Thin Film Deposition Control Products

Precisely the instruments you need

TABLE OF CONTENTS

This page left blank intentionally.

Quartz Crystal Deposition Controllers and Monitors

This page left blank intentionally.

Cygnus 2 Thin Film Deposition Controller

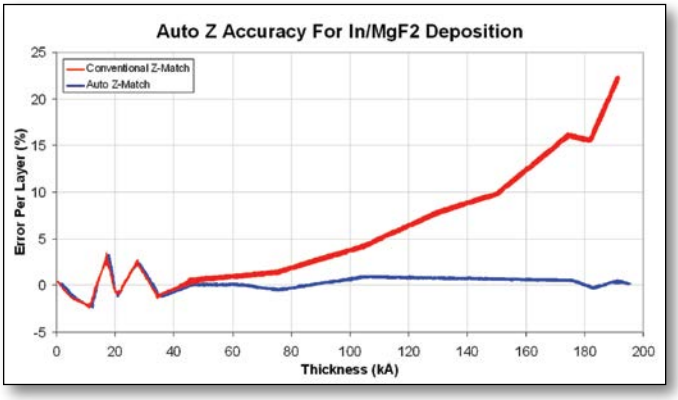
OLED APPLICATIONS

EXCELLENCE REPEATABLE

Cygnus 2 Thin Film Deposition Controller provides exceptional value by combining the proven performance of INFICON thin film controllers with unique features, all designed for you to achieve the most from your OLED process. Cygnus 2 uses our ModeLock frequency measurement system to provide stable, high-resolution rate and thickness measurement with an industry-leading rate resolution of 0.00433 Å/s every $^{1}/_{10}$ second. No other quartz crystal controller has the performance, quality, and features of Cygnus 2, allowing you to make excellence repeatable.

POWERFUL PERFORMANCE

Cygnus 2 can control up to six sources simultaneously, independently, or in any combination; reducing system complexity and cost by eliminating the need for two or three controllers.



Auto-Z dramatically improves the accuracy of measured thickness for multiple materials and layers.

The optional INFICON Crystal 12 Sensor switches crystals automatically without interrupting your process. This allows for continuous rate monitoring, extending the time between tool venting. For source control, rate or thickness monitoring and recording, Cygnus 2 has 12 assignable analog outputs, six standard and six additional (optional). In addition, I/O capabilities provide up to 24 relay outputs, 28 TTL inputs, and 14 TTL outputs. A 4 meter XIU option enables you to use long in-vacuum sensor cables for large systems.

FEATURES AT A GLANCE

- INFICON ModeLock technology ensures the most stable, highest resolution rate and thickness measurement available, even at very low rates
- Auto-Z improves thickness accuracy by automatically determining the Z-Ratio as material is deposited
- Up to six sources can be controlled simultaneously, independently, or in any combination by one Cygnus 2, relieving the need for two or three controllers
- Color TFT LCD display makes it easy to see what is going on with your process
- 10 Hz measurement
- ±0.0035 Hz over 100 ms sample
- USB data storage for screen shots, recipe storage, and data logging
- Thickness summing of multiple sources
- Measurement rate averaging for low density, very low rate materials (up to 30 seconds for use with stable sources for very low rate OLED dopant material deposition)
- Display rate resolution of up to 0.001 Å/s
- 4 meter XIU option provides the ability to use long in-vacuum sensor cables for large systems
- Non-deposit control allows for continuous source control as substrates are cycled through the deposition chamber
- Six DAC outputs standard, six additional optional for source control, rate or thickness monitoring
- Optional Ethernet communications
- RoHS compliant

Cygnus 2 (continued)

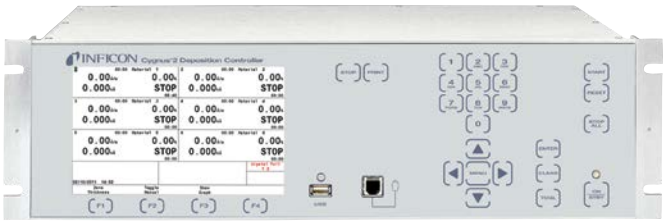
For stable, high resolution rate and thickness measurement and control at extremely low rates, Cygnus 2 has measurement rate averaging; valuable for low density materials deposited at very low rates (up to 30 seconds for use with stable sources for very low rate OLED dopant material deposition).

The Auto-Z function can automatically determine the Z-Ratio for organic materials, maintaining thickness and rate accuracy during the deposition of layered or doped materials. Auto-Z provides greater thickness accuracy during processes where the Z-Ratio for the material is not known or when codepositing two or more materials.

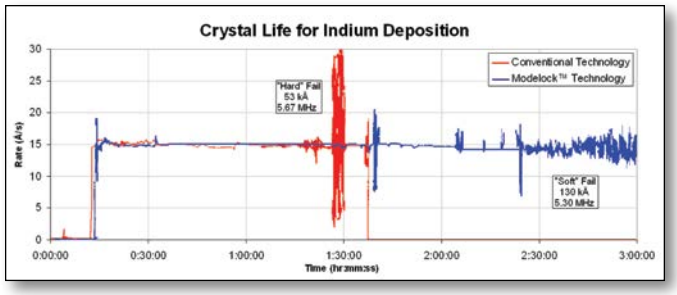
All these features make it easier to measure low density materials at low rates and communicate these measurements back to the system computer for reliable process control.

EFFORTLESS PROCESS SETUP

Operating Cygnus 2 is easy and intuitive with a color TFT LCD display and menu-driven navigation. Information is displayed on a clear, brightly lit screen for easy viewing. Soft keys help you maneuver quickly through the on-screen menus for efficient programming.



The brightly lit TFT LCD display delivers information in an easy-to-read format.



INFICON ModeLock measurement technology provides significantly longer crystal life, illustrated here in the deposition of indium.

HOW MODELOCK WORKS

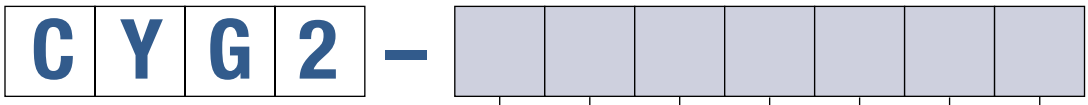
The proven INFICON ModeLock measurement system provides crystal frequency information with precision not possible from conventional “active oscillator” systems. It eliminates “mode-hopping,” a failure to maintain crystal oscillation at the fundamental frequency. ModeLock continuously tests the monitor crystal for resonance at the fundamental frequency, thereby eliminating weaknesses inherent in the conventional measurement method.

Conventional measurement methods incorporate the quartz monitoring crystal as an active element of the oscillator circuit. Consequently, the crystal controls the oscillator circuit. So, as the electrical characteristics of the crystal change during deposition, the oscillator circuit becomes less stable and may “hop” to another resonant frequency or fail completely, resulting in an inaccurate film thickness.

More powerful and precise—yet faster—than the conventional method, ModeLock continually tests and analyzes the phase-frequency relationship of the crystal. The crystal is not an active part of the oscillator circuit. The ModeLock measurement system determines and applies a precise frequency to the crystal, preventing the crystal from “hopping,” or operating at a frequency other than the fundamental.

Cygnus 2 (continued)

ORDERING INFORMATION



Basic Configuration

115V 50/60 Hz 1
230V 50/60 Hz 2

Sensor Measurement Module
(each has two sensor inputs)

Standard module 1
Two standard modules 2
Three standard modules 3

Additional Computer Communications Module
(RS-232 standard)

None 0
Ethernet 1

Expansion Slot

0 Optional feature (not currently available)

Optional DAC Module
(base unit includes six DAC outputs)

0 None
1 Additional six DAC outputs

Optional TTL Relay Module

0 None
1 Eight relay outputs / 14 TTL outputs

Additional I/O Relay Module
(Base unit includes eight relay outputs / 14 TTL inputs)

1 None
2 Eight relay outputs / 14 TTL inputs

ACCESSORIES AND REPLACEMENT PARTS

CYGNUS 2 CONTROLLER ACCESSORIES

755-262-G1	Handheld Power Controller – A handheld unit that allows remote control of deposition power levels while the controller is in manual mode. The handheld power controller plugs into the control unit front panel. Compatible with Cygnus 2, IC6, XTC/3, IC/5, and Cygnus.

Cygnus 2 (continued)

ACCESSORIES AND REPLACEMENT PARTS (CONTINUED)

CYGNUS 2 AND IC6 XIU PACKAGES AND INTERCONNECT CABLES

An XIU (oscillator) package includes all the cables between the controller and XIU (oscillator), an XIU, and the cable between the XIU and the vacuum feedthrough. One XIU (oscillator package) is required for each crystal sensor assembly connected to the controller.
NOTE: The Front Load Dual or Cool Drawer Dual Sensor, when used with the IC6 or Cygnus 2 requires either one XIU package and one CrystalTwo Switch (PN 779-220-G1 or -G2) OR two XIU packages.

CYGNUS 2 AND IC6 XIU (OSCILLATOR) PACKAGES	
781-611-G15	XIU package with 4.6 m (15 ft.) cable – For use with Cygnus 2 and IC6
781-611-G30	XIU package with 9.1 m (30 ft.) cable – For use with Cygnus 2 and IC6
781-611-G50	XIU package with 15.2 m (50 ft.) cable – For use with Cygnus 2 and IC6
781-611-G100	XIU package with 30.5 m (1000 ft.) cable – For use with Cygnus 2 and IC6
781-612-G15	4 m XIU package with 4.6 m (15 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-612-G30	4 m XIU package with 9.1 m (30 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-612-G50	4 m XIU package with 15.2 m (50 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-612-G100	4 m XIU package with 30.5 m (100 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-613-G15	4 m XIU package with 4.6 m (15 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
781-613-G30	4 m XIU package with 9.1 m (30 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
781-613-G50	4 m XIU package with 15.2 m (50 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
781-613-G100	4 m XIU package with 30.5 m (100 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
CYGNUS 2 AND IC6 XIU ONLY (NO CABLES)	
781-600-G1	IC6 and Cygnus 2 XIU (oscillator) – For XIU to sensor head cable lengths of 15 to 183 cm (6 to 72 in.)
781-600-G2	IC6 and Cygnus 2 XIU (oscillator) – For XIU to sensor head cable lengths of 3 to 4 m (118 in. to 157 in.)
CYGNUS 2, IC6, XTC/3M, AND XTC/3S INTERCONNECT CABLES	
755-257-G6	15.2 cm (6 in.) cable, XIU to vacuum feedthrough
600-1261-P15	4.6 m (15 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P30	9.1 m (30 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P50	15.2 m (50 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P100	30.5 m (100 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU

Cygnus 2 (continued)

SPECIFICATIONS

MEASUREMENT PERFORMANCE	
Frequency resolution	±0.0035 Hz @ 6 MHz
Thickness and rate resolution / measurement[1]	±0.00433 Å
Measurement frequency range	6.0 to 4.5 MHz (fixed)
Thickness accuracy[2]	0.5%
Measurement interval	0.10 s
Multiple measurement averaging	0.1, 0.4, 1.0, 4.0, 10.0, 20.0, and 30.0 s averaging allowed
DESIGN FEATURES	
Multiple sensor measurement	Yes (up to six sensors)
Auto-Z	Yes
Codeposition	Yes (up to six sources)
PROCESS RECIPE AND DATA MANAGEMENT	
Material programs	Six independent materials
USB memory	Yes
Data logging	Yes
HARDWARE FEATURES	
Sensors[3]	
Single	Six
Dual / CrystalTwo	Six (with one CrystalTwo Switch per sensor input)
CrystalSix	Six
Crystal 12	Six
Generic	Six
Source Controls	
Number of sources[4]	Up to six
Source control voltages	0 to ±10 V, adjustable
Output resolution	15 bits over full range (0 to 10 V)
Crucible positions	64
Inputs / Outputs	
Inputs	14 standard, up to 28 optional; TTL / CMOS logic compatible or closure to ground
Outputs	Eight standard, up to 24 optional programmable SPST relays rated at 30 V (dc) or 30 V (ac) RMS or 42 V peak @ 2.5 amps; 14 optional TTL outputs
Recorder output[4]	0 to +10 V, adjustable
Logic statements	100 fully programmable; up to five actions, five events per statement
Communications	
Standard	RS-232
Optional	Ethernet

[1] Tooling / density = 100/1, fundamental frequency = 6 MHz

[2] Varies according to process; figures reflect typical accuracy

[3] Maximum configuration of each type

[4] Cygnus 2 has six DAC outputs standard, six more can be added as an option. Any of the 12 can be configured as source control voltages or recorder outputs, however, the number of sources that can be controlled simultaneously is six.

Cygnus 2 (continued)

SPECIFICATIONS (CONTINUED)

DISPLAY	
Thickness resolution	1 Å for 0 to 9.999 kÅ
	10 Å for 10.00 to 99.99 kÅ
	100 Å for 100.0 to 999.9 kÅ
	1 kÅ for 1000 to 9999 kÅ
Rate resolution	0.001 Å/s for 0 to 9.999 Å/s
	0.01 Å/s for 10.00 to 99.99 Å/s
	0.1 Å/s for 100.0 to 999.9 Å/s
OPERATION	
Power requirements	100 to 230 V (ac) ±15%
	50 / 60 Hz ±3 Hz
Operating temperature	0° to 50°C (32° to 122°F)
Dimensions, excluding mounts (H x W x D)	133 x 483 x 330 mm (5.25 x 19 x 13 in.)
Weight	5.9 kg (13 lb.)

IC6 Thin Film Deposition Controller

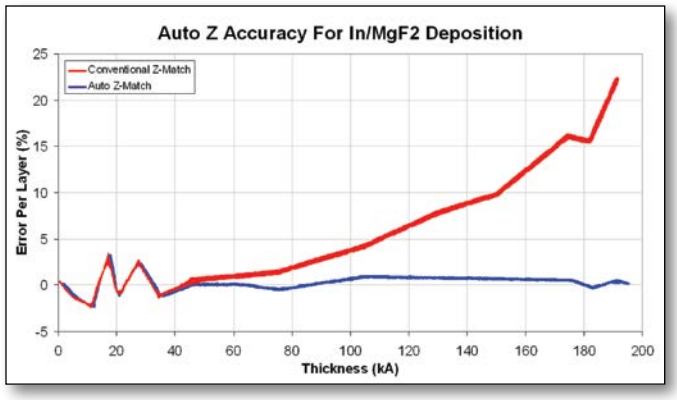
OPTICAL APPLICATIONS

EXCELLENCE REPEATABLE

The IC6 Thin Film Deposition Controller provides exceptional value by combining the proven performance of INFICON thin film controllers with unique features, all designed for you to achieve the most from your deposition process. The IC6 uses our ModeLock frequency measurement system to provide stable, high-resolution rate and thickness measurement with an industry-leading rate resolution of 0.00433 Å/s every $^{1}/_{10}$ second. Optical processes, such as reflective coatings, band-pass filters, and AR coatings benefit from high resolution and reliability along with the ability to accommodate 50 processes of 200 layers each. No other quartz crystal controller has the performance, quality, and features of the IC6, allowing you to make excellence repeatable.

RELIABLE PROCESS CONTROL

With a comprehensive list of features, it is easy to integrate the IC6 into your system for complete process control. The IC6 has the ability to control up to six sources simultaneously for rate and thickness control. Up to twelve analog outputs are assignable for source control or for rate or thickness recording.



Auto-Z dramatically improves the accuracy of measured thickness for multiple materials and layers.

FEATURES AT A GLANCE

- INFICON ModeLock technology ensures the most stable, highest resolution rate and thickness measurement available, even at very low rates
- Auto-Z improves thickness accuracy by automatically determining the Z-Ratio as material is deposited
- Codeposition of up to six sources simultaneously
- Color TFT LCD display makes it easy to see what is going on with your process
- ±0.0035 Hz over 100 ms sample
- USB data storage for screen shots, recipe storage, and data logging
- Powerful I/O with flexibility to integrate into simple or complex systems using expandable Inputs (28) and Outputs (24 Relays, 14 TTL outputs) and use of logic functions (100 logic statements)
- Six DAC outputs standard, six additional optional for source control, rate or thickness monitoring
- Can accommodate up to 50 processes of 200 layers each and processes can be linked together for a maximum of 10,000 layers
- Multiple sensor averaging for up to eight sensors
- 4 meter XIU option provides the ability to use long in-vacuum sensor cables for large systems
- Optional Ethernet communications
- RoHS compliant

IC6 - Optical (continued)

The logic and process control capabilities available on the IC6 include 100 programmable logic statements, 20 counters, and 20 timers. I/O capabilities provide up to 24 relay outputs, 28 TTL inputs, and 14 TTL outputs. Logic statements can be used in conjunction with external inputs or outputs; allowing the IC6 to perform functions that otherwise would require a PLC or additional equipment. Each logic statement can include up to five functions that can be linked using Boolean logic.

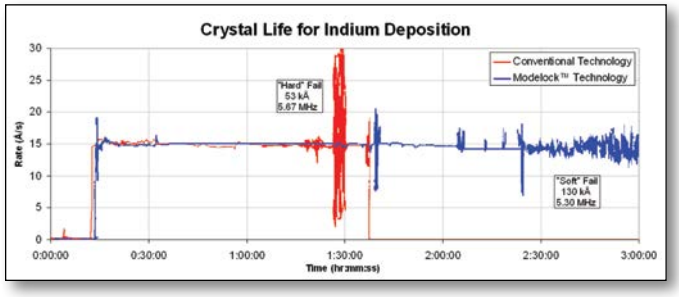
For process recipe flexibility, the IC6 can accommodate 50 processes of 200 layers each. Processes can be linked together for a maximum of 10,000 layers.

The Auto-Z function can automatically determine Z-Ratio, maintaining thickness and rate accuracy, and eliminating the need for the user to estimate the acoustic impedance. This is especially important during the deposition of different materials onto the same crystal, during codeposition of two or more materials, or when the Z-Ratio for a material is unknown.

EFFORTLESS PROCESS SETUP

Operating IC6 is easy and intuitive with a color TFT LCD display and menu-driven navigation. Information is displayed on a clear, brightly lit screen for easy viewing. Soft keys help you maneuver quickly through the on-screen menus for efficient programming.

The brightly lit TFT LCD display delivers information in an easy-to-read format.



INFICON ModeLock measurement technology provides significantly longer crystal life, illustrated here in the deposition of indium.

HOW MODELOCK WORKS

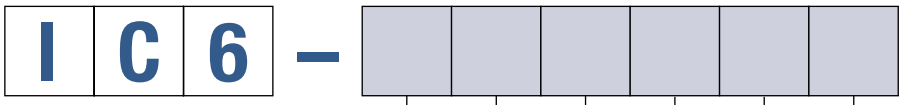
The proven INFICON ModeLock measurement system provides crystal-frequency information with precision not possible from conventional "active oscillator" systems. It eliminates "mode-hopping," a failure to maintain crystal oscillation at the fundamental frequency. ModeLock continuously tests the monitor crystal for resonance at the fundamental frequency, thereby eliminating weaknesses inherent in the conventional measurement method.

Conventional measurement methods incorporate the quartz monitoring crystal as an active element of the oscillator circuit. Consequently, the crystal controls the oscillator circuit. So, as the electrical characteristics of the crystal change during deposition, the oscillator circuit becomes less stable and may "hop" to another resonant frequency or fail completely, resulting in an inaccurate film thickness.

More powerful and precise—yet faster—than the conventional method, ModeLock continually tests and analyzes the phase-frequency relationship of the crystal. The crystal is not an active part of the oscillator circuit. The ModeLock measurement system determines and applies a precise frequency to the crystal, preventing the crystal from "hopping," or operating at a frequency other than the fundamental. This process takes place thousands of times per second to determine the resonant frequency to a precision of 0.0035 Hz/100 ms.

IC6 - Optical (continued)

ORDERING INFORMATION



Basic Configuration

115V 50/60 Hz	1
230V 50/60 Hz	2

Sensor Measurement Module
(each has two sensor inputs)

Standard module	1
Two standard modules	2
Three standard modules	3
Four standard modules	4

Additional Computer Communications Module
(RS-232 standard)

None	0
Ethernet	1

Additional I/O Relay Module
(base unit includes eight relay outputs / 14 TTL inputs)

1	None
2	Eight relay outputs / 14 TTL inputs

Optional TTL Relay Module

0	None
1	Eight relay outputs / 14 TTL outputs

Optional DAC Module
(base unit includes six DAC outputs)

0	None
1	Additional six DAC outputs

ACCESSORIES AND REPLACMENT PARTS

IC6 CONTROLLER ACCESSORIES

755-262-G1	Handheld Power Controller – A handheld unit that allows remote control of deposition power levels while the controller is in manual mode. The handheld power controller plugs into the control unit front panel. Compatible with Cygnus 2, IC6, XTC/3, IC/5, and Cygnus.

IC6 - Optical (continued)

ACCESSORIES AND REPLACEMENT PARTS (CONTINUED)

CYGNUS 2 AND IC6 XIU PACKAGES AND INTERCONNECT CABLES

An XIU (oscillator) package includes all the cables between the controller and XIU (oscillator), an XIU, and the cable between the XIU and the vacuum feedthrough. One XIU (oscillator package) is required for each crystal sensor assembly connected to the controller.
NOTE: The Front Load Dual or Cool Drawer Dual sensor assembly, when used with the IC6 or Cygnus 2 requires either one XIU package and one CrystalTwo Switch (PN 779-220-G1 or -G2) OR two XIU packages.

CYGNUS 2 AND IC6 XIU (OSCILLATOR) PACKAGES	
781-611-G15	XIU package with 4.6 m (15 ft.) cable – For use with Cygnus 2 and IC6
781-611-G30	XIU package with 9.1 m (30 ft.) cable – For use with Cygnus 2 and IC6
781-611-G50	XIU package with 15.2 m (50 ft.) cable – For use with Cygnus 2 and IC6
781-611-G100	XIU package with 30.5 m (100 ft.) cable – For use with Cygnus 2 and IC6
781-612-G15	4 m XIU package with 4.6 m (15 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-612-G30	4 m XIU package with 9.1 m (30 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-612-G50	4 m XIU package with 15.2 m (50 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-612-G100	4 m XIU package with 30.5 m (100 ft.) XIU cable – Includes 4 m in-vacuum cable and 6 in. BNC (XIU to feedthrough) cable
781-613-G15	4 m XIU package with 4.6 m (15 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
781-613-G30	4 m XIU package with 9.1 m (30 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
781-613-G50	4 m XIU package with 15.2 m (50 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
781-613-G100	4 m XIU package with 30.5 m (100 ft.) XIU cable – Includes 3.5 m in-vacuum cable and 20 in. BNC (XIU to feedthrough) cable
CYGNUS 2 AND IC6 XIU ONLY (NO CABLES)	
781-600-G1	IC6 and Cygnus 2 XIU (oscillator) – For XIU to sensor head cable lengths of 15 to 183 cm (6 to 72 in.)
781-600-G2	IC6 and Cygnus 2 XIU (oscillator) – For XIU to sensor head cable lengths of 3 to 4 m (118 to 157 in.)
CYGNUS 2, IC6, XTC/3M, AND XTC/3S INTERCONNECT CABLES	
755-257-G6	15.2 cm (6 in.) cable, XIU to vacuum feedthrough
600-1261-P15	4.6 m (15 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P30	9.1 m (30 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P50	15.2 m (50 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P100	30.5 m (100 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU

IC6 - Optical (continued)

SPECIFICATIONS

MEASUREMENT PERFORMANCE	
Frequency resolution	±0.0035 Hz @ 6 MHz
Thickness and rate resolution / measurement[1]	±0.00433 Å
Measurement frequency range	6.0 to 4.5 MHz (fixed)
Thickness accuracy[2]	0.5%
Measurement interval	0.10 s
Multiple measurement averaging	0.1, 0.4, 1.0, 4.0, 10.0, 20.0, and 30.0 s averaging allowed
DESIGN FEATURES	
Multiple sensor measurement	Yes (up to eight sensors)
Auto-Z	Yes
Autotune	Yes
Codeposition	Yes (up to six sources)
PROCESS RECIPE AND DATA MANAGEMENT	
Material programs	32
Process layers (per process)	200
Processes	50 (processes can be linked together)
USB memory	Yes
Data logging	Yes
HARDWARE FEATURES	
Sensors[3]	
Single	Eight
Dual / CrystalTwo	Four / eight (with CrystalTwo Switch)
CrystalSix	Eight
Crystal 12	Eight
Generic	Eight
Source Controls	
Number of sources[4]	Up to six
Source control voltages	0 to ±10 V, adjustable
Output resolution	15 bits over full range (0 to 10 V)
Crucible positions	64

[1] Tooling / density = 100/1, fundamental frequency = 6 MHz

[2] Varies according to process; figures reflect typical accuracy

[3] Maximum configuration of each type

[4] IC6 has six DAC outputs standard, six more can be added as an option. Any of the 12 can be configured as source control voltages or recorder outputs, however, the number of sources that can be controlled simultaneously is six.

IC6 - Optical (continued)

SPECIFICATIONS (CONTINUED)

Inputs / Outputs	
Recorder output[4]	0 to +10 V, adjustable
Logic statements	100 fully programmable; up to five actions, five events per statement
Communications:	6.0 to 4.5 MHz (fixed)
Standard	RS-232
Optional	Ethernet
Display	0.1, 0.4, 1.0, 4.0, 10.0, 20.0, and 30.0 s averaging allowed
Thickness resolution	1 Å for 0 to 9.999 kÅ
	10 Å for 10.00 to 99.99 kÅ
	100 Å for 100.0 to 999.9 kÅ
	1 kÅ for 1000 to 9999 kÅ
Rate resolution	0.001 Å/s for 0 to 9.999 Å/s if rate filter time setting is 10 seconds or greater
	0.01 Å/s for 0 to 99.99 Å/s
	0.1 Å/s for 100 to 999.9 Å/s
Operation	
Power requirements	100 to 230 V (ac) ±15%
	50 / 60 Hz ±3 Hz
Operating temperature	0° to 50°C (32° to 12°F)
Dimensions, excluding mounts (H x W x D)	133 x 483 x 330 mm (5.25 x 19 x 13 in.)
Weight	5.9 kg (13 lb.)

XTC/3 Thin Film Deposition Controllers

ADVANCED, AFFORDABLE RATE CONTROL FOR SINGLE OR MULTIPLE LAYERS

Now get everything you want in a thin film deposition controller for single and multiple-layer processes. XTC/3 with patented ModeLock provides proven mode-hop prevention for consistent quality. With the XTC/3 Thin Film Deposition Controller, you get highly accurate control of deposition rate and thickness, the capacity for virtually any number of layers, easy installation, and extremely high reliability to ensure productivity.

INFICON, the global leader in thin film deposition control, now offers an instrument with a remarkably low cost of ownership for unprecedented value.

Whether your control needs reflect production or research and development use, you will find a precise match in the INFICON XTC/3.

WORLDWIDE INFICON SUPPORT

No matter where you are, you get fast answers, attentive service, and maximum uptime. With offices around the world, INFICON is the only manufacturer of thin film deposition controllers to offer you local service and technical support around the world.

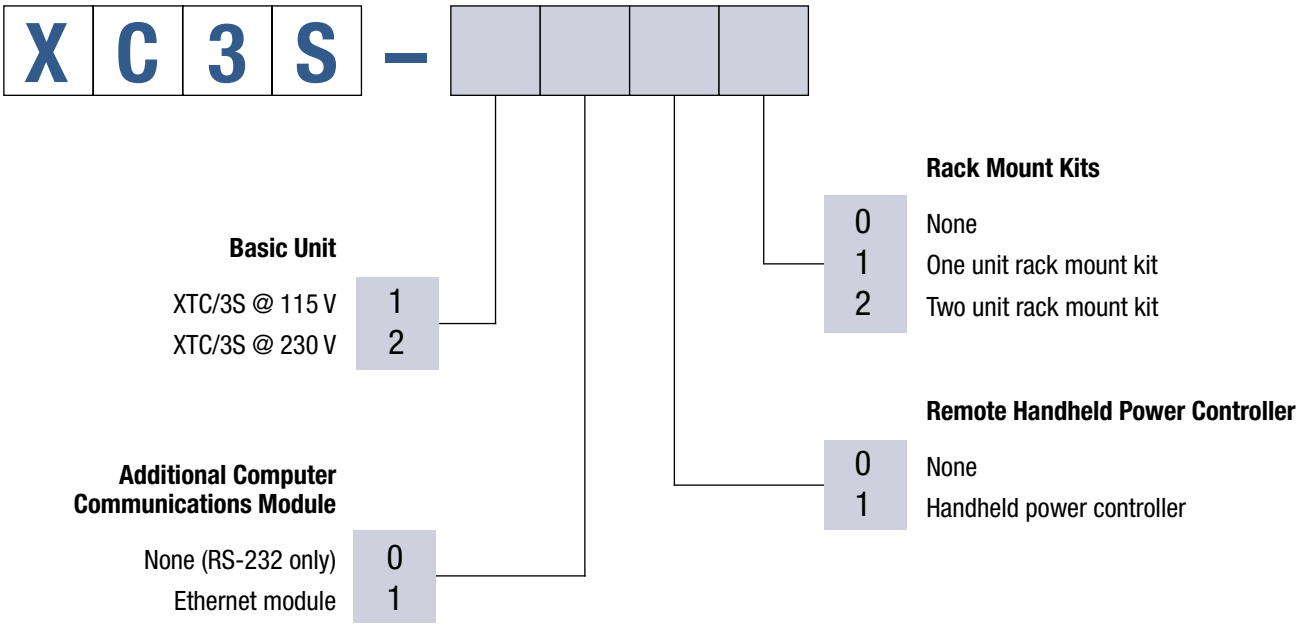
FEATURES AT A GLANCE

- Available in single-layer and multiple-layer models
- Patented ModeLock technology prevents film thickness errors caused by mode-hopping
- Supports INFICON Crystal 12®, CrystalSix®, and dual sensor automatic crystal switching for maximum productivity
- XTC/3M multiple-layer model supports up to 99 processes, 999 layers, 32 films, two sensors, and two sources
- XTC/3S single-layer model supports up to nine films, two sensors, and two sources
- Easy-to-read TFT LCD graphics display
- Films and processes can be assigned unique, descriptive names for easy retrieval
- Ethernet connection available
- Free-standing (no computer necessary) or optional Windows software for computer operation
- Plug-and-play replacement for INFICON XTC/2 controllers (limited to XTC/2 features and command set)

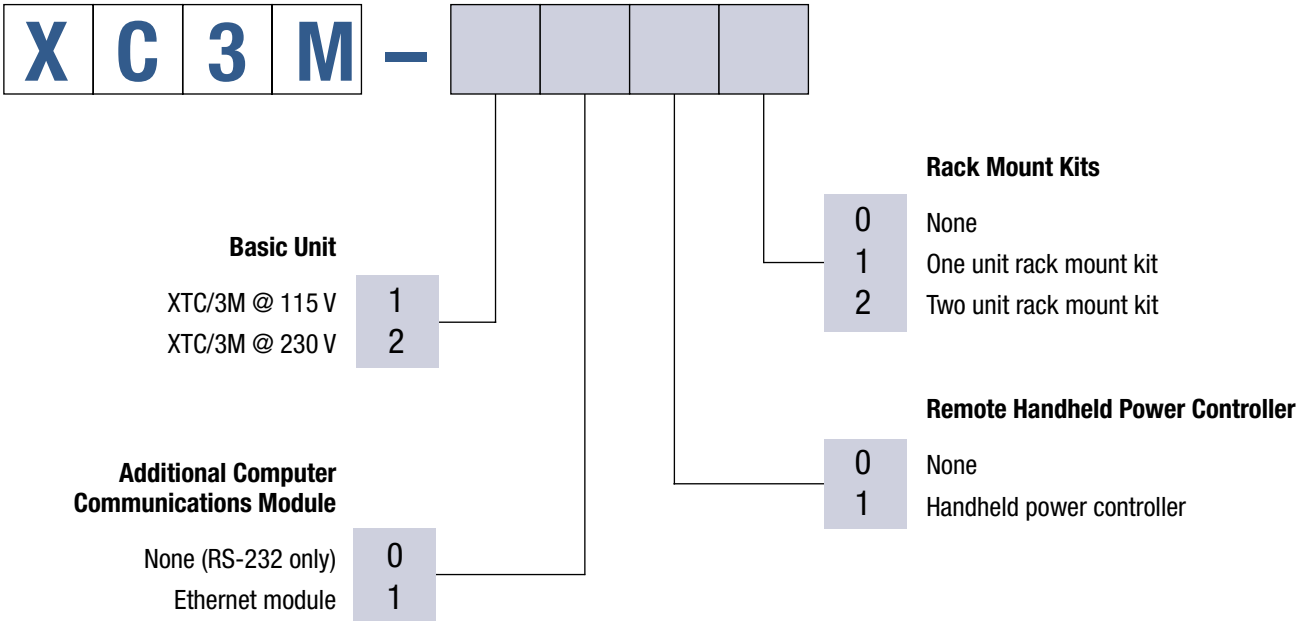
XTC/3 (continued)

ORDERING INFORMATION

XTC/3S – SINGLE-LAYER CONTROLLER



XTC/3M – MULTIPLE-LAYER CONTROLLER



XTC/3 (continued)

ACCESSORIES AND REPLACEMENT PARTS

XTC/3 ACCESSORIES	
780-700-G1	Ethernet Computer Communications Module – A plug-in Ethernet module providing industry standard signaling protocols and connectors for accepting operational commands from remote sources.
755-262-G1	Handheld Power Controller – A handheld unit that allows remote control of deposition power levels while the controller is in manual mode. The handheld power controller plugs into the control unit front panel.
780-702-G1	One unit rack mount kit – Provides all required materials to mount one XTC/3 into a standard 48.3 cm (19 in.) rack.
780-702-G2	Two unit rack mount kit – Provides all required materials to mount two XTC/3 units side by side in a standard 48.3 cm (19 in.) rack.

XTC/3 XIU PACKAGES AND INTERCONNECT CABLES

An XIU (oscillator) package includes all the cables between the controller and XIU (oscillator), an XIU, and the cable between the XIU and the vacuum feedthrough. One XIU (oscillator package) is required for each crystal sensor assembly connected to the controller.
NOTE: The Front Load Dual or Cool Drawer Dual Sensor, when used with the XTC/3 requires either one XIU package and one CrystalTwo Switch (PN 779-220-G1 or -G2) OR two XIU packages.

XTC/3 XIU (OSCILLATOR) PACKAGES	
780-611-G15	XIU PKG with 4.6m (15 ft.) cable - For use with XTC/3
780-611-G30	XIU PKG with 9.1m (30 ft.) cable - For use with XTC/3
780-611-G50	XIU PKG with 15.3m (50 ft.) cable - For use with XTC/3
780-611-G100	XIU PKG with 30.5m (100 ft.) cable - For use with XTC/3
780-612-G15	4m XIU PKG w/ 4.6m (15 ft.) XIU cable - Includes 4m in-vac. cable & 15.2cm (6 in.) BNC (XIU to Feedthrough) cable For use with XTC/3
780-612-G30	4m XIU PKG w/ 9.1m (30 ft.) XIU cable - Includes 4m in-vac. cable & 15.2cm (6 in.) BNC (XIU to Feedthrough) cable For use with XTC/3
780-612-G50	4m XIU PKG w/ 15.3m (50 ft.) XIU cable - Includes 4m in-vac. cable & 15.2cm (6 in.) (XIU to Feedthrough) cable For use with XTC/3
780-612-G100	4m XIU PKG w/ 30.5m (100 ft.) XIU cable - Includes 4m in-vac. cable & 15.2cm (6 in.) (XIU to Feedthrough) cable For use with XTC/3
780-613-G15	4m XIU PKG w/ 4.6m (15 ft.) XIU cable - Includes 3.5m in-vac. cable & 50.8cm (20 in.) BNC (XIU to Feedthrough) cable For use with XTC/3
780-613-G30	4m XIU PKG w/ 9.1m (30 ft.) XIU cable - Includes 3.5m in-vac. cable & 50.8cm (20 in.) BNC (XIU to Feedthrough) cable For use with XTC/3
780-613-G50	4m XIU PKG w/ 15.3m (50 ft.) XIU cable - Includes 3.5m in-vac. cable & 50.8cm (20 in.) BNC (XIU to Feedthrough) cable For use with XTC/3
780-613-G100	4m XIU PKG w/ 30.5m (100 ft.) XIU cable - Includes 3.5m in-vac. cable & 50.8cm (20 in.) BNC (XIU to Feedthrough) cable For use with XTC/3
XTC/3 XIU ONLY (NO CABLES)	
780-600-G1	XTC/3 XIU (oscillator) – For XIU to sensor head cable lengths of 15 to 183 cm (6 to 72 in.)
780-600-G2	XTC/3 XIU (oscillator) – For XIU to sensor head cable lengths of 3 to 4 m (118 to 157 in.)

XTC/3 (continued)

ACCESSORIES AND REPLACEMENT PARTS (CONTINUED)

CYGNUS 2, IC6, XTC/3M, AND XTC/3S INTERCONNECT CABLES	
755-257-G6	15.2 cm (6 in.) cable, XIU to vacuum feedthrough
600-1261-P15	4.6 m (15 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P30	9.1 m (30 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P50	15.2 m (50 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU
600-1261-P100	30.5 m (100 ft.) cable, Cygnus 2, IC6, or XTC/3 controller to XIU

SPECIFICATIONS

FEATURE, PARAMETER, OR SPECIFICATION	XTC/3S SINGLE LAYER	XTC/3M MULTIPLE LAYER
Frequency resolution	±0.028 Hz @ 6 MHz	±0.028 Hz @ 6 MHz
Measurement frequency range	6.0 to 5.0 MHz (fixed)	6.0 to 5.0 MHz (fixed)
Measurement interval	0.25 s	0.25 s
Thickness and rate resolution / measurement[1]	±0.034 Å	±0.034 Å
Measurement technology	ModeLock	ModeLock
Number of processes	One	99
Number of layers	One	999
Number of material programs (or films)	Nine	32
Number of sensor inputs	Two	Two
CrystalSix / Crystal 12 sensor support	Yes	Yes
Support XTAL2 switch	Yes	Yes
Number of source outputs	Two	Two
Computer communications	RS-232 standard, Ethernet TCP/IP optional	RS-232 standard, Ethernet TCP/IP optional
Max RS-232 baud rate	115.2 kbps	115.2 kbps
Automatic crystal switch	Yes	Yes
Number of relays	12, not event assignable	12, event assignable

[1] Tooling / density = 100/1, fundamental frequency = 6 MHz

XTC/3 (continued)

SPECIFICATIONS (CONTINUED)

FEATURE, PARAMETER, OR SPECIFICATION	XTC/3S SINGLE LAYER	XTC/3M MULTIPLE LAYER
Number of programmable relay functions	One	One
Functions per relay	One	One
Relay voltage rating	30 V (dc) or 30 V (ac) RMS or 42 V peak at 2.5 A	30 V (dc) or 30 V (ac) RMS or 42 V peak at 2.5 A
Number of inputs	Eight TTL, 24 V (dc) max	Eight TTL, 24 V (dc) max
Number of programmable input functions	One, not event assignable	One, event assignable
Number of recorder outputs	One	One
Manual power / hand held controller	Yes	Yes
Exhaust fan	No exhaust fan	No exhaust fan
Test mode	Yes	Yes
Shutter delay	Yes	Yes
Secondary tooling	Yes	Yes
Case dimensions	Half rack, 2U high	Half rack, 2U high
Rate and thickness display resolution	0.1 Å/s for 0.0 to 99.9 Å/s, 1 Å/s for 100 to 999 Å/s, display thickness resolution = 1 Å	0.1 Å/s for 0.0 to 99.9 Å/s, 1 Å/s for 100 to 999 Å/s, display thickness resolution = 1 Å
Film select via inputs	Yes	No
User guide languages	English, Chinese	English, Chinese
Control loops	PID	PID
Software to operate from computer	Yes	Yes
Data logging	Yes	Yes
Quality and stability function	Yes	Yes
Sample and hold (RateWatcher™)	Yes	Yes
Crucible selection	Yes	Yes
Crucible feedback input	Yes	Yes
Select control voltage polarity	Yes, ±2.5, 5, 10 V (dc); 15-bit resolution	Yes, ±2.5, 5, 10 V (dc); 15-bit resolution
Program lock code	Yes	Yes

SQC-310 Series Highly Accurate Sequential or Codeposition Control

THE MOST AFFORDABLE, ADVANCED MULTI-LAYER CONTROLLER—FROM THE TECHNOLOGY LEADER

The INFICON SQC-310 series offers features not found in any competitors' thin film controllers.

In addition to advanced electronics, an improved display, and an affordable price, SQC-310 is flexible in its configuration to meet the demands of any application.

For sequential deposition, SQC-310 features two sensor inputs, two source outputs, and eight digital inputs, and eight relay outputs. The optional expansion card doubles the available inputs and outputs. For codeposition, SQC-310C can monitor and control up to four sensor inputs and four source outputs simultaneously. SQC-310C also has available 16 digital inputs, and 16 relay outputs.

WORLDWIDE SUPPORT—OUR EXPERTISE IS YOUR COMPETITIVE ADVANTAGE

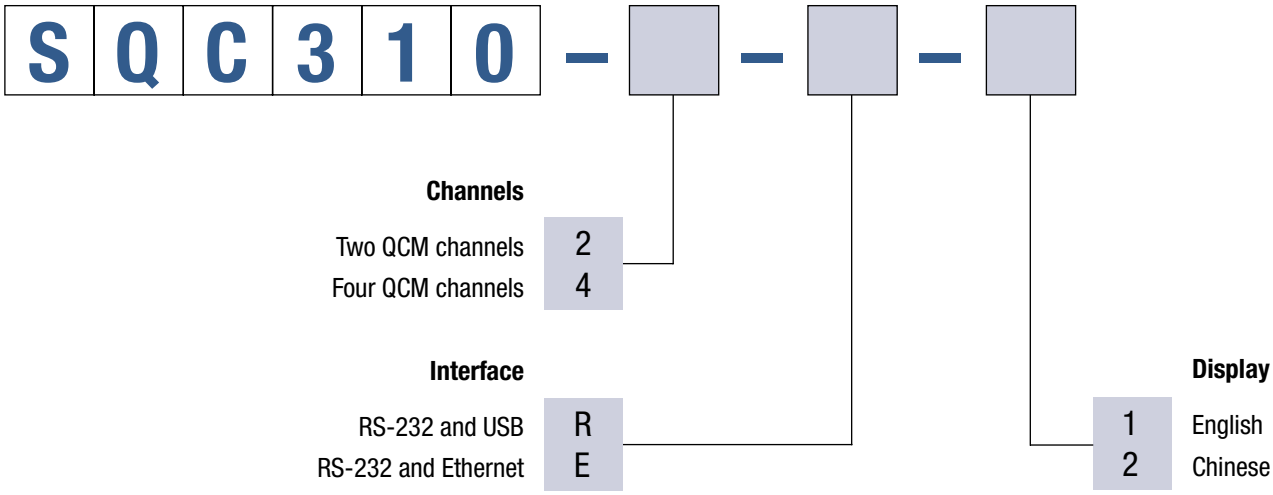
INFICON is the only manufacturer of thin film deposition controllers with local service and technical support around the world—including a broad selection of sensors, feedthroughs, and accessories to complement the SQC-310 series controllers. When you purchase your SQC-310 series controller—or any other INFICON product—you can be assured of fast answers, attentive service, and maximum uptime.

FEATURES AT A GLANCE

- Bright, color LCD display—available in English or Chinese
- Standard RS-232 and USB (RS-232 and Ethernet optional)
- Easy setup and operation with a "Quick Setup" Menu, six context-sensitive push buttons, and convenient parameter setting knob
- Windows® program for developing, testing, and downloading processes, and for logging instrument data to your computer for process analysis and quality control
- Accurate process control, especially for low deposition rates, with ±0.03 Hz resolution at 10 readings / second
- Storage capacity for up to 100 processes, 1,000 layers, and 50 films
- Monitoring of source material with a single sensor or with multiple sensors to provide accurate source distribution monitoring

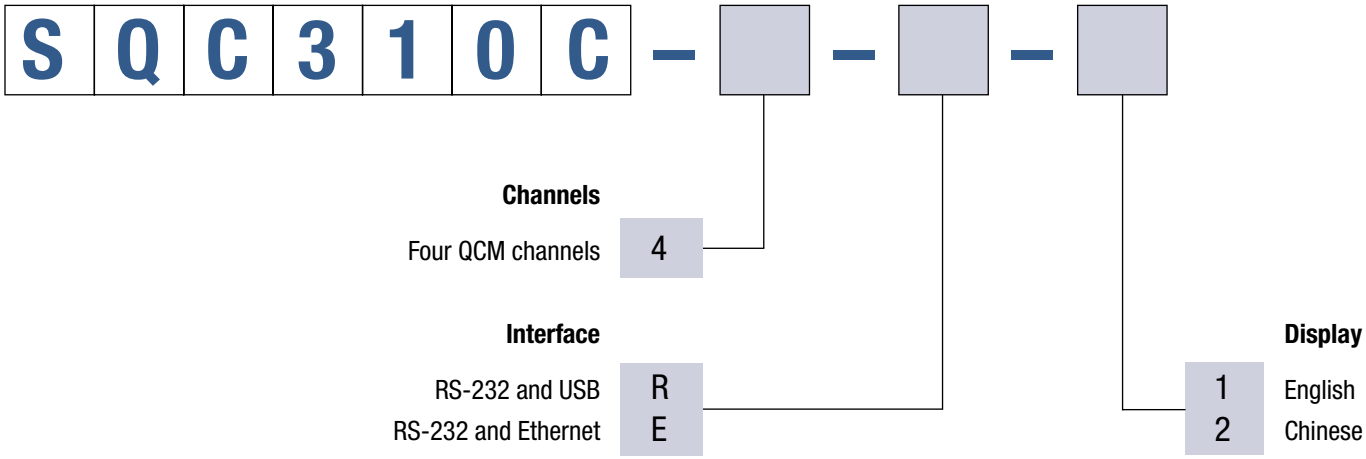
SQC-310 Series (continued)

ORDERING INFORMATION



EXAMPLE OF A COMPLETE SYSTEM:

SQC310-2-R-1	SQC-310 sequential controller with two channels, RS-232 and USB interface, and English display
783-500-109-10	3 m (10 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 3 m (10 ft.) BNC cable
SL-A0E47-30	Front Load Single Sensor with CF40 feedthrough, welded at a 30 cm length from the center of the crystal to the sealing surface of the CF40
008-010-G10	10-pack of gold-coated crystals (6 MHz) in cleanroom compatible dispenser



SQC-310 Series (continued)

ACCESSORIES AND REPLACEMENT PARTS

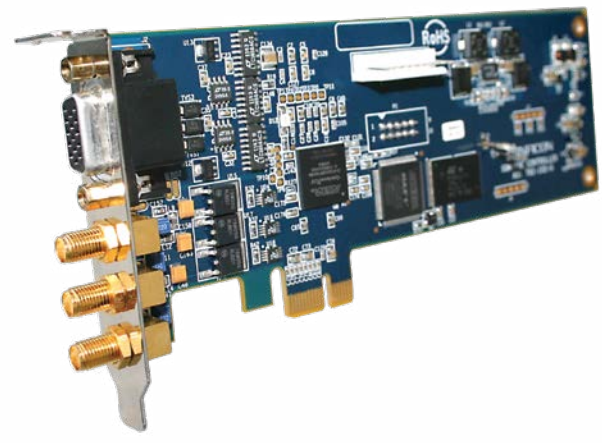
ACCESSORIES	
782-900-017	Handheld power control, 3 m (10 ft.) coiled cable
782-900-007	3U rack extender – mounts one SQC-310 instrument in 48.3 cm (19 in.) rack
782-900-016	3U rack adapter – mounts two SQC-310 instruments in 48.3 cm (19 in.) rack
OSCILLATORS AND CABLES	
783-500-109-10	3 m (10 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 3 m (10 ft.) BNC cable
783-500-109-25	7.6 m (25 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 7.6 m (25 ft.) BNC cable
783-500-109-50	15.2 m (50 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 15.2 m (50 ft.) BNC cable
783-500-109-75	22.8 m (75 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 22.8 m (75 ft.) BNC cable
783-500-013-G1	OSC-100 oscillator
782-902-011	BNC cable, male / female, 15.2 cm (6 in.)
782-902-012-10	3 m (10 ft.) BNC cable, male / male
782-902-012-25	7.6 m (25 ft.) BNC cable, male / male
782-902-012-50	15.2 m (50 ft.) BNC cable, male / male
782-902-012-75	22.8 m (75 ft.) BNC cable, male / male
782-902-022	BNC to Microdot® adapter cable, 15.2 cm (6 in.)

