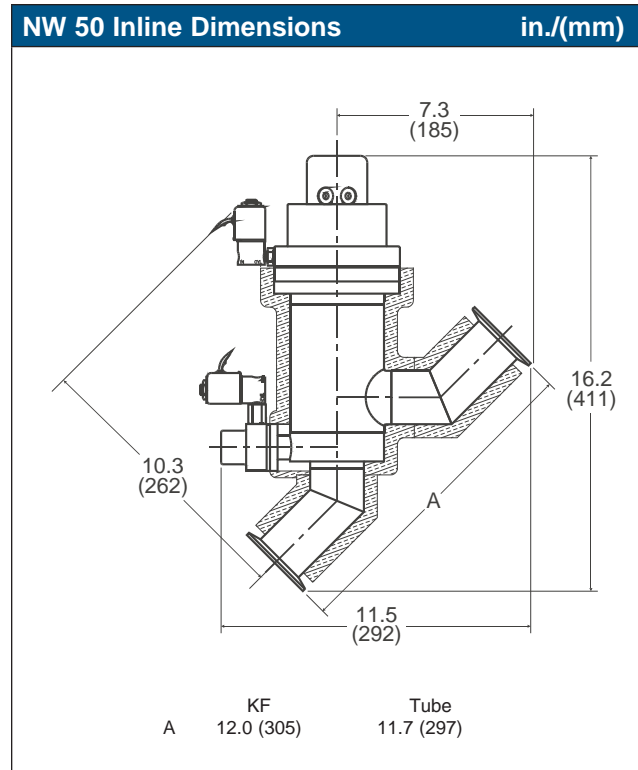
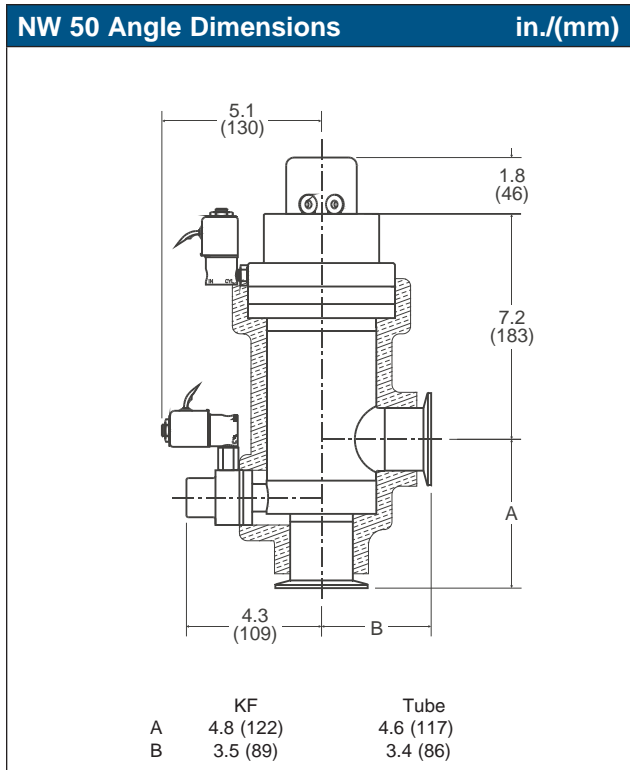
NW 50 Single-Stage Valve Ordering Information

Body Configuration	Limit Switch	Seal Type	Temperature Configuration	Pneumatic Solenoid Voltage
J1-XXX-XX	-X	X	XXX	-XXX
Select 1	Select 1	Select 1	Select 1	Select 1 or leave blank
J1-050-AK KF 50 Angle J1-050-AT 2" Tube Angle J1-050-IK KF 50 Inline J1-050-IT 2" Tube Inline	L w/ Limit Switch N w/o Limit Switch	H Viton Bonnet, Chemraz Nose Z Chemraz Bonnet and Nose	R6A Angle Heater R6I Inline Heaters L6A Angle LTA Heater L6I Inline LTA Heaters NH Without Heaters	24A 24 VAC 50/60 Hz 24D 24 VDC 120 120 VAC 50/60 Hz 208 208 VAC 50/60 Hz 240 220 VAC 50/60 Hz NONE 1/8" NPT-F

Add the price of the options to the price of the body. Sample part number: J1-050-AK-LHR6A-120.



