

- Temperature calibrators
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- Software

**PRODUCT  
SELECTION  
GUIDE**

## AMETEK Test & Calibration Instruments

AMETEK Test & 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. Our main brands are JOFRA for calibration instruments, Crystal for pressure instruments, Frode Pedersen for industrial temperature sensors, and Mansfield & Green for pumps and deadweight testers.

For over 25 years, AMETEK has solved a multitude of calibration problems making us a reputable and competent advisor to our customers. Our instruments are tested in our own accredited laboratories where precision calibration also takes place according to ISO 17025. Our Quality Assurance System is ISO 9001 certified.

AMETEK Test & Calibration Instruments is headquartered in Denmark and consists of three production facilities: AMETEK Denmark A/S, based in Allerød, Denmark, Crystal Engineering based in San Luis Obispo, California and Mansfield & Green based in Largo, Florida. All locations have R&D, production, sales and service facilities. Furthermore the company operates through a worldwide network of sales and service offices and distributors.



### JOFRA RTC Series – Reference Temperature Calibrator

The RTC Series features active dual- and triple-zone temperature control which provides excellent temperature homogeneity in the well by adjusting the temperature in the top of the well to the same temperature as in the bottom.

The RTC Series includes the patent-pending Dynamic Load Compensation (DLC) system that provides perfect temperature uniformity in the insert no matter the number or size of the sensors immersed. All calibrators offer unique fail safe plug & play connectivity for sensors, an easy-to-read full-color 5.7-inch VGA display and a USB connection for improved communications and software downloads.

All calibrators have a built-in reference sensor that offers high accuracy.

However, users can obtain even better accuracies and realize the calibrator's full potential by utilizing the STS (Superior Temperature Standard) reference sensor.

**The RTC-159 Ultra Cooler** has the widest available temperature range from -100 to +155°C and incorporates a highly efficient, free-piston Stirling cooler. It features improved heating and cooling speeds, and its patented cooling technology allows the calibrator to fast cool to -80°C in only 65 minutes.

The RTC-158 and RTC-250 offer combined dry block and liquid bath.

All of this makes the RTC Series the "Best performing dry-block with regard to the EURAMET/cg-13/v.01 guideline for testing of dry blocks".

- 12-month accuracy:  
RTC-156/157 -  $\pm 0.04^{\circ}\text{C}$   
RTC-158/250 -  $\pm 0.04^{\circ}\text{C}$   
RTC-159 -  $\pm 0.06^{\circ}\text{C}$   
RTC-700 -  $\pm 0.11^{\circ}\text{C}$
- Temperature range: -100 to 700°C
- Excellent stability
- Patent pending DLC for perfect temperature uniformity in the insert
- Input for external reference sensor and sensor-under-test
- Unique intelligent reference sensors for plug & play connection
- Auto-stepping and thermo switch test functions
- Multi-hole insert kits
- Active dual-zone or innovative triple-zone
- Functional carrying case design
- MVI stability circuitry

## JOFRA PTC Series – Professional Temperature Calibrator

The PTC Series is rugged, light weight and offers a wide range of innovative features like an intuitive interface and easy-to-read color VGA display. Along with a wide temperature range, PTC calibrators have increased heating and cooling speeds, making them even more versatile and cost effective.

The PTC-125 is the latest addition to the series. It offers a wide temperature range, from -90 to +125°C, and incorporates a highly efficient, free-piston Stirling cooler.

The newly designed STS-150 reference sensor that is angled at 90° and customized so the top of the sensor is only slightly higher than the top of the calibrator makes it easy for the PTC Series to calibrate threaded sensors and sensors with connection heads.



- High accuracy:  $\pm 0.06^\circ\text{C}$  using the external reference sensor
- Temperature range: -90 to  $660^\circ\text{C}$
- Excellent stability:  $0.01^\circ\text{C}$
- Input for external reference sensor and sensor-under-test
- Unique intelligent sensors for plug & play connection
- Auto-stepping and thermo switch test functions
- Multi-hole insert kits
- Active dual-zone or innovative triple-zone
- Functional carrying case design
- MVI stability circuitry
- USB connector for communication

## JOFRA ITC Series – Industrial Temperature Calibrator

The ITC Series combine the demand for small physical dimensions with high accuracy and stability. These units contain a dual-zone heating block and offer one-key-one-function operation. The ITC-320 and ITC-650 also offer a deep immersion depth and a wide enough diameter to allow for simultaneous insertion of a reference sensor and the sensor-under-test or for multiple sensor tests.

- Temperature range: -23 to  $650^\circ\text{C}$
- 12-month accuracy to  $\pm 0.18^\circ\text{C}$
- Stability to  $\pm 0.01^\circ\text{C}$
- MVI stability circuitry
- Stability indicator
- Auto-stepping and thermo switch test functions
- Central dual-zone



## JOFRA CTC Series – Compact Temperature Calibrator

The CTC Series is the economical, timesaving and reliable solution for on-site true temperature calibration. The CTC Series consists of six different models that differ in temperature ranges and two of the models have especially deep immersion depths.

