

# FP TEMPERATURE SENSORS

Product Selection Guide

*FP*  
*industrial*  
*temperature*  
*sensors*



*...because calibration is  
a matter of confidence*

# ...because calibration is a matter of confidence

## About AMETEK Calibration Instruments

AMETEK Calibration Instruments is one of the world's leading manufacturers and developers of calibration instruments for temperature, pressure and process signals as well as for temperature sensors both from a commercial and a technological point of view.

The company is situated in Alleroed, Denmark (near Copenhagen), where we have our R&D, production, sales, and service facilities. Furthermore the company operates through a worldwide network of sales offices and distributors.

## Brand names: JOFRA and FP

Besides manufacturing and selling calibrators under the brandname JOFRA, AMETEK Calibration Instruments are also producing and selling industrial temperature sensors under the brand name FP (Frode Pedersen).

## FP Industrial Temperature Sensors

The FP product line includes a complete range of thermocouple assemblies and resistance thermometers, measuring inserts, thermocouples of precious as well as base material, thermocouple wire, extension wire, temperature transmitters and portable digital thermometers.

Our standard products are fully documented in our specification sheets. (Available at [www.jofra.com](http://www.jofra.com)). For customer specified sensors, we make product specification, detailed construction and customer drawings. On request we can also supply test and calibration reports.

## JOFRA STS reference sensors

The JOFRA STS reference sensors for our JOFRA DTI reference thermometers and JOFRA ATC temperature dry-block calibrators are also manufactured by the FP team.

JOFRA temperature reference probes are based on more than 50 years of industrial temperature sensor manufacturing experience. The main requirement of a reference probe is stability: The less the probe drifts, the lower the measurement uncertainty.

All sensors under test are compared to a temperature reference sensor. The reference sensor can be the internal reference sensor in a dry-block or an external reference sensor, which is connected to the calibrator.

The JOFRA STS industrial temperature reference probes are economical and offer fast response times, low immersion depths, compact physical sizes, and specified low drift rates; even at high temperatures. These are all important considerations when selecting a reference probe.

## Frode Pedersen history

Frode Pedersen & Co. A/S was originally founded in 1945 and specialized in imported equipment for electrical temperature measurements. The in-house production started in 1950, and in 1987 Frode Pedersen moved to Alleroed in a 2000 m<sup>2</sup> new building. In 1997, Frode Pedersen was acquired by AMETEK Calibration Instruments, who is recognised as an experienced adviser of temperature measurement problems, producing JOFRA temperature calibrators and FP industrial temperature sensors in Alleroed, Denmark.



AMETEK Calibration Instruments in Denmark



Cutting protective tubes



FP Industrial Temperature Sensor production



## **Calibration laboratory**

Instruments and sensors from AMETEK Calibration Instruments are tested in our own laboratory where precision calibration also takes place.

Calibration means that the performance of the measuring instrument is compared to known temperature references. In this way, all sources of errors are analyzed and provided with numerical values. Increasing demands from the environment have resulted in a growing number of customers requesting calibration of their measuring equipment. In our laboratory we calibrate in the range of  $-30^{\circ}\text{C}$  to  $1100^{\circ}$ . Our reference sensors and instruments are traceable to the National Physical Laboratory (NPL) in London through recognized international laboratories.

All calibrations are documented by means of a certificate being our customers documentation to third parties.

## **Environment**

It is common knowledge that we need to save energy. Children learn it in school and adults meet the challenge everywhere in their daily life both at work and at home; resources are scarce - and as a consequence we need to use them prudently. Therefore it is also essential that the most energy consuming or polluting companies reduce their over-consumption. However, it is important to do so without damaging the final product. Within process industry and research, temperature is one of the most used measurement parameters. Correct measurements are very important to the product quality, safety, and energy consumption.

Correct selection, installation and calibration of temperature sensors are the most efficient way for companies to obtain the best use of energy resources.

## **Applications and temperature measurement**

Temperature is one of the most measured parameters within industry and science. A correct measurement is of great importance to the quality of the product, as well as the security and the energy consumption. Therefore, it is very important to choose the right sensor for the actual application. However, a 100% ideal solution for a measuring job is difficult to find if not to say impossible. The choice will often be a compromise between the requirements of the user and the technical limitations.

