

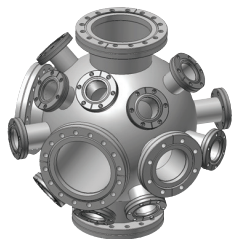
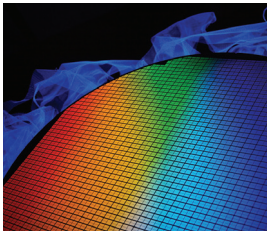
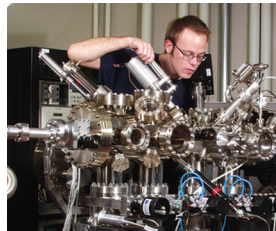
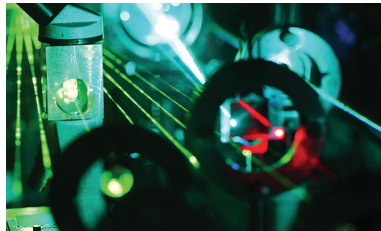


Nor-Cal Products  
**NC**  
by PFEIFFER VACUUM



# Nor-Cal Products

*where technology takes shape*

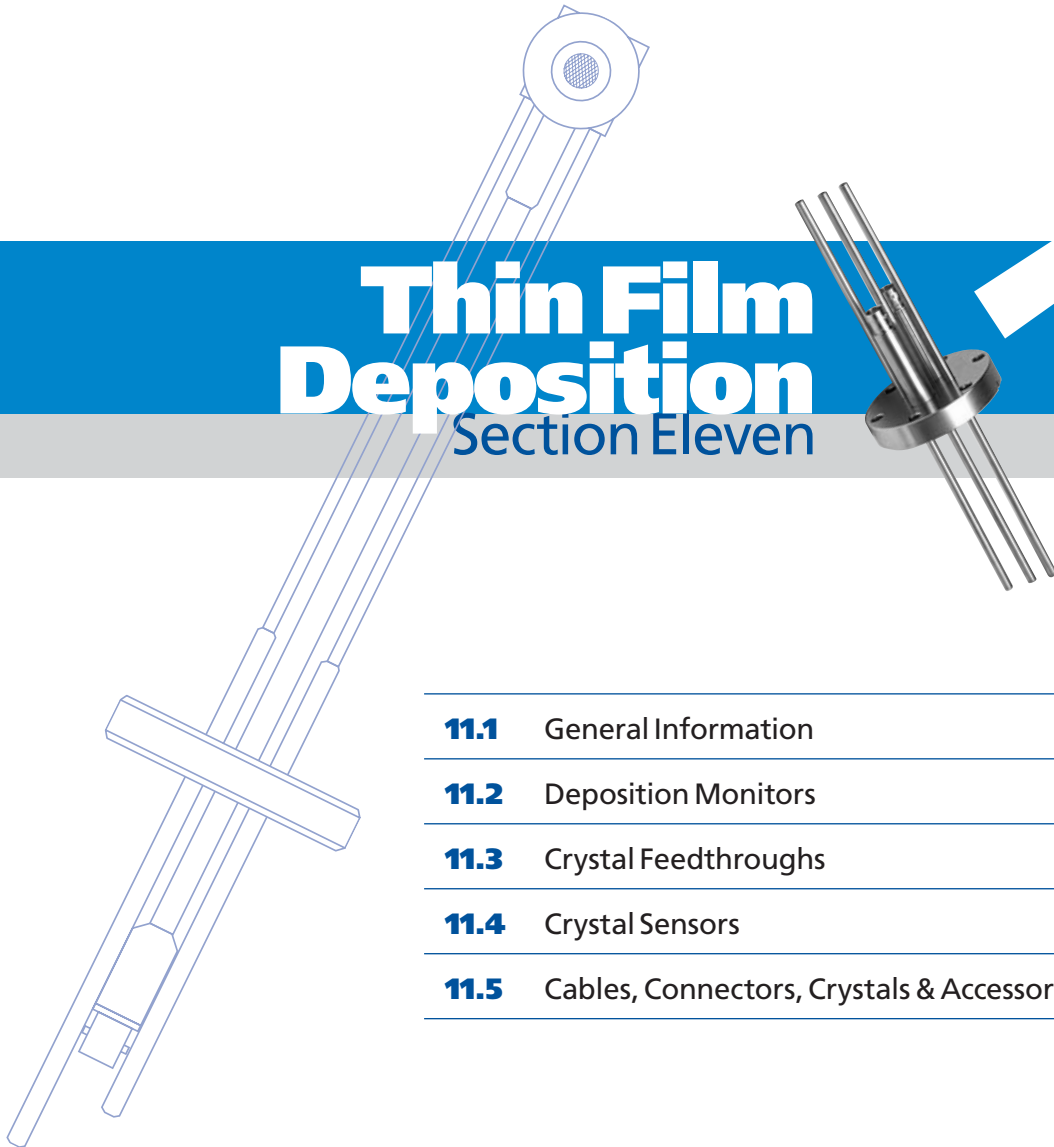


*vacuum products catalog*



# Thin Film Deposition

## Section Eleven



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# 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.

