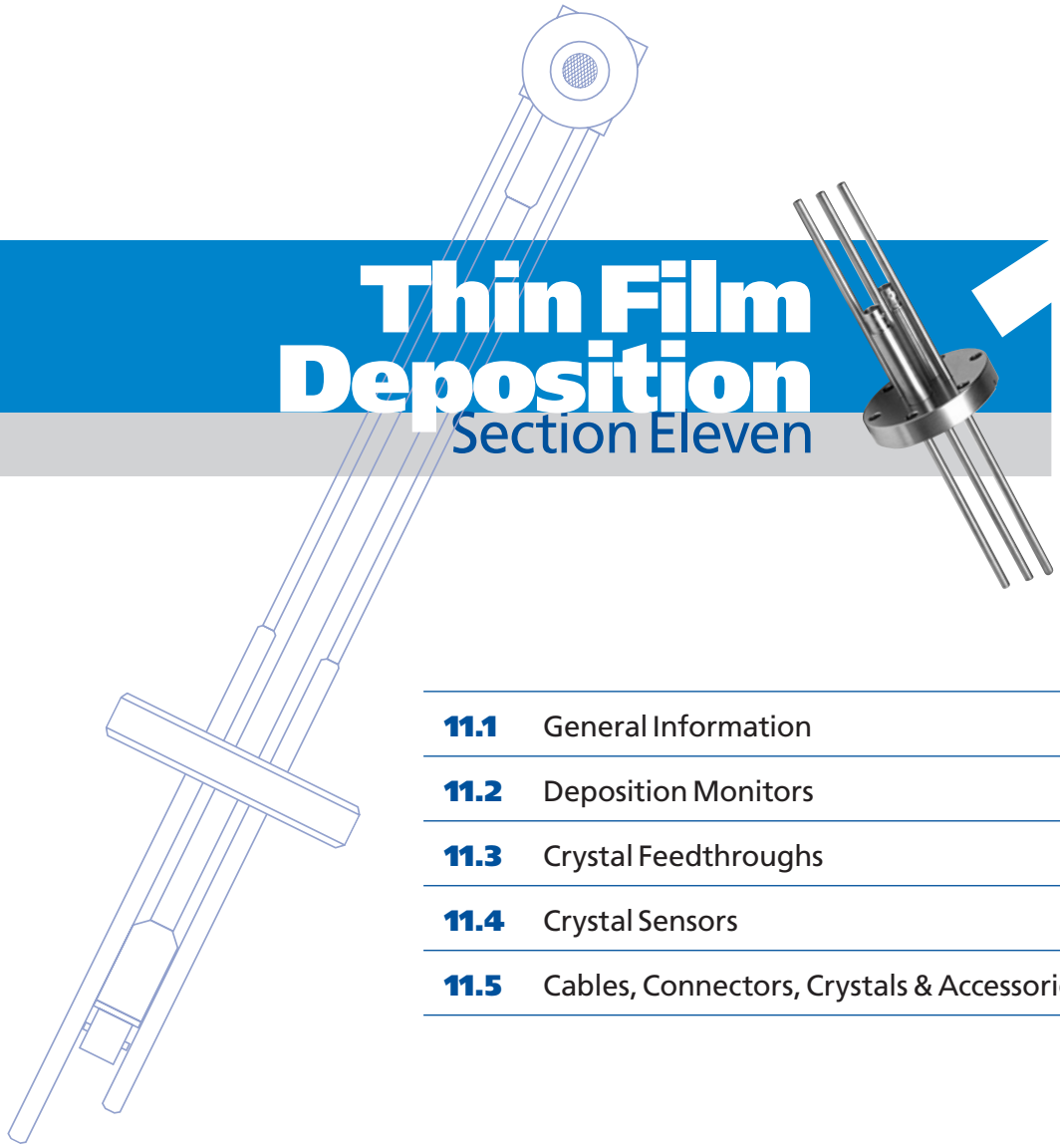


Thin Film Deposition

Section Eleven

Nor-Cal Products
INC
by PFEIFFER VACUUM

Nor-Cal Products, Inc.
1967 South Oregon Street
Yreka, California, 96097 USA
Tel: ***800-824-4166***
or 530-842-4457
Fax: 530-842-9130
www.n-c.com

