Pressure & Control Measurement

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Pressure Switches

TYPES 41B, 42B, 51B, 52B

The MKS Types 41B, 42B, 51B and 52B Vacuum, Atmospheric and Pressure Switches offer accurate and reliable protection for vacuum equipment, atmospheric switching, and vacuum/pressure processes in RoHS (Restriction of Hazardous Substances)-compliant models. Designed for applications where a DC signal output is not required, these switches provide relay outputs that are readily interfaced with alarms, valve actuators, computers, process controllers, load locks and other protection devices.

The Type 41B and 42B models are referenced to atmospheric pressure, while the Types 51B and 52B products are referenced to vacuum. The Type 41B/42B switches are often used to ensure a loadlock pressure has equilibrated to local atmospheric pressure before opening the door. The trip point on MKS' atmospheric switches can be set to trip above, below (reverse calibration), or exactly at current atmospheric pressure. Applications for the 51B/52B switches include soft pumping, gas box switching, and safety interlocks.

Features & Benefits

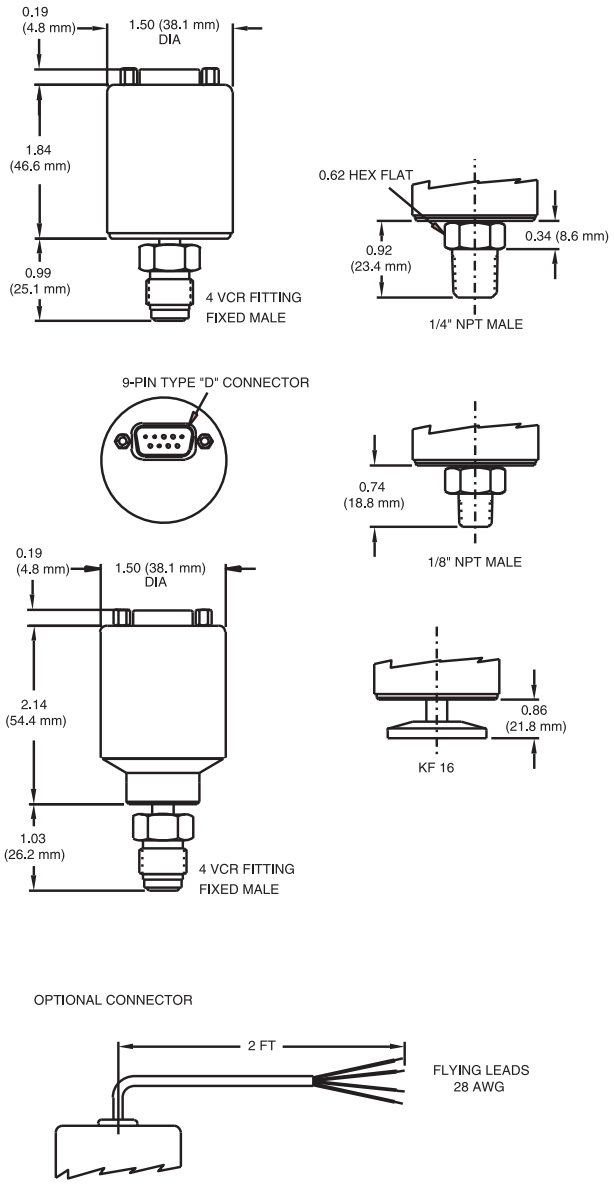
- Precise control for a wide variety of production applications including semiconductor processing tools, high vacuum pumps, compressors, blowers, medical equipment and machine tools
- Provides high reliability which reduces downtime and lowers the cost of ownership
- Superb set point accuracy and repeat-ability: 0.5% of F.S. increases process control
- Corrosion-resistant: all-metal, all-welded construction exposes only 316L S.S. and Inconel® to the media
- Switch relay can be set to energize above or below set point for fail-safe operation
- Low hysteresis due to capacitance technology improves set point accuracy over mechanical switches
- Factory-set trip point from 5% to 100% of Full Scale means no need for personnel to adjust the set point and elimination of safety concerns from an erroneously adjusted set point
- Fast response switching: 20 msec
- Excellent long term stability
- Rugged high overpressure rating (2 × F.S. or 45 psia, whichever is greater) for pressure cycling applications
- CE Compliant to ECD Directive 2004/108/EEC, RoHS-compliant, relays are UL and CSA approved