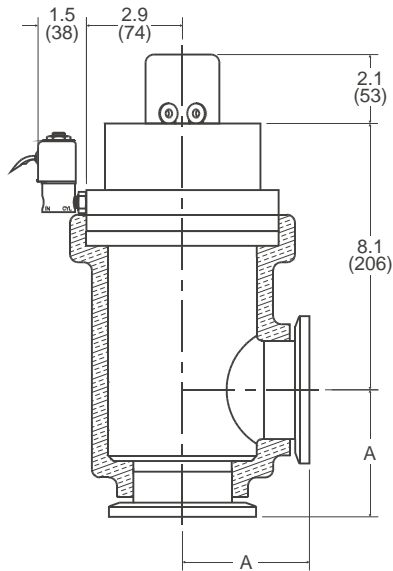
Ordering Information



NW 50 Two-Stage Valve Ordering Information						
Body Configuration	Bypass Orifice Size	Bypass Actuator Type	Limit Switch	Seal Type	Temperature Configuration	Pneumatic Solenoid Voltage †
J2-XXX-XX	-XXX	-X	X	X	XXX	-XXX
Select 1	Select 1	Select 1	Select 1	Select 1	Select 1	Select 1 or leave blank
J2-050-AK KF 50 Angle J2-050-AT 2" Tube Angle J2-050-IK KF 50 Inline J2-050-IT 2" Tube Inline	225 0.225"	C Normally Closed V Thumb Screw M Micrometer Head	L w/ Limit Switch N w/o Limit Switch	H Viton Bonnet, Chemraz Nose Z Chemraz Bonnet and Nose	R6A Angle Heater R6I Inline Heaters L6A Angle LTA Heater L6I Inline LTA Heaters NH Without Heaters	24A 24 VAC 50/60 Hz 24D 24 VDC 120 120 VAC 50/60 Hz 208 208 VAC 50/60 Hz 240 220 VAC 50/60 Hz NONE Main: 1/8" NPT-F Bypass: 10-32 UNF-F
Add the price of the options to the price of the body. Sample part number: J2-050-AK-225-CLHR6A-120. † Price includes one solenoid each for the bypass and main valve.						

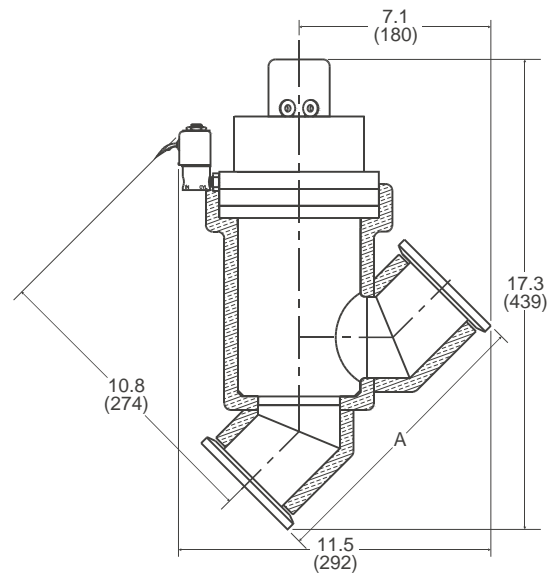


NW 80 Angle Dimensions in./(mm)



A KF/MF Tube
 3.9 (99) 3.3 (84)

NW 80 Inline Dimensions in./(mm)



A KF/MF Tube
 10.6 (269) 10.1 (257)