## **Quality Assurance and Supply Reliability**

As a supplier to demanding industries, quality, assurance and documentation are of vital importance. The quality demands imply for instance a full receiving-, process- and functional control of alle components / finished articles. The documentation includes constructional drawings by means of our CAD system, and all drawings are provided with numbers and customer ID. This guarantees future supply of the same article in case of reordering.

Over the years, AMETEK has solved a multitude of temperature measurement problems. The experience in this way makes us a well-reputed and competent advisor to the benefit of our customers. As a manufacturing enterprise, AMETEK knows the need for first-class quality products delivered on time and sometimes - in case of emergency - at very short notice.

Our Quality Assurance System is ISO 9001 certified.



**Final inspection of temperature calibrators**



**Welding of mineral insulated RTD's**



**Calibration set-up in laboratory**

# ...because calibration is a matter of confidence

## Unique selection system

Based on long-standing experience with development, production and sales of FP industrial temperature sensors, AMETEK Calibration Instruments has worked out a unique selection system facilitating the work when ordering temperature sensors - and at the same time ensuring you the optimal choice. The system can handle several million types without sacrifice of clarity. Only 51 "spec sheets" and the "Sensor Guide" now enable the user to design and adapt the sensor, which is best suited to the application.

All specification sheets and our Sensor guide are available at [www.jofra.com](http://www.jofra.com)

Temperature measurement in	Typical industries	Sensor type	
		Type	Spec sheet
<b>Closed pipelines and containers with liquid media such as e.g. water, oil and process liquids</b>	Energy sector	B	1304
	Power plants	D	1306
	CHP-stations, district heating	DS	1307
	Process industry	BF	1402
	Chemical and petrochemical industries	B	1403
	Food, beverage and tobacco industries	BH	1407
	Paper industry	D	1405
	Refrigeration industry	DS	1406
			BS
<b>Closed pipelines and containers with gaseous media such as e.g. steam, air and process gases</b>	Energy sector	B	1304
	Power plants	BH	1305
	CHP-stations	D	1306
	Process industry	DS	1307
	Chemical and petrochemical industries	BF	1402
	Food, beverage and tobacco industries	B	1403
	Paper industry	BH	1407
	Refrigeration industry	D	1405
	Iron and metal industries	DS	1406
		KM5	1711
<b>Solid media In and on materials and products</b>	Energy sector	MT	1500
	Power plants	MM	1600
	Process industry	KT1/2	1701
	Chemical and petrochemical industries	KT4	1704
	Engineering industry	KM1	1706
	Plastics industry	KM4	1710
	Iron and metal industries	OFM	1816
	Foundries and heat treatment plants	OFM4	1817
	Research and laboratories		
<b>Combustion chambers, furnaces with flue gasses, waste gases and air (high temperatures) Large ducts with air and waste gases (max. 800°C)</b>	Energy sector	AMK	1101
	Incineration plants, power plants and CHP-stations	AKK	1102
	Stone-working, pottery and glass industries	AK	1103
	Brickworks, glass works, ceramic industry	BMK	1104
	Petrochemical industry	BK	1105
	Furnace factories	AKT	1106
	Heat treatment	A	1301
		A	1401
<b>Marine and stationary diesel engines Exhaust, cooling water and bearings Cold stores, products</b>	Marine sector	All	All
	Refrigeration industry Engine manufactures		
<b>Air ducts Rooms Liquids Open containers and vessels</b>	Air-conditioning and ventilation systems	AF	1308
	CTS plants	BF	1402
	Cold stores	AF	1408
	Test set-ups	MT	1500
		MM	1600
		KM4	1710
		RM	1815

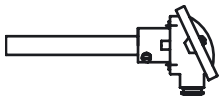


## Series 1100 - FP Industrial Temperature Sensors

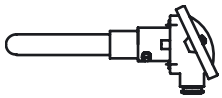
The 1100 series is straight type thermocouple assemblies. The temperature sensors are made for high temperature with protection tubes in heat resistant steel or ceramic. The combination of high temperature, corrosive gasses and particles demands special features in relation to life-time for the sensor thus minimizing the process downtime.

