MODEL FP5000

008927
Issue 4

High Performance Configurable Pressure Transducer

DESCRIPTION

The Honeywell Model FP5000 Series is a media-isolated piezoresistive silicon pressure sensor offering multiple output options for reading pressure over the specified full-scale pressure span and temperature range. It is compensated for sensor offset, sensitivity, temperature effects and non-linearity to offer improved thermal stability and accuracy. Hastelloy® C276 and 316L stainless steel wetted parts provide durability with abrasive or corrosive media.

DIFFERENTIATION

- Offers improved accuracy and reliability
- Configurable platform enables a sensor to be built to customer requirements. Simplified nomenclature and order codes make ordering easier
- Many pressure and operating temperature range options
- Built from stocked components; most configurations are shipped within ten business days
- Extensive history of pressure measurement know-how
- Bi-directional differential output available

FEATURES

- Pressure ranges from 10 in-H_2O [0.36 psi] up to 5000 psi
- Gage, absolute, vacuum, barometric, compound, and differential wet/wet pressure types
- Higher accuracy to 0.1 %FSS BFSL
- Multiple output types: 0 Vdc to 5 Vdc, 0 Vdc to 10 Vdc, 4 mA to 20 mA, 5 Vdc ±5 Vdc, 12 mA ±8 mA
- Multiple electrical and pressure connection options
- Zero adjustment through potentiometer
- Operating temperature ranges from -40°C to 125°C [-40°F to 250°F]
- Multiple compensation temperature ranges
- Faster response and higher resolution
- Fully analog reduced-noise signal path provides continuous output resolution
- Stainless steel construction
- Ha C276 and 316L stainless steel wetted parts offer more enhanced durability with abrasive or corrosive media
- CE, RoHS, REACH compliant
- Intrinsic Safety Certifications: cFMus, ATEX, IEC Ex certified 2AR option (4 mA to 20 mA), and 2BA option (12 mA ±8 mA)
- Non-Incendive Certifications: cFMus, certified 2AT option (4 mA to 20 mA) and 2BB option(12 mA ±8 mA)

VALUE TO CUSTOMERS

- Built on the Honeywell history of higher-quality pressure sensing technologies
- Next-gen design of the popular FP2000 pressure sensor
- Offers more repeatable, reliable, and accurate pressure measurements over time
- Rugged, stainless steel pressure sensors are built and tested to perform and survive in many demanding environments
- Configurable platform creates a wide range of standard configurations
- Stocked components enable shipping within ten business days on most configurations

APPLICATIONS

- Test stands (Automotive, Aerospace, Industrial, and Medical)
- R&D test labs
- Hydraulic and pneumatic system monitoring
- Leak detection
- Manufacturing mold pressure control
- Pump and compressor control
- Liquid level measurement
- Oil & gas process control
- Fluid flow measurement
- Valve testing

PORTFOLIO

Model FP5000 pressure transducers are part of a comprehensive line of Honeywell pressure sensors.

Honeywell

HIGH PERFORMANCE CONFIGURABLE PRESSURE TRANSDUCER
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TABLE 1. PERFORMANCE SPECIFICATIONS

Characteristic	Measure
Operating pressure ranges	Gage: 0.36 psi to 5000 psi Absolute: 5 psi to 5000 psi Vacuum: 0.36 psi to 15 psi Barometric: 0 to 30 in-Hg, 16 to 32 in-Hg, 26 to 32 in-Hg Compound ranges available consult factory Differential: 0.36 psi to 1000 psi Equivalent ranges are available in other pressure units also: kPa, bar, mm-Hg, in-Hg, mbar, torr, in-H_2O
Accuracy[1,7]	0.2 %FSS BFSL (Standard accuracy) 0.1 %FSS BFSL (High accuracy)
Output (selectable)	0 Vdc to 5 Vdc, 0 Vdc to 10 Vdc, or 4 mA to 20 mA (two wire)
Resolution	Continuous (Fully analog signal path)

TABLE 2. ENVIRONMENTAL SPECIFICATIONS

Characteristic	Measure
Operating temperature range	See Table 3 (Electrical connectors)
Compensated temperature range	See Table 4 (Thermal effects error band)
Thermal effects error band (TEEB)[2,3]	See Table 4 (Thermal effects error band)
Sealing	See Table 3 (Electrical connectors)

Notes:

1. Accuracies stated are with respect to best fit straight line (BFSL) for all errors including linearity, hysteresis, and non-repeatability through zero.
2. Thermal Effects Error Band - The maximum deviation in output due to changes in temperature over the entire compensated temperature range, relative to output measured at reference temperature. Includes all errors due to: Thermal Effect on Offset and Thermal Effect on Span.
3. Thermal effects error band (TEEB) increases pro-rata for pressure ranges below 5 psi [0.35 bar].
4. True Zero Output: The voltage output versions have onboard circuitry that allows the output signal to swing all the way to ground (True Zero) and even a little below (~-0.2 V). This mitigates increased error at lower voltage measurements.
5. Over pressure: The absolute maximum rating for pressure which may be safely applied to the product for it to remain in specification once pressure is returned to the operating pressure range. Exposure to higher pressure may cause permanent damage to the product.
6. Burst pressure: The maximum pressure that may be applied to the product without causing escape of the pressure media. The product should not be expected to function after exposure to any pressure beyond the rated burst pressure.
7. All specifications apply at 25°C [77°F] and under operating conditions unless otherwise noted.
8. Full Scale Span (FSS): The algebraic difference between output signal measured at the upper and lower limits of the operating pressure range. Also known as "span".
9. Offset: The output signal obtained when the reference pressure is applied to all available pressure ports. Also known as "null" or "zero".
10. Reference pressure: The pressure used as a reference (zero) in measuring product performance. Unless otherwise specified, this is vacuum (0 psia) for absolute pressure sensors and local ambient atmospheric pressure (0 psig) for gage/vacuum pressure sensors.
11. Minimum operating pressure: The lower limit of the operating pressure range.
12. Maximum line pressure: The maximum pressure that can be applied simultaneously to both ports of a Differential Pressure Sensor without causing changes in specified performance
13. Line pressure effect on zero: The change in the output at zero pressure caused by change in line pressure on both ports of differential pressure sensor.

TABLE 3. ELECTRICAL CONNECTORS

Connector	Operating Temperature Range	Sealing
PT-02A-10-6P	-40°C to 125°C [-40°F to 250°F]	IP67
DIN FORM A	-40°C to 125°C [-40°F to 250°F]	IP65
DIN FORM C	-40°C to 90°C [-40°F to 194°F]	IP65
Integral cable	-40°C to 105°C [-40°F to 221°F]	IP67
Conduit fitting	-40°C to 105°C [-40°F to 221°F]	IP67
M12 x 1, 4-pin	-40°C to 85°C [-40°F to 185°F]	IP67

TABLE 4. THERMAL EFFECTS ERROR BAND (TEEB)

Compensated Temperature Range	For Standard Accuracy	For High Accuracy
0° C to 60° C [40° F to 140° F]	< ±0.75 %FSS	< ±0.5 %FSS
-20° C to 80° C [0° F to 180° F]	< ±1.5 %FSS	< ±1 %FSS
-40° C to 85° C [-40° F to 185° F]	< ±2.25 %FSS	< ±1.5 %FSS
-40° C to 125° C [-40° F to 250° F]	< ±2.25 %FSS	< ±1.5 %FSS

TABLE 5. MECHANICAL SPECIFICATIONS

Characteristic	Measure
Media	Gas, liquid
Weight (approx.) – gage, absolute, vacuum, barometric, compound	150 g [5.3 oz]
Weight (approx.) – differential	300 g [10.6 oz]
Wetted parts material	Ha C276 and 316L stainless steel
Labels	Laser engraved
Maximum allowed line pressure[12]	
Operating range < 15 psi (1 bar):	50 psi
15 psi (1 bar) < Operating range ≤ 50 psi (3.5 bar):	250 psi
50 psi (3.5 bar) < Operating range ≤ 250 psi (17 bar):	Pressure range: +500 psi
250 psi (17 bar) < Operating range ≤ 1000 psi (70 bar):	Pressure range: +1000 psi
Line pressure effect on zero[13]	
Operating range < 15 psi (1 bar):	±1 % FSS
15 psi (1 bar) < Operating range ≤ 50 psi (3.5 bar):	±1 % FSS
50 psi (3.5 bar) < Operating range ≤ 250 psi (17 bar):	±1.5 % FSS
250 psi (17 bar) < Operating range ≤ 1000 psi (70 bar):	±1.5 % FSS

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TABLE 6. ELECTRICAL SPECIFICATIONS[7]

