Data Sheet

XacTorr® Series
Model CMX160

Vacuum Capacitance Manometers

High Temperature
Digital Capacitance Manometers
for Process Vacuum Measurement

XacTorr®
Digital Capacitance Manometer

Overview

Brooks' CMX160 (XacTorr™) is a compact heated vacuum gauge providing accurate total pressure measurement independent of gas composition. The CMX160 Series' digital architecture delivers improved performance, enables in-situ diagnostics and data logging facilities while maintaining an industry standard analog interface.

Designed for demanding thin-film processes such as LPCVD Nitride and Metal-CVD, the CMX160 Series provides superior reliability by combining Brooks' patented shielded sensor technonlogy and patent pending digital temperature control, greatly reducing the buildup of process condensable products that lead to process drift and premature failure of the gauge.

The CMX160 Series is offered in multiple ranges and supports industry standard electrical interfaces, ensuring an upgrade path from legacy analog capacitance manometers.

Product Description

Flexible digital signal processor based electronics eliminates manual potentiometers and drift associated with the aging of old-style analog electronics.

Digital precision:

• Multi-decade digital calibration provides superior window of "known accuracy"
• Real-time compensation for ambient temperature variations which improves measurement repeatability

Intelligent zero adjustment, local push-button, and remote zeroing for ease of maintenance capability that also improves long-term repeatability

• Intelli-Touch zeroing ensures that the XacTorr Series cannot be zeroed if the pressure is too high or if the capacitance manometer has not reached a stabilized operating temperature - a common operator error with analog capacitance manometers.

Highly efficient dual-zone temperature control:
• Real-time temperature control of the sensor for improved measurement stability & repeatability
• Fast warm-up with intuitive temperature status LED
• Rapid response to changing system conditions

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Features and Benefits

Digital Calibration
- Automated calibration improves gauge to gauge reproducibility
- Improved process reproducibility

In-situ Diagnostics & Independent Data Port
- Provides a simple non-invasive method for maintenance and troubleshooting

Dual Zone Temperature Control
- Rapid compensation for changes in process temperature
- Fast warm-up
- Fast recovery from venting to high pres-

Digital Architecture
- Virtually eliminates the drift associated with the aging of analog electronics
- Virtually eliminates the temperature effects associated with discrete analog components

Plasma Shield
- Protects the entire surface area of the diaphragm from the build-up of process byproducts and particulates

Mark IV Sensor
- Guard Volume - provides a "buffer zone" to protect the diaphragm from the build-up of process deposition and particulates
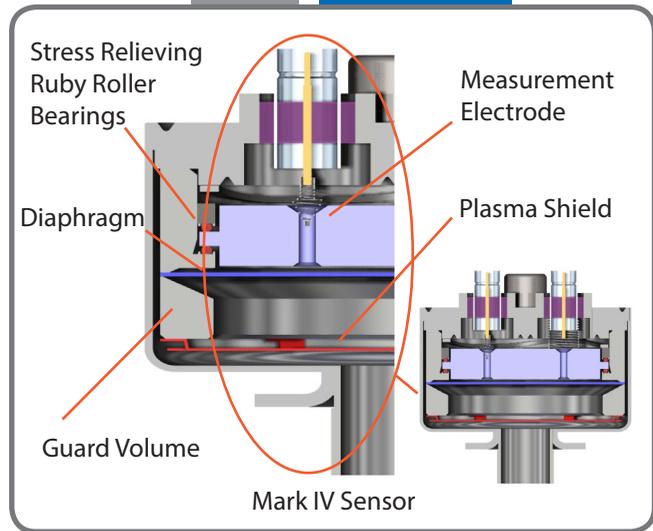- Eliminates the build-up of stress within the reference measurement cavity