- Temperature range: -17 to  $1205^\circ\text{C}$
- 12-month accuracy to  $\pm 0.4^\circ\text{C}$
- Stability to  $\pm 0.05^\circ\text{C}$
- MVI stability circuitry
- Stability indicator
- Deep immersion depth versions
- Auto-stepping and thermo switch test functions



## JOFRA ETC Series – Easy Temperature Calibrator

The ETC Series is one of the fastest calibrators as it completes a dual-point test in less than 10 minutes. The ETC-400R is designed for calibration of infrared thermometers, where the 36 mm (1.4 in) target provides the optimum size for reliable calibration. The small handheld size makes the ETC easy to fit into a toolbox.

- Three models, incl. an infrared version
- Temperature range: -10 to  $400^\circ\text{C}$
- 12-month accuracy to  $\pm 0.5^\circ\text{C}$
- Stability to  $\pm 0.05^\circ\text{C}$
- Heats up as quickly as  $100^\circ\text{C}$  per minute
- Stability indicator
- Auto-stepping function



## JOFRA HPC Series – Handheld Pressure Calibrator

The HPC Series is designed to meet high accuracy pressure calibration applications, and combines deadweight tester accuracy in a modern digital package with a wide range of user friendly features.

The ruggedized HPC has a large backlit graphical display, a user friendly menu that shows current status and mode and one, two or three measurement windows to suit specific applications.

All HPCs have a broad selection of useful functions, ranging from basic features to advanced high speed switch test. The more powerful members of the family have advanced error calculation, leak test and mathematical functions.

HPC600 includes a complete mA loop calibrator and has a built-in electrical pump system for generation of up to 20 bar pressure and vacuum.

HPC500/502 and HPC600 can be connected to external pressure modules.

The intrinsically safe HPC550/552Ex calibrators complies with ATEX/IECEX.



- Accuracy
  - HPC400:  $\pm 0.05\%$  F.S.
  - HPC500/502:  $\pm 0.025\%$  of reading,  $+ 0.01\%$  F.S.
  - HPC550/552Ex:  $\pm 0.025\%$  of reading,  $+ 0.01\%$  F.S.
  - HPC600:  $\pm 0.02\%$  of reading,  $+ 0.015\%$  F.S.
- Available as indicators or in complete systems including pumps
- HPC502 and 552 are equipped with two internal sensors
- HPC400: ranges to 20 bar/300 psi
- HPC500/502: ranges up to 700 bar/10.000 psi
- HPC550/552: ranges up to 700 bar/10.000 psi
- HPC600: ranges up to 20 bar/300 psi
- Special designed HPC softcase



## JOFRA DPC-501 – Documenting Pressure Calibrator

The DPC-501 is designed for high precision calibration of pressure gauges, transmitters, digital manometers, pressure switches and overpressure valves. The documenting feature makes it possible to handle 16 work orders with up to 22 calibration points each and have the result uploaded to a PC via JOFRACAL calibration software.

- Accuracy from  $\pm 0.02\%$  F.S.
- Available as indicator or a complete system
- 43 pressure ranges
- Interchangeable DPC-J reference sensor
- 15 standard pressure units and one user specified
- RS232 interface and JOFRACAL



## JOFRA IPI Mk. II – Industrial Pressure Indicator

The IPI indicator combines the ease of an analog gauge with the accuracy and easy-to-read display of a digital calibrator. The IPI offers a long battery life, high accuracy and serial communication. The accuracy rivals a pressure calibrator and the unit is temperature compensated for shop or machine room applications.

- Accuracy up to  $\pm 0.05\%$  F.S.
- Available as indicator or in a system
- Pressure range vacuum to 700 bar/10,000 psi
- 17 pressure units and one user specified
- Min/max readings
- RS232 interface and JOFRACAL
- ATEX and CSA certified



## JOFRA APM Mk. II – Advanced Pressure Module

APM pressure modules extend the usage of the pressure and signal calibrator. The modules are available in series of accuracies, ranges, units and pressure references from vacuum to absolute pressure.

- Accuracy up to 0.025% RDG + 0.01% F.S.
- Pressure range from 25 mbar to 700 bar
- Rugged and dependable
- Supplied with fittings for NPT and BSP
- Temperature compensated from 0 to 50°C for on-site operation

## Ready-to-use pressure systems for the HPC400, HPC500, HPC502, DPC-501 and IPI Mk. II

AMETEK offers several solutions for pressure generation. This line spans from a small pneumatic "bicycle" type pump to a hydraulic pump that generates up to 1,000 bar/15,000 psi. These are durable pumps with features such as venier valves, manifold connections, swivel fittings and optional O-ring materials and fittings making the pumps flexible to meet your calibration and testing applications.