SQC-310 Series (continued)

SPECIFICATIONS

	SQC-310		SQC-310C
MEASUREMENT			
Sensor inputs	Two (four optional)		Four
Measurement frequency range		6.5 to 1.0 MHz (adjustable)	
Frequency resolution1		±0.012 Hz at 6 MHz	
Thickness and rate resolution / measurement2		±0.015 Å	
Reference frequency stability		±2 ppm total, 0° to 50°C	
Measurement interval		0.1 to 1.0 s (adjustable)	
Rate display		0.01 Å/s	
Control			
Storage		100 processes, 1000 layers, 50 films	PID
Source outputs	Two (four optional)		Four
Output signal			0 to ±10 V (dc), 15-bit
Digital inputs / relays	Eight / eight (16 / 16 optional)		16 / 16
Digital inputs		5 V (dc) non-isolated	
Relays		SPST Form 1 A, 30 V (dc), 2 A maximum	
Interface(s)		RS-232 and USB (RS-232 and Ethernet optional)	
Remote power control		Optional	
Display			
Type		1/4 VGA 320 x 240 active matrix color LCD	
Graphs		Rate, deviation, power, or full screen numeric	
General			
Power		100 to 240 V (ac), 50/60 Hz, 25 W	
Compliance		CE, RoHS	
Windows software		Included	
Housing / mounting		13.3 cm (5.25 in.) half-rack	

IQM-233 Thin Film Deposition Controller Card



LOW-COST DEPOSITION CONTROL ON A PCI EXPRESS CARD

The IQM-233 PCI Express card turns your computer (PC) into a thin film deposition controller. This INFICON designed and manufactured product is the ideal choice for system OEMs, or anyone wishing to incorporate a thin film deposition controller into an existing computer or PLC controlled system. Installation is simple—all you need is an unoccupied PCI Express slot. IQM-233 is available to fit in standard or small form factor computer towers.

UNPARALLELED FEATURES

IQM-233 features three QCM sensor inputs and three source outputs on each card. Up to two IQM-233 cards can be installed in a single computer (using optional IQS-233 software), giving you a maximum of six sensor inputs and six source outputs. Only INFICON offers this level of flexibility in a fully integrated computer controlled QCM controller.

IQM-233 is compatible with INFICON oscillator, PN 782-900-010, so replacing an SQM-242 card does not require a new oscillator. It is also compatible with all INFICON single and dual sensor heads.

FEATURES AT A GLANCE

- PCI Express
- Three sensor inputs, three control outputs
- Install multiple cards in a computer
- Codeposition of multiple sources
- Easy PLC integration to add I/O capabilities
- Easy-to-use
- Value price

CHOOSE THE SOFTWARE SOLUTION RIGHT FOR YOU

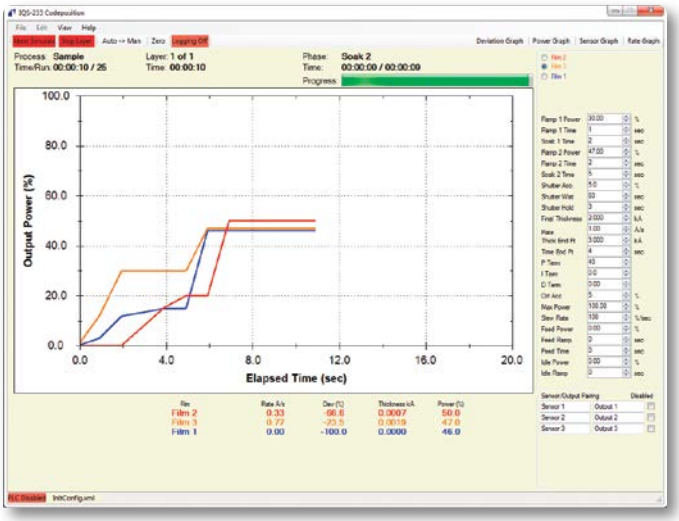
IQM-233 includes basic Windows software for setup and control of simple sequential or codeposition processes with one IQM-233 card. The optional IQS-233 advanced Windows software allows for more complex process setup, including multi-layer codeposition, graphing, and PLC integration with event selectable relay / input functions. IQS-233 software also allows for use of up to two IQM-233 cards.

As an alternative for customers wanting to write their own software, IQM-233 includes a LabVIEW™ sample program to provide basic functionality and demonstrate programming techniques.

INFICON WORLDWIDE SUPPORT

The IQM-233 card is designed and supported by INFICON, a worldwide leader in QCM control. No matter where you are, you get fast answers, attentive service, and the support you need to keep your INFICON product running smoothly. With offices around the world, INFICON offers local technical support and service where you need it.

IQM-233 (continued)



IQS-233 Codeposition software (optional)

IQM-233 Standard software (included)

ORDERING INFORMATION

782-IQM-233-G1	IQM-233 QCM controller card for standard PCI Express slot [3]
782-IQM-233-G2	IQM-233 QCM controller card for Small Form Factor (SFF) PCI Express slot [3]
782-IQS-233	IQS-233 codeposition software
600-1441-P1	SMA to BNC adapter for IQM-233 sensor inputs (one required for each sensor input)

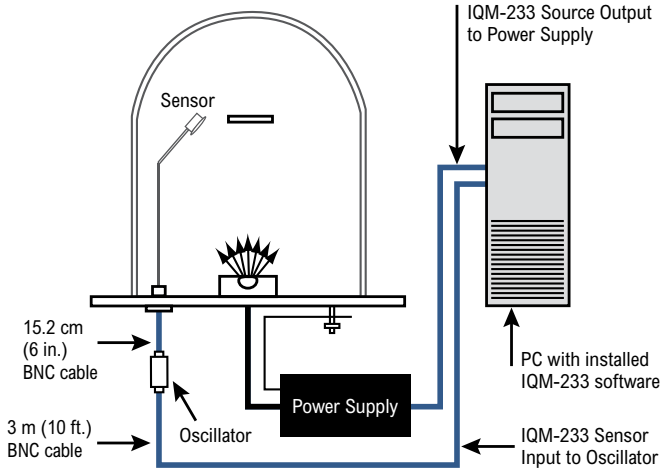
[3] Includes 1 SMA to BNC adapter (600-1441-P1)

IQM-233 STANDARD SOFTWARE (INCLUDED WITH IQM-233)

- Windows program provides basic setup and deposition control for one IQM-233 card.
- Simultaneous monitoring and / or control of up to three sensors and / or sources.
- A LabVIEW sample program and its source code are also included.

OPTIONAL IQS-233 CODEPOSITION SOFTWARE

- Provides complete setup and deposition control for one or two IQM-233 cards.
- Simultaneous monitoring and/or control of up to 6 sensors and / or sources.
- Multi-layer process recipes, pre/post conditioning, data logging, real-time data graphing, and digital I/O capabilities (requires a PLC).



IQM-233 (continued)

ACCESSORIES AND REPLACEMENT PARTS

OSCILLATORS AND CABLES

783-500-109-10	3 m (10 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 3 m (10 ft.) BNC cable
783-500-109-25	7.6 m (25 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 7.6 m (25 ft.) BNC cable
783-500-109-50	15.2 m (50 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 15.2 m (50 ft.) BNC cable
783-500-109-75	22.8 m (75 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 22.8 m (75 ft.) BNC cable
783-500-013-G1	OSC-100 oscillator
782-902-011	BNC cable, male / female, 15.2 cm (6 in.)
782-902-012-10	3 m (10 ft.) BNC cable, male / male
782-902-012-25	7.6 m (25 ft.) BNC cable, male / male
782-902-012-50	15.2 m (50 ft.) BNC cable, male / male
782-902-012-75	22.8 m (75 ft.) BNC cable, male / male
782-902-022	BNC to Microdot adapter cable, 15.2 cm (6 in.)

SPECIFICATIONS

COMPUTER REQUIREMENTS

- 1.5 GHz or better CPU
- 2 GB RAM
- 200 MB of free HD space
- Minimum screen resolution of 1152 x 648
- Windows XP SP3, Windows 7 32 / 64-bit, Windows 8 32 / 64-bit, Windows 10 32 / 64-bit
- One PCI Express slot (any size) is required for each IQM-233 card

IQM-233 THIN FILM DEPOSITION CONTROLLER CARD

SENSOR INPUTS	THREE QCM SENSOR INPUTS	OUTPUTS	THREE ANALOG SOURCE OUTPUTS
Connectors	SMA – Includes one SMA / BNC adapter	Connectors	15-pin high density D-sub
Measurement frequency range	6.1 to 4.0 MHz (adjustable)	Signal	0 to ±10 V (dc)
Frequency Resolution[1]	±0.10 Hz @ 6 MHz	Resolution	15-bit plus sign (per 500 ms sample)
Thickness and rate resolution / measurement[2]	±0.12 Å	Impedance	50 Ω
Measurement interval	0.1 to 2.0 s (adjustable)	Computer Interface	PCIe x1 – PCI Express Slot (Std or SFF)

[1] Resolution given for 0.25 s measurement interval

[2] Tooling / density = 100/1, fundamental frequency = 6 MHz, 0.25 s measurement interval

IMM-100 Thin Film Deposition Monitor

PROTECT AND GROW YOUR PROFIT WITH PRECISION RATE AND THICKNESS MONITORING

IMM-100 is a deposition monitor built with ModeLock technology to maximize reproducibility and uniformity with the highest thickness accuracy, best measurement resolution, and lowest rate noise.

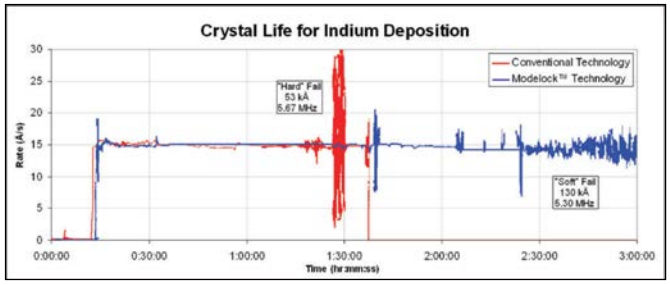
With the oscillator built-in IMM-100 can be easily integrated into an EtherCAT system with minimal hardware and footprint. This powerful and precise measurement monitor is sure to bring a new level of performance to your process.

FEATURES AT A GLANCE

- INFICON ModeLock technology provides the longest crystal life and ensures the most stable, highest resolution rate and thickness measurement available, even at very low rates
- Maximize yield with the best QCM thickness measurement possible
- Single channel rate and thickness monitor without unnecessary added features to minimize cost
- ±0.0035 Hz over 100 ms sample
- EtherCAT communications for seamless integration
- Compact size to minimize integration costs by saving tool real estate
- Expert application support, able to discuss unique application needs and give greater support than the competition
- RoHS compliant

HOW MODELOCK WORKS

The proven INFICON ModeLock measurement system provides crystal-frequency information with precision not possible from conventional “active oscillator” systems. It eliminates “mode-hopping,” a failure to maintain crystal oscillation at the fundamental frequency. ModeLock continuously tests the monitor crystal for resonance at the fundamental frequency, thereby eliminating weaknesses inherent in the conventional measurement method. Conventional measurement methods incorporate the quartz monitoring crystal as an active element of the oscillator circuit. Consequently, the crystal controls the oscillator circuit. So, as the electrical characteristics of the crystal change during deposition, the oscillator circuit becomes less stable and may “hop” to another resonant frequency or fail completely, resulting in an inaccurate film thickness. More powerful and precise—yet faster—than the conventional method, ModeLock continually tests and analyzes the phase frequency relationship of the crystal. The crystal is not an active part of the oscillator circuit. The ModeLock measurement system determines and applies a precise frequency to the crystal, preventing the crystal from “hopping,” or operating at a frequency other than the fundamental. This process takes place thousands of times per second to determine the resonant frequency to a precision of 0.0035 Hz/100 ms.



INFICON ModeLock measurement technology provides significantly longer crystal life, illustrated here in the deposition of indium.

IMM-100 (continued)

SPECIFICATIONS

Sensor inputs	One, female BNC
Measurement frequency range	6.0 to 4.5 MHz (fixed)
Frequency resolution	±0.0035 Hz @ 6 MHz
Measurement interval	0.10 s
Reference frequency stability	±2 ppm 0-50°C
Rate and thickness resolution	0.0042 Å (new crystal); 0.0076 Å (crystal @ 4.5 MHz) over 100 ms sample for material density = 1.0, Z-Ratio = 1.0
Measurement technique	ModeLock
Input voltage	24 V (dc)
Operating temperature	0 to 50°C (32 to 122°F)
Size	222.6 mm (8.76 in.) x 106.1 mm (4.18 in.) x 35.3 mm (1.39 in.)
Weight	0.48 kg (1.05 lbs.)
Communication type	EtherCAT, 2 RJ45 jacks, supports data daisy chaining. Explicit device ID via switches

ACCESSORIES

OPTIONAL POWER SUPPLIES

The power supplies listed below are rated for an input of 100 to 249 V (ac), 2 A, 50 to 60 Hz with an output of 24V (dc), 3.34 A, 80 W maximum.

961-021-G1	Power Supply Kit 80 - 250 VAC / 4 ft (1.2m) US plug
961-021-G2	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) US plug w/ 15 ft (4.5m) Extension Cable
961-021-G3	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) US plug w/ 30 ft (9m) Extension Cable
961-021-G4	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) 230V plug
961-021-G5	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) 230V plug w/ 15 ft (4.5m) Extension Cable
961-021-G6	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) 230V plug w/ 30 ft (9m) Extension Cable
961-021-G7	Power Supply Kit IL 240V
961-021-G8	Power Supply Kit IL 4.5 M Extension
961-021-G9	Power Supply Kit IL 9.0 M Extension
961-021-G10	Power Supply Kit UK 240V
961-021-G11	Power Supply Kit UK 4.5 M Extension
961-021-G12	Power Supply Kit UK 9.0 M Extension

OPTIONAL MOUNTING BRACKET

785-202-G1	Mounting bracket with four clean room compatible shock absorbing, female-to-female, stainless steel mounting feet
785-201-G1	Mounting bracket with four shock absorbing, male-to-female, black Neoprene rubber mounting feet

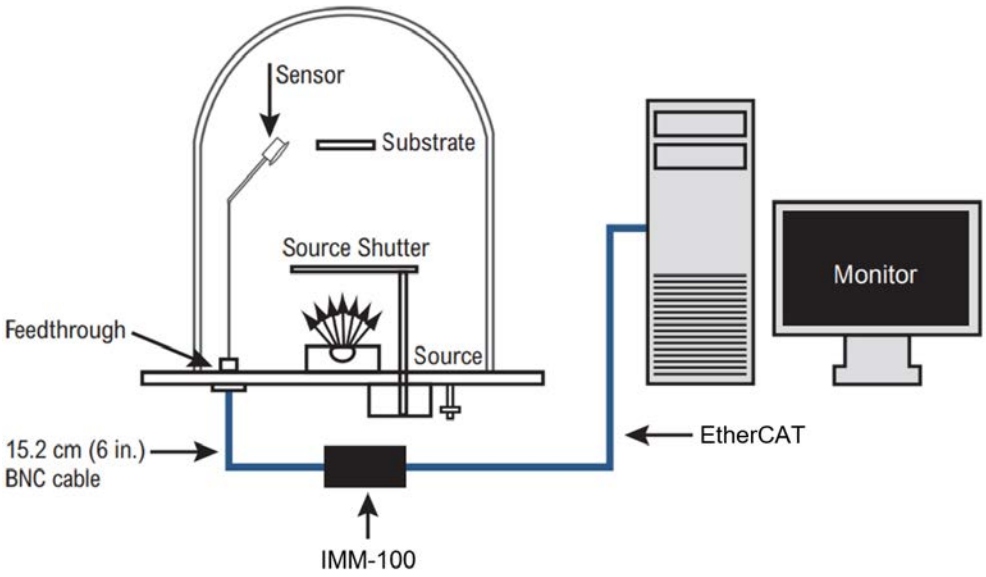
OPTIONAL COMMUNICATIONS CABLE

600-1190-P4	Ethernet 4 m cable
600-1190-P8	Ethernet 7.6 m cable
600-1190-P15	Ethernet 15 m cable

IMM-100 (continued)

IMM-100—A SIMPLE QCM

Figure below shows a typical IMM-100 thin film deposition system. A complete QCM system consists of IMM-100, a sensor, feedthrough, a computer, and crystals.



Typical IMM-100 installation

IMM-200 Thin Film Deposition Monitor

PROTECT AND GROW YOUR PROFIT WITH PRECISION RATE AND THICKNESS MONITORING

Protect and Grow Your Profit with Precision Rate and Thickness Monitoring

IMM-200 is a deposition monitor built with ModeLock technology to maximize reproducibility and uniformity with the highest thickness accuracy, best measurement resolution, and lowest rate noise.

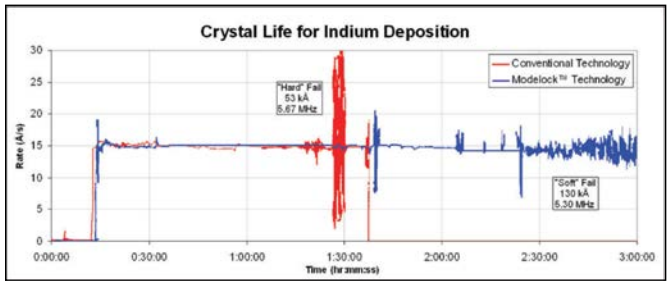
FEATURES AT A GLANCE

- INFICON ModeLock technology provides the longest crystal life and ensures the most stable, highest resolution rate and thickness measurement available, even at very low rates
- Maximize yield with the best QCM thickness measurement possible
- Single channel rate and thickness monitor without unnecessary added features to minimize cost
- ±0.0035 Hz over 100 ms sample
- Ethernet communications for seamless integration
- Compact size to minimize integration costs by saving tool real estate
- Expert application support, able to discuss unique application needs and give greater support than the competition
- RoHS compliant

With the oscillator built-in IMM-200 can be easily integrated into an Ethernet system with minimal hardware and footprint. This powerful and precise measurement monitor is sure to bring a new level of performance to your process.

HOW MODELOCK WORKS

The proven INFICON ModeLock measurement system provides crystal-frequency information with precision not possible from conventional “active oscillator” systems. It eliminates “mode-hopping,” a failure to maintain crystal oscillation at the fundamental frequency. ModeLock continuously tests the monitor crystal for resonance at the fundamental frequency, thereby eliminating weaknesses inherent in the conventional measurement method. Conventional measurement methods incorporate the quartz monitoring crystal as an active element of the oscillator circuit. Consequently, the crystal controls the oscillator circuit. So, as the electrical characteristics of the crystal change during deposition, the oscillator circuit becomes less stable and may “hop” to another resonant frequency or fail completely, resulting in an inaccurate film thickness. More powerful and precise—yet faster—than the conventional method, ModeLock continually tests and analyzes the phase frequency relationship of the crystal. The crystal is not an active part of the oscillator circuit. The ModeLock measurement system determines and applies a precise frequency to the crystal, preventing the crystal from “hopping,” or operating at a frequency other than the fundamental. This process takes place thousands of times per second to determine the resonant frequency to a precision of 0.0035 Hz/100 ms.



INFICON ModeLock measurement technology provides significantly longer crystal life, illustrated here in the deposition of indium.

IMM-200 (continued)

SPECIFICATIONS

MEASUREMENT	
Sensor inputs	1
Measurement frequency range	6.0 to 4.5 MHz (fixed)
Reference frequency stability	±2 ppm 0-50°C
Frequency resolution	±0.0035 Hz @ 6 MHz
Rate and thickness resolution	0.0042 Å (new crystal); 0.0076 Å (crystal @ 4.5 MHz) over 100 ms sample for material density = 1.0, Z-Ratio = 1.0
Measurement interval	100 ms
Measurement technique	ModeLock
OPERATION AND DIMENSIONS	
Input voltage	24 V (dc)
Operating temperature	0 to 50°C (32 to 122°F)
Size	222.6 mm (8.76 in.) x 106.1 mm (4.18 in.) x 35.3 mm (1.39 in.)
Weight	0.48 kg (1.05 lbs.)
Communication type	Ethernet, 1 RJ45 jack

ACCESSORIES

OPTIONAL POWER SUPPLIES	
The power supplies listed below are rated for an input of 100 to 249 V (ac), 2 A, 50 to 60 Hz with an output of 24V (dc), 3.34 A, 80 W maximum.	
961-021-G1	Power Supply Kit 80 - 250 VAC / 4 ft (1.2m) US plug
961-021-G2	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) US plug w/ 15 ft (4.5m) Extension Cable
961-021-G3	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) US plug w/ 30 ft (9m) Extension Cable
961-021-G4	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) 230V plug
961-021-G5	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) 230V plug w/ 15 ft (4.5m) Extension Cable
961-021-G6	Power Supply Kit 80 - 250 VAC / 4 ft (1.2 m) 230V plug w/ 30 ft (9m) Extension Cable
961-021-G7	Power Supply Kit IL 240V
961-021-G8	Power Supply Kit IL 4.5 M Extension
961-021-G9	Power Supply Kit IL 9.0 M Extension
961-021-G10	Power Supply Kit UK 240V
961-021-G11	Power Supply Kit UK 4.5 M Extension
961-021-G12	Power Supply Kit UK 9.0 M Extension
OPTIONAL MOUNTING BRACKET	
785-202-G1	Mounting bracket with four clean room compatible shock absorbing, female-to-female, stainless steel mounting feet
785-201-G1	Mounting bracket with four shock absorbing, male-to-female, black Neoprene rubber mounting feet

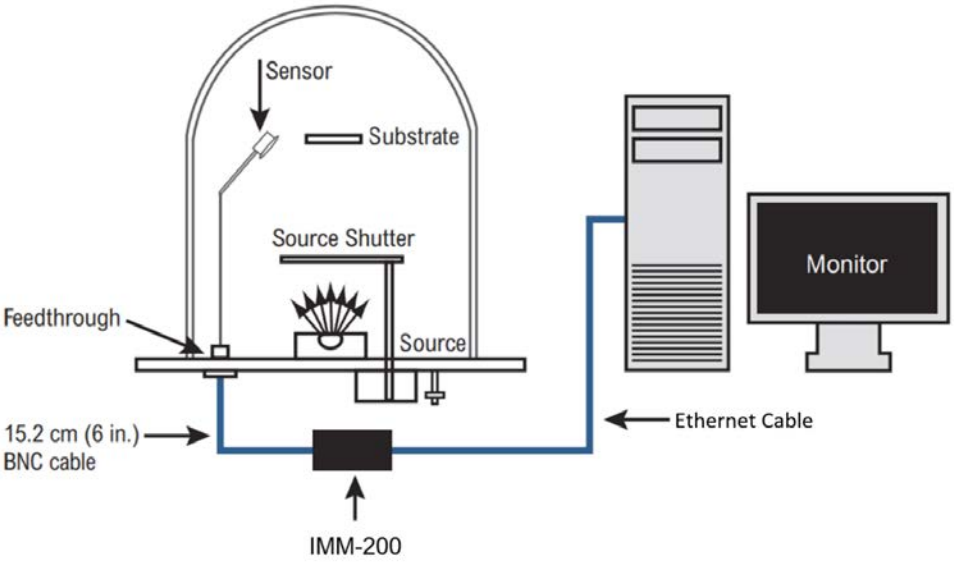
IMM-200 (continued)

ACCESSORIES (CONTINUED)

OPTIONAL COMMUNICATIONS CABLE	
600-1190-P4	Ethernet 4 m cable
600-1190-P8	Ethernet 7.6 m cable
600-1190-P15	Ethernet 15 m cable

IMM-200—A SIMPLE QCM

Figure below shows a typical IMM-200 thin film deposition system. A complete QCM system consists of IMM-200, a sensor, feedthrough, a computer, and crystals.



Typical IMM-200 installation

SQM-160 Multi-Film Rate / Thickness Monitor

MULTI-CHANNEL QUARTZ CRYSTAL MONITOR

SQM-160 uses proven INFICON quartz crystal sensor technology to measure rate and thickness in thin film deposition processes. Two sensor inputs are standard and four additional sensor inputs are optional. Two recorder outputs provide analog rate and thickness signals.

Sensor inputs can be assigned to different materials, averaged for accurate deposition control in large systems, or configured for a dual sensor. The rate sampling mode allows a shuttered sensor to extend sensor life in high rate processes. Rate displays of 0.1Å/s or 0.01Å/s are user-selectable. In addition, frequency or mass displays can be selected. Four relay outputs allow SQM-160 to control source or sensor shutters, signal time and thickness setpoints, and signal crystal failure. Digital inputs allow external signals to start / stop and zero readings.

SQM-160 comes with an RS-232 port and Windows software that allows instrument setup from a computer. The software can be used to set and store all parameters, operate the instrument, and save process data in an Excel® file format. USB or Ethernet options add to the communications flexibility.

EASY TO USE

The large, bright display simultaneously shows thickness and rate readings that are highly visible. Using SQM-160 is simple. To start rate and thickness measurements, press Zero to null the last thickness reading, then Shutter to open the source or sensor shutter. When the desired thickness is reached, or time has elapsed, the shutter closes and the appropriate front panel indicators illuminate. Press the Xtal Life button at any time to view the remaining crystal life.

Two menus control instrument setup for the 99 stored films. To access the menus, press Program. Rotate the control knob to select / edit parameters. The main display shows menu prompts, and values are shown in the auxiliary (Time) display.

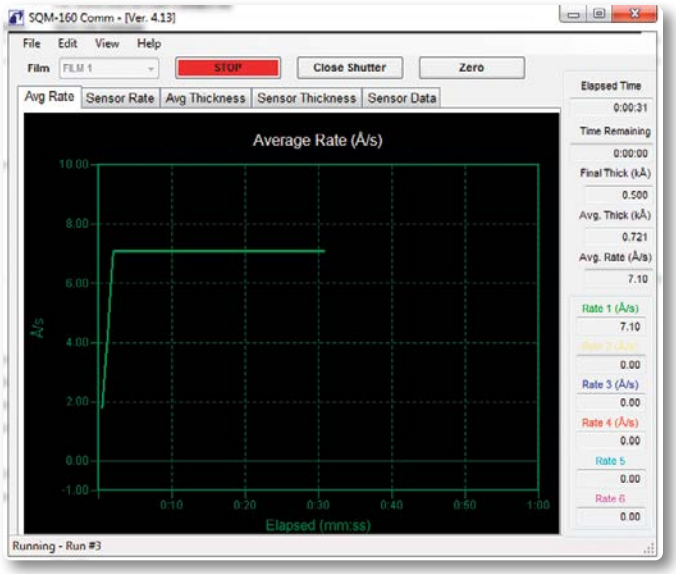
HIGH ACCURACY, LOW COST

SQM-160 is offered in a standard frequency resolution version (SQM160-S) and a high resolution version (SQM160-H). The standard frequency resolution is 0.30 Hz at 10 readings per second. The high resolution option increases resolution to 0.03 Hz at 10 readings per second. Temperature stability is 2 ppm over the entire operating range. This combination of high accuracy and high stability are unmatched in an instrument at this price!

FEATURES AT A GLANCE

- Two measurement channels standard, an additional four optional
- Analog outputs for rate / thickness recording
- High resolution option: 0.03 Hz at 10 readings / s
- RS-232 standard, USB or Ethernet optional

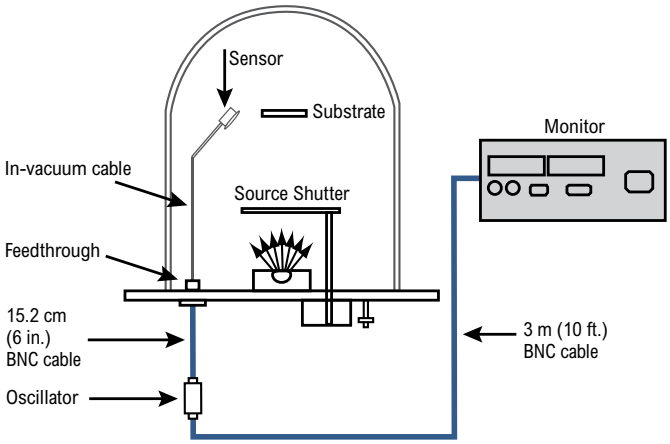
SQM-160 (continued)



Enhanced software provides a visual display of process data for easy process analysis and documentation. Backup of the SQM-160 setup data allows for process consistency.

TYPICAL SQM-160 SYSTEM

A typical QCM system consists of the SQM-160 monitor, at least one sensor / feedthrough combination, and an oscillator kit for each sensor.



ORDERING INFORMATION

S	Q	M	1	6	0	–		–		–	

Base Controller

Standard resolution	S
High resolution	H

Number of Channels

Two (standard)	2
Six	6

Interface

R	RS-232 Only
U	RS-232 and USB
E	RS-232 and Ethernet

SQM-160 (continued)

ACCESSORIES AND REPLACEMENT PARTS

ACCESSORIES	
782-900-008	2U rack extender – mounts one SQM-160 OR CI-100 instrument in 48.3 cm (19 in.) rack
782-900-014	2U rack adapter – mounts two SQM-160 OR CI-100 instruments in 48.3 cm (19 in.) rack
OSCILLATORS AND CABLES	
783-500-109-10	3 m (10 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 3 m (10 ft.) BNC cable
783-500-109-25	7.6 m (25 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 7.6 m (25 ft.) BNC cable
783-500-109-50	15.2 m (50 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 15.2 m (50 ft.) BNC cable
783-500-109-75	22.8 m (75 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 22.8 m (75 ft.) BNC cable
783-500-013-G1	OSC-100 oscillator
782-902-011	BNC cable, male / female, 15.2 cm (6 in.)
782-902-012-10	3 m (10 ft.) BNC cable, male / male
782-902-012-25	7.6 m (25 ft.) BNC cable, male / male
782-902-012-50	15.2 m (50 ft.) BNC cable, male / male
782-902-012-75	22.8 m (75 ft.) BNC cable, male / male
782-902-022	BNC to Microdot adapter cable, 15.2 cm (6 in.)

SQM-160 (continued)

SPECIFICATIONS

Sensor inputs	Standard: two; optional: four
Measurement frequency range	6.5 to 1.0 MHz (adjustable)
Frequency resolution[1]	Standard: ±0.30 Hz @ 6 MHz High resolution option: ±0.03 Hz @ 6 MHz
Thickness and rate resolution / measurement[2]	Standard: ±0.37 Å High resolution option: ±0.037 Å
Reference frequency stability	±2 ppm total, over 0° to 50°C
Measurement interval	0.10 to 2.0 s (adjustable)
Measurement filter	1 to 20 readings
Stored films	99
Analog outputs	Two 0 to 5 V (dc), rate and thickness
Digital inputs / outputs	Two inputs, four relay outputs
Communications interface	Standard: RS-232 Optional: USB or Ethernet
Power	100 to 120 / 200 to 240 V (ac), 50/60 Hz, 20 W
CE compliance	Class 1 equipment, 73/72/EEC LVD, 89/336/EEC ECD
RoHS compliance	Yes
Housing / mounting	1/2 rack cabinet, 89 x 213 x 197 mm (3.5 x 8.5 x 7.75 in.)
Weight	2.7 kg (6 lb.)
Windows software (included)	Provides remote setup and operation, (included) data logging functions

[1] Resolution given for 0.25 s measurement interval

[2] Tooling / density = 100/1, fundamental frequency = 6 MHz, 0.25 s measurement interval

STM-2XM
2-Channel Rate / Thickness Monitor

SIMPLE OPERATION FOR MANY APPLICATIONS

STM-2XM is a two channel rate / thickness monitor that combines high accuracy with flexible programming and easy operation at an affordable price.

STM-2XM is equipped with five operation modes to accommodate processes from simple to complex. For example, use simple mode to monitor just one single sensor for the simplest process, or use alloy mode for codeposition monitoring. Independent mode allows STM-2XM to function as two completely separate monitors.

Two sensor inputs allow for the use of two single quartz crystal sensors or one dual quartz crystal sensor. Ten measurements are taken per second while achieving a resolution of 0.037 Å per measurement.

FEATURE PACKED

STM-2XM has eight programmable digital inputs, eight programmable digital outputs, and four analog outputs allowing for a level of integration usually reserved for more expensive instruments.

Programmable features include shutter delay, time / power monitoring, and rate sampling. Use all of these features to achieve the most accurate readings and the longest crystal life.

FEATURES AT A GLANCE

- Two measurement channels
- Four analog outputs for rate, rate deviation, or thickness
- Eight programmable digital inputs
- Eight programmable digital outputs
- High accuracy at 10 readings per second
- Displays mass or thickness
- Codeposition monitoring capabilities

Operate and monitor STM-2XM through the simple front panel interface or program the STM-2XM through the included LabVIEW software. This simple software allows can be an online or offline editor for films and system parameters and is easy-to-use.

EASY TO USE

STM-2XM features a high contrast LCD display and intuitive menu system. On-screen hints can be found throughout the menus for simple, guided programming and operation. The easy-to-read LCD can display in accumulated mass or thickness.

STM-2XM (continued)

ORDERING INFORMATION

STM-2XM-G1	STM-2XM Monitor (US power cord)
STM-2XM-G2	STM-2XM Monitor (European power cord)

ACCESSORIES AND REPLACEMENT PARTS

ACCESSORIES	
783-014-008	Rack Mount Kit — mounts one STM-2XM monitor in a 48.3 cm (19 in.) rack
783-014-009	Dual Rack Mount Kit — mounts two STM-2XM monitors in a 48.3 cm (19 in.) rack
783-500-109-10	3 m (10 ft.) Oscillator kit – includes Oscillator, 15.2 cm (6 in.) BNC, and 3 m (10 ft.) BNC
OSCILLATORS AND CABLES	
783-500-109-10	3 m (10 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 3 m (10 ft.) BNC cable
783-500-109-25	7.6 m (25 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 7.6 m (25 ft.) BNC cable
783-500-109-50	15.2 m (50 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 15.2 m (50 ft.) BNC cable
783-500-109-75	22.8 m (75 ft.) oscillator kit – includes OSC-100 oscillator, 15.2 cm (6 in.) BNC, and 22.8 m (75 ft.) BNC cable
783-500-013-G1	OSC-100 oscillator
782-902-011	BNC cable, male / female, 15.2 cm (6 in.)
782-902-012-10	3 m (10 ft.) BNC cable, male / male
782-902-012-25	7.6 m (25 ft.) BNC cable, male / male
782-902-012-50	15.2 m (50 ft.) BNC cable, male / male
782-902-012-75	22.8 m (75 ft.) BNC cable, male / male
782-902-022	BNC to Microdot adapter cable, 15.2 cm (6 in.)

SPECIFICATIONS

Sensor inputs	Two
Compatible sensors	Single / shuttered single or dual QCM sensor
Measurement frequency range	6.0 to 5.0 MHz (fixed)
Frequency resolution	±0.03 Hz at 6 MHz
Reference frequency stability	±2 ppm
Thickness and rate resolution / measurement[1]	±0.037 Å
Measurement interval	0.10 s
Stored films	15
Display mode	Thickness / Mass
Digital inputs	Eight
Digital outputs	Eight
Analog outputs	Four
Analog output rating	0 to ±10 V, 10 mA
Relay rating	Up to 48 V (dc) • V (ac), 2 A
Mains power supply	100 to 240 V (ac) ±10%, 50/60 Hz, 2.5 VA
Weight	2.7 kg (6 lb.)
Windows software (included)	Provides remote setup and operation, (included) data logging functions

[1] Tooling / density = 100/1, fundamental frequency = 6 MHz

STM-2
USB Thin Film Thickness / Rate Deposition Monitor

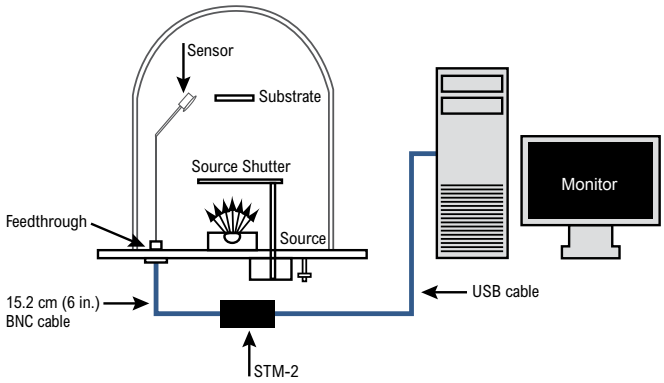


Figure 1: Typical STM-2 installation

SMALL IN SIZE AND PRICE, BIG IN PERFORMANCE

STM-2 combines the simplicity of USB connectivity with the accuracy of a precision measurement engine, all in a compact, inexpensive package. The size and simplicity of STM-2 help make setup and operation easy and efficient.

SUPERIOR PERFORMANCE

STM-2 is the most accurate USB powered thin film monitor in the industry. Ten measurements are taken per second while achieving a resolution of 0.037 Å per measurement.

EASY AND FLEXIBLE INSTALLATION

STM-2 comes with everything you need to connect a QCM sensor / feedthrough to a Windows computer. Up to eight STM-2s monitoring up to eight sensors can be connected to a computer simultaneously.

FEATURES AT A GLANCE

- Low cost instrument
- USB connection
- Internal oscillator
- High accuracy at 10 measurements per second
- Compatible with an external oscillator

To setup STM-2, simply connect the included BNC cable from the feedthrough to STM-2, then connect STM-2 to a computer using a standard mini USB cable. No external oscillator or power supply is required.

STM-2 features an internal oscillator that allows for simple and cost effective installation when STM-2 is located within 1 m (40 in.) of the quartz crystal. A standard INFICON oscillator kit can also be used for applications where STM-2 must be located farther away from the feedthrough.

STM-2 SOFTWARE

STM-2 includes LabVIEW software, capable of simple operation and data logging. Windows software is also included for operation and data logging of up to eight STM-2s.

STM-2—A SIMPLE QCM

Figure 1 shows a typical thin film deposition system. A complete QCM system consists of STM-2, a sensor, a feedthrough, a computer, and crystals.

STM-2 (continued)

ORDERING INFORMATION

STM-2	STM-2 Deposition Monitor, includes: • Windows software applications • 15.2 cm (6 in.) BNC cable (connects STM-2 to the feedthrough) • 5 m (16.4 ft.) USB cable (connects STM-2 to your computer)

SPECIFICATIONS

Compatible sensors	Non-shuttered single QCM sensor
Sensor input	One, female BNC
Measurement frequency range[1]	6.0 to 5.0 MHz (fixed)
Frequency resolution	±0.03 Hz at 6 MHz
Measurement interval	0.10 s
Reference frequency stability	±2 ppm
Thickness and Rate	±0.037 Å resolution / measurement
Thickness display resolution	1 Å (display on software only)
Interface	USB, v1.1 or later capable of providing 400 mA, 5 V (dc)
Size	11.4 x 7.6 x 2.5 cm (4.5 x 3 x 1 in.)
Weight	57 g (2 oz.)
Computer requirements	Windows 2000, Windows XP, Windows Vista, Windows 7, Windows 8, or Windows 10 with one available USB 1.1 (or later) port for each STM-2

[1] Tooling / density = 100/1, fundamental frequency = 6 MHz

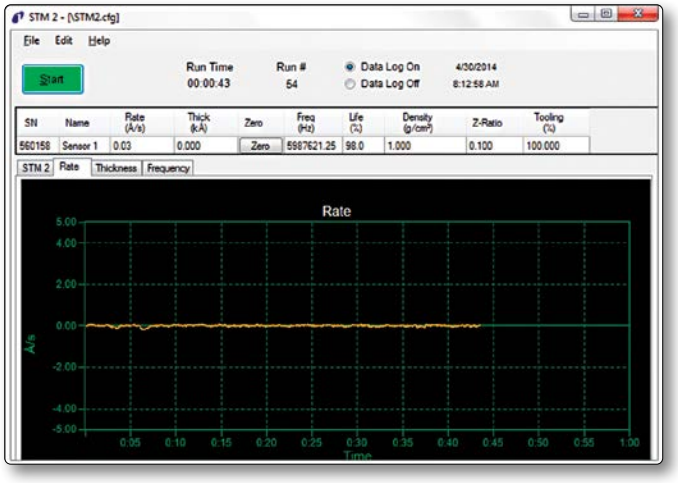


Figure 2: STM-2 Windows software

This page left blank intentionally.

Electron Impact Emission Spectroscopy

This page left blank intentionally.

Guardian™ Codeposition Control System

PRECISE CONTROL FOR EMERGING TECHNOLOGIES

Guardian Codeposition Controller, powered by electron impact emission spectroscopy (EIES), significantly improves the reproducibility of film quality during fabrication of CIGS films. Guardian provides precise control of deposition rates from 0.1 to 9999 Å/sec. The system operates one or two sensors, up to eight optical inputs and controls up to eight deposition sources, enabling codeposition of up to eight materials.

The unique Guardian EIES sensor measures deposition rates more accurately without interference from residual gases while monitoring CIGS processes. Its Windows-based software provides easy setup and operation of multi-material thin film deposition processes. It is fully compatible with INFICON Sentinel® sensors, providing easy integration into existing systems. Guardian Codeposition Controller is ideal for controlling simultaneous deposition of multiple materials in applications such as CIGS for photovoltaics, MBE, and superconducting thin films.

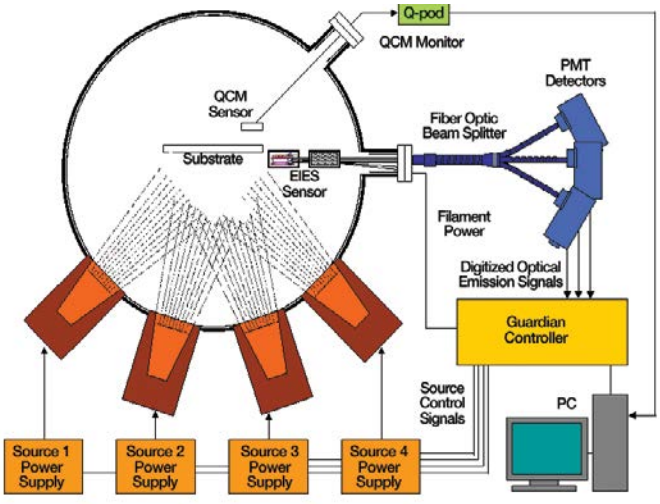


Figure 1: Conceptual system configuration.

SYSTEM OVERVIEW

A complete Guardian system consists of at least one sensor, one detector, an optical filter, a controller/interface unit, and a Windows®-compatible computer (user-supplied) with Guardian software. EIES is generally used to control deposition of multiple materials, so most EIES systems include additional sensors, detectors, optical components such as beam splitters, and Quartz Crystal Monitors (QCMs) for calibration or controlling deposition rate for some materials. The block diagram in Figure 1 shows a typical Guardian system configuration. In this system, the Guardian controls the deposition rate of four materials, using EIES for three of the materials and a QCM for the fourth. (A common configuration for deposition of CIGS materials in photovoltaics applications.)

FEATURES AT A GLANCE

- Monitor and control simultaneous deposition of up to eight materials
- Deposition rates from 0.1 to 9999 Å/s
- Integrated EIES and QCM thin film process control
- Ideal for CIGS thin films

TO CONFIGURE THE GUARDIAN CODEPOSITION SYSTEM, CONSIDER THE FOLLOWING

What are the primary and secondary emission wavelengths for your deposition materials? If different materials have peaks too close to each other, you may need to monitor a secondary wavelength, which has lower signal strength. During the deposition process, what background gases are present in your vacuum chamber, and what are the emission wavelengths for those gases? If emissions from background gases interfere with the deposition materials, a gas compensating sensor is recommended. EIES is most effective with the uniquely defined spectra of atomic species. Molecular species that generate unstable or broad emission spectra cannot be measured accurately. EIES is not suitable for organic materials. These, and other factors, determine the optimum EIES system configuration for each specific application. Papers have been published that describe these considerations in more detail. When you are

Guardian (continued)

configuring your EIES system, please contact us for a thorough discussion of your application.

The standard sensor has one thermionic emitter (filament) positioned near the vapor flux of the materials being deposited. The light generated travels through the light tube to the detector. A filter at the detector inlet passes the specific wavelength of interest. This sensor works well at high vacuum.

