

# Downstream Pressure Controllers and Valves

**Pressure**

PRODUCT SELECTION GUIDE  
TYPES 651, 1651, 153, 253, 653, AND HEATED VALVES

**Measurement  
& Control**

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# Downstream Pressure Controllers and Valves

Isolating and close-loop controlling each variable that affects a vacuum process is the best method for achieving process consistency. At MKS, we can isolate and close-loop control process pressure using a throttling control valve and a digital PID or self-tuning pressure controller. A typical pressure control system works as follows: (1) a Baratron® capacitance manometer senses pressure in a vacuum chamber; (2) this pressure is then compared to the desired set point pressure in the pressure controller; and (3) the pressure controller commands the control valve to open or close, changing the chamber pressure and bringing it to the desired process pressure set point.

No one pressure control technique is best for all applications, though the downstream control technique is chosen most often for today's more critical vacuum processes (see chart below). With the downstream control technique, an exhaust throttle valve is opened or closed, changing the conductance to the vacuum pump in order to achieve and maintain the desired process pressure—independent of gas inlet. The downstream pressure control technique provides high dynamic range, works well with all types of vacuum pumps, provides fast response, is tolerant to most effluent gases, and has moderate initial costs.

## Pressure Control Techniques

|   | Blower Speed Control                                  | Gas (Ballast) Bypass  | Downstream Control                              |
|---|---|---|---|
| <b>Dynamic Range</b>                    | low<br>(10 to 1 typical)                              | moderate<br>(500 to 1 typical - 1000 to 1 max.)               | high<br>(1000 to 1 typical - up to 10,000 to 1) |
| <b>Types of Pumps</b>                   | will not work on all pumps                            | will work with any pump which can operate at process pressure | all   |
| <b>Speed of Response</b>                | moderate  | fast  | fast  |
| <b>Initial Capital Cost</b>             | AC or SCR motor controller                            | bypass valve and optional controller                          | exhaust valve and controller                    |
| <b>Extra Operating Costs</b>            | none  | nitrogen  | none  |
| <b>Susceptibility to Effluent Gases</b> | none  | none  | slight  |
| <b>Special Requirements</b>             | pump controller and flow rates must be properly sized | bypass valve and pump must be properly sized                  | none  |



# Self-Tuning/Digital PID Pressure Controllers



## Type 651

The MKS Type 651 Self-tuning/Digital PID Valve Controller drives MKS Type 653 or 253 Exhaust Throttle Valves with speed and precision. Its self-tuning algorithm brings the system to set point faster than conventional controllers, and ensures repeatable process recipes without operator involvement. The self-tuning function determines optimal control parameters for any set point in the range of the valve by learning time constants, transfer functions of the valve and plumbing, valve gain, and other important parameters.

The 651 includes adjustable soft-start functions for each set point, as well as open and close functions to minimize turbulence in the chamber; local/remote transducer zeroing capability; and two relays to activate other system functions, or to indicate if the pressure deviates from the desired set point. All controls are easily accessed via a simple-to-use front panel, or remotely through RS-232, TTL, or analog voltage. An LCD readout shows valve position and displays pressure in a wide range of engineering units. Five reprogrammable set points are provided for pressure or position control.



## Type 1651

The 1651 is a display-less version of the Type 651 for OEM design engineers who wish to completely control their process via a host computer. Offered as an economical alternative to the 651, this "black box" version allows for remote setup or control entirely through rear panel interface—RS-232, TTL, or analog. Its compact size allows for installation anywhere on the process system, saving valuable rack space.



## Type 655

The Type 655 Controller can be operated by its easy-to-use front panel, or remotely via analog I/O, TTL, or the RS-232 interface. A front panel key lock switch selects either local or remote control. The 655 provides power for the Baratron® Capacitance Manometer, including most heated models. A remote zero feature on the 655 allows for convenient rezeroing. A two-line, lighted LCD display provides readout of pressure from the Baratron in several selectable engineering units, as well as valve position and other setup and operating parameters. The controller can be preset for up to five pressure or position set points.



## Exhaust Throttle Valve



### Type 253

The MKS Type 253 Exhaust Throttle Valve regulates the removal of gas from a processing system. Its flapper is positioned to modulate gas flow, thereby controlling process pressure. The 253 has a non-linear actuator placed between the flapper shaft and the motor drive shaft in order to generate a linear valve transfer characteristic and provide smooth linear pressure control. The MKS Type 253 is available in standard sizes and flange styles, and is compatible with all MKS throttle valve controllers.

## “Smart” Exhaust Throttle Valve



### Type 153

Specifically designed for computer-controlled applications where a simple pressure control system is desired, the Type 153 Valve integrates all control, communication, and driver circuits via a compact “add-on” electronics module within a Type 253 Throttle Valve assembly, eliminating the need for a separate pressure control electronics module. The 153 is operable in two modes, flapper positioning or pressure control.

For DeviceNet™ communications consult Applications Engineering on the Type 683.



## Downstream Exhaust Throttle and Poppet Valves

### Exhaust Throttle Valve with High-speed Motor/Gear Assembly



#### Type 653

The Type 653's high speed motor and gear/driver assembly provides fast response to a given set point to quickly achieve desired pressure and increase system throughput. High accuracy is attained by micro-stepping the flapper to give more precise control, and no drift, of pressure at the desired set point. The 653 has sufficient torque to operate sealing valves up to four inches and non-sealing valves to 12 inches to prevent clogging from contamination buildup. The valve body can be heated up to 150°C (using optional sealing materials) for operation in high temperature applications and processes. The Type 653 has a flapper position indicator to identify valve angle during system troubleshooting, is available in a variety of sizes and flange styles, and is compatible with MKS Type 651 and 1651 Controllers.

### Poppet Valve



#### Type 656

The MKS Type 656 Throttling Isolation Valves are designed on the platform of the industry standard HPS® bellow-sealed angle and in-line valves. The Type 656 provides: 1) fast, accurate closed-loop control of process pressures; 2) positive leak-tight shutoff when closed; and 3) soft pumpdown from atmosphere. These valves are a simpler and less costly alternative to the combination of shutoff gate, butterfly control, and soft start valves. The valves are available in angle or in-line configurations in 40 mm, 50 mm, 80 mm, and 100 mm sizes (1.5", 2", 3", 4" respectively).

Type 656 Valves feature a patented<sup>1</sup>, unique constant force closure that compensates for thermal expansion/contraction and seals leak-tight even under changing sealing conditions as encountered in many contaminant-prone processes.

<sup>1</sup>U.S. Patent #5318272. Foreign Patents pending.



## Heaters



### Series 45

Current trends in semiconductor processing are towards less maintenance, more uptime, and increased product yield. Reduction of the solid buildup resulting from the cooling of effluent gases can be a factor in achieving those goals. Heating the valve and other components of the system is part of a method to manage these byproducts, increasing uptime, and improving wafer yields, with a quick payback.

HPS Series 45 Heaters are designed to improve heat distribution on downstream lines while complying with strict agency and corporate personnel safety standards.