Bay Area
2161 O'Toole Avenue #40
San Jose, CA 95131 USA
Tel: ***800-824-4166***
or 530-842-4457
Fax: 530-842-9130

Europe
Anna-Vandenhoeck-Ring 44
37081 Göttingen, Germany
Tel: ***+49 551 99963-0***
Fax: +49 6441 802-1202

Republic of Korea
Gadong 2nd Floor, 531-8 Gajang-ro
Osan-si, Gyeonggi-do,
South Korea, 18103
Republic of Korea
Tel: ***+82 31 8003-1341***
Fax: +82 31 8003-1342

Asia-Pacific
Serangoon Garden
P. O. Box 428
Singapore 915531
Tel: ***+65-6634-1228***

Thin Film Deposition
General Information

Nor-Cal Products offers an extensive selection of commonly used quartz crystal feedthroughs, sensors and multi-channel monitors, cables, quartz crystals, accessories and replacement parts for use in semiconductor, optical and industrial thermal deposition processes. Custom feedthroughs are available with a variety of flanges in all sizes.

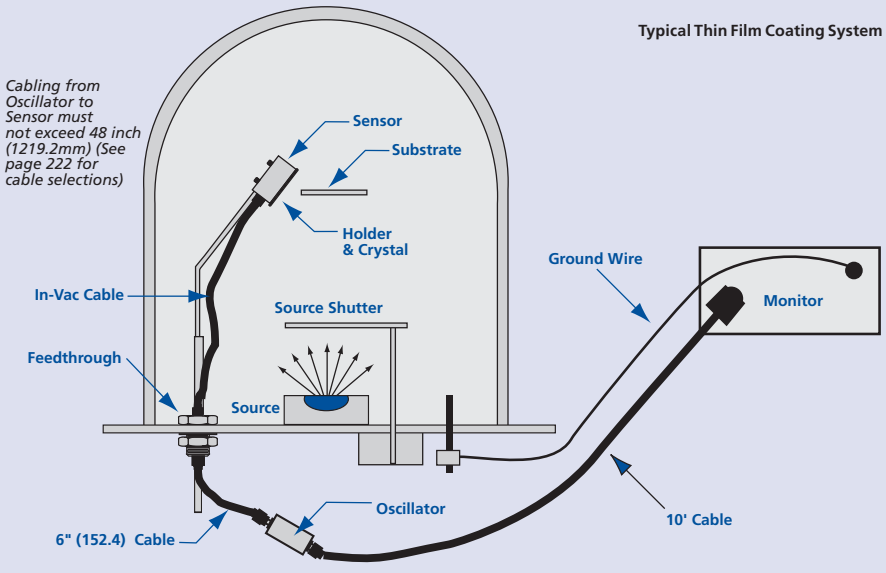
Our coating instrumentation products support one of the more popular methods of thin film measurement and rate control - the crystal monitor, which utilizes the piezo-electric properties of a quartz crystal.

The electrical characteristics of the crystal, which is held in place by the sensor, change during deposition. Single sensors are generally used for short deposition runs, whereas, dual sensors allow for longer runs. Dual sensors require an air line to operate a pneumatic shutter which covers one crystal at a time. The sensor is either welded to the feedthrough or attached with connectors. Most sensors are available with cooling lines.

The application determines the correct choice of sensor. The sensor determines compatible feedthroughs and cabling. The chamber determines the appropriate feedthrough and flange. For application temperatures up to 150°C, electrical connection between the sensor and feedthrough is accomplished with a vacuum coaxial cable. A bakeable, one piece sensor/feedthrough replaces the standard in-vac cable with a stainless steel high-temp coaxial line for high temperature applications up to 300°C.