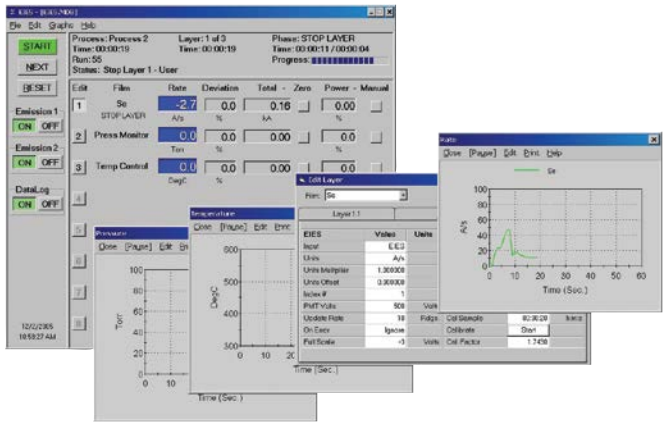
The gas compensation sensor incorporates a second filament in addition to the standard sensor. This second filament is positioned so that it sees only the background gases, not the vapor flux of the materials being deposited. The Guardian software then subtracts the background gases from the signal of interest, significantly improving stability. The gas compensation sensor is recommended when emissions from background gases, such as H_2O and CO_2, interfere with the signal from the material of interest.

The detector uses a photomultiplier tube (PMT) to convert the optical / light signal from the sensor into a high resolution digital signal. A filter at the detector inlet selects the specific material wavelength of interest. The detector inlet has a built-in filter holder for standard 25 mm (1 in.) diameter filters. For a single material system the optical detector module can mount directly on the feedthrough. For multiple materials, a beam splitter can be used to couple the optical signal from one sensor into several detectors. The gain of each detector can be adjusted individually to optimize performance for different materials.

Users familiar with optical beam handling equipment can readily design and build their own beam splitters, using standard components available from many suppliers. For best results, we recommend splitting the main beam into no more than three beams. We offer a fiber optic beam splitter that splits the main sensor optical beam into two or three beams. Please contact us with your requirements.

A filter is placed in the inlet of each detector, and blocks all light except one wavelength, which is usually the primary or secondary emission wavelength for the material of interest. Filters with narrow bandwidths reject adjacent wavelengths, but also pass less of the wavelength of interest. Numerous optical filters are available on the market; we offer filters with a good balance between bandwidth and signal levels for most applications.

The Guardian controller provides power for one or two sensors and up to six optical detectors, produces up to eight source control output signals, and provides digital I/O functions (12 relays, 12 logic inputs). The controller is also the digital interface between all of these functions and your computer. Two controller models are available: The basic controller (782-900-031) operates one sensor, the other (782-900-050) runs two. Both models operate standard or gas compensation sensors.



Guardian software provides all of the functions required for a six optical detector, eight output, multi-layer codeposition controller. Process settings, numeric data, and graphs can be displayed during all phases of deposition.

The final component of an EIES system is your computer and the Guardian software supplied with every controller. The software provides everything you need to setup and operate the EIES system, and run a multi-material thin film deposition process.

The software integrates a QCM, such as Q-pod transducer or SQM-242 card, for calibration of the EIES to a QCM reference, or for deposition control. The SQM-242 and SAM-242 option cards can also be used for calibration and control of analog devices.

Guardian (continued)

HOW ELECTRON IMPACT EMISSION SPECTROSCOPY WORKS

Guardian is powered by electron impact emission spectroscopy (EIES), a highly advanced method of controlling thin film properties during deposition of multiple films. The material being deposited is excited by a thermionic emitter, which results in creation of photons. The light created passes through an optical filter to a photomultiplier tube (PMT) detector, which measures the intensity of emission of the passed wavelength. Guardian then generates a signal to control the source for that material. Additional detectors, with appropriate optical filters, are used for multiple materials.

SPECIFICATIONS

SENSORS		Guardian Sensor Patent US 7,719,681 B2
Operating pressure		<5x10-4 Torr
Temperature		450˚C maximum during operation and / or bakeout
Size (approximate)		19 x 32 x 45 mm (0.75 x 1.25 x 1.75 in.)
Filament life (typical)		~1000 hours at 2 mA emission (Yttria), 4 mA for Thoria
Sensor-feedthrough linkage		Rigid ss tube, adjustable from 175 to 550 mm (7 to 22 in.)
Feedthrough / flange		One optical and four electrical feedthroughs on 2.75 in.CF (NW35CF)
DETECTOR		
Photomultiplier tube (PMT)		Hamamatsu R7518 or equivalent
Spectral response		185 to 730 nm
Detection limit		Better than 5 fW of optical input power
PMT gain		103 to 107 (detectors are independently adjustable)
Output resolution		20-bit
Optical entrance port		Built-in filter holder, for filters up to 2.54 cm (1 in.) diameter and 5 mm (0.2 in.) thick
Size		50 x 140 x 70 mm (2 x 5.5 x 2.75 in.) mounting holes on three sides (optional mounting brackets available)
CONTROLLERS		82-900-031: operates one sensor 782-900-050: operates one or two sensors
Sensors		16-600-G22: Standard Sensor Assembly 55.9 cm (22 in.) 016-601-G22: Gas Compensating Sensor Assembly 55.9 cm (22 in.)
Detectors		Six optical detector channels
Control outputs		Six source control outputs, 0 to ±10 V (dc) programmable
Digital I/O		12 relay outputs and 12 logic inputs
Power		100 to 240 V (ac), 50/60 Hz, 150 W
Size		483 x 89 x 305 mm (19 x 3.5 x 12 in.)
Compliance		CE
User interface	software:	Windows-based setup program included with Controller
Software displays	deposition rate:	4-digit numeric display of all channels, from 0.001 to 9999 Å/s, and graphical X-Y scrolling plot with selectable scales
	thickness:	4-digit numeric display with range selection, from 0.001 to 9999 kÅ

Guardian (continued)

SPECIFICATIONS (CONTINUED)

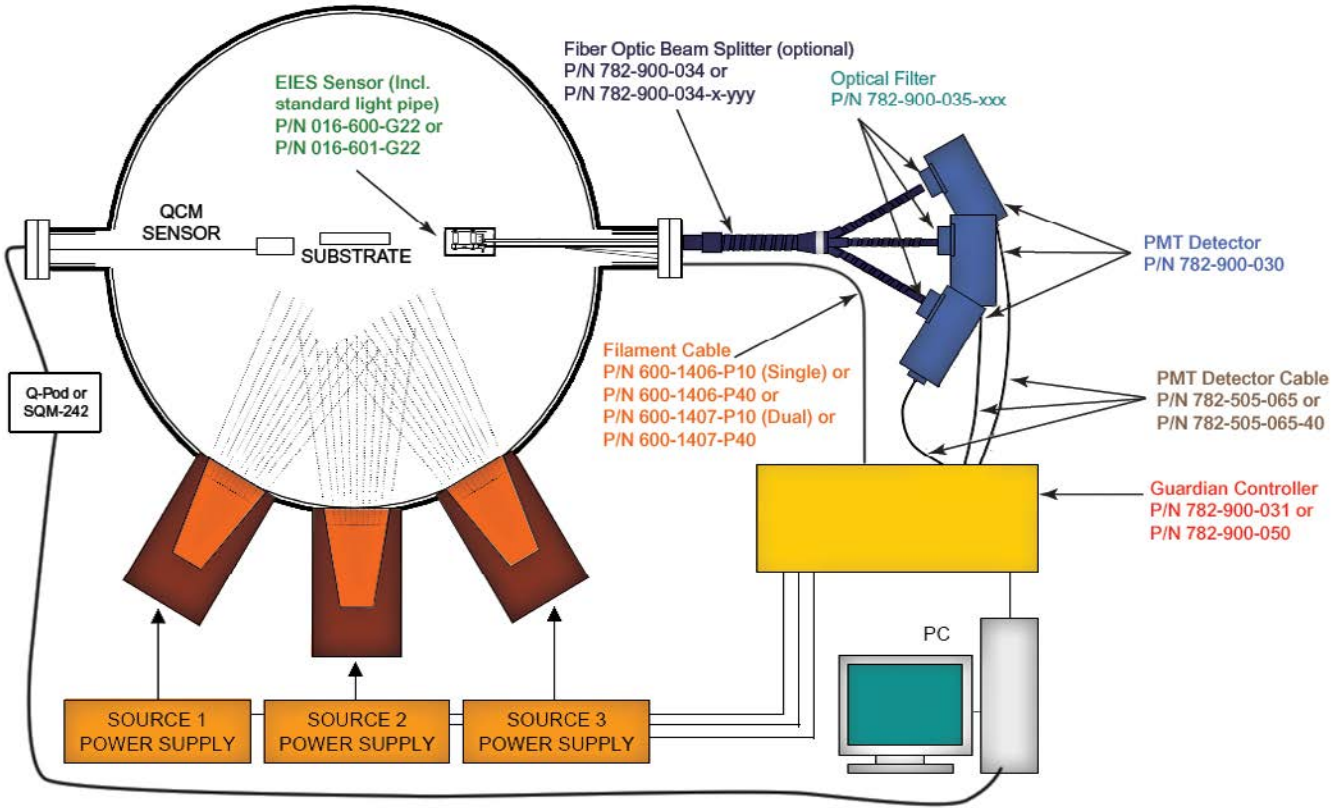
COMPUTER

user-supplied:	Any computer with Windows Vista / XP / 2000 / 7 / 8 / 10 operating system, and Ethernet or RS-232 interface

CONFIGURATION GUIDE

Guardian uses EIES (Electron Impact Emission Spectroscopy) technology to detect and monitor the deposition of thin films. It is especially useful for CIGS applications. A complete Guardian system includes a Guardian controller, an EIES Sensor with the appropriate filament cable, and an Optical Detector with the appropriate detector cable and filter. Up to four materials can be monitored at once with a single sensor (8 materials for two sensors) using the optional beam splitter and the appropriate number of detectors. Guardian can also be paired with a Q-pod or SQM-242 QCM system for automatic calibration through the Guardian software.

The following guide will help you select the options and accessories needed to build a complete Guardian system.



Guardian (continued)

ORDERING INFORMATION

GUARDIAN CONTROLLER (CHOOSE ONE)	
782-900-031	**Guardian Controller for One Sensor (Standard or Gas Compensating)** Guardian EIES Controller with one sensor input. This will work with either a standard or gas compensating sensor.
782-900-050	**Guardian Controller for Two Sensors (Standard or Gas Compensating)** Guardian EIES Controller with two sensor inputs. This will work with either a standard or gas compensating sensor in each of two inputs.
EIES SENSOR (CHOOSE ONE)	
016-600-G22	**Guardian Standard Single Sensor & Feedthrough Assembly, 22" (539 mm), CF40 Flange** Standard EIES single sensor. Includes CF40 (2-3/4" ConFlat) feedthrough assembly and in-vacuum hardware, standard 20" (508 mm) light pipe and in-vacuum EIES cable, 22" (539 mm). Other lengths available on request, min. 6.25" (159 mm), max. 32" (813 mm).
016-601-G22	**Guardian Gas Compensating Sensor & Feedthrough Assembly, 22" (539 mm), CF40 Flange** Gas compensating EIES sensor. Uses an additional filament to subtract the signal emitted by residual gas to achieve an accurate baseline. Detects materials that have difficulty when using a standard single sensor due to residual gas. Other lengths available on request, min. 9" (229 mm), max. 34.6" (879 mm).
BEAM SPLITTER (OPTIONAL)	
782-900-034	**Guardian Fiber Optic Beam Splitter (1:3) – 400 mm length** Splits the light beam from the sensor into 3 separate beams. Allows the detection of 3 materials from the same sensor. An optical detector and optical filter must be attached to each of the 3 ends.
782-900-034-x-yyy	**Guardian Fiber Optic Beam Splitter (1:x) – yyy mm length** A custom version of the standard beam splitter. The x value determines how many ways the beam is split (2 or 4 are the choices) and yyy determines the length of the splitter (400 mm is typical).
FILAMENT CABLE (CHOOSE ONE PER SENSOR) NEW DESIGN ATTACHES SECURELY TO FEEDTHROUGH.	
Cable that connects a standard single sensor feedthrough to the Guardian Controller.	
600-1406-P10	Guardian Single Filament Cable, 10' (3m)
600-1406-P40	Guardian Single Filament Cable, 40' (12m)
Cable that connects a gas compensating sensor feedthrough to the Guardian Controller.	
600-1407-P10	Guardian Dual Filament Cable, 10' (3m)
600-1407-P40	Guardian Dual Filament Cable, 40' (12m)
PMT DETECTOR (SELECT APPROPRIATE QUANTITY)	
782-900-030	**Guardian PMT Detector** Works in conjunction with an optical filter to isolate and detect the light from the sensor for a given material being deposited. Optical filters sold separately.
PMT DETECTOR CABLE (SELECT APPROPRIATE QUANTITY AND LENGTH)	
Cable that connects the optical detector to the Guardian.	
782-505-065	Guardian Detector Cable, 10' (3m)
782-505-065-40	Guardian Detector Cable, 40' (12m)

Guardian (continued)

ORDERING INFORMATION (CONTINUED)

GUARDIAN EIES OPTICAL FILTERS (SELECT APPROPRIATE QUANTITY AND WAVELENGTH)	
Filters the beam of light received by the optical detector to single out a specified wavelength. This allows the Guardian to monitor the specific material being deposited. Other filters available on request.	
782-900-035-202	Guardian optical filter – center wavelength – 202 nm, BP10 nm, (Zn)
782-900-035-241	Guardian optical filter – center wavelength – 241 nm, BP10 nm, (Co, Au)
782-900-035-252	Guardian optical filter – center wavelength – 252 nm, BP10 nm, (Si)
782-900-035-265	Guardian optical filter – center wavelength – 265 nm, BP10 nm, (Ge, Pt, Ta, Ir)
782-900-035-267	Guardian optical filter – center wavelength – 267 nm, BP3 nm, (Au)
782-900-035-294	Guardian optical filter – center wavelength – 294 nm, BP2 nm, (Hf) (Ga [when using a gas compensating sensor])
782-900-035-304	Guardian optical filter – center wavelength – 304 nm, BP2 nm (Ba, In [when using a gas compensating sensor])
782-900-035-325	Guardian optical filter – center wavelength – 325 nm, BP10 nm, (Cu, Cd)
782-900-035-358	Guardian optical filter – center wavelength – 358 nm, BP10 nm, (Nb, U, Cr)
782-900-035-364	Guardian optical filter – center wavelength – 364 nm, BP10 nm, (Ti, Pb)
782-900-035-396	Guardian optical filter – center wavelength – 396 nm, BP10 nm, (Al)
782-900-035-417	Guardian optical filter – center wavelength – 417 nm, BP2 nm, (Ga)
782-900-035-451	Guardian optical filter – center wavelength – 451 nm, BP5 nm, (In)
REPLACEMENT PARTS FOR NEW SENSORS AND FEEDTHROUGH ASSEMBLY 016-600-GXX AND -601-GXX	
016-400-G1	Flux Sensor, High Rate for 016-600-Gxx Sensor and Feedthrough Assembly
016-400-G2	Flux Sensor, Standard Rate for 016-600-Gxx Sensor and Feedthrough Assembly
016-400-G5	Gas Sensor, for 016-601-Gxx Sensor and Feedthrough Assembly
016-400-G6	Flux Sensor, for 016-601-Gxx Sensor and Feedthrough Assembly
016-201-G1	Emitter assembly for all 016-400-Gx sensors used in 016-600-Gxx and -601-Gxx
782-900-038	**Guardian Photomultiplier Tube Replacement** Replaces the photomultiplier tube in the optical detector.
016-509-G22	**Guardian Sensor EIES In-vacuum Cable, 22" (559 mm), other lengths available.** A gas compensating sensor uses two cables. For retrofit to new sensors.
REPLACEMENT PART FOR DISCONTINUED SENSORS	
782-530-015	**Guardian Sensor Filament Replacement (for discontinued 782-900-029 and -052 sensors)** Replacement filaments for EIES sensors. A gas compensating sensor uses two filaments.

Quartz Crystal Sensors and Feedthroughs

This page left blank intentionally.

Front Load Single Sensor

INFICON Front Load Single Sensors offer proven reliability and durability and have the best thermal stability of any sensor head on the market. The front load design allows for easy insertion of the crystal holder in applications lacking sufficient room for side insertion. Assembled mechanically rather than soldered, parts can be replaced conveniently in the field, if necessary. Sensors can be ordered individually or in a sensor / feedthrough combination that can be either welded or assembled with compression fittings.

SENSOR CONFIGURATIONS

Two sensor configurations are offered: the standard version and the right angle (compact) version. The standard version is designed for installation from the side or bottom of the chamber having the cooling tubes parallel to the crystal face. The right angle version is designed for installation through the top of the vacuum system having the water cooling tubes perpendicular to the crystal face. Optionally, sensors can be ordered with a pneumatically driven crystal shutter to protect the crystal during source warm up, when not used during deposition of an alternate material, or to extend crystal life when used with RateWatcher™. The shutter is designed to flip down allowing easy crystal replacement.

The exposed crystal electrode is fully grounded to effectively eliminate problems due to RF interference.

FEEDTHROUGHS

INFICON offers two types of feedthroughs, either a 1 inch bolt feedthrough or a 2¾ inch (CF40) ConFlat® flange feedthrough. KF40 feedthroughs are available on request.

FEEDTHROUGH CONNECTION

Front Load Single Sensors can be ordered in combination with a feedthrough. The sensor / feedthrough connection can be either welded or made with compression fittings. Compression fittings allow for easy adjustability without the need for brazing or welding. The feedthrough can be moved along the length of the tubes allowing the length inside the vacuum systems to be adjusted over a range of 20.3–71.1 cm (8–28 in.) for “E” length sensors. Once the desired length is determined, the compression fittings allow for a finger tight tube seal. Alternately, a welded connection may be chosen.

ADVANTAGES

- Front load crystal holder
- Easy installation
- Available with:
  – CF40 feedthrough
  – 2.54 cm (1 in.) bolt feedthrough
- Adjustable length if ordered with compression fittings
- Sensor / feedthrough combinations available welded to customer specified lengths
- No brazing required if ordered with compression fittings or welded to feedthrough

Front Load Single Sensor (continued)

ORDERING INFORMATION

FRONT LOAD SINGLE SENSOR (WITH IN-VACUUM CABLES)

S L – [ ][ ][ ][ ][ ] – [ ][ ]

Type of Sensor
(Includes in-vacuum cable. Crystals sold separately.)

- A — Standard sensor (water lines parallel)
- B — Right angle sensor (water lines perpendicular)

Shutter Assembly – SEE NOTE 3

- 0 — None
- 1 — Standard shutter

Length of Sensor – SEE NOTE 2

- E — Standard length: includes 78.1 cm (30.75 in.) in-vacuum cable

Feedthrough – SEE NOTE 1

- 0 — None
- 3 — 1 in. bolt
- 4 — CF40

Feedthrough Connection – SEE NOTES 3 & 4

- 0 — Sensor not connected to feedthrough
- 7 — Sensor welded to feedthrough
- 8 — Feedthrough equipped with Ultra-Torr® compression fittings (allows for adjustable sensor length)

Welded Sensor Length SEE NOTES 2 & 5

(Use only when feedthrough connection is 7)

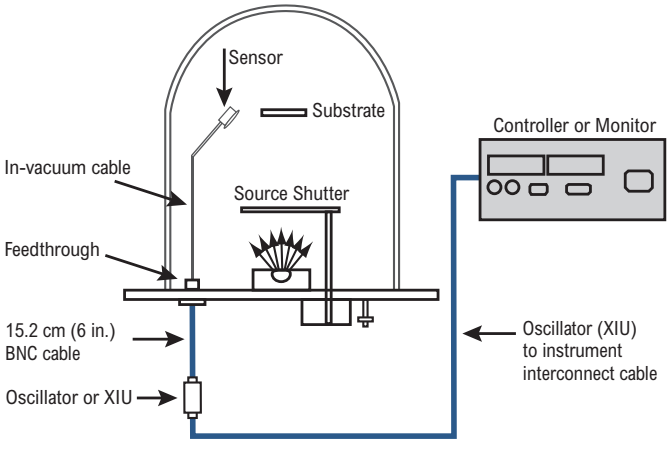
Not required when feedthrough connection option is 0 or 8

- 71–99 — Weld length in centimeters, 71–99 cm (28–39 in.).
- 20–70 — Weld length in centimeters, 20–70 cm (8–27.5 in.)

***Other lengths may be available: contact factory. Other lengths will be considered a special order and will be subject to additional cost and lead time.

The following combinations are not available: (see notes 3 and 4): SL-A1E38, SL-B1E38, SL-A1E47, and SL-B1E47

Examples of non-valid part numbers include all options with no feedthrough connection or compression fittings and a welded sensor length; for example, SL-A0E48-20, SL-B1E40-20, etc.



NOTE 1:
Feedthrough configuration varies depending on options selected (Front Load or Cool Drawer, with or without shutter, type of feedthrough, etc.). Example: SL-A0E37 uses feedthrough PN 002-042 while SL-A1E37 uses feedthrough PN 750-030-G1.

NOTE 2:
Sensor lengths are measured from center of the crystal to the vacuum side (sealing surface) of the feedthrough. Once a welded sensor order is confirmed, it cannot be cancelled.

NOTE 3:
Front Load Sensors ordered with shutters and 1 in. bolt style feedthrough can only be welded (compression fittings not available).

NOTE 4:
Front Load Sensors ordered with a CF40 feedthrough and a shutter cannot be welded due to dimensional limits of the CF40.

NOTE 5:
Front Load sensors welded to lengths between 28–34 in. will include a 36 in. in-vacuum cable. Sensors welded to lengths between 34–39 in. will include a 48 in. in-vacuum cable.

Front Load Single Sensor (continued)

SPECIFICATIONS

SL-A _ E _ SERIES STANDARD SINGLE SENSOR	
Maximum bakeout temp with no water	130°C
Maximum operating isothermal environment temperature with minimum water flow	400°C
SL-A Size (maximum envelope without shutter)	27 x 61.47 x 17.53 mm (1.063 x 2.42 x 0.69 in.)
Water tube	3.175 mm (1/8 in.) O.D. seamless stainless steel
Crystal exchange	Front loading; self-contained package for ease of exchange
Mounting	Two #4-40 tapped holes on the back of the sensor body
INSTALLATION REQUIREMENTS	
Feedthrough	Two pass water 4.8 mm (3/16 in.) OD tubing with Microdot coax connector
Water flow rate	Minimum water flow 150-200 cm^3/min, 30°C max (Do not allow to freeze)
Water quality	S-304, 3.175 mm (0.125 in.) O.D. x 0.381 mm (0.015 in.) wall thickness seamless stainless steel tubing
MATERIALS	
Body and holder	304 type stainless steel
Springs, electrical contacts	Au plated Be-Cu
Water tubes	S-304, 3.175 mm (0.125 in.) O.D. x 0.381 mm (0.015 in.) wall thickness seamlessstainless steel tubing
Connector (Microdot)	Stainless steel, Teflon® and glass insulated
Insulators	>99% Al_2O_3
Wire	Teflon insulated copper
Braze	Vacuum process high temperature Ni-Cr alloy
Crystal	13.97 mm (0.550 in.) diameter

Front Load Single Sensor (continued)

SPECIFICATIONS

SL-B _ E _ SERIES RIGHT ANGLE SINGLE SENSOR SPECIFICATIONS	
Maximum bakeout temp. with no water	130°C
Maximum operating isothermal environment temperature with minimum water flow	400°C
SL-B _ E _ size	28.19 x 26.92 x 26.92 mm (1.11 x 1.06 x 1.06 in.) (maximum envelope without shutter)
Water tube	3.175 mm (1/8 in.) O.D. seamless stainless steel
Crystal exchange	Front loading; self-contained package for ease of exchange
Mounting	Two #4-40 tapped holes on the back of the sensor body
INSTALLATION REQUIREMENTS	
Feedthrough	Two pass water 4.8 mm (3/16 in.) OD tubing with Microdot coax connector
Other	XIU or oscillator to match specific controller, solenoid valve assembly 750-420-G1 for shuttered sensors
Water flow rate	Minimum water flow 150-200 cm^3/min, 30°C max
Water quality	Coolant should not contain chlorides as stress corrosion cracking may occur. Extremely dirty water may result in loss of cooling capacity
MATERIALS	
Body and holder	304 type stainless steel
Springs, electrical contacts	Au plated Be-Cu
Water tubes	S-304, 3.175 mm (0.125 in.) O.D. x 0.381 mm (0.015 in.) wall thickness seamless stainless steel tubing
Connector (Microdot)	Stainless steel, Teflon and glass insulated
Insulators	>99% Al_2O_3
Wire	Teflon insulated copper
Braze	Vacuum process high temperature Ni-Cr alloy
Crystal	0.550 in. (13.97 mm) diameter

SPECIFICATIONS

FEEDTHROUGH SPECIFICATIONS	
NOTE: Sensor / feedthrough combination specifications are determined by lowest component specification	
1 IN. BOLT AND ULTRA-TORR (COMPRESSION FITTING) TERMINATIONS	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, Viton
Temperature	Operational environment to 300°C with water cooling or 165°C without
Mounting	25.8 mm (1.015 in. ±0.010 in.) diameter aperture
CF40 (2 3/4 IN. CONFLAT) WITH WELDED TERMINATIONS:	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel
Temperature	Operational environment to 450°C with water cooling or 165°C without
Mounting	Mates with 2¾ in. ConFlat type flanges with 1.375 in. I.D. min.

Front Load Single Sensor (continued)

SPARE PARTS LIST

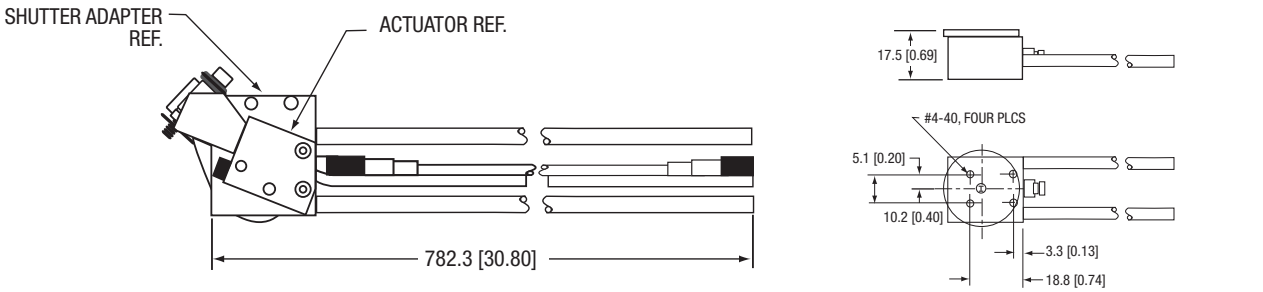
PN	DESCRIPTION
007-007	Retainer spring (for crystal holder)
007-023	Ceramic retainer
007-044	In-vacuum cable, 78.1 cm (30.75 in.)
080-018	Set screw (for female coax)
082-044	Teflon screw (for leaf spring)
750-115-P4	Coupling (for bellows assembly)
750-169-P2	Bellows assembly (coupling not included)
750-171-P1	Finger spring contact

PN	DESCRIPTION
321-039-G13	In-vacuum cable, 154.2 cm (60 in.)
750-172-G1	Crystal holder (includes retainer spring)
750-174-P2	Female coax
750-175-P1	Insulator (underneath leaf spring)
750-188-P3	Leaf spring
750-210-G1	Shutter module (bellows assembly, shaft assembly, and shutter assembly)
750-215-G1	Shaft assembly (part of shutter module)
750-216-G1	Shutter assembly (part of shutter module)

DIMENSIONS

SL-A _ E _ _ SERIES STANDARD SINGLE SENSOR (SENSOR ONLY)

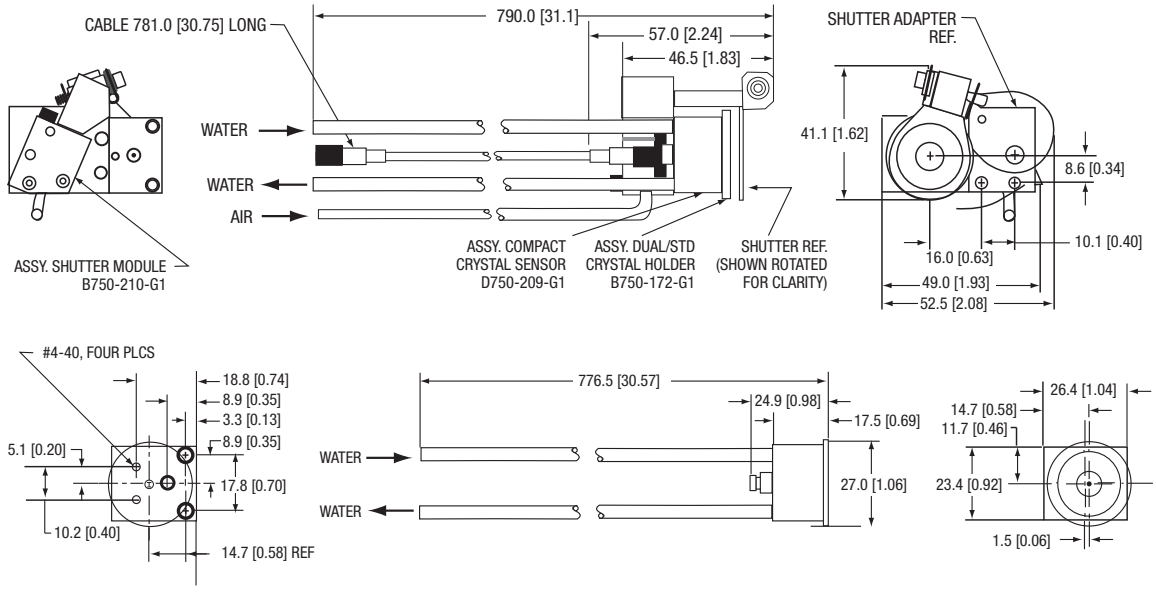
NOTE: Measurements in mm [in.]



DIMENSIONS

SL-B _ E _ _ SERIES RIGHT ANGLE SINGLE SENSOR (SENSOR ONLY)

NOTE: Measurements in mm [in.]

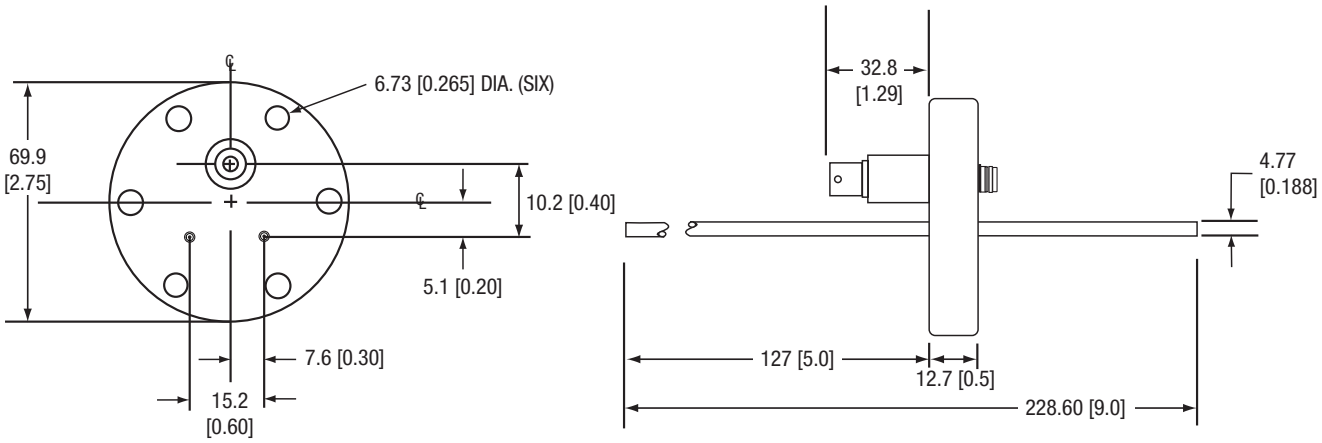


Front Load Single Sensor (continued)

DIMENSIONS

FEEDTHROUGH USED FOR SL-A0E47-XX, SL-A0E40, SL-B0E47-XX, AND SL-B0E40 SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 002-043)

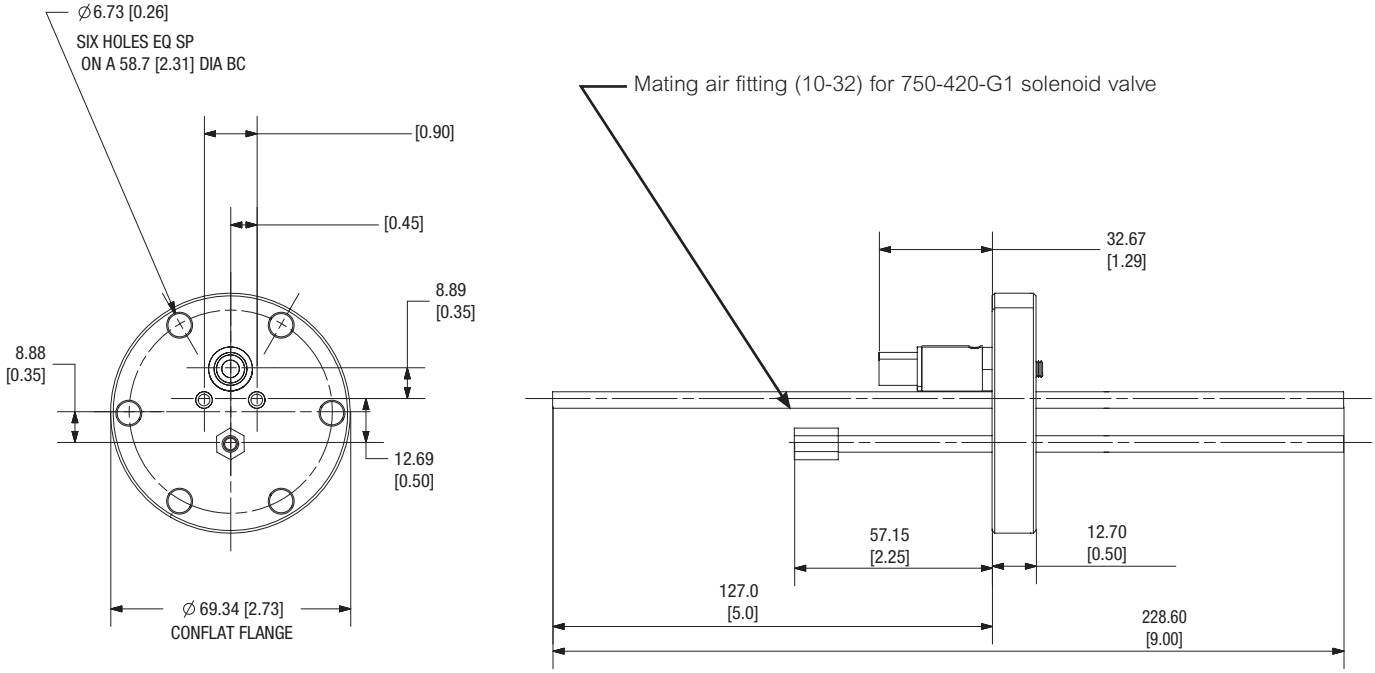
NOTE: Measurements in mm [in.]



DIMENSIONS

FEEDTHROUGH USED FOR SL-A1E40 AND SL-B1E40 SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 750-685-G1)

NOTE: Measurements in mm [in.]

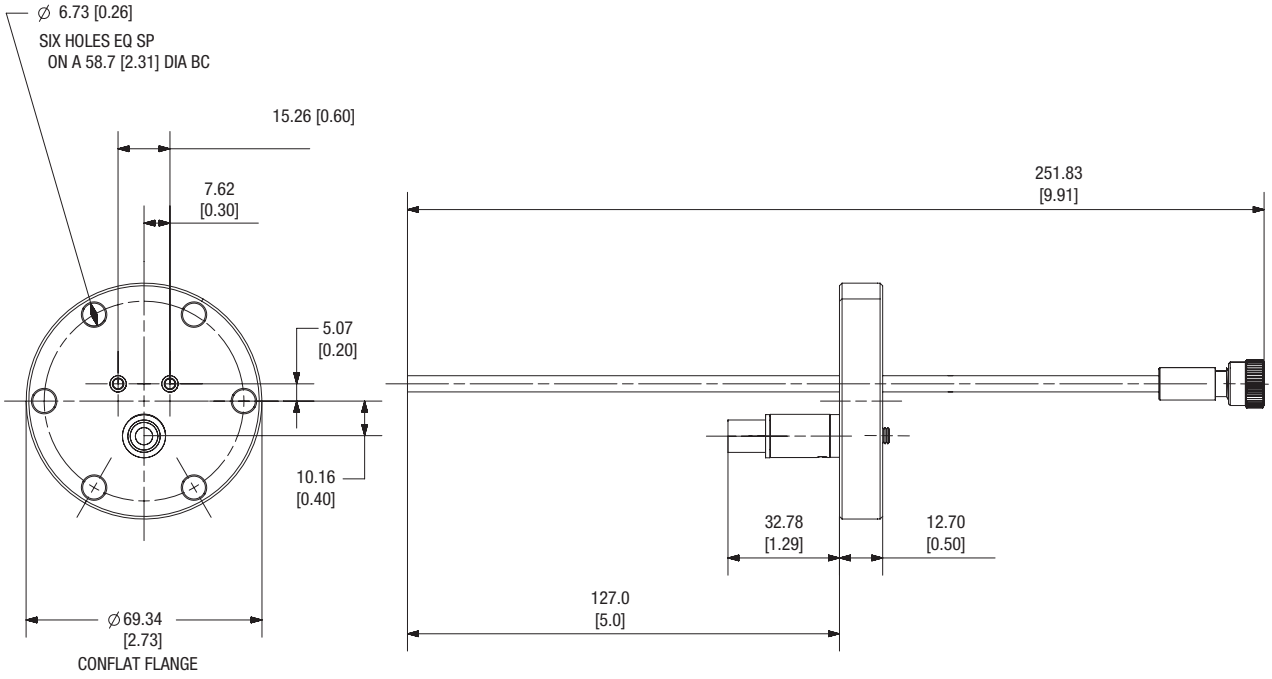


Front Load Single Sensor (continued)

DIMENSIONS

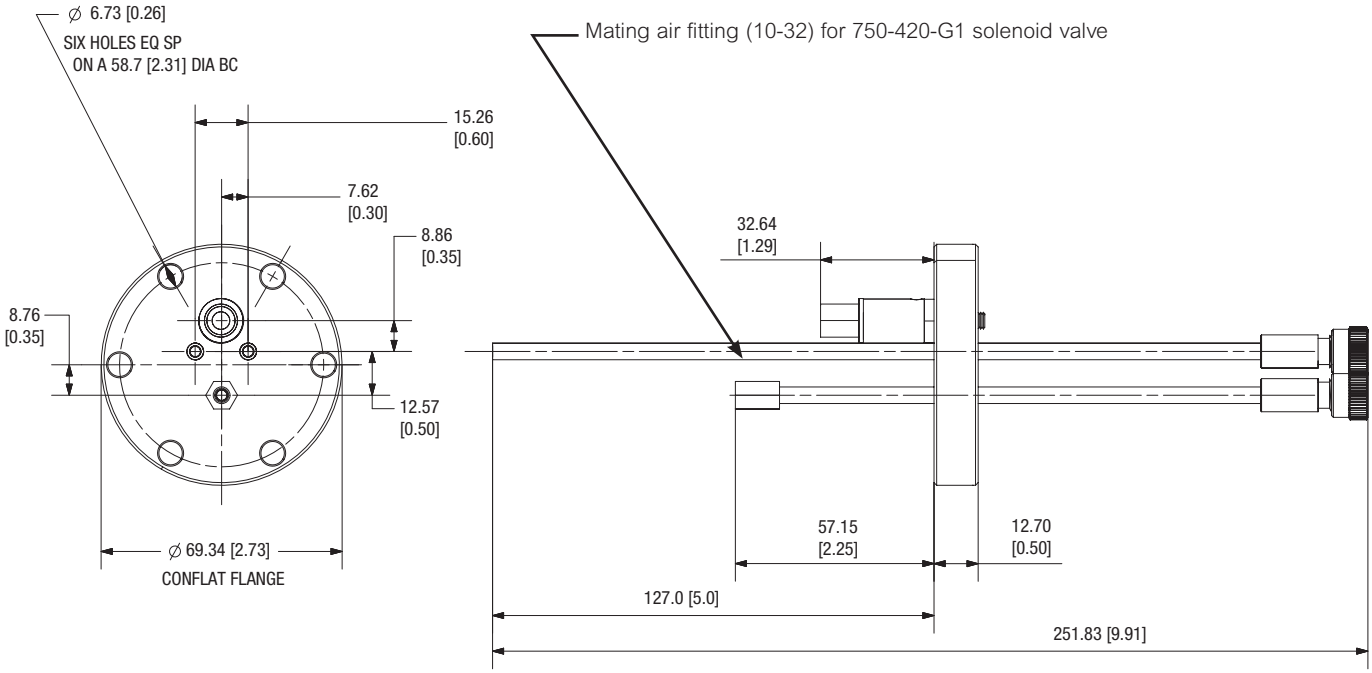
FEEDTHROUGH USED FOR SL-A0E48 AND SL-B0E48 SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 206-878-G2)

NOTE: Measurements in mm [in.]



FEEDTHROUGH USED FOR SL-A1E48 AND SL-B1E48 SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 750-685-G2)

NOTE: Measurements in mm [in.]

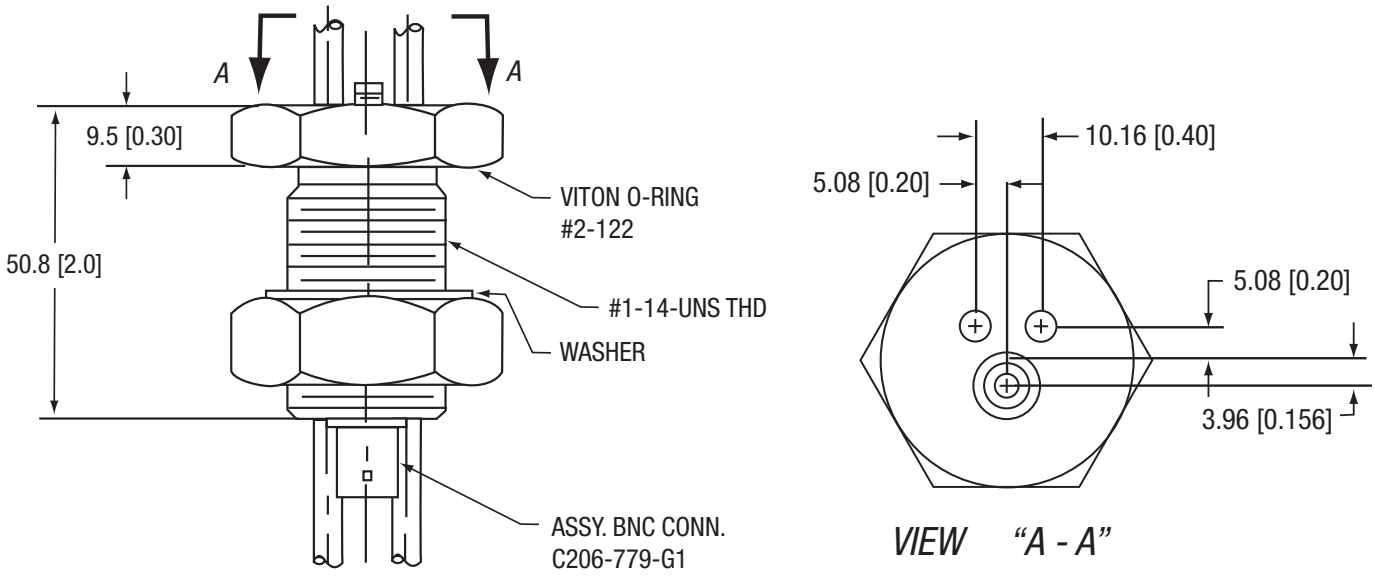


Front Load Single Sensor (continued)

DIMENSIONS

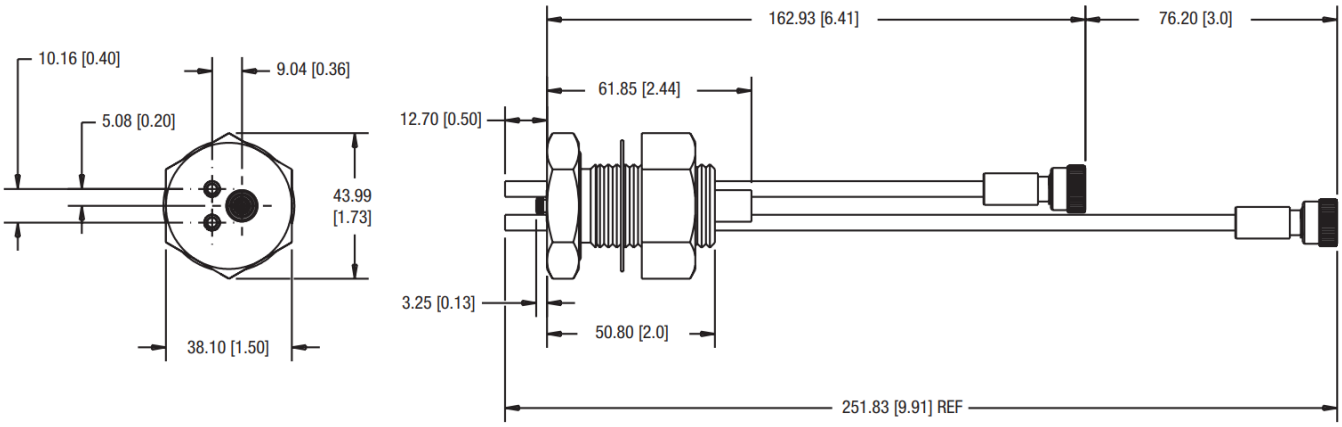
FEEDTHROUGH USED FOR SL-A0E37, SL-B0E37, SL-A0E30 AND SL-B0E30 SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 002-042)

NOTE: Measurements in mm [in.]



FEEDTHROUGH USED FOR SL-A0E38 AND SL-B0E38 SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 750-624-G1)

NOTE: Measurements in mm [in.]

