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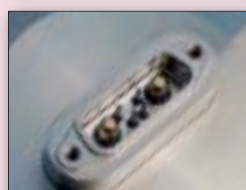
Thermo-D™
Thermocouple Feedthroughs



Thermo-D™ Vacuum-Side
Connectors / Cables



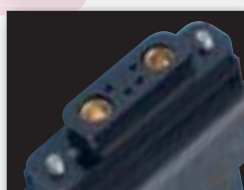
Thermo-D™ Air-Side
Connectors / Cables



TC Power-D™
Power-TC Feedthroughs



TC Power-D™ Vacuum-Side
Connectors / Cables



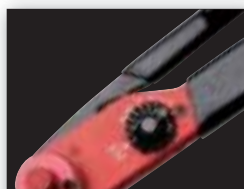
TC Power-D™ Air-Side
Connectors / Cables



Type-K Mini Connectors
Nylon / Ceramic Types



UHV Compatible
Type-K Socket Contacts



Thermocouple
Wiring Tools and Accessories

Product Highlights

Type-K — Offers broadest temperature range (-200°C to +1250°C), and is the most widely used thermocouple type. For these reasons Accu-Glass supports Type-K with feedthroughs having Chromel® and Alumel® pins and mating contacts for maximum accuracy.

Matched pin material for Type-T, J, E, S, R and C thermocouple are not available. Use of standard instrumentation feedthroughs with gold-plated nickel-iron alloy pins, and gold-plated copper alloy contacts are offered instead. The error introduced using these pins and contacts is less than 2%.

Cable Assemblies — Air side and UHV cable assemblies for all thermocouple types. Refer to specific cables for construction details.



Thermo-D™ Type-K

Thermocouple and TC-Power Feedthroughs

UHV Feedthrough, 100800,
Conflat® Compatible Flange

Air-Service Female Cable
Assembly, 100840,
Delrin® connector and
cable

UHV Female Cable Assembly,
100820, PEEK Vacuum Side
Connector and Kapton® insulated
wire

Thermo-D™ and TC Power-D™ Interface

Accu-Glass® Type-K Thermo-D™ (4-pair thermocouple) and TC Power-D™ (2-pair / 2-power thermocouple-power combination) hermetic Subminiature-D feedthroughs are constructed with pin arrangements designed to meet IEC 807-2 and DESC 85039 specifications.

Standard Type-K thermocouple feedthroughs feature Chromel® and Alumel® pins and/or Au plated NiFe power combinations in a Subminiature-D shell. Straight through pins are hermetically sealed and electrically insulated in a 304 stainless steel shell using the latest in glass-ceramic / metal bonding technology. Ultrahigh vacuum cables fitted with PEEK polymer connectors and Kapton® insulated leads are available to meet the rigorous demands of UHV environments. Mating thermocouple cable assemblies, connectors, contacts, wires, tools, and other TC accessories are available starting on page 50. Custom thermocouple or TC-power solutions are available on request, please contact the factory for more details.

Thermocouple feedthroughs do not measure temperature, but merely provide a conduit to bring the EMF signal generated at a thermocouple junction through a vacuum vessel wall to an external voltage measuring or temperature readout instrument. Type-K thermocouples with positive Chromel® and negative Alumel® leads are recommended for use in clean oxidizing atmospheres. The maximum operating temperature for these alloys is 1260°C for larger wire sizes. The useful temperature measuring range for a Type-K thermocouple is between 200°C to 1250°C.

Features

- Subminiature-D Interface
- Type-K Chromel®/Alumel® pins
- 4 TC-pairs / 2 TC-pair and 2 power leads
- High temperature rated to 250°C
- UHV compatible construction
- Conflat® and ISO NW compatible mounts
- Kapton® insulated vacuum cables
- PEEK Connector with locking screws
- Air service cables / connectors
- Custom solutions on request

Specifications

Voltage¹

Thermocouple Pins	Millivolts
Power Pins, Maximum	500VDC

Current

Thermocouple Pins	Milliamperes
Power Pins, Maximum @ 20° C	20A

Material

Shell	304 Stainless Steel
Thermocouple (+)	Chromel®
Thermocouple (-)	Alumel®
Power Pins	Au Plated, Ni-Fe Alloy
Seal / Insulator	Glass-Ceramic
Connector, Air	Delrin® Polymer
Connector, Vacuum ²	PEEK Polymer

Vacuum Range

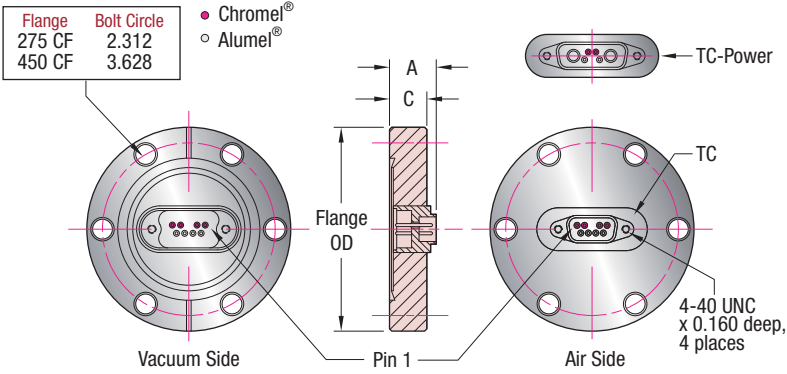
UHV, Ultrahigh Vacuum	1x10 ⁻¹⁰ Torr
HV, High vacuum	1x10 ⁻⁸ Torr

Temperature Range³

Feedthrough	250°C
Flange Mount, Conflat®	450°C
Flange Mount, ISO	150°C
Connector / Cable, Air	80°C
Connector / Cable, Vacuum	250°C
Thermal Gradient	25°C / Minute Maximum

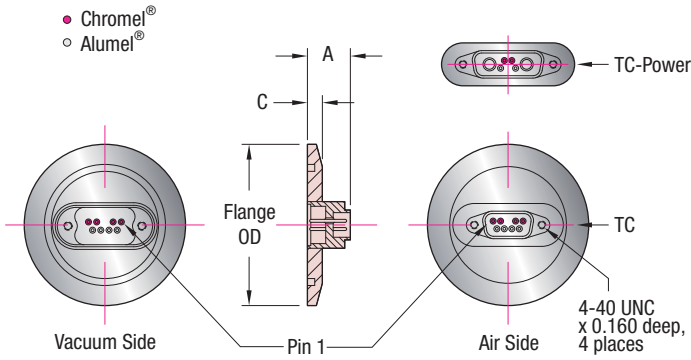
Notes

1. Electrical ratings are maximum test values, with feedthrough's vacuum side at $\leq 1 \times 10^{-4}$ Torr. Feedthroughs are intended for instrumentation applications carrying low level signal voltage and current.
 2. PEEK is a polyether ether ketone thermoplastic.
 3. Overall assembly ratings must be adjusted to that of its lowest rated component.
 4. Unless designated a 'kit,' connectors and cable assemblies are not included with feedthrough and must be purchased separately.
- § Unless specified otherwise, dimensional units in all sections of this catalog are expressed in inches.



CF Flange — 6 and 8 Pin CF Flange / 500 VDC, 20 Amp / 250°C / UHV to 1×10^{-10} Torr

Contacts	TC Pairs	Power Pins	CF Flange	OD	A	B	Model Number	Part Number
8	4	—	275 CF	2.73	0.63	0.50	9D-8TC-275	100790
8	4	—	450 CF	4.47	0.76	0.68	9D-8TC-450	112709
6	2	2	450 CF	4.47	0.76	0.68	15D-4TC2P-450	100800



ISO KF Flange — 6 and 8 Pin ISO Flange / 500 VDC, 20 Amp / 150°C / HV to 1×10^{-8} Torr

Contacts	TC Pairs	Power Pins	CF Flange	OD	A	B	Model Number	Part Number
8	4	—	NW40 KF	2.16	0.59	0.20	9D-8TC-K40	100791
6	2	2	NW50 KF	2.95	0.59	0.20	15D-4TC2P-K50	100801



100790 / UHV 4-Pair TC Feedthrough (Vacuum Side)



100800 / UHV TC-Power Feedthrough (Air Side)



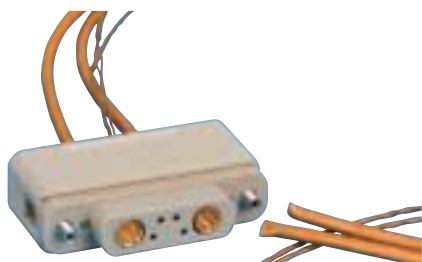
100791 / HV 4-Pair TC Feedthrough (Vacuum Side)



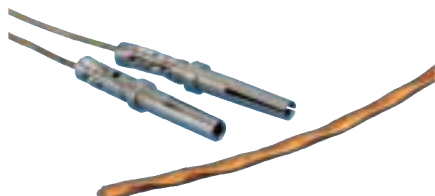
100801 / HV TC-Power Feedthrough (Air Side)



100810 / Type-K
Connector to Cable Assembly



100820 / Type-K
Connector to Cable Assembly



100850 / Type-K
Connector to Cable Assembly



Type K "Hot Junction"



Options .42 / .43 / Male / Female
Ceramic Mini-Type-K Connector

See page 48 for **Specifications**

See page 94 for **Cable Specs**

Ultrahigh Vacuum Thermocouple / Power Cable Assemblies

Connector to Cable UHV Type-K thermocouple cable assemblies are fitted with PEEK polymer Subminiature-D connectors, .040 diameter Type-K Chromel® and Alumel® socket contacts, and solid 30 AWG Kapton® insulated Chromel® and Alumel® leads. Female connectors mate with Thermo-D™ feedthroughs on page 49. Power leads are fitted with 0.142 diameter Au plated Cu female socket contacts and 12 AWG Kapton® insulated multi-strand wire. TC-Power cable assemblies mate with corresponding TC Power-D™ feedthroughs.

Contact to Cable UHV leads do not include PEEK connectors. Warning: Contact fitted leads will not allow subsequent PEEK connector installation.

Cable Termination Options 'Hot Junction' is a user specified addition to standard cable assemblies. A thermocouple 'Hot Junction' is where temperature will be measured and where dissimilar wire metals are joined. Descriptions, definitions and illustrations, are on page 266.

Cable Assemblies — 250°C / UHV to 1x10⁻¹⁰ Torr

Contacts	Cable Length	Connector		Model Number	Part Number
		Gender	W x H x D		

Connector to Cable — Four-Pair Thermocouple

8	19	M	1.30 x 0.50 x 0.75	9KAP-8TC-19PC	110930
8	39	M	1.30 x 0.50 x 0.75	9KAP-8TC-39PC	110931
8	19	F	1.30 x 0.50 x 0.75	9KAP-8TC-19SC	100810
8	39	F	1.30 x 0.50 x 0.75	9KAP-8TC-39SC	100811

Connector to Cable — Two-Pair Thermocouple / Two-Pin Power

6	19	M	1.70 x 0.50 x 0.99	15KAP-4TC2P-19PC	110932
6	39	M	1.70 x 0.50 x 0.99	15KAP-4TC2P-39PC	110933
6	19	F	1.70 x 0.50 x 0.99	15KAP-4TC2P-19SC	100820
6	39	F	1.70 x 0.50 x 0.99	15KAP-4TC2P-39SC	100821

Contact to Cable — One-Pair Thermocouple Leads with Socket Contacts

2	19	F	Fits 0.040 Pin Dia.	KAP-TC-19S	100850
2	39	F	Fits 0.040 Pin Dia.	KAP-TC-39S	100851

Contact to Cable — One-Pin Power Lead with Socket Contacts

1	19	F	Fits 0.142 Pin Dia.	KAP-P-19S	100860
1	39	F	Fits 0.142 Pin Dia.	KAP-P-39S	100861

Cable Termination Options — 'Hot-Junction'

1	Fusion welded thermocouple wire ends			Append to Part #	.40
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Cable Termination Options — Miniature Thermocouple Connector (Blade Type)

1	F / White / High Purity Alumina			Append to Part #	.43
1	M / White / High Purity Alumina			Append to Part #	.42

Cable Termination Options Ordering Instructions: To order this 'factory only' option, add the 'option number' to a desired cable assembly 'part number' from the table above. Increase the base cable assembly price by factoring in the selected 'option' price. For example, part number 100810.40 would require four (4) 'junctions', as there are four unterminated thermocouple pairs on 100810... the adjusted price for 100810.40 is \$300 + \$60 (\$15 x 4) = \$360 total.

Related Products

12 AWG Kapton® insulated power-lead wire / 100700
30 AWG Kapton® insulated Type-K wire / 100770, 100771 and 100772
ANSI Type-K Thermocouple wire reference data

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Page 97
Page 266

Ultrahigh Vacuum Connectors and Contacts

Connectors are made of a PEEK polymer and mate with Thermo-D™ Subminiature-D feedthroughs listed on page 49. Connectors do not include contacts, which must be purchased separately. 20 to 24 AWG Thermocouple Type-T1tc contacts in 'standard' and/or 'high duty cycle' grades are offered. 12 AWG Type-T3 contacts for power leads are also listed in tables below.

Strain Reliefs are also made of PEEK and sold as options, separate from connectors. They are designed for use with either power or bare thermocouple leads insulated with dual-bore Ceramic Insulators (page 107). However, they will **not** provide strain relief for Kapton® insulated thermocouple leads.

Connectors — 250°C / UHV to 1x10⁻¹⁰ Torr

Contacts	Connector		Model Number	Part Number
	Gender	W x H x D		

Thermo-D™ Connectors — Four-Pair Thermocouple

8	M	1.30 x 0.50 x 0.75	9D-8TC-PKP	101021
8	F	1.30 x 0.50 x 0.75	9D-8TC-PKS	101019

TC Power-D™ Connectors — Two-Pair Thermocouple / Two Power

8	M	1.70 x 0.50 x 0.99	15D-4TC2P-PKP	101031
8	F	1.30 x 0.50 x 0.75	15D-4TC2P-PKS	100970

Strain Reliefs — for PEEK Connectors

Four-Pair Thermocouple — Kapton insulated wire	9D-PKBS	100445
Four-Pair Thermocouple — Ceramic insulated bare wire	8TC-PKBS	112290
Two-Pair Thermocouple / Two Power — Ceramic insulated bare wire	4TC2P-PKBS	112291

Ceramic Connectors — White Miniature Thermocouple

2	F	0.75 x 0.38 x 1.06	TC-K-MINI-F	110987
2	M	0.75 x 0.38 x 0.88	TC-K-MINI-M	110988

Bare Thermocouple Wire and Ceramic Insulators are located in the **Wire and Accessories** section, page 107.

Contacts¹ — 250°C / UHV to 1x10⁻¹⁰ Torr

Number Contacts	Contact		Wire		Model Number	Part Number
	Gender	Material	Dia.	Dia. / Gauge		

Contacts, Type-T1tc — Standard / Type-K, Chromel® and Alumel® / 5 Per Pack

1 Pack	M	Chromel®	0.04	.043-.046 / 20-24 AWG	CP-5	100981
1 Pack	M	Alumel®	0.04	.043-.046 / 20-24 AWG	AP-5	100991
1 Pack	F	Chromel®	0.04	.043-.046 / 20-24 AWG	CS-5	100980
1 Pack	F	Alumel®	0.04	.043-.046 / 20-24 AWG	AS-5	100990

Contacts^{2,3}, Type-T1tc — High Duty Cycle / Type-K, Chromel® and Alumel® / 5 Per Pack

1 Pack	F	Chromel®	0.04	.043-.046 / 20-24 AWG	CS-5-S	111323
1 Pack	F	Alumel®	0.04	.043-.046 / 20-24 AWG	AS-5-S	111324

Contacts, Type-T3 — Power / 5 per Pack

1 Pack	M	Cu alloy, Au plated	0.142	.081 / 12 AWG	PP-5	101001
1 Pack	F	Cu alloy, Au plated	0.142	.081 / 12 AWG	PS-5	101000

1. See Tools on page 53. 2. High duty cycle stainless steel contacts require positioner DCT-P-2 on DCT-1 crimp tool. 3. Has a SS sleeve over spring section



101019 / Four-Pair Thermocouple Connector (Contacts Sold Separately)



100970 / Two-Pair TC, Two Power Thermocouple Connector (Contacts Sold Separately)



112290 / Four-Pair Strain Relief (Connector Sold Separately)



110988 / **110987** / Male / Female Ceramic Mini-Type-K Connector



100980 / Chromel® Contacts



Thermocouple

UHV Type-K, Air-service Cable Assemblies

Thermocouple



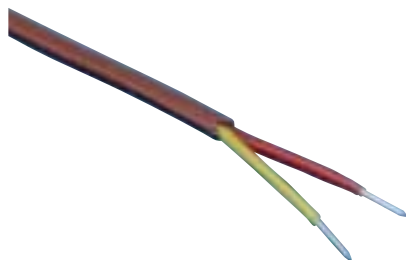
100830 / Type-K Air-Service
Connector to Cable Assembly



100840 / Type-K Air-Service
Connector to Cable Assembly



Options .45 / .46 / Male / Female
Mini-Type-K Connector



100967 / Thermocouple Wire

Air-service Thermocouple / Power Cable Assemblies

Connector to Cable Air-service Type-K thermocouple cable assemblies are fitted with Delrin® polymer Subminiature-D female connectors, .040 diameter Type-K Chromel® and Alumel® socket contacts, and solid core 24 AWG FEP insulated Chromel® (+ Yellow) and Alumel® (– Red) leads. Connectors mate with Thermo-D™ feedthroughs on page 49. Power leads are fitted with 0.142 diameter Au plated Cu female socket contacts and 12 AWG PVC insulated multi-strand wire. TC-Power cable assemblies mate with corresponding TC Power-D™ feedthroughs.

Connector to Cable Air-service cable assemblies may be used without connector shell for a smaller footprint in tight space applications.

Cable Termination Options — Blade-type miniature thermocouple connectors are a user specified (factory installed) addition to standard cable assemblies. For DIY installation/modifications, purchase individual connectors and accessories from page 53.

Cable Assemblies — 80°C / Air Atmosphere

Contacts	Cable Length	Connector		Model Number	Part Number
		Gender	W x H x D		

Connector to Cable — Four-Pair Thermocouple / Unterminated

8	96	F	1.40 x .75 x 2.52 ¹	AIR-8TC-96SC	100830
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Connector to Cable — Two-Pair Thermocouple + Two-Pin Power / Unterminated

6	96	F	1.72 x .75 x 2.51 ²	AIR-4TC2P-96SC	100840
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Cable Termination Options — Miniature Thermocouple Connector (Blade Type)

1	F / Yellow / Nylon (Glass Filled)	Append to Part #	.45
1	M / Yellow / Nylon (Glass Filled)	Append to Part #	.46

1. 1.30 x 0.50 x 0.75 without shell. 2. 1.70 x 0.50 x 0.99 without shell.

Connector Option Ordering Instructions: To order a connector option, add the 'option number' to a desired cable assembly 'part number' from the table above. Increase the base cable assembly price by factoring in the selected 'option' price. For example, part number 100830.46 would require four (4) mini thermocouple connectors, as there are four unterminated thermocouple pairs on 100830... the adjusted price for 100830.46 is \$275 + \$32 (\$8 x 4) = \$307 total.

Air-Service Cable — 80°C / Air Atmosphere

Leads	Type	Length Feet	Gauge AWG	Wire Material / Type	Model Number	Part Number

Power

1	Air	15	12	Cooper ¹	AIR-P-15'	100966
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Thermocouple

2	Air	15	24	K	KAIR-TC-15'	100967
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1. Stranded

Air-service Connectors, Contacts and Cable

Components in this section are sold as the most basic components. Connectors do not include contacts and must be purchased separately. Thermocouple-only connectors (9-pin connectors used for four-pair, 8-contact connectors) are made of Delrin® polymer. The 6-contact thermocouple / power connector uses a glass-filled polyester composite. Sub-D thermocouple connectors mate directly onto the air side of feedthrough flanges shown on page 49.

Connectors — Sub-D may be used without the outer shell for minimum space requirements.

Connectors¹ — All TC Types / 80°C / Air Atmosphere

Contacts	Connector			Model Number	Part Number
	Gender	W x H x D			

Thermo-D™ Connectors — Four-Pair Thermocouple on Subminiature-D

8	F	1.40 x 0.75 x 2.52 ²	9D-8TC-DS	101020	
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TC Power-D™ Connectors — Two-Pair Thermocouple / Two Power Leads on Subminiature-D Combo

8	F	1.72 x 0.75 x 2.51 ³	15D-4TC2P-DS	101030	
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Plastic Connectors — Miniature Thermocouple

2	K	Yellow	M	0.63 x 0.31 x 1.02	KAIR-MINI-M	112153	
2	K	Yellow	F	0.63 x 0.31 x 0.75	KAIR-MINI-F	112152	
Mini Strain Relief				TC-MINI-SR	112156		

1. Contacts sold separately. 2. 1.30 x 0.50 x 0.75 without shell. 3. 1.70 x 0.50 x 0.99 without shell

Contacts — 250°C / UHV to 1x10⁻¹⁰ Torr

Number Contacts	Contact			Wire		Model Number	Part Number
	Gender	Material	Dia.	Dia. / Gauge			

Contacts, Type-T1tc — Standard / Type-K, Chromel® and Alumel® / 5 Per Pack

1 Pack	M	Chromel®	0.04	.043-.046 / 20-24 AWG	CP-5	100981	
1 Pack	M	Alumel®	0.04	.043-.046 / 20-24 AWG	AP-5	100991	
1 Pack	F	Chromel®	0.04	.043-.046 / 20-24 AWG	CS-5	100980	
1 Pack	F	Alumel®	0.04	.043-.046 / 20-24 AWG	AS-5	100990	

Contacts^{1,2}, Type-T1tc — High Duty Cycle / Type-K, Chromel® and Alumel® / 5 Per Pack

1 Pack	F	Chromel®	0.04	.043-.046 / 20-24 AWG	CS-5-S	111323	
1 Pack	F	Alumel®	0.04	.043-.046 / 20-24 AWG	AS-5-S	111324	

Contacts, Type-T3 — Power / 5 per Pack

1 Pack	M	Cu alloy, Au plated	0.142	.081 / 12 AWG	PP-5	101001	
1 Pack	F	Cu alloy, Au plated	0.142	.081 / 12 AWG	PS-5	101000	

1. High duty cycle stainless steel contacts require positioner DCT-P-2 on DCT-1 crimp tool. 2. Has a SS sleeve over spring section

Tools — for wiring Thermocouple contacts

Contents	Description	Model Number	Part Number
1 Unit	Crimping tool for Type-T1 Contacts	DCT-1	100190
1 Unit	Crimp Tool Positioner ¹	DCT-POS-T2	111315
1 Unit	Crimping tool for Type-T3 Contacts	DCT-3	101080
1 Unit	Extraction Tool for Type-T3 Contacts	CX-ET	100935
1 Set	Connector Screwdriver Set ²	DRVR-SET	112146

1. Used only with high duty cycle stainless steel contacts, fits DCT-1 part number 100190. 2. Includes one each flat, phillips and hex drivers



101020 / Air-Connector
(Contacts Sold Separately)



101030 / Air Connector
(Contacts Sold Separately)



112152 / 112153 / Male / Female
Mini-Type-K Connector



100980 / Chromel® Contacts



101080 / Contact Crimp Tool