# Pressure Controller Specifications

|  | Type 651C  | Type 1651C   | Type 655   |
|--|--|--|--|
| <b>Valves Operated</b>                             | Type 653 and 253 Exhaust Throttle Valves   | Type 653 and 253 Exhaust Throttle Valves   | Type 656 Exhaust Throttle Valves   |
| <b>Pressure Input Signal</b>                       | 0-10 VDC, 0-5 VDC, or 0-1 VDC, selectable  | 0-5 VDC, 0-10 VDC, 0-1 VDC, selectable   | 0-10, 0-5, or 0-1 VDC, selectable  |
| <b>Input Power Required</b>                        | 90-132 or 180-264 VAC, 50/60 Hz  | ±15 VDC ±5%  | 90-132 or 180-264 VAC 48/62 Hz   |
| <b>Minimum Input Current</b>                       |  | For Type 653 Valve: 1 Amp + transducer current<br>For Type 253 Valve: 0.5 Amp + transducer current   |  |
| <b>Maximum Input Current Set Points</b>            |  | Not to exceed 7 Amps   |  |
| <b>Programmable</b>                                | 5 total, programmable in any combination for pressure or position (adjustable from the front panel or RS-232; selectable from the front panel, TTL, or RS-232) | 5 total, programmable in any combination for pressure or position (adjustable via RS-232; selectable via TTL or RS-232)  | 5 total, programmable in combinations for pressure or position (adjustable from front panel or RS-232; selectable from front panel, TTL or RS-232) |
| <b>External Analog</b>                             | 1; pressure or position, 0-5 or 0-10 VDC   | 1; pressure or position, 0-5 or 0-10 VDC   | 1; pressure or position, 0-5 or 0-10 VDC   |
| <b>Controller Repeatability</b>                    | ±0.1% of F.S.  | ±0.1% of F.S.  | ±0.1% F.S.   |
| <b>Ambient Operating Temperature</b>               | 15°-40°C (60°-104°F); 15°-35°C with battery backup option  | 15°-50°C (60°-122°F)   | 15° to 40°C (59° to 104°F)   |
| <b>Output Power</b>                                | Standard: ±15 VDC ±5 @ 0.5 Amp (Derated to 0.4 Amp with 90-99 or 180-198 VAC input)<br>Optional: ±15 VDC ±5% @ 1.5 Amps max.                                   | Available to external transducers: ±15 Volts @ 3 Amps max. (90 Watts) when powered from an external power supply with a capacity of ±15 Volts @ 5 Amps (150 Watts)       | ±15 VDC ±5% @ 1.0 Amp max.   |
| <b>Analog Output Signal</b>                        | 0-5 or 0-10 VDC for 0-100% valve position and 0-10 VDC for 0-100% F.S. pressure  | 0-5 or 0-10 VDC for 0-100% valve position and 0-10 VDC for 0-100% F.S. pressure  | 0-5 or 0-10 VDC for 0-100% valve position and 0-10 VDC for 0-100% F.S. pressure  |
| <b>Size</b>  | 1/2-rack packaging:<br>3-1/2"H x 9-1/2"W x 9"D<br>12"D with battery backup option  | 3 1/2" H x 6.7"W x 9.15"D  | Std. 1/2 rack packaging:<br>3-1/2"H x 9-1/2"W x 9"D  |
| <b>Display</b>                                     | 2-line LCD with 4-1/2 place readout (pressure and valve position)  | N/A  | 2 line LCD with 4-1/2 place readout  |
| <b>Display Units</b>                               | Torr, mTorr, mbar, Pascal, cmH <sub>2</sub> O, inH <sub>2</sub> O, μbar, kPa   | N/A  | Torr, mTorr, mbar, Pascal, cmH <sub>2</sub> O, inH <sub>2</sub> O, μbar, kPa   |
| <b>Soft Start</b>                                  | Standard   | Standard   | Standard   |
| <b>Self-tuning Unit</b>                            | Standard   | Standard   | Standard   |
| <b>PID Control</b>                                 | Standard   | Standard   | Standard   |
| <b>Remote Zero</b>                                 | Standard   | Standard   | Standard   |
| <b>Interface</b>                                   | Front panel, Analog, TTL (16 inputs, 6 outputs) and RS-232   | Analog, TTL (16 inputs, 6 outputs) and RS-232  | Analog , TTL (16 inputs, 6 outputs), and RS-232  |
| <b>Relay Outputs</b>                               | 2, process limits: 24 Volts AC/DC @ 1 Amp resistive  | 2, process limits: 24 Volts VDC @ 1 Amp resistive  | 2, process limits: 24 Volts AC/DC @1 Amp, resistive  |
| <b>Remote Control Override (Open, Close, Hold)</b> | Standard   | Standard   | Standard   |
| <b>Position Control Capability</b>                 | Standard   | Standard   | Standard   |
| <b>Battery Backup</b>                              | Optional   | N/A  | Optional   |
| <b>Connectors</b>                                  | Valve: 9-pin Type "D" female<br>I/O: 37-pin Type "D" female<br>Transducer: 15-pin Type "D" female<br>RS-232: 9-pin Type "D" male                               | Power Connector: 9-pin Type "D" male<br>Valve: 9-pin Type "D" female<br>I/O: 37-pin Type "D" female<br>Transducer: 15-pin Type "D" female<br>RS-232: 9-pin Type "D" male | Valve: 15-pin Type "D" female<br>I/O: 37-pin Type "D" female<br>Sensor: 15-pin Type "D" female<br>RS-232: 9-pin Type "D" male                      |
| <b>CE Mark Compliance</b>                          |  |  |  |
| <b>Electromagnetic Compatibility</b>               | Fully compliant to EMC Directive 2004/108/EEC when used with an overall metal braided shielded cable, properly grounded at both ends                           | Fully compliant to EMC Directive 2004/108/EEC when used with an overall metal braided shielded cable, properly grounded at both ends                                     | Fully compliant to EMC Directive 2004/108/EEC when used with an overall metal braided shielded cable, properly grounded at both ends               |
| <b>Product Safety</b>                              | Fully compliant to Low Voltage Directive 72/23/EEC   | N/A  | Fully compliant to Low Voltage Directive 72/23/EEC   |



## Throttle Valve Specifications (Common to All Sizes & Flanges)

|  | Type 653B  | Type 253B   |
|--|--|---|
| Speed (open to close)                          | 1.7 sec  | Standard: 7.5 sec.<br>Optional: <2 sec. (Note 1)  |
| Resolution                                     | 1/12,000   | Standard: 1/10,000<br>Fast Motor Option: 1/2800   |
| Drive Method                                   | Direct gear drive  | Mechanical (non belt) drive with integral cosine generator to linearize valve transfer characteristic   |
| Maximum Valve Body Operating Temperature       | Standard 0°C-100°C<br>Optional: 0°C-150°C (Note 1)   | 0°-90°C   |
| Valve Motor Ambient Operating Temperature      | -20°C to +40°C   | 0°C-70°C max.   |
| Differential Pressure Across Valve             | 1 atm. (15 psig) max.  | 1 atm. (15 psig)  |
| External Leakage at Shaft Seal                 | 1x10 <sup>-8</sup> scc/sec He  | 1x10 <sup>-7</sup> scc/sec He   |
| Materials Exposed to Process                   | Standard: 316L S.S., Viton (Note 2)  | 316 S.S., Viton (Note 2)  |
| Compatible Controller                          | Types 651, 1651  | Types 651, 1651, 153  |
| Visual Position Indicator                      | Standard   | N/A   |
| Drive Output Torque (with Type 651 Controller) | 800 in-oz  | Standard: speed: 600 in-oz<br>High Speed: 170 in-oz   |
| Closed Leakage (valves with a flapper o-ring)  | <10 <sup>-7</sup> (Torr l/s)   | <10 <sup>-7</sup> (Torr l/s)  |
|  | Notes:<br>1 Consistent with shaft seal and flapper seal o-ring material.<br>2 Where Viton is used, other materials are available.<br>Contact Applications Engineering. | Notes:<br>1 Fast Motor Option only available on non-sealing valves.<br>2 Where Viton is used, other materials are available.<br>Contact Applications Engineering. |



# Exhaust Throttle Valve Sizes and Flange Styles

## ASA Flanges

### Type 253B

| Part Number | Mounting Flange | (A) Nominal Inside Diameter | (B) Outside Diameter | (C) Thickness | (D) Bolt Hole Diameter | (E) Number of Bolt Holes | Overall Height* | Bolt Circle Diameter | Flange O-ring Groove ID | Flapper O-ring | Flange O-ring Parker No. | (**) Controllable Conductance l/s min | (max) |
|-------------|-----------------|-----------------------------|----------------------|---------------|------------------------|--------------------------|-----------------|----------------------|-------------------------|----------------|--------------------------|---------------------------------------|-------|
| 253B-2-2-1  | 2" ASA          | 1.88 (48)                   | 5.95 (151)           | 0.75 (19)     | 0.75 (19)              | 4                        | 10.79 (274)     | 4.750 (121)          | 3.365 (85)              | Yes            | 2-237                    | 0.35                                  | 300   |
| 253B-2-2-2  | 2" ASA          | 1.95 (50)                   | 5.95 (151)           | 0.75 (19)     | 0.75 (19)              | 4                        | 10.79 (274)     | 4.750 (121)          | 3.365 (85)              | No             | 2-237                    | 0.7                                   | 300   |
| 253B-60-2-2 | 2" ASA          | 2.362 (60)                  | 5.95 (151)           | 0.75 (19)     | 0.75 (19)              | 4                        | 10.79 (274)     | 4.750 (121)          | 3.365 (85)              | No             | 2-237                    | 0.8                                   | 375   |
| 253B-3-2-2  | 2" ASA          | 3.025 (77)                  | 5.95 (151)           | 0.75 (19)     | 0.75 (19)              | 4                        | 10.79 (274)     | 4.750 (121)          | 3.365 (85)              | No             | 2-237                    | 1                                     | 500   |
| 253B-3-3-2  | 3" ASA          | 3.025 (77)                  | 7.40 (188)           | 0.88 (22)     | 0.75 (19)              | 4                        | 12.24 (311)     | 6.000 (152)          | 4.475 (114)             | No             | 2-349                    | 1                                     | 500   |
| 253B-3-3-2  | 3" ASA          | 3.965 (101)                 | 7.40 (188)           | 0.88 (22)     | 0.75 (19)              | 4                        | 12.24 (311)     | 6.000 (152)          | 4.475 (114)             | No             | 2-349                    | 1.5                                   | 950   |
| 253B-4-4-2  | 4" ASA          | 3.965 (101)                 | 8.90 (226)           | 0.88 (22)     | 0.75 (19)              | 8                        | 13.74 (349)     | 7.500 (191)          | 5.995 (152)             | No             | 2-258                    | 1.5                                   | 950   |

