Valve Solutions

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T3B

HIGH-SPEED EXHAUST THROTTLE VALVES

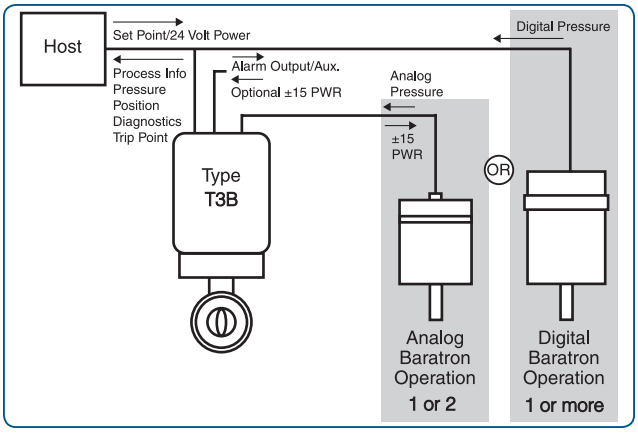
The T3B High-speed Exhaust Throttle Valves are specifically designed for applications where a simple pressure control system is desired. The T3B integrates all control, communication, and driver circuits within a throttle valve assembly, thereby eliminating the need for mounting a separate pressure control electronics module. The self-tuning control algorithm and high-speed operation drives the system to set point fast and with minimum overshoot, and ensures repeatable process recipes without operator involvement.

Features & Benefits

- Compact pressure control system - valve with integrated on-board controller electronics
  - — Easy integration, no need for additional cables or rack space
- High-speed option (180 msec open to close)
  - — Allows quicker time to set point and faster recovery from flow and pressure perturbations
  - — Enables high tool throughput
- High-torque option
  - — Extends uptime in harsh process conditions
- Dual-channel Baratron® manometer input with range auto switching
  - — Supports wide dynamic pressure control range
  - — Allows for high-pressure control accuracy
- Available with multiple communication protocols: Analog, RS232, or DeviceNet™
- Programmable for pressure, position, or set point limits
- Advanced self-tuning control algorithm
  - — Minimizes time to set point
  - — Ensures repeatable process recipes without operator involvement
- Encoder-based actual position verification
- Available in low conductance versions
  - — Suitable for “house exhaust” or atmospheric applications
- Provides power for connected Baratron capacitance manometers (optional)
- Heatable (105°C standard, 150°C optional)

The T3B Throttle Valves can operate in two modes: flapper positioning or pressure control, either of which can be user-activated through the I/O interface. All of the adjustable setup parameters, run time operation, and diagnostics information is available through the communications interface. The T3B also includes adjustable soft-start functions for set point changes to minimize turbulence and thus particle distribution in the chamber. Two alarm relay outputs are available. The T3B is compatible with all MKS Baratron capacitance manometers to allow for precise closed-loop pressure control.

The downstream pressure control technique provides wide dynamic range, works with all types of pumps, provides fast response, and is tolerant to most effluent gases.



DeviceNet™ Pressure Control System

The T3B can communicate either via Analog, RS232, or a DeviceNet interface. DeviceNet is a high-performance communication link based on a broadcast-oriented protocol called Controller Area Network (CAN). The DeviceNet protocol, managed by the Open DeviceNet Vendor Association (ODVA), is easy to install and provides a simple and economical way for instruments and controllers to be interoperable on a network. The T3B complies with the ODVA profile for a Process Control Valve.

The “intelligent instrument” concept results in valuable system space savings, improved noise immunity, and easy access to time-critical process and calibration information as well as on-board diagnostic functions.

Software Functions

- Pressure control or position control mode
- Set points for pressure and position control
- Soft start mode with user-definable ramp rate
- Adjust trip points
- Manual override to open or close valve
- Report pressure from external transducer
- Report HW/SW revision, serial and model numbers
- Report valve cycles and run hours

The Valve

The T3B utilizes a direct drive high-speed stepper motor. The valve driver provides high-resolution pressure control. The robust, high-torque motor provides extended uptime and reduces preventative maintenance cycles — a great advantage in demanding processes where just one hour of downtime can cost thousands of dollars. The T3B is also available in geared versions, providing additional torque, and enabling long-term operation in harsh environments.

The T3B valves are heatable up to 150°C with optional MKS external heaters (proper selection of seal materials is required).

The T3B is available in unique MKS low conductance versions, enabling high-speed pressure control in atmospheric applications, including exhaust pressure control, CVD, and RTP without a need for relying on O-Ring-based designs to minimize valve conductance.

An encoder-based position feedback system is provided for diagnostic purposes. The valve is constructed of corrosion-resistant 316 stainless steel, compatible with most process gases and is available in standard ISO flange styles with bore sizes from ¾” to 10” (20-250 mm). Standard seals offered are Viton®; alternate materials can be specified for compatibility with various process chemistries and/or heated applications.