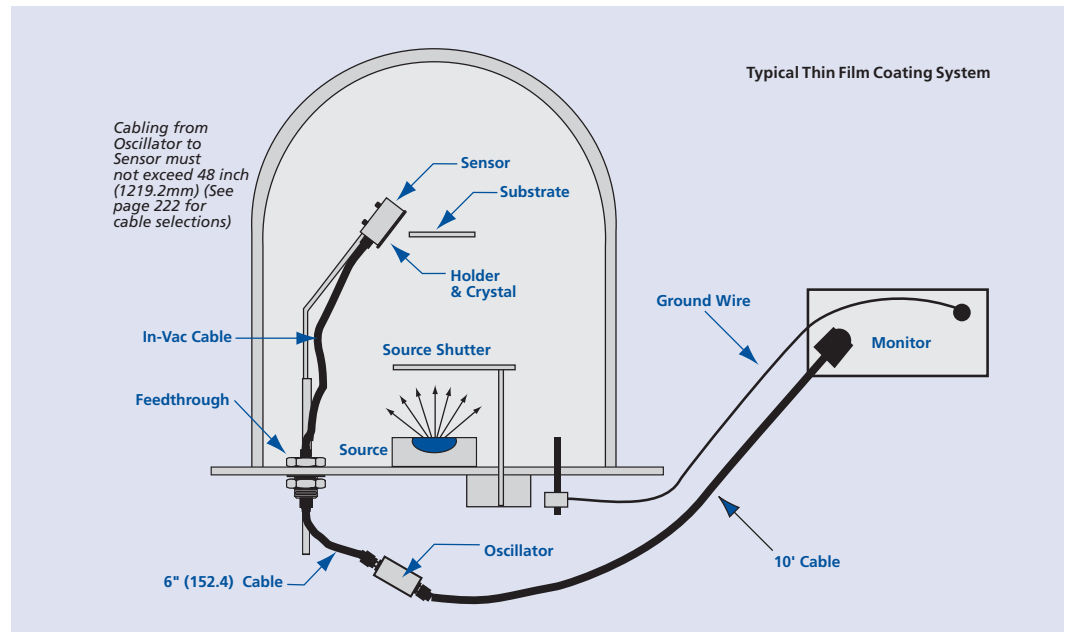
The electrical characteristics of the crystal, which is held in place by the sensor, change during deposition. Single sensors are generally used for short deposition runs, whereas, dual sensors allow for longer runs. Dual sensors require an air line to operate a pneumatic shutter which covers one crystal 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 sensor's 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.