Features	Benefits
Patented Mark IV Sensor	Lower drift, superior protection from deposition of process gases
Dual Zone Temperature Control	Fast warm-up, close temperature control, rapid response to changes
Digital Calibration	Multi decade calibration provides superior window of known accuracy, real time compensation of ambient temp effects
Digital Architecture	Eliminates manual potentiometers and drift associated with electronics
Intelli-Touch Zero Adjustment	Cannot be zeroed if pressure is too high or desired temperature not reached

Product Description
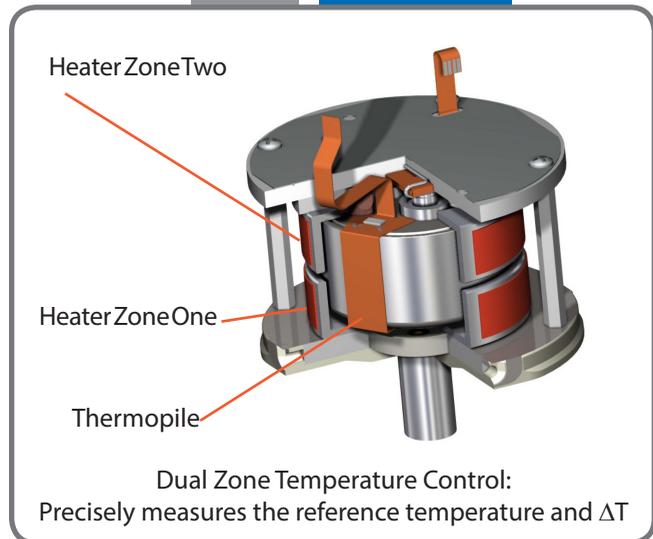
Patented Mark IV Sensor

The XacTorr capacitance manometers utilize patented sensor technology. Unique corrosion resistant, shielded sensor design offers superior protection against condensable process byproducts. The sensor diaphragm is made from corrosion resistant Inconel®. This allows for extended operation of the capacitance manometers without degrading accuracy.

Stress Relieving Ruby Roller Bearings

Measurement Electrode

Diaphragm

Plasma Shield

Guard Volume

Mark IV Sensor

Highly Efficient Dual Zone Temperature Control

The XacTorr 160 capacitance manometer operates at an elevated but regulated temperature of 160^0C. Brooks utilizes a highly efficient dual zone temperature control system to maintain the sensor diaphragm to within 0.1^0C of the specified temperature. Such real time and close temperature control improves measurement stability and repeatability.

This temperature management system also allows for fast warm up. An LED indicates when the instrument reaches the desired temperature level allowing for reliable measurements to be made.

Heater Zone Two

Heater Zone One

Thermopile

Dual Zone Temperature Control:
Precisely measures the reference temperature and ΔT

The dual zone control also ensures rapid response to changing system conditions.

Flexible Digital Signal Processor

The XacTorr capacitance manometers incorporate patented advanced digital architecture. This eliminates manual potentiometers and drift associated with the aging of old style analog electronics.

The instrument is calibrated using multi decade digital calibration which provides a superior window of known accuracy.

The digital precision allows for real time compensation of ambient temperature effect for improved measurement repeatability.

The Intelli-Touch zeroing ensures that the XacTorr capacitance manometers cannot be zeroed if the pressure is too high or if the gauge has not reached

Flexible Digital Signal Processor

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Independent Communications and Diagnostic Interface
The XacTorr's RS485 diagnostic port provides a unique, independent means of communicating with the gauge without having to "interupt" tool communications. This allows monitoring and data acquisition capabilities simultaneously with gauge operation, for chamber and tool matching along with "real time" advanced troubleshooting.