The feedthrough is the air-to-vacuum connection between the sensor and the oscillator. The feedthrough transfers the quartz crystal's piezo-electric vibrations to the oscillator via a short coaxial cable. The oscillator conditions the signals and transfers them to the monitor via another coaxial cable. The monitor then measures, interprets and displays the thickness, rate and frequency of deposition. Nor-Cal's thin film deposition monitors are available with up to six independent channels to read six sensors. Each sensors' rate, thickness and frequency can be read from the RS-232 port, and placed in a spreadsheet formatted file for later inspection. Each sensor requires its own cabling and oscillator. Contact our sales staff for help with your system configuration.

Typical Thin Film Coating System



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Thin Film Deposition
Deposition Monitors & Oscillators

Deposition Monitors

Our deposition monitors measure film thickness/rate or frequency using crystals as the sensor device. Independent channels monitor different films or average different sensors together to provide a more uniform deposition measurement. These monitors are Class 1 Equipment CE approved. Included are a RS-232 cable and Windows software. This software will allow you to change the monitor's parameters, save process readings in Excel formatted files, and operate the monitor remotely. Mounting brackets are included, rack-mount extenders are available on request

MODEL NUMBER	CRYSTAL INPUTS	POWER INPUT	TEMPERATURE RANGE	FREQUENCY RANGE
CM-2	2	120/240 VAC, 20 VA	0º to 50ºC	6.0 to 4.0 MHz
CM-6	6	120/240 VAC, 20 VA	0º to 50ºC	6.0 to 4.0 MHz

SPECIFICATIONS

Dimensions: 8.38 x 3.50 x 7.75 inches (212.85 x 88.9 x 196.85mm)

Connections
Inputs: 4 digital, 2 or 6 sensor
Outputs: 4 relay, analog rate & thickness
PC: RS-232 port

Display: Alphanumeric LED

Frequency: 6.0 to 4.0 MHz, programmable

Rate averaging: 1 to 20 readings

Frequency resolution: 0.1 Hz

Thickness resolution: 1 Å

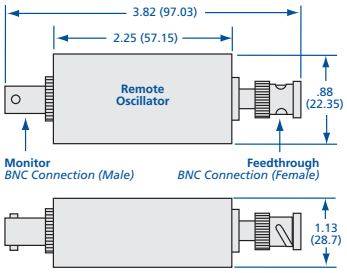
Rate resolution: 0.1 or 0.01 Å/s selectable

Measurement rate: 0.15 to 2 seconds

Remote Oscillators

Oscillators condition the signal from the crystal sensor to the controller. They are housed in a die-cast aluminum body. BNC connectors are used to interface with the monitor and sensor. Refer to the diagram on this page for installation and to page 222 of the catalog for cabling and accessories. In-vacuum oscillators are available. Call for information and pricing.

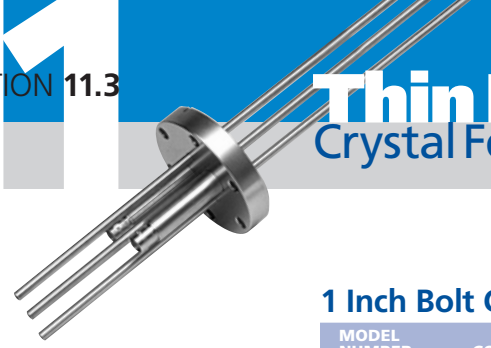
MODEL NUMBER	TEMPERATURE RANGE	FREQUENCY RANGE
CO-A	10º to 40ºC	6.0 to 4.0 MHz



Thin film deposition systems

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Thin Film Deposition
Crystal Feedthroughs



SPECIFICATIONS

Materials
Feedthrough: 304 stainless steel

Vacuum range: ≥1 x 10^{-9} mbar (High vacuum)

Temperature range: ≤150°C

Leak rate: ≤10^{-9} l/sec

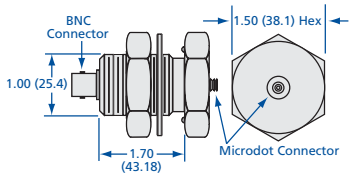
Baseplate thickness: 1 inch (25.4mm) maximum

