

Pressure

Type T3PIA

INTEGRATED HIGH SPEED PENDULUM VALVE AND CONTROLLER

MKS T3P Pendulum Valves have been designed for the most demanding semiconductor and thin film applications. T3P valves feature wide control range and high valve speed to enable fast, precise and reliable pressure control for all etch, deposition and chamber clean process steps - including those with reduced flows or at high pressures. The ability to precisely control conductance over the entire valve stroke, including near-closed positions, enables recipe pressures to be reached quickly and with minimal overshoot. With its advanced model-based control, the T3P valve provides superior process stability and maximizes throughput. Combining wide dynamic range pressure control and isolation capabilities into a single unit, the T3P valve reduces cost and system complexity.

An on-board digital controller supports multiple communication protocols - including DeviceNet and RS232, adding the T3P to MKS' portfolio of digitally controlled products. By combining the T3P with industry standard MKS Baratron® capacitance manometers, MKS provides the optimal solution for pressure measurement and process control.

The mechanical design features of the T3P include MKS' patented CAM mechanism providing a symmetrical and linear control and a space-saving low profile design. A simple operating mechanism featuring a minimal number of moving parts and fewer wetted stainless steel parts, provides virtually particle-free operation.

Features & Benefits

- Integrated isolation and pressure control system (with on-board controller)
 - Easy integration, no need for additional cables or rack space
 - Less space required (compared to isolation/butterfly valve combination)
- Wide conductance range
 - Low closed conductance - allows for operation at higher pressures
 - Precise conductance control in near closed positions - extended control range
 - Low backlash (patented cam arrangement) - smooth operation and precise pressure control
- High Speed
 - Allows quicker time to set point and faster recovery from flow and pressure perturbations
 - Increased tool throughput
- Programmable for pressure, position, or set point limits
- Dual channel Baratron® input with range auto switching
 - Supports wide dynamic control range
 - Allows for high pressure control accuracy
- Available with multiple communications protocols: Analog/RS232/DeviceNet
- Advanced model-based control algorithm
 - Minimizes time to setpoint
 - Ensures repeatable process recipes without operator involvement
- Sensor and battery backup system
 - Ensures safe valve closure in the event of power or compressed air loss
- Heatable
- Field serviceable
 - Easy on-tool maintenance
- Other sizes and custom configurations available upon request



Measurement & Control

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Description (continued)

MKS offers T3P pendulum valves in nominal 4" to 12" (100mm - 320mm) bore sizes, with ISO and JIS flange styles and a variety of O-ring materials. For applications requiring increased internal valve temperature, the T3P can be supplied with an optional heater package.

The T3P is field serviceable in place – without the need to remove the valve - and offers easy maintenance with reduced MTTR (replacement of sealing ring in less than 30 minutes). The T3P includes an air pressure sensor and battery backup system, ensuring a safe valve closure in the event of air or power loss.

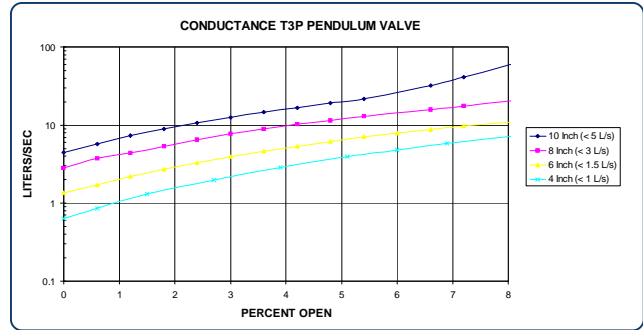


Figure 1 —

The MKS T3P low closed conductance enables higher pressures at lower flows with increased throughput. The patented cam mechanism linearizes the response curve (above) for superior control performance.

Specifications

Construction

Wetted Materials

Body
Valve Plate
Other Parts
Seals
Body and Plate Surface Treatment

6061 - T6 Aluminum
6061 - T6 Aluminum
SS316, Viton®, 6061 - T6 Aluminum
Viton® standard, Chemraz®, Kalrez®, others available upon request
Bare aluminum standard, hard anodizing optional

Performance

Accuracy
Control Range
Valve Speed

The greater of 5mV or 0.25% of Reading
0.0001%-100% FS (with Dual Transducer Input)

Gate (Control System)

	100mm	160mm	200mm	250 mm	320 mm
Soft-Closed to Open	0.8s	0.9s	1s	1.3s	2s
Open to Soft-Closed	0.8s	0.9s	1s	1.3s	2s

Isolation System

	100mm	160mm	200mm	250 mm	320 mm
Seal Time (soft-closed to hard-closed)	< 2s	< 2s	< 2s	< 2s	< 2s
Unseal Time (hard-closed to soft-closed)	3.5s	3.5s	3.5s	3.5s	3.5s

Minimum Controllable Conductance
(horizontal motor down orientation)