Product Specifications

Performance

Operating Temperatures:	160°C
Full Scale Ranges	1, 2, 10, 20, 100, 1000 Torr
Accuracy[1]	1000 Torr Ranges = 0.5% of Reading; 10-100 Torr Ranges = 0.25% of Reading; 1 and 2 Torr = .35% of Reading
Measurement Range	4 Decades
Temperature Effect on Zero	0.002% F.S./°C
Temperature Effect on Span	0.02% F.S./°C

Mechanical

Exposed Materials	Inconel® and/or AISI 316L Stainless Steel
Over-Pressure Limit	17 psia or 125% of Full Scale, whichever is greater
Approximate Shipping Weight	1.40 lbs. (726 grams)

Outputs Supported

Analog Models	Analog (010 Vdc 5k Ω load) - Yes
	RS485 - Yes
	DeviceNet - No
DeviceNet Models	Analog (010 Vdc 5k Ω load) - Yes
	RS485 - Yes
	DeviceNet - Yes

Connectors

Analog	9-Pin Male Sub D or 15-Pin Sub D
RS485	2.5mm Mini Jack
DeviceNet	5-Pin Eurofast (DeviceNet) & 9-Pin Female Sub D (Analog)

Relay Contact Rating

Available on 15-Pin Male Sub D interface	1A @ 30 Vdc/0.3A @ 125 Vac

Environmental

Ambient Operating Temperature	CMX160: 15-35°C

Certifications

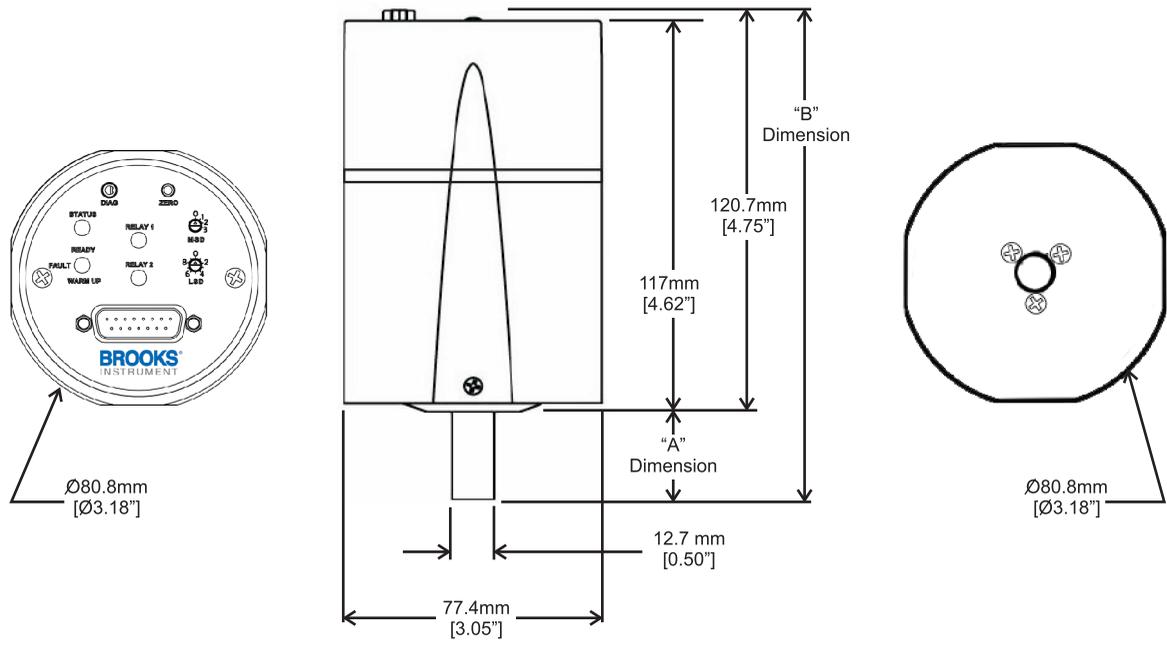|	
Electromagnetic Compatibility	Fully CE Certified to EMC Directive 89/336/EEC
RoHS Compliance	With "R" in the Part Number Code