\*For Type 153 Valves, add 1.93" (49mm) to the Type 253 Dimension

\*\* Molecular flow regime

### Type 653B

| Part Number  | Mounting Flange | (A) Nominal Inside Diameter | (B) Outside Diameter | (C) Thickness | (D) Bolt Hole Diameter | (E) Number of Bolt Holes | Overall Height | Bolt Circle Diameter | Flange O-ring Groove ID | Flapper O-ring | Flange O-ring Parker No. | (**) Controllable Conductance l/s min | (max) |
|--------------|-----------------|-----------------------------|----------------------|---------------|------------------------|--------------------------|----------------|----------------------|-------------------------|----------------|--------------------------|---------------------------------------|-------|
| 653B-2-2-1   | 2" ASA          | 1.886 (48)                  | 5.95 (151)           | 1.00 (25)     | 0.75 (19)              | 4                        | 12.53 (318)    | 4.750 (121)          | 3.365 (85)              | Yes            | 2-237                    | 0.35                                  | 300   |
| 653B-2-2-2   | 2" ASA          | 1.886 (48)                  | 5.95 (151)           | 1.00 (25)     | 0.75 (19)              | 4                        | 12.53 (318)    | 4.750 (121)          | 3.365 (85)              | No             | 2-237                    | 0.7                                   | 300   |
| 653B-60-2-1  | 2" ASA          | 2.360 (60)                  | 5.95 (151)           | 1.00 (25)     | 0.75 (19)              | 4                        | 12.53 (318)    | 4.750 (121)          | 3.365 (85)              | Yes            | 2-237                    | 0.4                                   | 375   |
| 653B-60-2-1  | 2" ASA          | 2.360 (60)                  | 5.95 (151)           | 1.00 (25)     | 0.75 (19)              | 4                        | 12.53 (318)    | 4.750 (121)          | 3.365 (85)              | Nos            | 2-237                    | 0.8                                   | 375   |
| 653B-3-2-1   | 2" ASA          | 2.886 (73)                  | 5.95 (151)           | 1.00 (25)     | 0.75 (19)              | 4                        | 12.53 (318)    | 4.750 (121)          | 3.365 (85)              | Yes            | 2-237                    | 0.5                                   | 500   |
| 653B-3-2-2   | 2" ASA          | 2.886 (73)                  | 5.95 (151)           | 1.00 (25)     | 0.75 (19)              | 4                        | 12.53 (318)    | 4.750 (121)          | 3.365 (85)              | No             | 2-237                    | 1                                     | 500   |
| 653B-3-3-1   | 3" ASA          | 2.886 (73)                  | 7.40 (188)           | 1.00 (25)     | 0.75 (19)              | 4                        | 14.02 (356)    | 6.000 (152)          | 4.475 (114)             | Yes            | 2-349                    | 0.75                                  | 500   |
| 653B-3-3-2   | 3" ASA          | 2.886 (73)                  | 7.40 (188)           | 1.00 (25)     | 0.75 (19)              | 4                        | 14.02 (356)    | 6.000 (152)          | 4.475 (114)             | No             | 2-349                    | 1                                     | 500   |
| 653B-4-3-1   | 3" ASA          | 3.885 (99)                  | 7.40 (188)           | 1.00 (25)     | 0.75 (19)              | 4                        | 14.02 (356)    | 6.000 (152)          | 4.475 (114)             | Yes            | 2-349                    | 0.75                                  | 950   |
| 653B-4-3-2   | 3" ASA          | 3.885 (99)                  | 7.40 (188)           | 1.00 (25)     | 0.75 (19)              | 4                        | 14.02 (356)    | 6.000 (152)          | 4.475 (114)             | No             | 2-349                    | 1.5                                   | 950   |
| 653B-4-4-1   | 4" ASA          | 3.885 (99)                  | 8.90 (226)           | 1.00 (25)     | 0.75 (19)              | 8                        | 15.54 (395)    | 7.500 (191)          | 5.995 (152)             | Yes            | 2-258                    | 0.75                                  | 950   |
| 653B-4-4-2   | 4" ASA          | 3.885 (99)                  | 8.90 (226)           | 1.00 (25)     | 0.75 (19)              | 8                        | 15.54 (395)    | 7.500 (191)          | 5.995 (152)             | No             | 2-258                    | 1.5                                   | 950   |
| 653B-6-4-1   | 4" ASA          | 5.503 (140)                 | 8.90 (226)           | 1.62 (41)     | 0.75 (19)              | 8                        | 16.16 (410)    | 7.500 (191)          | 5.995 (152)             | No             | 2-258                    | 4                                     | 2150  |
| 653B-6-6-2   | 6" ASA          | 5.869 (149)                 | 10.90 (277)          | 1.62 (41)     | 0.88 (22)              | 8                        | 18.18 (462)    | 9.500 (241)          | 8.000 (203)             | No             | 2-266                    | 4                                     | 2150  |
| 653B-8-6-2   | 6" ASA          | 7.636 (194)                 | 10.90 (277)          | 1.62 (41)     | 0.88 (22)              | 8                        | 18.18 (462)    | 9.500 (241)          | 8.000 (203)             | No             | 2-266                    | 6                                     | 3600  |
| 653B-8-8-2   | 8" ASA          | 7.636 (194)                 | 13.19 (335)          | 1.62 (41)     | 0.88 (22)              | 8                        | 20.48 (520)    | 11.750 (298)         | 9.750 (248)             | No             | 2-273                    | 8                                     | 3600  |
| 653B-10-10-2 | 10" ASA         | 10.118 (257)                | 16.00 (406)          | 1.62 (41)     | 1.00 (25)              | 12                       | 23.31 (592)    | 14.250 (362)         | 11.938 (362)            | No             | 2-278                    | 10                                    | 6400  |

Dimensions in inches (mm)

\*\* Molecular flow regime



# CF Flanges

## Type 253B

| Part Number   | Mounting Flange | (A)<br>Nominal Inside Diameter | (B)<br>Outside Diameter | (C)<br>Thickness | (D)<br>Bolt Hole Diameter | (E)<br>Number of Bolt Holes | Overall Height* | Bolt Circle Diameter | Flapper O-ring | (**) Controllable Conductance l/s min | (max) |
|---------------|-----------------|--------------------------------|-------------------------|------------------|---------------------------|-----------------------------|-----------------|----------------------|----------------|---------------------------------------|-------|
| 253B-20-2CF-1 | 2 3/4" CF       | 0.779 (20)                     | 2.75 (70)               | 1.25 (32)        | 0.26 (6.6)                | 6                           | 8.64 (220)      | 2.312 (59)           | Yes            | 0.07                                  | 24    |
| 253B-20-2CF-2 | 2 3/4" CF       | 0.779 (20)                     | 2.75 (70)               | 1.25 (32)        | 0.26 (6.6)                | 6                           | 8.64 (220)      | 2.312 (59)           | No             | 0.25                                  | 31    |
| 253B-1-2CF-1  | 2 3/4" CF       | 1.270 (32)                     | 2.75 (70)               | 1.25 (32)        | 0.26 (6.6)                | 6                           | 8.64 (220)      | 2.312 (59)           | Yes            | 0.2                                   | 50    |
| 253B-1-2CF-2  | 2 3/4" CF       | 1.270 (32)                     | 2.75 (70)               | 1.25 (32)        | 0.26 (6.6)                | 6                           | 8.64 (220)      | 2.312 (59)           | No             | 0.4                                   | 55    |
| 253B-2-3CF-1  | 3 3/8" CF       | 1.889 (48)                     | 3.25 (83)               | 1.06 (27)        | 0.33 (8.3)                | 8                           | 9.14 (232)      | 2.850 (72)           | Yes            | 0.35                                  | 300   |
| 253B-2-3CF-2  | 3 3/8" CF       | 2.000 (51)                     | 3.25 (83)               | 1.06 (27)        | 0.33 (8.3)                | 8                           | 9.14 (232)      | 2.850 (72)           | No             | 0.7                                   | 300   |
| 253B-2-4CF-2  | 4 1/2" CF       | 2.000 (51)                     | 4.47 (114)              | 1.00 (25)        | 0.33 (8.3)                | 8                           | 10.36 (263)     | 3.628 (92)           | No             | 0.7                                   | 300   |
| 253B-3-6CF-2  | 6" CF           | 3.000 (76)                     | 7.40 (188)              | 0.81 (21)        | 0.33 (8.3)                | 16                          | 12.24 (311)     | 5.128 (130)          | No             | 1                                     | 500   |
| 253B-4-6CF-2  | 6" CF           | 3.875 (98)                     | 7.40 (188)              | 0.94 (24)        | 0.33 (8.3)                | 16                          | 12.24 (311)     | 5.128 (130)          | No             | 1.5                                   | 900   |