In the 1100 series, you find 6 different temperature sensors, typically used within the following fields of application:

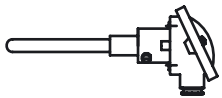
- Furnaces
- Ceramic industry
- Research and test plants
- Process industry - combustion, furnaces and heat treatment
- Brickworks, porcelain factories
- Refuse and hazardous waste incineration plants
- Chemical process engineering
- Glass annealing ovens, ceramic baking ovens
- Energy and furnaces
- Annealing and thermal treatment processes



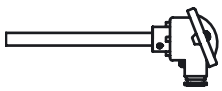
**1101 - Type AMK - Thermocouple assembly AMK with steel protective tube and ceramic inner tube**  
Measurement of high temperature in big furnaces and ducts with combustion gasses and air. The operating range is up to 1100°C (shortly 1200°C)



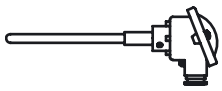
**1102 - Type AMK - Thermocouple assembly AMK with ceramic protective tube and ceramic inner tube (double protection)**  
Measurement of high temperature in big furnaces and ducts with combustion gasses and air. The operating range is up to 1600°C



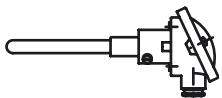
**1103 - Type AK - Thermocouple assembly AK with ceramic protective tube**  
For technical temperature measurements in combustion processes and hot-gas environments, primarily in all types of furnaces up to 1500°C (shortly 1800°C)



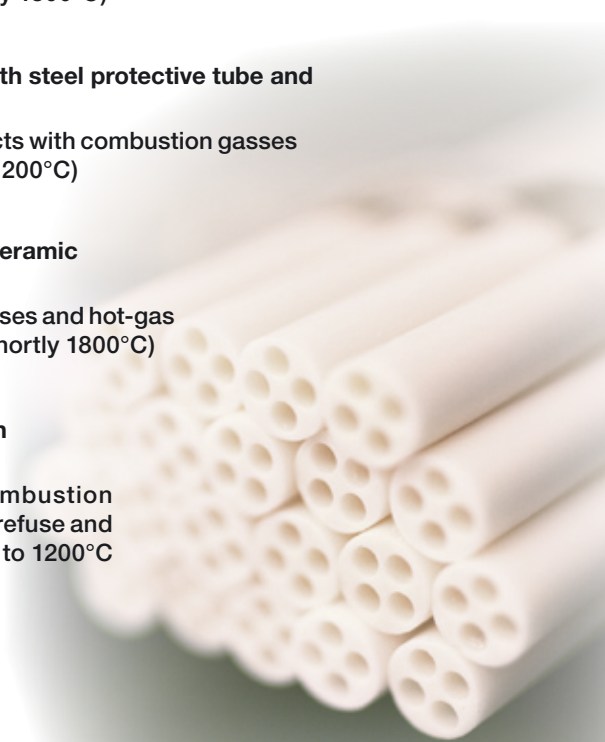
**1104 - Type BMK - Thermocouple assembly BMK with steel protective tube and ceramic inner tube**  
Measurement of high temperature in furnaces and ducts with combustion gasses and air. The operating range is up to 900°C (shortly 1200°C)



**1105 - Type BK - Thermocouple assembly BK with ceramic protective tube**  
For temperature measurements in combustion processes and hot-gas environment. The operating range is up to 1500°C (shortly 1800°C)



**1106 - Type AKT - Thermocouple assembly AKT with measuring insert and ceramic outer protective tube**  
For technical temperature measurements in combustion processes and hot-gas environments, primarily in all refuse and waste incineration plants. The operating range is up to 1200°C (shortly 1300°C)



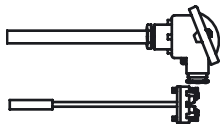
# ...because calibration is a matter of confidence

## Series 1300 - FP Industrial Temperature Sensors

The 1300 series is thermocouple assemblies with fixed or interchangeable inserts. With welded or drilled thermowells for low and high pressure. Screw-in or welded to the process.