Power Required

Power Input at Initial Warm-up Analog Models, Typical Values[2]	≤800 mA @ ± 15 Vdc (±5%)
Power Input at Steady State Analog Models, Typical Values[2]	≤800 mA @ ± 15 Vdc (±5%)
Power Input at Initial Warm-up DeviceNet Models, Maximum Values	1.2 A @ 24 Vdc
Power Input at Steady State DeviceNet Models, Typical Values	900 mA @ 24 Vdc

Notes:
1. Includes Hysteresis, linearity and repeatability within the calibrated range at 21°C specification for 1000 Torr tentative pending final qualification.
2. 15-Pin Male Sub D Model requires an additional 40 mA to power the internal relays (if energized).

"B" Dimension

120.7mm [4.75"]

117mm [4.62"]

"A" Dimension

12.7 mm [0.50"]

77.4mm [3.05"]

Ø80.8mm [Ø3.18"]

Ø80.8mm [Ø3.18"]

FITTING TYPE*	FITTING CODE	"A" Dimension	"B" Dimension
.05" OD Tube	0	26.30mm [1.04"]	147.00mm [5.79"]
KF-10 Flange	1	39.00mm [1.54"]	159.70mm [6.29"]
KF-16 Flange	2	39.00mm [1.54"]	159.70mm [6.29"]
KF-25 Flange	3	30.10mm [1.19"]	150.80mm [5.94"]
8 VCR Female	4	55.0 mm [2.17"]	175.70mm [6.92"]
Mini CF	5	27.56mm [1.09"]	148.26mm [5.84"]

* For other fittings and flanges call Brooks Technical Support.
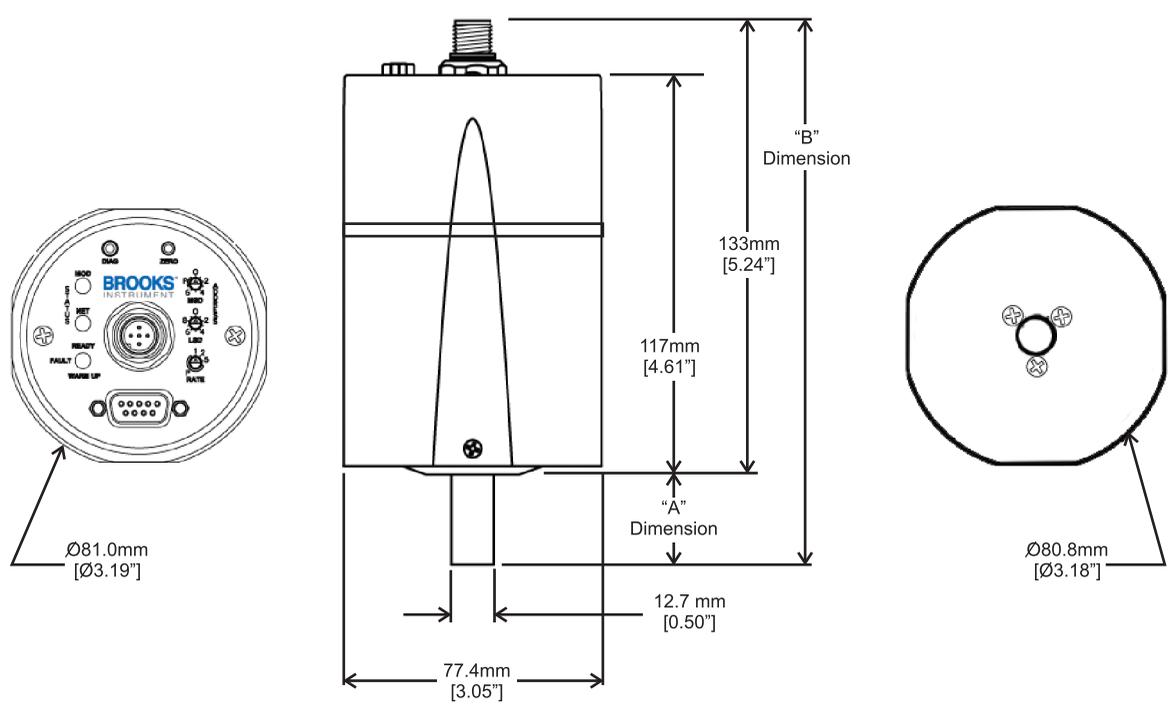