\*For Type 153 Valves, add 1.93" (49mm) to the Type 253 Dimension

\*\* Molecular flow regime

## Type 653B

| Part Number   | Mounting Flange | (A)<br>Nominal Inside Diameter | (B)<br>Outside Diameter | (C)<br>Thickness | (D)<br>Bolt Hole Diameter | (E)<br>Number of Bolt Holes | Overall Height | Bolt Circle Diameter | Flapper O-ring | (**) Controllable Conductance l/s min | (max) |
|---------------|-----------------|--------------------------------|-------------------------|------------------|---------------------------|-----------------------------|----------------|----------------------|----------------|---------------------------------------|-------|
| 653B-20-2CF-1 | 2 3/4" CF       | 0.779 (20)                     | 2.75 (70)               | 1.00 (25)        | 0.27 (6.8)                | 6                           | 10.55 (268)    | 2.312 (59)           | Yes            | 0.07                                  | 24    |
| 653B-20-2CF-2 | 2 3/4" CF       | 0.779 (20)                     | 2.75 (70)               | 1.00 (25)        | 0.27 (6.8)                | 6                           | 10.55 (268)    | 2.312 (59)           | No             | 0.25                                  | 31    |
| 653B-1-2CF-1  | 2 3/4" CF       | 1.270 (32)                     | 2.75 (70)               | 1.00 (25)        | 0.27 (6.8)                | 6                           | 10.55 (268)    | 2.312 (59)           | Yes            | 0.2                                   | 50    |
| 653B-1-2CF-2  | 2 3/4" CF       | 1.270 (32)                     | 2.75 (70)               | 1.00 (25)        | 0.27 (6.8)                | 6                           | 10.55 (268)    | 2.312 (59)           | No             | 0.4                                   | 55    |
| 653B-2-3CF-1  | 3 3/8" CF       | 1.886 (48)                     | 3.25 (83)               | 1.00 (25)        | 0.34 (8.6)                | 8                           | 11.05 (281)    | 2.850 (72)           | Yes            | 0.35                                  | 300   |
| 653B-2-3CF-2  | 3 3/8" CF       | 1.886 (48)                     | 3.25 (83)               | 1.00 (25)        | 0.34 (8.6)                | 8                           | 11.05 (281)    | 2.850 (72)           | No             | 0.7                                   | 300   |
| 653B-2-4CF-1  | 4 1/2" CF       | 1.886 (48)                     | 4.47 (114)              | 1.00 (25)        | 0.34 (8.6)                | 8                           | 12.28 (312)    | 3.628 (92)           | Yes            | 0.35                                  | 300   |
| 653B-2-4CF-2  | 4 1/2" CF       | 1.886 (48)                     | 4.47 (114)              | 1.00 (25)        | 0.34 (8.6)                | 8                           | 12.28 (312)    | 3.628 (92)           | No             | 0.7                                   | 300   |
| 653B-3-6CF-1  | 6" CF           | 2.886 (73)                     | 7.40 (188)              | 1.00 (25)        | 0.33 (8.4)                | 16                          | 14.07 (357)    | 5.128 (130)          | Yes            | 0.5                                   | 500   |
| 653B-3-6CF-2  | 6" CF           | 2.886 (73)                     | 7.40 (188)              | 1.00 (25)        | 0.33 (8.4)                | 16                          | 14.07 (357)    | 5.128 (130)          | No             | 1                                     | 500   |
| 653B-4-6CF-1  | 6" CF           | 3.885 (99)                     | 7.40 (188)              | 1.00 (25)        | 0.33 (8.4)                | 16                          | 14.07 (357)    | 5.128 (130)          | Yes            | 0.75                                  | 900   |
| 653B-4-6CF-2  | 6" CF           | 3.885 (99)                     | 7.40 (188)              | 1.00 (25)        | 0.33 (8.4)                | 16                          | 14.07 (357)    | 5.128 (130)          | No             | 1.5                                   | 900   |
| 653B-6-8CF-2  | 8" CF           | 5.869 (149)                    | 8.90 (226)              | 1.62 (41)        | 0.33 (8.4)                | 20                          | 17.13 (435)    | 7.128 (181)          | No             | 2                                     | 2100  |
| 653B-8-10CF-2 | 10" CF          | 7.650 (194)                    | 11.22 (285)             | 1.62 (41)        | 0.33 (8.4)                | 24                          | 18.90 (480)    | 9.128 (232)          | No             | 3                                     | 3750  |

Dimensions in inches (mm)

\*\* Molecular flow regime



# Exhaust Throttle Valve Sizes and Flange Styles

## ISO Flanges

### Type 253B

| Part Number  | Mounting Flange | (A)<br>Inside Diameter | (B)<br>Nominal Outside Diameter | (C)<br>Thickness | (D)<br>Bolt Hole Diameter | (E)<br>Number of Bolt Holes | Overall Height* | Bolt Circle Diameter | Flapper O-ring | (**)<br>Controllable Conductance l/s min | (max) |
|--------------|-----------------|------------------------|---------------------------------|------------------|---------------------------|-----------------------------|-----------------|----------------------|----------------|--|-------|
| 253B-20-40-1 | ISO KF-40       | 0.779 (20)             | 2.75 (70)                       | 2.25 (57)        | N/A                       | N/A                         | 8.64 (219)      | N/A                  | Yes            | 0.07                                     | 24    |
| 253B-20-40-2 | ISO KF-40       | 0.779 (20)             | 2.75 (70)                       | 2.25 (57)        | N/A                       | N/A                         | 8.64 (219)      | N/A                  | No             | 0.25                                     | 31    |
| 253B-1-40-1  | ISO KF-40       | 1.270 (32)             | 2.75 (70)                       | 2.25 (57)        | N/A                       | N/A                         | 8.64 (219)      | N/A                  | Yes            | 0.2                                      | 50    |
| 253B-1-40-2  | ISO KF-40       | 1.770 (32)             | 2.75 (70)                       | 2.25 (57)        | N/A                       | N/A                         | 8.64 (219)      | N/A                  | No             | 0.4                                      | 55    |
| 235B-2-50-1  | ISO KF-50       | 1.888 (48)             | 3.25 (83)                       | 2.00 (51)        | N/A                       | N/A                         | 9.14 (232)      | N/A                  | Yes            | 0.35                                     | 300   |
| 235B-2-50-2  | ISO KF-50       | 2.000 (51)             | 3.25 (83)                       | 2.00 (51)        | N/A                       | N/A                         | 9.14 (232)      | N/A                  | No             | 0.7                                      | 300   |
| 253B-60-63-2 | ISO NW-63       | 2.362 (60)             | 5.95 (151)                      | 0.81 (21)        | 0.35 (9)                  | 4                           | 10.79 (274)     | 4.330 (110)          | No             | 0.8                                      | 375   |
| 253B-3-80-2  | ISO NW-80       | 3.000 (76)             | 5.95 (151)                      | 0.81 (21)        | 0.35 (9)                  | 8                           | 10.79 (274)     | 4.920 (125)          | No             | 1  | 500   |
| 253B-4-100-2 | ISO NW-100      | 3.875 (98)             | 7.40 (188)                      | 0.94 (24)        | 0.35 (9)                  | 8                           | 12.24 (311)     | 5.710 (145)          | No             | 1.5                                      | 900   |