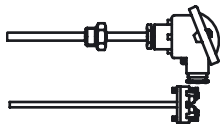
In the 1300 series, you find 6 different temperature sensors, typically used within the following fields of application:

- Petro- and chemical process engineering
- Chemical process engineering
- Process industry
- Incinerators
- Boilers
- Power plants
- Drying equipment



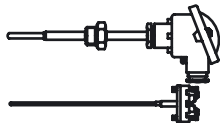
### 1301 - Type A - Thermocouple assembly A with interchangeable measuring insert

Measurement of temperature in ducts and furnaces with air and flue gasses. The operating range is up to 800°C in the low-pressure range



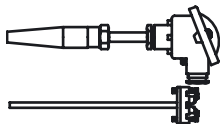
### 1304 - Type B - Thermocouple assembly, screw-in type interchangeable insert

Measurement of temperature in pipes and containers with gaseous and liquids media, such as air, vapour, gasses, water and oil. The operating range is up to 800°C, max. 50 bar and flow velocity is up to 25m/sec (air)



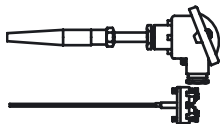
### 1305 - Type BH - Thermocouple assembly BH with interchangeable insert. Fast response time

Measurement of temperature in pipes and containers with gaseous and liquids media, such as air, vapour, gasses, water and oil. The operating range is up to 800°C, max. 50 bar and flow velocity is up to 25m/sec (air)



### 1306 - Type D - Thermocouple assembly D for welding with interchangeable insert

Temperature measurement in pipe systems and tanks with gasses and fluid medias such as air, steam and water at high pressure and flow velocity. Operating range is up to 600°C, max. 450 bar (water) and 60 m/sec. (steam)



### 1307 - Type DS - Thermocouple assembly DS for welding with interchangeable insert. Fast response time

Temperature measurement in pipe systems and tanks with gasses and fluid medias such as air, steam and water at high pressure and flow velocity. Operating range is up to 600°C, max. 450 bar (water) and 60 m/sec. (steam)



### 1308 - Type AF - Thermocouple assembly AF measuring insert with connection head

Measurement of temperature in ducts and furnaces with air and flue gasses. The operating range is up to 800°C in the low-pressure range

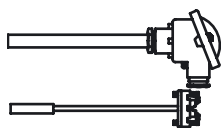


## Series 1400 - FP Industrial Temperature Sensors

The 1400 series is resistance thermometers with fixed or interchangeable inserts. With welded or drilled thermowells for low and high pressure. Screw-in or welded to the process.

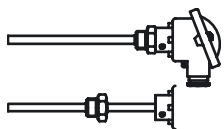
In the 1400 series, you find 7 different temperature sensors, typically used within the following fields of application:

- Chemical process engineering
- Heat and ventilation (HVAC)
- Heat and energy distribution (district heating)
- Machine construction and environmental engineering
- Incinerators
- Power plants
- Boilers
- Drying equipment



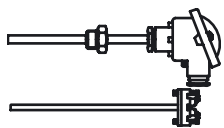
### 1401 - Type A - Resistance Thermometer A with interchangeable insert

Measurement of temperature in ducts and furnaces with air and flue gasses. The operating range is up to 600°C in the low-pressure range



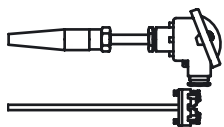
### 1402 - Type BF - Resistance Thermometer BF, screw-in type with fixed insert

The operating range is up to 400°C, max. 50 bar and flow velocity up to 25m/sec (air). Measurement of temperature in air and liquids media, where a fast response time is required, but also in closed pipes and containers with an optional screw-in pocket



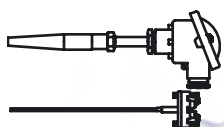
### 1403 - Type B - Resistance Thermometer B, screw-in type with interchangeable insert

Measurement of temperature in pipes and containers with gaseous and liquids media, such as air, vapour, gasses, water and oil. The operating range is up to 600°C, max. 50 bar and flow velocity up to 25 m/sec (air)