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



### 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	0° to 50°C	6.0 to 4.0 MHz
CM-6	6	120/240 VAC, 20 VA	0° to 50°C	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

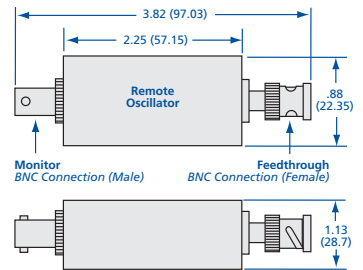
**Measurement rate:** 0.15 to 2 seconds



### 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	10° to 40°C	6.0 to 4.0 MHz



Thin film deposition systems

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



### SPECIFICATIONS

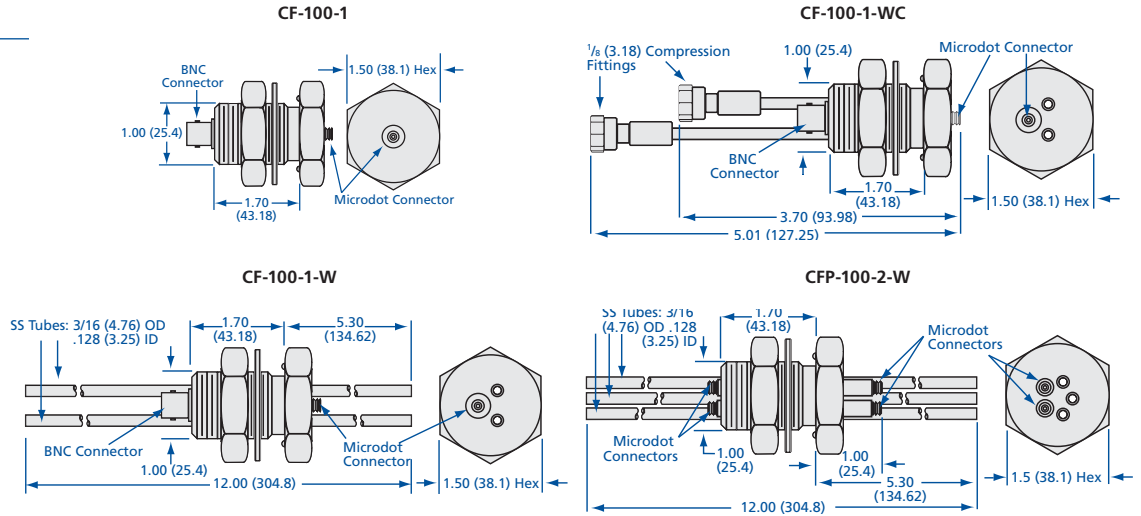
<b>Materials</b>
Feedthrough: 304 stainless steel
<b>Vacuum range:</b> $\geq 1 \times 10^{-9}$ mbar (High vacuum)
<b>Temperature range:</b> $\leq 150^\circ\text{C}$
<b>Leak rate:</b> $\leq 10^{-9}$ l/sec
<b>Baseplate thickness:</b> 1 inch (25.4mm) maximum



### 1 Inch Bolt Crystal Feedthroughs

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

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



### SPECIFICATIONS

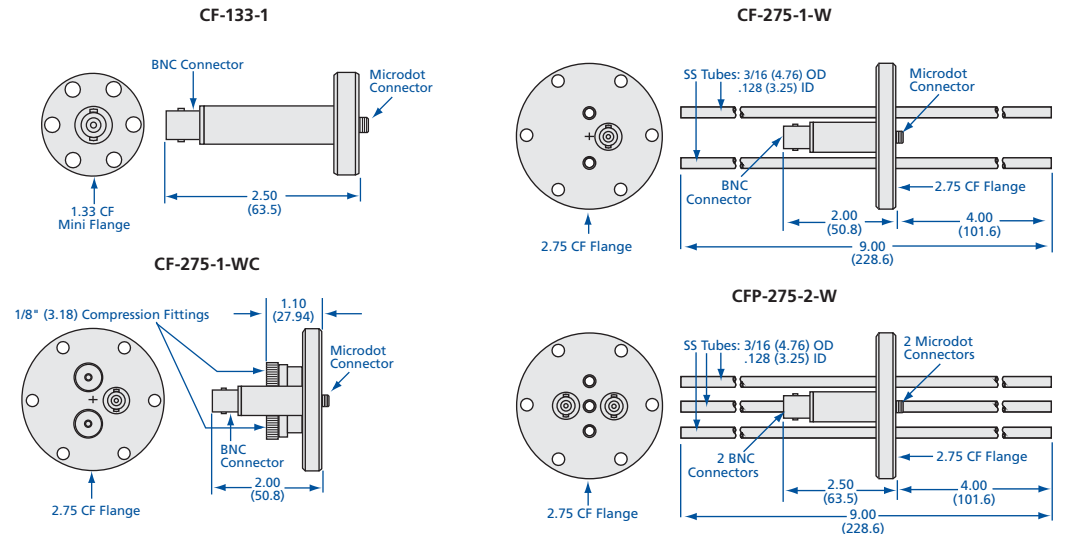
<b>Materials</b>
Flanges: 304 stainless steel
Flange sizes: 1 1/3 to 2 3/4 CF
Feedthrough: 304 stainless steel
<b>Vacuum range:</b> $\geq 1 \times 10^{-9}$ mbar (High vacuum)
<b>Temperature range:</b> $\leq 150^\circ\text{C}$
<b>Leak rate:</b> $\leq 10^{-9}$ l/sec



