MODEL DW

Pressure Display Controller Low Differential Pressure

The Model DW pressure controller accurately monitors and controls very low pressures. It combines in one enclosure a low pressure transducer, a digital display and two alarms (see Fig. 1). This pressure controller has a three-state output: a high pressure alarm when the pressure exceeds a high limit, a low pressure alarm when the pressure falls below a low limit, and no output when the pressure is within these limits.

It is typically used for the monitoring and control of pressure in closed areas such as rooms and buildings.

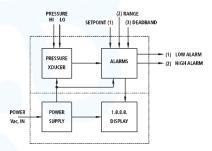


Fig. 1 Block Diagram

DESCRIPTION

The pressure sensing element is a differential capacitance cell for pressure measurements ranging from 0.1 to 5.00 inches of water (25 Pa to 1.0 kPa), or a piezoresistive (silicon) sensor for pressures from 5 inches of water to 30 PSI (1.0 kPa to 200 kPa).

The display section has 3 1/2 digits with bright, easy to read LEDs. The display is factory-calibrated to read in engineering units.

The alarm section is offered with 2 alarms. Each alarm may be ordered with a relay, or transistor output. On the front panel are three multiturn potentiometers and three pushbuttons. Momentarily pressing a pushbutton displays the corresponding potentiometer setting (see Fig. 2).

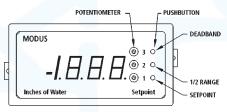
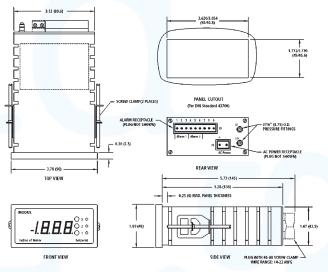


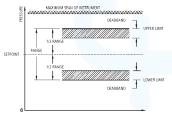
Fig. 2 Front panel of controller

Potentiometer 1 sets the desired control pressure (setpoint). **Potentiometer 2** controls the range (or the \pm deviation from the setpoint). Displayed value is 1/2 the range.

Potentiometer 3 controls the deadband. This is the pressure change required to turn the high or low alarm OFF when the controlled pressure is moving toward the setpoint after reaching the upper or lower limit (see fig. 3). Barb fittings and pluggable terminals with screw clamps are provided at the rear for quick and simple field connections.



DIMENSIONS ARE IN INCHES (MILLIMETERS).



SPECIFICATIONS

Accuracy of reading: Standard $\pm 1\%$ of span +1 digit (including non-linearity & hysteresis)

Setpoint accuracy: ±0.2% of span + 1 digit (including repeatability)

Power requirements: 21- 32 Vac 50/60 Hz, 105-135 Vac 50/60 Hz or 210-265 Vac 50/60 Hz

Power consumption: 2.5 VA

Electrical connections: Non-interchangeable power and alarm plugs with #4-40 screw clamps; wire range is 14-22 AWG

Warmup time: 5 minutes to rated accuracy

Pressure Transmitter

Measures differential gage pressure or vacuum

Medium: Air or inert gases

Standard pressure ranges: See reference table D

Maximum safe momentary overpressure: See reference table D
Zero & span adjustments: 15-turn potentiometers accessible behind
red front filter

Port connections: 3/16" (4.75 mm) Dia. suitable for 1/8" or 5/32" I.D. Tygon™ or polyurethane tubing; 1/4"O.D. polyethylene tubing Air filter at both ports

Display

Display: 3 1/2 digits 7 segments orange-red LEDs 0.56"(14.2 mm) high decimal point factory-programmable to 4 positions (1.8.8.8.)

Conversion rate: 3 readings/sec

Polarity: Automatic, no positive sign, "-" negative sign Overrange indication: Beyond 1999 display shows "1"

Zero & span adjustments: 15-turn potentiometers accessible behind red front filter

Alarms

Number of alarms: 2 alarms

Setpoint range & deadband adjustments: 15-turn potentiometers accessible through holes in front filter (see fig.2)

Setpoint range or deadband display: by pressing momentary pushbutton in front of controller (see fig.2)

Setpoint adjustment: from 0 to 100% of span 1/2 range adjustment: from 1% to 33% of span Deadband adjustment: from 0 to 33% of span

Output: each alarm is available with either:

A. SPDT (1 form C) electromechanical relay; contacts rated at 3A 30V DC or 120V AC, or 4A at 240V AC resistive

- Contact material is gold overlay
- Isolation between contacts and coil is 2000 Vrms minimum.
- B. Transistor (NPN with open collector) rated at: 40 Vdc off-state voltage
 - 120 mAdc on-state current when using an external power supply
 - 40 mA per alarm when using the internal 5 Vdc supply (consult factory for higher currents)
 - 0.4 V saturation voltage at 100 mA
 - Internal diode to absorb transients when the internal 5 Vdc supply is connected to inductive loads

Environmental

Operating temperature: 0°C to 52°C (32°F to 125°F) Storage temperature: -40°C to 85°C (-40°F to 185°F) Relative humidity: 10% to 90% R.H. non-condensing

Effect of temperature: ±0.05%/°C reading ±0.01%/°C setpoint

Physical

Dimensions: 1/8 DIN case (see drawing)

Case material: glass reinforced NORYL™ rated UL94V-1

Weight: 1.0 Lb (465 g)

ORDERING INFORMATION

Order Number (See Table below and Reference Table D on page 27)

DW - PS - IP - O - AO

EXAMPLE: DW - 1 - 13P - 0 - TFTR00

PS = Power Supply			AO = Alarm Output (See Notes)
1 = 120 Vac 2 = 240 Vac 3 = 24 Vac	See Table D for English or metric, or Table E for English or metric velocity (square root outputs)	Offsets are not available. Enter "0", no offset.	RFRR00 = Electro mechanical relay TFTR00 = Transistor, NPN with open collector

NOTES

Alarm Outputs

RFRR00 Electromechanical relay

TFTR00 Transistor, NPN with open collector (specify if external power supplied is used). Alarm 1 is configured to energize on falling pressure and alarm 2 on rising pressure (alarm 3 is not used).

When ordering a Model DW controller, supply the following three fields: power supply, input pressure and alarm outputs. A typical part number may look as follows: DW-1-13P-0-TFTR00

WIRING DIAGRAMS

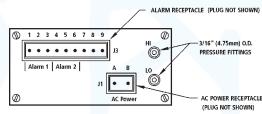


Fig.5 Rear panel connections.

Figure 5 is a view of the rear panel of the controller with the high and low pressure ports, the power receptacle J1 (with terminals labeled A & B) and the alarm output receptacle J3 (with terminals labeled 1 through 9).

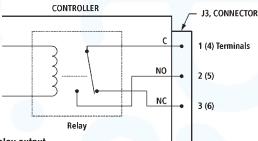


Fig.6 Relay output.

Figure 6 shows the internal wiring of the electromechanical relay. This type of output will switch small loads such as pilot lights or audible alarms. Also, the gold contacts offer a reliable output when a contact closure must be sensed and the current is very low.

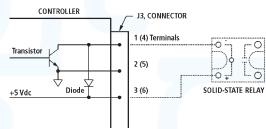


Fig. 7 Transistor output, internal power supply.

Figure 7 is a wiring diagram of the transistor output connected to a solid-state relay. The input voltage range of the relay is 3 to 32 Vdc. Power is supplied by the internal 5 Vdc supply of the controller. If an inductive load is connected, the internal diode will protect the transistor against transients.

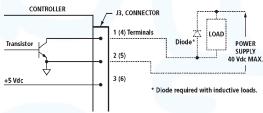


Fig.8 Transistor output, external power supply.

Figure 8 shows the transistor controlling a load powered by an external 12 or 24 Vdc supply. The internal diode has been removed and an external diode or other means of limiting transients to 40 Volts must be added if the load is inductive. The current must not exceed 120 mA.