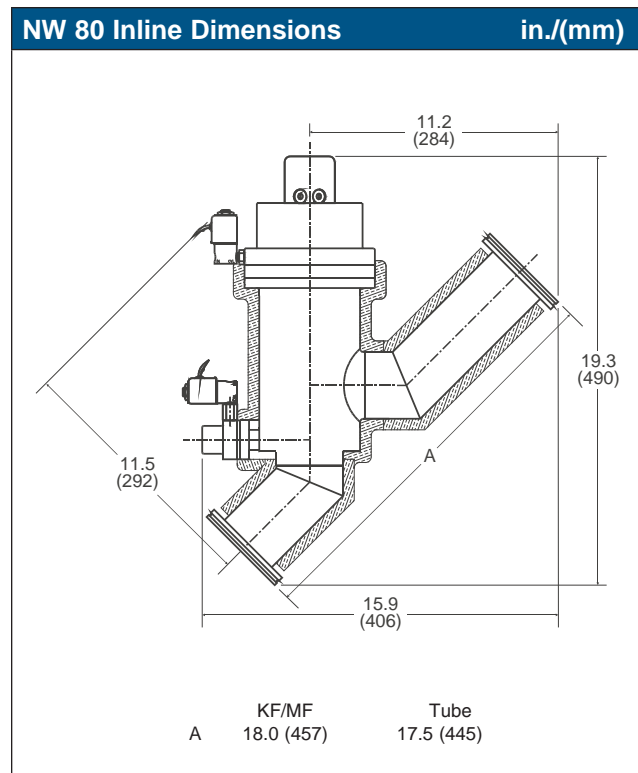
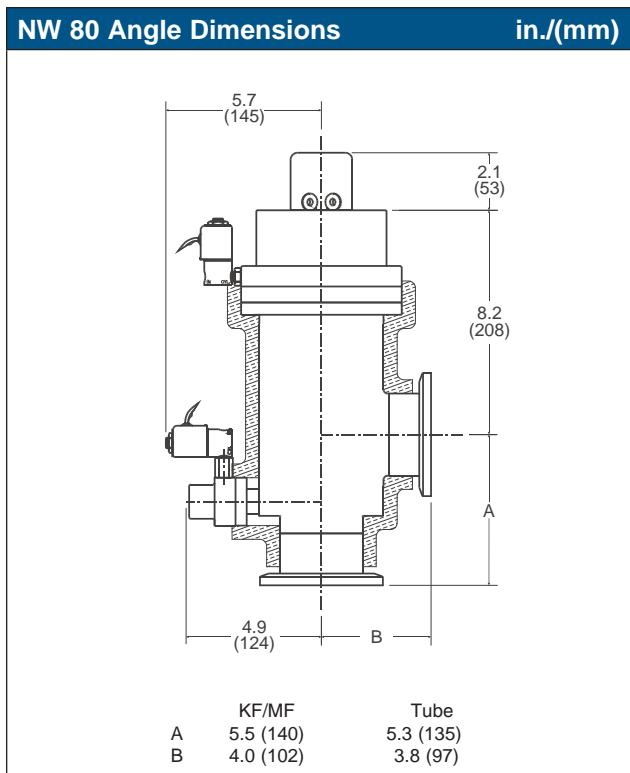
NW 80 Single-Stage Valve Ordering Information

Body Configuration	Limit Switch	Seal Type	Temperature Configuration	Pneumatic Solenoid Voltage
J1-XXX-XX	-X	X	XXX	-XXX
Select 1	Select 1	Select 1	Select 1	Select 1 or leave blank
J1-080-AM MF 80 Angle	L w/ Limit Switch	H Viton Bonnet, Chemraz Nose	R6A Angle Heater	24A 24 VAC 50/60 Hz
J1-080-AT 3" Tube Angle	N w/o Limit Switch	Z Chemraz Bonnet and Nose	R6I Inline Heaters	24D 24 VDC
J1-080-AK KF 80 Angle			L6A Angle LTA Heater	120 120 VAC 50/60 Hz
J1-080-IM MF 80 Inline			L6I Inline LTA Heaters	208 208 VAC 50/60 Hz
J1-080-IT 3" Tube Inline			NH Without Heaters	240 220 VAC 50/60 Hz
J1-080-IK KF 80 Inline				NONE 1/8" NPT-F

Add the price of the options to the price of the body. Sample part number: J1-080-AM-LHR6A-120.



Ordering Information

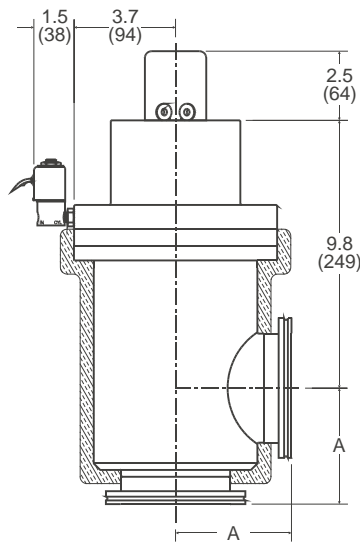


NW 80 Two-Stage Valve Ordering Information						
Body Configuration	Bypass Orifice Size	Bypass Actuator Type	Limit Switch	Seal Type	Temperature Configuration	Pneumatic Solenoid Voltage †
J2-XXX-XX	-XXX	-X	X	X	XXX	-XXX
Select 1	Select 1	Select 1	Select 1	Select 1	Select 1	Select 1 or leave blank
J2-080-AM MF 80 Angle	225 0.225"	C Normally Closed	L w/ Limit Switch	H Viton Bonnet, Chemraz Nose	R6A Angle Heater	24A 24 VAC 50/60 Hz
J2-080-AT 3" Tube Angle		V Thumb Screw	N w/o Limit Switch	Z Chemraz Bonnet and Nose	R6I Inline Heaters	24D 24 VDC
J2-080-AK KF 80 Angle		M Micrometer Head			L6A Angle LTA Heater	120 120 VAC 50/60 Hz
J2-080-IM MF 80 Inline					L6I Inline LTA Heaters	208 208 VAC 50/60 Hz
J2-080-IT 3" Tube Inline					NH Without Heaters	240 220 VAC 50/60 Hz
J2-080-IK KF 80 Inline						NONE Main: 1/8" NPT-F Bypass: 10-32 UNF-F

Add the price of the options to the price of the body. Sample part number: J2-080-AM-225-CLHR6A-120.
 † Price includes one solenoid each for the bypass and main valve.