### CF Flanged Crystal Feedthroughs

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

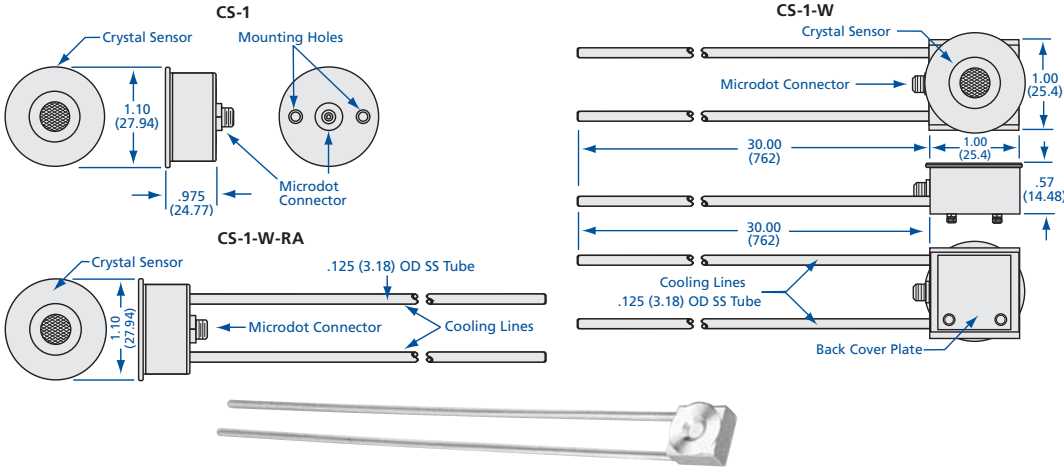
Note: ISO, NW, and ASA flanged feedthroughs are available upon request. Call for pricing.



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

## 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°	✓



### SPECIFICATIONS

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

**Vacuum range:**  $\geq 1 \times 10^{-9}$  mbar (High Vacuum)

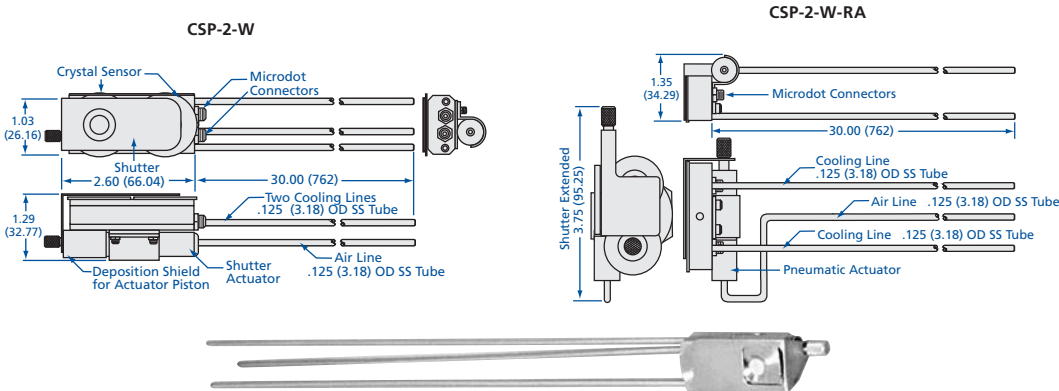
**Temperature range:**  $\leq 225^\circ\text{C}$