\*For Type 153 Valves, add 1.93" (49mm) to the Type 253 Dimension

\*\* Molecular flow regime

### Type 653B

| Part Number   | Mounting Flange | (A)<br>Nominal Inside Diameter | (B)<br>Outside Diameter | (C)<br>Thickness | (D)<br>Bolt Hole Diameter | (E)<br>Number of Bolt Holes | Overall Height | Bolt Circle Diameter | Flapper O-ring | (**)<br>Controllable Conductance l/s min | (max) |
|---------------|-----------------|--------------------------------|-------------------------|------------------|---------------------------|-----------------------------|----------------|----------------------|----------------|--|-------|
| 653B-20-40-1  | ISO KF-40       | 0.779 (20)                     | 2.75 (70)               | 2.25 (57)        | N/A                       | N/A                         | 10.58 (268)    | N/A                  | Yes            | 0.07                                     | 24    |
| 653B-20-40-2  | ISO KF-40       | 0.779 (20)                     | 2.75 (70)               | 2.25 (57)        | N/A                       | N/A                         | 10.58 (268)    | N/A                  | No             | 0.25                                     | 31    |
| 653B-1-40-1   | ISO KF-40       | 1.270 (32)                     | 2.75 (70)               | 2.25 (57)        | N/A                       | N/A                         | 10.58 (268)    | N/A                  | Yes            | 0.2                                      | 50    |
| 653B-1-40-2   | ISO KF-40       | 1.270 (32)                     | 2.75 (70)               | 2.25 (57)        | N/A                       | N/A                         | 10.58 (268)    | N/A                  | No             | 0.4                                      | 55    |
| 653B-2-50-1   | ISO KF-50       | 1.886 (48)                     | 3.25 (83)               | 2.00 (51)        | N/A                       | N/A                         | 11.06 (281)    | N/A                  | Yes            | 0.35                                     | 300   |
| 653B-2-50-2   | ISO KF-50       | 1.886 (48)                     | 3.25 (83)               | 2.00 (51)        | N/A                       | N/A                         | 11.06 (281)    | N/A                  | No             | 0.7                                      | 300   |
| 653B-60-63-1  | ISO NW-63       | 2.360 (60)                     | 5.95 (151)              | 1.00 (25)        | 0.35 (9)                  | 4                           | 12.53 (318)    | 4.330 (110)          | Yes            | 0.4                                      | 375   |
| 653B-60-63-2  | ISO NW-63       | 2.360 (60)                     | 5.95 (151)              | 1.00 (25)        | 0.35 (9)                  | 4                           | 12.53 (318)    | 4.330 (110)          | No             | 0.8                                      | 375   |
| 653B-3-80-1   | ISO NW-80       | 2.886 (74)                     | 5.95 (151)              | 1.00 (25)        | 0.35 (9)                  | 8                           | 12.53 (318)    | 4.920 (125)          | Yes            | 0.5                                      | 500   |
| 653B-3-80-2   | ISO NW-80       | 2.886 (74)                     | 5.95 (151)              | 1.00 (25)        | 0.35 (9)                  | 8                           | 12.53 (318)    | 4.920 (125)          | No             | 1  | 500   |
| 653B-4-100-1  | ISO NW-100      | 3.885 (99)                     | 7.40 (1.88)             | 1.00 (25)        | 0.35 (9)                  | 8                           | 14.02 (356)    | 5.710 (145)          | Yes            | 0.75                                     | 950   |
| 653B-4-100-2  | ISO NW-100      | 3.885 (99)                     | 7.40 (1.88)             | 1.00 (25)        | 0.35 (9)                  | 8                           | 14.02 (356)    | 5.710 (145)          | No             | 1.5                                      | 900   |
| 653B-6-160-2  | ISO NW-160      | 5.869 (149)                    | 8.90 (226)              | 1.62 (41)        | 0.43 (11)                 | 8                           | 16.16 (410)    | 7.870 (200)          | No             | 4  | 2100  |
| 653B-8-200-2  | ISO NW-200      | 7.650 (194)                    | 11.22 (285)             | 1.62 (41)        | 0.43 (11)                 | 12                          | 18.50 (470)    | 10.240 (260)         | No             | 6  | 3750  |
| 653B-10-250-2 | ISO NW-250      | 9.700 (246)                    | 13.19 (335)             | 1.62 (41)        | 0.43 (11)                 | 12                          | 20.48 (520)    | 12.200 (310)         | No             | 8  | 6000  |
| 653B-12-320-2 | ISO NW-320      | 12.370 (314)                   | 16.73 (425)             | 1.62 (41)        | 0.55 (14)                 | 12                          | 24.02 (610)    | 15.55 (395)          | No             | 10                                       | 9300  |

Dimensions in inches (mm)

\*\* Molecular flow regime



# JIS Flanges

## Type 253B

| Part Number   | Mounting Flange | Nominal Inside Diameter | Outside Diameter | Thickness | Bolt Hole Diameter | Number of Bolt Holes | Overall Height* | Bolt Circle Diameter | Flange O-ring Groove ID | Flange O-ring Size (JIS)  | Flapper O-ring | Controllable (**)<br>Conductance l/s<br>min (max) |
|---------------|-----------------|-------------------------|------------------|-----------|--------------------|----------------------|-----------------|----------------------|-------------------------|---------------------------|----------------|---|
| 253B-2-50J-1  | JIS 50mm        | 1.888 (48)              | 4.47 (114)       | 1.00 (25) | 0.39 (10)          | 4                    | 10.36 (263)     | 3.937 (100)          | 2.766 (70)              | 2.765 x 0.157 (70) x (4)  | Yes            | 0.35 300  |
| 253B-2-50J-2  | JIS 50mm        | 2.000 (51)              | 4.47 (114)       | 1.00 (25) | 0.39 (10)          | 4                    | 10.36 (263)     | 3.937 (100)          | 2.766 (70)              | 2.765 x 0.157 (70) x (4)  | No             | 0.35 300  |
| 253B-4-100J-2 | JIS 50mm        | 3.875 (98)              | 7.40 (188)       | 0.94 (24) | 0.47 (12)          | 8                    | 13.29 (338)     | 6.299 (160)          | 4.724 (120)             | 4.724 x 0.157 (120) x (4) | No             | 0.35 300  |

\*For Type 153 Valves, add 1.93" (49mm) to the Type 253 Dimension

\*\* Molecular flow regime

## Type 653B

| Part Number    | Mounting Flange | Nominal Inside Diameter | Outside Diameter | Thickness | Bolt Hole Diameter | Number of Bolt Holes | Overall Height | Bolt Circle Diameter | Flange O-ring Groove ID | Flange O-ring Size (JIS)   | Flapper O-ring | Controllable (**)<br>Conductance l/s<br>min (max) |
|----------------|-----------------|-------------------------|------------------|-----------|--------------------|----------------------|----------------|----------------------|-------------------------|----------------------------|----------------|---|
| 653B-2-50J-1   | JIS 50mm        | 1.886 (48)              | 4.47 (114)       | 1.00 (25) | 0.39 (10)          | 4                    | 12.27 (312)    | 3.937 (100)          | 2.766 (70)              | 2.756 x 0.157 (70) x (4)   | Yes            | 0.35 300  |
| 653B-2-50J-2   | JIS 50mm        | 1.886 (48)              | 4.47 (114)       | 1.00 (25) | 0.39 (10)          | 4                    | 12.27 (312)    | 3.937 (100)          | 2.766 (70)              | 2.756 x 0.157 (70) x (4)   | No             | 0.7 300   |
| 653B-4-100J-1  | JIS 100mm       | 3.8865 (99)             | 7.28 (185)       | 1.00 (25) | 0.47 (12)          | 8                    | 13.90 (353)    | 6.299 (160)          | 4.724 (120)             | 4.724 x 0.157 (120) x (4)  | Yes            | 0.75 950  |
| 653B-4-100J-2  | JIS 100mm       | 3.8865 (99)             | 7.28 (185)       | 1.00 (25) | 0.47 (12)          | 8                    | 13.90 (353)    | 6.299 (160)          | 4.724 (120)             | 4.724 x 0.157 (120) x (4)  | No             | 1.5 900   |
| 653B-6-150J-2  | JIS 150mm       | 5.709 (145)             | 9.25 (235)       | 1.62 (41) | 0.47 (12)          | 8                    | 16.51 (419)    | 8.268 (210)          | 6.890 (175)             | 6.890 x 0.157 (173) x (4)  | No             | 2 2100  |
| 653B-8-200J-2  | JIS 200mm       | 7.677 (195)             | 11.81 (300)      | 1.62 (41) | 0.59 (15)          | 8                    | 19.09 (485)    | 10.630 (270)         | 8.858 (225)             | 8.761 x 0.236 (223) x (6)  | No             | 3 3600  |
| 653B-10-250J-2 | JIS 250mm       | 9.645 (245)             | 13.78 (350)      | 1.62 (41) | 0.59 (15)          | 12                   | 21.08 (535)    | 12.598 (320)         | 10.827 (275)            | 10.709 x 0.236 (272) x (6) | No             | 4 6000  |
| 653B-12-300J-2 | JIS 300mm       | 11.597 (295)            | 15.75 (400)      | 1.62 (41) | 0.59 (15)          | 12                   | 23.02 (585)    | 14.566 (370)         | 12.795 (325)            | 12.795 x 0.236 (322) x (6) | No             | 5 8600  |

Dimensions in inches (mm)

\*\* Molecular flow regime

## Type 656

Consult Applications Engineering for availability.