Analog Specifications: 9-Pin Male D Sub		
Port	Pinout	Option 2 Connector
Analog Port (9-Pin Male D Sub)	1	Pressure Output
	2	Not Used
	3	Temperature Status
	4	+15 Vdc Supply
	5	-15 Vdc Supply
	6	Case Ground
	7	Remote Zero
	8	Signal Common
	9	Power Supply Common
RS485 Port (2.5mm Jack)	Tip	RS_A
	Ring 1	RS_B
	Sleeve	Ground

Analog Specifications: 15-Pin Male D Sub				
Port	Pinout	Option 2 Connector	Option 4 Connector	Option 5 Connector
Analog Port (15-Pin Male D Sub)	1	Temperature Status	Temp in Control Relay NO	Temp in Control Relay NO
	2	Pressure Output	Pressure Signal	Pressure Signal
	3	Remote Zero	Temp in Control Relay Common	Temp in Control Relay Common
	4	Not Used	Temp in Control Relay NC	Temp in Control Relay NC
	5	Power Supply Common	Power Supply Common	Power Supply Common
	6	-15 Vdc Supply	-15 Vdc Supply	-15 Vdc Supply
	7	+15 Vdc Supply	+15 Vdc Supply	+15 Vdc Supply
	8	Relay 1-Normally Open	Relay 1-Normally Open	Relay 1-Normally Open
	9	Relay 1-Common	Relay 1-Common	Relay 1-Common
	10	Relay 1-Normally Closed	Relay 1-Normally Closed	Relay 1-Normally Closed
	11	Relay 2-Normally Open	Relay 2-Normally Open	Overheat Relay Normally Open
	12	Signal Common	Signal Common	Signal Common
	13	Relay 2-Common	Relay 2-Common	Overheat Relay Common
	14	Relay 2-Normally Closed	Relay 2-Normally Closed	Overheat Relay Normally Closed
	15	Case Ground	Case Ground	Case Ground
RS485 Port (2.5mm Jack)	Tip	RS_A	RS-A	RS_A
	Ring 1	RS_B	RS_B	RS_B
	Sleeve	Ground	Ground	Ground

"B" Dimension

133mm [5.24"]

117mm [4.61"]

"A" Dimension

Ø81.0mm [Ø3.19"]

12.7 mm [0.50"]

77.4mm [3.05"]

Ø80.8mm [Ø3.18"]

FITTING TYPE*	FITTING CODE	"A" Dimension	"B" Dimension
.05" OD Tube	0	26.30mm [1.04"]	147.00mm [5.79"]
KF-10 Flange	1	39.00mm [1.54"]	172.00mm [6.78"]
KF-16 Flange	2	39.00mm [1.54"]	172.00mm [6.78"]
KF-25 Flange	3	30.10mm [1.19"]	163.10mm [6.33"]
8 VCR Female	4	55.0mm [2.17"]	188.00mm [7.41"]
Mini CF	5	27.56mm [1.09"]	160.56mm [6.43"]

* For other fittings and flanges call Brooks Technical Support.

