TEMPERATURE PRODUCTS

EXPERIENCE THE POWER™

THERMOCOUPLE

AMETEK Exhaust Gas (EGT) and Wheel Space Frame Turbine Thermocouples meet the specific operational and performance requirements for REPLACEMENT and RETROFIT Frame gas turbine applications. AMETEK’s expertise in solving creep, stress, rupture, corrosion, EMF drift, and other problems affecting sensor performance has resulted in a robust line of single and dual element thermocouple designs. Typical applications include wheel space and exhaust gas temperature monitoring.

AMETEK EGT and Wheel Space Thermocouples use Type K wire with MgO insulation and stainless steel sheathing. The thermocouple probe tips and terminations are hermetically sealed against exposure to operational environments and have been qualified to ASTM E585 and ASTM E608 standards, with a leak rate of less than 1 x 10^-6 cc/sec.

For exhaust gas applications, AMETEK manufactures production-qualified radiation shields. These shields, together with AMETEK EGT Thermocouples, form a system that controls thermocouple immersion depth, eliminates fretting due to vibration, and provides improved turbine performance.

AMETEK can provide kits to RETROFIT older Frame turbines with this improved thermocouple and radiation shield configuration. Contact AMETEK for a cross-reference list that contains hundreds of different thermocouple, radiation shield, and retrofit kit part numbers.

FEATURES AND BENEFITS

- Hermetically-sealed single and dual junction configurations
- Exhaust gas temperature systems prevent: Mechanical probe damage at installation Tip vibration during normal operation
- Rapid time response
- Cost-effective retrofit capability
- AMETEK quality, OEM experience, and worldwide service
SPECIFICATIONS

Time Response
• Below 1.3 sec for 0.125 tip diameters
• Below 0.8 sec for 0.0625 tip diameters

Calibration
• ± 0.75% for Type K thermocouples
• ± 0.4% for all exhaust gas temperature thermocouples

Hermetic Seal
• 1 x 10^-6 cc/sec

Temperature at Environmental Seal
• -70° to 400°F (-57° to 204°C)

Lengths
• Various from 60" to 500"

Sheath Diameters
• 0.062" to 0.125"

NOTE: Dimension (A) varies between 60 and 500 inches depending on the part number ordered.
Qualified Hermetic Exhaust Gas Temperature Thermocouple Upgrade

FOR NEW AND EXISTING FRAME 5, 6, 7, AND 9 GAS TURBINE APPLICATIONS

THERMOCOUPLE

FIT-IT & FORGET-IT
Eliminate Exhaust Gas Temperature (EGT) thermocouple concerns with AMETEK's new EGT thermocouple product offering for Frame turbine applications. AMETEK has worked closely with the turbine OEM to design and engine test this thermocouple as a direct replacement and upgrade for all new and existing EGT thermocouples. The new EGT thermocouples are qualified and meet all design specifications.

MISTAKE-FREE INSTALLATION
The new EGT design makes it impossible to over-tighten, while ensuring the proper immersion depth of the thermocouple into the radiation shield. Furthermore, the new EGT design allows the cable leads to be attached to the thermocouple prior to insertion into the radiation shield, and also enables a convenient, stress-free orientation of the thermocouple junction box and cable leads.

SINGLE EGT THERMOCOUPLES AND COMPLETE UPGRADE KITS AVAILABLE
Whether you are upgrading from the 302A4010Pxxx, 351A3488Pxxx, or the 362A1102Pxxx EGT thermocouples, AMETEK can provide either the thermocouples only or the complete upgrade kit with all the required fittings, adapters, and cables. A more detailed description of the many different upgrade options available, including parts lists, installation instructions, and drawings, can be found in AMETEK's EGT THERMOCOUPLE RETROFIT MANUAL.

FEATURES AND BENEFITS
- Foolproof Installation—ensures proper insertion depth and eliminates over-tightening induced open circuit failures
- Flexible Installation—enables cable leads to be connected prior to assembly and a stress-free orientation of the thermocouple junction box and cable leads
- Quick Installation—use of compression fitting significantly reduces installation time
- New Probe Design—eliminates thermal gradient differences that could cause thermocouple element breakage
- Includes the Benefits of the Original Design—100% Hermetic for high accuracy and long life, Positive Stop to ensure proper location of the thermocouple into the radiation shield, Material Selection eliminates seizure, Type K Terminal Studs to reduce secondary junction error, and a Junction Box that simplifies installation and makes cable connection foolproof

AMETEK

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SPECIFICATIONS

Calibration
- Type K, ungrounded
- Error: special limits (±0.4%)

Time Response
- Approximately 2.9 seconds

Hermetic Seal
- $1 \times 10^{-6}$cc/sec for entire thermocouple

Environment
- -20° to 700°F at thermocouple junction box (-29° to 371°C)
- -20° to 392°F for the cable (-29° to 200°C)
- 100% humidity for the entire thermocouple

Lengths
- For Frame 5, 6, 7, and 9 gas turbine applications

Figure 1: Replacing 362A1102P001, P006, or P011 EGT Thermocouples

For details on how to replace 302A4010Pxxx or 351A3488Pxxx EGT Thermocouples, please refer to AMETEK’s EGT THERMOCOUPLE RETROFIT MANUAL.
TEMPERATURE PRODUCTS

Hermetic Exhaust Gas and Wheel Space Thermocouple and Cable
FOR FRAME 6, 7, AND 9 GAS TURBINE APPLICATIONS

THERMOCOUPLE
AMETEK Hermetic Exhaust Gas (EGT) and Wheel Space Frame Turbine Thermocouples are the latest OEM production qualified design and incorporate many improvements over previous thermocouple offerings. AMETEK’s new thermocouple is 100% hermetic which ensures longer product life, improved temperature accuracy, and no troublesome insulation resistance failures during operation. The junction box mounts directly to the radiation shield or turbine case and eliminates the problem of mineral insulated cable extending outside the turbine. Materials were carefully selected to ensure long life and to eliminate vibration and galling failures. This new thermocouple, used in conjunction with AMETEK’s flexible cable, provides a product that is not only easier to install and maintain, but also a product that is more reliable, accurate, and longer lived.