The design of these switches is based on the well-known MKS Baratron® capacitance manometer principle of operation. MKS has utilized this capacitance technology for more than three decades and it remains the most stable, accurate, and reliable sensor available today. The MKS pressure switches sense the deflection of a diaphragm due to applied pressure, providing a switched output when pressure exceeds or drops below the chosen set point. The dual electrode sensor is an all-metal, all-welded design, thus exposing only corrosion-resistant 316L S.S. and Inconel® to process gases. The sensor is then mated to sophisticated electronics to further optimize performance. The resulting enhanced accuracy and long-term stability yield a switch with unparalleled repeatability.

The relay mode on MKS Types 41B, 42B, 51B, and 52B switches can be set to either energize above or below the set point. If the unit loses power, the relay switches to the Normally Closed position. The user can indicate whether the Normally Closed position is above or below the set point. Using Energize Above the set point as an example, the relay is in the Normally Open position when the pressure is higher than the trip point and Normally Closed when the pressure is below the trip point. The scenario is reversed for Energize Below the set point option. In vacuum systems, the fail-safe operation is if the system loses power causing the relay to de-energize, the relay is in the same state as the high pressure condition. Therefore, most vacuum systems require the relay energize with pressure decreasing or below the set point.

The Type 41B, 42B, 51B and 52B Vacuum, Atmospheric and Pressure Switches provide increased accuracy over mechanical type switches, thereby providing tighter control and repeatability of process, improving throughput and yield.

Low Pressure (1000 Torr and lower)



Dimensional Drawing: Single Ended—

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

Output Connections	
9-pin Type "D"	**Flying Leads**
1. Power Return (-)	Red - Power Input (+)
2. Power Input (+)	Black - Power Return (-)
3. Relay NO Contact	Green - Relay NO Contact
4. Relay Common	White - Relay Common
5. Relay NC Contact	Orange - Relay NC Contact
6. Unused	Bare Wire - Chassis Ground
7. Unused	
8. Unused	
9. Chassis Ground	

Specifications

Full Scale Ranges	10 Torr through 500 psi (Consult Applications Engineering on Full Scale ranges in other engineering units. Selection of trip point and Full Scale range should be as close as possible as trip point accuracy is affected by the Full Scale range)
Trip Point Range	5% to 100% of F.S.
Accuracy	±0.5% of F.S. (±temperature coefficient)
Temperature Coefficient*	±0.07% of F.S./°C
Ambient Operating Temperature	0° to 50°C
Trip Point Dead Band	±3% of F.S.(nominal)
Response Time	<20 msec
Materials Exposed to Process Gases	Inconel and 316L S.S. 10 µRa max. on switches with Swagelok® VCR® fittings (5 µRa max. optional)
Internal Volume	3.3 cc for single-ended, 6.6 cc for flow-through
Overpressure	2 × F.S. or 45 psia, whichever is greater
Outputs	
Electromechanical relay	SPDT (isolated) contacts rated up to 1 Amp @ 30 VDC resistive. Relay is energized either with increasing pressure or decreasing pressure.
Input Power Required	10 to 20 VDC @ 35 mA max. or 20 to 30 VDC @ 30 mA max.
Fittings	
Type 42B/52B	4 VCR® male
Type 41B/51B	4 VCR® male, NW 16 KF, 1/8 NPT, 1/4 NPT
Electromagnetic Compatibility	CE Compliant to EMC Directive 2004/108/EC when used with an overall metal braided shielded cable, properly grounded at both ends (flying leads are already shielded but must be properly grounded at user's end to comply)
Restriction of Hazardous Substances	Fully compliant to RoHS Directive 2002-95-EC