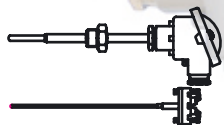
### 1405 - Type D - Resistance Thermometer D for welding with interchangeable insert

Temperature measurement in pipe systems and tanks with gasses and fluid medias such as air, steam and water at high pressure and flow velocity. Operating range is up to 600°C, max. 450 bar (water) and 60 m/sec. (steam)



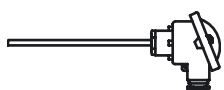
### 1406 - Type DS - Resistance Thermometer for welding with interchangeable insert. Fast response time

Temperature measurement in pipe systems and tanks with gasses and fluid medias such as air, steam and water at high pressure and flow velocity. Operating range is up to 600°C, max. 450 bar (water) and 60 m/sec. (air)



### 1407 - Type BH - Resistance Thermometer BH with interchangeable insert. Fast response time

Measurement of temperature in pipes and containers with gaseous and liquids media, such as air, vapour, gasses, water and oil. The operating range is up to 600°C, max. 50 bar and flow velocity up to 25m/sec (air)



### 1408 - Type AF - Resistance Thermometer AF measuring insert with connection head

Measurement of temperature in ducts and furnaces with air and flue gasses. The operating range is up to 600°C in the low-pressure range


# ...because calibration is a matter of confidence

## Series 1500 and 1600 - FP Industrial Temperature Sensors


The 1500 and 1600 series are both mineral insulated thermocouple and resistance thermometer assemblies.

The 1500 and 1600 series of temperature sensors are typically used within the following fields of application:

- Power plants - e.g. turbines and steam tubes
- Process industry - e.g. petrochemical, combustion, furnaces and heat treatment
- Engines - e.g. exhaust and material
- Machinery, in laboratories and experimental plants
- Containers, pipelines and chemical apparatus



**1500 - Type MT 0 - MT 6 - Mineral-insulated Thermocouple assembly MT**  
Mineral-insulated thermocouples are used for measuring temperature where flexible, rugged, corrosive resistant, and fast responding sensors are needed. Used in solid, fluid and gas medias up to 1100°C (shortly 1250°C)




**1600 - Type MM 1 - MM 5 - Mineral-insulated Resistance Thermometer**  
Mineral-insulated resistance thermometers are used for measuring temperature where flexible, rugged, corrosive resistant, and fast sensors are needed. Operating range is in solid, fluid and gaseous medias up to 600°C

## Series 1700 - FP Industrial Temperature Sensors


The 1700 series consists of thermocouple and resistance thermometer assemblies with cable. They are available with fixed or adjustable process connections and used for both low and medium-high temperature.

In the 1700 series, you find 5 different temperature sensors, typically used within the following fields of application:


- Plastic industry
- Machinery and tool industries
- Laboratories and experimental plants
- Machinery, chemical apparatus
- Containers, pipelines and chemical apparatus




**1701 - KT 1 and KT 2 - Thermocouple KT 1 and KT 2 with cable and bayonet socket**  
For measurement and surveillance of temperature on e.g. plastic extruders, tools and machine constructions. Can be used on surfaces up to 180°C



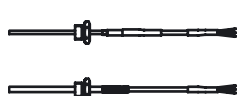
**1704 - Type KT 4 - Thermocouple KT 4, cable sensor**  
Measurement of temperature in ducts, pockets, machine construction containers, environmental chambers and test. Operating range is in solid, fluid and gaseous medias up to 400°C



**1706 - Type KM 1 - Resistance Thermometer KM 1 with cable and bayonet socket**  
For measurement and surveillance of temperature on e.g. plastic extruders, tools and machine constructions. Can be used on surfaces up to 180°C



**1710 - Type KM 4 - Resistance Thermometer KM 4, cable sensor**  
Measurement of temperature in ducts, pockets, machine construction, containers, environmental chambers and test. Operating range is in solid, fluid and gaseous medias up to 400°C



**1711 - Type KM 5 - Resistance Thermometer KM 5, cable sensor with fixed thread or swivel**  
Measurement of temperature in ducts, pockets, machine construction, containers, environmental chambers and test. Operating range is in solid, fluid and gaseous medias up to 400°C



## Series 1800-1812 - FP Marine Temperature Sensors

The 1800 series is a series of thermocouple and resistance thermometer assemblies classified for installation on ships for surveillance of engines, bearings, cooling systems, cargo etc. These marine type sensors are specially designed with high resistance against vibration according to IEC 68-2-6. and marine approved by Lloyds Register of Shipping and Det Norske Veritas.