Specifications	2AR, 2AT 4 mA to 20 mA	2BA*, 2BB* 12 mA ±8 mA	2AN 0 V to 5 V	2AP 0 V to 10 V	2AW* 5 V ±5 V
Supply voltage	9 Vdc to 28 Vdc		9 Vdc to 28 Vdc	14 Vdc to 28 Vdc	
Current consumption	4 mA to 24 mA		< 6 mA		
Output at reference pressure [10] – (absolute, gage, vacuum, differential) **Output at minimum operating pressure[11] – (compound, barometric)**	4 mA ±0.5 %FSS	12 mA ±0.5 %FSS	0 V ±0.5 %FSS	0 V ±0.5 %FSS	5 V ±0.5 %FSS
Full scale span (FSS)[8]	16 mA ±1 %FSS	16 mA ±1 %FSS	5 V ±1 %FSS	10 V ±1 %FSS	10 V ±1 %FSS
Frequency response	3500 Hz				
Reverse voltage protection	Yes, 28 V				
Load impedance	< 950 Ohm at 28 V decreasing linearly to 0 Ohm at 9 V		> 10K Ohms		
Insulation resistance	>500 MOhm to case GND at 33 V				
Overvoltage protection	>32 V				
Power up time	< 1 sec				
Zero adjustment potentiometer	Yes, > ±5 %FS adjustment, accessible from top after demounting connector				

**2BA, 2BB, and 2AW are available only for bi-directional differential pressure sensing*

TABLE 7. OVERPRESSURE AND BURST PRESSURE RATINGS

Pressure type/Port	Operating Range	Over Pressure	Burst Pressure
Gage, absolute, vacuum, barometric, compound, differential version positive (high side)	≤ 15 psi (1 bar)	6X FS	10X FS
	15 psi to 1000 psi (1 bar to 70 bar)	4X FS	6X FS
	> 1000 psi (70 bar)	3X FS or 10,000 psi (700 bar) whichever is less	4X FS or 10,000 psi (700 bar) whichever is less
Differential version negative (low side) with respect to positive (high side)	≤ 15 psi (1 bar)	6 X	10X
	15 psi to 1000 psi (1 bar to 70 bar)	4X FS or 250 psi whichever is less	6X FS or 500 psi whichever is less

TABLE 8. DIN FORM A (6M), DIN FORM C (6BO) WIRING

PIN	STANDARD		ALTERNATIVE	
	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/ 5 V ± 5 V (2AN, 2AP, 2AW)	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/5 V ± 5 V (2AN, 2AP, 2AW)
	Designation	Designation	Designation	Designation
1	(+) Supply	(+) Supply	(+) Supply	(+) Supply
2	(+) Output	(+) Output	(+) Output	Supply return/ (-) Output
3	No connection	Supply return/ (-) Output	No connection	(+) Output
E	No connection	No connection	Case GND	Case GND

TABLE 9. PT02A-10-6P, 6-PIN (6A) WIRING

PIN	STANDARD		ALTERNATIVE	
	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/ 5 V ± 5 V (2AN, 2AP, 2AW)	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/5 V ± 5 V (2AN, 2AP, 2AW)
	Designation	Designation	Designation	Designation
A	(+) Supply	(+) Supply	(+) Supply	(+) Supply
B	No connection	Supply return	(+) Output	(+) Output
C	No connection	(-) Output	No connection	No connection
D	(+) Output	(+) Output	No connection	Supply return/ (-) Output
E	No connection	No connection	No connection	No connection
F	No connection	No connection	No connection	No connection

TABLE 10. INTEGRAL CABLE (6Q), CONDUIT FITTING (6R) WIRING

PIN	STANDARD		ALTERNATIVE	
	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/ 5 V ± 5 V (2AN, 2AP, 2AW)	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/5 V ± 5 V (2AN, 2AP, 2AW)
	Designation	Designation	Designation	Designation
Red	(+) Supply	(+) Supply	(+) Supply	(+) Supply
Black	(+) Output	Supply return	Not available	Supply return/ (-) Output
Green	Not available	(-) Output	Not available	Not available
White	Not available	(+) Output	(+) Output	(+) Output

TABLE 11. M12 X 1, 4-PIN (6BJ) WIRING

PIN	STANDARD		ALTERNATIVE	
	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/ 5 V ± 5 V (2AN, 2AP, 2AW)	4 mA to 20 mA / 12 mA ±8 mA (2AR, 2BA, 2AT, 2BB)	0 V to 5 V/0 V to 10 V/5 V ± 5 V (2AN, 2AP, 2AW)
	Designation	Designation	Designation	Designation
1	(+) Supply	(+) Supply	(+) Supply	(+) Supply
2	No connection	(+) Output	(+) Output	No connection
3	(+) Output	Supply return/ (-) Output	No connection	Supply return/ (-) Output
4	Case GND	Case GND	Case GND	(+) Output