# Throttle Valve Heater Kits

## NW40

| Voltage | Temp. | LTA | Watts | Amps | Kit# (253 & 653) |
|---------|-------|-----|-------|------|------------------|
| 120 VAC | 150°C | No  | 59    | 0.49 | 55-0361          |
| 120 VAC | 150°C | Yes | 59    | 0.49 | 55-0362          |
| 120 VAC | 105°C | No  | 59    | 0.49 | 55-0363          |
| 120 VAC | 105°C | Yes | 59    | 0.49 | 55-0364          |
| 240 VAC | 150°C | No  | 59    | 0.25 | 55-0367          |
| 240 VAC | 150°C | Yes | 59    | 0.25 | 55-0368          |
| 240 VAC | 105°C | No  | 59    | 0.25 | 55-0369          |
| 240 VAC | 105°C | Yes | 59    | 0.25 | 55-0370          |

## NW50

| Voltage | Temp. | LTA | Watts | Amps | Kit# (253 & 653) |
|---------|-------|-----|-------|------|------------------|
| 120 VAC | 150°C | No  | 68    | 0.57 | 55-0371          |
| 120 VAC | 150°C | Yes | 68    | 0.57 | 55-0372          |
| 120 VAC | 105°C | No  | 68    | 0.57 | 55-0373          |
| 120 VAC | 105°C | Yes | 68    | 0.57 | 55-0374          |
| 240 VAC | 150°C | No  | 68    | 0.28 | 55-0377          |
| 240 VAC | 150°C | Yes | 68    | 0.28 | 55-0378          |
| 240 VAC | 105°C | No  | 68    | 0.28 | 55-0379          |
| 240 VAC | 105°C | Yes | 68    | 0.28 | 55-0380          |

## NW63

| Voltage | Temp. | LTA | Watts | Amps | Kit# 253 | Kit# 653 |
|---------|-------|-----|-------|------|----------|----------|
| 120 VAC | 150°C | No  | 104   | 0.87 | 55-0721  | 55-0731  |
| 120 VAC | 150°C | Yes | 104   | 0.87 | 55-0722  | 55-0732  |
| 120 VAC | 105°C | No  | 104   | 0.87 | 55-0723  | 55-0733  |
| 120 VAC | 105°C | Yes | 104   | 0.87 | 55-0724  | 55-0734  |
| 240 VAC | 150°C | No  | 104   | 0.43 | 55-0727  | 55-0737  |
| 240 VAC | 150°C | Yes | 104   | 0.43 | 55-0728  | 55-0738  |
| 240 VAC | 105°C | No  | 104   | 0.43 | 55-0729  | 55-0739  |
| 240 VAC | 105°C | Yes | 104   | 0.43 | 55-0730  | 55-0740  |

## Heater Specifications

|                              |  |   |          |
|------------------------------|--|---|----------|
| <b>Temperature</b>           |  |   |          |
| Nominal Setpoint             |  | 150°C   | 105°C    |
| Exterior Range               |  | 60-70°C   | 45-55°C  |
| Interior Range               |  | 130-170°C   | 90-120°C |
| <b>Electrical Duty Cycle</b> |  |   |          |
|                              |  | 100 volts   | 72%      |
|                              |  | 120 volts   | 50%      |
| <b>Foam Thickness</b>        |  | 0.5 in. (12.7mm)  |          |
| <b>Materials</b>             |  | Molded silicone foam, fiberglass reinforced silicone, Teflon insulated wire             |          |
| <b>Relative Humidity</b>     |  | 90% Maximum   |          |
| <b>Connectors</b>            |  | Midget Twist-Lock, nylon NEMA ML-1  |          |
| <b>Weight Range</b>          |  | 0.5 to 3.3 lb (0.73 to 1.5 kg)  |          |
| <b>Product Safety</b>        |  | CE Mark: 89/336/EEC EMC Directive, 73/23/EEC LV Directive<br>UL Listed: File E52951 2JR |          |

## NW80\*

| Voltage | Temp. | LTA | Watts | Amps | Kit# 253 | Kit# 653 |
|---------|-------|-----|-------|------|----------|----------|
| 120 VAC | 150°C | No  | 104   | 0.87 | 55-0172  | 55-0176  |
| 120 VAC | 150°C | Yes | 104   | 0.87 | 55-0173  | 55-0177  |
| 120 VAC | 105°C | No  | 104   | 0.87 | 55-0170  | 55-0174  |
| 120 VAC | 105°C | Yes | 104   | 0.87 | 55-0171  | 55-0175  |
| 240 VAC | 150°C | No  | 104   | 0.43 | 55-0221  | 55-0225  |
| 240 VAC | 150°C | Yes | 104   | 0.43 | 55-0222  | 55-0226  |
| 240 VAC | 105°C | No  | 104   | 0.43 | 55-0223  | 55-0227  |
| 240 VAC | 105°C | Yes | 104   | 0.43 | 55-0224  | 55-0228  |

## NW100\*\*

| Voltage | Temp. | LTA | Watts | Amps | Kit# 253 | Kit# 653 |
|---------|-------|-----|-------|------|----------|----------|
| 120 VAC | 150°C | No  | 123   | 1.02 | 55-0251  | 55-0255  |
| 120 VAC | 150°C | Yes | 123   | 1.02 | 55-0252  | 55-0256  |
| 120 VAC | 105°C | No  | 123   | 1.02 | 55-0253  | 55-0257  |
| 120 VAC | 105°C | Yes | 123   | 1.02 | 55-0254  | 55-0258  |
| 240 VAC | 150°C | No  | 123   | 0.51 | 55-0261  | 55-0265  |
| 240 VAC | 150°C | Yes | 123   | 0.51 | 55-0262  | 55-0266  |
| 240 VAC | 105°C | No  | 123   | 0.51 | 55-0263  | 55-0267  |
| 240 VAC | 105°C | Yes | 123   | 0.51 | 55-0264  | 55-0268  |

Kits include any special hardware required, such as clamps.

LTA- Low Temperature Alarm

\*Valve Heater designed to mate with heater on 3" tubing (consult for other size tubing)

\*\*Valve Heater designed to mate with heater on 4" tubing (consult for other size tubing)

Note: Heaters can only be used with valves that are configured for use at higher temperatures. To obtain the order code for a heatable throttle valve, place the letter "A" in place of the last "-" in the part number.

Example: 253B-20-40-1  
Becomes  
253B-20-40A1

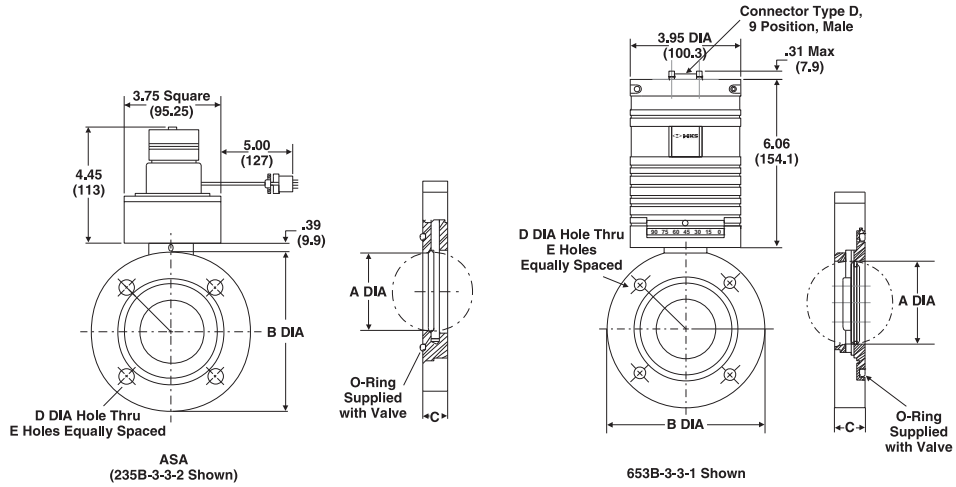


## LTA Monitor Specifications

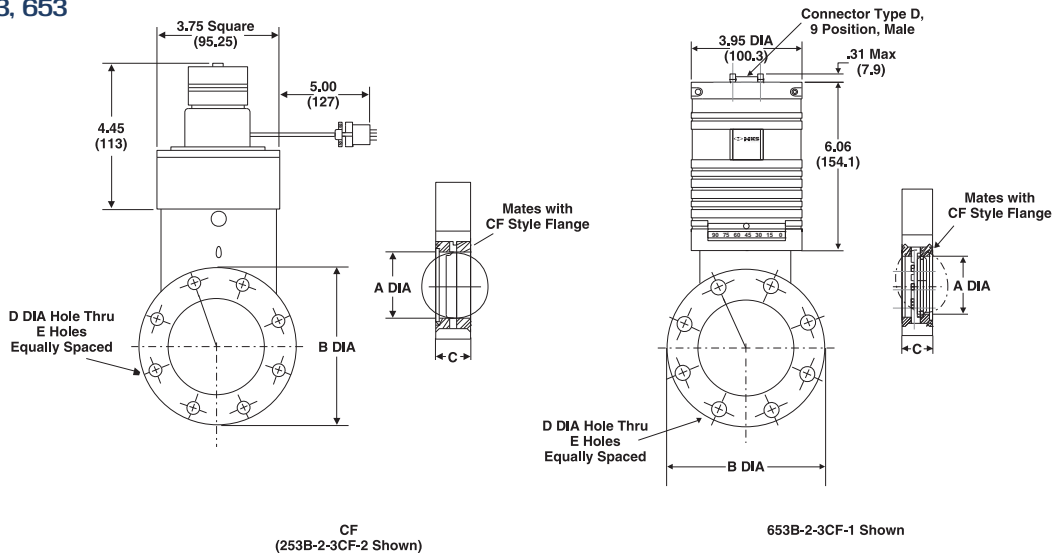
|                                  |   |
|----------------------------------|---|
| <b>Enclosure</b>                 | Black Plastic   |
| <b>Power Requirements</b>        | 90-130 VAC input, 12 VDC ±3 VDC output  |
| <b>Power Consumption</b>         | 0.3 W   |
| <b>Relay Contact Rating</b>      | SPDT, 2A @ 50 VAC resistive<br>1 @ 30 VDC   |
| <b>Input/Output Wiring</b>       | 1 Thermal switch line IN<br>2 Thermal switch line OUT<br>3 Normally closed<br>4 Common<br>5 Normally open |
| <b>Dimensions</b><br>(L x H x D) | 2.58" x 4.76" x 1.46" (inches)<br>66 x 121 x 37 (mm)  |
| <b>Product Safety</b>            | CE Mark: 89/336/EEC EMC<br>Directive 92/59/EEC General<br>Product Safety Directive                        |