*Custom lengths and bends available for all sensors.*

*Cables, crystals and accessories are on page 222.*

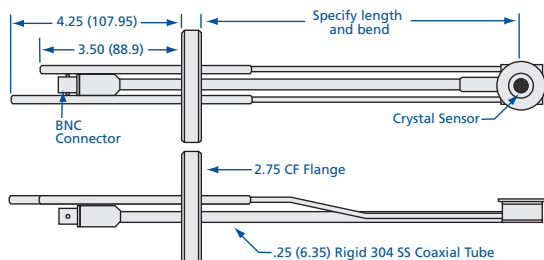
## Dual Crystal Sensors

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



## Bakeable Crystal Sensors

MODEL NUMBER	FLANGE TYPE	DESCRIPTION	TEMPERATURE RANGE	WATER COOLED
CSH-275-1-W	2.75 CF	Single sensor with feedthrough	$\leq 300^\circ\text{C}$	✓



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



# Thin Film Deposition

## Cables, Connectors, Crystals & Accessories



### Cables and Connectors

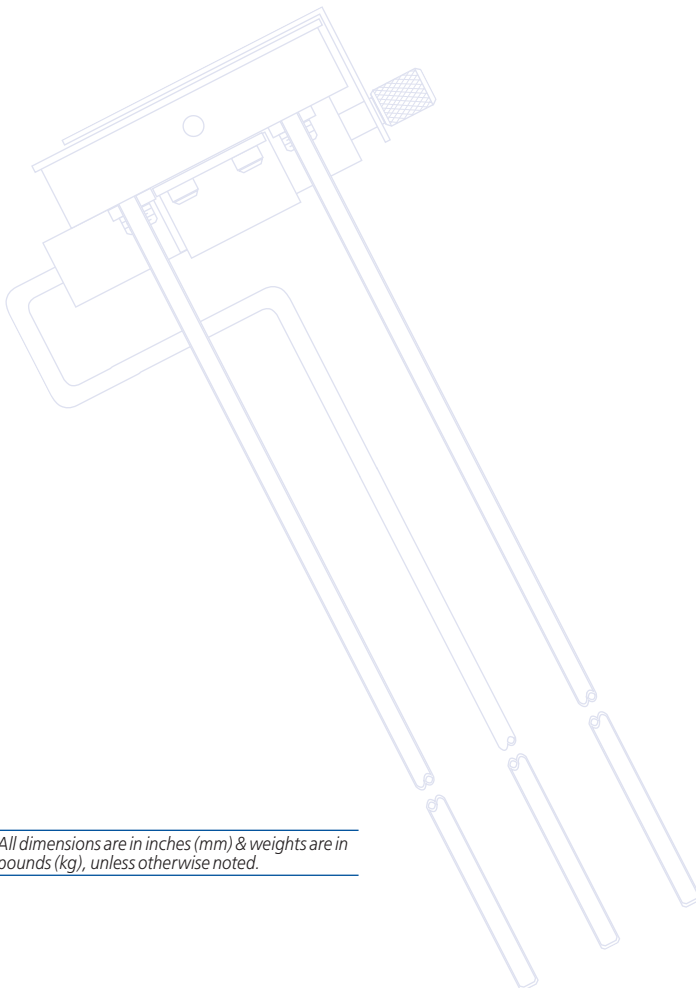
MODEL NUMBER	DESCRIPTION	LENGTH
<b>CCV-MM-30*</b>	Microdot to Microdot in-vacuum coaxial cable, metal sheath. Connects feedthrough to sensor.	30.75* (781.05)
<b>CCV-MM-30T*</b>	Microdot to Microdot in-vacuum coaxial cable, PTFE coated metal sheath. Connects feedthrough to sensor.	30.75* (781.05)
<b>CCA-BB-6</b>	BNC to BNC cable (Male to Female). Connects feedthrough to oscillator.	6.00 (152.40)
<b>CCA-BM-6</b>	BNC to Microdot cable. Connects feedthrough to oscillator.	6.00 (152.40)
<b>CCA-BB-10</b>	BNC to BNC cable (Male to Male). Connects oscillator to monitor.	120.00 (3048)
<b>CRU-1</b>	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
<b>CQ-G</b>	6MHz gold, .550 (13.97) diameter	Pkg. of 10
<b>CQ-A</b>	6MHz aluminum alloy, .550 (13.97) diameter	Pkg. of 10
<b>CH-1</b>	Replacement crystal holder	Each