TABLE 12. INTRINSICALLY SAFE APPROVALS FOR OPTION 2AR OR 2BA

Agency	Approvals
cFMus	Class I, Div 1, Groups A, B, C, D Class I, Zone 0, AEx/Ex ia IIC T4/T5 Ga Ta= -40°C to 40°C (T5), -40°C to 85°C (T4)
ATEX	II 1 G Ex ia IIC T4/T5 Ga Ta= -40°C to 40°C (T5), -40°C to 85°C (T4)
IEC Ex	Ex ia IIC T4/T5 Ga Ta= -40°C to 40°C (T5), -40°C to 85°C (T4)
UKCA	II 1 G Ex ia IIC T4/T5 Ga Ta= -40°C to 40°C (T5), -40°C to 85°C (T4) (Pending Approval)

See Honeywell's website (http://sps.honeywell.com/ast) for up-to-date information regarding intrinsically safe approvals. Refer to Installation manual #008-0751-00 for installation/wiring instructions, cautions and warnings.

TABLE 13. NON INCENDIVE APPROVALS FOR OPTION 2AT OR 2BB

Agency	Approvals
cFMus	Class I, Div 2, Groups A, B, C, D CLASS I, ZONE 2, GROUP IIC Ta= -40°C to 40°C (T5), -40°C to 85°C (T4)

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Figure 1. Product Nomenclature

NFG 1 BR, 1AK, 2AP, 5F , 6M ,7BA

Type

NFG	Gage
NFA	Absolute
NFV	Vacuum
NFB	Barometric (UG, UQ, UR only)
NFC	Compound (consult factory)
NDW	Differential, wet/wet

Accuracy

1	0.10 %*
2	0.20 %

**Not available in ranges ≤ 2 psi*
**Not available for 2AY and 2AW*

Range

kPa		*bar*		*psi*	
KD	35 kPa	**ME**	1 bar	**AN***	0.5 psi
KF	100 kPa	**MF**	2 bar	**AP***	1 psi
KG	200 kPa	**NA**	3.5 bar	**AT**	5 psi
KH	300 kPa	**MG**	5 bar	**AV**	10 psi
KJ	700 kPa	**NB**	7 bar	**BJ**	15 psi
KL	1000 kPa	**MH**	10 bar	**BL**	25 psi
KM	1500 kPa	**MI**	20 bar	**BM**	30 psi
KQ	3000 kPa	**MJ**	30 bar	**BN**	50 psi
KR	5000 kPa	**NC**	35 bar	**BP**	75 psi
KS	7000 kPa	**MK**	50 bar	**BR**	100 psi
KT**	10000 kPa	**ND**	70 bar	**CJ**	150 psi
		ML**	100 bar	**CL**	200 psi
in-H_2O		**NE****	135 bar	**CN**	250 psi
WA*	10 in-H_2O	**MY****	200 bar	**CP**	300 psi
WC*	20 in-H_2O	**NG****	350 bar	**CQ**	400 psi
WE*	30 in-H_2O			**CR**	500 psi
WG*	50 in-H_2O	*in-Hg*		**CS**	600 psi
		UG	30 in-Hg	**CT**	750 psi
		UQ	16-32 in-Hg	**CV**	1000 psi
		UR	26-32 in-Hg	**DJ****	1500 psi
				DL**	2000 psi
				DM**	2500 psi
				DN**	3000 psi
				DR **	5000 psi

More ranges are available.
Please consult Honeywell for options.

** Not available in absolute pressure type*
*** Not available in differential pressure type*

Ranges with blue highlight (greater than 100 kPa, 15 psi, 1 bar) are NOT available in Vacuum.

Calibration Data*

	5-point calibration at 77°F (default option)
9A	9-point calibration at 77°F

** Only positive side calibration data provided for differential sensors*

Wiring

7BA	Standard
7BB	Alternative

Electrical Connection

6A	PT02A-10-6P, 6-pin
6M	DIN A 43650, 4-pin
6BO	DIN C, 4-pin
6Q	Integral cable, 5 feet#
6R	Conduit fitting with 5 feet# cable*
6BJ	M12 x 1 (IEC 61076-2-101 style AM), 4-pin

#Consult factory for other cable lengths
** For Div 2 Location(2AT), Electrical connection 6R can be used without using Associated apparatus.*