**ASA Flange**  
Types 253, 653

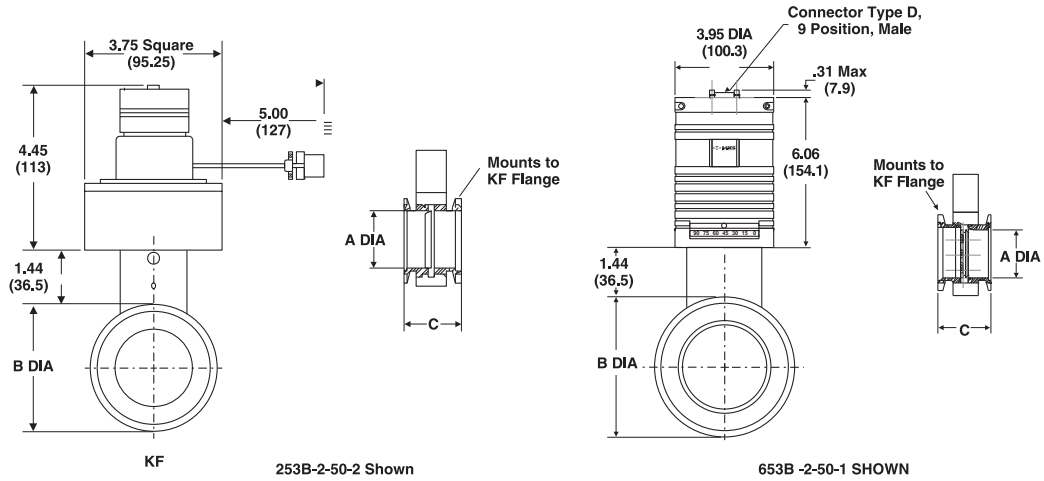


**CF Flange**  
Types 253, 653

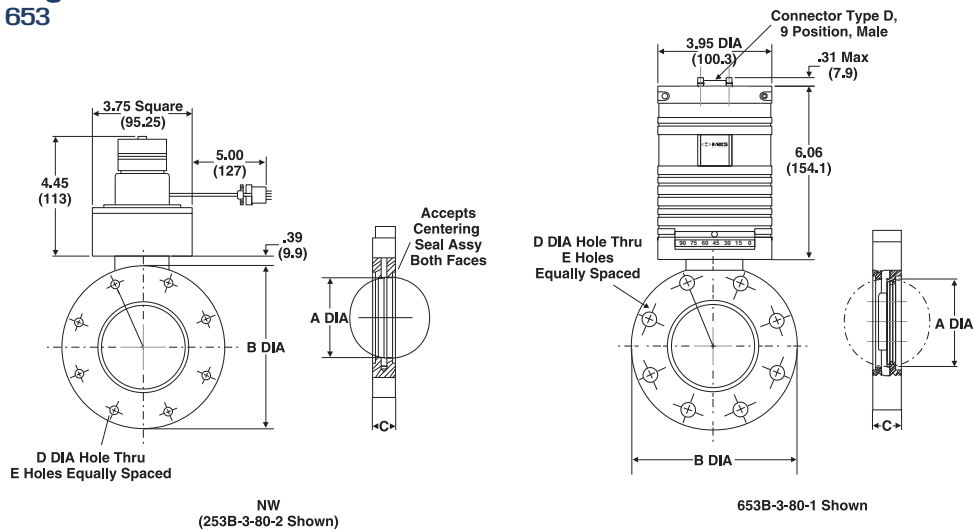


# Dimensional Drawings

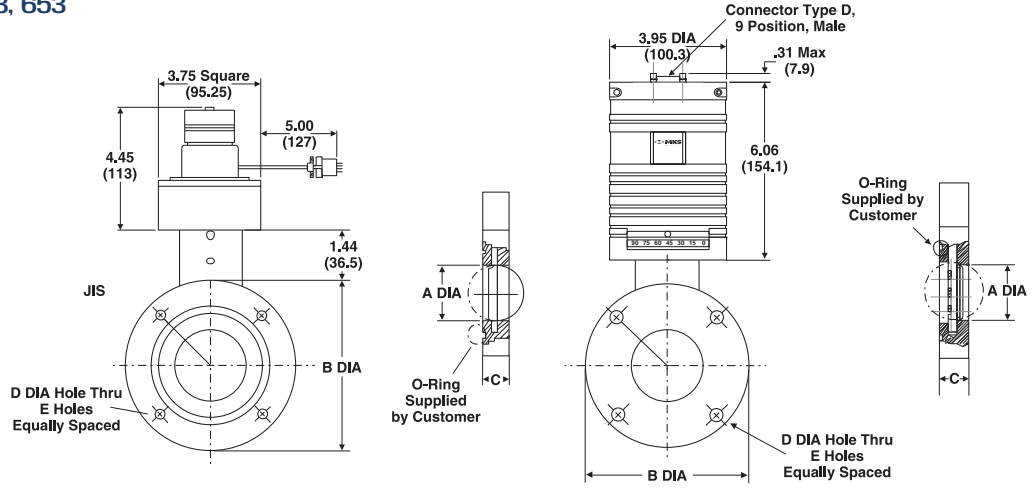
## ISO KF Flange Types 253, 653



## ISO NW Flange Types 253, 653



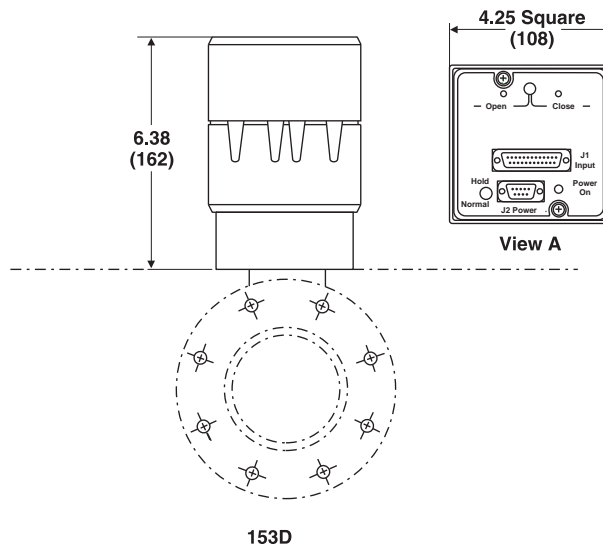
**JIS Flange**  
Types 253, 653



253B-2-50J-2 Shown

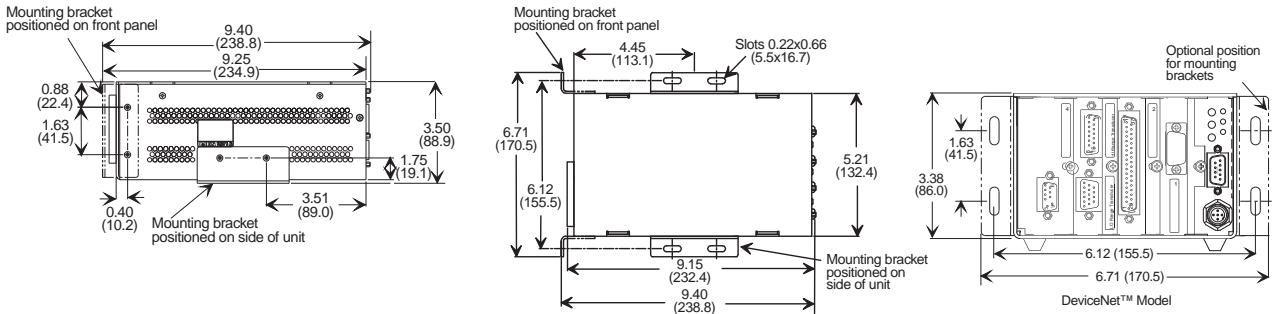
653A -2-50J-1 Shown

**Type 153**

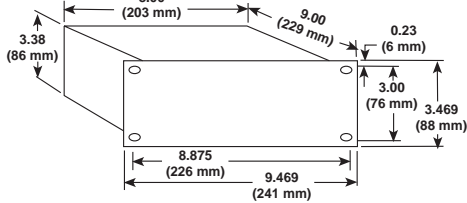


# Dimensional Drawings

## Pressure Controller Type 1651

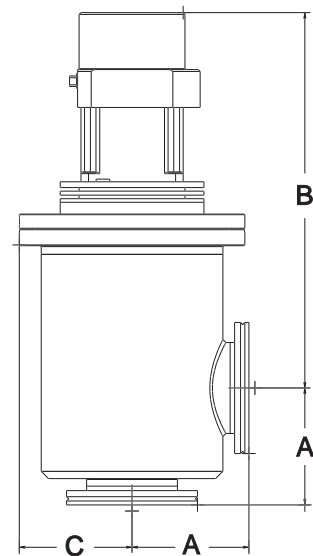
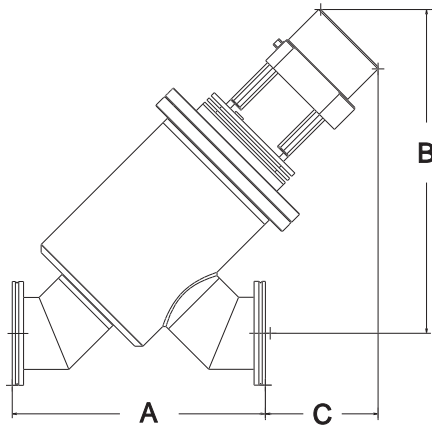


## Type 651



Note: Allow 2.5" (63 mm) clearance behind rear panel for connectors/cables.

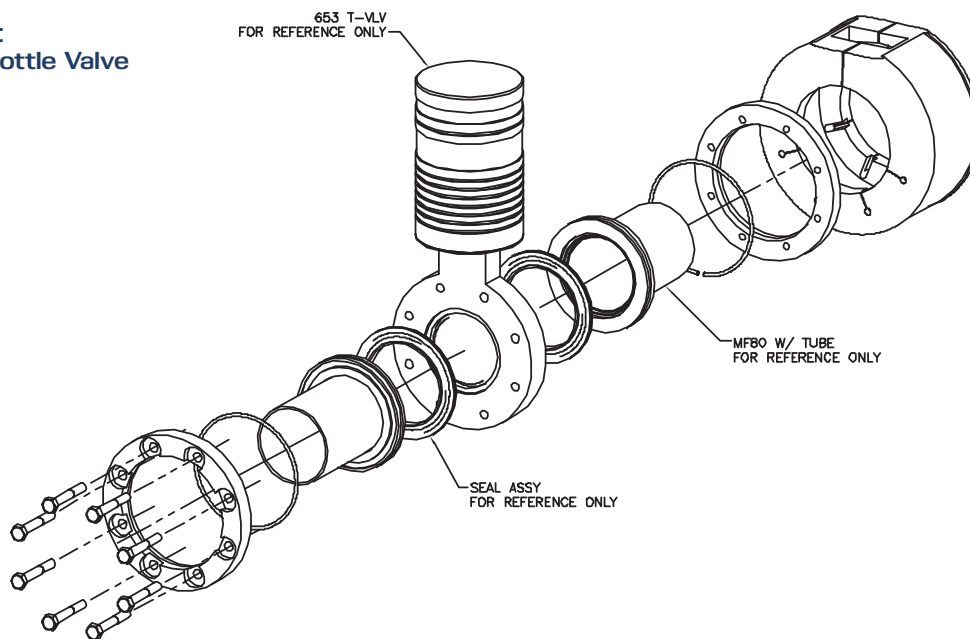
## Poppet Valve Type 655/656 In-line & Angle



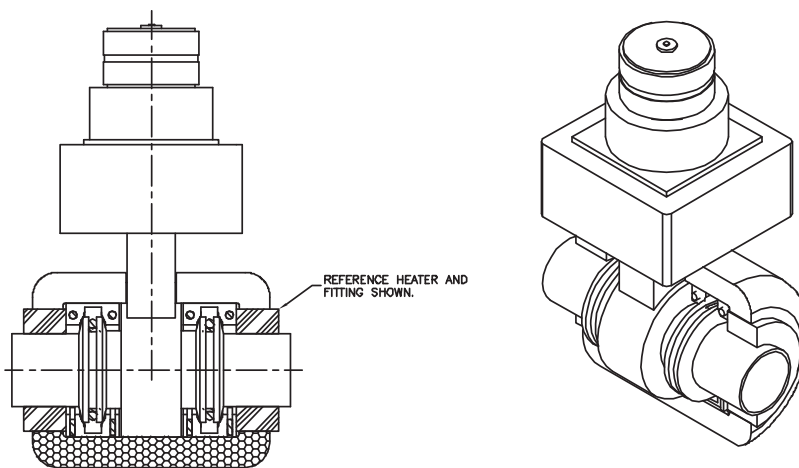
| In-Line Valve Size | A                | B                | C               | Angle Valve Size | A              | B                | C              |
|--------------------|------------------|------------------|-----------------|------------------|----------------|------------------|----------------|
| 40 mm              | 5.12 (130.1 mm)  | 10.64 (270.3 mm) | 6.28 (159.5 mm) | 40 mm            | 2.57 (65.3 mm) | 10.82 (274.8 mm) | 2.38 (60.5 mm) |
| 50 mm              | 7.00 (177.8 mm)  | 10.88 (276.4 mm) | 5.35 (135.9 mm) | 50 mm            | 2.77 (70.4 mm) | 10.82 (274.8 mm) | 2.38 (60.5 mm) |
| 80 mm              | 10.55 (268 mm)   | 13.50 (342.9 mm) | 4.69 (119.1 mm) | 80 mm            | 3.86 (98 mm)   | 12.39 (314.7 mm) | 3.73 (94.7 mm) |
| 100 mm             | 13.58 (344.9 mm) | 14.02 (356.1 mm) | 3.18 (80.8 mm)  | 100 mm           | 4.25 (108 mm)  | 12.39 (314.7 mm) | 3.73 (94.7 mm) |



**Heater Kit  
for 653 Throttle Valve**



**Heater Kit  
For 253 and 653 Throttle Valves**



NOTES:  
KIT SHOWN WITH 253 THROTTLE VALVE (REFERENCE ONLY).  
THIS KIT WILL IS DESIGNED FOR BOTH THE 253 AND 653 THROTTLE VALVES.