Specifications

ISO Flanges

Valve Model Number T3BIAxxxxxx Valve Model Number T3BIBxxxxxx (xxxxxx = additional option codes)	19K2xxxxxx	19K3xxxxxx	20K2xxxxxx	20K3xxxxxx	01K2xxxxxx	01K3xxxxxx	02K2xxxxxx	02K3xxxxxx	60N2xxxxxx	60N3xxxxxx	03N2xxxxxx	03N3xxxxxx	04N2xxxxxx
Approximate Bore In (mm)	0.779 (20)	0.779 (20)	0.779 (20)	0.779 (20)	1.270 (32)	1.270 (32)	1.886 (48)	1.886 (48)	2.360 (60)	2.360 (60)	2.886 (74)	2.886 (74)	3.885 (99)
Mounting Flange	KF25	KF25	KF40	KF40	KF40	KF40	KF50	KF50	NW63	NW63	NW80	NW80	NW100
Flapper Seal Material	none	PTFE	none	PTFE	none	PTFE	none	PTFE	none	PTFE	none	PTFE	none
Controllable Conductance (l/sec): min/max, molecular flow conditions unless otherwise noted	0.25 / 31	~ 0* / 31	0.25 / 31	~ 0* / 31	0.4 / 55	~ 0* / 55	0.7 / 150	~ 0* / 150	0.8 / 375	~ 0* / 375	1 / 500	~ 0* / 500	2.2 / 900
Maximum Closed Leakage (sccm) @ 760 Torr to vacuum @ 10T to vacuum	n/a n/a	< 1000 < 10	n/a n/a	< 1000 < 10	n/a n/a	< 1000 < 10	n/a n/a	< 1000 < 10	n/a n/a	< 1500 < 10	n/a n/a	< 2000 < 10	n/a n/a
Body Thickness In (mm)	2.25 (57)	2.25 (57)	2.25 (57)	2.25 (57)	2.25 (57)	2.25 (57)	2.00 (51)	2.00 (51)	1.00 (25)	1.00 (25)	1.00 (25)	1.00 (25)	1.00 (25)

Chart 1: Available Bore, Flange, Seal Combinations —

**The actual closed conductance, essentially zero at molecular flow, increases with increasing pressure. As an example the equivalent closed-conductance for the KF50 size valve with f-cup at very high pressure (i.e. 760 Torr) is <0.02 l/s.*

Specifications

Valve Speed (open to close)

High-speed, direct drive non-sealing	<0.2 seconds (available in 4" and smaller sizes only)
Standard speed, geared drives or F-seal versions	<0.5 - 1.0 seconds (size dependent)

Pressure Control Performance

Accuracy	0.25% of set point, or 5mV (whichever is greater)
Control Range	0.0001%-100% FS (with Dual Transducer Input)

Operating Temperature

Motor and Electronics	0° to 40°C
Valve Body	0° to 105°C, 150°C (optional)

Storage Temperature -20° to 80°C

Optional Seal Material Kalrez®, Chemraz®, others upon request

Analog I/O

Pressure input (dual channel)	Nominally ±10 VDC, ±5 VDC and ±1 VDC are selectable

Discrete I/O

Alarm trip point outputs	(2) relays @ 2.0A @ 30 VDC with status LEDs

Physical Switches Valve Open
Valve Close

Power Input

DeviceNet	11-25 VDC (used exclusively to power CAN tranceiver)
Valve Power	24 VDC @ <100 W max.

Optional Power Output ±15 VDC @ up to 650mA available for analog transducers

Auxiliary I/O Connector

RS232 and Analog/TTL version	25-pin female Type "D" for trip points, analog pressure and position, TTL level inputs, outputs and serial communications
DeviceNet version	25-pin female Type "D" for trip points, analog pressure and position, 5-pin male Micro for Communications
Power Input	9-pin male Type "D"

Gauge Connector(s), (Analog) 15-pin female Type "D" each channel

Compliance

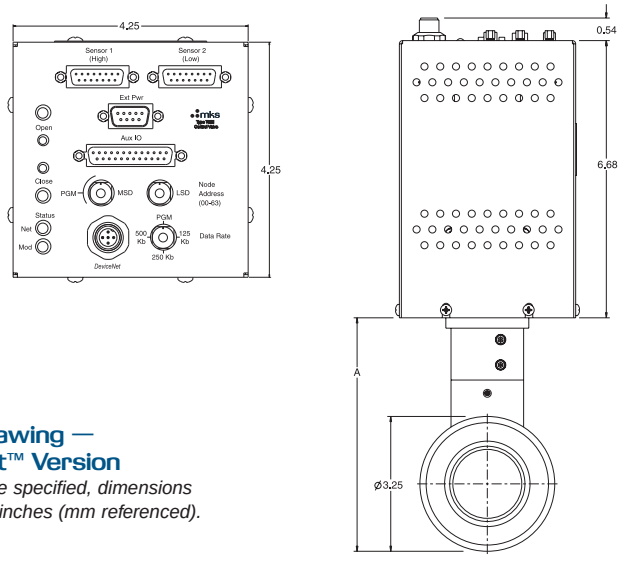
T3BIB	CE; recommended for integration with new systems
T3BIA	Maintained for continuity with legacy systems

Ordering Information

Ordering Code Example: T3BIA20K21V91VV

T3B High-speed Exhaust Throttle Valves	Code	Configuration
Model Number	T3BIA	T3BIA
Model Number	T3BIB	
Valve Bore/Flange Size		
20mm/KF-25	19K	20K
20mm/KF-40	20K	
1”/KF-40	01K	
2”/KF-50	02K	
60mm/NW-63	60N	
3”/NW-80	03N	
4”/NW-100	04N	
Valve Type		
Non-sealing Direct Drive	2	2
Low Conductance F-seal	3	
Heatability		
Up to 105°C	1	1
Up to 150°C*	2	
Seal Materials (Valve Shaft)		
Viton	V	V
Chemraz E38	C	
Chemraz 592	D	
Kalrez 8085	K	
Kalrez 4079	L	
Communications		
DeviceNet	9	9
RS232	2	
Analog/TTL	0	
Pressure Sensor Power		
None	1	1
±15 VDC @650mA total	2	
Firmware		
Unless otherwise specified, MKS will ship the current firmware revision	VV	VV

** The 150°C operation requires high temperature compatible O-Ring, Viton not allowed.*



Dimensional Drawing — KF50 DeviceNet™ Version

Note: Unless otherwise specified, dimensions are nominal values in inches (mm referenced).

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