DeviceNet Specifications		
Port	Pinout	Description
DeviceNet Port (5-Pin Eurofast)	1	Drain
	2	V+
	3	V-
	4	Can_H
	5	Can_L
Analog Port (9-Pin D Sub)	1	Pressure Output
	2	Not used
	3	Temperature Status
	4	Not Used
	5	Not Used
	6	Case Ground
	7	Remote Zero
	8	Signal Common
	9	Not Used
Rs485 Port (2.5mm Jack)	Tip	RS_A
	Ring 1	RS_B
	Sleeve	Ground

DeviceNet*	
Data Rate/Network Length	User selectable: 125 kbps, 500m (1,640 ft), 250 kbs, 250m (820 ft)
	500 kbps, 100m (328 ft)
Digital Functions	Read Pressure, set zero, reset factory defaults, report run time (hours) change device address and baud rate
Data Rate Switch	4 positions: 125, 250, 500k, PGM (programmable over the network)
MAC ID Switches	2 switches, 10 positions each, 00 to 63 are valid MAC ID (addresses) numbers; Switch settings from 64 through 99 are in the PMG range, and the MAC ID can the be programmable over the network.
Network Message Size	Master/Slave information flow (Group 2 only server)
Network Size	Up to 64 nodes
Network Topology	Linear (trunkline/dropline) power and signal on same network cable
Visual Communication Indicators	LED network status (green/red), LED module status (green/red)

*Meets SEMI E54 and ODVA SEMI SIG vacuum gauge profile

Option Zero Bias (Indy) 15-Pin D Sub Configuration

• Superior ambient operating condition capacity (15 - 50°C)

• Ability to locally adjust zero bias output via external rotary switches.

• Zero consumption warning - triggered when 80% of adjustment range has been used.

• Two process setpoint dry contact relays.

Model Code

Code Description		Code Option	Option Description
I.	Base Model Code	CMX	Capacitance Manometer
II.	Model/Ordering Temperature	3	CMX160 (160°C)
III.	Full Scale Range	T01	1 Torr
		T02	2 Torr
		T11	10 Torr
		T21	100 Torr
		T31	1000 Torr
IV.	Electrical Connector	1	9-Pin Male Sub D
		2	15-Pin Male Sub D
		3	DeviceNet with 9-Pin Female Sub D, Default Configuration, Real Data
	4 15-Pin D Sub Connector with 2 Process Relays and a Temperature in Control Relay		
		5	15-Pin D Sub Connector with 1 Process Relay, 1 Temperature in Control Relay, and an Overheat Indicator Relay
V.	Fitting*	0	1/2"Tube Stub
		1	KF-10 Flange
		2	KF-16 Flange
		3	KF-25 Flange
		4	8 VCR® Female
		5	Mini CF
VI.	Calibration		Calibration Orientation relevant to 1 Torr full scale range only**
		(Blank)	Horizontal
		V	Vertical
VII.	Calibration	R	RoHS Compliant

Include Option Code "R" in the CMX Part Number field in order to receive RoHS Compliant devices.
Option "R" is not available for 9-pin or DeviceNet Connector options.

Sample Model Code

I	II	III	IV	V	VI	VII
CMX	3	T11	2	1	V	☐

R

—— Required for RoHS Devices

* Contact Brooks Technical Support for other options.
** Full scale range above 1 Torr is not sensitive to mounting orientation.

Service and Support

Brooks is committed to assuring all of our customers receive the ideal flow solution for their application, along with outstanding service and support to back it up. We operate first class repair facilities located around the world to provide rapid response and support. Each location utilizes primary standard calibration equipment to ensure accuracy and reliability for repairs and recalibration and is certified by our local Weights and Measures Authorities and traceable to the relevant International Standards.

Visit www.BrooksInstrument.com to locate the service location nearest to you.

START-UP SERVICE AND IN-SITU CALIBRATION

Brooks Instrument can provide start-up service prior to operation when required. For some process applications, where ISO-9001 Quality Certification is important, it is mandatory to verify and/or (re)calibrate the products periodically. In many cases this service can be provided under in-situ conditions, and the results will be traceable to the relevant international quality standards.

SEMINARS AND TRAINING

Brooks Instrument can provide seminars and dedicated training to engineers, end users, and maintenance persons.

Please contact your nearest sales representative for more details.

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