The 1800-1812 series of temperature sensors is typically used within the following fields of application:

- Marine sector
- Diesel engines for generators
- Generators
- Big ship engines
- Containers
- Refrigeration industry



### 1801 - Type UST 1 - Thermocouple assembly for exhaust gasses

Measurement of exhaust temperature in ships and stationary diesel engines. The operating range is up to 800°C in gaseous media



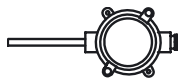
### 1802 - UST 2 - Thermocouple assembly for exhaust gasses with interchangeable insert

Measurement of exhaust temperature in ships and stationary diesel engines. The operating range is up to 800°C in gaseous media with high flow velocity



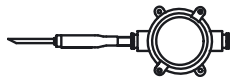
### 1803 - Type UST 3 - Thermocouple assembly UST 3 for exhaust gasses with interchangeable insert

Measurement of exhaust temperature in ships and stationary diesel engines. The operating range is up to 800°C in gaseous media with high flow velocity



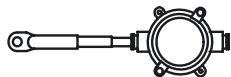
### 1804 - Type RM 2 - Resistance Thermometer, room sensor for ships

Measurement of temperature in rooms e.g. refrigeration, freeze and cargo stores, specially onboard ships. The operating range is from -40 to 80°C



### 1805 - Type IM - Resistance thermometer, insertion sensor

Measurement of temperature in e.g. meat and fruit during transportation specially onboard ships. The operating range is from -40 to 70°C



### 1806 - Type GM - Resistance Thermometer GM, vulcanized with rubber

Measurement of temperature in cold and wet areas e.g. in cargo rooms, in refrigeration and fishing ships, reservoirs and containers. The operating range is from -40 to 70°C



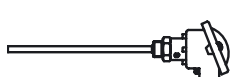
### 1807 - Type ST - Thermocouple assembly, stern tube

For measurement and surveillance of bearing temperature in stern tubes on ships in order to avoid damages and breakdown of costly equipment. The operating range is up to 800°C



### 1808 - Type SM - Resistance Thermometer, stern tube

For measurement and surveillance of bearing temperature in stern tubes on ships in order to avoid damages and breakdown of costly equipment. The operating range is up to 400°C



### 1809 - Type BFM - Resistance Thermometer, screw-in type with fixed insert. Classified

Measurement of temperature in gasses, vapours and fluids in pipes and cooling systems. Threaded connection to the process directly or with separate screw-in pocket. The operating range is up to 250°C, max. 50 bar and flow velocity is up to 25m/sec (air)



### 1810 - Type BM - Resistance Thermometer, screw-in type with interchangeable insert

Measurement of temperature in pipes and containers with gaseous and liquids media, such as air, vapour, gasses, water and oil. The operating range is up to 600°C, max. 50 bar and flow velocity is up to 25m/sec (air)



### 1812 - HLM - Resistance Thermometer HLM for bearing and surface temperature measurement

For measurement and surveillance of bearing temperature on ship engines and machine constructions. Can be used on surfaces up to 180°C

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## Series 1814-2304 - FP Industrial Temperature Sensors

Thermocouple and resistance thermometer assemblies – special sensors. For surfaces, energy measurement and handheld sensors.