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

# Order Information

## Regional Sales Contacts

### Nor-Cal Products



by PFEIFFER VACUUM

#### Manufacturing & Corporate Global Headquarters

1967 South Oregon Street, Yreka, CA 96097

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or call  
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for assistance

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and quote  
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#### Nor-Cal Products, Asia Pacific

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#### IT Jang

*South Korea  
Regional Sales Manager*

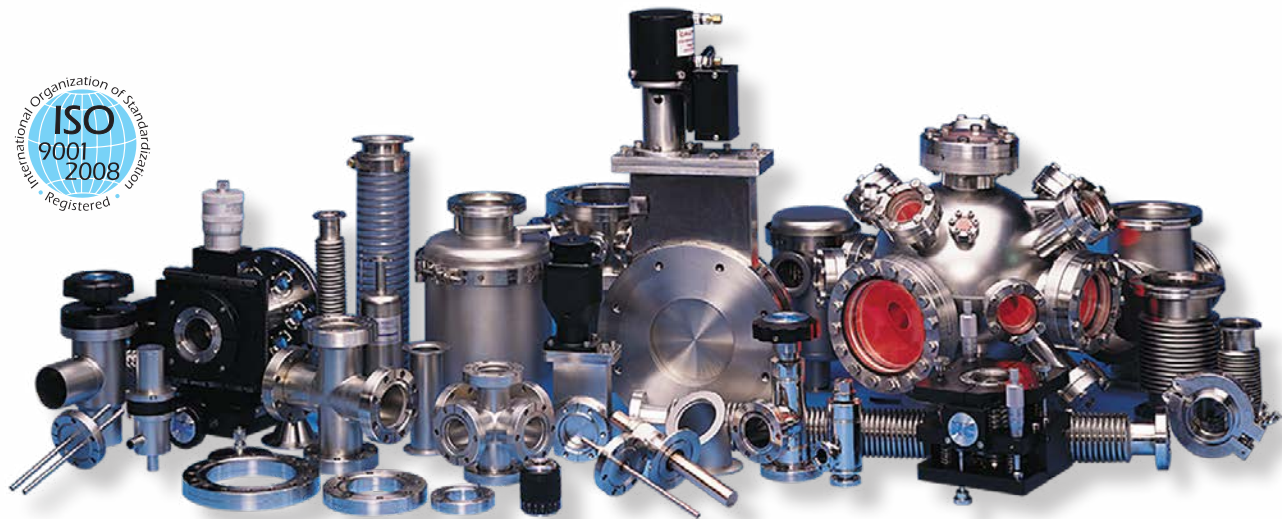
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Republic of Korea

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Fax: +82-31-8003-1342





### Terms & Conditions of Sale

Payment terms are net 30 days from the date of the invoice once credit has been approved. Otherwise, C.O.D. Most major credit cards are accepted.

If payment in full is not received within 30 days, a 1.5% per month late charge may be added to the unpaid balance. Discounts may be revoked if an account is not paid within these terms.

**MINIMUM ORDERS:** The minimum domestic order is \$40. The minimum international order is \$100.00.

#### QUANTITY PRICING:

Quantity pricing is valid on single shipments only.

**AVAILABILITY:** Our inventory is updated automatically, but there is always a possibility that an item may be unavailable or sold-out. If this occurs, customers are notified as soon as possible and alternative options are offered if available.

**PACKAGING:** The factory will determine the most cost effective method to package items for shipment. A \$5.00 USD per cardboard box charge will be applied to all orders with a maximum charge of \$25.00 USD per shipment. Large products requiring a wooden crate will be charged an amount consistent with the fabrication of the necessary crate.

**FOB POINT:** All orders ship FOB Yreka from 1967 S. Oregon, Yreka, California, 96097, USA unless quoted otherwise.

**LOST OR DAMAGED ITEMS:** Nor-Cal does not assume responsibility for items lost or damaged in transit, or for any direct or indirect damages incurred. Shipping damages are to be handled by the customer. Nor-Cal will provide the tracking number and contact information for the shipping company as needed. All items are purchased at the customer's risk.

**EXPORTED COMMODITIES:** US Export administration Regulations must be followed. Diversion contrary to US Law is prohibited.

### Pricing & Dimensions

In order to meet the changing needs of our customers we periodically make design revisions in our standard product line. As a result, the dimensions, pricing and specifications are subject to change without notice. International pricing may also vary.

**SPECIAL TOOLING:** Products ordered to non-standard specifications should state specification requirements in detail. Fee for special tooling may apply. On request, test report(s) and/or certification(s) can be supplied at additional cost.

### Discounts

OEM and quantity discounts are available to qualified customers.

### Return Policy

An RMA (Return Materials Authorization) number must be obtained from Nor-Cal Products before returning any merchandise. The RMA form can be found under SUPPORT in the footer of pages at [www.n-c.com](http://www.n-c.com). To expedite the assignment of an RMA number, complete the form online and submit online. You may also print and email the completed form to [rma@n-c.com](mailto:rma@n-c.com) or fax to the attention of the RMA Coordinator at 866-640-9012.

- Nor-Cal Products reserves the right to refuse the return of non-stocked items. A twenty-five (25) percent restocking fee may be charged.
- Nor-Cal Products shall incur no liability for damage, shortages or other cause alleged to have occurred at, or prior to, delivery to the carrier unless buyer shall have entered full details thereof on its receipt to the carrier. Products over 60 days old from the date of shipment will not be accepted for return.
- Nor-Cal Products must be allowed time to investigate all returns.

### Cancellations & Rescheduling

Any request by customers to reschedule or cancel in total or part of any purchase order must be approved at the sole discretion of Nor-Cal Products and shall be subject to the following conditions. Nor-Cal must receive written notice of Request for Cancellation or Reschedule, stating the reasons therefore.

#### Customer shall be liable for payment of the following charges to Nor-Cal in the event of Cancellation or Reschedule.

- For all charges incurred (including overhead, G&A, and profit) prior to the date that notice of cancellation is received by Nor-Cal for all parts peculiar to customer's requirements. Upon payment by the customer of these charges, such parts become the property of customer, Nor-Cal will store said parts for a reasonable period of time pending the receipt of customer's instructions for disposition. Such storage is at customer's risk and may be subject to storage charges if stored by Nor-Cal for longer than 30 days from the cancellation date; plus
- Charges to convert modified standard parts for return to Nor-Cal's inventory; plus
- A restocking charge of twenty (25) percent of the purchase price of the cancelled item.

**Warranty** Products manufactured by Nor-Cal Products are warranted against defects in material and workmanship for a period of twelve (12) months from the date of shipment from Nor-Cal Products to the buyer. Any modification to the product by the buyer or their agent voids this warranty. Liability under this warranty is expressly limited to the replacement or repair (at Nor-Cal Products' option) of defective parts. Nor-Cal Products may at any time discharge its warranty as to any of its products by refunding the purchase price and taking back the products. This warranty applies only to parts manufactured and labor provided by Nor-Cal Products under valid warranty claims received by Nor-Cal Products within the applicable warranty period and shall be subject to the terms and conditions hereof.

- Expendable items such as tubes, heaters, sources, bellows, etc., by their nature, may not function for one year; if such items fail to give reasonable service for a reasonable period of time, as determined solely by Nor-Cal Products, they will be repaired or replaced by Nor-Cal Products at its election.
- All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Nor-Cal Products, are due or traceable to defects in original materials or workmanship. Malfunctions caused by abuse or neglect of the equipment are expressly not covered by this warranty. Nor-Cal Products expressly disclaims responsibility for any loss or damage caused by the use of its products other than in accordance with proper operating and safety procedures. Reasonable care must be taken by the user to avoid hazards.
- The buyer shall give Nor-Cal Products prompt notice of any claim under this warranty. If Nor-Cal Products, in its sole discretion, determines that the product does not conform to this warranty, Nor-Cal Products shall replace or repair the product free of charge. If such replacement or repair is not feasible, Nor-Cal Products may, at its sole option, refund the purchase price.
- In-warranty repaired or replacement parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the parts which have been repaired or replaced.
- After the expiration of the applicable warranty period, the buyer shall be charged at Nor-Cal Products' then current prices for parts and labor plus transportation.
- Except as stated herein, Nor-Cal Products makes no warranty, expressed or implied (either in fact or operation of law), statutory or otherwise: and, except as stated herein, Nor-Cal Products shall have no liability for special or consequential damages of any kind or from any cause arising out of the sale, installation, or use of any of its products. Statements made by any person, including representatives of Nor-Cal Products, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon Nor-Cal unless reduced to writing and approved by an officer of Nor-Cal Products.
- This warranty shall not extend to any product, that in Nor-Cal Products' judgment, has been affected by damage or wear resulting from operations performed after the sale, or misuse, abrasion, negligence, accident, tampering, faulty installation, inadequate maintenance, damage or casualty.

**DISCLAIMER OF WARRANTY:** NOR-CAL MAKES NO WARRANTIES WITH RESPECT TO THIS SALE, WHETHER EXPRESSED OR IMPLIED, EXCEPT AS STATED HEREIN, NOR-CAL PRODUCTS MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

**LIMITATION OF REMEDY AND DAMAGES:** THE EXCLUSIVE REMEDY OF THE BUYER WITH RESPECT TO THE TRANSACTIONS CONTEMPLATED HEREIN SHALL BE THE REPLACEMENT OR REPAIR OF SAID PRODUCTS, OR THE RETURN OF THE PURCHASE PRICE, AS SET FORTH UNDER "WARRANTY".

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# Order Information

## Patents & Trademarks

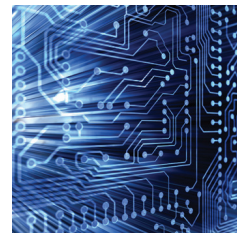
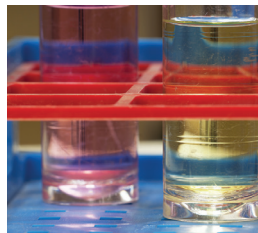
**Nor-Cal Products, Inc. patents and trademarks:**

Genesis Modular Valves are manufactured under patent number 6289932  
Intellisys Pressure Control Products are manufactured under patent number 6612331  
Genesis is a trademark of Nor-Cal Products, Inc.  
Intellisys is a registered trademark of Nor-Cal Products, Inc.

**Other registered patents and trademarks:**

Magnetic Linear/Rotary Feedthroughs are manufactured under patent number 5514925  
Sample Transfer Systems are manufactured under patent number 5705128  
Alumel is a registered trademark of Concept Alloys, Inc.  
Cajon is a registered trademark of Swagelok Company  
Chemraz is a registered trademark of Greene Tweed Company  
Chromel is a registered trademark of Concept Alloys, Inc.  
ConFlat is a registered trademark of Varian Associates Corp.  
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**Nor-Cal Products**



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