Size	100mm	160mm	200mm	250 mm	320 mm
100mm	<1 l/s	<1.5 l/s	<1.5 l/s	<1.5 l/s	<3 l/s
250mm	<5 l/s	<15 l/s	<15 l/s	<15 l/s	<15 l/s

Operating Pressure, Chamber Side
7.5 x 10⁻⁹ to 900 Torr (1 x 10⁻⁸ to 1200 mbar)

Maximum Pressure Across Closed Valve
(Orientation Dependent)
900 Torr chamber side, 0 Torr pump side or
0 Torr chamber side, 760 pump side

Maximum Differential Pressure
(during control)

Size	100mm	160mm	200mm	250 mm	320 mm
100mm	(40 Torr)	(20 Torr)	(5 Torr)	(5 Torr)	(5 Torr)
250mm	(5 Torr)	(3.75 Torr)	(3.75 Torr)	(3.75 Torr)	(3.75 Torr)

Operating Temperature

Body
Ambient Operating Conditions
125°C max with optional heater package
20°C to 40°C

Leak Rate - External (outside-in)

Aluminum Body
Anodized Body
< 1 x 10⁻⁹ scc/sec He
< 1 x 10⁻⁷ scc/sec He (< 1 x 10⁻⁹ available upon special request)

Leak Rate - Internal (side-to-side)

Aluminum Body
Anodized Body
< 1 x 10⁻⁹ scc/sec He
< 1 x 10⁻⁵ scc/sec He

Weight

Size	100mm	160mm	200mm	250 mm	320 mm
100mm	30 lbs	45 lbs	55 lbs	70 lbs	115 lbs
250mm	70 lbs	115 lbs	115 lbs	115 lbs	115 lbs

Cycles Until First Service*

(*Under Clean Conditions)

1 million cycles soft open/close
200,000 cycles seal/unseal

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 Type "D" male

Gauge Connector(s) (Analog)

Gauge Input

15-pin female Type "D" each channel

Power Input

DeviceNet
Auxilliary Power

0-10 VDC can be calibrated to any voltage between 1-10 VDC, bipolar
11-25 VDC (used exclusively to power CAN transceiver)
24 VDC @ < 100 W max.

Power Output

±15 VDC @ 650 mA available for analog transducers

Pneumatic Supply

Recommended
Minimum

75 -100 psig (clean air or N₂)
75 psig (12"), 65 psig (10"), 55 psig (8", 6", 4" sizes)

CE Mark Compliance

Electromagnetic Compatibility

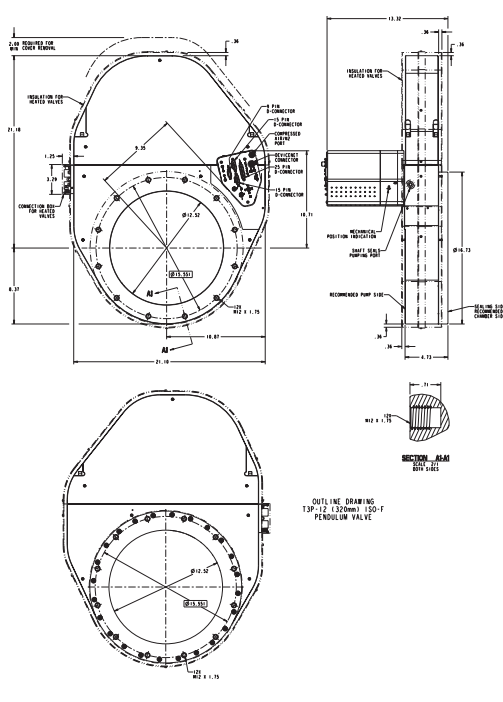
Fully compliant to EMC Directive 2004/108/EEC when used with an overall metal braided shielded cable, properly grounded at both ends

Product Safety (heater only)

Fully compliant to Low Voltage Directive 72/23/EEC



Ordering Information



ISO NW-320 DeviceNet Version Shown

Ordering Code Example: T3PIA1000VAFDVV	Code	Typical Configuration
Type T3PIA Pendulum Valve	T3PIA	T3PIA
Flange Size (mm)		
100	10	10
160	16	
200	20	
250	25	
320	32	
Flange Type		
ISO	0	0
JIS	1	
Finish		
None	0	0
Anodized	1	
Main Seal		
Viton	V	V
Chemraz E38	C	
Kalrez 8085	K	
Heater		
None	A	A
105°C @ 115VAC	E	
105°C @ 230VAC	F	
120°C @ 115VAC	H	
120°C @ 230VAC	J	
Installation Orientation		
Counter Clockwise Close, Horizontal	F	F
Counter Clockwise Close, Vertical	P*	
Controller Options		
DeviceNet	D	D
RS232	R	
TTL/Analog	T	
Firmware Revision		
Firmware Revision installed indicated by a two-character code		VV

* Available in sizes 250mm and smaller. For vertical operation of 320mm T3P, please consult factory.



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