TABLE A—STANDARD PRESSURE RANGES

	ENGLISH		METRIC UNITS					
Pressure	Pressure Range	Max. Safe Momentary	Pressure	Pressure Range	Max. Safe Momentary	Pressure	Pressure Range	Max. Safe Momentary
Code	English	Overpressure	Code	Pascals	Overpressure	Code	Pascals	Overpressure
01E	0-0.100 in. H ₂ 0		01P	0-25.0 Pa		01M	0-2.50 mm H ₂ 0	
02E	0-0.200 in. H ₂ 0	5 in. H ₂ 0	02P	0-50.0 Pa	1.25 kPa	02M	0-5.00 mm H ₂ 0	125 mm
03E	0-0.300 in. H ₂ 0		03P	0-75.0 Pa		03M	0-7.50 mm H ₂ 0	
04E	0-0.500 in. H ₂ 0		04P	0-100.0 Pa		04M	0-10.00 mm H ₂ 0	
05E	0-1.00 in. H ₂ 0		05P	0-250 Pa		05M	0-25.0 mm H ₂ 0	
06E	0-2.00 in. H ₂ 0	20 in. H ₂ 0	06P	0-500 Pa	5 kPa	06M	0-50.0 mm H ₂ 0	500 mm
07E	0-3.00 in. H ₂ 0		07P	0-750 Pa		07M	0-75.0 mm H ₂ 0	
08E	0-5.00 in. H ₂ 0		08P	0-1.00 kPa		08M	0-100 mm H ₂ 0	
09E	0-10.0 in. H ₂ 0	5 psid	09P	0-2.50 kPa	35 kPa	09M	0-250 mm H ₂ 0	3.5 m
11E	0-20.0 in. H ₂ 0	·	11P	0-5.00 kPa		11M	0-500 mm H ₂ 0	
12E	0-30.0 in. H ₂ 0		12P	0-7.50 kPa		12M	0-750 mm H ₂ 0	
13E	0-50.0 in. H ₂ 0		13P	0-10.0 kPa		13M	0-1.00 m H ₂ 0	
14E	0-100 in. H ₂ 0	15 psid	14P	0-25.0 kPa	100 kPa	14M	0-2.5 m H ₂ 0	10 m
15E	0-1.00 psid		15P	0-50.0 kPa		15M	0-5.0 m H ₂ 0	
16E	0-2.00 psid		-	-		-	-	
17E	0-3.00 psid		-	-		-	-	
18E	0-5.00 psid		-	-		-	-	
19E	0-15.0 psid	30 psid	16P	0-100 kPa	200 kPa	16M	0-10.0 m H ₂ 0	20 m
20E	0-30.0 psid	60 psid	17P	0-200 kPa	400 kPa	17M	0-20.0 m H ₂ 0	40 m

TABLE B—STANDARD PRESSURE RANGES FOR W SERIES

	ENGLISH UNIT	·s	METRIC UNITS					
Pressure Code	Differential Pressure Range, psid	Operating Static Pressure, psi	Pressure Code	Differential Pressure Range, kPA	Operating Static Pressure, psi	Pressure Code	Differential Pressure Range, k mm H ₂ 0	Operating Static Pressure k mm H ₂ 0
31E	0-6 psid		31P	0-50 kPa		31M	0-5.0 k mm H ₂ 0	
32E	0-10 psid	0-100 psi*	32P	0-75 kPa	0 - 700 kPa*	32M	0-7.5 k mm H ₂ 0	0-70 k mm H ₂ 0
33E	0-15 psid	0 100 poi	33P	0-100 kPa		33M	0-10 k mm H ₂ 0	
34E	0-30 psid		34P	0-200 kPa		34M	0-20 k mm H ₂ 0	
35E	0-60 psid		35P	0-500 kPa		35M	0-50 k mm H ₂ 0	0-200 k mm H ₂ 0
36E	0-100 psid	0 - 300 psi*	0 - 300 psi* 36P		0 - 2000 kPa*	36M	0-75 k mm H ₂ 0	U-200 K IIIIII П ₂ 0
37E	0-150 psid		37P	0-1000 kPa		37M	0-100 k mm H ₂ 0	
38E	0-200 psid		38P	0-1500 kPa		38M	0-150 k mm H ₂ 0	

 $^{^{\}star}$ Maximum safe momentary overpressure at any port is 2X the maximum operating static pressure