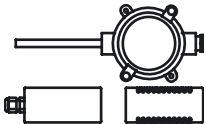
The 1814-2304 series of temperature sensors is typically used within the following fields of application:

- Machinery, chemical apparatus
- Refrigeration industry
- Heating and ventilation (HVAC)
- Engine room
- Energy management
- Heat- and energy distribution
- Process industry e.g. petrochemical, combustion, furnaces and heat treatment
- Laboratories and tests
- With handheld digital thermometers



### 1814 - Type BS - Resistance Thermometer BS with screw-in pocket

For measurement of temperature in closed pipes with gaseous and liquids media, such as gasses and water. The operating range is up to 200°C



### 1815 - Type RM 1/2/4 - Resistance Thermometer RM 1/2/4, room sensor for wall mounting

Measurement of temperature in rooms e.g. refrigeration, freeze and cargo stores, outdoor temperature. RM 4 is for dry rooms. The operating range is from -40 to 80°C



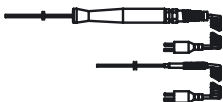
### 1816 - Type OFM - Resistance Thermometer OFM for surface measurement, cable sensor

For measurement and surveillance of temperature on tubes, tools and machine constructions. Operating range is on surfaces up to 180°C



### 1817 - Type OFM 4 - Resistance Thermometer OFM 4, for surface measurement on tube

For measurement and surveillance of temperature on tubes and machine constructions. The operating range is from -40 to 130°C



### 2101 - Type UHT - Thermocouple assembly UHT handheld, for general purpose

For measuring temperature where a portable, flexible, rugged, corrosive resistant and fast responding sensor is needed. Used in solid, fluid and gas medias up to 1100°C (shortly 1250°C)

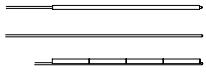


### 2304 - Type TT - Thermocouple wire sensor TT handheld, for general use

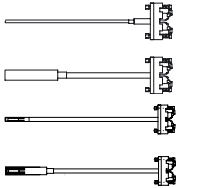
For measuring temperature where a portable, flexible and fast responding sensor is needed. Used in solid and gaseous medias up to 400°C

## Series 9100 - Accessories for FP Industrial Temperature Sensors

The 9100 series consists of thermocouples, measuring inserts, thermowells and protective tubes. Connection fittings, compensation cables, thermocouple wires, transmitters and local display.

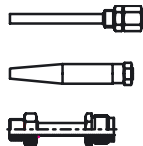


**9107 - Thermocouple for AMK/AKK/AK/BMK/BK, precious and non-precious metal.**  
For installation/exchange in our standard thermocouple assemblies



**9108-01 - Type TK80/115/125/TS85 - Measuring insert T, inserts for thermocouple assemblies.**  
For installation/exchange in protective tubes and thermowells

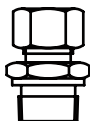
**9108-02 - Type MKM/M40/MK60 - Measuring insert M, inserts for resistance thermometers.**  
For installation/exchange in protective tubes and thermowells



**9111 - Protective tubes and thermowells for thermocouple and resistance assemblies**

**Types:**

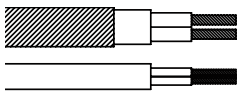
- Protective tubes in ceramic and steel
- Thermowells for weld-in (drilled from bar stock) and screw-in pockets (fabricated)



**9113 - Process connection, Adjustable compression fittings and flanges for connecting sensors with adjustable attachment to the process**

**Types:**

- Flanges in stainless steel
- Compression fittings with ceramic sealing
- Flanges + counter flanges in cast iron with ceramic sealing
- Compression fittings with steel ferrule or Teflon olive



**9150 - Extension and compensating cable between the thermocouple at the measuring point and an instrument with built-in cold junction compensation (reference point)**

**Types:**

- Extension cable: Extension wires of original materials are made of the same material as the accompanying thermocouple and can be used at a higher temperature than a compensating cable. The cable is designated with an X after the thermocouple type, e.g. JX
- Compensation cable: Compensation wires of substitute materials consisting of alloys, which, within a limited temperature range, have the same thermoelectric properties as the accompanying thermocouple. The cable is designated with a C after the thermocouple type, e.g. KC
- Wide range of insulation materials and wire sizes. The choice depends on the application such as ambient temperature and distance. There are also types with electrical screen and steel braiding for extra mechanical protection



**9152 - Thermocouple wire, insulated and bare wires used for manufacturing thermocouples according to all standard combinations in IEC 584**

**Types:**

- Bare thermocouple wire: The maximum temperature stated depends on many factors such as ambient atmosphere, type of installation and diameter etc. The limits are for mechanically unloaded thermocouple wires under continuous use in air not contaminated by noxious gasses
- Insulated thermocouple wire: The temperature limits indicated apply to the insulation materials