# Pressure Controller Ordering Information

| Ordering Code Example: 651CDYZCD   | Code  | Configuration |
|--|-------|---------------|
| Type 651C Self-Tuning/Digital PID Pressure Controller<br>(for use with 653 or 253 Throttle Valves) | 651CD | 651CD         |
| <b>Interface (Y)</b>   |       |               |
| RS-232   | 2     | 2             |
| <b>Valve Driver (Z)</b>  |       |               |
| Stepper Motor  | S     | S             |
| <b>Power Supply (C)</b>  |       |               |
| 0.5 Amp  | 1     | 1             |
| 1.5 Amp  | 2     |               |
| <b>Options (D)</b>   |       |               |
| None   | N     | B             |
| Battery Backup   | B     |               |

## Cabling for 651CD:

### Input Cables:

CB112-2-10 to connect 651 to 223, 225, 622, 623, 722 (terminal strip)  
 CB259-5-10 to connect 651 to 624, 625, 626, 627, 628, 722 (15-pin)  
 CB120-6-10 to connect 651 to 120  
 CB112-10-10 to connect 651 to 220  
 CB112-14-10 to connect 651 to 121, 221

### Valve Cables:

CB652-1-10 to connect 651 to 653B  
 CB651-30-10 to connect 651 to 253B

| Ordering Code Example: 1651CZY  | Code  | Configuration |
|---|-------|---------------|
| Type 1651C Displayless Self-Tuning/Digital PID Pressure Controller<br>(for use with 653 or 253 Throttle Valves) | 1651C | 1651C         |
| <b>Interface (Y)</b>  |       |               |
| RS-232  | 2     | 2             |
| <b>Valve Driver (Z)</b>   |       |               |
| Stepper Motor   | S     | S             |

## Cabling for 1651C

### Input Cables:

CB112-2-10 to connect 1651 to 223, 225, 622, 623, 722 (terminal strip)  
 CB147-1-10 to connect 1651 to 624, 625, 626, 627, 628, 722 (15-pin)  
 CB120-1-10 to connect 1651 to 120  
 CB112-10-10 to connect 1651 to 220  
 CB112-14-10 to connect 1651 to 121, 221

### Valve Cables:

CB652-1-10 to connect 1651 to 653B  
 CB651-30-10 to connect 1651 to 253B





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