*Example: A 100 Torr sensor with a 2°C change has a trip point temperature-induced error less than or equal to:
(0.0007 x 100 Torr x 2) = 0.14 Torr error anywhere within the trip point range

Note: Atmospheric switches provide a means by which the trip set point is referenced to current atmospheric conditions. "Reverse Calibration" allows the trip point to be set at or below the current atmospheric pressure. When ordering, a value of 000 in the last three digits of the model code would equate to atmospheric pressure. A value of 002 would equate to 2 Torr or 2 PSIG below atmospheric pressure, depending on the use of the "D" or "C" ordering code for Full Scale range.

This method provides an excellent mechanism to achieve switching at current atmospheric conditions, regardless of the location of the installed base or present weather conditions.

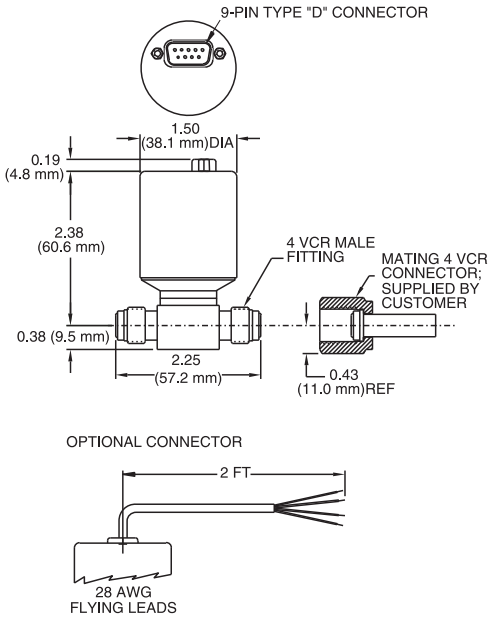
Ordering Information

Ordering Code Example: 41B11TCA1AA005

Type 41B, 42B, 51B, 52B Unheated Vacuum/Pressure Switch		Code	Configuration
Single-ended gauge		41B	41B
Flow-through gauge		42B	
Single-ended absolute		51B	
Flow-through absolute		52B	
Full Scale Ranges Available (Contact Applications Engineering for other engineering units)			
10 Torr	Type 41B/51B only	11T	11T
30 Torr		31T	
100 Torr		12T	
500 Torr		52T	
1000 Torr		13T	
20 psi		21P	
50 psi		51P	
100 psi		12P	
250 psi		RDP	
500 psi		52P	
For Reverse Calibration only[1] (trip point below atmospheric pressure):			
10 Torr	Type 41B only	11D	
30 Torr		31D	
100 Torr		12D	
500 Torr		52D	
1000 Torr		13D	
20 psi	Type 41B/42B only	21C	
50 psi		51C	
100 psi		12C	
250 psi		RDC	
500 psi		52C	
Fittings			
NW 16 KF	Type 41B/51B only	GA	CA
1/8 NPT male		FE	
1/4 NPT male		FB	
4 VCR fixed male		CA	
4 VCR fixed male	Type 42B/52B only	CH	
Input Voltage			
10-20 VDC		1	1
20-30 VDC		2	
Relay Mode			
Energizes with pressure above the set point		A	A
Energizes with pressure below the set point		B	
Connector			
9-pin Type "D" male		A	A
Flying leads - 2 ft. shielded cable		F	
Trip Point[2]			
Three digit value (in same units as F.S. ranges) (For reverse calibration, the trip point is given as value below atmosphere.)		XXX	005

[1] For a trip point of 000 (atmospheric pressure), use a reverse calibration Full Scale range code.

[2] For the absolute model, the trip point is the actual pressure at which the relay should trip. For the atmosphere model, the trip point is the pressure above or below atmospheric pressure at which the relay should trip.



Dimensional Drawing: Flow Through-

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

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