neyco
VACUUM & MATERIALS

THERMOCOUPLE FEEDTHROUGHS

30 avenue de la Paix – 92170 VANVES - France

Description

Thermocouples are widely used to measure the temperature inside a vacuum or pressure chamber. CeramTec's thermocouple feedthroughs, manufactured with thermocouple materials or compensating material, transmit through the wall of the chamber the electromotive force (emf) generated by the application of heat to the thermocouple bead without introducing error. External instrumentation can then evaluate the strength of the emf that is proportional to the temperature at the thermocouple bead, thus yielding a temperature measurement. The Ceramaseal® thermocouple feedthroughs provide the necessary electrical isolation and a hermetic seal.

For refractory and noble metal thermocouples, Ceramaseal® products use compensating wires. The junction between the compensating wires and the true thermocouple conductor material must be thermally shielded and not exceed 250° C. A Thermocouple Application Chart is shown on the next page.

Standard Specifications

- Temperature Range: Cryogenic (-269°C) to 450°C
- Internal pressure from 10^{-10} torr to 3500 psig
- Thermocouple Type C, K, R, S, T
- Single to 10 pairs

Extreme / Custom Design

- 940-pin feedthrough using thermocouple materials
- Sub D connectors using thermocouple materials
- Single pair high-temperature cable end seal in a special plug design
- Type E, J and N thermocouples

Installation

Standard installation mountings include:

- Weld (Pulse-TIG, TIG, Laser, E-Beam)
- ISO KF flange
- ConFlat flange
- NPT fitting (see Pressure section)

For details and information on thermocouple assembly installation, refer to the Technical Reference section.

Applications

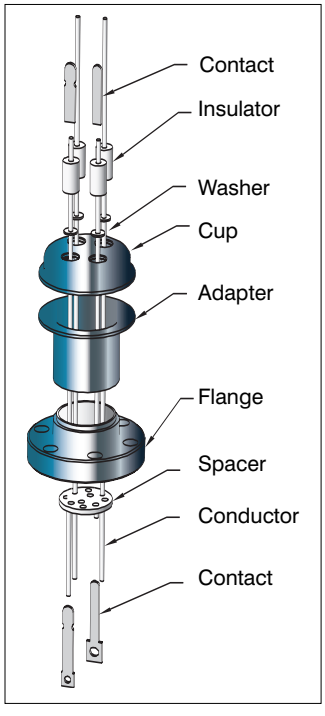
A few of the many applications in which these thermocouples are commonly used are:

- Furnaces
- Power generation measurement and control
- Aerospace equipment
- In-vacuum coating
- Semiconductor processing equipment
- Energy research
- Industrial equipment
- Telecommunications

New Products

- Multipin spade type thermocouples
- Single conductor thermocouples in spade and loop type
- Thermocouples now available in ISO KF flanges

Typical Thermocouple Construction



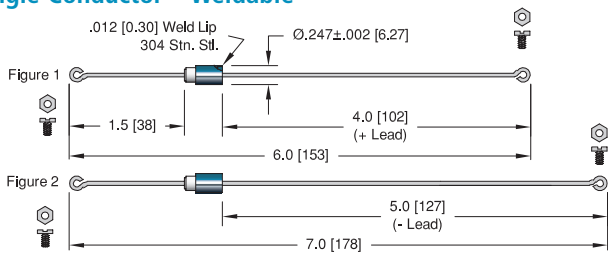
Type	Voltage DC	Temperature Rating ˚C	Number of Pairs	Thermocouple Types	Sub-section	Section Pages
		Min Max				
	NA	Thermocouple: -269 450	Single, 1, 2	R, S, T (see table below)	Loop Type	D.1 142-143
	NA	Thermocouple: -269 450 Air Side Plug: -73 650	Single,1, 2, 3, 5	C, K (see table below)	Spade Type	D.2 144-147
	to 5 kV	Thermocouple: -269 450 Air Side Plug: -73 650	1 Pair, 2 Conductors	C, K (see table below)	Spade & Power	D.3 148-149
	NA	Thermocouple: -269 450 Air Side Plug: -55 125	3, 5, 10	K (see table below)	MIL-C-5015 Type	D.4 150-151

THERMOCOUPLE APPLICATION CHART

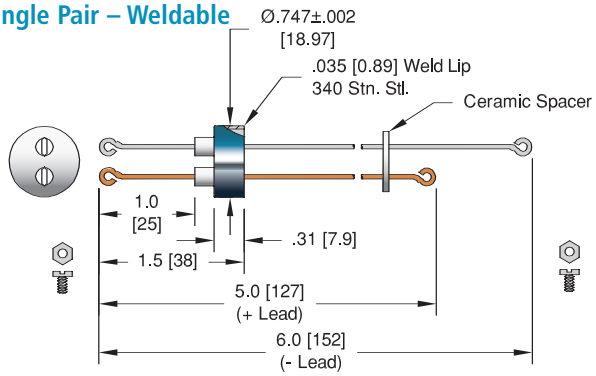
ANSI Type	Thermocouple	Polarity	Degrees C	emf (mV)
T	Copper Constantan	+ -	-200 to 350	-5.60 to 17.82
K	Chromel Alumel	+ -	-200 to 1250	-5.9 to 50.63
S	Platinum 10% Rhodium Platinum	+ -	0 to 1450	0 to 14.97
R	Platinum 13% Rhodium Platinum	+ -	0 to 1450	0 to 16.74
C*	Tungsten 5% Rhenium Tungsten 26% Rhenium	+ -	0 to 2315	0 to 37.06

*Not an ANSI symbol

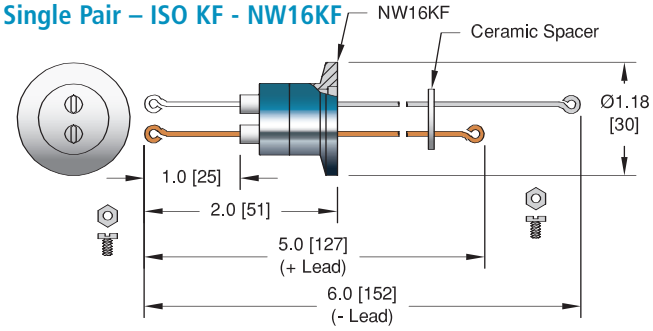
Single Conductor – Weldable



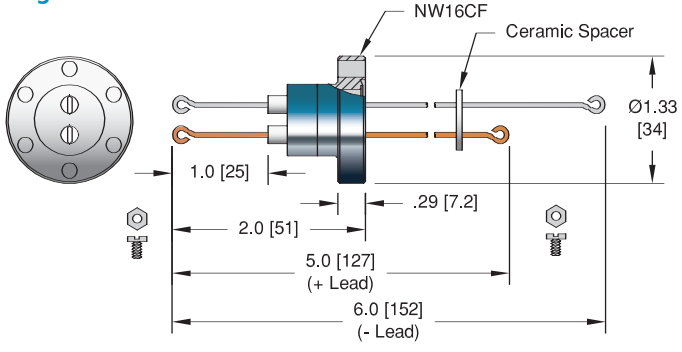
Single Pair – Weldable



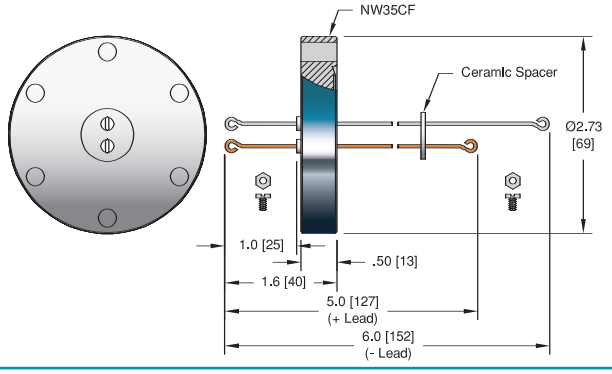
Single Pair – ISO KF - NW16KF



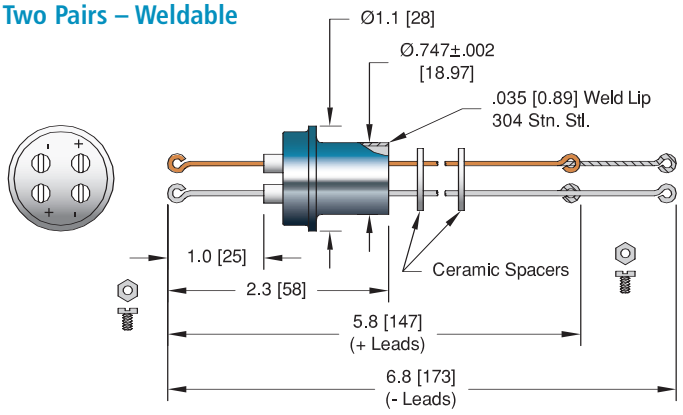
Single Pair – ConFlat - NW16CF



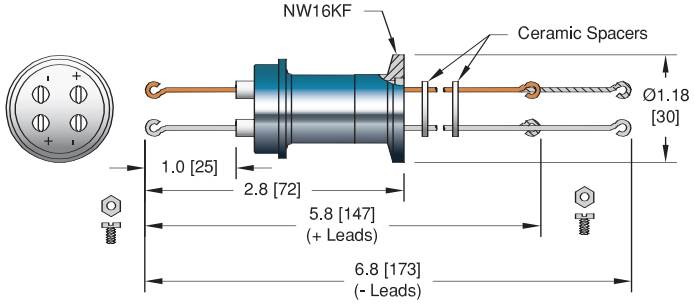
Single Pair – ConFlat - NW35CF



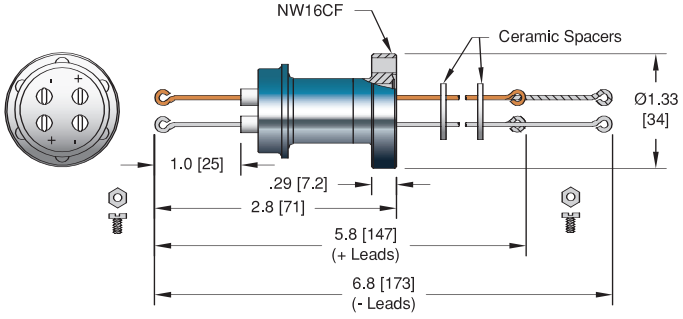
Two Pairs – Weldable



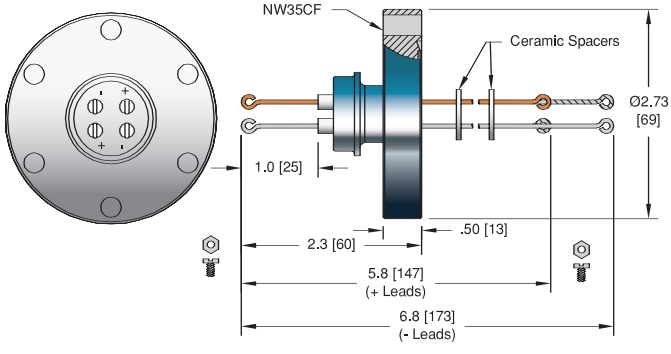
Two Pairs – ISO KF - NW16KF



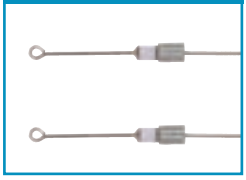
Two Pairs – ConFlat - NW16CF



Two Pairs – ConFlat - NW35CF

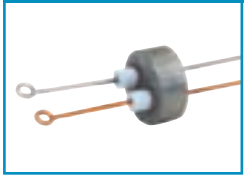


Weldable Single Conductor



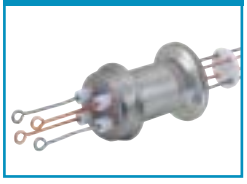
THERMOCOUPLE MATERIAL	FIGURE NUMBER	INSTALLATION	PART NUMBER
Copper	1	Weld	18085-13-W
Constantan	2	Weld	18085-14-W
Platinum-Rhodium*	2	Weld	18085-15-W

Weldable 1 or 2 Pairs



ANSI TYPE	THERMOCOUPLE MATERIALS	INSTALLATION	NO. OF PAIRS	PART NUMBER
T	Copper/Constantan	Weld	1	8900-02-W
R/S	Platinum-Rhodium*	Weld	1	8900-03-W
T	Copper/Constantan	Weld	2	8800-02-W
R/S	Platinum-Rhodium*	Weld	2	8800-03-W

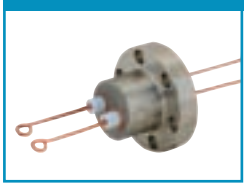
ISO KF 1 or 2 Pairs



ISO FLANGE

T	Copper/Constantan	NW16KF	1	18004-01-KF
R/S	Platinum-Rhodium*	NW16KF	1	18004-02-KF
T	Copper/Constantan	NW16KF	2	15108-01-KF
R/S	Platinum-Rhodium*	NW16KF	2	15108-02-KF

ConFlat 1 or 2 Pairs



CONFLAT FLANGE

T	Copper/Constantan	1 1/3" (NW16CF)	1	9020-02-CF
R/S	Platinum-Rhodium*	1 1/3" (NW16CF)	1	9020-03-CF
T	Copper/Constantan	2 3/4" (NW35CF)	1	9806-02-CF
R/S	Platinum-Rhodium*	2 3/4" (NW35CF)	1	9806-01-CF
T	Copper/Constantan	1 1/3" (NW16CF)	2	8820-02-CF
R/S	Platinum-Rhodium*	1 1/3" (NW16CF)	2	8820-03-CF
T	Copper/Constantan	2 3/4" (NW35CF)	2	10584-02-CF
R/S	Platinum-Rhodium*	2 3/4" (NW35CF)	2	10584-03-CF

*Uses compensating wire. Maximum junction temperature 250° C.

Specifications - Single Conductor

Materials

Shell: 304 Stainless steel
Thermocouple materials:
- Copper
- Constantan
- Platinum-Rhodium

Insulation: Alumina ceramic
Magnetic Materials: No

Temperature Range -269°C to 450°C

Pressure @ 20°C 3500 PSIG (241 Bar), ISO KF 0 PSIG

Specifications - 1 or 2 Pairs

Materials

Shell: 304 Stainless steel
Thermocouple materials:
- Copper/Constantan (Type T)
- Platinum-Rhodium (Type R/S)

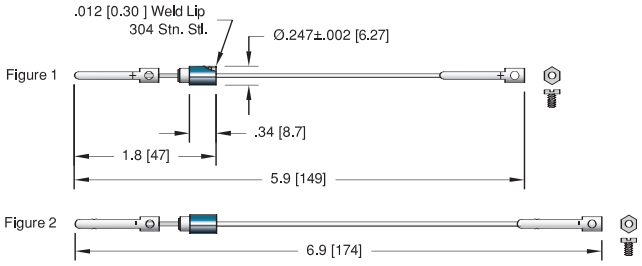
Insulation: Alumina ceramic
Magnetic Materials: No

Temperature Range -269°C to 450°C

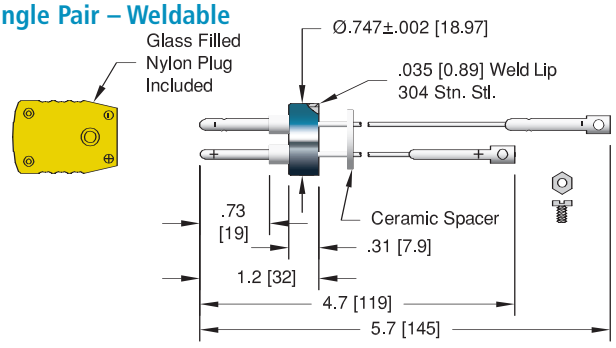
Pressure @ 20°C ISO KF 0 PSIG

1 Pair: 1250 PSIG (86 Bar)
2 Pairs: 800 PSIG (55 Bar)

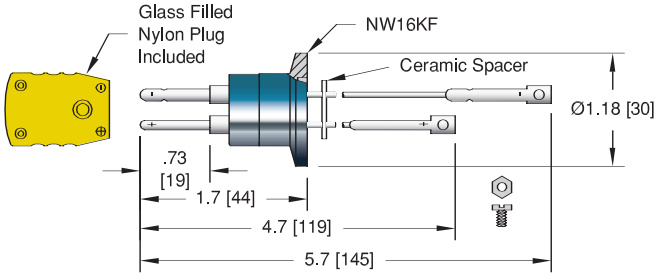
Single Conductor – Weldable



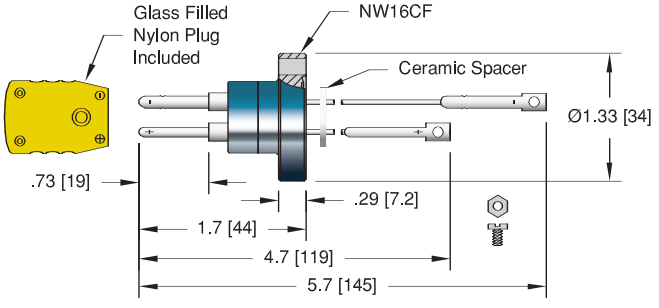
Single Pair – Weldable



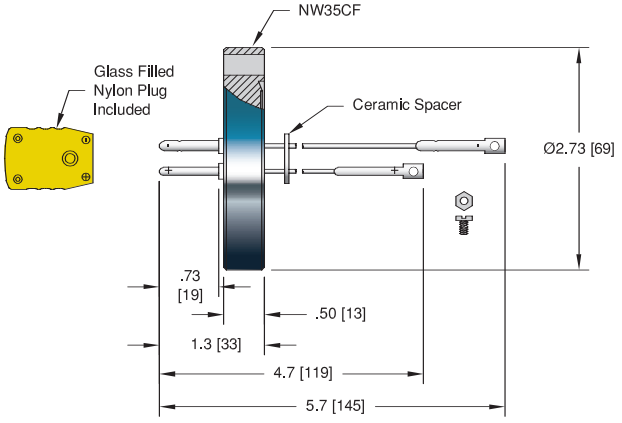
Single Pair – ISO KF - NW16KF



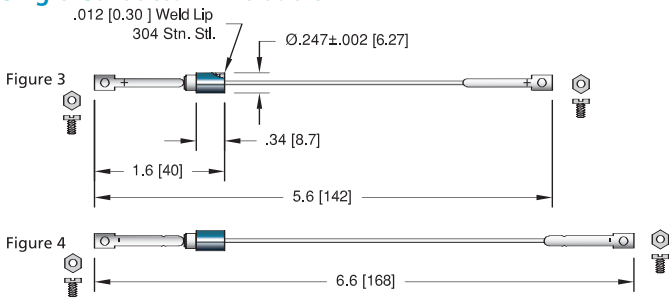
Single Pair – ConFlat - NW16CF



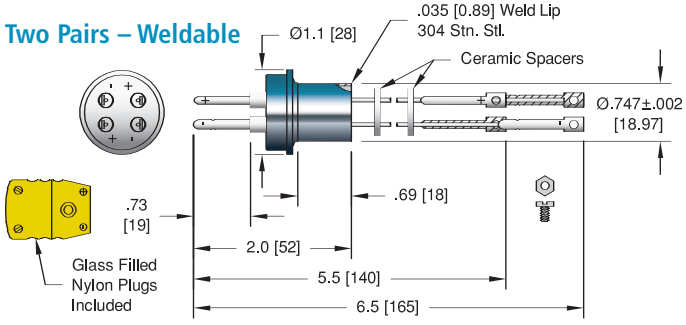
Single Pair – ConFlat - NW35CF



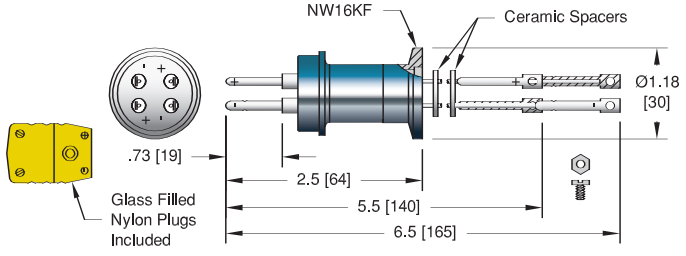
Single Conductor – Weldable



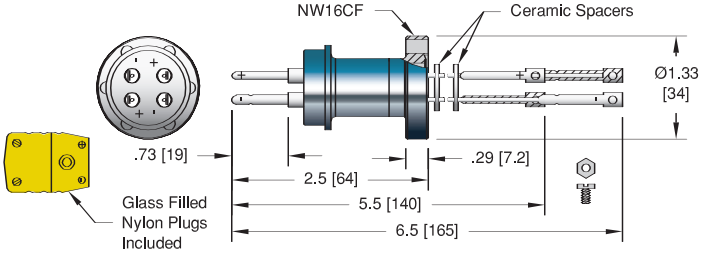
Two Pairs – Weldable



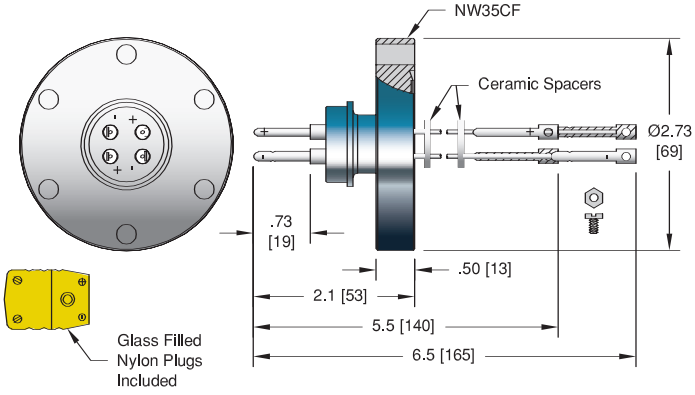
Two Pairs – ISO KF - NW16KF



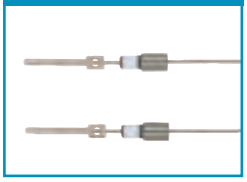
Two Pairs – ConFlat - NW16CF



Two Pairs – ConFlat - NW35CF

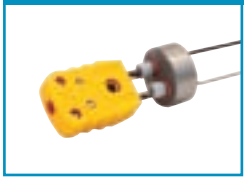


Weldable Single Conductor



THERMOCOUPLE MATERIALS	FIGURE NUMBER	INSTALLATION	PART NUMBER
Chromel	1	Weld	18085-02-W
Alumel	2	Weld	18085-06-W
Chromel	3	Weld	18085-08-W
Alumel	4	Weld	18085-12-W

Weldable 1 or 2 Pairs

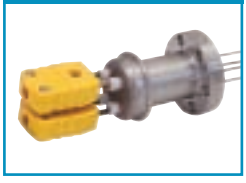


ANSI TYPE	THERMOCOUPLE MATERIALS	INSTALLATION	NO. OF PAIRS	PART NUMBER
K	Chromel/Alumel	Weld	1	8117-01-W
C	Tungsten-Rhenium*	Weld	1	8117-04-W
K	Chromel/Alumel	Weld	2	8233-01-W
C	Tungsten-Rhenium*	Weld	2	8233-04-W

ISO KF 1 or 2 Pairs

		ISO FLANGE		
K	Chromel/Alumel	NW16KF	1	13563-01-KF
C	Tungsten-Rhenium*	NW16KF	1	13563-04-KF
K	Chromel/Alumel	NW16KF	2	18003-01-KF
C	Tungsten-Rhenium*	NW16KF	2	18003-03-KF

ConFlat 1 or 2 Pairs



		CONFLAT FLANGE		
K	Chromel/Alumel	1 1/3" (NW16CF)	1	8118-01-CF
C	Tungsten-Rhenium*	1 1/3" (NW16CF)	1	8118-04-CF
K	Chromel/Alumel	2 3/4" (NW35CF)	1	10583-01-CF
C	Tungsten-Rhenium*	2 3/4" (NW35CF)	1	10583-03-CF
K	Chromel/Alumel	1 1/3" (NW16CF)	2	8232-01-CF
C	Tungsten-Rhenium*	1 1/3" (NW16CF)	2	8232-04-CF
K	Chromel/Alumel	2 3/4" (NW35CF)	2	8593-01-CF
C	Tungsten-Rhenium*	2 3/4" (NW35CF)	2	8593-04-CF

Air Side Plug

ANSI TYPE	THERMOCOUPLE MATERIALS	TYPE	MATERIALS	TEMPERATURE °C MIN	TEMPERATURE °C MAX	COLOR CODE	PART NUMBER
K	Chromel/Alumel	Standard	Glass Filled Nylon	-29	218	Yellow	08151-01
K	Chromel/Alumel	High Temp	Ceramic	-73	650	Yellow	08151-09
C	Tungsten-Rhenium	Standard	Glass Filled Nylon	-29	218	Red	08151-04
C	Tungsten-Rhenium	High Temp	Ceramic	-73	250	Red	08151-07

*Uses compensating wire. Maximum junction temperature 250° C. See the Accessories section for more information on all accessories.

Specifications - Single Conductor

Materials

Shell: 304 Stainless steel
Thermocouple materials:
Chromel
Alumel
Insulation: Alumina ceramic
Magnetic Materials:
Chromel: No
Alumel: Yes

Temperature Range -269°C to 450°C

Pressure @ 20°C 3500 PSIG (241 Bar), ISO KF 0 PSIG

Specifications - 1 or 2 Pairs

Materials

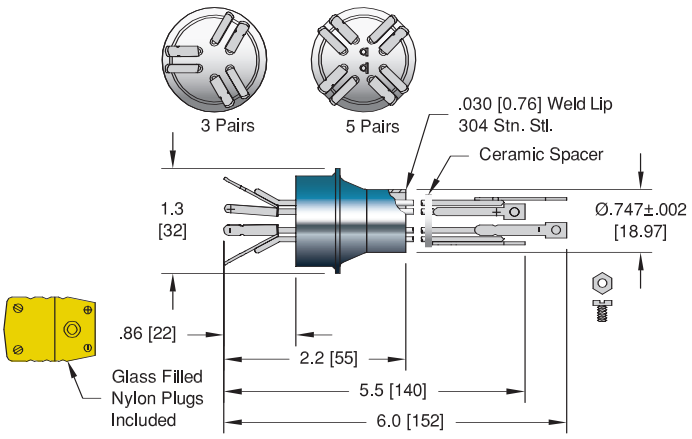
Shell: 304 Stainless steel
Thermocouple materials:
Chromel/Alumel (Type K)
Tungsten-Rhenium (Type C)
Insulation: Alumina ceramic
Magnetic Materials: Yes

Temperature Range -269°C to 450°C

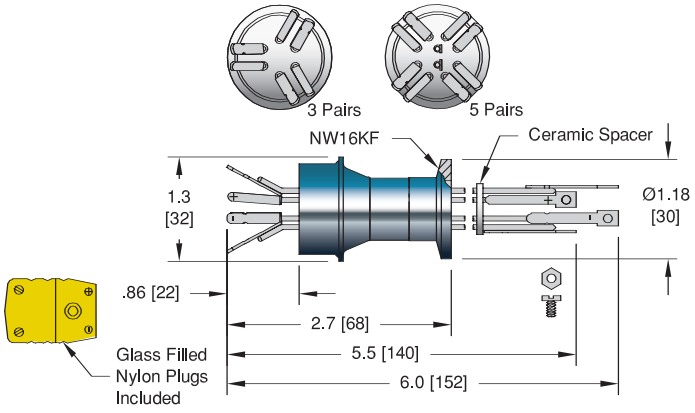
Pressure @ 20°C ISO KF 0 PSIG

1 Pair: 1250 PSIG (86 Bar)
2 Pairs: 800 PSIG (55 Bar)

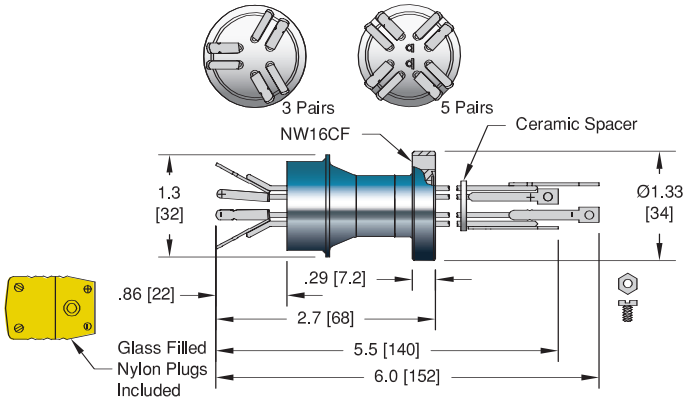
Weldable



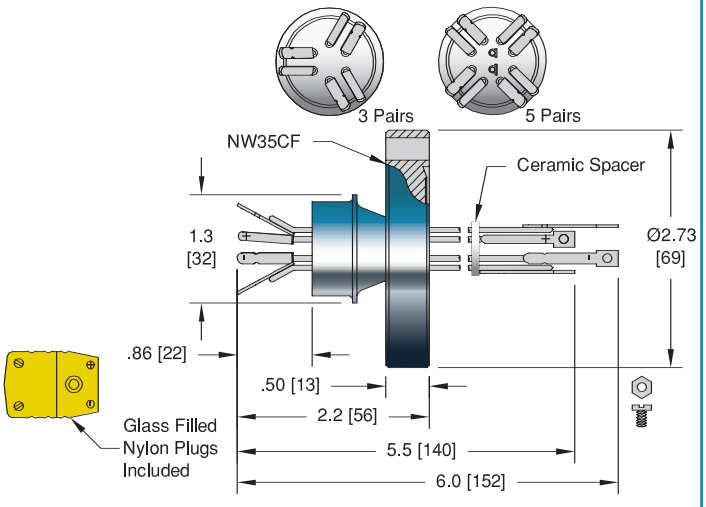
ISO KF



ConFlat – NW16CF



ConFlat – NW35CF



Specifications

Materials

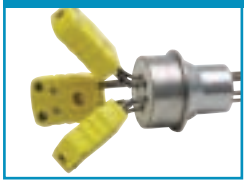
Shell: 304 Stainless steel
Thermocouple materials:
Chromel/Alumel (Type K)
Insulation: Alumina ceramic
Magnetic Materials: Yes

Temperature Range -269°C to 450°C

Pressure @ 20°C ISO KF 0 PSIG

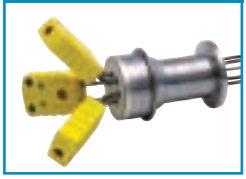
3 Pairs: 400 PSIG (28 Bar)
5 Pairs: 350 PSIG (24 Bar)

Weldable 3 or 5 Pairs



ANSI TYPE	THERMOCOUPLE MATERIALS	INSTALLATION	NO. OF PAIRS	PART NUMBER
K	Chromel/Alumel	Weld	3	18618-01-W
K	Chromel/Alumel	Weld	5	18619-01-W

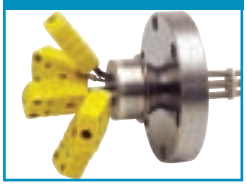
ISO KF 3 or 5 Pairs



ISO FLANGE

K	Chromel/Alumel	NW16KF	3	18618-02-KF
K	Chromel/Alumel	NW16KF	5	18619-02-KF

ConFlat 3 or 5 Pairs



CONFLAT FLANGE

K	Chromel/Alumel	1 1/3" (NW16KF)	3	18618-03-CF
K	Chromel/Alumel	1 1/3" (NW16KF)	5	18619-03-CF
K	Chromel/Alumel	2 3/4" (NW35CF)	3	18618-04-CF
K	Chromel/Alumel	2 3/4" (NW35CF)	5	18619-04-CF

Air Side Plug

ANSI TYPE	THERMOCOUPLE MATERIALS	TYPE	MATERIALS	TEMPERATURE °C MIN	TEMPERATURE °C MAX	COLOR CODE	PART NUMBER
K	Chromel/Alumel	Standard	Glass Filled Nylon	-29	218	Yellow	08151-01
K	Chromel/Alumel	High Temp	Ceramic	-73	650	Yellow	08151-09

See the Accessories section for more information on all accessories.

THERMOCOUPLE

Specifications

Materials

Shell: 304 Stainless steel
Thermocouple materials:
Chromel/Alumel (Type K)
Tungsten-Rhenium (Type C)
Pins: Nickel or Copper
Insulation: Alumina ceramic
Magnetic Materials: Yes

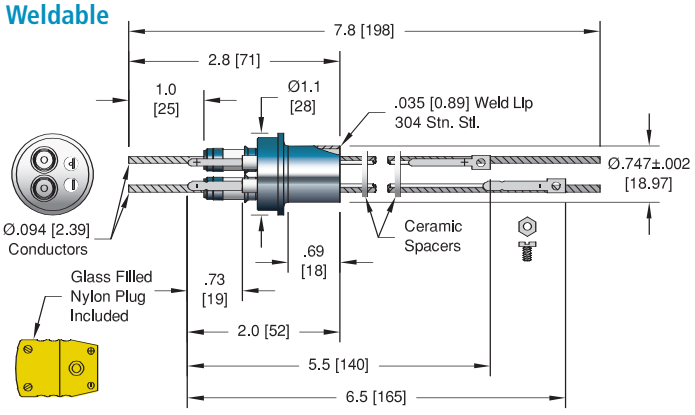
Voltage Rating 5 kV DC

Current Rating See table

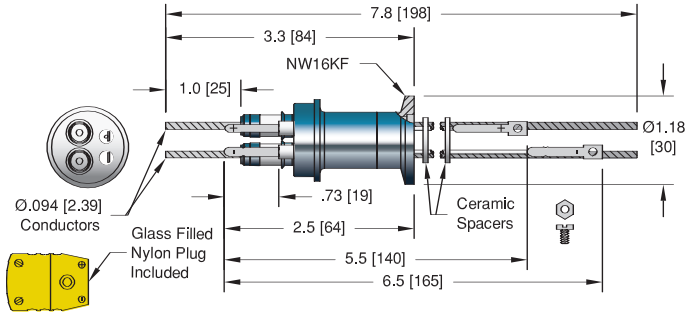
Temperature Range -269°C to 450°C

Pressure @ 20°C 500 PSIG (34 Bar), ISO KF 0 PSIG

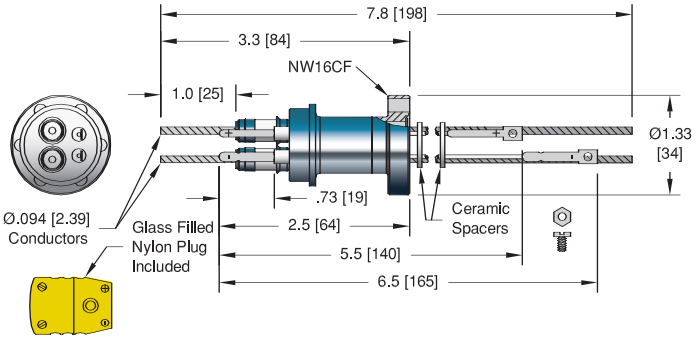
Weldable



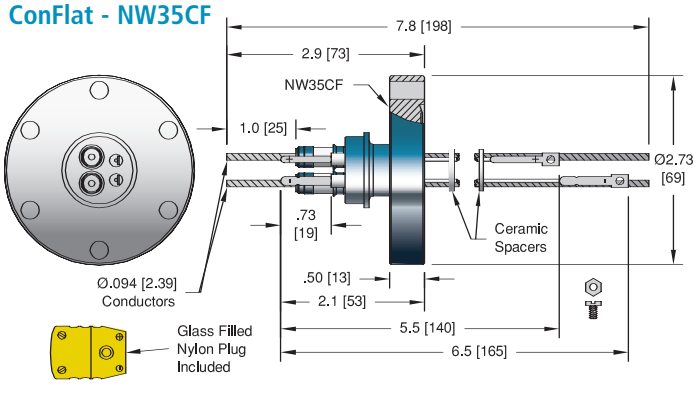
ISO KF



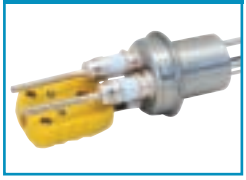
ConFlat - NW16CF



ConFlat - NW35CF

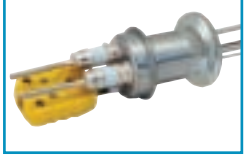


Weldable



ANSI TYPE	THERMOCOUPLE MATERIALS	INSTALLATION	CONDUCTOR AMPS	CONDUCTOR MATERIAL	PART NUMBER
K	Chromel/Alumel	Weld	16.5	Nickel	3181-02-W
K	Chromel/Alumel	Weld	55	Copper	3181-01-W
C	Tungsten-Rhenium**	Weld	16.5	Nickel	0572-02-W
C	Tungsten-Rhenium**	Weld	55	Copper	0572-01-W

ISO KF



ISO FLANGE

K	Chromel/Alumel	NW16KF	16.5	Nickel	18007-01-KF
K	Chromel/Alumel	NW16KF	55	Copper	18007-02-KF
C	Tungsten-Rhenium**	NW16KF	16.5	Nickel	18007-05-KF
C	Tungsten-Rhenium**	NW16KF	55	Copper	18007-06-KF

ConFlat

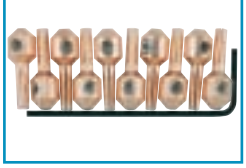
CONFLAT FLANGE

K	Chromel/Alumel	1 1/3" (NW16KF)	16.5	Nickel	8878-07-CF
K	Chromel/Alumel	1 1/3" (NW16KF)	55	Copper	8878-01-CF
C	Tungsten-Rhenium**	1 1/3" (NW16KF)	16.5	Nickel	8878-06-CF
C	Tungsten-Rhenium**	1 1/3" (NW16KF)	55	Copper	8878-02-CF
K	Chromel/Alumel	2 3/4" (NW35CF)	16.5	Nickel	10586-06-CF
K	Chromel/Alumel	2 3/4" (NW35CF)	55	Copper	10586-01-CF
C	Tungsten-Rhenium**	2 3/4" (NW35CF)	16.5	Nickel	10586-08-CF
C	Tungsten-Rhenium**	2 3/4" (NW35CF)	55	Copper	10586-02-CF

Air Side Plug

ANSI TYPE	THERMOCOUPLE MATERIALS	TYPE	MATERIALS	TEMPERATURE °C MIN	TEMPERATURE °C MAX	COLOR CODE	PART NUMBER
K	Chromel/Alumel	Standard	Glass Filled Nylon	-29	218	Yellow	08151-01
K	Chromel/Alumel	High Temp	Ceramic	-73	650	Yellow	08151-09
C	Tungsten-Rhenium**	Standard	Glass Filled Nylon	-29	218	Red	08151-04
C	Tungsten-Rhenium**	High Temp	Ceramic	-73	250	Red	08151-07

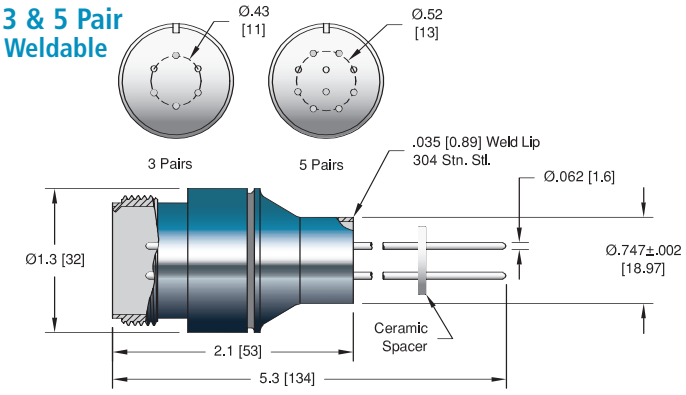
Contacts



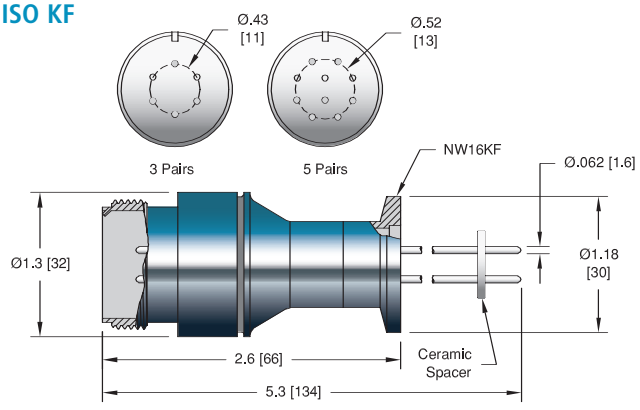
TYPE	MATERIAL	DESCRIPTION	PART NUMBER
0.094 Set Screw Type Contacts	Beryllium Copper	Accepts wire up to 0.050 [1.3]	7429-01-A†
0.094 Barrel Type Contacts	Beryllium Copper	Accepts wire up to 0.094 [2.4]	7332-04-A

*Contacts priced and sold in packages of 10. **Uses compensating wire. Maximum junction temperature 250° C. †Shown in photo.
See the Accessories section for more information on all accessories.

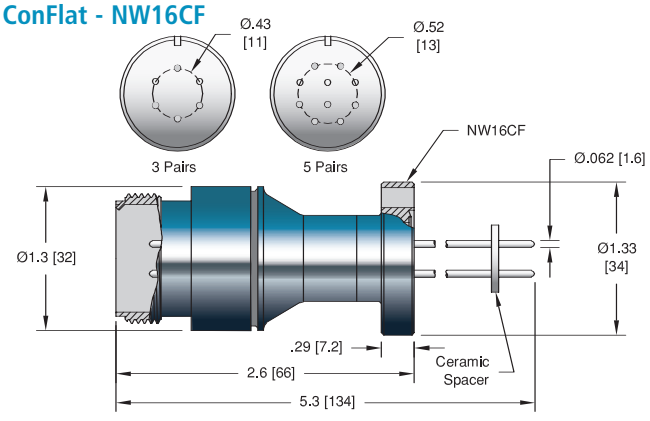
3 & 5 Pair Weldable



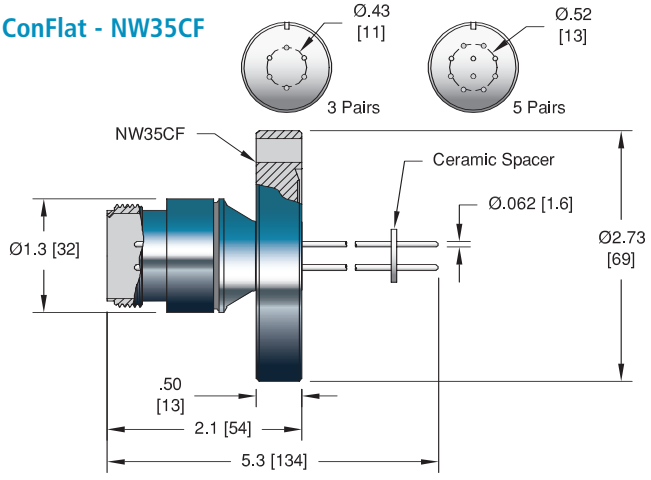
ISO KF



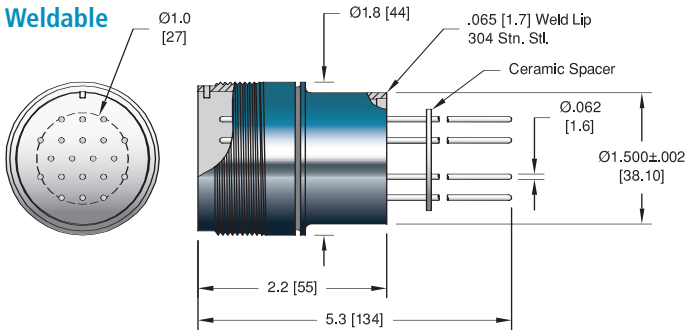
ConFlat - NW16CF



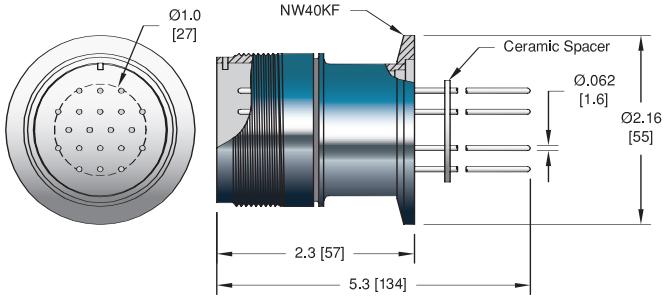
ConFlat - NW35CF



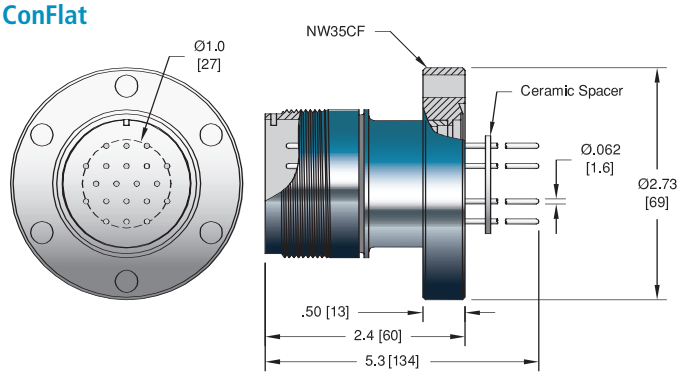
10 Pair Weldable



ISO KF



ConFlat



Specifications

Materials

Shell: 304 Stainless steel
Thermocouple materials:
Chromel/Alumel (Type K)
Insulation: Alumina ceramic
Magnetic Materials: Yes

Temperature Range -269°C to 450°C

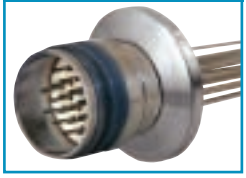
Pressure @ 20°C ISO KF 0 PSIG

3 Pair: 400 PSIG (28 Bar)
5 Pair: 350 PSIG (24 Bar)
10 Pair: 125 PSIG (8.6 Bar)

Weldable 3, 5 or 10 Pairs

ANSI TYPE	THERMOCOUPLE MATERIALS	INSTALLATION	T/C PAIRS	PART NUMBER
K	Chromel/Alumel	Weld	3	10084-05-W
K	Chromel/Alumel	Weld	5	11342-08-W
K	Chromel/Alumel	Weld	10	11343-07-W

ISO KF 3, 5 or 10 Pairs



ISO FLANGE

K	Chromel/Alumel	NW16KF	3	18008-02-KF
K	Chromel/Alumel	NW16KF	5	17155-02-KF
K	Chromel/Alumel	NW40KF	10	18010-02-KF

ConFlat 3, 5 or 10 Pairs

CONFLAT FLANGE

K	Chromel/Alumel	1 1/3" NW16CF	3	10084-06-CF
K	Chromel/Alumel	2 3/4" NW35CF	3	10084-07-CF
K	Chromel/Alumel	1 1/3" NW16CF	5	11342-09-CF
K	Chromel/Alumel	2 3/4" NW35CF	5	11342-10-CF
K	Chromel/Alumel	2 3/4" NW35CF	10	11343-05-CF

Air Side Plug

ANSI TYPE	THERMOCOUPLE MATERIALS	DIMENSIOINS H	L	T/C PAIRS	PART NUMBER
K	Chromel/Alumel	1.4 [36]	4.4 [112]	3	15911-02-A
K	Chromel/Alumel	1.4 [36]	4.4 [112]	5	15912-02-A
K	Chromel/Alumel	1.9 [49]	4.3 [109]	10	15913-02-A

Note that thermocouple contacts are included with all plugs.

Contacts

TYPE	MATERIAL	TEMPERATURE MIN	MAX	GROOVE	PART NUMBER
Crimp	Chromel	-269	350	Yes	11259-05-X
Crimp	Alumel	-269	350	No	11259-06-X
Crimp Tool					2840-05

*Contacts priced and sold in packages of 5. See the Accessories section for more information on all accessories.