Pressure Port

5A	1/4-18 NPT female
5AE	1/2-14 NPT male
5B	1/4-18 NPT male
5C	7/16-20 UNF female
5D	7/16-20 UNF male
5F	G1/4 B female
5G	G1/4 B male
5I	1/8-27 NPT male
5P	M12 x 1.5 male

Output

2AN	0 Vdc to 5 Vdc
2AP	0 Vdc to 10 Vdc
2AR	4 mA to 20 mA Intrinsically Safe (see Table 12 for certifications)
2AT	4 mA to 20 mA Non-Incendive (see Table 13 for certifications)
2AW	5 V ±5 V‡
2BA	(12 mA ±8 mA) Intrinsically safe (see Table 12 for certifications)‡
2BB	(12 mA ±8 mA) Non-Incendive (see Table 13 for certifications)‡

‡2BA, 2BB, and 2AW are available only for bi-directional differential pressure sensing

Temperature Compensation

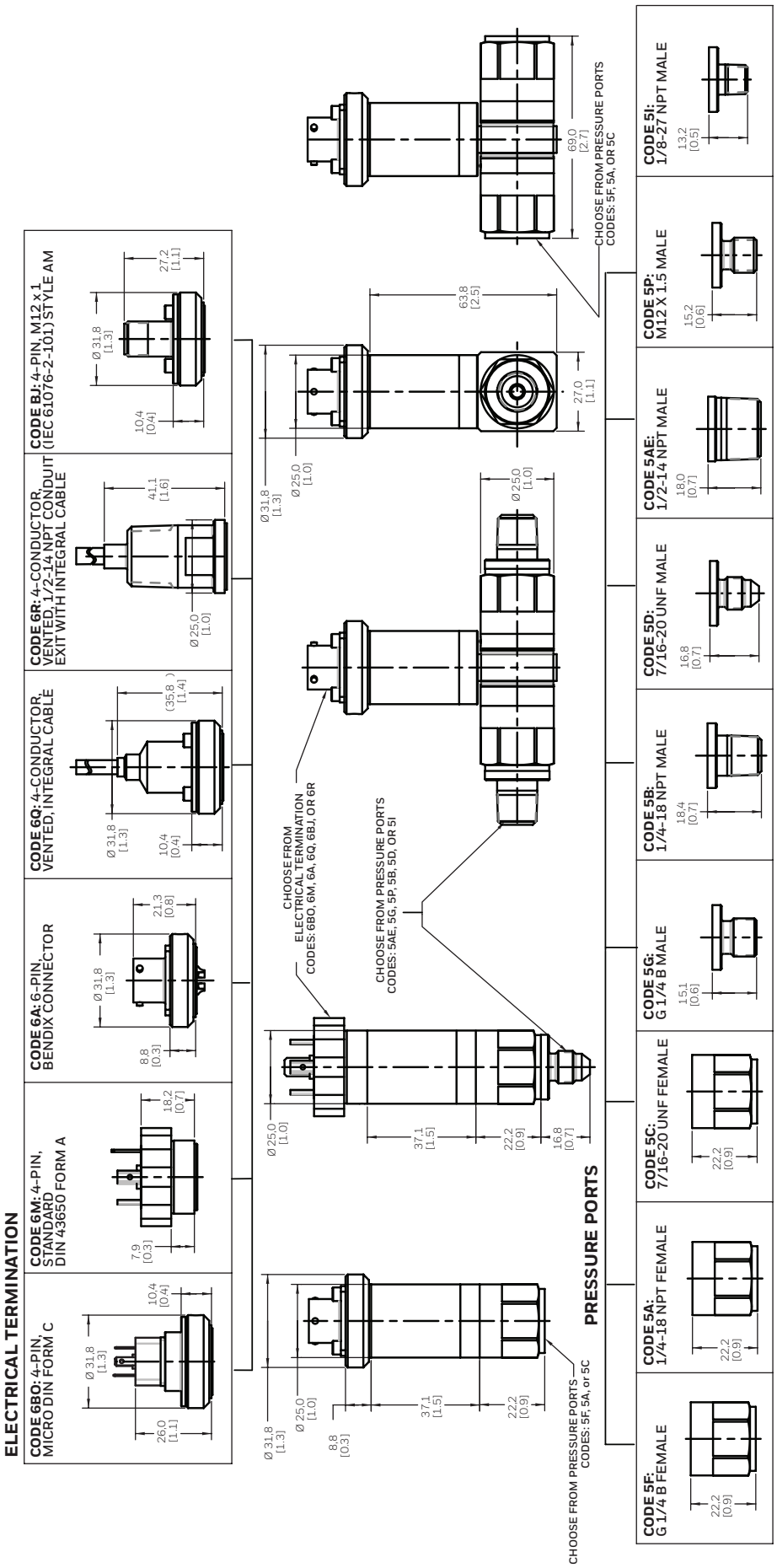
1AK	0°C to 60°C [40°F to 140°F]
1Y[1]	-20°C to 80°C [0°F to 180°F]
1AP[1]	-40°C to 85°C [-40°F to 185°F]
1BA[2]	-40°C to 125°C [-40°F to 250°F]