1 Inch Bolt Crystal Feedthroughs

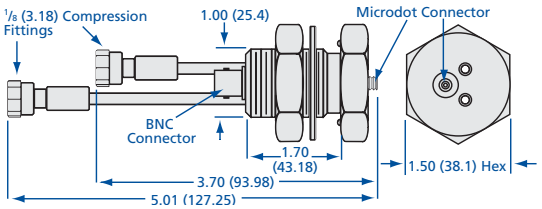
MODEL NUMBER	SENSOR CONNECTIONS	IN VAC CONNECTOR	EXTERNAL CONNECTOR	COOLING LINES	COMPRESSION FITTINGS	AIR LINES
CF-100-1	1	Microdot	BNC	-		-
CF-100-1-W	1	Microdot	BNC	2		-
CF-100-1-WC	1	Microdot	BNC	2	✓	-
CFP-100-2-W	2	Microdot	Microdot	2		1

Note: *1.25 inch (31.75) bolt feedthroughs are available. Call for pricing.*

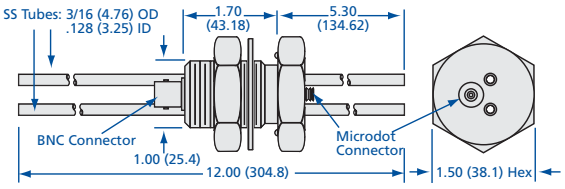
CF-100-1



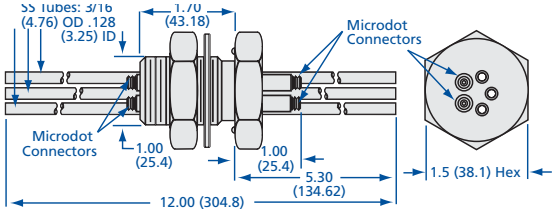
CF-100-1-WC



CF-100-1-W



CFP-100-2-W



SPECIFICATIONS

Materials
Flanges: 304 stainless steel
Flange sizes: 1 1/3 to 2 3/4 CF
Feedthrough: 304 stainless steel

Vacuum range: ≥1 x 10^{-9} mbar (High vacuum)

Temperature range: ≤150°C

Leak rate: ≤10^{-9} l/sec

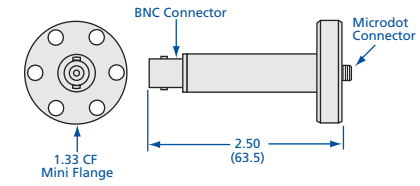
All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

CF Flanged Crystal Feedthroughs

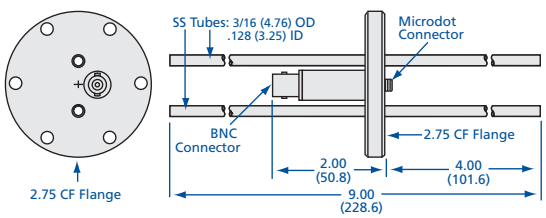
MODEL NUMBER	FLANGE TYPE	SENSOR CONNECTIONS	IN VAC CONNECTOR	EXTERNAL CONNECTOR	COOLING LINES	COMPRESSION FITTINGS	AIR LINES
CF-133-1	1.33 CF	1	Microdot	BNC	-		-
CF-275-1-W	2.75 CF	1	Microdot	BNC	2		-
CF-275-1-WC	1.33 CF	1	Microdot	BNC	2	✓	-
CFP-275-2-W	2.75 CF	2	Microdot	BNC	2		1

Note: *ISO, NW, and ASA flanged feedthroughs are available upon request. Call for pricing.*