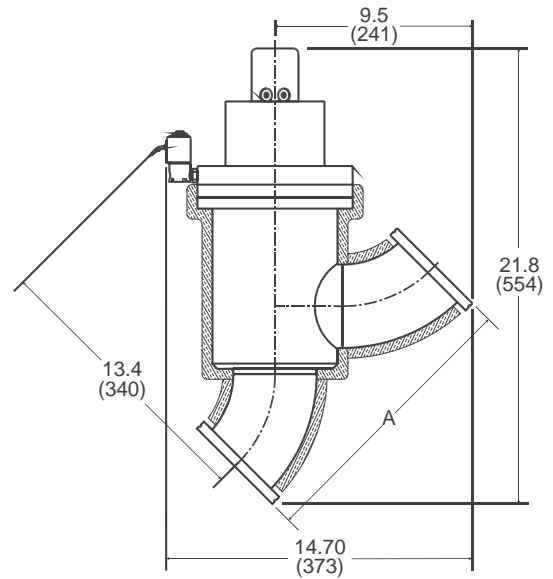


NW 100 Angle Dimensions in./(mm)



	KF/MF	Tube
A	4.3 (109)	4.0 (102)

NW 100 Inline Dimensions in./(mm)



	KF/MF	Tube
A	13.6 (345)	13.1 (333)

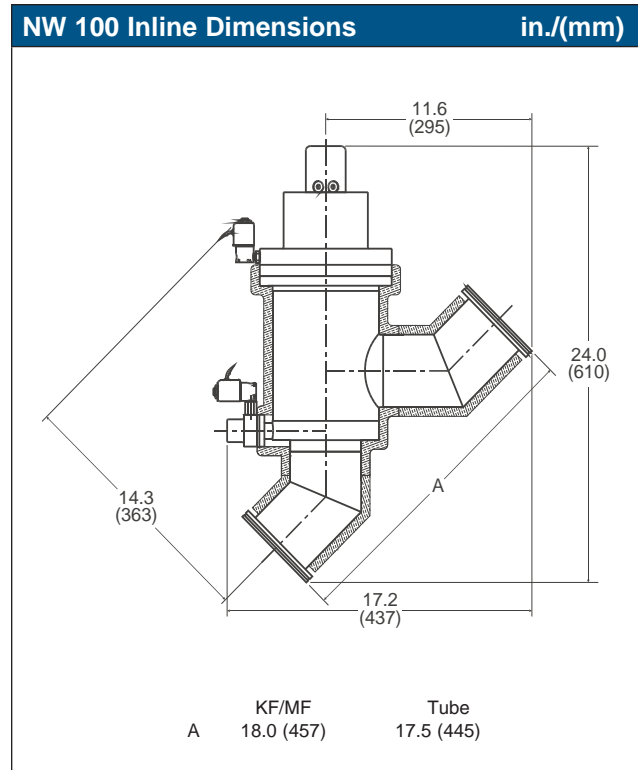
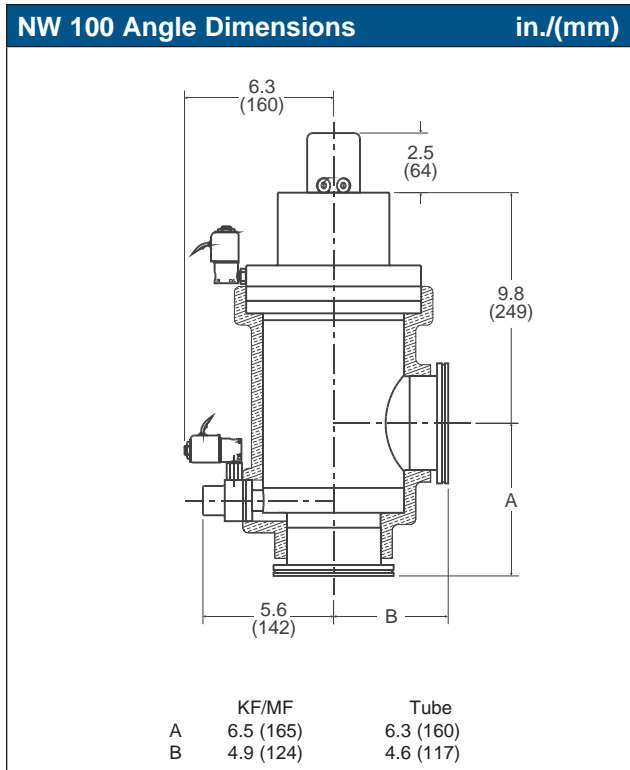
NW 100 Single-Stage Valve Ordering Information