**9168 - Type FPTU/FPTT/FPTM - Headmounted transmitters**

Conversion and linearization of thermocouples and Pt100 resistance thermometers signals into a temperature proportional 4 -20 mA standard current signal

**Technical features:**

- 2-wire transmitter
- Input for TC, Pt100, ohm or mV

## Customized RTD's and Thermocouples for OEM's

As it is our objective to be a company specialized in temperature measurement, with a high know-how and service level, AMETEK Calibration Instruments can provide much more than just standard sensors and assemblies.

Our long experience, developing and producing industrial temperature sensor, provides us with a wide knowledge about applications and customer needs, enabling us to build and deliver quick and custom-designed quality temperature sensors for all kinds of solutions and applications no matter what industry.

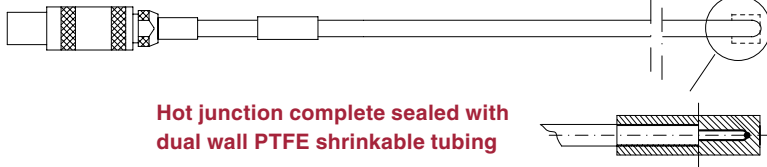
**Biopharmaceutical industry • Energy sector • Process industry • Chemical and petrochemical industries • Food, beverage and tobacco industries • Paper industry • Iron and metal industries • Engineering industry • Plastics industry • Foundries and heat treatment plants • Research and laboratories • Stone-working, pottery and glass industries • Brickworks, glass works, ceramic industry • Petrochemical industry • Marine sector**

If you have any special requirements for industrial temperature sensors, we are pleased to provide you with an offer or answer any questions regarding temperature sensors you may have.

## Examples of custom-made temperature sensors

### Pharmaceutical industry

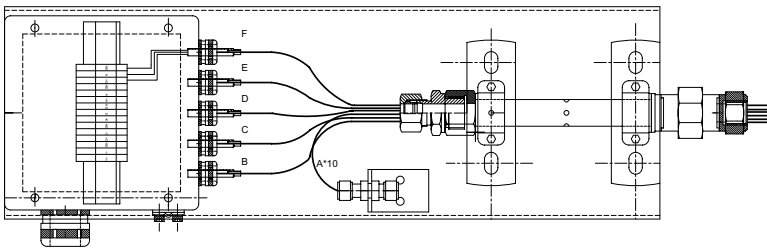
Wire sensor for freeze dryers and autoclaves



Hot junction complete sealed with dual wall PTFE shrinkable tubing

### Petrochemical industry

Thermocouple assembly for Ammonia reformer



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**AMETEK Calibration Instruments** is one of the world's leading manufacturers and developers of calibration instruments for temperature, pressure and process signals as well as for temperature sensors both from a commercial and a technological point of view.

**JOFRA Temperature Instruments**  
Portable precision thermometers. Dry-block and liquid bath calibrators: 4 series, with more than 25 models and temperature ranges from -90° to 1205°C / -130° to 2200°F. All featuring speed, portability, accuracy and advanced documenting functions with JOFRACAL calibration software.

**JOFRA Pressure Instruments**  
Convenient electronic systems ranging from -1 to 1000 bar (25 inHg to 14,500 psi) - multiple choices of pressure ranges, pumps and accuracies, fully temperature-compensated for problem-free and accurate field use.

**JOFRA Signal Instruments**  
Process signal measurement and simulation for easy control loop calibration and measurement tasks - from handheld field instruments to laboratory reference level bench top instruments.

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A complete range of calibration equipment for temperature, pressure and signal, approved for marine use.

**FP Temperature Sensors**  
A complete range of temperature sensors for industrial and marine use.

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Pneumatic floating-ball or hydraulic piston dead weight testers with accuracies to 0.015% of reading.

**M&G Pumps**  
Pressure generators from small pneumatic "bicycle" style pumps to hydraulic pumps generating up to 1,000 bar (15,000 psi).

*..because calibration is  
a matter of confidence*

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