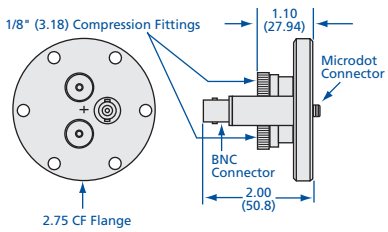
CF-133-1



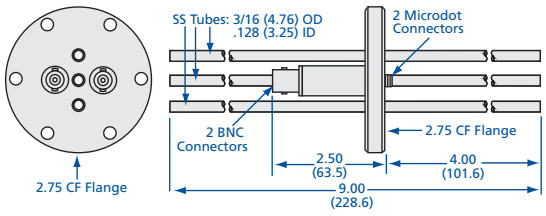
CF-275-1-W



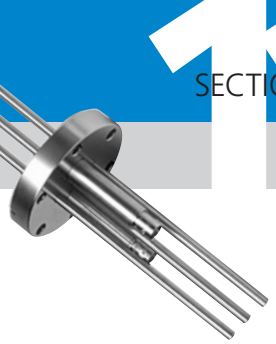
CF-275-1-WC



CFP-275-2-W



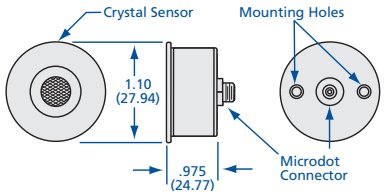
Thin Film Deposition
Crystal Sensors



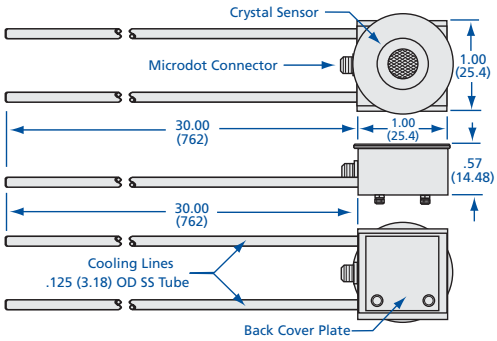
Single Crystal Sensors

MODEL NUMBER	SENSORS	MOUNTING BRACKET	SENSOR ORIENTATION	WATER COOLED
CS-1	1	✓	0°	
CS-1-W	1		0°	✓
CS-1-W-RA	1		90°	✓

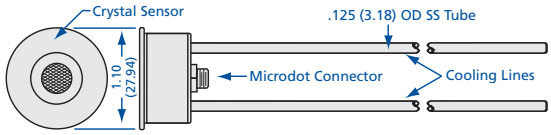
CS-1



CS-1-W



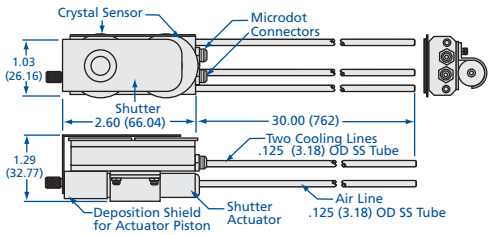
CS-1-W-RA



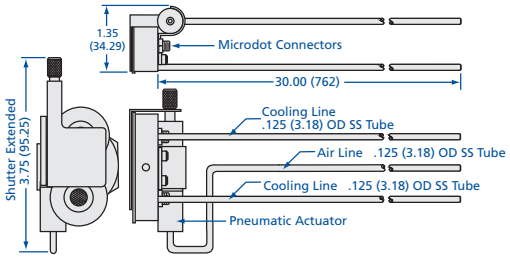
Dual Crystal Sensors

MODEL NUMBER	SENSORS	SENSOR ORIENTATION	PNEUMATIC SHUTTER	WATER COOLED
CSP-2-W	2	0°	✓	✓
CSP-2-W-RA	2	90°	✓	✓

CSP-2-W

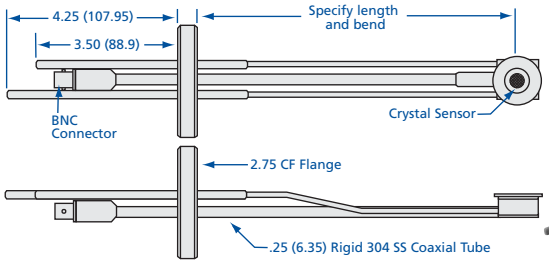


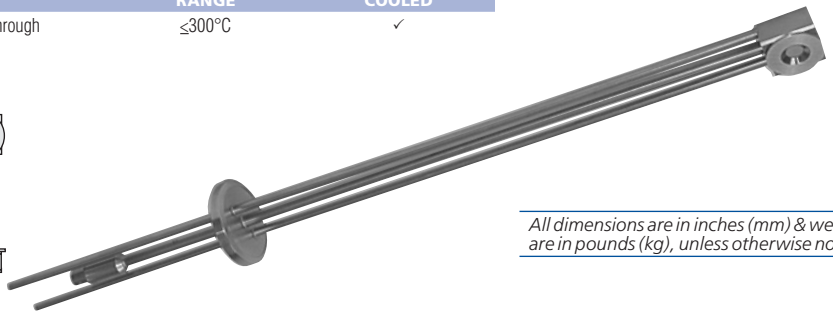
CSP-2-W-RA



Bakeable Crystal Sensors

MODEL NUMBER	FLANGE TYPE	DESCRIPTION	TEMPERATURE RANGE	WATER COOLED
CSH-275-1-W	2.75 CF	Single sensor with feedthrough	≤300°C	✓





SPECIFICATIONS

Materials
Body: 304 stainless steel
Crystals: 6 MHz gold and aluminum alloy

Vacuum range: ≥1x 10^{-9} mbar (High Vacuum)

Temperature range: ≤225°C

Custom lengths and bends available for all sensors.