TABLE C—STANDARD PRESSURE RANGES FOR MANOMETER

	ENG	LISH		METRIC UNITS							
Pressure Code	Pressure Range	Displayed Units	Max. Safe Momentary	Pressure Code	Pressure Range Pascals	Displayed Units	Max. Safe Momentary Overpass	Pressure Code	Pressure Range mm of H ₂ O	Displayed Units	Max. Safe Momentary Overpass
01E	0-0.100 in. H ₂ 0	.100	Overpass	01P	0-25.0 Pa	25.0	010.paoo	01M	0-2.50 mm	2.50	Overpade
02E	0-0.200 in. H ₂ 0	.200	5 in H₂0	02P	0-50.0 Pa	50.0	1.25 kPa	02M	0-5.00 mm	5.00	125 mm
03E	0-0.300 in. H ₂ 0	.300	2	03P	0-75.0 Pa	75.0		03M	0-7.50 mm	7.50	
04E	0-0.500 in. H ₂ 0	.500		04P	0-100 Pa	100.0		04M	0-10.0 mm	10.0	
05E	0-1.00 in. H ₂ 0	1.000		05P	0-250 Pa	250		05M	0-25.0 mm	25.0	
06E	0-2.00 in. H ₂ 0	1.999	2H ₂ 0	06P	0-500 Pa	500	5 kPa	06M	0-50.0 mm	50.0	500 mm
07E	0-3.00 in. H ₂ 0	3.00	_	07P	0-750 Pa	750		07M	0-75.0 mm	75.0	
08E	0-5.00 in. H ₂ 0	5.00		08P	0-1.00 kPa	1.000		M80	0-100 mm	100.0	
09E	0-10.0 in. H ₂ 0	10.00		09P	0-2.50 kPa	2.50		09M	0-250 mm	250	
11E	0-20.0 in. H ₂ 0	19.99	5 psid	11P	0-5.00 kPa	5.00	35 kPa	11M	0-500 mm	500	3.5 m
12E	0-30.0 in. H ₂ 0	30.0		12P	0-7.50 kPa	7.50		12M	0-750 mm	750	
13E	0-50.0 in. H ₂ 0	50.0		13P	0-10.0 kPa	10.00		13M	0-1.00 m	1.000	
14E	0-100 in. H ₂ 0	100.0		14P	0-25.0 kPa	25.0		14M	0-2.50 m	2.50	
15E	0-1.00 psid	1.000	5 psid	15P	0-50.0 kPa	50.0	100 kPa	15M	0-5.00 m	5.00	10 m
16E	0-2.00 psid	1.999		16P	0-100 kPa	100.0		16M	0-10.0 m	10.00	
17E	0-3.00 psid	3.00		17P	0-200 kPa	199.9		17M	0-20.0 m	19.99	
18E	0-5.00 psid	5.00									

TABLE D—STANDARD PRESSURE RANGES

English Units

Pressure Code ⁽¹⁾	Pressure Range	Displayed Units ⁽²⁾	Resolution	Maximum Overpressure
01E	0-0.1 in. H ₂ 0	.100	0.001"	5.0"
02E	0-0.2 in. H ₂ 0	.200	0.001"	5.0"
04E	0-0.5 in. H ₂ 0	.500	0.001"	5.0"
05E	0-1.0 in. H ₂ 0	1.000	0.001"	20.0"
06E	0-2.0 in. H ₂ 0	1.999	0.001"	20.0"
08E	0-5.0 in. H ₂ 0	5.00	0.01"	5 psid
09E	0-10.0 in. H ₂ 0	10.00	0.01"	5 psid
11E	0-20.0in. H ₂ 0	19.99	0.01"	5 psid
15E	0-1 psid	1.000	0.001"psid	15 psid
16E	0-2 psid	1.999	0.001"psid	15 psid
17E	0-3 psid	3.00	0.01"psid	15 psid
18E	0-5 psid	5.00	0.01"psid	15 psid
19E	0-15 psid	15.00	0.01"psid	30 psid
20E	0-30 psid	30.0	0.1"psid	60 psid
**E	·			

Metric Units, millimeters of water

Pressure Code ⁽¹⁾	Pressure Range	Displayed Units ⁽²⁾	Resolution	Maximum Overpressure
01M	0-2.50 mm H ₂ 0	2.50	0.01 mm	125 mm
02M	0-5.00	5.00	0.01 mm	125 mm
04M	0-10.0	10.00	0.01 mm	125 mm
05M	0-25.0	25.0	0.1 mm	500 mm
06M	0-50.0	50.0	0.1 mm	500 mm
08M	0-100	100.0	0.1 mm	3.5 m
09M	0-250	250	1.0 mm	3.5 m
11M	0-500	500	1.0 mm	3.5 m
13M	0-1.00 meter	1.000	.001 meter	10 m
14M	0-2.50 meter	2.50	.01 meter	10 m
15M	0-5.00 meter	5.00	.01 meter	10 m
16M	0-10.0 meter	10.00	.01 meter	20 m
17M	0-20.0 meter	19.99	.01 meter	40 m
**M	Contact factory fo			