CABLE
The flexible, stainless steel braided thermocouple Cable mates directly to the new Hermetic Thermocouple and creates a much more reliable thermocouple system than previous designs. The Cable uses Type K wire and terminal lugs so no secondary junction errors are introduced into the thermocouple circuit. The terminal lugs use two different sizes of captivated nuts making it impossible to install incorrectly or to lose any of the hardware.

FEATURES AND BENEFITS
Thermocouple
• 100% Hermetic—provides longer life, better accuracy, and no insulation resistance failures
• Positive Stop—ensures proper location of thermocouple tip in radiation shield
• Material Selection—eliminates seizure of thermocouple into radiation shield
• Type K Terminal Studs—reduces secondary junction errors
• Junction Box—simplifies installation and makes cable connection foolproof

Cable
• Type K Terminal Lugs—ensures no secondary junction errors are introduced
• Different Sized Terminal Lugs—make it impossible to cross-wire
• Captivated Hardware—nothing to lose and nothing more to purchase
• Stainless Steel Braid—protects Teflon coated wires from abrasion

Experience the Power™
SPECIFICATIONS

Calibration
- Type K, Ungrounded
- Error: Standard (±0.75%) or Special (±0.4%) limits depending on part number

Time Response
- Varies from 1.7 to 4.0 seconds depending on tip configuration

Hermetic Seal
- 1 x 10^-6 cc/sec for entire thermocouple

Environment
- -20° to 700°F at thermocouple junction box (-29° to 371°C)
- -20° to 392°F for the cable (-29° to 200°C)
- 100% Humidity for the entire thermocouple

Lengths
- Various from 9" to 123"

Tip Diameters
- Various from 0.062" to 0.125"

Sheath Diameters
- Various from 0.125" to 0.188"

NOTE: DIMENSION “A” AND TIP CONFIGURATION VARIES DEPENDING ON THE PART NO. ORDERED.
**TEMPERATURE PRODUCTS**

**Individual Exhaust Gas (T5.4) Thermocouple and Cable System**

FOR RETROFIT ON LM2500 AND LM5000 GAS TURBINES

**THERMOCOUPLE**

AMETEK's Individual EGT Probe System (AMETEK P/N 8TC34BAG1, GE P/N L44830P01) is designed for retrofit on LM2500 and LM5000 gas turbines. Exhaust gas temperatures are measured using a combination of individual thermocouples mated to a flexible harness assembly, eliminating the need for rigid harness systems. Operators and overhaul facilities can replace a single probe without removing a full harness quadrant or affecting other serviceable system components. This results in lower component and maintenance costs and shorter turbine downtime cycles.

The Individual EGT System incorporates a combination of AMETEK thermocouple designs that are currently qualified and operating on production gas turbines. Its probe design is identical to the design presently operating on production LM2500 and LM5000 turbines, while its junction box is identical to that utilized on other industrial and aerospace turbine thermocouples.

AMETEK can provide either averaging or individual mating cables. The averaging cables mimic the output of the rigid harness system whereas the individual cables provide a separate output for each of the 11 thermocouples. This flexibility enables the operator to select the measurement that best captures turbine performance.

Since October, 1993, AMETEK's Individual Probe Systems have entered field service at numerous operator sites. The system has accumulated over 250,000 hours of trouble-free operation, and it continues to demonstrate the quality and performance of the AMETEK design.

**FEATURES AND BENEFITS**

Utilizes AMETEK designs presently operating on LM2500, LM5000, and LM6000 gas turbines.

- Qualified through GE, P/N L44830P01
- Eliminates the need for rigid thermocouple quadrants
- Replacement of single probes results in lower component and maintenance costs and shorter turbine downtime cycles
**SPECIFICATIONS**

**THERMOCOUPLE PROBE ASSEMBLY**

**Temperature Range**
- -65° to 1875°F (-54° to 1023°C)

**Accuracy**
- ±4° to 530°F (2.2° to 277°C);
- 0.75% above 530°F (277°C)

**Time Response**
- < 4 sec. for temp. change from 1400°
- to 1500°F (760° to 816°C) at 6 lb./sec./sq.ft.

**Output**
- Type K (millivolts)

**Vibration**
- 12 Gs

**Leakproof**
- Hermetically sealed

**FLEXIBLE CABLE ASSEMBLY**

**Conductor**
- 17 gage thermocouple grade material,
- Type K (+ and -)

**Outer Jacket**
- 34 gage stainless steel braid

**Operating Temperature**
- To 1000°F (538°C)

**Insulation**
- Multi-Layer System:
  - Mica Tape
  - Refrasil Braid
  - E Type Fiberglass

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**For customer support call:**

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