Cables, crystals and accessories are on page 222.

All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.

Thin Film Deposition
Cables, Connectors, Crystals & Accessories

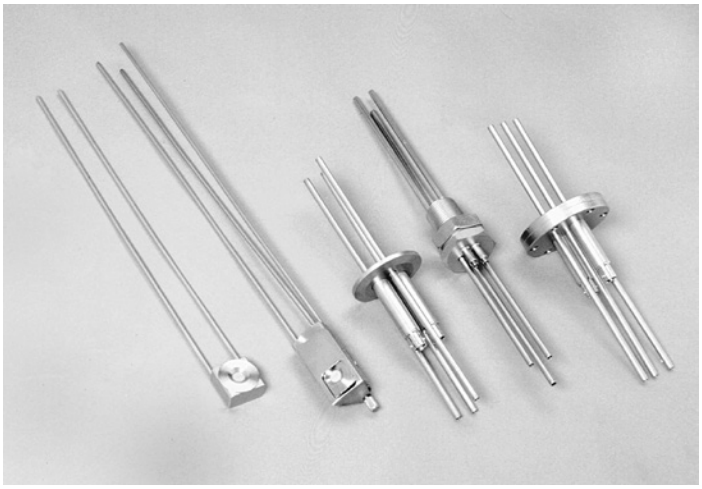
Cables and Connectors

MODEL NUMBER	DESCRIPTION	LENGTH
CCV-MM-30*	Microdot to Microdot in-vacuum coaxial cable, metal sheath. Connects feedthrough to sensor.	30.75* (781.05)
CCV-MM-30T*	Microdot to Microdot in-vacuum coaxial cable, PTFE coated metal sheath. Connects feedthrough to sensor.	30.75* (781.05)
CCA-BB-6	BNC to BNC cable (Male to Female). Connects feedthrough to oscillator.	6.00 (152.40)
CCA-BM-6	BNC to Microdot cable. Connects feedthrough to oscillator.	6.00 (152.40)
CCA-BB-10	BNC to BNC cable (Male to Male). Connects oscillator to monitor.	120.00 (3048)
CRU-1	Reducing union tube connector 3/16 to 1/8. Connects cooling and air lines between feedthrough and sensor	Each

**Additional charges will apply for Special Lengths*

Quartz Crystals and Accessories

MODEL NUMBER	DESCRIPTION	QUANTITY
CQ-G	6MHz gold, .550 (13.97) diameter	Pkg. of 10
CQ-A	6MHz aluminum alloy, .550 (13.97) diameter	Pkg. of 10
CH-1	Replacement crystal holder	Each



All dimensions are in inches (mm) & weights are in pounds (kg), unless otherwise noted.