[1] 1Y and 1AP not available for pressure ranges below 5 psi [0.35 bar]
[2] 1BA not available for pressure ranges below 50 psi [3.5 bar]

SAMPLE CATALOG LISTINGS

Order Code	Description
NFA1BM,1AK,2AP,5A,6A,7BA	Model FP5000; 0.10% accuracy; 30 psi absolute; compensated across 0°C to 60°C [40°F to 140°F]; 0 Vdc to 10 Vdc output; 1/4-18 NPT female port; PT02A-10-6P 6-pin electrical connector; standard wiring; 5-point calibration data at 77°F
NFG2DR,1Y,2AR, 5G,6Q,7BB	Model FP5000; 0.20% accuracy; 5000 psi gage; compensated across -20°C to 80°C [0°F to 180°F]; Intrinsic Safety Certifications; 4 mA to 20 mA output; G 1/4 B male port; 5 ft long integral cable; alternative wiring; 5-point calibration data at 77°F
NDW1BR,1AK,2AM,5F,6A,7BA	Model FP5000; 0.10 % accuracy; 100 psi differential; compensated across 0°C to 60°C [40°F to 140°F]; 4 mA to 20 mA output; G 1/4B female port, PT02A-10-6P 6-pin electrical connector; standard wiring; 5-point calibration data at 77°F

Figure 2. Mounting Dimensions



CAUTION
PRODUCT DAMAGE DUE TO MECHANICAL ISSUES

- Ensure torque specifications are determined for the specific application. Mating materials and thread sealants can result in significantly different torque values from one application to the next.
- When using mating parts made of stainless steel, use a thread sealant with anti-seize properties to prevent thread galling. Ensure the sealant is rated for the application.
- Use appropriate tools (such as an open-ended wrench or deep-well socket) to install transducers.
- Always hand-start transducers into the hole to prevent cross threading and damage.
- Ensure that torque is not applied to the electrical connector.
- Ensure that the proper mating electrical connector with a seal is used to connect the transducer. Improper or damaged seals can compromise ingress protection, leading to short circuits.
- To ensure proper environmental sealing and electrical connections when using a connector, follow the connector manufacturer's installation guidelines.
- All terminal cavities must be sealed using the correct wire gauge and seal combination.
- If only two leads are used, any additional terminal cavities should be sealed per the connector manufacturer's installation guide.
- Honeywell recommends using a crimping tool for crimping wires to the connector terminals.
- Contact the individual connector manufacturer for connector wiring.

Failure to comply with these instructions could result in product damage.

NOTICE

Refer installation manual #008-0751-00 for installation/ wiring instructions, cautions and warnings related to Intrinsically Safe FP5000 (option 2AR).

For more information

Honeywell Sensing & Safety Technologies services its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing, or the nearest Authorized Distributor, visit sps.honeywell.com/ast or call:

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⚠ WARNING
PERSONAL INJURY

DO NOT USE these products as safety or emergency stop devices or in any other application where failure of the product could result in personal injury.

Failure to comply with these instructions could result in death or serious injury.

⚠ WARNING
MISUSE OF DOCUMENTATION

- The information presented in this product sheet is for reference only. Do not use this document as a product installation guide.
- Complete installation, operation, and maintenance information is provided in the instructions supplied with each product.

Failure to comply with these instructions could result in death or serious injury.

Warranty/Remedy

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship during the applicable warranty period. Honeywell's standard product warranty applies unless agreed to otherwise by Honeywell in writing; please refer to your order acknowledgment or consult your local sales office for specific warranty details. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace, at its option, without charge those items that Honeywell, in its sole discretion, finds defective. **The foregoing is buyer's sole remedy and is in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose. In no event shall Honeywell be liable for consequential, special, or indirect damages.**

While Honeywell may provide application assistance personally, through our literature and the Honeywell website, it is buyer's sole responsibility to determine the suitability of the product in the application.

Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this writing. However, Honeywell assumes no responsibility for its use.

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