Metric Units, pascals

Pressure Code ⁽¹⁾	Pressure Range	Displayed Units ⁽²⁾	Resolution	Maximum Overpressure
01P	0-25 Pa	25.0	0.1 Pa	1.25 kPa
02P	0-50 Pa	50.0	0.1 Pa	1.25 kPa
04P	0-100 Pa	100.0	0.1 Pa	1.25 kPa
05P	0-250 Pa	250	1 Pa	5.0 kPa
06P	0-500 Pa	500	1 Pa	5.0 kPa
08P	0-1.0 kPa	1.000	1 Pa	35 kPa
09P	0-2.5 kPa	2.50	10 Pa	35 kPa
11P	0-5.0 kPa	5.00	10 Pa	35 kPa
13P	0-10 kPa	10.00	10 Pa	100 kPa
14P	0-25 kPa	25.0	100 Pa	100 kPa
15P	0-50 kPa	50.0	100 Pa	100 kPa
16P	0-100 kPa	100.0	100 Pa	200 kPa
17P	0-200 kPa	199.9	100 Pa	400 kPa
**P				

⁽¹⁾ Use this code when ordering.(2) This column shows the number of digits that are displayed and the position of the decimal point.

TABLE E

Velocity Ranges, feet per minute

Pressure Code ⁽¹⁾	Pressure Range	Velocity Range	Displayed Units ⁽²⁾	Resolution	Maximum Overpressure		
capacitance cell							
01F	0-0.1 in. H ₂ 0	90 - 1266 fpm	1.27	10 fpm	5.0 in. H ₂ 0		
02F	0-0.2 in. H ₂ 0	125 - 1791 fpm	1.80	10 fpm	5.0 in. H ₂ 0		
04F	0-0.5 in. H ₂ 0	200 - 2832 fpm	2.83	10 fpm	5.0 in. H ₂ 0		
05F	0-1.0 in. H ₂ 0	280 - 4005 fpm	4.00	10 fpm	20.0 in. H ₂ 0		
06F	0-2.0 in. H ₂ 0	400 - 5664 fpm	5.66	10 fpm	20.0 in. H ₂ 0		
08F	0-5.0 in. H ₂ 0	4625 - 8955 fpm	8.96	10 fpm	50.0 in. H ₂ 0		
09F	0-10.0 in. H ₂ 0	885 - 12665 fpm	12.7	100 fpm	50.0 in. H ₂ 0		
**F	Contact fa	Contact factory for other pressure or velocity ranges, displayed units and resolution					

^{1.} Use this code when ordering.

 $V = 4005 \sqrt{H_v}$

Where:

V is air velocity in feet per minute

H_v is velocity pressure in inches of water

Velocity Ranges, meters per second

Pressure Code ⁽¹⁾	Pressure Range	Velocity Range	Displayed Units ⁽²⁾	Resolution	Maximum Overpressure		
capacitance cell							
01V	0-2.5 mm H ₂ 0	0.45 - 6.4 m/s	6.50	0.01 m/s	125 mm		
02V	0-5.0 mm H ₂ 0	0.63-9 m/s	9.00	0.01 m/s	125 mm		
04V	0-10.0 mm H ₂ 0	0.90 - 13 m/s	13.0	0.1 m/s	125 mm		
05V	0-25.0 mm H ₂ 0	1.4 - 20 m/s	20.0	0.1 m/s	500 mm		
06V	0-50.0 mm H ₂ 0	2.0 - 29 m/s	29.0	0.1 m/s	500 mm		
V80	0-100 mm H ₂ 0	2.8 - 40 m/s	40.0	0.1 m/s	1250 mm		
09V	0-250 mm H ₂ 0	4.5 - 64 m/s	64.0	0.1 m/s	1250 mm		
**V	Contact fa	Contact factory for other pressure or velocity ranges, displayed units and resolution					

^{1.} Use this code when ordering.

 $V = 4.037 \sqrt{H_v}$

Where

V is air velocity in meters per second

H_v is velocity pressure in millimeters of water

^{2.} The velocities are accurate for dry air at standard conditions (air density of 0.075 lb/ft³; barometric pressure of 29.92 inches of mercury and temperature of 70°F). It is also assumed that standard pitot tubes similar to those described in the accessory bulletin are used. The velocities are derived from the following formula:

^{2.} The velocities are accurate for dry air at standard conditions (air density of 1.201 kg/m³ barometric pressure of 760 mm of mercury and temperature of 21°C). It is also assumed that standard pitot tubes similar to those described in the accessory bulletin are used. The velocities are derived from the following formula: