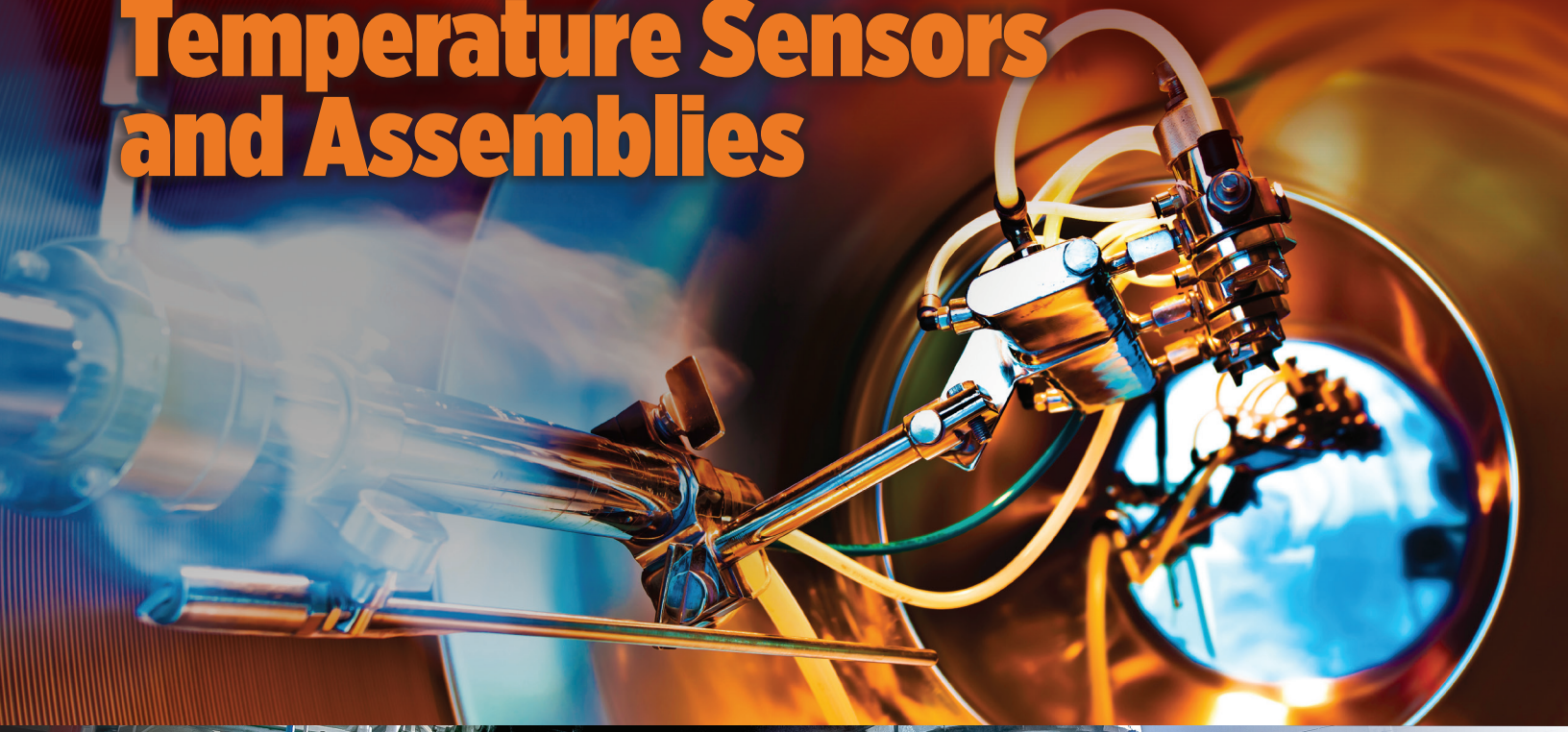
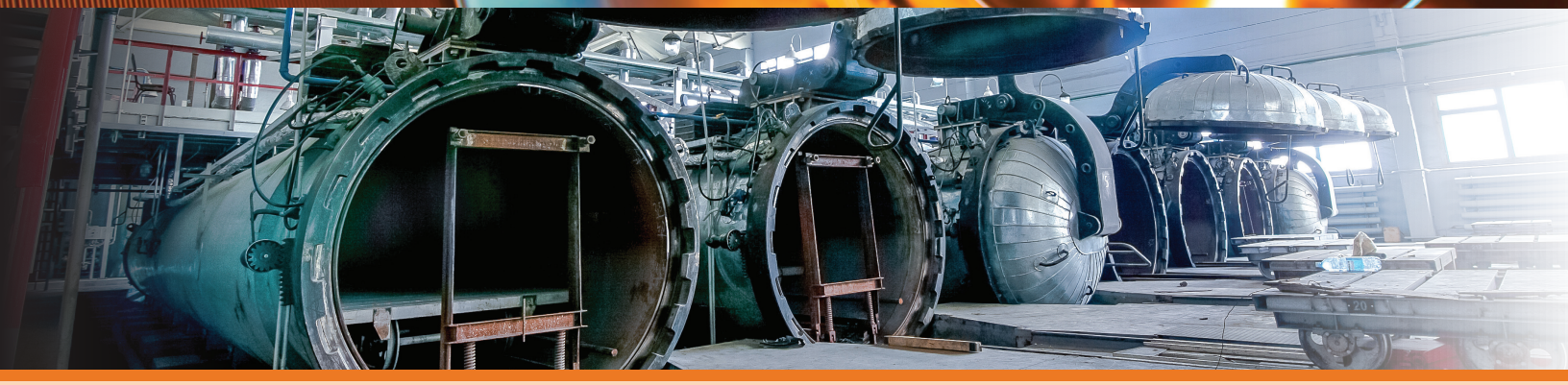
A complete range of

Temperature Sensors and Assemblies





Thermocouples and RTDs to ensure:

- Better process control
- AMS2750 compliance
- Traceability to national standards
- ISO/IEC 17025 accredited calibration laboratory

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RTD and thermocouple assemblies for industry

Common mounting styles

(See catalog 5001 for more details)

Direct-mount Male threads screw directly into the vessel, securing the sensor assembly. Multiple mounting configurations are shown.

PG Series Fittings (PG) Single bore compression seal fittings of stainless steel construction include a "soft sealant" that allows adjustable immersion, securing of probe, and environment sealing.

Midlock Fitting (MK) This all stainless steel assembly is used for gas or liquid sealing and may be opened and resealed at a fixed immersion depth.

W-Fitting (W) A stainless steel fitting is brazed or welded to the probe for a rugged leak-tight mounting.

Nipple-Union-Nipple Configuration (NUN) This configuration allows the terminal head to be positioned for easy assembly and alignment with conduit.

Spring-loaded nipple (SLN) is supplied for use with thermowell assemblies.

Thermowells (TW) are available in varying configurations in stainless steel, alumina (Al_2O_3) or brass for additional protection of your sensor assembly.

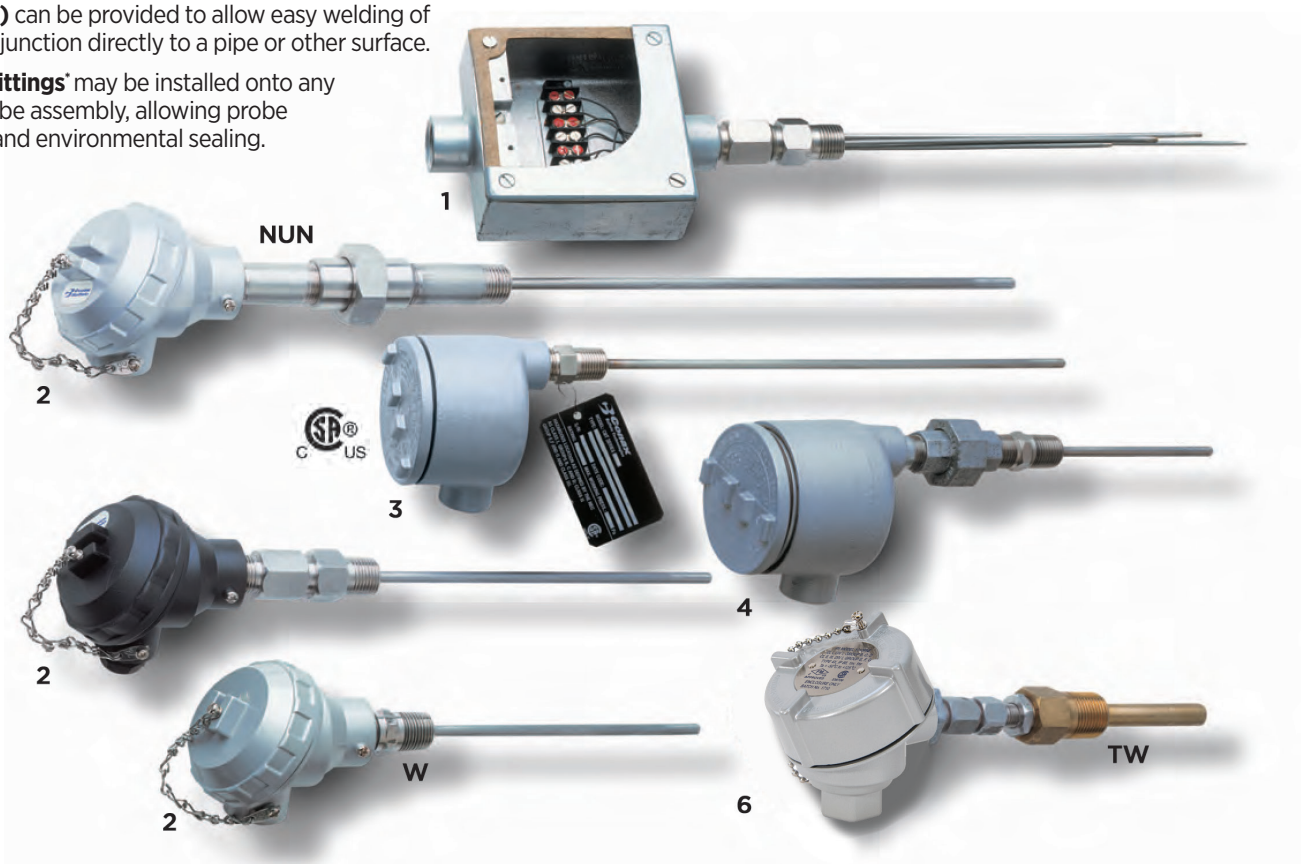
Weld pad (F) can be provided to allow easy welding of a sensor hot junction directly to a pipe or other surface.

Adjustable fittings* may be installed onto any terminal/probe assembly, allowing probe adjustment and environmental sealing.

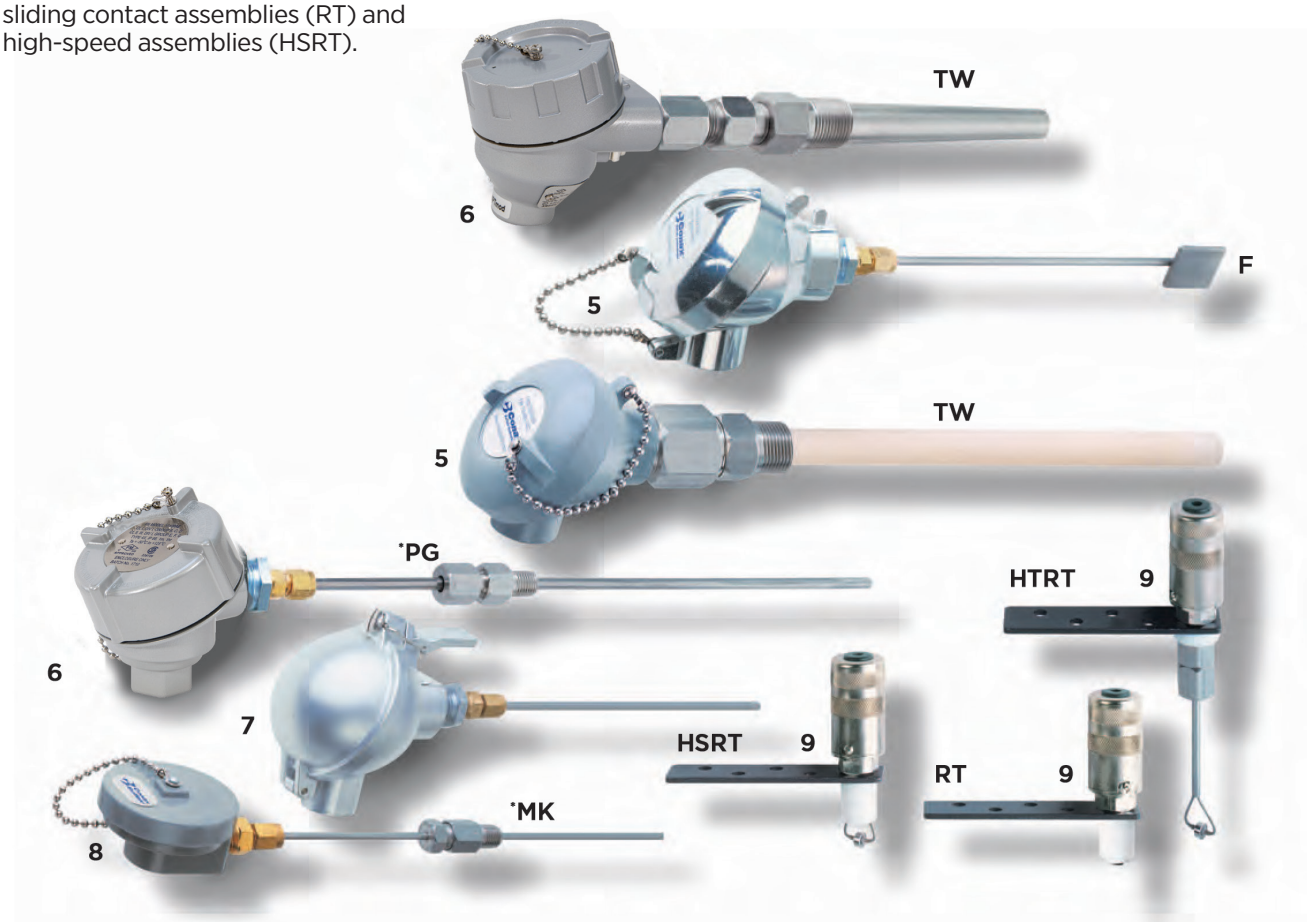
Termination heads

(See catalog 5005 for more details)

1. **T7 Terminal Box** The weatherproof gasketed aluminum T7 terminal box can accommodate up to 40 terminals and is ideal for multiple probe or extra long thermocouple assemblies.
2. **T11 Screw Cover Head** The T11 termination provides a screw cover with chain leash and a 6-post terminal block. The T11 is available in cast aluminum (AL) or plastic (PL). An optional spring loaded terminal block assembly allows complete disassembly and removal of the sensor probe without dismantling the terminal head from the conduit or vessel.
3. **T8E Explosion-Proof Head (CSA/NRTL/C & UL)** T8E assemblies can be supplied to meet CSA/NRTL/C standards with UL terminations for use in hazardous locations.
4. **T8E Explosion-Proof Head (NEMA 7)** The T8E explosion-proof head features a gray iron body with an aluminum screw cover. It accommodates up to 8 leads. This termination meets NEMA 7 requirements.
5. **T5 Terminal Head (NEMA 4)** The T5 (O-ring sealed) is a highly versatile NEMA 4-rated head featuring 6 terminal posts. It is available in aluminum, cast iron and stainless steel.



6. **T15EAL or T15ESS (ATEX)** FM- and CSA-approved for hazardous environments with an explosion-proof rating, and NEMA4- or 4X-rated when equipped with optional o-ring. The T15EAL is of aluminum construction while the T15ESS is stainless steel. Both can accommodate a 6-post terminal block or "hockey puck" transmitter.
7. **T12 Camlock Head** The T12 features an easy to open globe design with camlock. A simple flick of the lock provides easy access to this weatherproof aluminum head. The T12 accepts up to 4 leads.
8. **P4 Miniature Plastic Head** Miniature, weatherproof terminal head for corrosive environment applications where space is limited, provides 4 terminals.
9. **Roll Temp Assemblies** Roll Temp assemblies are ideal for sensing surface temperature on drums, rollers or other moving surfaces. These are designed to detect temperature variations in continuous process applications for relative temperature measurement. These include high temperature assemblies (HTRT), sliding contact assemblies (RT) and high-speed assemblies (HSRT).



Termination styles

T Series termination styles

(See catalog 5005 for more details)

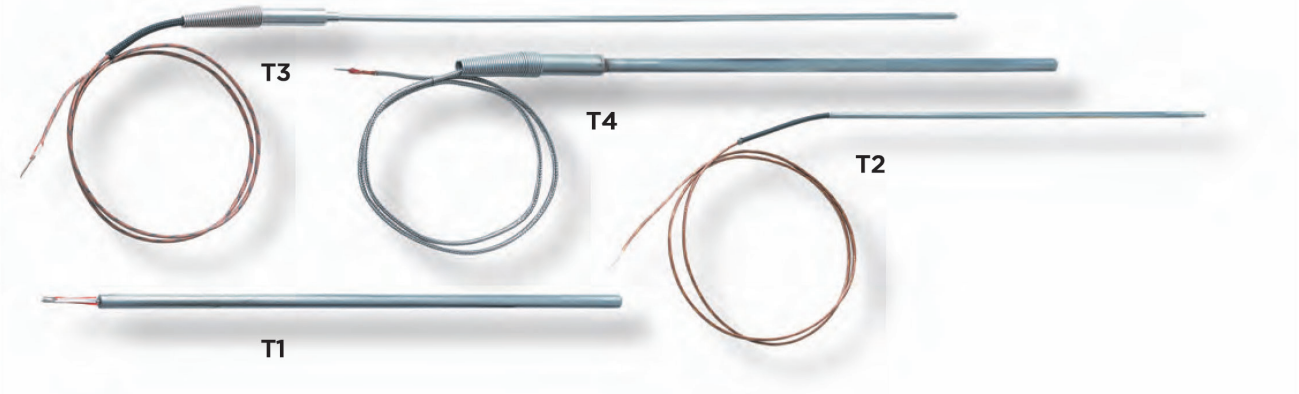
Conax offers a number of sensor termination styles.

T1 This basic configuration features a standard 1-inch bare wire lead, with ISA-designated color-coded PTFE-sleeves. The probe end is sealed with an adhesive to prevent liquid or gas penetration.

T2 This configuration features a silicone-impregnated glass braid insulation combination swaged approximately 3/4-inch into the sheath.

T3 This is an epoxy-filled termination barrel which provides a mechanical and environmental epoxy seal as the conductors from the sensor probe transition to lead wire.

T4 This adds a stainless steel overbraid to the **T3** configuration. This also protects lead wires and offers maximum flexibility and resistance to abrasion. The **T2**, **T3** and **T4** terminations feature a standard lead wire length of 24 inches with longer leads available on request.



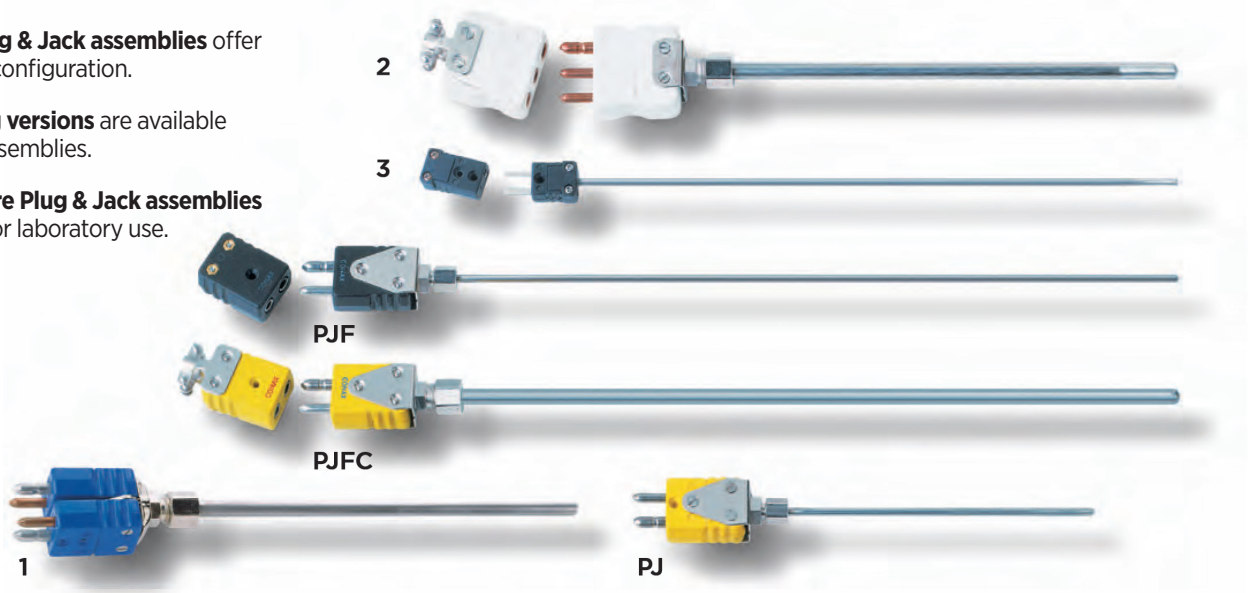
Plug and jack assemblies

The PJ Series of polarized plug and jack assemblies are made of molded, glass-filled thermoset compounds with contacts made of thermocouple alloys for thermocouples, or copper for RTDs. They are available as male only (PJ), female only (PF), male/female assemblies (PJF) and male/female assemblies with cable clamp (PJFC). High temperature assemblies are available for applications above 400°F.

1. Dual Plug & Jack assemblies offer four-wire configuration.

2. 3-Prong versions are available for RTD assemblies.

3. Miniature Plug & Jack assemblies are ideal for laboratory use.



Additional termination styles

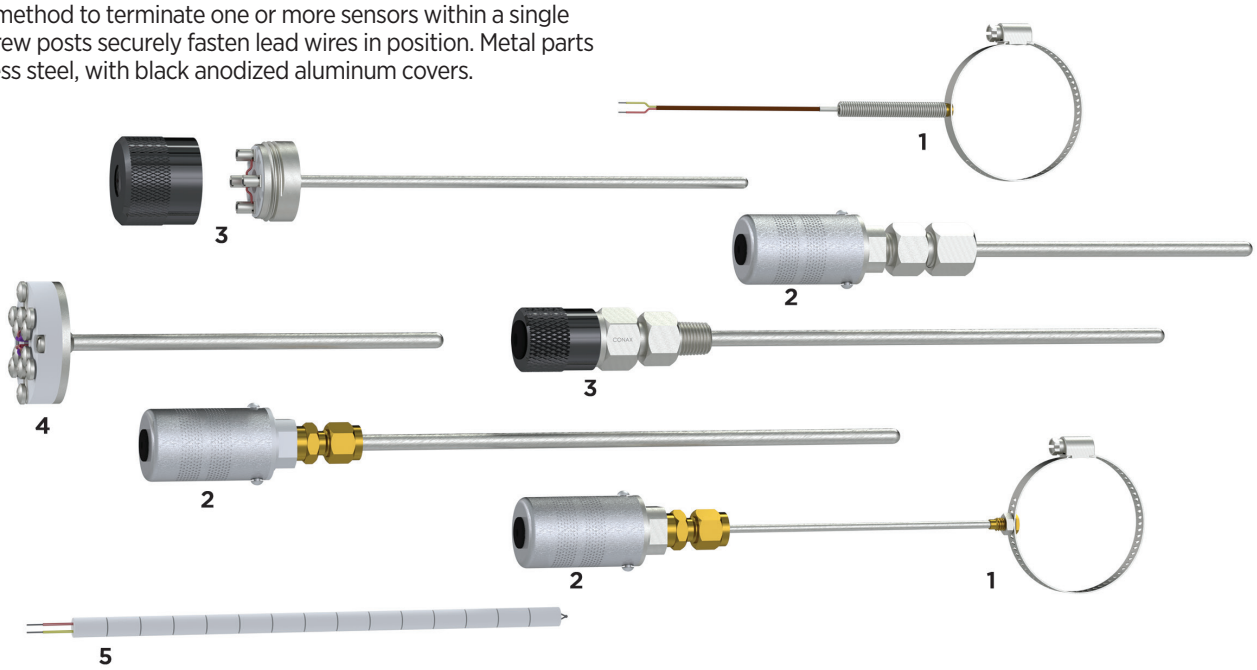
1. Pipe Clamps Stainless steel Pipe Clamp assemblies are available for use with all Conax probes for temperature reading of outside pipe temperatures. They can be used with any terminal head or with wire alone.

2. Type B Terminations Compact, lightweight Type B heads make terminating probes easy and convenient. Available in 2-, 3- and 4-wire post configurations, these corrosion-resistant heads offer easy and convenient hookup of customer's extension wire. An O-ring seal prevents moisture intrusion.

3. Type C Terminations C terminations provide a convenient, compact method to terminate one or more sensors within a single probe. Screw posts securely fasten lead wires in position. Metal parts are stainless steel, with black anodized aluminum covers.

4. Type D Terminations The Type D disc terminations feature a stainless steel base brazed to the sensor sheath. The terminal block uses an exclusive Conax design with up to 6 barrier-type terminals on a ceramic block.

5. Basic Sensor Conax supplies the most basic sensor configuration, consisting of thermocouple wire surrounded with hard-fired alumina (Al_2O_3) insulators. A one-inch lead termination is provided.



Reliable thermocouples for high temperature applications

(See catalog 6008 for more details)

Since 1950, Conax has been designing and manufacturing high temperature thermocouples for a broad range of industries and applications. This extensive experience has helped Conax become a leader in supplying high-quality, standard sensors. It has also given us the expertise to modify standard designs, creating customized solutions that meet our customers' toughest challenges. These customized sensors are designed to increase sensor life and ultimately lower the cost of ownership.

We understand that the cost of ownership includes more than just the cost of the sensor itself. That's why we take other important factors into account such as ease of installation, initial accuracy, accuracy drift over the life of the sensor and the cost of lost product or production due to premature sensor drift or failure.

High temperature applications

Conax Technologies' high temperature thermocouples are specifically designed for durability and reliability in high temperature applications to 4200˚F (2315˚C). These applications typically involve oxidizing, reducing, inert gas or contaminated atmospheres that challenge the life of the thermocouple.

For temperatures less than 1230˚C, base metal thermocouples with thermoelements of types J, K, E, T and N are commonly used. For temperatures exceeding 1230˚C, thermocouples with thermoelements of types R, S, B and C are commonly used. Additionally, more exotic sheath materials are used which include refractory metals such as molybdenum, tantalum and tungsten; or ceramic sheath materials such as alumina, silicon carbide, mullite, quartz sheaths common in the semiconductor industry. Other than tantalum, these sheath materials are non-bendable and therefore may be limiting in use. Further high temperature thermocouple considerations include the internal wire insulation, appropriate process connection hardware, wire termination styles, and possible use of extension grade conductors vs. thermoelement conductors for the lead wiring.

Industry Applied high temperature applications

1. S24-AL25-AL-U-T5AL(S4BLD4)PGAG–16.00" Platinum thermocouple assembly with support tube for controlling temperature inside a vacuum furnace in a crystal growing application.

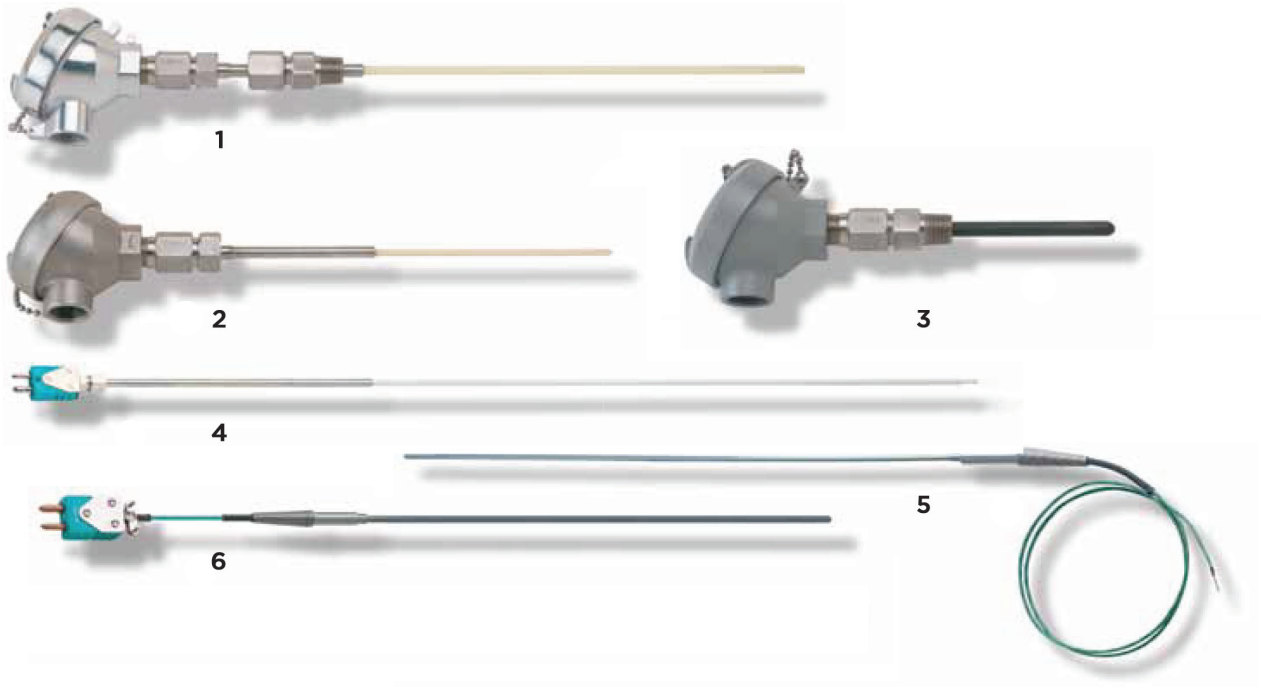
2. S24-AL18-AL-U-T5SS(S4BVC4)–10.00" Platinum thermocouple assemblies with support tubes for limit and control, used in a vacuum-environment, heat-treat furnace with inert-gas purge.

3. C24-SASIC37-AL-U-T5CI(PG4BL)–6.00" Tungsten-rhenium Type C assembly with sintered alpha silicon carbide sheath tubewell for use in metal sintering applications.

4. S24-AL18-AL-B-PJ-48.00"–SP Thermocouple for monitoring surface temperature during the manufacturing process of flat panel glass. A unique bare 44 AWG wire hot junction (0.002" diameter) maximizes time response while minimizing surface contact.

5. R24-MO12-AL-U-T3(36")–18.00" Single-point platinum thermocouple with molybdenum sheath to manually profile rapid thermal process epitaxial reactors.

6. R24-MO18-AL-U-T3(6")PJC–16.00" Molybdenum-sheathed platinum thermocouple, terminated with quick disconnect male plug and flexible leadwire, used for process temperature control in MOCVD reactors.



RTD and thermocouple calibrations

In addition to using our many years of manufacturing excellence building sensors of the highest quality, Conax Technologies has also applied our knowledge and expertise to the area of electrical calibration of RTDs and thermocouples.

The highest standards for quality

Our fully-equipped calibration lab is ISO/IEC 17025 accredited and ILCA MRA certified. These accreditations set the standard of excellence for the competence of testing, and the Conax calibration laboratory is officially recognized as fully competent and capable of producing valid and reliable calibration data, including calibrations in compliance with the latest AMS2750 standards.

Temperature capabilities range from -195.79°C (the boiling point of liquid nitrogen) to 1600°C. All calibrations are conducted under the guidance of our quality system, certified to AS9100 with ISO 9001 and are performed by comparison techniques as defined in ASTM E220. Calibrations may be conducted either at Conax standard temperatures or at customer specified temperatures, using our state-of-the-art measuring equipment with a custom automated process control and data acquisition system to guarantee the accuracy and integrity of each calibration.

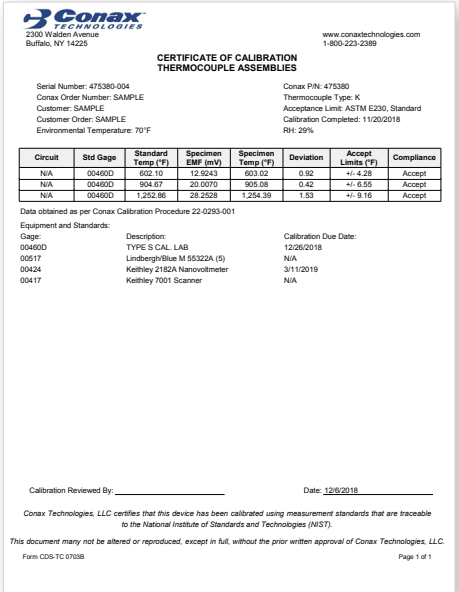
Our fully automated thermocouple and RTD calibration system continuously monitors the outputs of each sensor and the standard, while simultaneously controlling the temperature setting of the furnace. This system requires that the sensors stabilize at each calibration temperature before data is collected. Software then converts the thermocouple millivolt signal or RTD resistance to a temperature and compares this value to the temperature of the standard. The offset and acceptance to defined limits is determined without technician intervention, thereby eliminating possible human error and providing optimal accuracy.

Calibration data

When an individual sensor is calibrated as described in the previous section, we refer to the calibration as a unit calibration. Depending on the customer's requirement, actual data detailing each temperature is provided as a "Certificate of Calibration" as shown in *figure 1.* In some applications, data is provided in a table format over a defined temperature range with corrections or deviations from the standard at each temperature. This is called a Sensor Calibration Table as shown in *figure 3.*

As an alternative to unit calibration data, for thermocouple applications, bulk material calibration data is available. Wire or mineral insulated cable from each lot of material is calibrated using our automated calibration system. The lot from the calibrated material is then released for production with a bulk material calibration certificate. Conax can provide bulk wire calibration data in a table format. A white paper discussion of the merits of bulk wire calibration vs. unit calibration may be found on our website.

When a bulk material AMS2750 calibration is requested, a sample of the bulk wire or mineral insulated cable is taken from each end of the spool and calibrated, typically at 135°C increments or less over the range of the calibration. The data is checked not only for adherence to the selected tolerance standard, but it is also checked for calibration agreement between the two ends of the spool. Data is then run through a regression algorithm and data is provided for each sample at the temperatures requested by the customer. A typical Calibration Table for an AMS2750 thermocouple with bulk material calibration is shown in *figure 2.*



CERTIFICATE OF CALIBRATION
THERMOCOUPLE ASSEMBLIES

2300 Walden Avenue
Buffalo, NY 14225

www.conaxtechnologies.com
1-800-223-2389

Serial Number: 475380-004
Conax Order Number: SAMPLE
Customer: SAMPLE
Customer Order: SAMPLE
Environmental Temperature: 70°F

Conax P/N: 475380
Thermocouple Type: K
Acceptance Limit: ASTM E230, Standard
Calibration Completed: 11/20/2018
RH: 29%

Circuit	Std Gage	Standard Temp (°F)	Specimen EMF (mV)	Specimen Temp (°F)	Deviation	Accept Limits (°F)	Compliance
N/A	00460D	602.10	12.9243	603.02	0.92	+/- 4.28	Accept
N/A	00460D	904.67	20.0070	905.08	0.42	+/- 6.55	Accept
N/A	00460D	1,252.86	28.2528	1,254.39	1.53	+/- 9.16	Accept

Data obtained as per Conax Calibration Procedure 22-0293-001

Equipment and Standards:

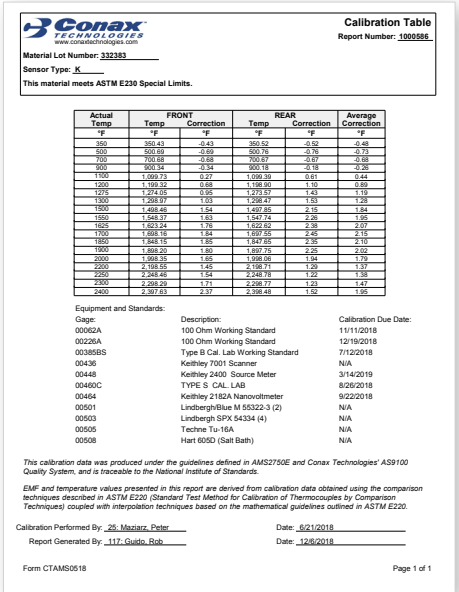
Gage:	Description:	Calibration Due Date:
00460D	TYPE S CAL. LAB	12/26/2018
00517	Lindbergh/Blue M 55322A (5)	N/A
00424	Keithley 2182A Nanovoltmeter	3/11/2019
00417	Keithley 7001 Scanner	N/A

Calibration Reviewed By: _____ Date: 12/6/2018

Conax Technologies, LLC certifies that this device has been calibrated using measurement standards that are traceable to the National Institute of Standards and Technologies (NIST).

Form CDS-TC 0703B Page 1 of 1

Figure 1: Certificate of Calibration



Calibration Table
Report Number: 1000586

Material Lot Number: 332383
Sensor Type: K
This material meets ASTM E230 Special Limits.

Actual Temp	FRONT Temp	FRONT Correction	REAR Temp	REAR Correction	Average Correction
°F	°F	°F	°F	°F	°F
350	350.43	-0.43	350.52	-0.52	-0.48
500	500.69	-0.69	500.76	-0.76	-0.73
700	700.68	-0.68	700.67	-0.67	-0.68
900	900.34	-0.34	900.18	-0.18	-0.26
1100	1,099.73	0.27	1,099.39	0.61	0.44
1200	1,199.32	0.68	1,198.90	1.10	0.89
1275	1,274.05	0.95	1,273.57	1.43	1.19
1300	1,298.97	1.03	1,298.47	1.53	1.28
1500	1,498.46	1.54	1,497.85	2.15	1.84
1550	1,548.37	1.63	1,547.74	2.26	1.95
1625	1,623.24	1.76	1,622.62	2.38	2.07
1700	1,698.16	1.84	1,697.55	2.45	2.15
1850	1,848.15	1.85	1,847.65	2.35	2.10
1900	1,898.20	1.80	1,897.75	2.25	2.02
2000	1,998.35	1.65	1,998.06	1.94	1.79
2200	2,198.55	1.45	2,198.71	1.29	1.37
2350	2,348.46	1.54	2,348.78	1.22	1.38
2300	2,298.29	1.71	2,298.77	1.23	1.47
2400	2,397.63	2.37	2,398.48	1.52	1.95

Equipment and Standards:

Gage:	Description:	Calibration Due Date:
00062A	100 Ohm Working Standard	11/11/2018
00226A	100 Ohm Working Standard	12/19/2018
00385BS	Type B Cal. Lab Working Standard	7/12/2018
00436	Keithley 7001 Scanner	N/A
00448	Keithley 2400 Source Meter	3/14/2019
00460C	TYPE S CAL. LAB	8/26/2018
00464	Keithley 2182A Nanovoltmeter	9/22/2018
00501	Lindbergh/Blue M 55322-3 (2)	N/A
00503	Lindbergh SPX 54334 (4)	N/A
00505	Techne Tu-16A	N/A
00508	Hart 605D (Salt Bath)	N/A

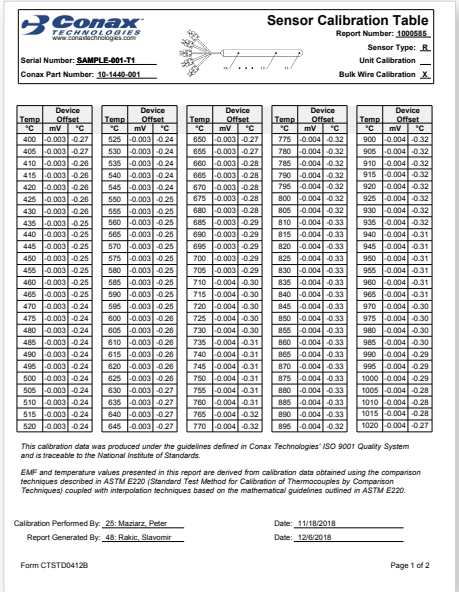
This calibration data was produced under the guidelines defined in AMS2750E and Conax Technologies' AS9100 Quality System, and is traceable to the National Institute of Standards.

EMF and temperature values presented in this report are derived from calibration data obtained using the comparison techniques described in ASTM E220 (Standard Test Method for Calibration of Thermocouples by Comparison Techniques) coupled with interpolation techniques based on the mathematical guidelines outlined in ASTM E220.

Calibration Performed By: 25: Maziarz, Peter Date: 6/21/2018
Report Generated By: 117: Guido, Rob Date: 12/6/2018

Form CTAMS0518 Page 1 of 1

Figure 2: Sample Certificate of Calibration



Sensor Calibration Table
Report Number: 1000585

Serial Number: SAMPLE-001-T1
Conax Part Number: 10-1440-001

Sensor Type: R
Unit Calibration
Bulk Wire Calibration X

Temp °C	Device Offset mV	Device Offset °C
400	-0.003	-0.27
405	-0.003	-0.27
410	-0.003	-0.26
415	-0.003	-0.26
420	-0.003	-0.26
425	-0.003	-0.26
430	-0.003	-0.26
435	-0.003	-0.25
440	-0.003	-0.25
445	-0.003	-0.25
450	-0.003	-0.25
455	-0.003	-0.25
460	-0.003	-0.25
465	-0.003	-0.25
470	-0.003	-0.24
475	-0.003	-0.24
480	-0.003	-0.24
485	-0.003	-0.24
490	-0.003	-0.24
495	-0.003	-0.24
500	-0.003	-0.24
505	-0.003	-0.24
510	-0.003	-0.24
515	-0.003	-0.24
520	-0.003	-0.24
525	-0.003	-0.24
530	-0.003	-0.24
535	-0.003	-0.24
540	-0.003	-0.24
545	-0.003	-0.24
550	-0.003	-0.25
555	-0.003	-0.25
560	-0.003	-0.25
565	-0.003	-0.25
570	-0.003	-0.25
575	-0.003	-0.25
580	-0.003	-0.25
585	-0.003	-0.25
590	-0.003	-0.25
595	-0.003	-0.25
600	-0.003	-0.26
605	-0.003	-0.26
610	-0.003	-0.26
615	-0.003	-0.26
620	-0.003	-0.26
625	-0.003	-0.26
630	-0.003	-0.27
635	-0.003	-0.27
640	-0.003	-0.27
645	-0.003	-0.27
650	-0.003	-0.27
655	-0.003	-0.27
660	-0.003	-0.28
665	-0.003	-0.28
670	-0.003	-0.28
675	-0.003	-0.28
680	-0.003	-0.28
685	-0.003	-0.29
690	-0.003	-0.29
695	-0.003	-0.29
700	-0.003	-0.29
705	-0.003	-0.29
710	-0.004	-0.30
715	-0.004	-0.30
720	-0.004	-0.30
725	-0.004	-0.30
730	-0.004	-0.30
735	-0.004	-0.31
740	-0.004	-0.31
745	-0.004	-0.31
750	-0.004	-0.31
755	-0.004	-0.31
760	-0.004	-0.31
765	-0.004	-0.32
770	-0.004	-0.32
775	-0.004	-0.32
780	-0.004	-0.32
785	-0.004	-0.32
790	-0.004	-0.32
795	-0.004	-0.32
800	-0.004	-0.32
805	-0.004	-0.32
810	-0.004	-0.33
815	-0.004	-0.33
820	-0.004	-0.33
825	-0.004	-0.33
830	-0.004	-0.33
835	-0.004	-0.33
840	-0.004	-0.33
845	-0.004	-0.33
850	-0.004	-0.33
855	-0.004	-0.33
860	-0.004	-0.33
865	-0.004	-0.33
870	-0.004	-0.33
875	-0.004	-0.33
880	-0.004	-0.33
885	-0.004	-0.33
890	-0.004	-0.33
895	-0.004	-0.32
900	-0.004	-0.32
905	-0.004	-0.32
910	-0.004	-0.32
915	-0.004	-0.32
920	-0.004	-0.32
925	-0.004	-0.32
930	-0.004	-0.32
935	-0.004	-0.32
940	-0.004	-0.31
945	-0.004	-0.31
950	-0.004	-0.31
955	-0.004	-0.31
960	-0.004	-0.31
965	-0.004	-0.31
970	-0.004	-0.30
975	-0.004	-0.30
980	-0.004	-0.30
985	-0.004	-0.30
990	-0.004	-0.29
995	-0.004	-0.29
1000	-0.004	-0.29
1005	-0.004	-0.28
1010	-0.004	-0.28
1015	-0.004	-0.28
1020	-0.004	-0.27

This calibration data was produced under the guidelines defined in Conax Technologies' ISO 9001 Quality System and is traceable to the National Institute of Standards.

EMF and temperature values presented in this report are derived from calibration data obtained using the comparison techniques described in ASTM E220 (Standard Test Method for Calibration of Thermocouples by Comparison Techniques) coupled with interpolation techniques based on the mathematical guidelines outlined in ASTM E220.

Calibration Performed By: 25: Maziarz, Peter Date: 11/18/2018
Report Generated By: 48: Rakic, Slavomir Date: 12/6/2018

Form CTSTD0412B Page 1 of 2

Figure 3: Sensor Calibration Table

Conax has the ideas and solutions to help you succeed

Conax Technologies is a global leader in the design and manufacture of temperature sensors, compression seal fittings, and cable and harness assemblies for a broad range of industries and applications. Since 1950, Conax's customers have relied on our expertise to provide both standard products and custom-designed solutions.

Innovative ideas are the result of collaboration. So we take the time to understand your unique challenges and develop solutions that help you—and your customers—succeed. Our commitment to delivering high-quality, leading-edge products on time and at a competitive cost makes us your indispensable partner.

For more information, visit ConaxTechnologies.com.

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Bulletin 6002, Rev H

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