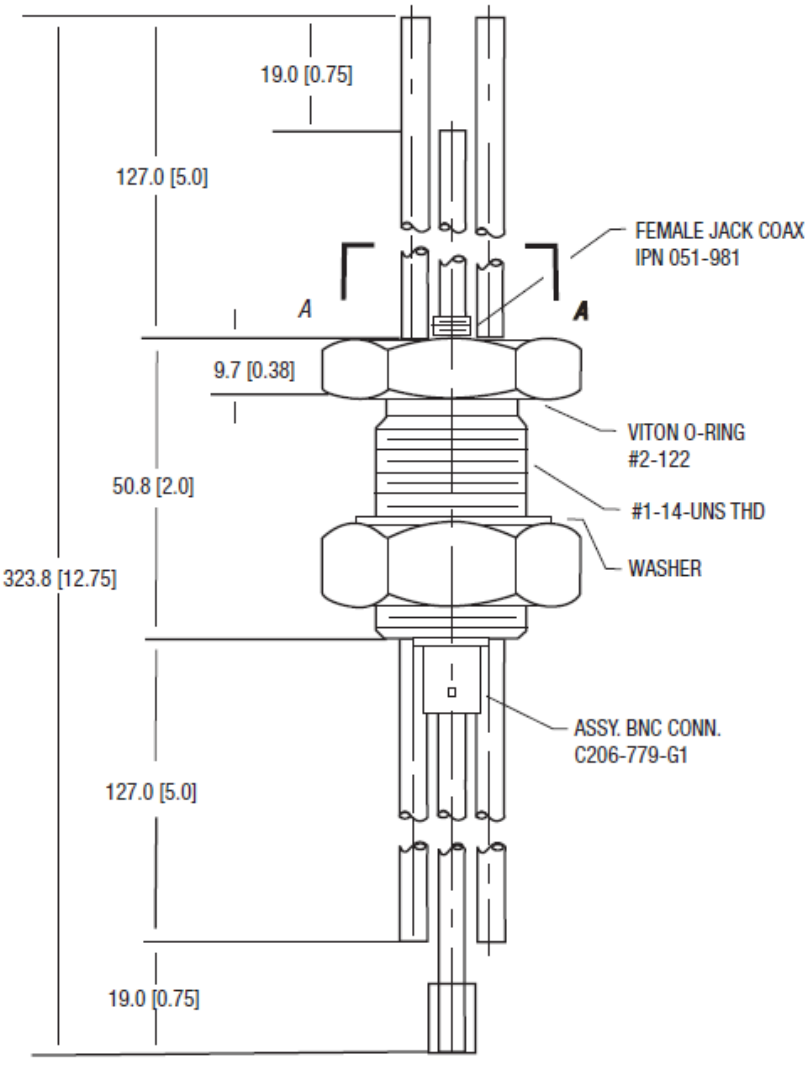


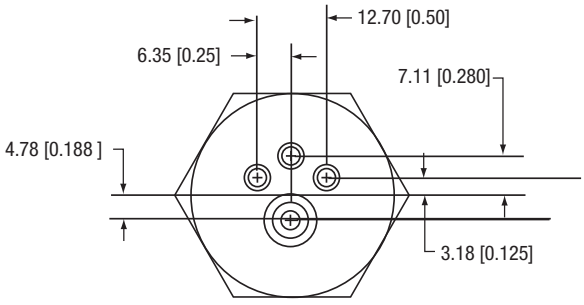
Front Load Single Sensor (continued)

DIMENSIONS

FEEDTHROUGH USED FOR SL-A1E37-XX, SL-B1E37-XX, SL-A1E30 AND SL-B1E30 SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 750-030-G1)

NOTE: Measurements in mm [in.]





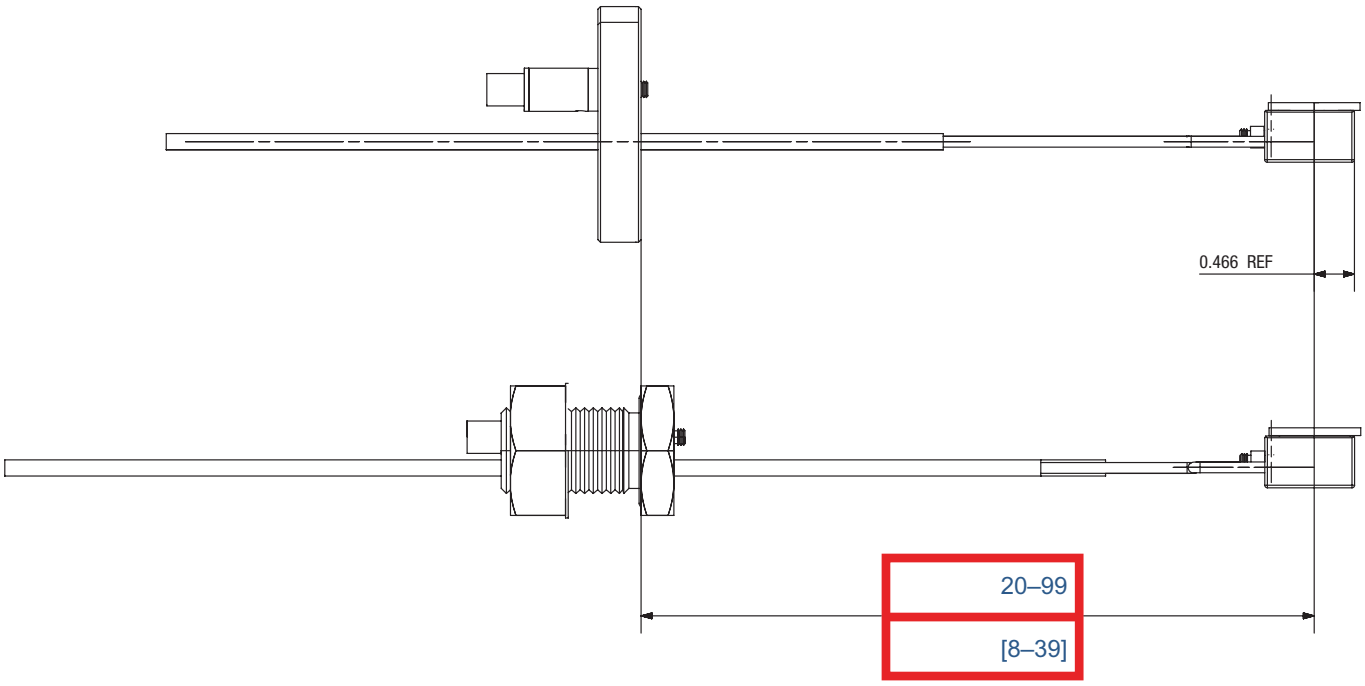
VIEW "A - A"

Front Load Single Sensor (continued)

DIMENSIONS

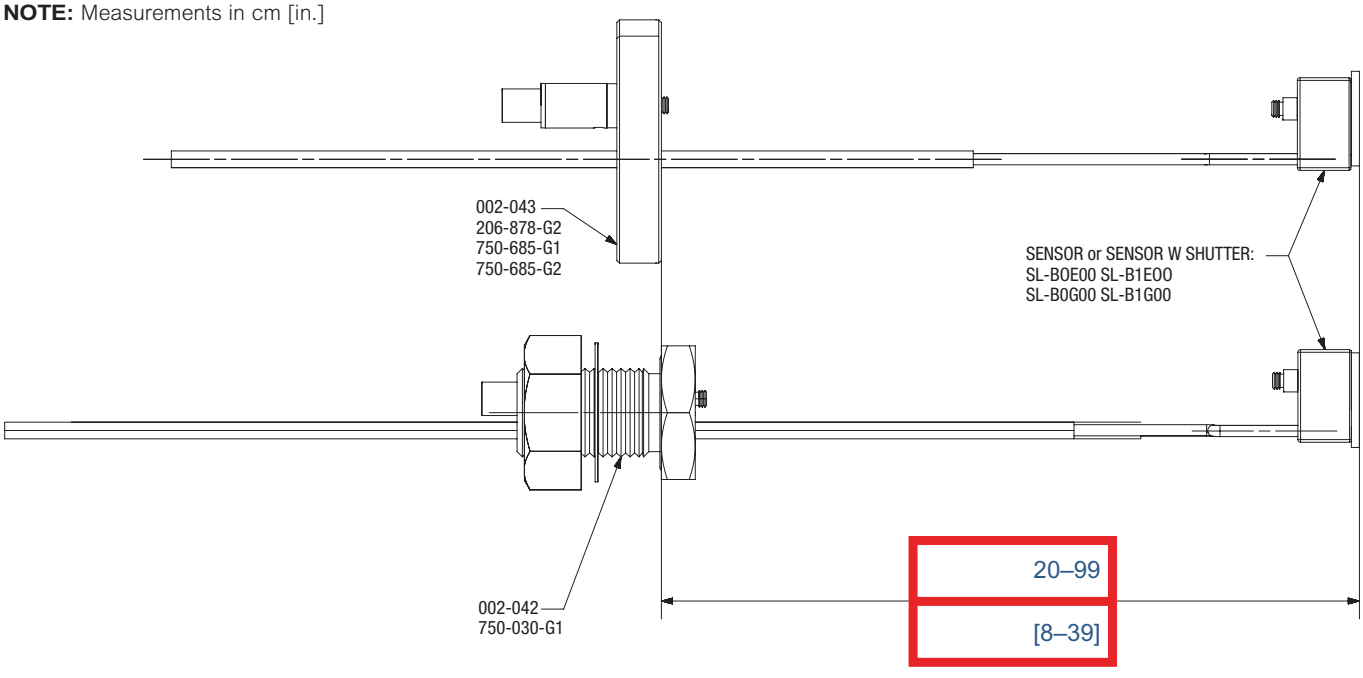
SENSOR LENGTH SPECIFICATION FOR SL-A_ E _ _-XX SENSOR/ FEEDTHROUGH COMBINATIONS

NOTE: Measurements in cm [in.]



SENSOR LENGTH SPECIFICATION FOR SL-B_ E _ _-XX SENSOR / FEEDTHROUGH COMBINATIONS

NOTE: Measurements in cm [in.]



Cool Drawer Single Sensor

The Cool Drawer™ Single Sensors allow crystal installation into the sensor from the side, convenient for systems with insufficient room for front load crystal installation. The Cool Drawer Single Sensor employs the Cool Drawer Crystal Holder which is thermally shielded by the water-cooled housing ensuring excellent crystal performance.

SENSOR CONFIGURATIONS

Two sensor configurations are offered: the standard version and the right angle version. The standard version is designed for installation from the side or bottom of the chamber and the cooling tubes and the crystal face are parallel. The right angle version is designed for installation through the top of the vacuum system and the water cooling tubes are perpendicular to the crystal face. Both versions are available with or without a crystal shutter.

The exposed crystal electrode is fully grounded to effectively eliminate problems due to RF interference. The housing is provided with two tapped (4-40) holes for convenient mounting.

FEEDTHROUGHS

IINFICON offers two choices for feedthrough connection types: either a 1 in. bolt feedthrough or a 2¾ in. ConFlat® feedthrough.

FEEDTHROUGH CONNECTIONS

Cool Drawer Single Sensors must be ordered in combination with a feedthrough. The sensor / feedthrough connection can be either welded or made with compression fittings.

Compression fittings allow for easy adjustability without the need for brazing or welding. The feedthrough can be moved along the length of the tubes allowing the length inside the vacuum system to be adjusted over a range of 10 – 66 cm (4 – 26 in.). Once the desired length is determined, the compression fittings allow for a finger tight tube seal.

When selected with the welded CF40, the sensor is designed for high temperature processes where reliability is critical. Constructed of stainless steel and ceramic materials it is suitable for applications requiring high temperature bakeout (see specifications).

ADVANTAGES

- No internal cables
- Cool Drawer crystal holder
- Easy installation
- Bakeable if ordered with welded CF40 flange
- Available with:
  – CF40 feedthrough
  – 2.54 cm (1 in.) bolt feedthrough
- Adjustable length if ordered with compression fittings
- No brazing required if ordered with compression fittings
- Sensor / feedthrough combinations available welded to customer specified lengths

Cool Drawer Single Sensor (continued)

ORDERING INFORMATION

COOL DRAWER SINGLE SENSOR (WITH CONDUCTOR TUBE)

NOTE: Measurements in cm [in.]

C D S – [ ] [ ] [ ] [ ] [ ] – [ ] [ ]

Type of Sensor (includes user manual, crystal sold separately)

- A — Standard Cool Drawer (water lines parallel to crystal face)
- B — Right angle Cool Drawer (water lines perpendicular to crystal face)

Shutter Assembly

- 0 — None
- 1 — Standard shutter

Length of Sensor – SEE NOTES 1 and 3

- F — Length: 10 – 66 cm (4 – 26 in.)

Feedthrough – SEE NOTES 2 and 4

- 3 — 1 in. bolt
- 4 — CF40

Feedthrough Connection – SEE NOTES 2, 3, and 4

- 7 — Sensor welded to feedthrough
- 8 — Feedthrough equipped with Ultra-Torr compression fittings (allows for adjustable sensor length). NOT AVAILABLE WITH CF40 FEEDTHROUGH AND SHUTTER COMBINATION

Welded Sensor Length – SEE NOTES 1 and 2

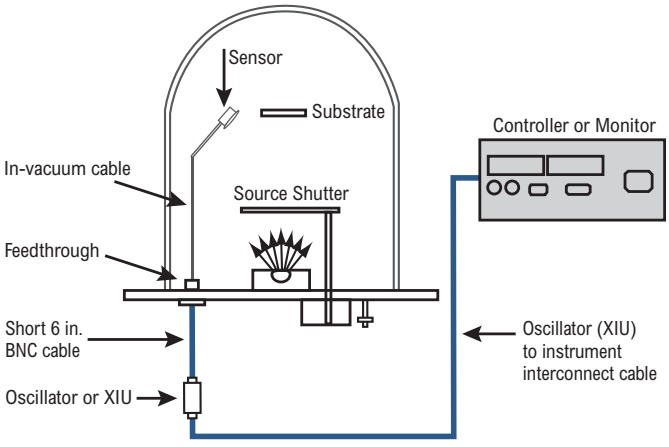
(Use only when feedthrough connection is 7)

Not required when feedthrough connection option is 8.

- 10–66 — Weld length in centimeters, 10 – 66 cm (4 – 26 in.).

***Other lengths may be available: contact factory. Other lengths will be considered a special order and will be subject to additional cost and lead time.

The following combinations are not available: CDS-A1F48, CDS-B1F48. Examples of non-valid part numbers include all options with compression fittings and a welded sensor length; for example, CDS-A0F48-20, etc.



NOTE 1:
Orders for a WELDED sensor / feedthrough combination are measured from center of the crystal to the vacuum side (sealing surface) of the feedthrough. Once a welded sensor order is confirmed, it cannot be cancelled.

NOTE 2:
Feedthrough configuration varies depending on options selected (type of feedthrough and connection). Example: CDS-A1F47-XX and -B1F47-XX use a two-piece hybrid feedthrough design due to dimensional limits of a standard CF40.

NOTE 3:
For sensors ordered without a weld connection (option "8"), tubes are made to a length of approximately 76.2 cm (30 in.) for standard Cool Drawer Sensors and approximately 66 cm (26 in.) for Right Angle Cool Drawer Sensors.

NOTE 4:
Cool Drawer Sensors are not available without a feedthrough and must be either welded or connected with Ultra-Torr fittings.

Cool Drawer Single Sensor (continued)

SPECIFICATIONS

CDS SERIES COOL DRAWER SINGLE SENSOR SPECIFICATIONS	
Finish	Stainless steel, gold plated cool drawer
Cooling water	0.2 GPM using 1/8 in. O.D. tube (Do not allow to freeze)
Electrical connection	One standard female BNC on atmosphere side
Crystal	Industry standard 0.550 in. diameter
Air supply	Shuttered sensors require 55–60 psi regulated.
1 IN. BOLT AND COMPRESSION FITTING TERMINATIONS:	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, Viton®
Temperature	Operational environment to 300°C with water cooling or 165°C without
Mounting	25.8 mm (1.015 in. ±0.010 in.) diameter aperture
CF40 (2 3/4 IN. CONFLAT) WELDED TERMINATIONS:	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel
Temperature	Operational environment to 450°C with water cooling or 200°C without
Mounting	Mates with 2¾ in. ConFlat type flanges with 1.375 in. I.D. min.
Water tubes	S-304, 3.175 mm (0.125 in.) O.D. x 0.381 mm (0.015 in.) wall thickness seamless stainless steel tubing
Connector (Microdot)	Stainless steel, Teflon® and glass insulated
Insulators	>99% Al_2O_3
Wire	Teflon insulated copper
Braze	Vacuum process high temperature Ni-Cr alloy
Crystal	13.97 mm (0.550 in.) diameter

SPARE PARTS LIST

PN	DESCRIPTION
123417	Shutter bracket
123418	Bellows cover
123419	Shutter
147207	Bellows and cover assembly (Items marked with * are included in 147207)
147402	Link
147403*	Actuator
147406*	Bellows support
147407*	Bellows cover
147408*	Threaded shaft
147411	Spacer
147424*	Bellows tube

NOTE: Items marked with * are included in 147207

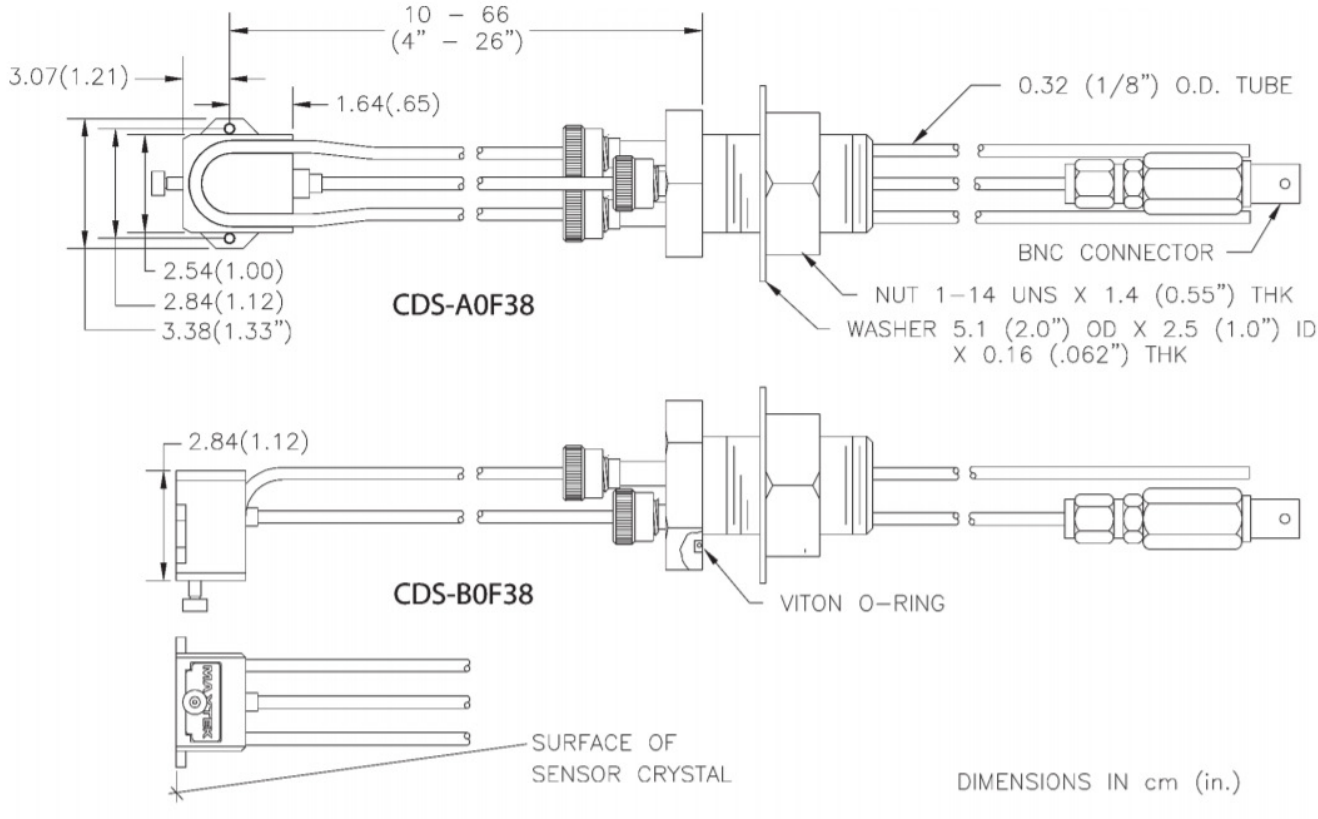
PN	DESCRIPTION
084-026*	Hex nut
084-064*	Lockwasher
084-205*	#4-40 x 3/16 in. Phillips screw
800128	#4 Lockwasher
800371	Shoulder screw
800372	Washer
800416*	6-32 x 3/16 in. set screw
803313*	Spring
123223-1	Conduit brazed assembly – long pin
123223-2	Conduit brazed assembly – short pin
147206-2*	Bellows with 35 in. tube
803102	O-Ring for five port adjustable feedthrough
803261	Washer for five port adjustable feedthrough

Cool Drawer Single Sensor (continued)

DIMENSIONS

CDS-A0F38 AND CDS-B0F38
COOL DRAWER SINGLE SENSOR / FEEDTHROUGH COMBINATIONS

NOTE: Measurements in cm [in.]

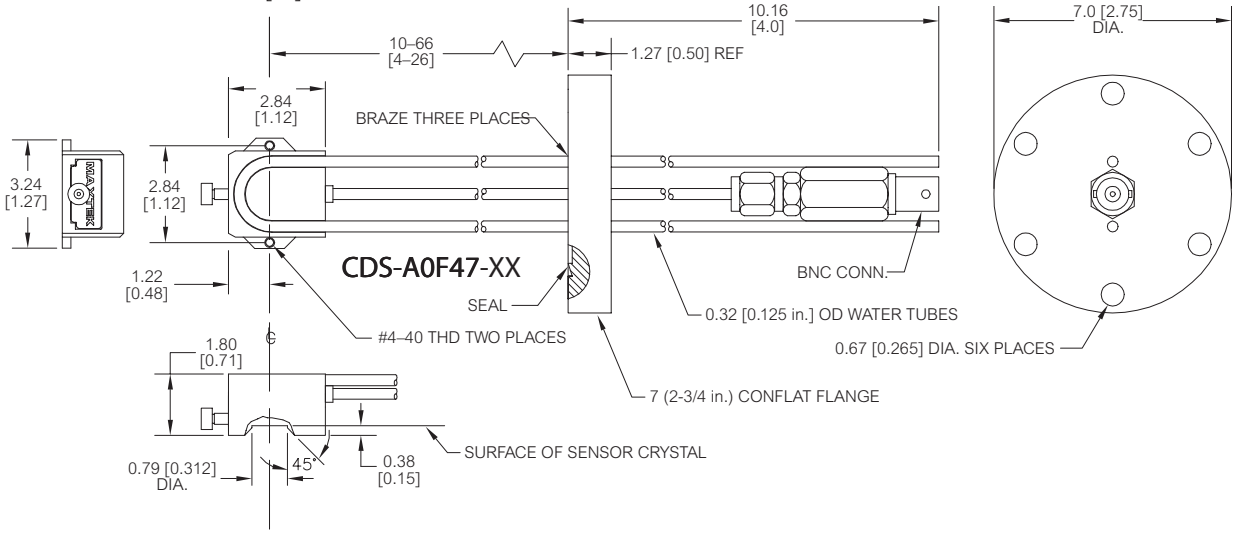


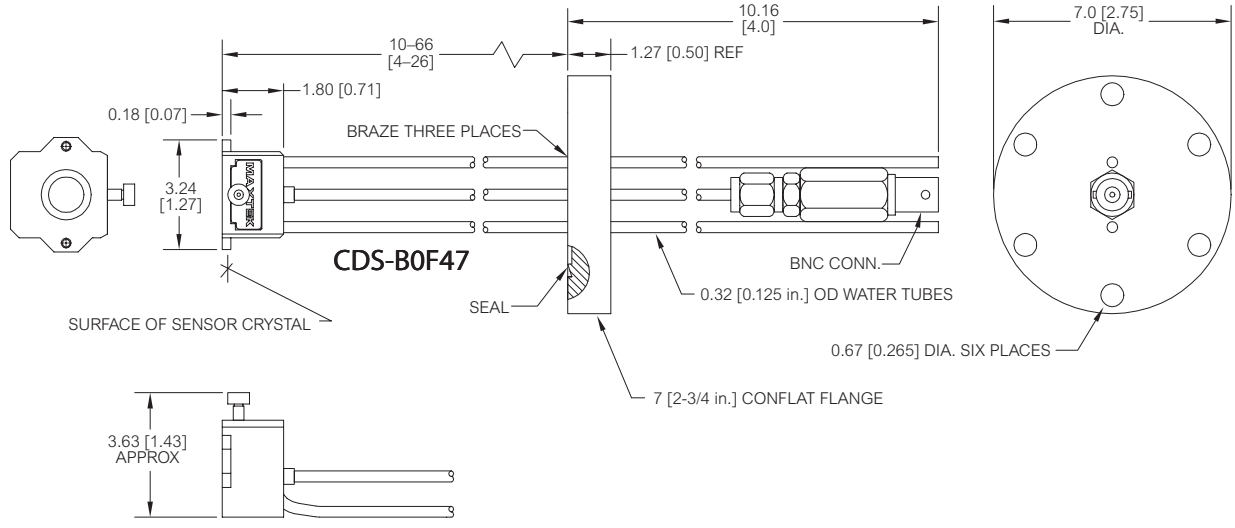
Cool Drawer Single Sensor (continued)

DIMENSIONS

CDS-A0F47-XX AND CDS-B0F47-XX
COOL DRAWER SINGLE SENSOR / FEEDTHROUGH COMBINATIONS

NOTE: Measurements in cm [in.]



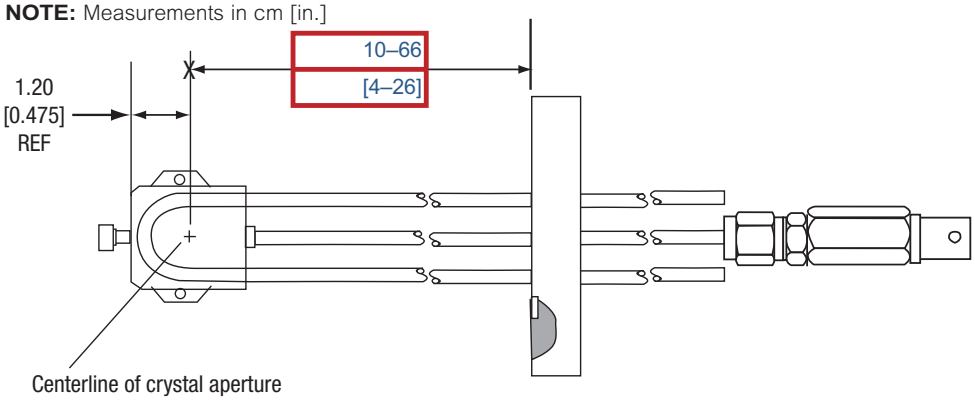


Cool Drawer Single Sensor (continued)

DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDS-A0F47-XX SENSOR / FEEDTHROUGH COMBINATIONS

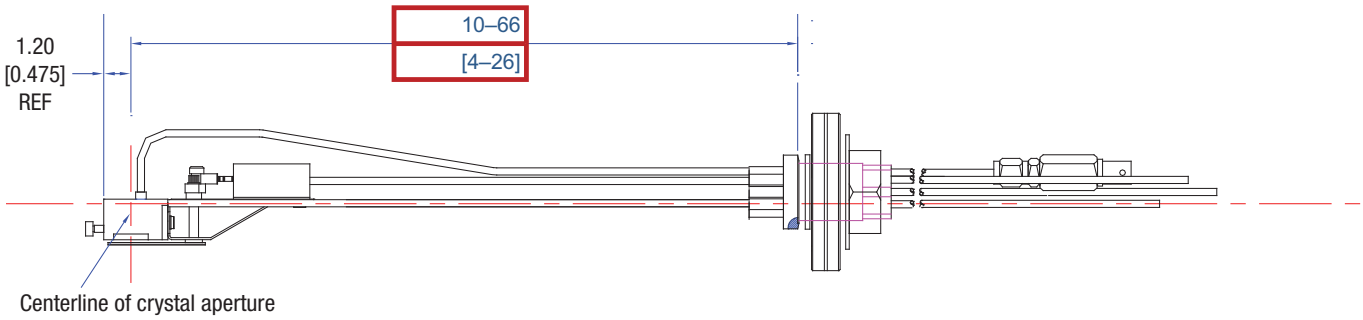
NOTE: Measurements in cm [in.]



DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDS-A1F47-XX SENSOR / FEEDTHROUGH COMBINATIONS

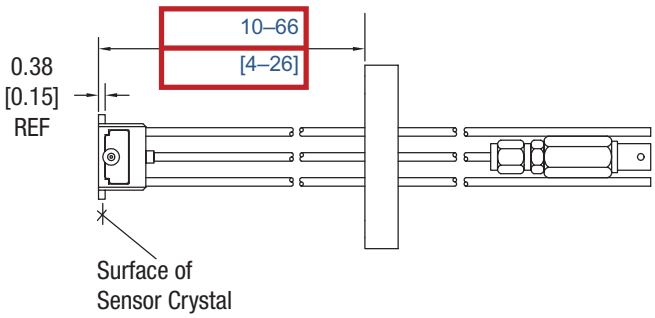
NOTE: Measurements in cm [in.]



DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDS-B0F47-XX SENSOR / FEEDTHROUGH COMBINATIONS

NOTE: Measurements in cm [in.]

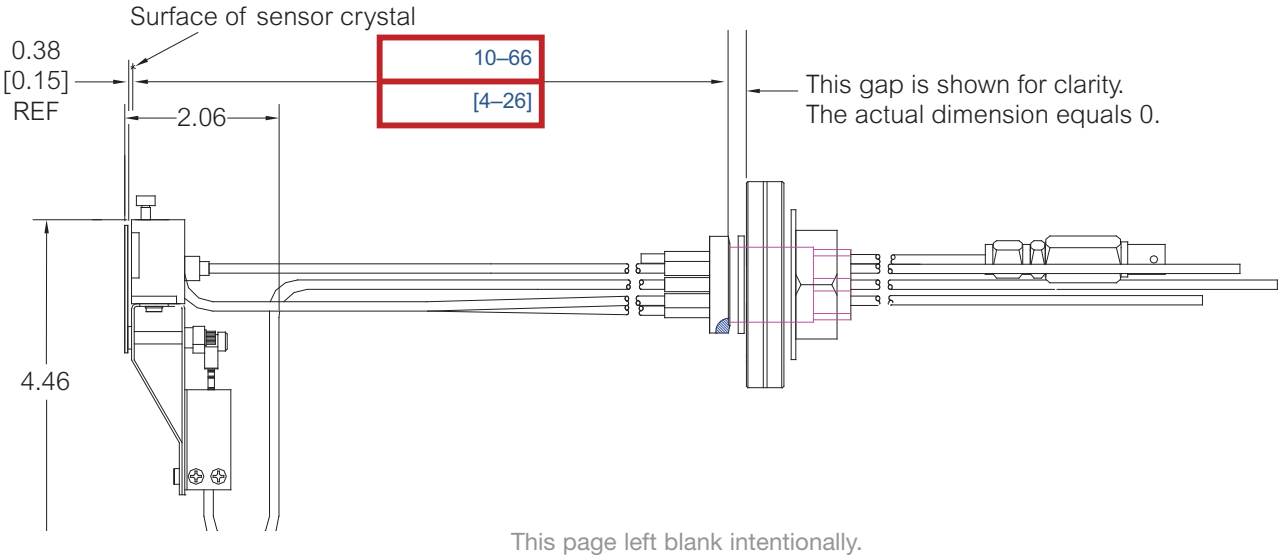


Cool Drawer Single Sensor (continued)

DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDS-B1F47-XX SENSOR / FEEDTHROUGH COMBINATIONS

NOTE: Measurements in cm [in.]

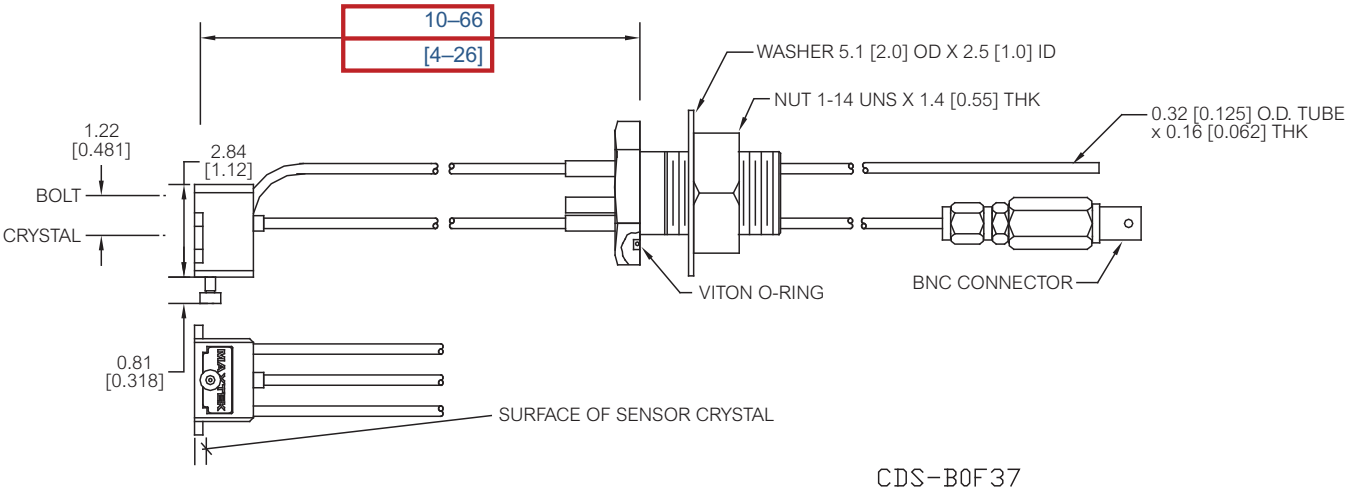


This page left blank intentionally.

DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDS-B0F37-XX SENSOR / FEEDTHROUGH COMBINATIONS

NOTE: Measurements in cm [in.]



Easy Rate Single Sensor

INFICON Easy Rate single crystal sensors minimize quartz crystal microbalance (QCM) total cost of ownership through low price and extended sensor life. This sensor minimizes production cost with the lowest initial investment and total cost of ownership. It is also designed to maximize availability through a long-lasting sensor that has less maintenance. INFICON Easy Rate single crystal sensors are designed and manufactured to provide a cost effective solution to high-accuracy thickness monitoring for short optical and batch coating processes.

SENSOR CONFIGURATIONS

The INFICON Easy Rate Single Sensor is available with standard or right angle orientations. The standard version is designed for installation from the side or bottom of the chamber having the cooling tubes parallel to the crystal face. The right angle version is designed for installation through the top of the vacuum system having the water cooling tubes perpendicular to the crystal face. The front load design allows for easy insertion of the crystal holder in applications lacking sufficient room for side insertion. All Easy Rate Sensors are compatible with industry-standard 6 MHz crystals and are designed for easy crystal changes while remaining rugged enough for even the most demanding depositions.

FEEDTHROUGHS

INFICON Easy Rate Sensors are offered with either a 2.54 cm (1 in.) bolt feedthrough or a CF40 (2.75 in.) ConFlat® flange feedthrough.

FEEDTHROUGH CONNECTION

The sensor / feedthrough connection can be either welded onsite by the user or made with bored-through union fittings. These union fittings allow for easy adjustability without the need for brazing or welding. The length of the tubes can be cut to meet the needs of the chamber, allowing the length inside the vacuum system to be customized and the feedthrough to be attached easily and quickly. Alternately, if using a custom feedthrough or bending the sensor on site, an option of no connection may be chosen allowing for onsite welding.

ADVANTAGES

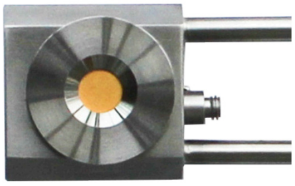
- Minimum investment with lowest upfront cost
- Lowest total cost of ownership
- Maximum throughput with less maintenance
- Optimize system performance through worldwide expert applications support
- Available in two configurations
- Standard (water tubes parallel)
- Right angle (water tubes perpendicular)

AVAILABLE WITH

- 2.54 cm (1 in.) bolt feedthrough
- CF40 feedthrough
- Adjustable position when ordered with bored-through union fittings
- Shutter option available

Easy Rate Single Sensor (continued)

ORDERING INFORMATION



E R S – [ ] [ ] [ ] E 1 [ ] [ ]

Type of Sensor

Standard sensor (water tubes parallel)	A
Right angle sensor (water tubes perpendicular)	B

In-Vacuum Cable

None	0
25.4 cm (10 in.) in-vacuum cable	1
76.2 cm (30 in.) in-vacuum cable	2

Shutter Assembly (SEE NOTE 1)

None	0
Shutter	1

Length of Sensor – SEE NOTE 3

E

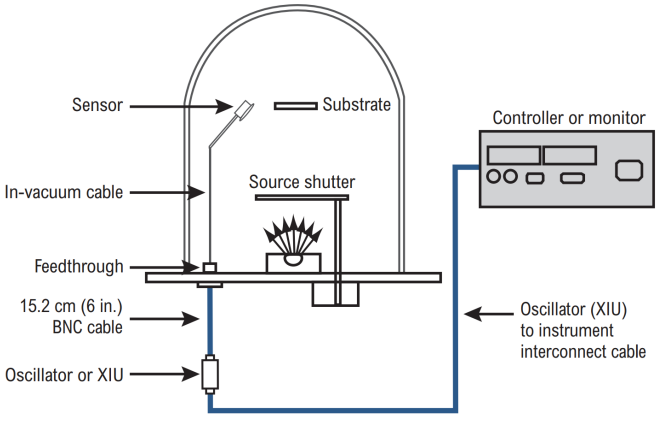
Standard: 771 mm (30.35 in.)
Right angle: 776 mm (30.55 in.)

Feedthrough

0	None
3	1 in. bolt
4	CF40

Feedthrough Connection

0	Sensor not connected to feedthrough
9	**Bored-through union fittings** (Allow the sensor water tubes to slide into the feedthrough.)



The following combinations are not available:
ERS-BX1E1XX

NOTE 1: Shutter not available for Right Angle Single Sensor.

NOTE 2: Crystals sold separately.

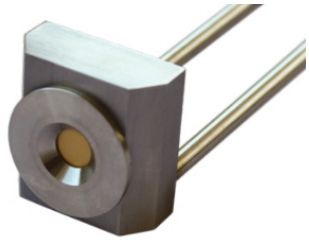
NOTE 3: Sensor length is measured from center of crystal to the end of the water tubes (see drawings).

Easy Rate Single Sensor (continued)

SPECIFICATIONS	
Maximum bakeout temp with no water	175˚ C 165°C (sensor and feedthrough)
Maximum operating isothermal environment	400˚ C
TEMPERATURE WITH MINIMUM WATER FLOW	
Size (maximum envelope without shutter)	3.25 x 4.04 x 1.53 cm (1.28 x 1.59 x 0.60 in.)
Size (maximum envelope with shutter)	3.25 x 7.06 x 3.15 cm (1.28 x 2.78 x 3.15 in.)
Water tube	4.76 mm (0.188 in.) OD seamless stainless steel
Crystal exchange	Front loading
Mounting	Four #4-40 tapped holes on the back of the sensor body
INSTALLATION REQUIREMENTS	
Feedthrough	Two pass water 6.35 mm (0.250 in.) OD with one microdot coaxial connection One pass air 4.76 (0.188 in) OD (with shutter)
Other	XIU or oscillator to match controller, solenoid valve assembly for shuttered sensors
Utilities	Minimum water flow 150 – 200 cm^3/min, 30°C max. For shuttered sensors, air 70 – 80 psi (gauge) {85 – 95 psi (absolute)} (5.8 – 6.5 bar (absolute)) [584–653 kPa (absolute)]. Do not exceed 100 psi (gauge) {115 psi (absolute)} (7.9 bar (absolute)) [791 kPa (absolute)].
Water quality	Coolant should not contain chlorides as stress corrosion cracking may occur. Extremely dirty water may result in loss of cooling capacity.
Crystal	13.97 mm (0.550 in.) diameter
MATERIALS	
Body and holder	304 type stainless steel
Springs, electrical contacts	Gold plated beryllium copper
Water tubes	S-304, 4.76 mm (0.188 in.) OD x 0.51 mm (0.020 in.) wall thickness
SEAMLESS STAINLESS STEEL TUBING	
Connector (Microdot)	Stainless steel, Teflon® and glass insulation
Insulators	>99% aluminum oxide, Teflon
Wire	Tin plated copper

Easy Rate Single Sensor (continued)

SPECIFICATIONS



EASY RATE RIGHT ANGLE SINGLE SENSOR	
Maximum bakeout temp with no water	175˚ C (sensor only no feedthrough) 165˚ C (sensor and feedthrough)
Maximum operating isothermal environment	400˚ C
TEMPERATURE WITH MINIMUM WATER FLOW	
Size	3.25 x 4.04 x 1.53 cm (1.28 x 1.59 x 0.60 in.)
Water tube	4.76 mm (0.188 in.) OD seamless stainless steel
Crystal exchange	Front loading
Mounting	Four #4-40 tapped holes on the back of the sensor body
INSTALLATION REQUIREMENTS	
Feedthrough	Two pass water 6.35 mm (0.250 in.) OD with one microdot coaxial connection. One pass air 4.76 (0.188 in) OD
Other	XIU or Oscillator to match controller, solenoid valve assembly for shuttered sensors
Utilities	Minimum water flow 150-200 cm^3/min, 30° C max. For shuttered sensors, air 70-80 psi (gauge) {85-95 psi (absolute)} (5.8-6.5 bar (absolute)) [584-653 kPa (absolute)]. Do not exceed 100 psi (gauge) {115 psi (absolute)} (7.9 bar (absolute)) [791 kPa (absolute)].
Water quality	Coolant should not contain chlorides as stress corrosion cracking may occur.
Crystal	13.97 mm (0.550 in.) diameter
MATERIALS	
Body and holder	304 type stainless steel
Springs, electrical contacts	Gold plated beryllium copper
Water tubes	S-304, 4.76 mm (0.188 in.) OD x 0.51 mm (0.020 in.) wall thickness
Air tube	S-304, 3.175 mm (0.125 in.) OD x 0.381 mm (0.015 in.) wall thickness seamless stainless steel tubing
SEAMLESS STAINLESS STEEL TUBING	
Connector (Microdot)	Stainless steel, Teflon and glass insulation
Insulators	>99% aluminum oxide, Teflon
Wire	Tin plated copper

Easy Rate Single Sensor (continued)

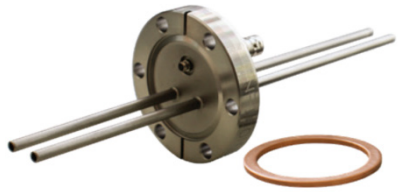
SPECIFICATIONS

Feedthroughs

NOTE: Sensor / feedthrough combination specifications are determined by lowest component specification. Appearance as shown here will differ to match sensor requirements accordingly.

1 IN. BOLT FEEDTHROUGH	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, VITON®
Temperature	Operational environment to 300°C with water cooling or 165°C without
Mounting	25.8 mm (1.015 in., ±0.010 in.) diameter aperture
Electrical connection	BNC connector (atmosphere side)
Sealing surface	O-ring

SPECIFICATIONS



CF40 FEEDTHROUGH	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, copper
Temperature	Operational environment to 450°C with water cooling or 165°C without
Mounting	2 ¾ in. ConFlat type flanges with 1.375 in. I.D. min.
Electrical Connection	BNC connector (atmosphere side)

MICRODOT CONNECTOR (VACUUM SIDE)	
Sealing Surface	Gasket

SPARE PARTS LIST

PN	DESCRIPTION
784-205-G1	Crystal holder assembly, Easy Rate Sensor
784-204-G1	Ceramic retainer
784-404-P1	Retaining ring, Easy Rate Sensor
784-403-P1	Crystal finger spring, Easy Rate Sensor
784-300-P1	Crystal holder, Easy Rate Sensor
784-307-P1	Dual shutter, Easy Rate Sensor
784-405-P1	Holder finger spring, Easy Rate Sensor
080-011-P3	Screw 0-80 x 0.125 in. LG PH PAN HD SS GP
784-322-P1	0-80 retainer plate
784-323-P1	Coax connector, female, flat sides

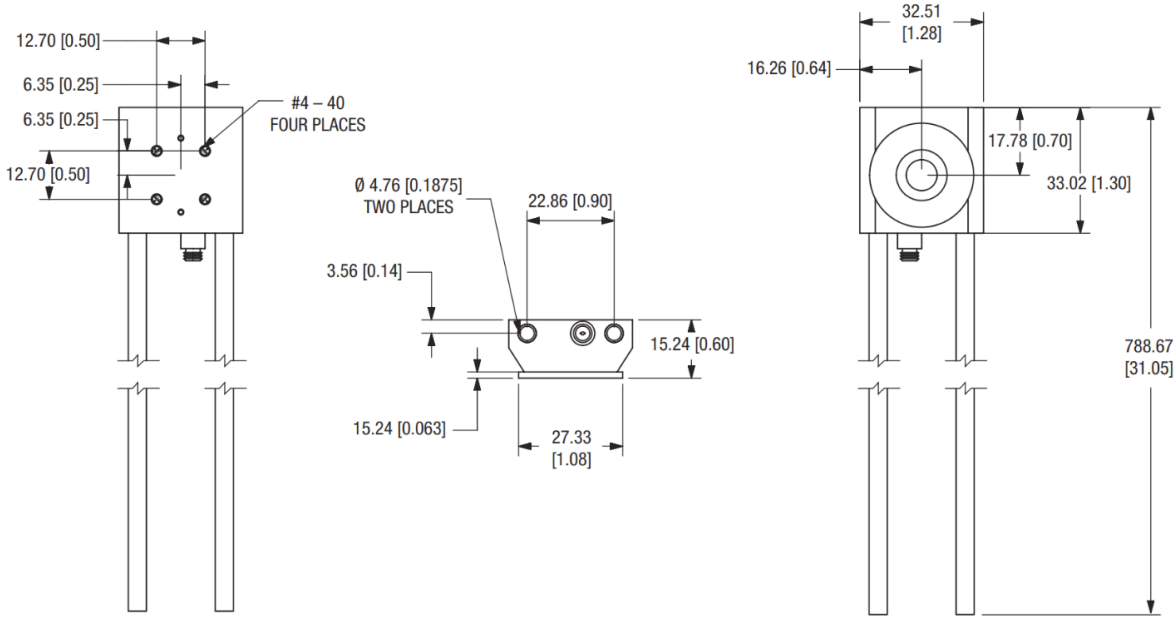
PN	DESCRIPTION
783-500-023	25.4 cm (10 in.) in-vacuum cable
783-500-024	76.2 cm (30 in.) in-vacuum cable
059-0773	0.125 – 0.188 in. thru union with Ferrule set
059-0774	0.188 – 0.250 in. thru union with Ferrule set
784-209-G1	Actuator single kit
750-420-G1	Solenoid valve, 24 V (dc) or 24 V (ac)

Easy Rate Single Sensor (continued)

DIMENSIONS

EASY RATE STANDARD SINGLE SENSOR

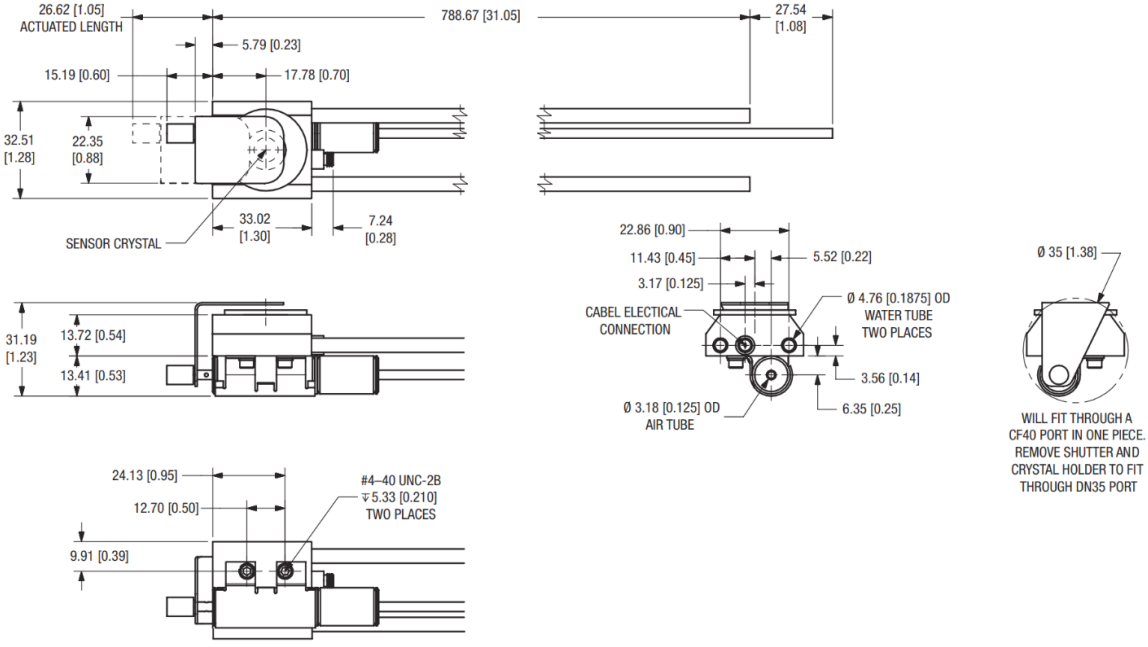
NOTE: Measurements in mm [in.]



DIMENSIONS

EASY RATE SHUTTERED STANDARD SINGLE SENSOR

NOTE: Measurements in mm [in.]

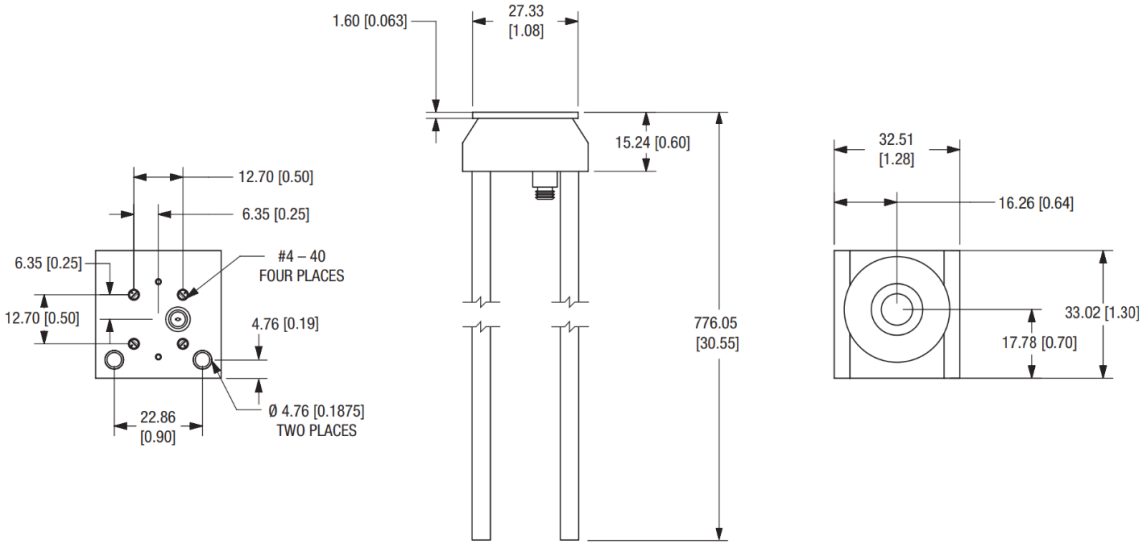


Easy Rate Single Sensor (continued)

DIMENSIONS

EASY RATE RIGHT ANGLE SINGLE SENSOR

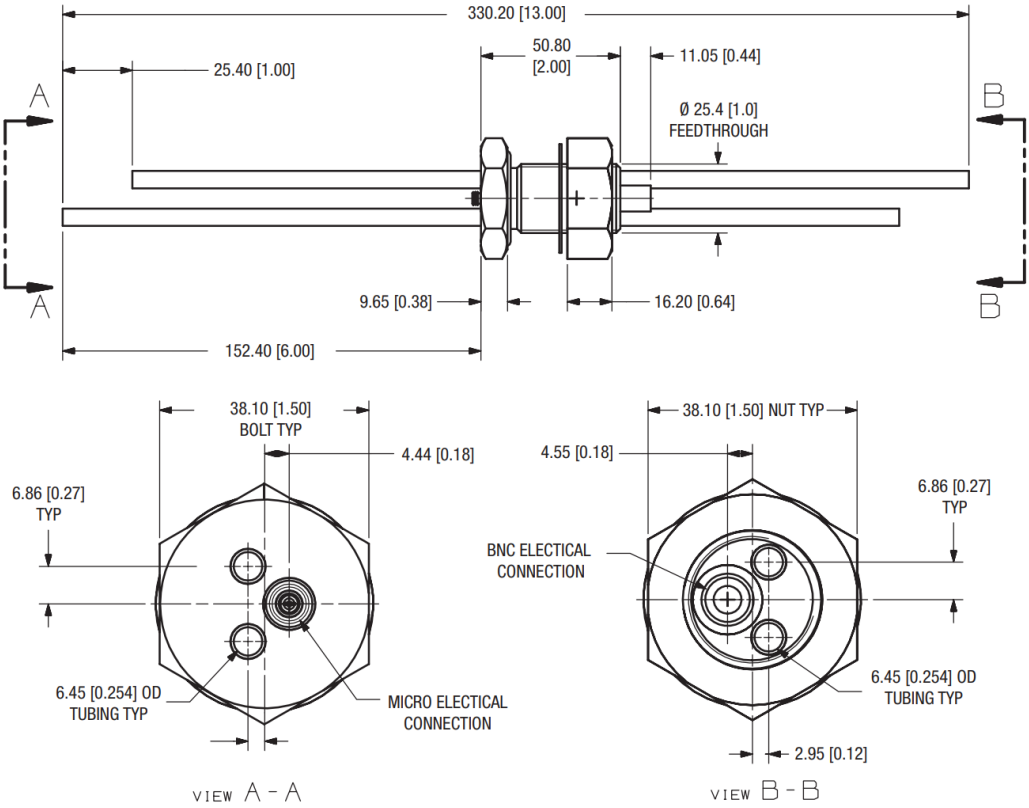
NOTE: Measurements in mm [in.]



DIMENSIONS

BOLT FEEDTHROUGH OFFERED FOR ERS-A_0E13_ AND ERS-B_0E13_ SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 784-283-G1)

NOTE: Measurements in mm [in.]

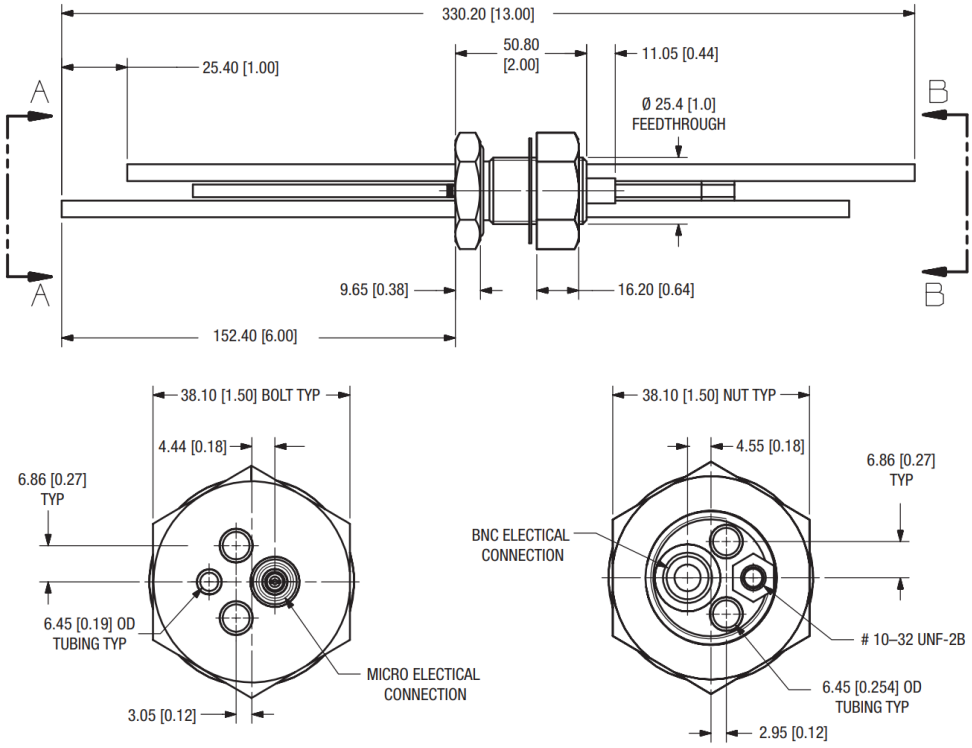


Easy Rate Single Sensor (continued)

DIMENSIONS

CF40 FEEDTHROUGH OFFERED FOR ERS-A_1E13_ AND ERS-B_1E13_ SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 784-284-G1)

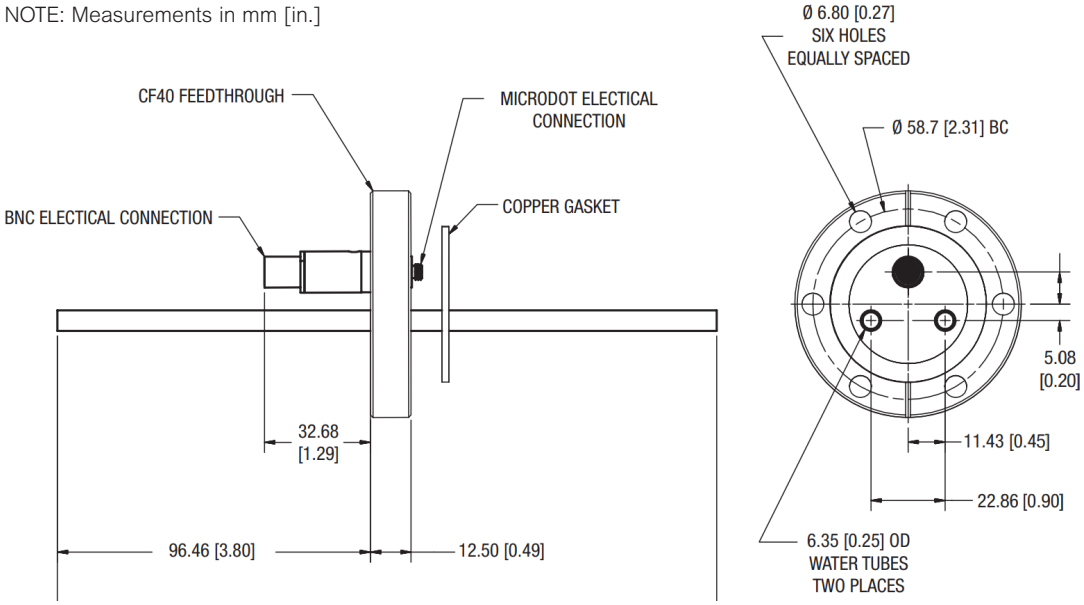
NOTE: Measurements in mm [in.]



DIMENSIONS

CF40 FEEDTHROUGH OFFERED FOR ERS-A_0E14_ AND ERS-B_0E14_ SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 784-273-G1)

NOTE: Measurements in mm [in.]

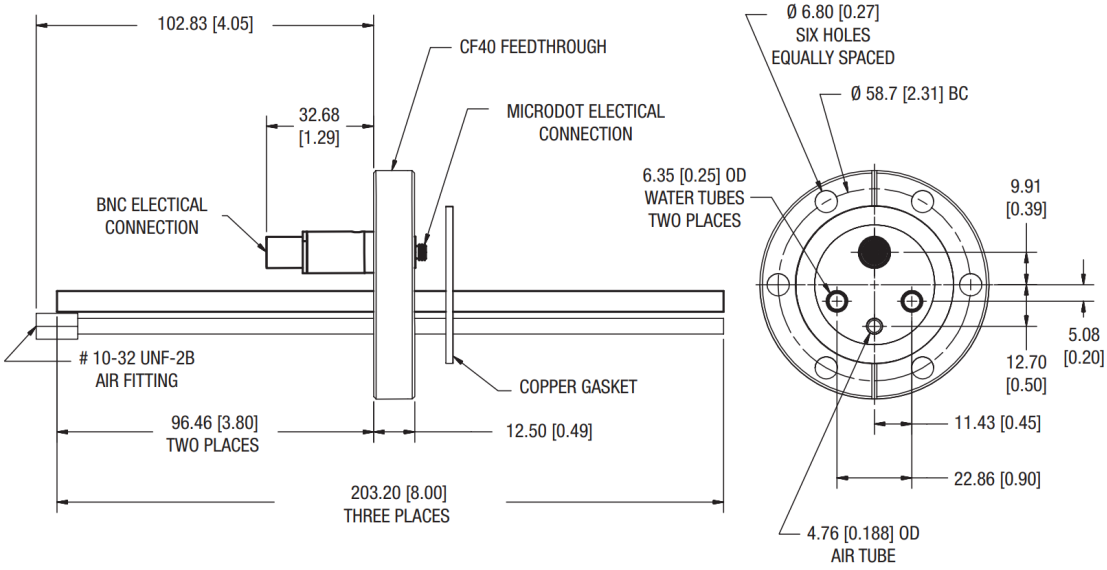


Easy Rate Single Sensor (continued)

DIMENSIONS

CF40 FEEDTHROUGH OFFERED FOR ERS-A_1E14_ SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 784-274-G1)

NOTE: Measurements in mm [in.]



Front Load Dual Sensor

INFICON Front Load Dual Sensors offer proven reliability and durability and have the best thermal stability of any sensor head on the market. The dual sensor provides a backup crystal and is essential for critical processes where it is desirable to have a second crystal in the vacuum chamber.

The front load design allows for easy insertion of the crystal holder in applications lacking sufficient room for side insertion. Assembled mechanically rather than soldered, parts can be replaced conveniently in the field, if necessary. Sensors can be ordered individually or in a sensor / feedthrough combination that can be either welded or assembled with compression fittings.

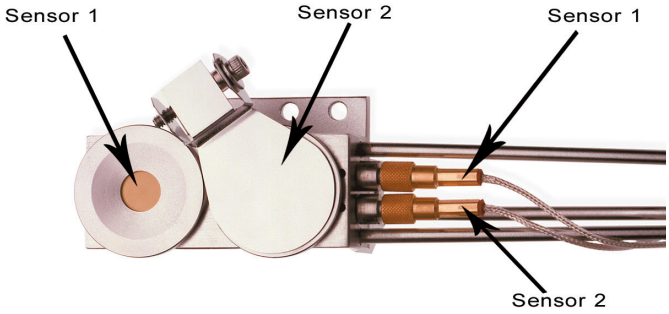
SENSOR CONFIGURATIONS

The Front Load Dual Sensor is available in a standard mount configuration where the water tubes are parallel to the crystal face. A pneumatically driven crystal shutter comes standard to protect the backup crystal, while the primary crystal monitors the deposition rate. The shutter is designed to flip down allowing easy crystal replacement.

The exposed crystal electrode is fully grounded to effectively eliminate problems due to RF interference.

FEEDTHROUGHS

INFICON offers two feedthroughs, a 1 inch bolt feedthrough or a 2¾ inch (CF40) ConFlat® flange feedthrough. KF40 feedthroughs are available on request.



FEEDTHROUGH CONNECTION

Front Load Dual Sensors can be ordered in combination with a feedthrough. The sensor/ feedthrough connection can be either made with compression fittings or welded when in combination with a 1 inch bolt. Compression fittings allow for easy adjustability without the need for brazing or welding. The feedthrough can be moved along the length of the tubes allowing the length inside the vacuum systems to be adjusted over a range of 20.3–71.1 cm (8–28 in.). Once the desired length is determined, the compression fittings allow for a finger tight tube seal.

ADVANTAGES

- Dual crystals
- Crystal shutter
- Front load crystal holder
- Easy installation
- Available with:
  - 2.54 cm (1 in.) bolt feedthrough
  - CF40 feedthrough
- Adjustable length if ordered with compression fittings
- No brazing required if ordered with compression fittings or welded to feedthrough
- Sensor / feedthrough combinations available welded to customer specified lengths.

Front Load Dual Sensor (continued)

ORDERING INFORMATION

FRONT LOAD DUAL SENSOR (WITH IN-VACUUM CABLES)

D L – [ ][ ][ ][ ] – [ ][ ]

Type of Sensor
Includes in-vacuum cable, crystal snatcher and user manual. Crystals sold separately)

Standard Sensor (water lines parallel)	A

Length of Sensor – SEE NOTES 1 and 5

Standard length – includes 78.1 cm (30.75 in.) in-vacuum cable (see note 4).	E

Feedthrough – SEE NOTE 2

None	0
1 in. bolt	3

Welded Sensor Length – SEE NOTES 2 and 5

(Use Only When Feedthrough Connection is 7)

Not required when feedthrough connection option is 0 or 8.

20–70	Weld length in centimeters, 20-70 cm (8-27.5 in.).
71–99	Weld length in centimeters, 71-99 cm (28-39 in.).

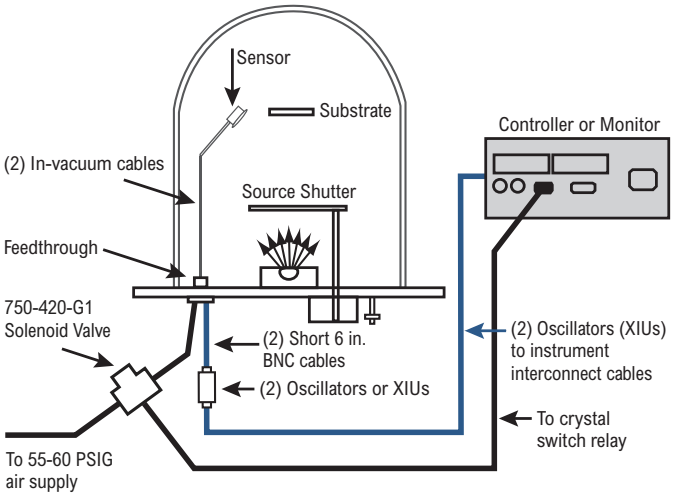
***Other lengths may be available: contact factory. Other lengths will be considered a special order and will be subject to additional cost and lead time.

Feedthrough Connection – SEE NOTES 3 and 5

0	Sensor not connected to feedthrough
7	Sensor welded to feedthrough
8	Feedthrough equipped with Ultra-Torr® compression fittings (allows for adjustable sensor length)

The following combinations are not available (See Notes 3 and 4):
DL-AE47, DL-AG47, DL-AE38, DL-AG38

Examples of non-valid part numbers include all options with no feedthrough connection or compression fittings and a welded sensor length; for example,



NOTE: (2) indicates that two XIU or oscillator packages are required for a typical dual sensor installation. 779-220-G1, crystal two switch option allows operation with only one oscillator (XIU).

NOTE 1:
Orders for a WELDED sensor / feedthrough combination are measured from center of the crystal to the vacuum side (sealing surface) of the feedthrough. Once a welded sensor order is confirmed, it cannot be cancelled.

NOTE 2:
Feedthrough configuration varies depending on options selected (Front Load or Cool Drawer, with or without shutter, type of feedthrough, etc.). Example: SL-A0E37 uses feedthrough PN 002-042 while SL-A1E37 uses feedthrough PN 750-030-G1.

NOTE 3:
Front Load Dual sensors ordered with a CF40 feedthrough cannot be welded due to dimensional limits of the CF40.

NOTE 4:
For sensors ordered without a weld connection (option "0" or "8"), tubes are made to a length of approximately 76.2 cm (30 in.)

NOTE 5:
Front Load Dual sensors welded to lengths between 28 and 34 inches will include a 36 inch in-vacuum cable. Sensors welded to lengths between 34 and 39 inches will include a 48 inch in-vacuum cable.

Front Load Dual Sensor (continued)

SPECIFICATIONS

DL-A E 0 0 SERIES FRONT LOAD DUAL SENSOR SPECIFICATIONS	
Maximum bakeout temp with no water	130°C
Maximum operating isothermal environment temperature with minimum water flow	400°C
Size (maximum envelope without shutter)	39.12 x 82.04 x 49.54 mm (1.54 x 3.23 x 1.95 in.)
Water tube and coax length, “E” sensor	Standard 762 mm (30 in.)
Crystal exchange	Front-loading, self-contained package for ease of exchange. Shutter flips up to ease access to the holders.
Mounting	Two #4-40 tapped holes on the back of the sensor body
INSTALLATION REQUIREMENTS	
Feedthrough	One 69.85 mm (2¾ in.) ConFlat® with two Microdot®, two pass water and air, or One 25.4 mm (1 in.) bolt with two Microdot, two pass water and air.
Other	1) Valve assembly for air – PN 750-420-G1
	2) Two oscillators or one oscillator and 779-220-G1 CrystalTwo Switch designed to interface with the deposition controller.
	3) For automatic operation, the deposition process controller must be designed for the implementation of this feature.
Utilities	1) Minimum water flow 150-200 cm^3/min, 30°C max (Do not allow to freeze.)
	2) Air, 80 PSIG (5.5 bar) [552 kPa] very low volume, DO NOT EXCEED 110 PSIG (7.6 bar) [760 kPa])
Water quality	Coolant should not contain chlorides as stress corrosion cracking may occur. Extremely dirty water may result in loss of cooling capacity.
MATERIALS	
Body and holder	304 Type stainless steel
Springs	Au plated Be-Cu
Water tubes	S-304, 3.175 mm (0.125 in.) OD x 0.381 mm (0.015 in.) wall thickness seamless stainless steel tubing
Insulators	>99% Al_2O_3
Wire	Teflon insulated copper
Other mechanical parts	304 or 18-8 stainless steel
Braze	Vacuum process high temperature Ni-Cr alloy
Crystal	0.550 in. (13.97 mm) diameter

Front Load Dual Sensor (continued)

SPECIFICATIONS

FEEDTHROUGH SPECIFICATIONS

NOTE: Sensor / Feedthrough combination specifications are determined by lowest component specification

1 IN. BOLT AND ULTRA-TORR (COMPRESSION FITTING) TERMINATIONS:	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, Viton
Temperature	Operational environment to 300°C with water cooling or 165°C without
Mounting	25.8 mm (1.015 in. ±0.010 in.) diameter aperture
CF40 WELDED TERMINATIONS:	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel
Temperature	Operational environment to 450°C with water cooling or 165°C without
Mounting	Mates with 2¾ in. ConFlat type flanges with 1.375 in. I.D. min.

SPARE PARTS LIST

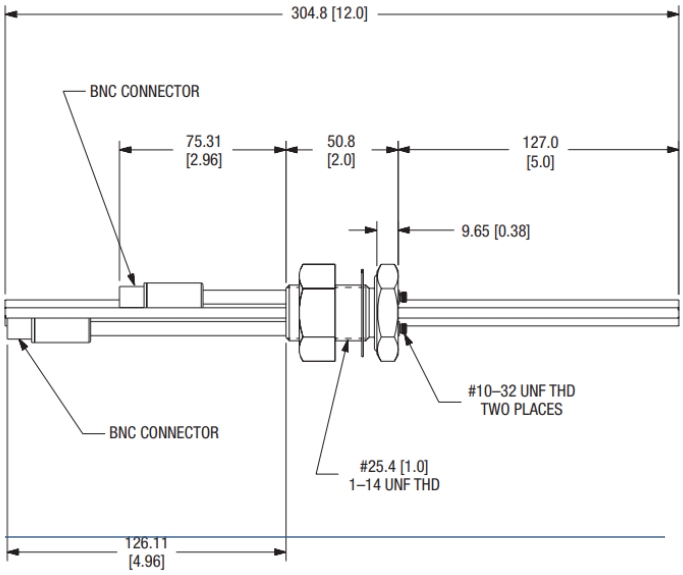
PN	DESCRIPTION
007-007	Retainer spring (for crystal holder)
007-023	Ceramic retainer
007-044	In-vacuum cable, 78.1 cm (30.75 in.)
080-018	Set screw (for female coax)
082-044	Teflon screw (for leaf spring)
750-115-P4	Coupling (for bellows assembly)
750-169-P2	Bellows assembly (coupling not included)
750-171-P1	Finger spring contact
750-172-G1	Crystal holder (includes retainer spring)
750-174-P2	Female coax
750-175-P1	Insulator (underneath leaf spring)
750-188-P3	Leaf spring
750-210-G1	Shutter module (bellows assembly, shaft assembly, and shutter assembly)
750-215-G1	Shaft assembly (part of shutter module)
750-216-G1	Shutter assembly (part of shutter module)
321-039-G13	In-vacuum cable 152.4 cm (60 in.)

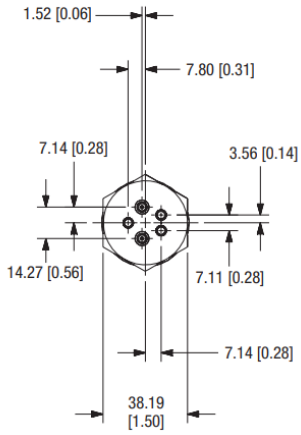
Front Load Dual Sensor (continued)

DIMENSIONS

FEEDTHROUGH USED FOR DL-AE37 AND DL-AE30 SENSOR / FEEDTHROUGH COMBINATION (FEEDTHROUGH PN 750-707-G1)

NOTE: Measurements in mm [in.]

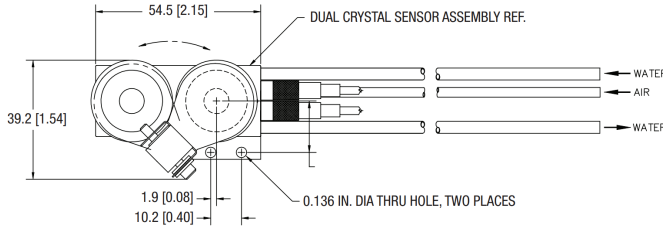


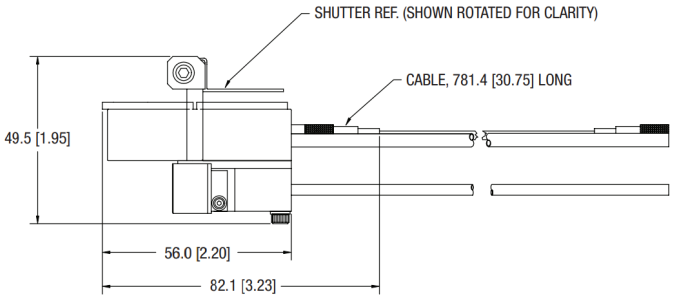


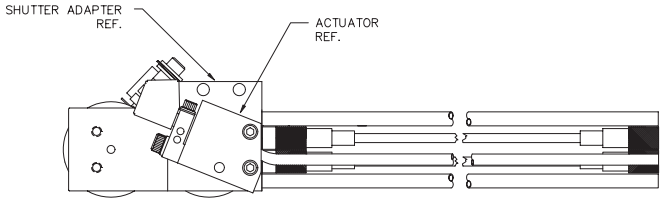
DIMENSIONS

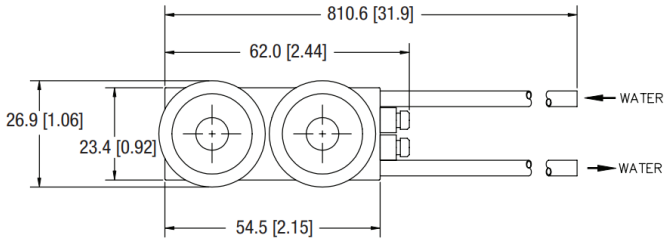
DL-AE00 FRONT LOAD DUAL SENSOR (SENSOR ONLY)

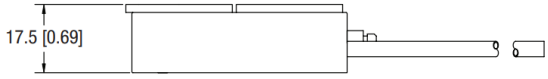
NOTE: Measurements in mm [in.]

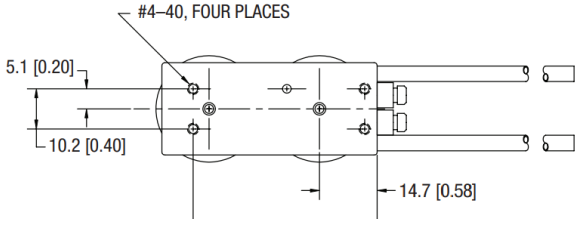










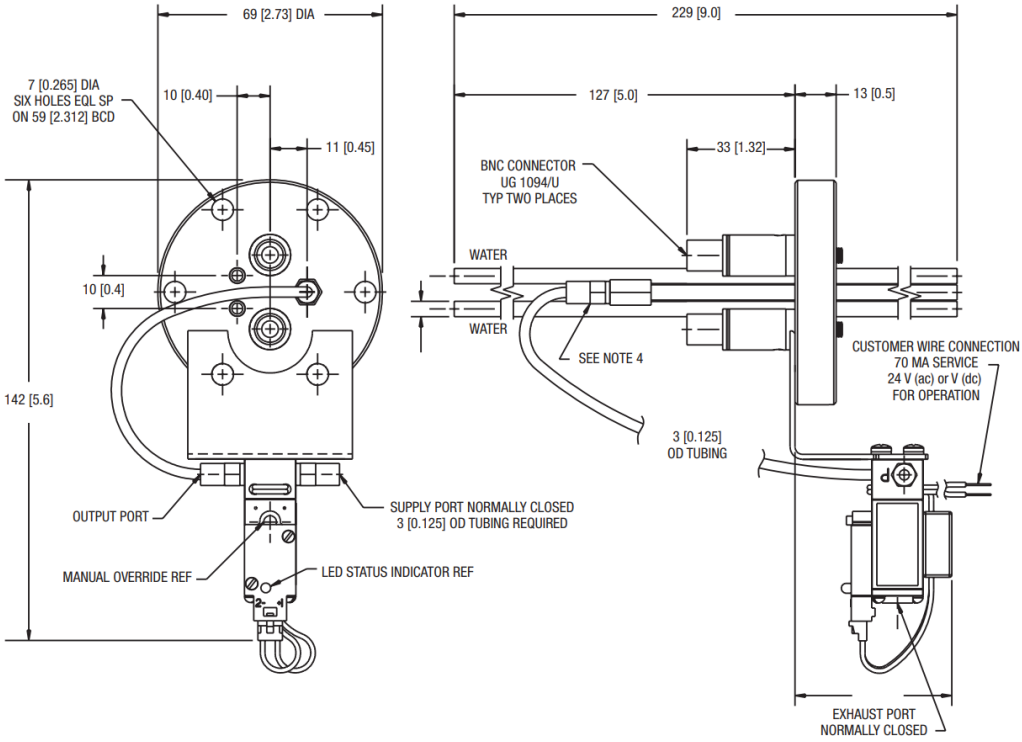


Front Load Dual Sensor (continued)

DIMENSIONS

FEEDTHROUGH USED FOR DL-AE40 SENSOR / FEEDTHROUGH COMBINATION (FEEDTHROUGH PN 002-080, SHOWN WITH 750-420-G1 SOLENOID VALVE)

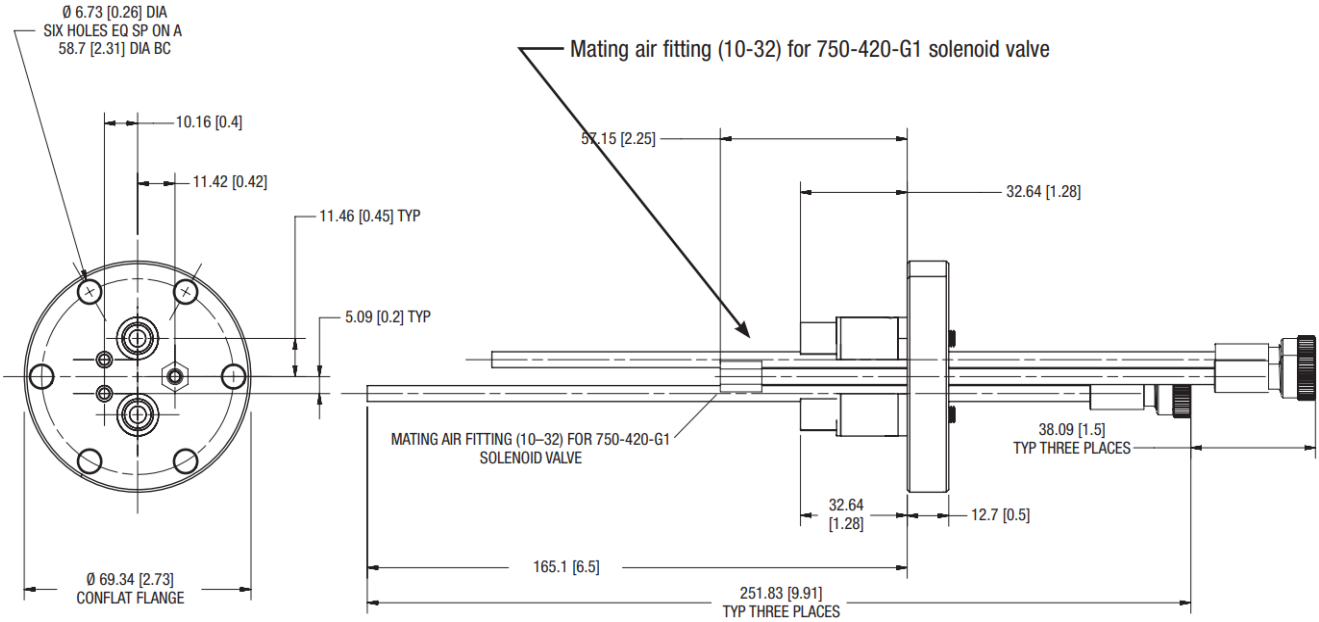
NOTE: Measurements in mm [in.]



DIMENSIONS

FEEDTHROUGH USED FOR DL-AE48 SENSOR / FEEDTHROUGH COMBINATION (FEEDTHROUGH PN 206-890-G2)

NOTE: Measurements in mm [in.]



Cool Drawer Dual Sensor

The Cool Drawer™ Dual Sensor is designed for use in critical processes where it is desirable to have a second crystal in the vacuum chamber. Water cooled, cast stainless steel sensor body, two Cool Drawer crystal holders and a pneumatically actuated shutter provide for a rugged sensor head with the extra reliability of a backup crystal. A cleaner, more reliable vacuum system installation is possible as there are no coaxial cables inside the chamber.

SENSOR CONFIGURATIONS

Two sensor configurations are offered: the standard version and the right angle version. The standard version is designed for installation from the side or bottom of the chamber and the cooling tubes and the crystal face are parallel. The right angle version is designed for installation through the top of the vacuum system and the water cooling tubes are perpendicular to the crystal face. In either configuration, sensor head length can range from 10 – 66 cm (4 – 26 in.).

FEEDTHROUGHS

INFICON offers two choices for feedthrough types: a 1 in. bolt feedthrough or a CF40 feedthrough.

FEEDTHROUGH CONNECTIONS

Cool Drawer Dual Sensors must be ordered in combination with a feedthrough. The sensor / feedthrough connection can be either welded or made with compression fittings.

Compression fittings allow for easy adjustability without the need for brazing or welding. Sensor head length is adjustable from 10 – 66 cm (4 – 26 in.). When selected with the welded CF40, the sensor is designed for high temperature processes where reliability is critical. Constructed of stainless steel and ceramic materials, it is suitable for applications requiring high temperature bake out (see specifications).

The Cool Drawer Dual Sensor with the CF40 flange is pre-installed in a special two piece 7 cm (2¾ in.) ConFlat® feedthrough. This allows the sensor head to be rotated independently of the flange and circumvents the dimensional limitations of the CF40 flange. Sensor / feedthrough length can be specified between 10 – 66 cm (4 – 26 in.).

ADVANTAGES

- Dual crystals
- Cool Drawer crystal holder
- No internal cables
- Crystal shutter
- Available with:
  – CF40 feedthrough
  – 2.54 cm (1 in.) bolt feedthrough
- Bakeable if ordered withwelded CF40 flange
- Adjustable length if ordered with compression fittings
- Sensor / feedthrough combinations available welded to customer specified lengths

Cool Drawer Dual Sensor (continued)

ORDERING INFORMATION

COOL DRAWER DUAL SENSOR (WITH CONDUCTOR TUBES)

C D D – [ ][ ][ ][ ] – [ ][ ]

Type of Sensor
(includes user manual, crystals sold separately)

- A — Standard Cool Drawer (water lines parallel to crystal face)
- B — Right angle Cool Drawer (water lines perpendicular to crystal face)

Length of Sensor
SEE NOTE 3

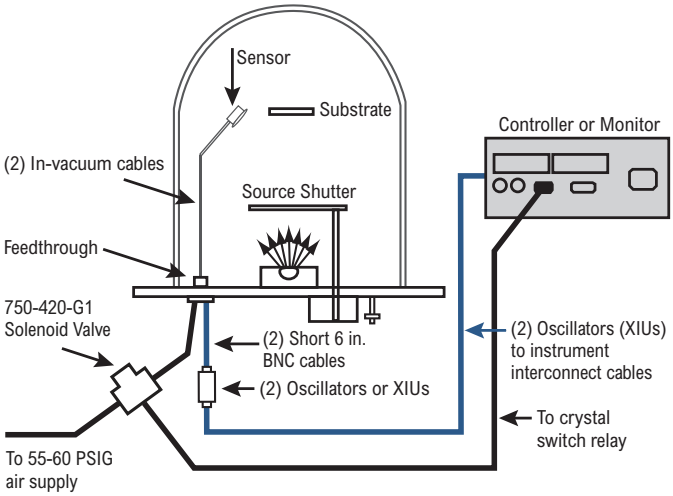
- F — Length: 10–66 cm (4–26 in.)

Feedthrough
SEE NOTES 2 and 4

- 3 — 1 in. bolt
- 4 — CF40

Feedthrough Connection
SEE NOTE 1

- 10–66 — Welded sensor length
  (Use Only When Feedthrough Connection is 7)
  Not required when feedthrough connection option is 8.
  Weld length in centimeters, 10 – 66 cm (4 – 26 in.).
  ***Other lengths may be available: contact factory. Other lengths will be considered a special order and will be subject to additional cost and lead time.
- 7 — Sensor welded to feedthrough –
- 8 — Feedthrough equipped with Ultra-Torr® compression fittings (allows for adjustable sensor length). NOT AVAILABLE WITH CF40 FEEDTHROUGH



NOTE: (2) indicates that two XIU or oscillator packages are required for a typical dual sensor installation.

The following combinations are not available: CDD-AF48, CDD-BF48 Examples of non-valid part numbers include all options with compression fittings and a welded sensor length; for example, CDD-AF48-20, etc.

NOTE 1:
Orders for a WELDED sensor / feedthrough combination are measured from center of the crystal to the vacuum side (sealing surface) of the feedthrough. Once a welded sensor order is confirmed, it cannot be cancelled.

NOTE 2:
Feedthrough configuration varies depending on options selected (type of feedthrough, and connection). Example: CDD-AF47-XX and -BF47-XX use a two-piece hybrid feedthrough design due to dimensional limits of a standard CF40.

NOTE 3:
For sensors ordered without a weld connection (option "8"), tubes are made to a length of approximately 76.2 cm (30 in.) for standard Cool Drawer Sensors and approximately 66 cm (26 in.) for Right Angle Cool Drawer sensors.

NOTE 4:
Cool Drawer Sensors are not available without a feedthrough and must be either welded or connected with Ultra-Torr fittings.

Cool Drawer Dual Sensor (continued)

SPECIFICATIONS

CDD SERIES COOL DRAWER DUAL SENSOR SPECIFICATIONS	
Finish	Stainless steel, gold plated Cool Drawer™
Cooling water	0.2 GPM using 1/8 in. O.D. tube, 30°C max. (Do not allow to freeze)
Crystal (sold separately)	Industry standard 0.550 in. diameter
Air supply	55 to 60 PSI regulated
Electrical connection	Two standard female BNCs on atmosphere side
1 IN. BOLT AND COMPRESSION FITTING SEALED TERMINATIONS	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, Viton
Temperature	Operational environment to 300°C with water cooling or 165°C without
Mounting	25.8 mm (1.015 in. ±0.010 in.) diameter aperture
CF40 WELDED TERMINATIONS	
Materials	304 stainless steel, ceramic, beryllium nickel
Temperature	Operational environment to 450°C with water cooling or 200°C without
Mounting	Mates with 2¾ in. ConFlat® type flanges

SPARE PARTS LIST

PN	DESCRIPTION
147206-2*	Bellows with 35 in. tube
147207	Bellows and cover assembly (Includes all parts marked with *)
147401	Shutter
147402	Link
147403*	Actuator
147406*	Bellows support
147407*	Bellows cover
147408*	Threaded shaft
147411	Spacer
147424*	Bellows tube
082-026*	Hex nut

PN	DESCRIPTION
082-064*	Lockwasher
084-205*	#4-40 x 3/16 in. Phillips screw
800128	#4 Lockwasher
800371	Shoulder screw
800372	Washer
800416*	6-32 x 3/16 in. set screw
803313*	Spring
123223-2	Conduit brazed assembly – short pin
803102	O-Ring for 5 port adjustable feedthrough
803261	Washer for 5 port adjustable feedthrough

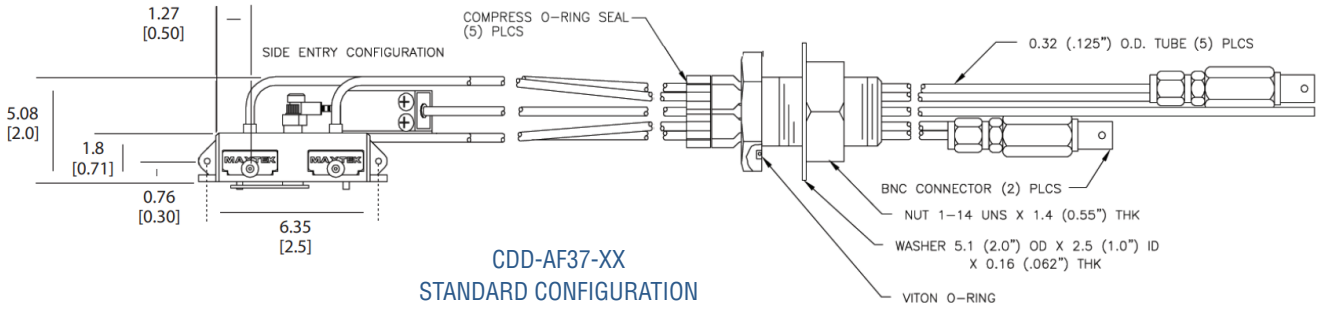
NOTE: Items marked with * are included in 147207

Cool Drawer Dual Sensor (continued)

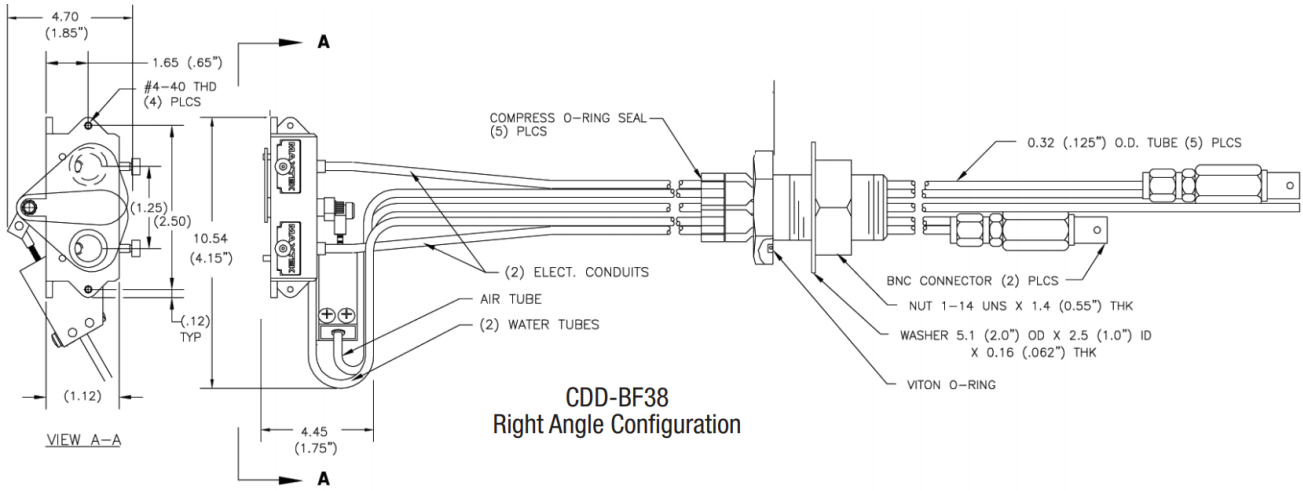
DIMENSIONS

CDD-AF37-XX, CDD-AF38 AND CDD-BF38 COOL DRAWER DUAL SENSOR / FEEDTHROUGH COMBINATIONS
COOL DRAWER DUAL SENSOR / FEEDTHROUGH COMBINATIONS

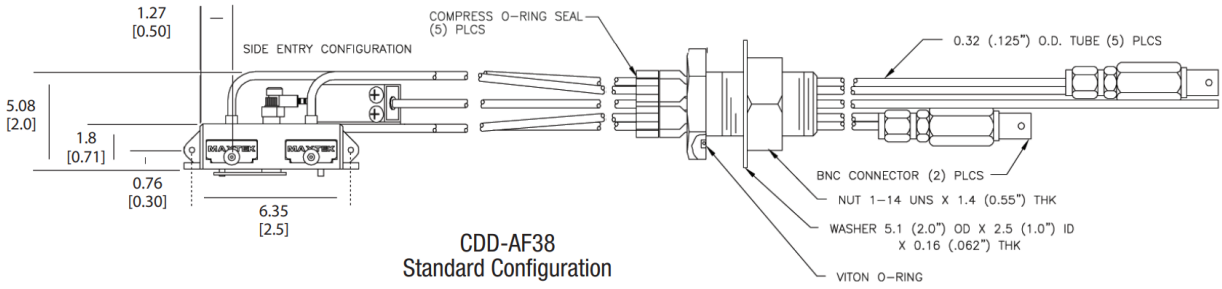
NOTE: Measurements in cm [in.]



CDD-AF37-XX
STANDARD CONFIGURATION



CDD-BF38
Right Angle Configuration



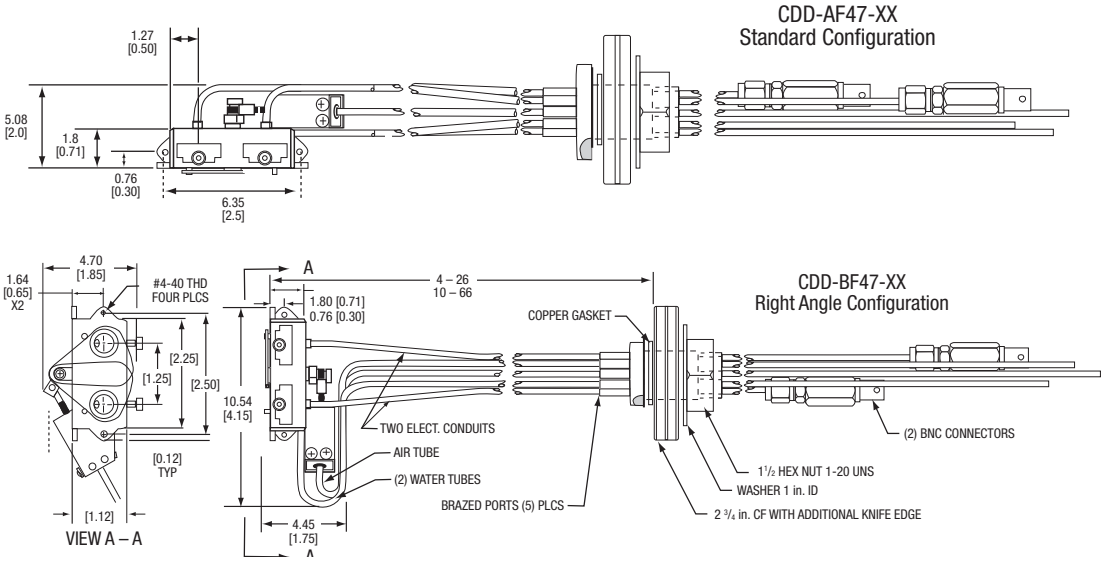
CDD-AF38
Standard Configuration

Cool Drawer Dual Sensor (continued)

DIMENSIONS

CDD-AF47-XX AND CDD-BF47-XX
COOL DRAWER DUAL SENSOR/FEEDTHROUGH COMBINATIONS

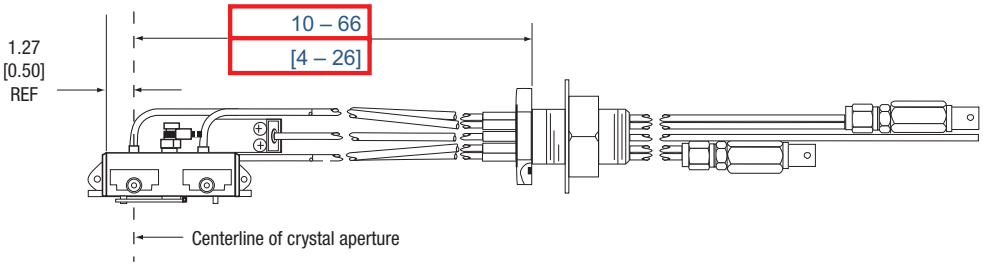
NOTE: Measurements in cm [in.]



DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDD-AF37-XX SENSOR / FEEDTHROUGH COMBINATION

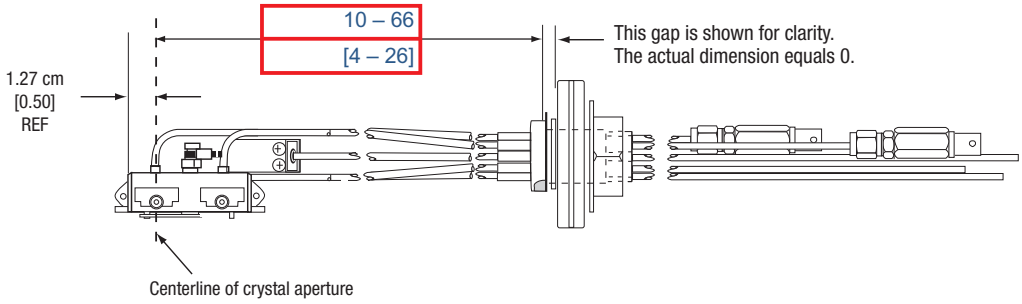
NOTE: Measurements in cm [in.]



DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDD-AF47-XX SENSOR / FEEDTHROUGH COMBINATION

NOTE: Measurements in cm [in.]

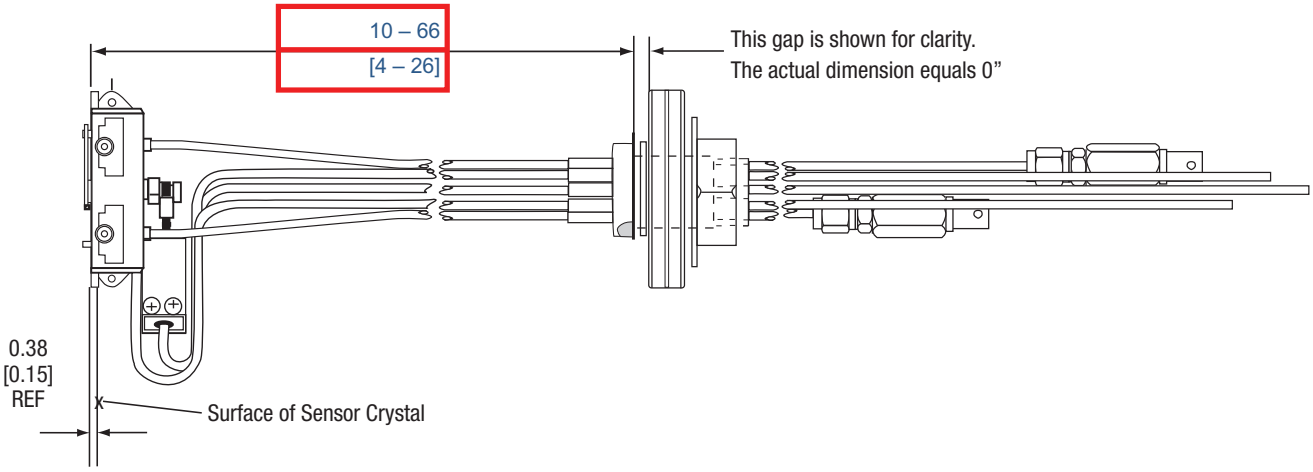


Cool Drawer Dual Sensor (continued)

DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDD-BF47-XX SENSOR / FEEDTHROUGH COMBINATION

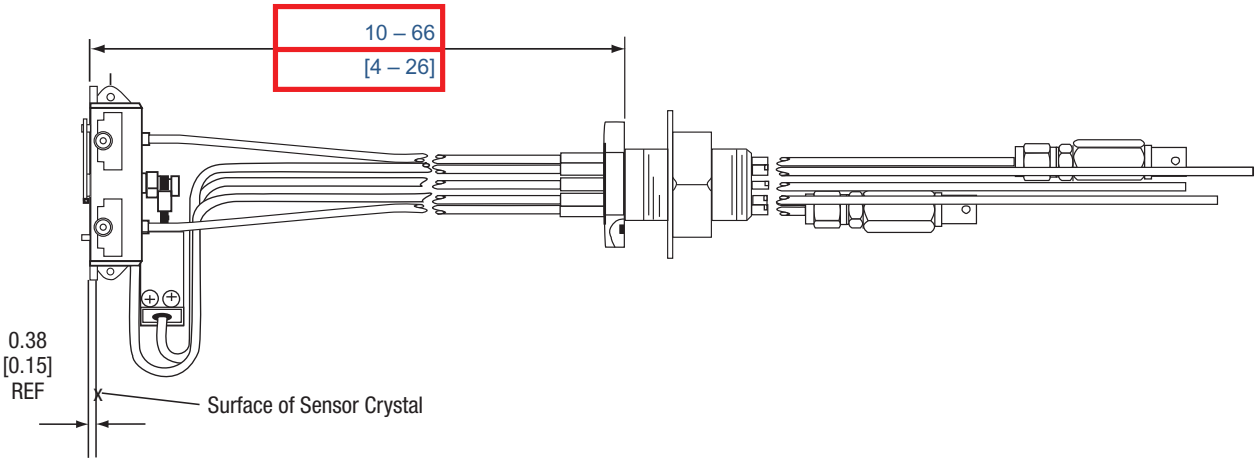
NOTE: Measurements in cm [in.]



DIMENSIONS

SENSOR LENGTH SPECIFICATION FOR CDD-BF37-XX SENSOR / FEEDTHROUGH COMBINATION

NOTE: Measurements in cm [in.]



Easy Rate Dual Sensor

INFICON Easy Rate dual crystal sensors minimize quartz crystal microbalance (QCM) total cost of ownership through low price and extended sensor life. This sensor minimizes production cost with the lowest initial investment and total cost of ownership. It is also designed to maximize availability through a long-lasting sensor that has less maintenance.

INFICON Easy Rate dual crystal sensors are designed and manufactured to provide a cost effective solution to high-accuracy thickness monitoring for short optical and batch coating processes.

SENSOR CONFIGURATIONS

The INFICON Easy Rate Dual Sensor is available with standard or right angle orientations. The standard version is designed for installation from the side or bottom of the chamber having the cooling tubes parallel to the crystal face. The right angle version is designed for installation through the top of the vacuum system having the water cooling tubes perpendicular to the crystal face. A pneumatically driven crystal shutter comes standard to protect the unused crystal during deposition, while the primary crystal monitors the deposition rate. The shutter is designed to move to the side, allowing for easy crystal replacement.

The front load design allows for easy insertion of the crystal holder in applications lacking sufficient room for side insertion. All Easy Rate Sensors are compatible with industry-standard 6 MHz crystals and feedthroughs and are designed for easy crystal changes while remaining rugged enough for even the most demanding depositions.

FEEDTHROUGHS

INFICON Easy Rate Sensors are offered with either a 2.54 cm (1 in.) Bolt Feedthrough or a CF40 (2.75 in.) ConFlat® flange feedthrough.

ADVANTAGES

- Minimum investment with lowest upfront cost
- Lowest total cost of ownership
- Maximum throughput with less maintenance
- Available in two configurations
- Standard (water tubes parallel)
- Right angle (water tubes perpendicular)

FEEDTHROUGH CONNECTION

The sensor / feedthrough connection can be either welded onsite by the user or made with bored-through union fittings. These union fittings allow for easy adjustability without the need for brazing or welding. The length of the tubes can be cut to meet the needs of the chamber, allowing the length inside the vacuum system to be customized and the feedthrough to be attached easily and quickly. Alternately, if using a custom feedthrough or bending the sensor on site, no connection may be chosen for onsite welding.

AVAILABLE WITH

- 2.54 cm (1 in.) bolt feedthrough
- CF40 feedthrough
- Adjustable position when ordered with bored-through union fittings

Easy Rate Dual Sensor (continued)

ORDERING INFORMATION

E R D – [ ] [ ] E 1 [ ] [ ]

Type of Sensor
(Includes in-vacuum cable. Crystals sold separately.)

- A — Standard sensor (water tubes parallel)
- B — Right angle sensor (water tubes perpendicular)

In-Vacuum Cable

- 0 — None
- 1 — 25.4 cm (10 in.) in-vacuum cable
- 2 — 76.2 cm (30 in.) in-vacuum cable

Length of Sensor – SEE NOTE 1

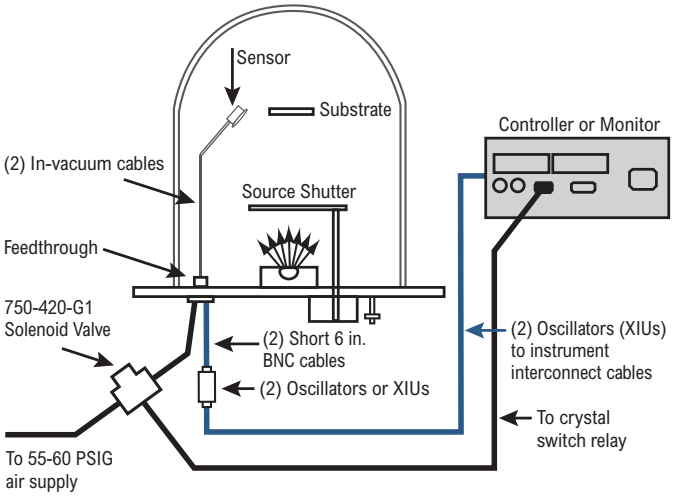
- E — Standard: 806 mm (31.72 in.)
- Right angle: 776 mm (30.55 in.)

Feedthrough Connection

- 0 — Sensor not connected to feedthrough
- 9 — **Bored-through union fittings** (Allow the sensor water tubes to slide into the feedthrough.)

Feedthrough

- 0 — None
- 3 — 1 in. bolt
- 4 — CF40



NOTE 1:
Sensor length is measured from center of crystal to the end of the water tubes (see drawings).

NOTE 2:
Crystals sold separately

Easy Rate Dual Sensor (continued)

SPECIFICATIONS

EASY RATE STANDARD DUAL SENSOR	
Maximum bakeout temp with no water	175˚ C (sensor only no feedthrough) 165˚ C (sensor and feedthrough)
Maximum operating isothermal environment temperature with minimum water flow	400˚ C
Size	3.25 x 9.00 x 3.15 cm (1.28 x 3.55 x 1.24 in.)
Water tube	4.76 mm (0.188 in.) OD seamless stainless steel
Crystal exchange	Front loading; shutter can easily be removed for access to the holders
Mounting	Two #4-40 tapped holes on the back of the sensor body
INSTALLATION REQUIREMENTS	
Feedthrough	Two pass water 6.35 mm (0.250 in) OD with two microdot coaxial connections One pass air 4.76 (0.188 in) OD
Other	XIUs or oscillators to match specific controller, solenoid valve assembly for shutter. For automatic operation, the deposition process controller must be designed for the implementation of this feature.
Utilities	Minimum water flow 150-200 cm^3/min, 30° C max Air 70–80 psi (gauge) {85–95 psi (absolute)} (5.8–6.5 bar (absolute)) [584–653 kPa (absolute)] Do not exceed 100 psi (gauge) {115 psi (absolute)} (7.9 bar (absolute)) [791 kPa (absolute)]
Water quality	Coolant should not contain chlorides as stress corrosion cracking may occur Extremely dirty water may result in loss of cooling capacity
Crystal	13.97 mm (0.550 in.) diameter
MATERIALS	
Body and holder	304 type stainless steel
Springs, electrical contacts	Gold plated beryllium copper
Water tubes	S-304, 4.76 mm (0.188 in.) OD x 0.51 mm (0.020 in.) wall thickness seamless stainless steel tubing
Air tube	S-304, 3.175 mm (0.125 in.) OD x 0.381 mm (0.015 in.) wall thickness seamless stainless steel tubing
Connector (Microdot)	Stainless steel, Teflon® and glass insulation
Insulators	>99% aluminum oxide, Teflon
Wire	Tin plated copper

Easy Rate Dual Sensor (continued)

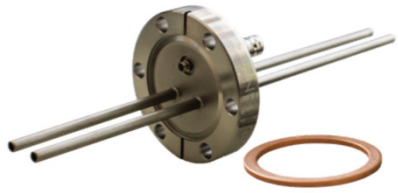
SPECIFICATIONS

FEEDTHROUGHS	
INSTALLATION REQUIREMENTS	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, VITON®
Temperature	Operational environment to 300°C with water cooling or 120°C without
Mounting	25.8 mm (1.015 in., ±0.010 in.) diameter aperture
Electrical connection	BNC connector (atmosphere side) Microdot connector (vacuum side)
Sealing Surface	O-ring

NOTE: Sensor / feedthrough combination specifications are determined by lowest component specification. Appearance as shown here will differ to match sensor requirements accordingly.

SPECIFICATIONS

CF40 FEEDTHROUGH	
INSTALLATION REQUIREMENTS	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, copper
Temperature	Operational environment to 450°C with water cooling or 165°C without
Mounting	2 ¾ in. ConFlat type flanges with 1.375 in. I.D. min.
Electrical connection	BNC connector (atmosphere side) Microdot connector (vacuum side)
Sealing Surface	Gasket



SPARE PARTS LIST

PN	DESCRIPTION
784-205-G1	Crystal holder assembly, Easy Rate Sensor
784-204-G1	Ceramic retainer
784-404-P1	Retaining ring, Easy Rate Sensor
784-403-P1	Crystal finger spring, Easy Rate Sensor
784-300-P1	Crystal holder, Easy Rate Sensor
784-307-P1	Dual shutter, Easy Rate Sensor
784-405-P1	Holder finger spring, Easy Rate Sensor
080-011-P3	Screw 0-80 x 0.125 in. LG PH PAN HD SS GP
784-322-P1	0-80 retainer plate
784-323-P1	Coax connector, female, flat sides

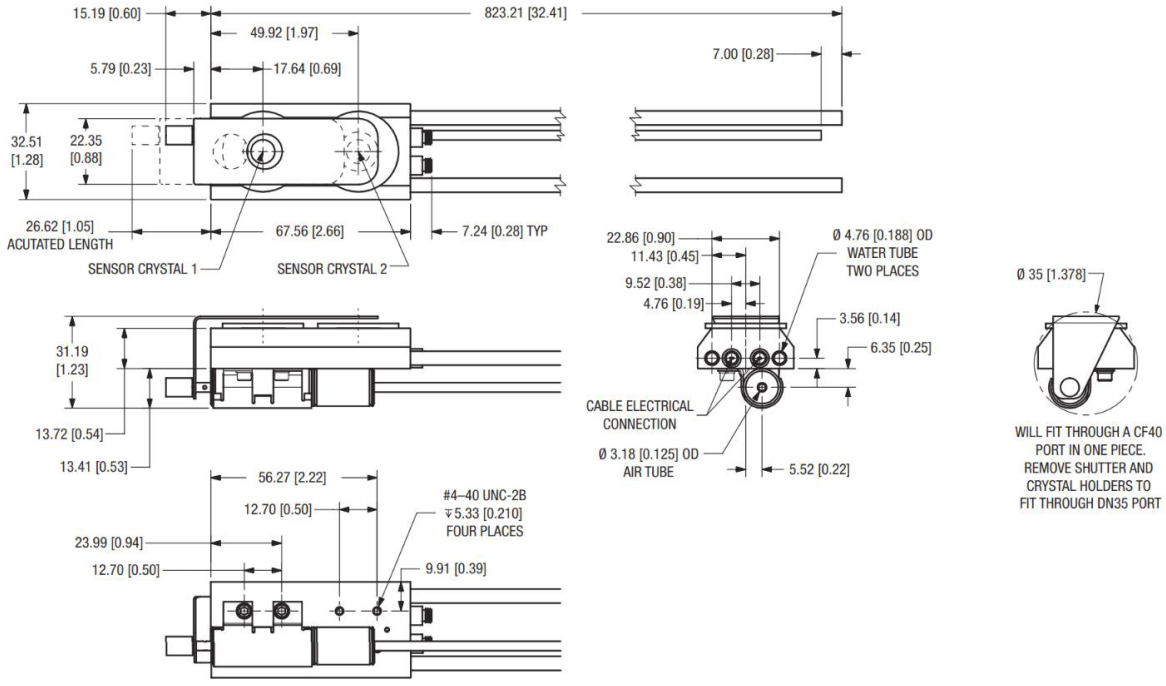
PN	DESCRIPTION
784-206-G1	Easy Rate Sensor actuator
784-306-P1	Actuator clamp, Easy Rate Sensor
084-054	#4 split lockwasher SS
084-027	Screw 4-40 x 0.250 in. LG SOC HD CAP SS
784-210-G1	Shutter kit, dual, Easy Rate Sensor
783-500-023	25.4 cm (10 in.) in-vacuum cable
783-500-024	76.2 cm (30 in.) in-vacuum cable
059-0773	0.125 – 0.188 in. thru union with Ferrule set
059-0774	0.188 – 0.250 in. thru union with Ferrule set
750-420-G1	Solenoid valve, 24 V (dc) or 24 V (ac)

Easy Rate Dual Sensor (continued)

DIMENSIONS

EASY RATE DUAL SENSOR

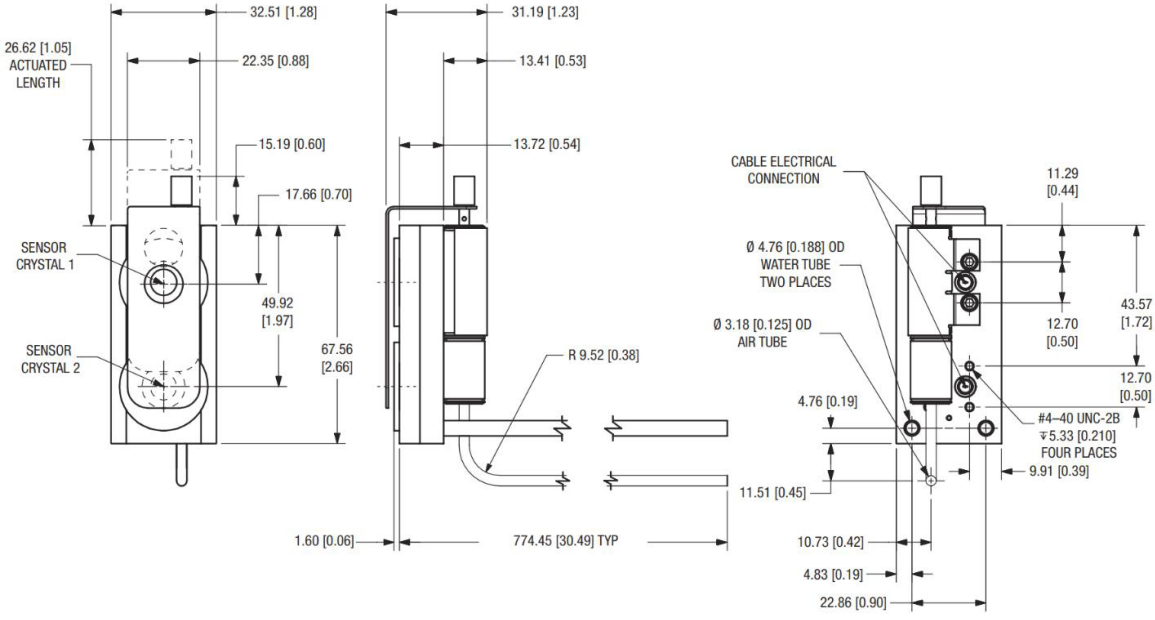
NOTE: Measurements in mm [in.]



DIMENSIONS

EASY RATE DUAL SENSOR

NOTE: Measurements in mm [in.]

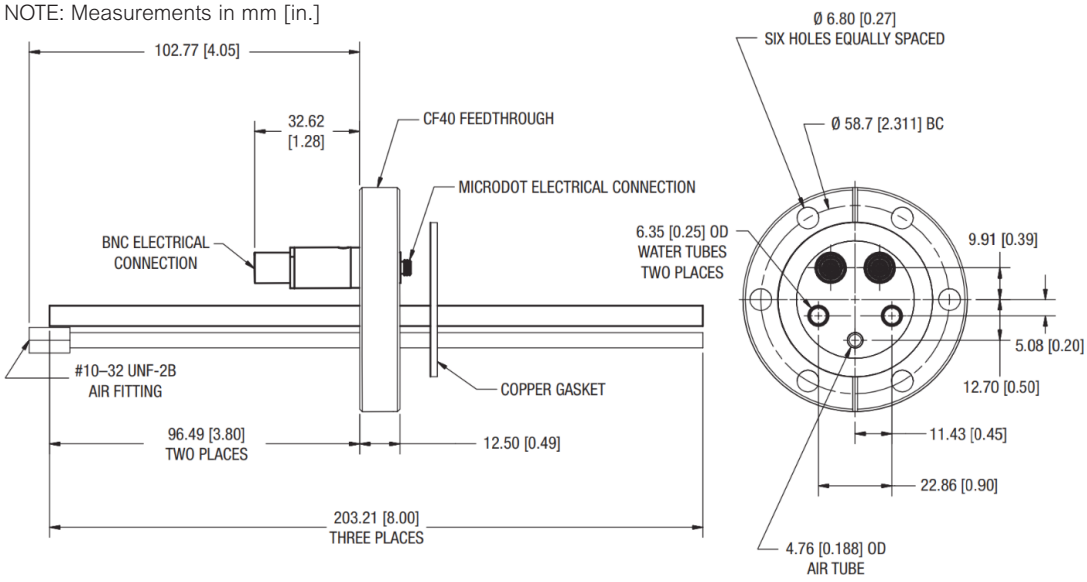


Easy Rate Dual Sensor (continued)

DIMENSIONS

FEEDTHROUGH OFFERED FOR ERD-A_E14_ AND ERD-B_E14_ SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 784-275-G1)

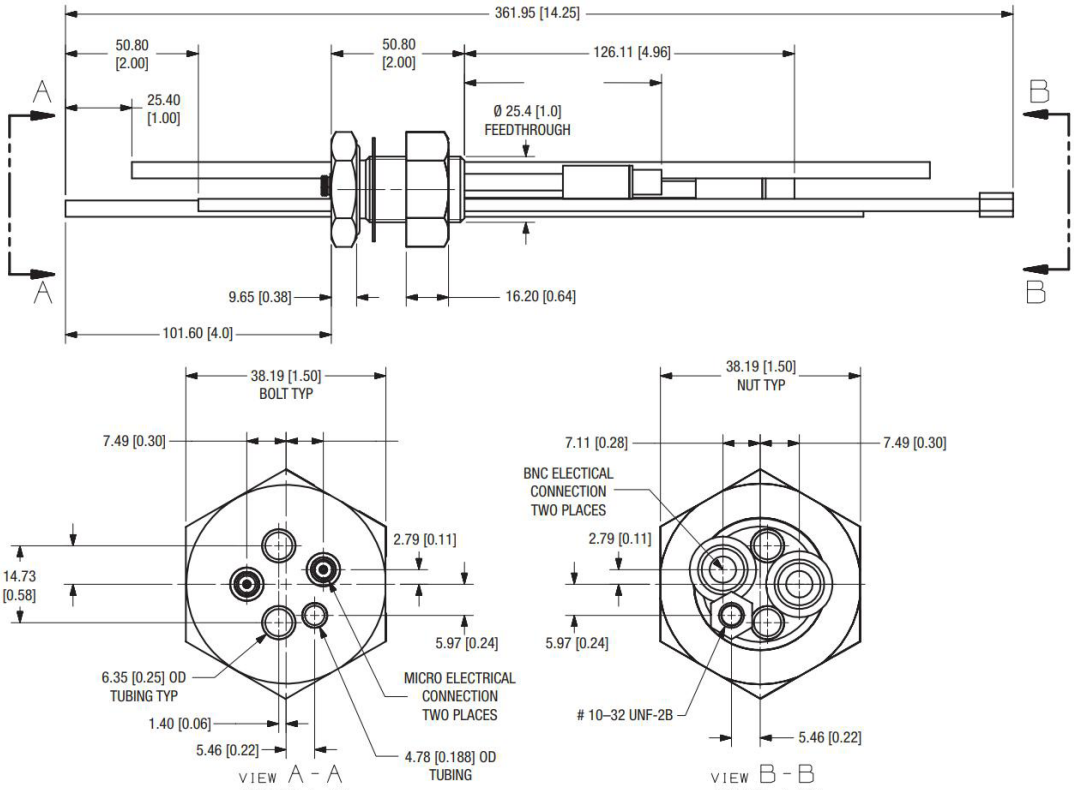
NOTE: Measurements in mm [in.]



DIMENSIONS

FEEDTHROUGH OFFERED FOR ERD-A_E13_ AND ERD-B_E13_ SENSOR / FEEDTHROUGH COMBINATIONS (FEEDTHROUGH PN 784-285-G1))

NOTE: Measurements in mm [in.]



UHV Bakeable Sensor

INFICON UHV Bakeable Sensors offer proven reliability and durability and have the best thermal stability of any sensor head on the market. Made from 304 stainless steel, molybdenum, Inconel, nickel, and alumina materials, the UHV Bakeable Sensor is designed to withstand continuous bakeout temperatures up to 450°C (for bakeout only, water flow required for actual deposition monitoring). The front load design allows for easy insertion of the crystal holder in applications lacking sufficient room for side insertion.

SENSOR CONFIGURATIONS

The UHV Bakeable Sensor is available in a standard configuration where the water tubes are parallel to the crystal face. Optionally, sensors can be ordered with a pneumatically driven crystal shutter to protect the crystal during source warm up, when not used during deposition of an alternate material, or to extend crystal life when used with RateWatcher™.

The exposed crystal electrode is fully grounded to effectively eliminate problems due to RF interference.

FEEDTHROUGH AND FEEDTHROUGH CONNECTION

All UHV Bakeable Sensors come welded to a CF40 (2¾ in. ConFlat®) flange feedthrough.

ADVANTAGES

- High temperature braze and welded construction
- Bakeout temperatures to 450°C
- Crystal shutter (option)
- Front load crystal holder
- Easy installation
- CF40 feedthrough
- No brazing or welding to feedthrough required
- Sensor / feedthrough combination welded to customer specified lengths

UHV Bakeable Sensor (continued)

ORDERING INFORMATION

UHV BAKEABLE SENSOR

B K – [ ][ ][ ] – [ ][ ]

Type of Sensor
(Includes crystal snatcher and user manual.)

A — Standard (water lines parallel to crystal face)

Shutter Assembly – SEE NOTE 3

0 — None

1 — Standard shutter

Welded Sensor Length – SEE NOTES 1 and 2

10–70 — Weld length in centimeters, 10-70 cm (8-27.5 in.).

71–99 — Weld length in centimeters, 71-99 cm (28-39 in.).

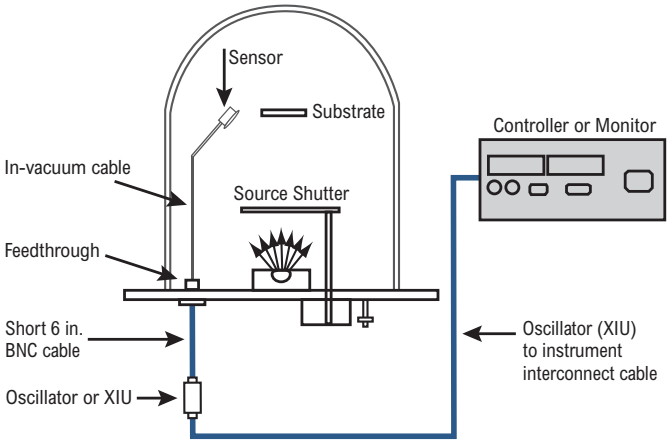
Length of Sensor – SEE NOTE 1

F — Standard length:

Shuttered sensors: 17–99 cm (28–39 in.)

Non-shuttered sensors: 10–99 cm (28–39 in.)

***Sensor lengths over 76.2 cm (30 in.) are subject to an additional charge, as well as 2-4 weeks additional lead time.



NOTE 1:
UHV Bakeable Sensor orders are measured from center of the crystal to the vacuum side (sealing surface) of the feedthrough. Once a welded sensor order is confirmed, it cannot be cancelled.

NOTE 2:
All UHV Bakeable Sensors are welded to a CF40 feedthrough.

NOTE 3:
Shutter air tube is connected to the feedthrough tube using VCR fittings for field replacement.

UHV Bakeable Sensor (continued)

SPECIFICATIONS

	BK-A0F SERIES UHV BAKEABLE SENSOR WITHOUT SHUTTER	BK-A1F SERIES UHV BAKEABLE SENSOR WITH SHUTTER)
Maximum temperature (for bake only; water flow recommended for actual deposition monitoring)	450°C continuous	400°C continuous
Feedthrough	CF40 (2¾ in. ConFlat®), integral with sensor head	CF40 (2¾ in. ConFlat®), integral with sensor head
Water and coax lines	Water: 3 mm (0.125 in.) O.D. water x 0.4 mm (0.015 in.) wall thickness seamless 304 stainless steel; 5 mm (0.188 in.) O.D. coax	3 mm (0.125 in.) O.D. water and air x 0.4 mm (0.015 in.) wall thickness seamless 304 stainless steel; 5 mm (0.188 in.) O.D. coax
Sensor head size (maximum envelope)	34 x 35 x 24 mm high (1.35 x 1.38 x 0.94 in. high)	34 x 35 x 31 mm high (1.35 x 1.38 x 1.21 in. high)
Crystal exchange	Front loading, self-contained package for ease of exchange. Cam-type locking handle allows easy removal and good thermal contact.	Front loading, self-contained package for ease of exchange. Cam-type locking handle allows easy removal and good thermal contact. Pneumatically operated shutter flips up for easy crystal exchange
Mounting	Four #4-40 tapped holes on back of sensor body	Four #4-40 tapped holes on back of sensor body
Utilities	Minimum water flow 150–200 cm^3/min., 30°C max. (Do not allow to freeze.) (Customer should provide means of easily disconnecting the 6.4 mm (0.25 in.) water tubes during bakeout.)	1) Minimum water flow 150–200 cm^3/min, 30° C max. (Do not allow to freeze.) (Customer should provide means of easily disconnecting the 6.4 mm [0.25 in.] water tubes during bakeout.) 2) Filtered, oil-free air, regulated at 80 psi (gauge) {95 psi (absolute)} 6.5 bar (absolute) [653 kPa (absolute)] (maximum) 3) Solenoid valve, PN 750-420-G1, 24 V (ac) or V (dc), or equivalent valve required
Crystal	13.97 mm (0.550 in.) diameter	13.97 mm (0.550 in.) diameter
MATERIALS		
Body and holder	304 type stainless steel	304 type stainless steel
Springs	Molybdenum and Inconel X-750	Molybdenum and Inconel X-750
Other mechanical parts	18-8 or 304 stainless steel	18-8 or 304 stainless steel
Insulators	>>99% Al_2O_3 in vacuum; other high density ceramics used elsewhere	>99% Al_2O_3 in vacuum
Wire	1) Ni (in vacuum) 2) Ni plated Cu (elsewhere)	1) Ni (in vacuum) 2) Ni plated Cu (elsewhere)
Braze	Vacuum process high temperature Ni-Cr alloy	Vacuum process high temperature Ni-Cr alloy

UHV Bakeable Sensor (continued)

SPARE PARTS LIST

PN	DESCRIPTION
007-064	Ceramic retainer
007-094	Clamping spring
007-095	Handle
007-098	Female Connector (includes ferrules and nut)
007-099	Bakeable head contact
007-100	Insulator for BNC
007-103	Insulator for bakeable head contact
007-104	BNC Body
007-157	Braze assembly – 76.2 cm (30 in.)
007-147	#4-40 x 3/8 in. screw
007-007	Retainer spring (part of crystal holder)
007-228	#4-40 x 5/8 in. screw
059-0084	VCR gasket
070-0201	#4 Split lockwasher

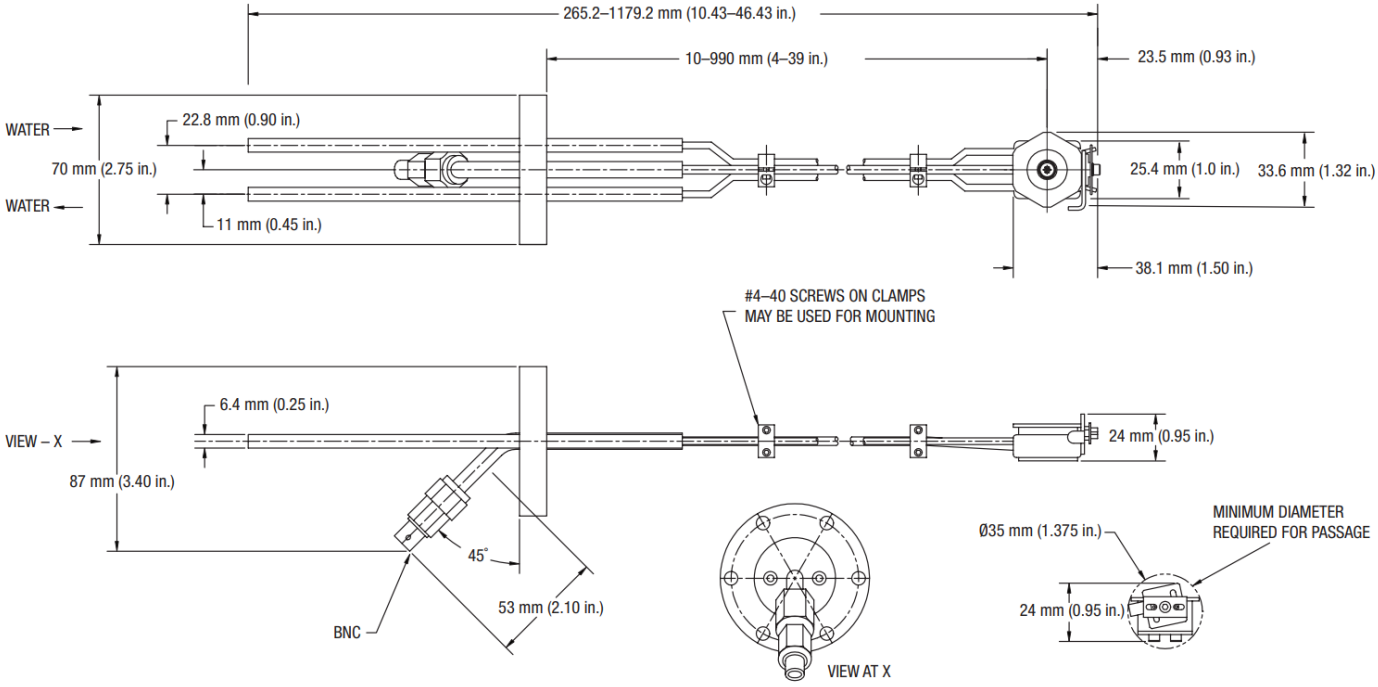
PN	DESCRIPTION
007-267-P2	Spreader bar
007-268-P1	Shoulder washer
007-269-P1	Shoulder washer
084-069-P1	#4-40 x 3/16 in. screw
750-018-P3	Split clamp
750-018-P5	Split clamp
750-022-G7	Bellows assembly – 76.2 cm (30 in.)
750-028-G7	Braze assembly with air line – 76.2 cm (30 in.)
750-115-P4	Coupling
750-118-P4	Actuator support
750-120-G3	Shaft assembly
750-216-G1	Shutter assembly
750-218-G1	Crystal holder

UHV Bakeable Sensor (continued)

DIMENSIONS

BK-A0F SENSOR / FEEDTHROUGH COMBINATION

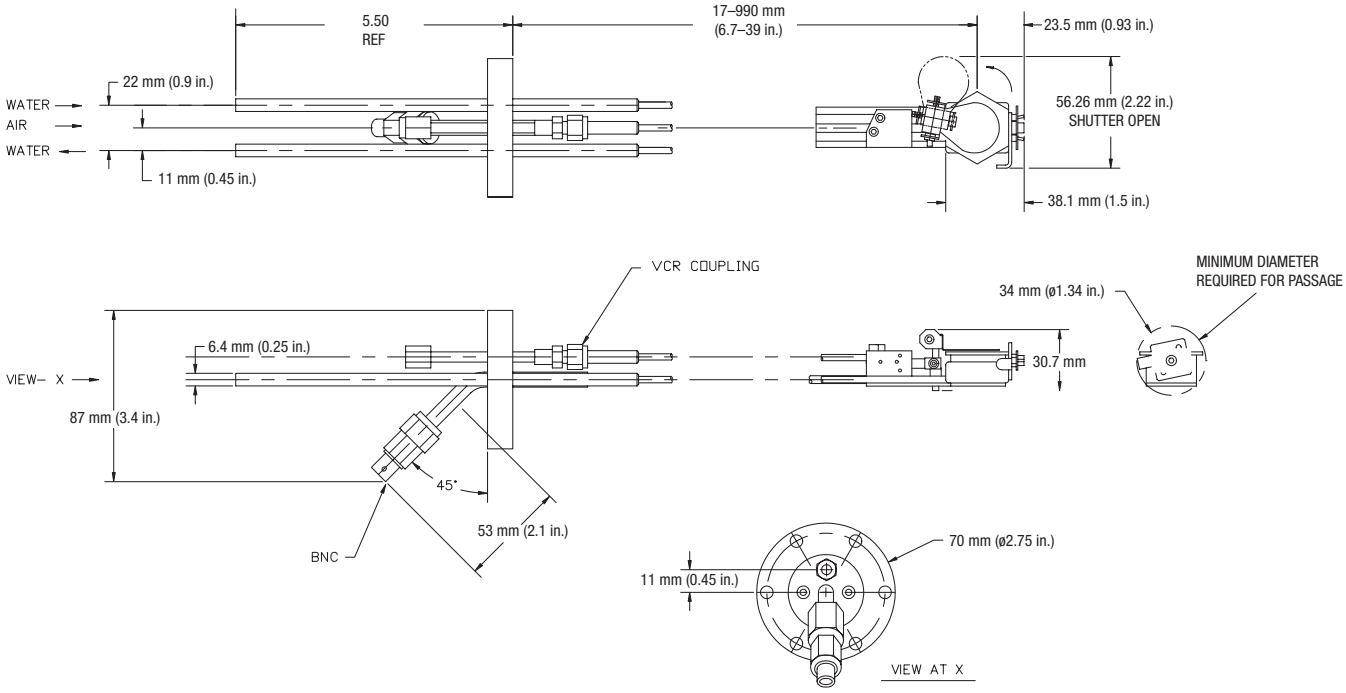
NOTE: Measurements in mm [in.]



DIMENSIONS

BK-A1F SENSOR / FEEDTHROUGH COMBINATION

NOTE: Measurements in mm [in.]



ALD Sensor

INFICON ALD Sensors bring the repeatability, precision and durability of quartz crystal microbalance (QCM) measurement to atomic layer deposition (ALD). The ALD Sensor can withstand temperatures up to 450°C and is designed to operate in the harsh environment of an ALD application.

A unique feature of the INFICON ALD Sensor is a gas tube used to purge the back of the crystal and sensor cavity with an inert gas, typically nitrogen. This keeps reactive chamber gases from entering the sensor head and keeps the back of the crystal and electrical contacts free of deposition material.

INFICON ALD Sensors are available in custom welded lengths or with compression fittings for adjustable length without the need for brazing or welding. All configurations use a CF40 (2 ¾ in. ConFlat®) flange feedthrough.

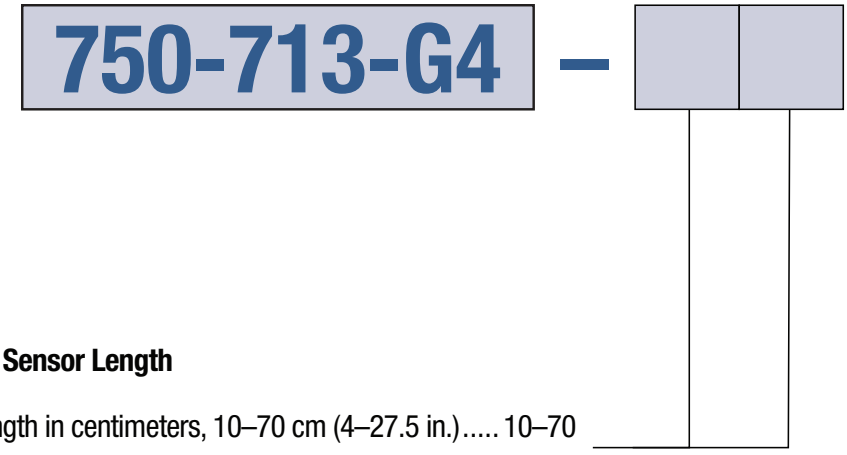
ADVANTAGES

- Operating temperature up to 450°C
- Gas purge line keeps back of crystal free of deposition material
- Welded CF40 (2 ¾ in. ConFlat) provides custom length with no customer welding required
- O-ring compression fitting option provides easy sensor length adjustment

ALD Sensors (continued)

ORDERING INFORMATION

WELDED ALD SENSOR



Welded Sensor Length

Weld length in centimeters, 10–70 cm (4–27.5 in.)..... 10–70

Weld length in centimeters, 71–99 cm (28–39 in.)..... 71–99

NOTE 1:
ALD Sensor orders are measured from center of the crystal to the vacuum side (sealing surface) of the feedthrough. Once a welded sensor order is confirmed, it cannot be cancelled.

ORDERING INFORMATION

ALD SENSORS	
750-717-G2	Adjustable ALD Sensor, length adjustable from 101.6 to 393.7 mm (4 to 15.5 in.)
750-717-G4	Adjustable ALD Sensor, length adjustable from 101.6 to 901.7 mm (4 to 35.5 in.)

HIGH TEMPERATURE CRYSTALS	
750-1058-G10	120°C optimized crystals, 6 MHz, 14 mm (0.55 in.), gold, pack of 10
750-1059-G10	240°C optimized crystals, 6 MHz, 14 mm (0.55 in.), gold, pack of 10
750-1060-G10	285°C optimized crystals, 6 MHz, 14 mm (0.55 in.), gold, pack of 10

ALD Sensors (continued)

SPECIFICATIONS

FEATURE, PARAMETER, OR SPECIFICATION	WELDED ALD SENSOR (PN 750-713-G4-XX)	ADJUSTABLE ALD SENSOR (PN 750-717-G2 AND G4)
Maximum temperature	450°C continuous	130°C continuous
Feedthrough	2 ¾ in. ConFlat	2 ¾ in. ConFlat equipped with O-ring compression fittings
Sensor / feedthrough connection	Welded (no fillers)	O-ring compression fittings
Gas and coax tubes	Gas: 3.2 mm (0.125 in.) OD (vacuum side) 6.4 mm (0.25 in.) OD (atmosphere side) Coax: 4.8 mm (0.375 in.) OD	Gas: 3.2 mm (0.125 in.) OD Coax: 4.8 mm (0.375 in.) OD
Sensor head size (maximum envelope)	34 x 35 x 24 mm (1.35 x 1.38 x 0.94 in.)	34 x 35 x 24 mm (1.35 x 1.38 x 0.94 in.)
Crystal exchange	Front loading, self-contained package Cam-type locking handle	Front loading, self-contained package Cam-type locking handle
Mounting	Four #4-40 tapped holes on back of sensor body	Four #4-40 tapped holes on back of sensor body
Utilities	Customer to provide means of attaching gas tube to purge gas supply	Customer to provide means of attaching gas tube to purge gas supply
Crystal (not included with sensor)	14 mm (0.55 in.) diameter	14 mm (0.55 in.) diameter
MATERIALS		
Body and holder	304 type stainless steel	304 type stainless steel
Springs	Molybdenum and Inconel X-750	Molybdenum and Inconel X-750
Gas and coax tubes	Seamless 304 stainless steel	Seamless 304 stainless steel
Other mechanical parts	18-8 or 304 stainless steel	18-8 or 304 stainless steel
Insulators	>99% Al_2O_3 in vacuum; other high density ceramics used elsewhere	>99% Al_2O_3 in vacuum; other high density ceramics used elsewhere
Wire	1) Ni (in vacuum) 2) Ni plated Cu (elsewhere)	1) Ni (in vacuum) 2) Ni plated Cu (elsewhere)
Braze	Vacuum process high temperature Ni-Cr alloy	Vacuum process high temperature Ni-Cr alloy
O-ring compression fittings	N/A	304 stainless steel, Viton

ALD Sensors (continued)

SPARE PARTS LIST

PN	DESCRIPTION
007-064	Ceramic retainer
007-094	Clamping spring
007-095	Handle
007-098	Female Connector (includes ferrules and nut)
007-099	Bakeable head contact
007-100	Insulator for BNC
007-103	Insulator for bakeable head contact
007-104	BNC Body
007-157	Braze assembly – 76.2 cm (30 in.)
007-147	#4-40 x 3/8 in. screw

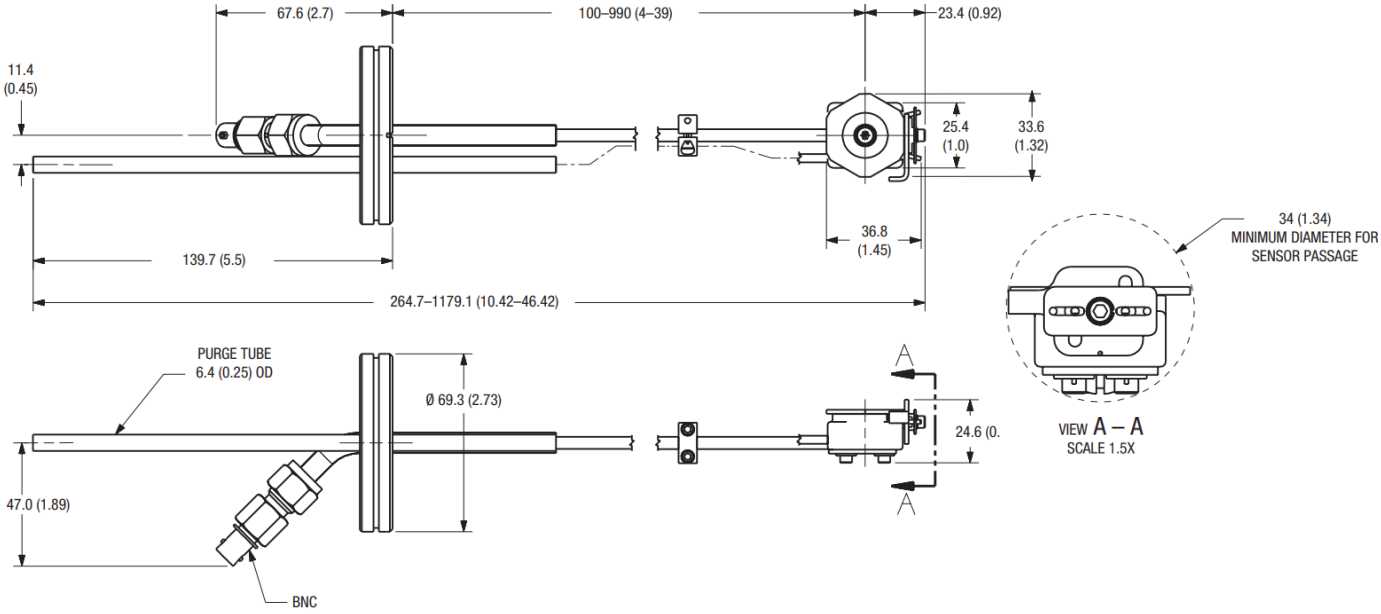
PN	DESCRIPTION
007-007	Retainer spring (part of crystal holder)
007-228	#4-40 x 5/8 in. screw
070-0201	#4 Split lockwasher
007-268-P1	Shoulder washer
007-269-P1	Shoulder washer
084-069-P1	#4-40 x 3/16 in. screw
750-018-P3	Split clamp
750-018-P5	Split clamp
750-022-G7	Bellows assembly – 76.2 cm (30 in.)
750-216-G1	Shutter assembly
750-218-G1	Crystal holder

ALD Sensors (continued)

DIMENSIONS

WELDED ALD SENSOR, 750-713-G4-XX

NOTE: Measurements in mm [in.]

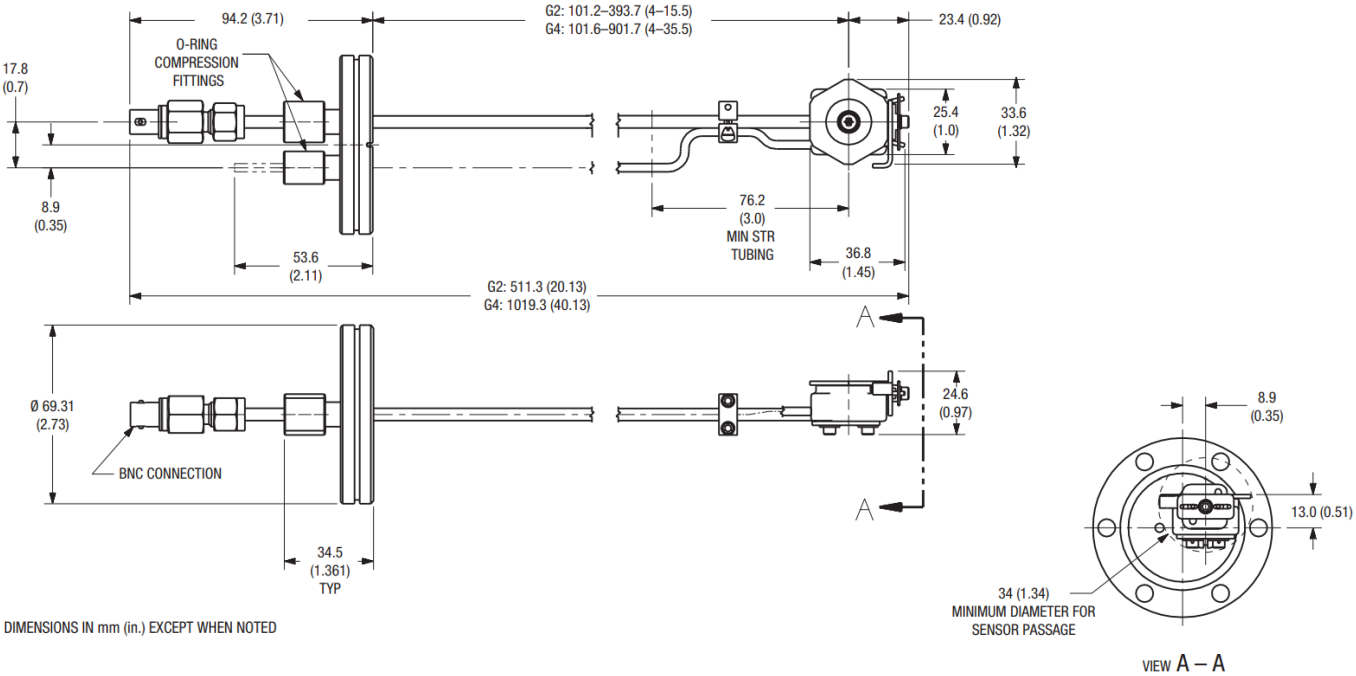


DIMENSIONS IN mm (in.) EXCEPT WHEN NOTED

DIMENSIONS

WELDED ALD SENSOR, 750-713-G4-XX

NOTE: Measurements in mm [in.]



DIMENSIONS IN mm (in.) EXCEPT WHEN NOTED

Sputtering Sensor

The INFICON Sputtering Sensor is specifically designed for use in any sputtering process. The sensor body and cooling tubes are gold plated beryllium copper for maximum cooling efficiency in the sputtering environment. A magnet built into the sensor head reduces excessive heating by energetic free electrons in sputtering systems by deflecting them with the external magnetic field. The rear loading crystal holder design allows easy crystal replacement without having to remove the sensor head from the system.

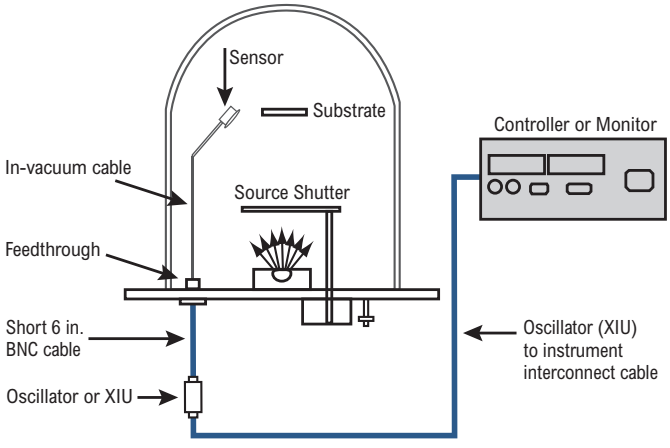
ADVANTAGES

- Gold plated beryllium copper sensor body and cooling tubes for maximum cooling efficiency
- Magnet to deflect free electrons away from the monitor crystal
- Easy installation with bendable water tubes allowing flexibility in sensor placement
- Rear load crystal insertion for easy crystal replacement

ORDERING INFORMATION

SPUTTERING SENSOR	
750-618-G1	Sputtering Sensor
750-005-G1	Sputtering Sensor Shutter Module

NOTE: Includes 78 cm (30.75 in.) in-vacuum cable, crystal snatcher, pack of 10 silver crystals, and manual (other in-vacuum cable lengths available separately)



Sputtering Sensor (continued)

SPECIFICATIONS

750-618-G1 SPUTTERING SENSOR	
Maximum bakeout temp with no water	105°C
Maximum operating isothermal environment temp with minimum water flow	400°C
Size (maximum envelope)	1.36 in. OD x 0.69 in. high (3.45 cm x 1.75 cm)
Water, air and coax length	Standard 30 in. (76.2 cm)
Crystal exchange	Rear loading
Mounting	Customer supplied
INSTALLATION REQUIREMENTS	
Feedthrough	2 pass water with coax connector 2¾ in. ConFlat® Flange – PN 002-0431 in. Bolt – PN 002-042
Other	Customer to provide vacuum-tight braze joints or connectors for the water tubes. XIU or Oscillator designed to interface with the specific deposition controller.
Water flow rate	Minimum water flow 750 cm^3/min, 30° C max (Do not allow to freeze) Coolant should not contain chlorides as stress corrosion cracking may occur. If the water tube passes through a cryoshroud, drain the tubes if the water flow is stopped for any reason.
MATERIALS	
Crystal	0.550 in. (1.4 cm) Diameter
Body and holder	Au plated Be-Cu
Springs, electrical contacts	Au plated Be-Cu
Water tubes	Au plated Be-Cu, 0.125 in. (0.32 cm) O.D.
Connector	304 Stainless steel
Insulators	99% Al_2O_3
Wire	Teflon insulated copper
Solder	Cadmium free silver and indium alloys
Magnet	ALNICO 5 Alloy
OPTIONAL SHUTTER ASSEMBLY 750-005-G1 SPECIFICATIONS:	
Temperature	130°C
Materials	300 series stainless steel
Pressure	90-95 PSIG (6.2-6.55 bar) [620-655 kPa] operation110 PSIG (7.6 bar) [760 kPa] maximum
Shutter	Pneumatically operated, requires solenoid valve, PN 750-420-G1
Braze	Vacuum process high temperature Ni-Cr Alloy

Sputtering Sensor (continued)

SPECIFICATIONS

FEEDTHROUGH SPECIFICATIONS

NOTE: Sensor / Feedthrough combination specifications are determined by lowest component specification

1 INCH BOLT AND ULTRA-TORR (COMPRESSION FITTING) TERMINATIONS:	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel, Viton
Temperature	Operational environment to 300°C with water cooling or 165°C without
Mounting	25.8 mm (1.015 in. ±0.010 in.) diameter aperture

CF 40 (2 3/4 IN. CONFLAT) WELDED TERMINATIONS:	
Materials	304 stainless steel, Teflon, ceramic, beryllium nickel
Temperature	Operational environment to 450°C with water cooling or 165°C without
Mounting	Mates with 2 ¾ in. ConFlat type flanges with 1.375 in. I.D. min.

SPARE PARTS LIST

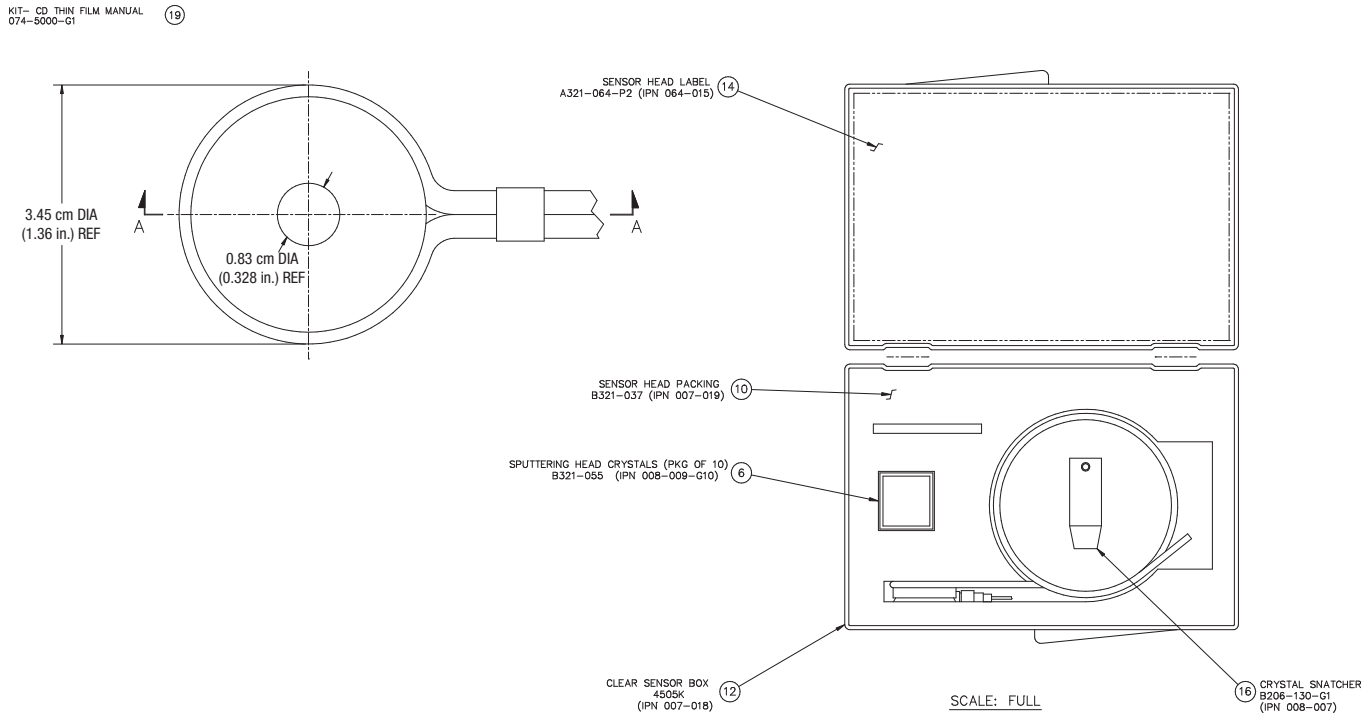
PN	DESCRIPTION
007-049	Crystal holder
007-007	Retainer spring for crystal holder
007-044	In-Vacuum Cable (30.75 in. / 78.1 cm)
007-047	Sputtering head cover with water lines
007-009	Magnet for sputtering head cover
070-0440	Retaining ring (installs onto shaft of shutter assembly)
070-0442	Retaining ring (installs onto shaft of shutter assembly)
070-0441	Spacer (installs onto shaft of shutter assembly)
082-044	2-56 X 1/4 in. Teflon screw for 750-619-G1 sputtering head body
082-029-P1	2-56 X 1/8 in. set screw for 750-619-G1 sputtering head body
750-005-G1	Pneumatic shutter assembly
750-009-P2	Pivot cover (installs onto shaft of shutter assembly)
750-046-G2	Shutter assembly for pneumatic shutter assembly
750-048-P1	Retainer spring for 007-048 and 750-619-G1 sputtering head bodies
750-115-P4	Coupling (installs into bellows assembly)
750-169-P4	Bellows assembly for pneumatic shutter assembly
750-174-P2	Female coax connector for 750-619-G1 sputtering head body
750-175-P1	Insulator for 750-619-G1 sputtering head body
750-188-P3	Leaf spring for 750-619-G1 sputtering head body
750-619-G1	Sputtering head body with coax connector
750-626-P1	Spring for sputtering head cover

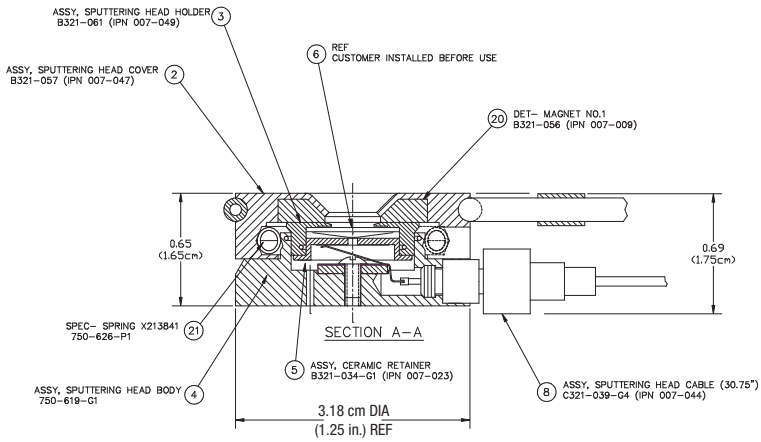
Sputtering Sensor (continued)

DIMENSIONS

750-618-G1 SPUTTERING SENSOR

NOTE: Measurements in cm [in.]



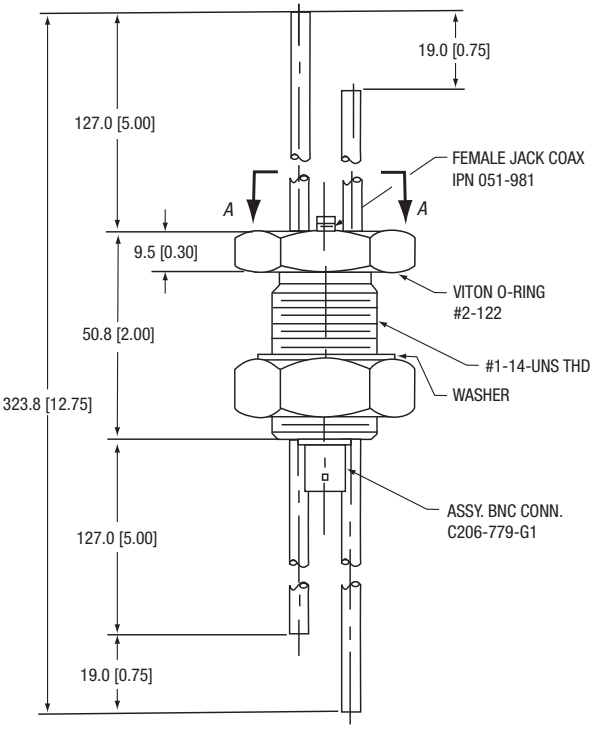


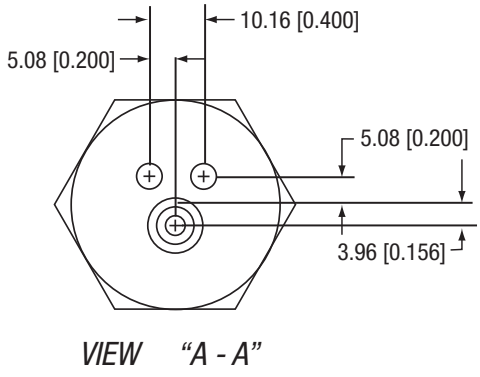
Sputtering Sensor (continued)

DIMENSIONS

WELDED ALD SENSOR, 750-713-G4-XX

NOTE: Measurements in mm [in.]



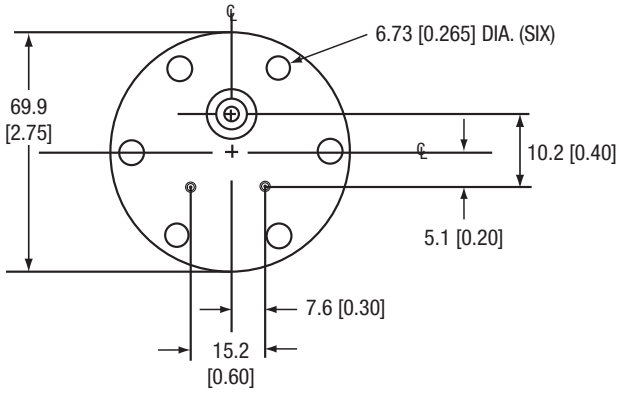


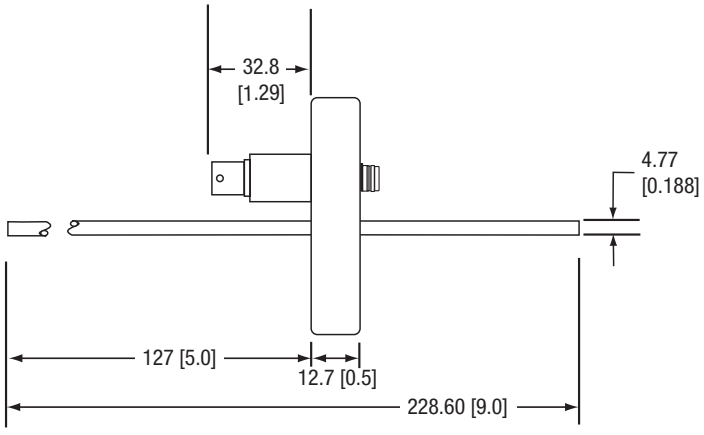
VIEW "A - A"

DIMENSIONS

PN 002-043

NOTE: Measurements in mm [in.]



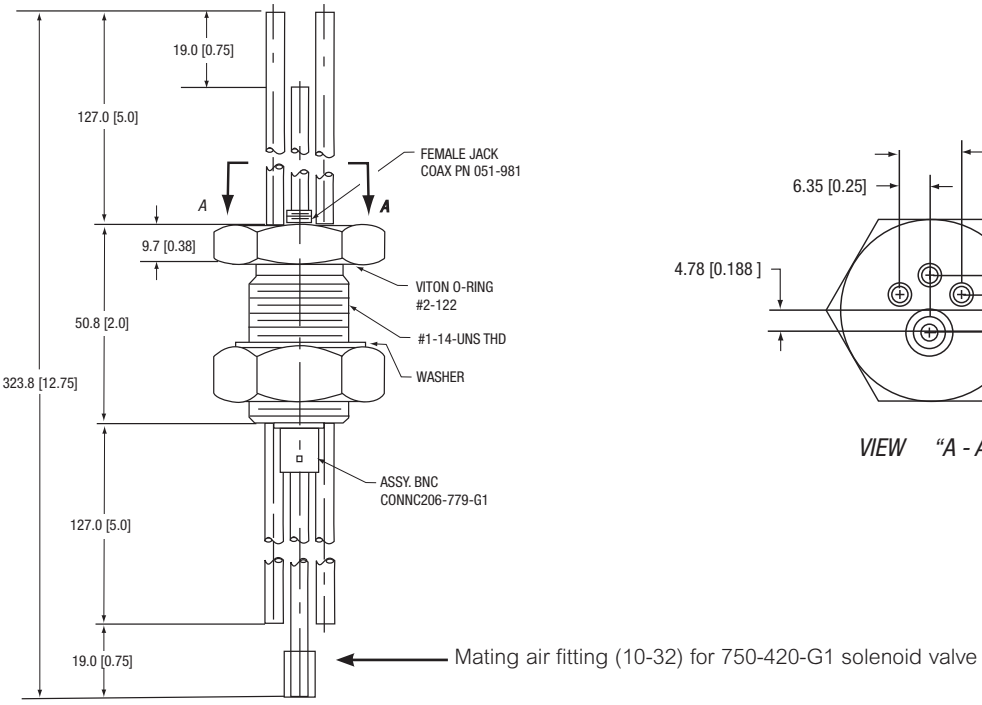


Sputtering Sensor (continued)

DIMENSIONS

PN 750-030-G1

NOTE: Measurements in mm [in.]

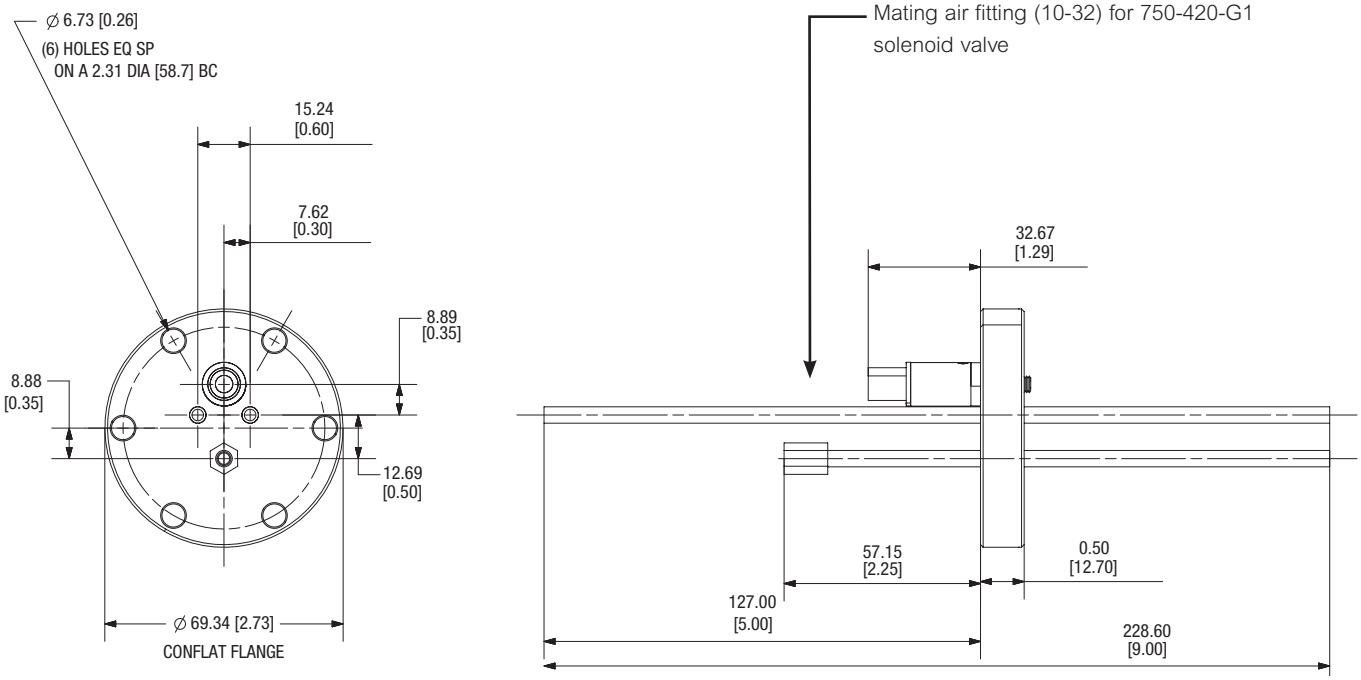


VIEW "A - A"

DIMENSIONS

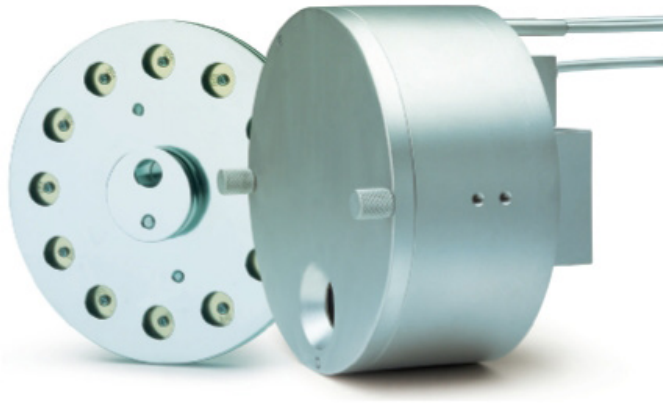
PN 750-685-G1

NOTE: Measurements in mm [in.]



Crystal 12® Sensor

The INFICON Crystal 12® Sensor is critical for long processes demanding continuous rate control. Whether an OLED, MBE, Solar or other process having an extended period between chamber venting, the Crystal 12 Sensor offers the security of 12 quartz monitor crystals in one sensor head. When used with Cygnus 2, IC6, XTC/3M, XTC/3S, SQC310 or SQC310C, the Crystal 12 automatically rotates a new crystal into position whenever the current crystal fails or becomes unstable. Crystals are automatically replaced without interrupting your process for continuous deposition rate monitoring. To further minimize downtime, crystals can be preloaded into a second optional carousel, which can then be quickly and easily exchanged with the carousel containing the exhausted crystals, minimizing the time the system is open.



Crystal indexing is accomplished with a pneumatically driven mechanism. This pneumatic drive provides better thermal stability than competitive units using expensive in-vacuum, heat generating, electric motors. One-eighth inch water cooling tubes keep the sensor head thermally stable and allow flexibility in sensor placement.

ADVANTAGES

- Holds 12 crystals with robust, automatic switching to maximize process uptime
- Easy-to-remove carousel allows fast replacement of all 12 crystals
- Stable crystal temperature, because crystal switching is pneumatically-driven (competitive units use heat-generating motors)
- 1/8 in. tubes maintain thermal stability and allow flexibility in sensor placement
- Easy-to-remove front deposition shield protects the crystals and carousel from material accumulation, minimizing the need to remove entire sensor for maintenance

Crystal 12 Sensor (continued)

ORDERING INFORMATION

Crystal 12 Sensor

X	L	1	2	–						

Type of Sensor
(Includes User Manual. Crystals sold separately)

None	0
Base unit – Crystal 12 sensor	1

In-vacuum Cable Assembly Length – SEE NOTE 3

None	0
78 cm (30.75 in)	1
15.2 cm (6 in)	2
30.5 cm (12 in)	3
61 cm (24 in)	4
91.4 cm (36 in)	5
121.9 cm (48 in)	6
152.4 cm (60 in)	7
182.9 cm (72 in)	8

Crystal Carousel Assembly

One (included in base unit)	0
Spare crystal carousel assembly	1

Solenoid Valve – SEE NOTE 2

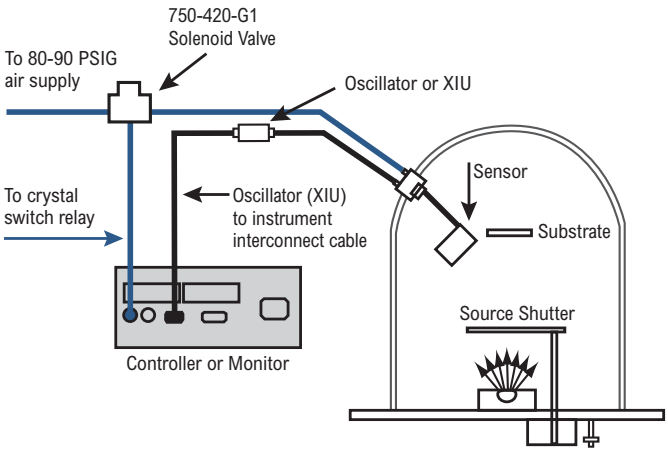
0	None
1	Solenoid Valve

Mounting Post with Hardware

0	None
1	Mounting post kit

Front Deposition Shield

0	One (included in base unit)
1	Spare front deposition shield



Custom parts, special bends and other non-standard parts available—Consult factory

NOTE 1:
Auto Crystal Switch only with IC6, Cygnus 2 , XTC/3M, XTC/3S, SQC-310, and SQC-310C.

NOTE 2:
The Crystal 12 Sensor requires the 750-420-G1 solenoid valve with orifice installed (orifice PN 059-0189, included in Crystal 12 ship kit).

NOTE 3:
All lengths are supported with IC6, Cygnus 2, XTC/3M, and XTC/3S. SQC-310 and SQC-310C support in-vacuum lengths up to 30.75 in. only.

NOTE 4:
Position feedback is not available with SQC-310 or SQC-310C.

Crystal 12 Sensor (continued)

SPECIFICATIONS

CRYSTAL 12 SENSOR SPECIFICATIONS	
Maximum bakeout temp with no water	130°C
Maximum operating isothermal environment temperature with minimum water flow	300°C
Size (maximum envelope)	4.0 in. (102 mm) dia. x 3.3 in. (84 mm) high 4.75 in. (121 mm) dia. x 3.46 in. (88 mm) with optional mounting posts installed
Water and air length	Standard 30 in. (762 mm)
Crystal exchange	Front-loading
Mounting	Six #4-40 tapped holes on the back of the sensor body, six #4-40 tapped holes on outside circumference. Three #6-32 tapped holes with optional mounting kit (PN 750-670-G1)
Weight	4.92 lb. (2.23 kg)
INSTALLATION REQUIREMENTS	
Feedthrough	Qty (1) 2-3/4 in. ConFlat® with one coaxial feedthrough, two pass water, one air, IPN 750-685-G1,or, Qty (1) 750-685-G2, with one coaxial feedthrough three tube with Ultra-Torr compression fittings or, Qty (1) 1 in. bolt with one coaxial feedthrough, two pass water, one air IPN 750-030-G1
Mounting	User to provide mounting structure adequate to support weight of Crystal12 and designed to facilitate removal and replacement with minimal change in exact position. An optional mounting post kit, PN 750-670-G1, may be purchased for this purpose
Air and water connections	User to provide vacuum-tight braze joints or connectors for the water and air tubes.Valve assembly for air, IPN 750-420-G1 (not provided), with a 0.022 in. restrictor orifice installed by the user. (Orifice included with Crystal12 accessory kit.)
Utilities	Minimum water flow 150-200 cc / min, 30° C max (Do not allow water to freeze).Coolant should not contain chlorides as stress corrosion cracking may occur.Regulated air supply 80-90 PSIG (5.5 bar – 6.2 bar) [550 kPa – 620 kPa]2 meter maximum length of 1/8 in. tubing between sensor head and the solenoid valve.
MATERIALS	
Crystal	0.550 in. (13.97 mm) diameter
Plate, Material Shield, Mechanical Parts, Body and Carousel	304 type stainless steel
Springs, Electrical Contacts	Au plated Be-Cu, Au Plated 302 stainless steel
Water and air tubes	S-304, 0.125 in. (3.2 mm) O.D. x .016 in. (0.4 mm) Wall Thickness x 30 in. Long (762 mm) seamless stainless steel tubing
Connector	Stainless steel
Insulators	Teflon, Peek®
Cable	Teflon insulated copper plated steel

Crystal 12 Sensor (continued)

SPARE PARTS LIST

PN	DESCRIPTION
750-276-P3	Actuator cover
750-644-G1	Housing
750-658-G1	Deposition shield
750-286-P2	Pneumatic actuator
750-291-P1	Detent
750-294-P2	Stop ratchet
750-293-P2	Ratchet
750-256-P2	Extension spring
750-252-P2	Spring post
750-649-G1	Electrical connection
750-295-G1	Pawl and actuator
750-258-P2	Bearing shaft
070-779	Ball bearing
750-652-G1	Carousel
750-650-P1	Aperture plate (without dowel pin)
070-1253	Dowel pin
750-651-P1	Resistor network support
750-655-P1	Resistor network insulator
750-642-G1	Resistor network
750-661-P1	Contact terminal (carousel component)
750-656-P1	Crystal insulator (carousel component)
321-038-P6	Leaf spring (carousel component)
750-657-P1	Grounding leaf spring
750-671-P1	Torsion spring
750-626-P1	Spring
750-647-P1	Spindle
070-1268	Spindle bearing (spindle component)
070-1254	E-Ring (spindle component)
750-660-P1	Location screw (spindle component)

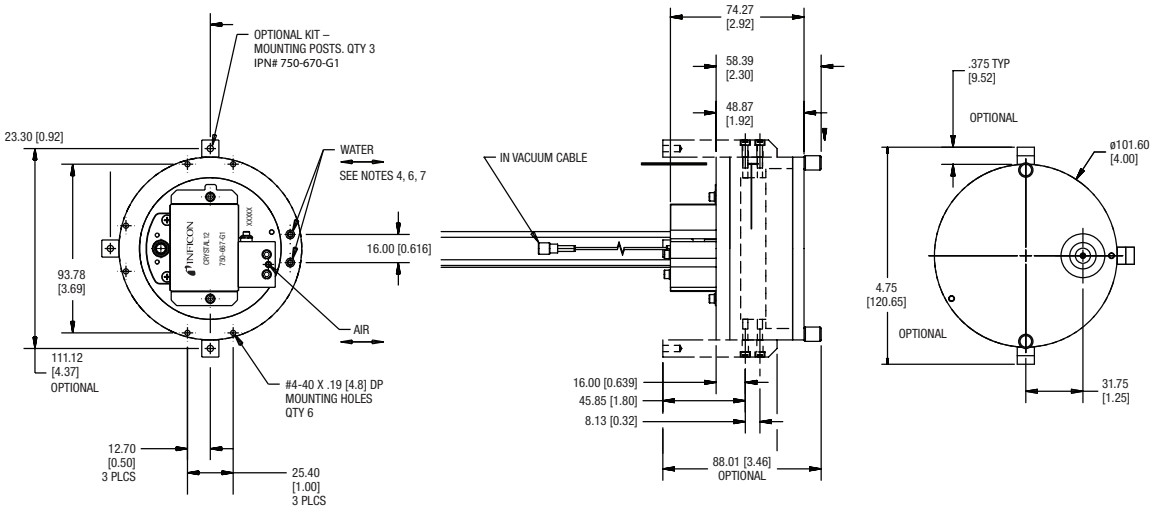
PN	DESCRIPTION
007-126	0.125 in. x 30 in. (3.175 mm x 762 mm) seamless tubing
070-201	#4 Split lock washer
084-004	#4-40 x .187 in. Hex Socket Head Screw
070-398	Retaining ring
070-867	Shaft spacer
070-170	#2 Split lock washer
070-177	#4-40 x 3.12 in. Hex head screw
080-038	#0-80 x 0.375 in. Phillips Pan Head Screw
082-032	#2 Internal lock washer
082-045	#2-56 x 0.187 in. Phillips Screw
084-054	#4 Split lock washer
082-022	#2 Flat washer
082-024	#2-56 x 0.250 in. Hex Socket Screw
082-032	#2 Internal lock washer
750-292-P2	Detent spacer
080-013	#0-80 Split washer
080-007-P1	#0-80 x 0.170 in. Flat washer
080-009-P1	#0-80 x 0.188 in. Socket head screw
084-048	#4-40 x 0.250 in. Flat Head Screw
750-665-P1	#2-56 Torsion spring shoulder screw
070-170	#2 Split lock washer
082-045	#2-56 x 0.187 in. Phillips Screw
070-201	#4 Split lock washer
084-093	#4-40 x 1.125 in. Socket Head Screw
086-084-P2	#6-32 x 0.125 in. Set Screw
086-041	#6 Flat washer
086-038	#6 Split lock washer
086-036	#6-32 x 0.375 in. socket head screw
086-084-P2	#6-32 x 0.125 in. Set Screw

Crystal 12 Sensor (continued)

DIMENSIONS

CRYSTAL 12 SENSOR

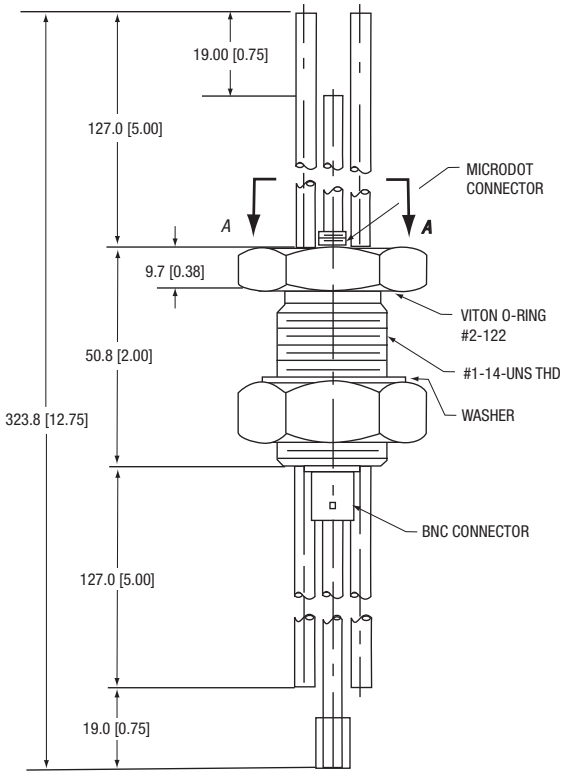
NOTE: Measurements in mm [in.]

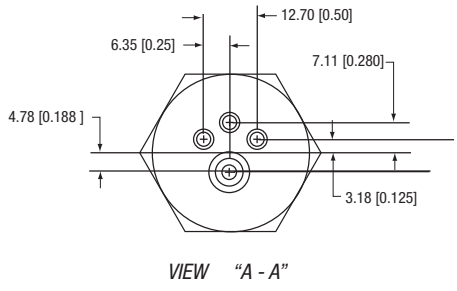


DIMENSIONS

CRYSTAL 12 SENSOR CAN BE USED WITH THE FOLLOWING FEEDTHROUGHS: PN 750-030-G1

NOTE: Measurements in mm [in.]





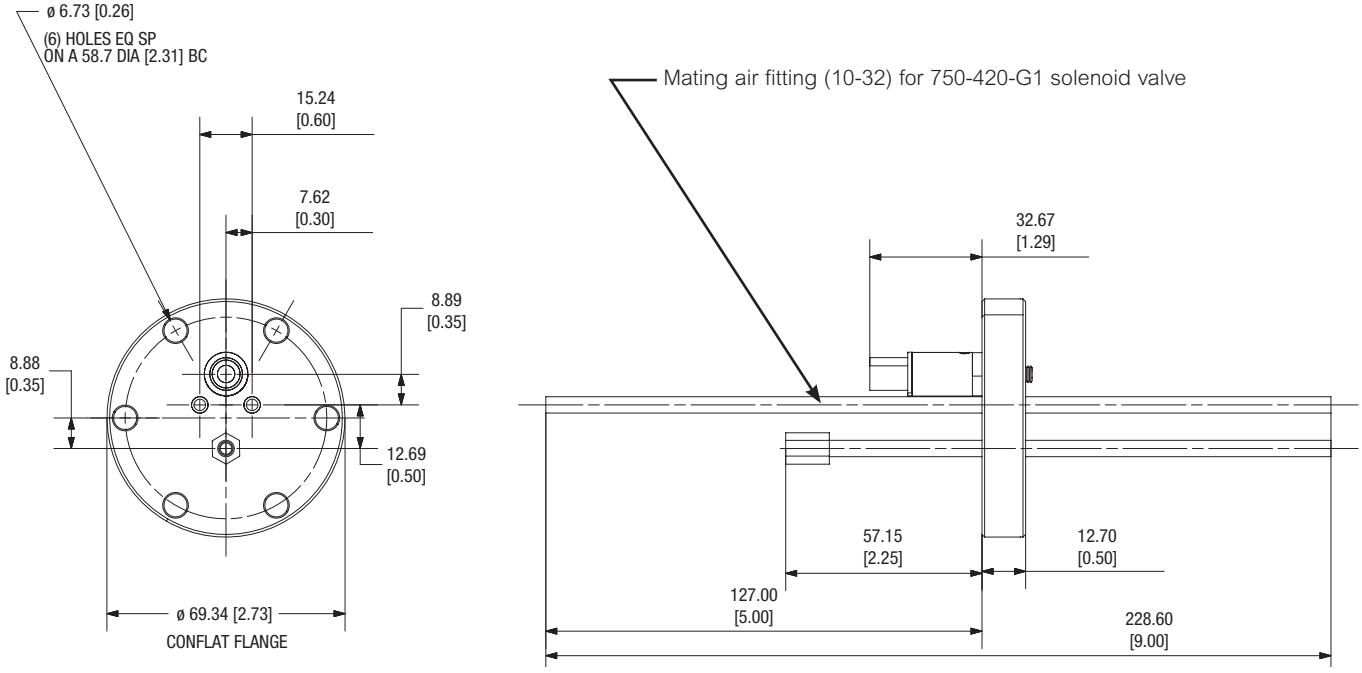
VIEW "A - A"

Crystal 12 Sensor (continued)

DIMENSIONS

PN 750-685-G1

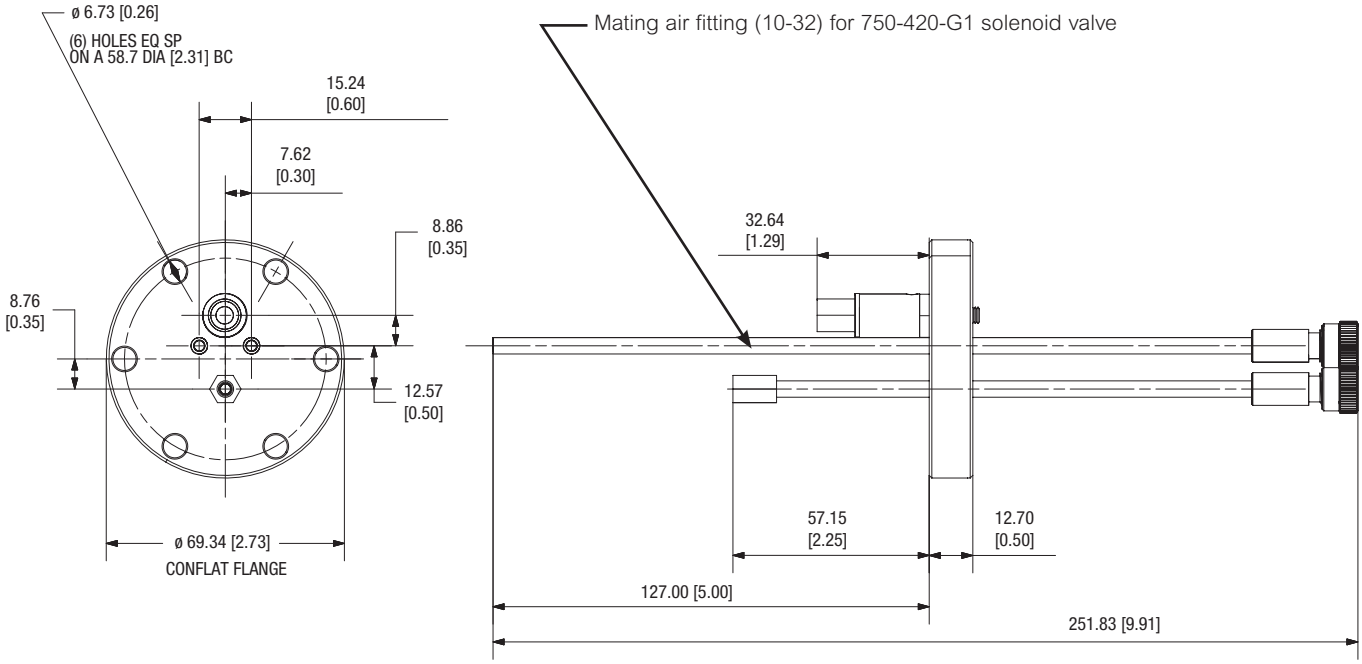
NOTE: Measurements in mm [in.]



DIMENSIONS

PN 750-685-G2

NOTE: Measurements in mm [in.]



This page left blank intentionally.

CrystalSix® Sensor

INFICON CrystalSix Sensors are designed and manufactured to provide the best quality and reliability in thickness monitoring for applications where single and dual sensors do not last through the complete process life. Whether an OLED, MBE, solar, long optical coating, or other processes having an extended period between chamber venting, the CrystalSix Sensor will maximize PVD production with six crystals per sensor and minimize cost through a low price. When used with an INFICON Thin Film Controller, the CrystalSix automatically rotates a new crystal into position whenever the current crystal fails or becomes unstable. Crystals are automatically replaced without interrupting your process for continued deposition rate monitoring.

Crystal indexing is accomplished with a pneumatically driven mechanism. This pneumatic drive provides better crystal thermal stability than competitive units using expensive in-vacuum, heat generating, electric motors. One-eighth inch water cooling tubes keep the sensor head thermally stable and allow flexibility in sensor placement.

When used with certain INFICON thin film controllers, the sensor provides position feedback so specific positions can be used with specific materials.

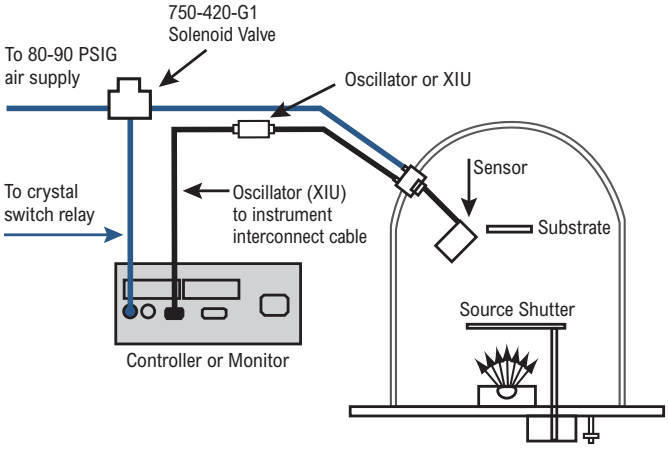
ADVANTAGES

- Minimize investment with lowest upfront cost
- Increase production with maximum uptime
- Ensure quality products using real-time rate control for continuous or multi-layer film depositions
- Save time with easy installation for system integration
- Optimize system performance through worldwide expert applications support
- Compatibility with industry-leading INFICON controllers
- Stable crystal temperature, because crystal switching is pneumatically-driven (competitive units use heat-generating motors)

CrystalSix Sensor (continued)

ORDERING INFORMATION

CRYSTALSIX SENSOR	
750-446-G1	CrystalSix Sensor
SPS-1039-G1	CrystalSix Sensor with Shutter



NOTE 1:
The CrystalSix sensor requires the 750-420-G1 solenoid valve with orificeinstalled (PN 059-0189 included in CrystalSix ship kit).

NOTE 2:
The CrystalSix sensor cannot be used with Thin Film Deposition monitors.

CrystalSix Sensor (continued)

SPECIFICATIONS

CRYSTALSIX SENSORS	
750-446-G1 CrystalSix Sensor Specifications	130°C
Maximum bakeout temp with no water	130°C
Maximum operating isothermal environment temperature with minimum water flow	400°C
Water, air and coax length	76 cm (30 in.)
Crystal exchange	Front-loading, extraction tool required (supplied with unit)
Mounting	Six #4-40 tapped holes on the back of the sensor body
Size (maximum envelope)	9.7 cm (3.8 in.) DIA x 5.1 cm (2.0 in.) high
INSTALLATION REQUIREMENTS	
Feedthrough	Qty (1) 2¾ in. ConFlat® with one coaxial feedthrough, two pass water, one air PN 750-685-G1,or, Qty (1) 750-685-G2, with one coaxial feedthrough three tube with Ultra-Torr compression fittings or,Qty (1) 1 in. bolt with one coaxial feedthrough, two pass water, one air PN 750-030-G1
Other	User to provide vacuum-tight braze joints or connectors for the water and air tubes. Valve assembly for air, PN 750-420-G1 (not provided), with a 0.022 in. restrictor orifice installed by the user. (Orifice included with CrystalSix accessory kit.)
Utilities	User to provide vacuum-tight braze joints or connectors for the water and air tubes.Valve assembly for air, IPN 750-420-G1 (not provided), with a 0.022 in. restrictor orifice installed by the user. (Orifice included with Crystal12 accessory kit.)
Minimum water flow	150-200 cc/min, 30°C max (Do not allow water to freeze) Coolant should not contain chlorides as stress corrosion cracking may occur
Regulated air supply	80–90 PSIG (5.5 bar–6.2 bar) [550 kPa – 620 kPa]2 m maximum length of 1/8 in. tubing between sensor head and the solenoid valve
MATERIALS	0.550 in. (13.97 mm) diameter
Crystal	0.550 in. (13.97 mm) diameter
Plate, holders, material shield, mechanical parts	304 type stainless steel
Springs, electrical contacts	Au plated Be-Cu, Au Plate Inconel, 303 stainless steel
Water and air tubes	S-304, 0.32 cm (0.125 in.) O.D. x 0.04 cm (0.016 in.) wall thickness 76 cm long (30 in.) seamless stainless steel tubing
Connector (Microdot)	Stainless steel
Insulators	>99% Al_2O_3
Cable	Teflon insulated copper
Body and carousel	2024 T351 Aluminum

CrystalSix Sensor (continued)

SPARE PARTS LIST

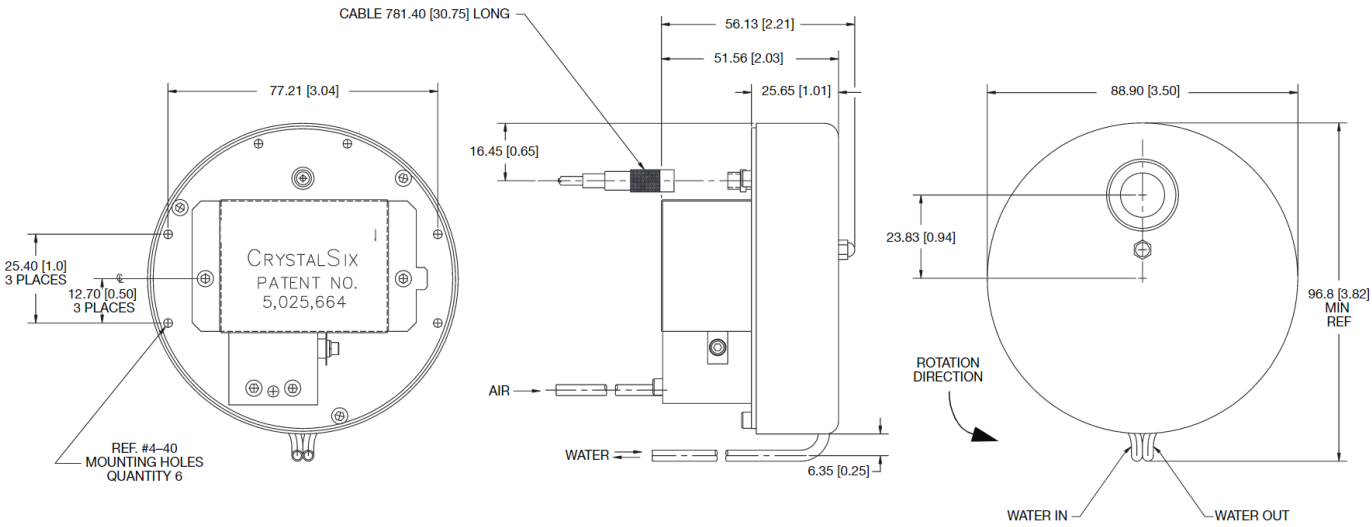
PN	DESCRIPTION
007-007	Retaining spring (part of crystal holder)
007-023	Ceramic retainer
007-044	In-vacuum cable 78 cm (30.75 in.)
070-0170	#2 lockwasher (part of heat shield assembly)
070-0398	Retaining ring (secures bearing located next to pawl and actuator stem)
070-0777	Compression spring (on carousel shaft)
070-0778	Ball bearing (underneath carousel)
070-0779	Bearing (makes contact with pawl and actuator stem)
070-0870	Teflon washer (on carousel shaft)
070-0877	Shim spacer (part of heat shield assembly)
070-0879	Bearing (at center of top plate weld assembly)
073-114	Wire 0.022 x 1.06 in. (clamps heat shield retaining pin)
082-026	#2-56 nut (part of heat shield assembly)
750-048-P1	Retaining spring (clamps crystal holders to carousel)
750-175-P1	Bottom insulator (underneath leaf springs)
750-188-P3	Leaf spring
750-249-P2	Retaining pin (part of heat shield assembly)
750-250-G1	Heat shield assembly
750-256-P2	Extension spring (part of top plate weld assembly)
750-257-P3	Corrugated spring 11.2 cm (4.40 in.)
750-261-G1	Carousel assembly (includes resistor network and electrical contacts)
750-262-G1	Crystal holder
750-265-G1	Top plate weld assembly
750-276-P2	Actuator cover
750-278-P2	Water line
750-286-P2	Bellows assembly
750-290-P3	Carousel electrical contacts (set of eight)
750-291-P1	Detent
750-293-P2	Ratchet
750-294-P2	Stop ratchet
750-295-G1	Pawl and actuator stem
750-336-G1	Resistor network assembly
750-338-P1	Contact insulator (underneath carousel electrical contacts)

CrystalSix Sensor (continued)

DIMENSIONS

750-446-G1 CRYSTALSIX SENSOR

NOTE: Measurements in mm [in.]

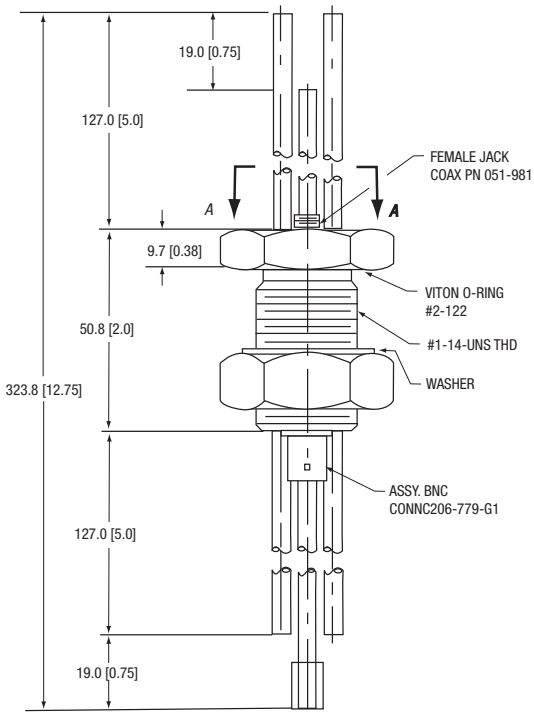


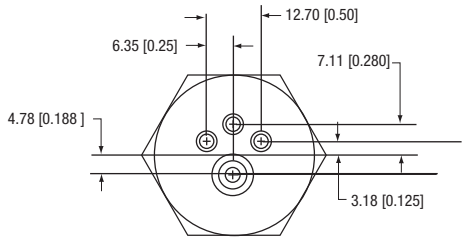
DIMENSIONS

CRYSTALSIX SENSOR 750-446-G1 CAN BE USED WITH THE FOLLOWING FEEDTHROUGHS:

PN 750-030-G1

NOTE: Measurements in mm [in.]





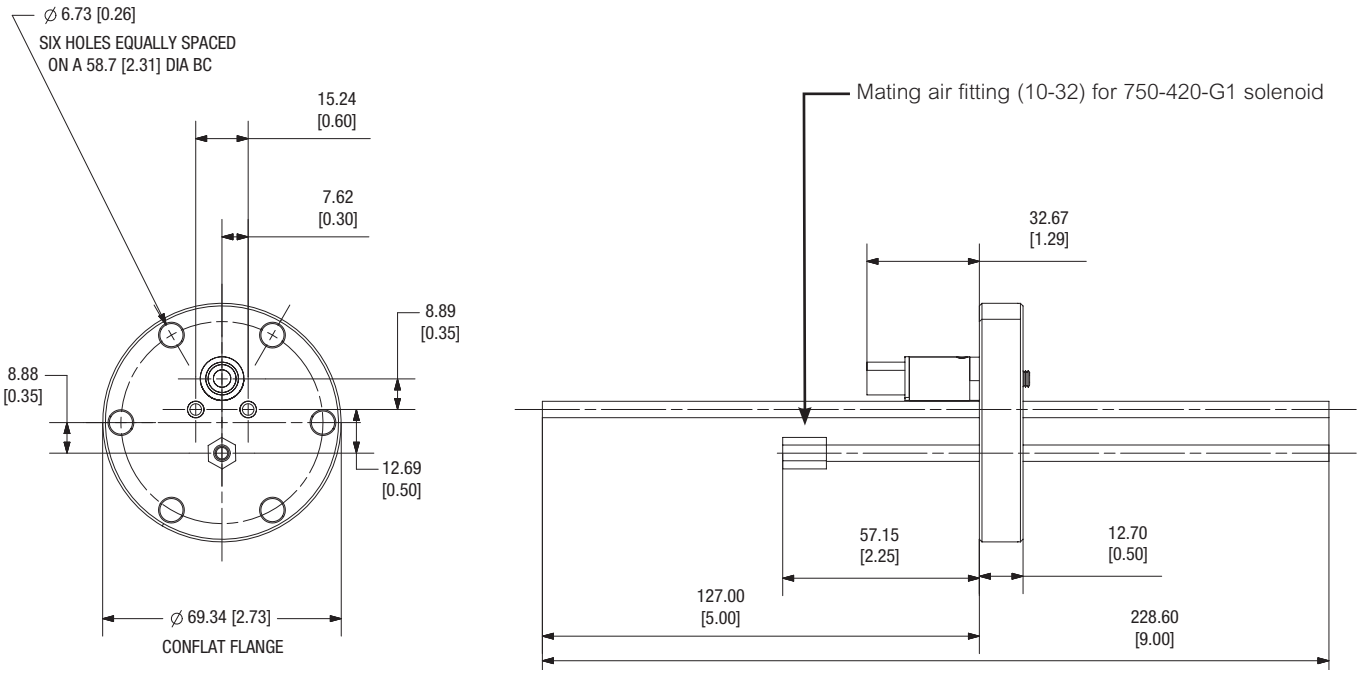
VIEW "A - A"

CrystalSix Sensor (continued)

DIMENSIONS

PN 750-685-G1

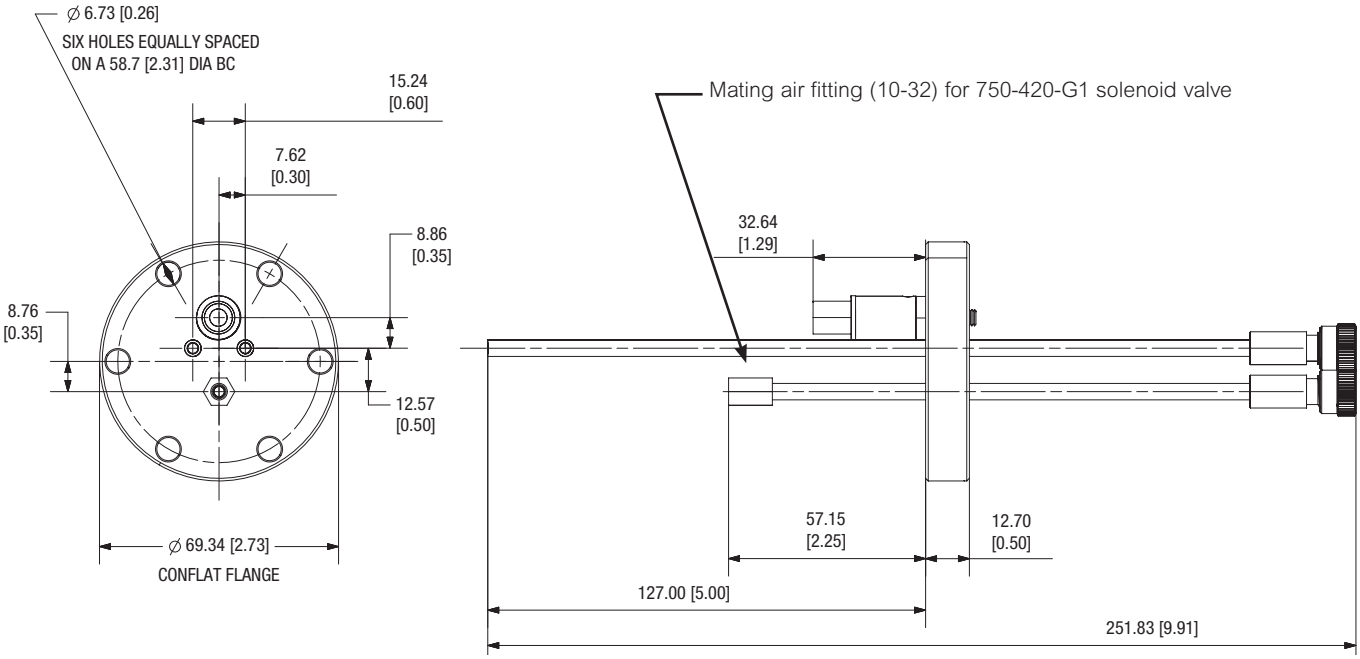
NOTE: Measurements in mm [in.]



DIMENSIONS

PN 750-685-G2

NOTE: Measurements in mm [in.]

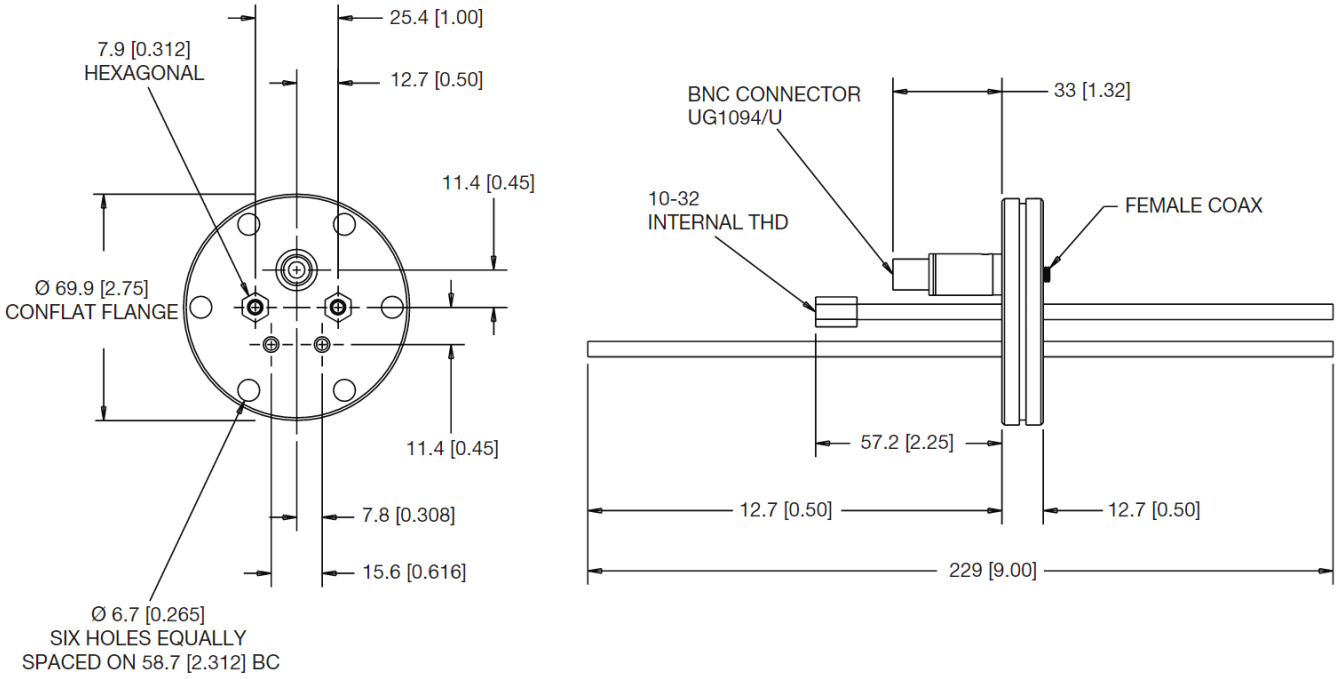


CrystalSix Sensor (continued)

DIMENSIONS

CRYSTALSIX SENSOR WITH SHUTTER SPS-1039-G1 CAN BE USED WITH FEEDTHROUGH PN 750-683-G1

NOTE: Measurements in mm [in.]



This page left blank intentionally.

RSH-600 Rotary Sensor Head

Maximize PVD accuracy and production with six crystals per sensor and a long-lasting sensor design. INFICON RSH-600 Sensors are designed and manufactured to provide the best quality and reliability in thickness monitoring for applications where one or two crystals do not last through the complete process.

Crystal retainer assembly and standard stainless steel cover

Copper Head Cover

45° Angle Head

QUALITY

Maximize film quality: long lifetime design, quality manufacturing, and effective crystal cooling maximizes accuracy. RSH-600 holds six crystals in a thermally shielded, water cooled housing, ensuring excellent crystal performance in temperature environments up to 300°C.

Maximize throughput: maximum uptime with easy, on-site maintenance. Crystals are housed in an easy to remove stainless steel crystal holder. Crystal position is incremented pneumatically by applying a one second pulse to a 115 V (ac) or 24 V (dc) solenoid valve. A 7-pin connector provides individual switch closures to ground to indicate the current crystal position.

SENSOR CONFIGURATIONS

RSH-600 can be configured with a flat head for top mount installation through an O-ring sealed feedthrough (not included). The 45° angle head can be configured for installation through the side of the chamber. Standard head covers are made of stainless steel. Copper head covers are available for applications where temperature is a concern. RSH-600 is available in the following in-vacuum lengths:

- 200 mm (7.9 in.)
- 350 mm (13.8 in.)
- 450 mm (17.7 in.)
- 540 mm (21.3 in.)
- 650 mm (25.6 in.)

NOTE: Angled heads add 11 mm (0.4 in.) to in-vacuum length. (See the drawing on page C80.)

ADVANTAGES

- Maximize yield and film accuracy with the highest quality design and manufacturing available
- Increase production with maximum uptime
- Maximize throughput with fast and easy crystal exchange
- Save time with easy, on-site maintenance and installation
- Optimize system performance through worldwide expert applications support

RSH-600 Rotary Sensor Head (continued)

ORDERING INFORMATION

Rotary Sensor Head – RSH-600 Sensor

1	5	3	2	0		–		

Type of Sensor

Stainless steel flat head	6
Stainless steel angle head	7
Copper flat head	8
Copper angle head	9

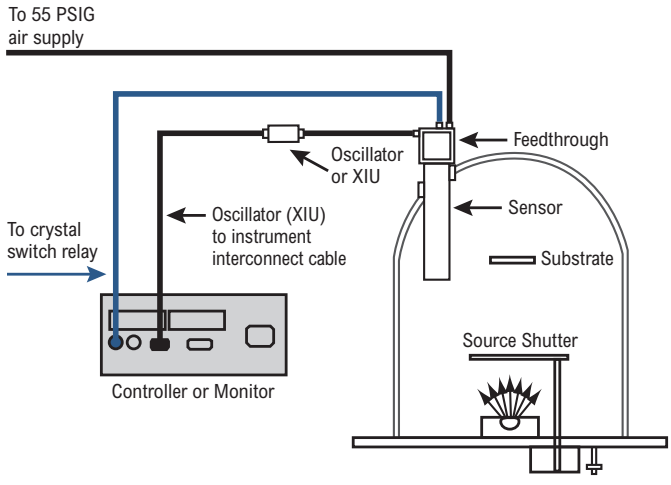
Length of Sensor
(in-vacuum length)

200 mm (7.9 in.)	0
350 mm (13.8 in.)	1
450 mm (17.7 in.)	2
540 mm (21.3 in.)	3
650 mm (25.6 in.)	4

NOTE: Angled heads add 11 mm (0.4 in.) to in-vacuum length.

Voltage

1	115 Volts
2	24 Volts



RSH-600 Rotary Sensor Head (continued)

SPECIFICATIONS

RSH600 SPECIFICATIONS	
Number of crystals	Six
Crystal size	14 mm (0.550 in.) diameter
Installation aperture	50.8 mm (2.0 in.) diameter
Overall length	See chart on the following page
Power requirement 24 V (dc) solenoid valve	21.6 – 26.4 V (dc), 40 mA 90 – 132 V (ac), 36/32 mA rms (50/60 Hz) 115 V (ac) solenoid valve
Crystal switching method	Air actuated @ 55 psi (4 kg/cm^2) regulated
Cooling method	Water-cooled @ 5 L/m at 2 kg/cm^2 (28 psi) (Do not allow to freeze)
Air and water connections	One ¼ in. quick connect for air, two ¼ in. compression fittings for water
Maximum bakeout temperature without water	130°C
Operating temperature	300°C max with water cooling and stainless steel head cover 400°C max with water cooling and copper head cover
Weight	~ 3.8 kg (8.5 lb.), varies with overall length
Materials	304 stainless steel, Teflon®, beryllium nickel

SPARE PARTS LIST

PN	DESCRIPTION
144-101	M3x6 SOC head screw for flat crystal retainer
153706	Spring retainer assembly – flat
153707	24 V (dc) solenoid valve assembly
153709	Retaining screw for flat crystal retainer
153710	Crystal holder – flat (includes 153709)
153714	Spring retainer assembly – angled
153715	Retaining screw for angled crystal retainer
153716	Crystal holder – angled
153722	Signal and ground contact module
153724	Spring retainer contact kit – flat (set of six)
153726	Spring contact for crystal retainer assembly

ACCESSORIES

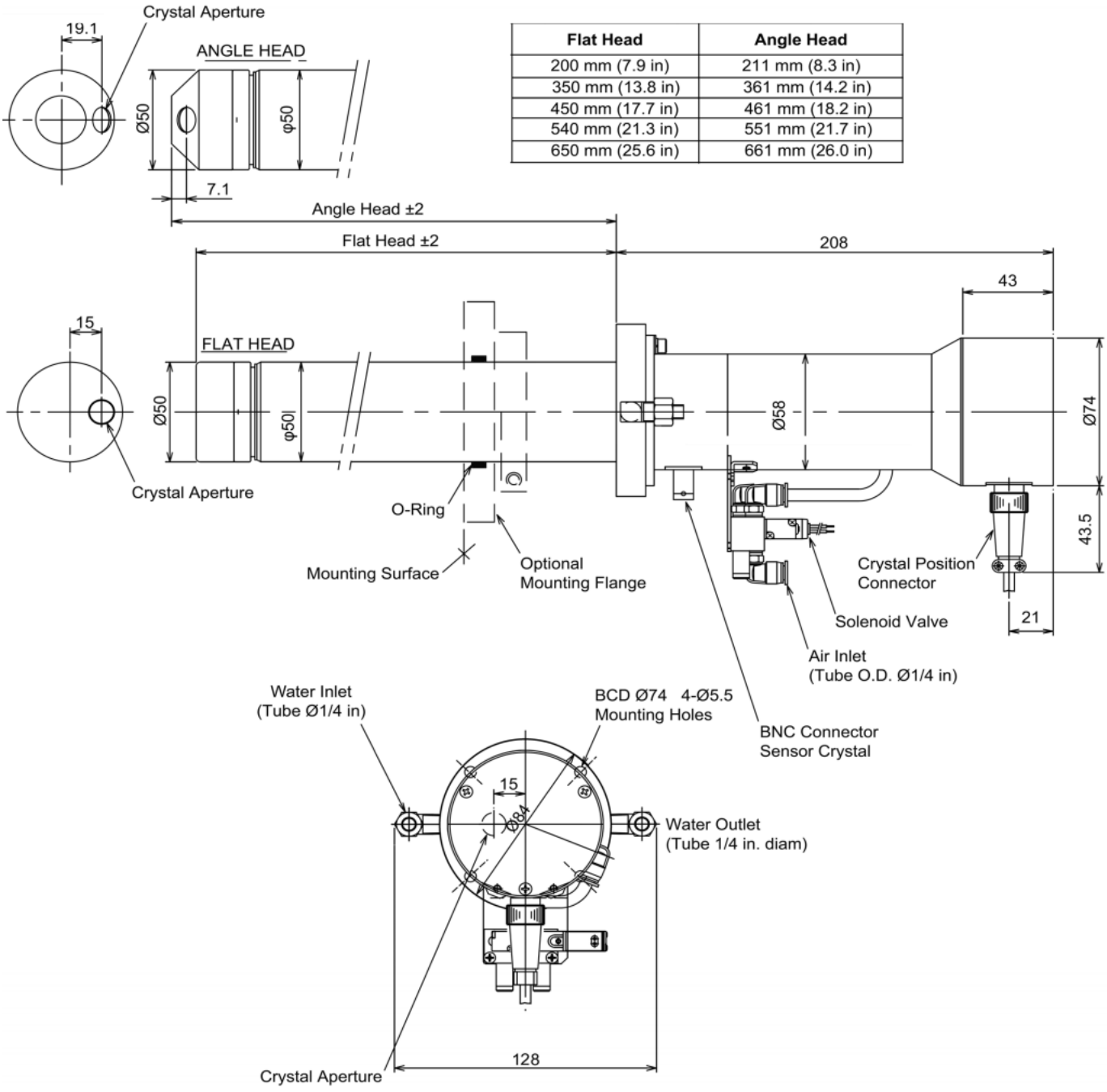
PN	DESCRIPTION
153202	RSH-600 adjustable flange
153204	Crystal retainer assembly, flat
153204-2	Crystal retainer assembly, angled
153708	Sensor head cover, stainless steel, flat
153713	Sensor head cover, stainless steel, angled
153731	Sensor head cover, copper, flat
153731-2	Sensor head cover, copper, angled

NOTE: Conversion from flat to angled head requires parts numbers 153204-2 and either 153713 or 153731-2. Conversion from angled to flat requires parts numbers 153204 and either 153708 or 153731.

RSH-600 Rotary Sensor Head (continued)

DIMENSIONS

Flat Head	Angle Head
200 mm (7.9 in)	211 mm (8.3 in)
350 mm (13.8 in)	361 mm (14.2 in)
450 mm (17.7 in)	461 mm (18.2 in)
540 mm (21.3 in)	551 mm (21.7 in)
650 mm (25.6 in)	661 mm (26.0 in)



SemiQCM Sensors

This page left blank intentionally.

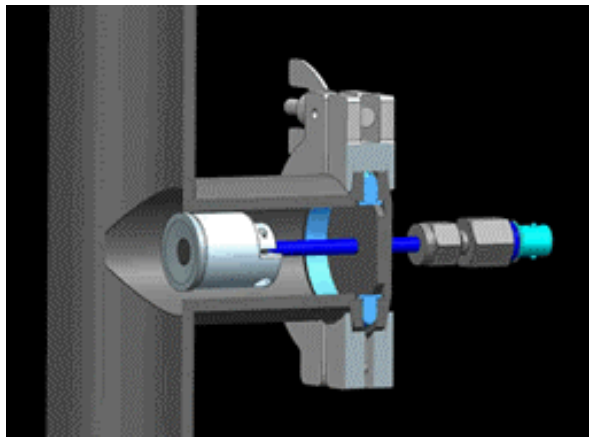
SemiQCM™

PROTECT AND GROW YOUR PROFIT WITH PRECISION RATE AND THICKNESS MONITORING

The SemiQCM sensor is one component of a QCM system for monitoring TDMAT precursor with the other components being an IMM-200 and FabGuard (version 19.12.00-a or higher).

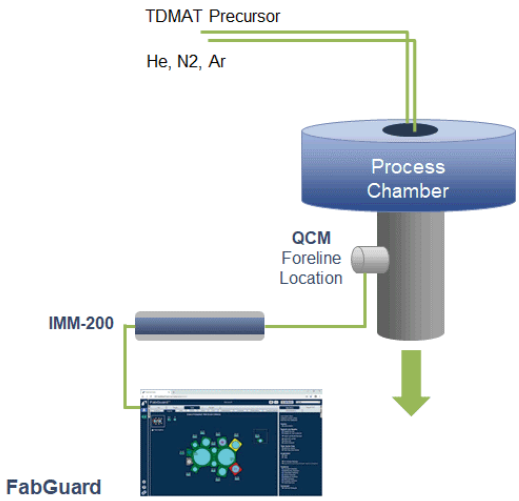
Semi Process Monitoring can be used in semiconductor applications for end point detection and fault elimination by monitoring the amount of precursor in the foreline or chamber exhaust. The use of an in situ QCM provides affordable process monitoring and improved semiconductor process profitability.

The failure to deliver precursor to a wafer can be detected in as little as one wafer.



ADVANTAGES

- Real-Time, in situ process monitoring
- Prevent over-etching, identify chamber clean end point
- Identify equipment or process state fault
- QCM data monitored at 10Hz
- FabGuard correlates QCM data to tool state and process step
- Precise measurement of deposition or etch rates
- Sensitivity & precision for sub-monolayer thickness measurement



750-7000-GXX Sensor

INFICON 750-7000-GXX sensors, installed on the foreline of a semiconductor chamber, offer a proven solution as part of a precursor delivery fault detection system. By connecting to FabGuard® via an IMM-200, the 750-7000-GXX sensor becomes an integrated part of the tool. The sensor is installed via a KF40 cross or KF40 Tee to the foreline and actively monitors excess precursor and precursor derivatives for each wafer run. The failure to deliver precursor to a wafer can be detected in as little as one wafer. Additional information on this precursor delivery fault detection system can be found in document TDMAT Precursor Monitoring with a Quartz Crystal Microbalance.

SPECIFICATIONS

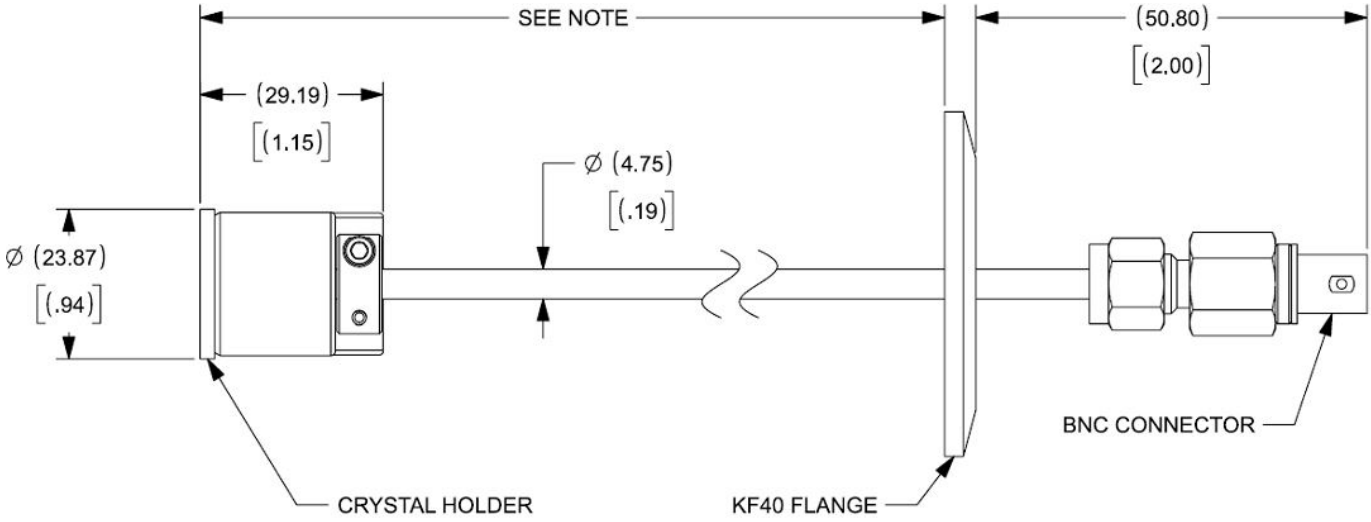
Maximum temperature	200 °C
Sensor head size (maximum envelope)	23.87 mm O.D. x 29.19 mm (0.94 in. O.D. x 1.15 in.)
Mounting feedthrough	KF40 flange
MATERIALS	
Body and holder	304 stainless steel
Springs	Au plated BeCu
Coax line	5 mm (1.88 in.) O.D. stainless steel
Other mechanical parts	18-8 or 304 stainless steel, Hastelloy® c276
Insulators	<99% Al_2O_3 in vacuum: Teflon® used elsewhere
Wire	1. Ni (in vacuum) 2. Ni plated Cu (elsewhere)
Braze	Vacuum process high temperature NiCr alloy
Crystal	13.97 mm (0.550 in.) diameter

750-7000-GXX Sensor (continued)

DIMENSIONS

750-7000-GXX Sensor

NOTE: Measurements in mm [in.]



SENSOR PN	LENGTH*
750-7000-G5	50 mm (1.97 in.)
750-7000-G6	60 mm (2.36 in.)
750-7000-G7	70 mm (2.76 in.)
750-7000-G8	80 mm (3.15 in.)
750-7000-G9	90 mm (3.54 in.)
750-7000-G10	100 mm (3.94 in.)
750-7000-G11	110 mm (4.33 in.)
750-7000-G12	120 mm (4.72 in.)
750-7000-G13	130 mm (5.12 in.)
750-7000-G14	140 mm (5.52 in.)
750-7000-G15	150 mm (5.90 in.)

SPARE PARTS LIST

PN	DESCRIPTION
750-7013-G1S	Crystal holder assembly
750-7005-G1S	Crystal holder with retainer spring
007-023	Ceramic retainer
750-1070-G10	6 MHz Crystals

This page left blank intentionally.

Quartz Crystals

This page left blank intentionally.

INFICON Quartz Crystals

OPTIMIZE PROCESS EFFICIENCY AND CONSUMABLE INVENTORY

INFICON quartz crystals minimize process interruption and consumable cost. Each crystal is tested and inspected to ensure the most consistent and most reliable crystal with maximum crystal life. INFICON works with you to optimize inventory management with flexible delivery schedules. We offer a stable supply of a critical component as the world leader in thin film solutions.

DELIVERING JUST THE RIGHT CRYSTAL

INFICON offers vacuum deposition crystals in different crystal diameters, frequencies, electrode patterns, electrode coatings, and packaging options to meet the unique needs of each customer. In addition, INFICON manufactures specialty crystals that are applicationspecific, such as crystals customized for ALD depositions. For more information on all the variations of crystals and their purposes, refer to the application note, Guide to INFICON Quartz Monitor Crystals, available on the website at: https://goo.gl/UEHuXY

CHOOSING THE RIGHT CRYSTAL

Our continuing research into quartz crystal characteristics results in ongoing improvements to offer the highest reliability in your process. We recommend gold crystals for most applications. However, silver crystals will provide superior performance in processes with high heat loads, such as sputtering. They may also improve the deposition of oxides. And alloy crystals are recommended for optical coating with dielectric materials and for semiconductor processes with high-stress materials.

HIGH TEMPERATURE CRYSTALS

Designed specifically for ALD and other applications where water cooling is not possible, INFICON's high temperature quartz crystals provide you with superior performance and frequency stability at sustained high temperatures. High temperature crystals are available optimized for a variety of temperatures.

A COMPLETE LINE OF THIN FILM CONTROL INSTRUMENTS

However simple or complex your system—whether it involves thermal evaporation, sputtering or ion beam processes—INFICON makes a complete line of controllers, monitors, sensors and feedthroughs to meet your needs, allowing for deposition process optimization and enabling you to produce superior quality products.

ADVANTAGES

- Minimize cost of consumables with the most consistent and most reliable crystals
- Increase profitability and maximize continuous process runs with increased production time
- Optimize inventory management with flexible delivery schedules and in-stock products
- Stable supply from an ISO-certified company
- Maximize process performance and gain customized solutions with worldwide applications support
- Rapid troubleshooting of process variances with expert support

INFICON Quartz Crystals (continued)

FOUR CONVENIENT PACKAGES

- Cleanroom compatible dispenser—holds 10 crystals which can be dispensed directly into the sensor holder, with Teflon® tweezers, or with the tool provided.
- Flatpack carousel dispenser—holds 10 crystals which are extracted by vacuum pencil, with Teflon tweezers, or dispensed directly into the holder. Flat Pack Carousel packages are easy to store and stack.
- Compact box—holds 10 INFICON crystals, provides easy storage and consumes the least amount of shelf space. Crystals are dispensed using plastic tweezers or a vacuum pencil. Crystals are separated from each other by inert, low-friction paper, and are cushioned with foam pads.
- 50-Pack—holds 50 INFICON crystals in a clear rectangular plastic package. This package is convenient for high volume production. The 50-Pack package is easy to store and stack. Crystals are dispensed using a vacuum pencil.

100% TESTING AND INSPECTION

INFICON manufactures and inspects each crystal in a cleanroom to deliver the highest standards of quality assurance from raw quartz to the final packaged products ready for shipment using the following criteria:

- Resistance: checked to assure measurement stability and longer coating life
- Curvature: assures resonance stability
- Frequency: before and after application of electrodes to ensure accurate thickness measurement
- Visual conformity: inspected for electrode uniformity, surface flaws, and other imperfections which might indicate poor adhesion or contamination
- Visual Conformity—Each crystal is inspected for electrode uniformity, surface flaws, and other imperfections that are indicators of poor electrode adhesion and contamination.

INFICON Quartz Crystals (continued)

ORDERING INFORMATION

PN	Description (crystals are 14 mm (0.55 in.) (diameter and 10 crystals per pack unless otherwise noted)
008-010-G10	6 MHz Gold, in cleanroom compatible dispenser
008-009-G10	6 MHz Silver, in cleanroom compatible dispenser
750-679-G1	6 MHz Alloy, in cleanroom compatible dispenser
SPC-1157-G10	6 MHz Gold Thermal Shock, in cleanroom compatible dispenser
750-1000-G10	6 MHz Gold, in flat-pack carousel dispenser
750-1001-G10	6 MHz Silver, in flat-pack carousel dispenser
750-1002-G10	6 MHz Alloy, in flat-pack carousel dispenser
SPC-1194-G10	6 MHz Gold Thermal Shock, in flat-pack carousel dispenser
SPC-1093-G10	6 MHz Gold, in compact box
750-1014-G10	6 MHz Silver, in compact box
750-1015-G10	6 MHz Alloy, in compact box
750-225-G2	5 MHz Gold, in cleanroom compatible dispenser
750-226-G2	5 MHz Silver, in cleanroom compatible dispenser
750-678-G1	5 MHz Alloy, in cleanroom compatible dispenser
750-1005-G10	5 MHz Gold, in flat-pack carousel dispenser
750-1006-G10	5 MHz Silver, in flat-pack carousel dispenser
750-1007-G10	5 MHz Alloy, in flat-pack carousel dispenser
750-1016-G10	5 MHz Gold, in compact box
750-1017-G10	5 MHz Silver, in compact box
750-1018-G10	5 MHz Alloy, in compact box
750-1020-G10	5 MHz Gold, 12.4 mm (0.490 in.) diameter, in cleanroom compatible dispenser
HIGH TEMPERATURE CRYSTALS	
750-1058-G10	120°C optimized crystals, 6 MHz, 14 mm (0.55 in.), gold, pack of 10
750-1059-G10	240°C optimized crystals, 6 MHz, 14 mm (0.55 in.), gold, pack of 10
750-1060-G10	285°C optimized crystals, 6 MHz, 14 mm (0.55 in.), gold, pack of 10

Inspired by visions. Proven by success.

www.inficon.com **reachus@inficon.com**