

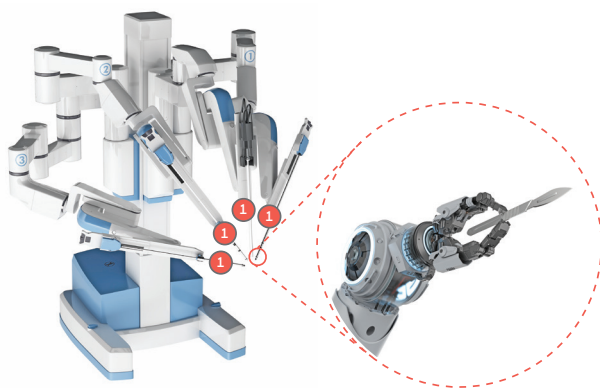
FMA SERIES **MICROFORCE** **SENSORS**

For Use in Robotic Surgery Equipment

Honeywell

FMA SERIES MICROFORCE SENSORS FOR USE IN ROBOTIC SURGERY EQUIPMENT

The FMA Series may be used in robotic surgery to provide a sense of touch, helping to mimic the dexterity of human hands and wrists. This tactile force helps to ensure proper instrument grip.



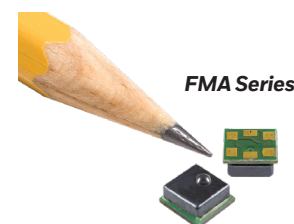
- 1
 - Used in feedback loop to ensure that the correct amount of force is being applied, minimizing damage to patient or equipment
 - Prevents damage to instrument by ensuring that excess force is not applied during a procedure
 - Allows user to accurately identify and correctly handle instruments based on amount of force required
 - May be located on the robotic end-effector as a gripper, instrument changer or collision sensor

The FMA Series piezoresistive-based force sensors offer a digital output for reading force over the specified full scale force span and temperature range. They are fully calibrated and temperature compensated for sensor offset, sensitivity, temperature effects, and nonlinearity using an on-board Application Specific Integrated Circuit (ASIC).

The direct mechanical coupling allows for easier interface with the sensor (using tubing, membrane or a plunger), providing repeatable performance and a more reliable mechanical interface to the application. These sensors offer a more stable output which is directly proportional to the force applied to the mechanically-coupled sphere.

The digital I²C interface permits multiple addresses on the same bus, allowing the use of multiple sensors and helping to reduce system complexity. The optional internal diagnostics function enables fault detection.

FMA SERIES SPECIFICATIONS	
CHARACTERISTIC	PARAMETER
Description	compensated/amplified
Force range	5 N, 15 N, 25 N
Output	SPI, I ² C
Supply voltage	3.3 V, 5.0 V
Supply current, typ.	2.8 mA (3.3 V), 3.9 mA (5.0 V)
Operating temperature range	-40°C to 85°C [-40°F to 185°F]
Compensated temperature range	5°C to 50°C [41°F to 122°F]
Accuracy, typ.	±2% FSS BFLSL
Total Error Band, max.	±8% FSS BFLSL
Output resolution	12 bits
Long term stability	±1.6 FSS
Humidity	0% to 95% RH, non-condensing
Shock	MIL-STD-202, Method 213, Condition A (50 G)
Vibration	MIL-STD-202, Method 214, Condition 1F (20.71 Gms)
Life	1 million full scale force cycles minimum
Package size	5 mm x 5 mm [0.20 in x 0.20 in]



Sensor optimized to be as small as possible while still allowing for mechanical coupling.

PRODUCT NOMENCLATURE

FM ¹ MicroForce Sensors	A Type	M Coupling	S Contact Element	D Option Code	XX Option Code 1	025 ² Force Range	W Force Unit	C Force Type	S Output	C ³ Transfer Function	3 Supply Voltage
	A Compensated/ amplified	M Mechanical	S Sphere		XX Future placeholder		W Newton (N)		S SPI		3 3.3 V ±10%
			N No diagnostics			005 5 (Newtons)		C Compression	2 I ² C, Address 0x28	A 10% to 90%	5 5.0 V ±5%
			D Sensor short and open diagnostics			015 15 (Newtons)			3 I ² C, Address 0x38	C 20% to 80%	
						025 25 (Newtons)			4 I ² C, Address 0x48		
									5 I ² C, Address 0x58		
									6 I ² C, Address 0x68		
									7 I ² C, Address 0x78		

¹ Custom configurations are available upon request. Please contact Honeywell Sales.

² Three characters specify the desired force level; allowable characters are the numbers 0 through 9 for currently configurable force ranges.

³ For other available transfer functions, contact Honeywell Customer Service.

⚠ 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 document 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.

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Advanced Sensing Technologies

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008339-2-EN | 2 | 05/21
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