Body Configuration	Limit Switch	Seal Type	Temperature Configuration	Pneumatic Solenoid Voltage
J1-XXX-XX	-X	X	XXX	-XXX
Select 1	Select 1	Select 1	Select 1	Select 1 or leave blank
J1-100-AM MF 100 Angle	L w/ Limit Switch	H Viton Bonnet, Chemraz Nose	R6A Angle Heater	24A 24 VAC 50/60 Hz
J1-100-AT 4" Tube Angle	N w/o Limit Switch	Z Chemraz Bonnet and Nose	R6I Inline Heaters	24D 24 VDC
J1-100-AK KF 100 Angle			L6A Angle LTA Heater	120 120 VAC 50/60 Hz
J1-100-IM MF 100 Inline			L6I Inline LTA Heaters	208 208 VAC 50/60 Hz
J1-100-IT 4" Tube Inline			NH Without Heaters	240 220 VAC 50/60 Hz
J1-100-IK KF 100 Inline				NONE 1/8" NPT-F

Add the price of the options to the price of the body. Sample part number: J1-100-AM-LHR6A-120.



Ordering Information



NW 100 Two-Stage Valve Ordering Information						
Body Configuration	Bypass Orifice Size	Bypass Actuator Type	Limit Switch	Seal Type	Temperature Configuration	Pneumatic Solenoid Voltage †
J2-XXX-XX	-XXX	-X	X	X	XXX	-XXX
Select 1	Select 1	Select 1	Select 1	Select 1	Select 1	Select 1 or leave blank
J2-100-AM MF 100 Angle	225 0.225"	C Normally Closed	L w/ Limit Switch	H Viton Bonnet, Chemraz Nose	R6A Angle Heater	24A 24 VAC 50/60 Hz
J2-100-AT 4" Tube Angle		V Thumb Screw	N w/o Limit Switch	Z Chemraz Bonnet and Nose	R6I Inline Heaters	24D 24 VDC
J2-100-AK KF 100 Angle		M Micrometer Head			L6A Angle LTA Heater	120 120 VAC 50/60 Hz
J2-100-IM MF 100 Inline					L6I Inline LTA Heaters	208 208 VAC 50/60 Hz
J2-100-IT 4" Tube Inline					NH Without Heaters	240 220 VAC 50/60 Hz
J2-100-IK KF 100 Inline						NONE Main: 1/8" NPT-F Bypass: 10-32 UNF-F

Add the price of the options to the price of the body. Sample part number: J2-100-AM-225-CLHR6A-120.
 † Price includes one solenoid each for the bypass and main valve.



Ordering Information

Main Valve Spare Parts					
Port Size in (NW)	Main Valve Internals, Chemraz/Viton Seals	Main Valve Internals, Chemraz Seals	Limit Switch	Chemraz/Viton Seal Set	Chemraz Seal Set
	Part Number	Part Number	Part Number	Part Number	Part Number
2.0 (50)	100010658	100010659	100001683	100010643	100010642
3.0 (80)	100010656	100010657	100001684	100010645	100010644
4.0 (100)	100010654	100010655	100003663	100010647	100010646

Bypass Valve Spare Parts				
Actuator Type	Internal Rebuild Kits, Chemraz/Viton	Internal Rebuild Kits, Chemraz	Chemraz/Viton Seal Set	Chemraz Seal Set
	Part Number	Part Number	Part Number	Part Number
Normally Closed	100010652	100010650	100010649	100010648
Thumb Screw & Micrometer	100010653	100010651	100010649	100010648

Replacement Solenoid Valves		
Voltage and Frequency	Watts	Part Number
24 VAC 50/60 Hz	6.0	100008164
24 VDC	7.0	100008163
120 VAC 50/60 Hz	7.5	100008165
208 VAC 50/60 Hz	7.5	100008166
220 VAC 50/60 Hz	7.5	100008167



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