JOFRA pressure calibrators are as standard delivered as individual indicators or as complete calibration systems ready to use in a carrying case, including pump, hose, set of fittings, batteries, test leads, user manual and a traceable calibration certificate.



*Our systems come in carrying cases with cutouts for fittings, hose and the complete assembled calibration unit - no time required to assemble the unit before use!*

System A	System B	System C	System D	System E	System F
<ul style="list-style-type: none"> <li>• DPC-501, HPC400, HPC500, HPC502 and IPI Mk. II</li> <li>• 0 to 40 bar</li> <li>• 0 to 580 psi</li> </ul>	<ul style="list-style-type: none"> <li>• DPC-501, HPC400, HPC500, HPC502 and IPI Mk. II</li> <li>• Vacuum to 40 bar</li> <li>• Vacuum to 580 psi</li> </ul>	<ul style="list-style-type: none"> <li>• DPC-501, HPC500, HPC502 and IPI Mk. II</li> <li>• 0 to 350 bar</li> <li>• 0 to 5,000 psi</li> </ul>	<ul style="list-style-type: none"> <li>• DPC-501, HPC500, HPC502 and IPI Mk. II</li> <li>• 0 to 350 bar</li> <li>• 0 to 5,000 psi</li> </ul>	<ul style="list-style-type: none"> <li>• DPC-501, HPC500, HPC502 and IPI Mk. II</li> <li>• 0 to 700 bar</li> <li>• 0 to 10,000 psi</li> </ul>	<ul style="list-style-type: none"> <li>• DPC-501, HPC500, HPC502 and IPI Mk. II</li> <li>• 0 to 1,000 bar</li> <li>• 0 to 15,000 psi</li> </ul>

## Crystal pressure

Pressure is our Business

Crystal Engineering produces highly accurate, field-capable Pressure Gauges, Calibrators, and Reference Recorders for measurement and calibration applications up to 15,000 psi. The most popular products include the nVision Data Recorder, XP2i Digital Pressure Gauge, M1 Digital Pressure Gauge, 30 Series Field Calibrator.

Crystal specializes in extremely rugged, Intrinsically Safe, hand-held pressure

measurement devices with Active Digital Temperature Compensation and excellent linearity. Crystal has pioneered the industry with gauges specifying of-reading accuracy instead of "of full scale" accuracy.

Crystal also offers CPF Fittings: a patented line of calibration & test pressure fittings, equipped with a self-venting weep and a replaceable O-ring that allows leak-free seals up to 10,000 psi.

Crystal is based in California and manufactures products for testing, calibration and measurement applications in oil & natural gas, offshore drilling, oil refineries, gas distribution, power generation, nuclear power, waste water, water supply, manufacturing, aerospace, and aircraft maintenance.





## JOFRA ASM - Advanced Signal Multi-scanner

The ASM adds flexibility and time-saving features to your calibration routine. It is delivered in three versions that enable you to calibrate different kinds of sensors and to calibrate up to eight sensors per unit. Connecting three ASMs together makes it possible to perform automatic calibrations of up to 24 sensors at the same time using JOFRACAL. Furthermore the JOFRALOG software allows the user to use the ASM as a data-logging device.

- Accuracy to 0.026°C
- Input: TCs, RTDs, 0-12 VDC, 0-24 mA, 0-4000Ω
- 24 V supply for transmitters
- 100% automatic calibration of up to 24 sensors
- RS232 interface and JOFRACAL



## JOFRA AMC910 - Advanced Multi-purpose Calibrator

The AMC910 multi-purpose calibrator is the right solution for high precision signal, temperature and pressure calibrations, as it combines sourcing and measuring in one instrument.

Use the AMC910 for temperature or pressure calibration by connecting to a dry block calibrator or an APM pressure module. Document the results with our calibration software JOFRACAL.

- Accuracy to  $\pm 0.003\%$  of reading  $\pm 0.001\%$  F.S.
- Output: 0-100 mA, 0-100 VDC, -10-100 mV, TCs, RTDs, 5-4000Ω
- Input: -10-75 mV, TCs, RTDs, 5-4000Ω
- Isolated input: 0-100 VDC, 0-50 mA
- Use with APM pressure modules
- RS232, IEEE-488 or optional USB interface



## JOFRA ASC Series - Advanced Signal Calibrator

The ASC Series has a full numerical keypad with a series of function keys and the cursor keys, which provide a simple and quick user interface. The units' ClearBrite™ graphical display offers the best visibility.

The ASC321 is a full documenting calibrator, using predefined work orders from JOFRACAL. This ensures easy documentation and reduces the possibilities for errors when calibrating in the field.

The ASC301 is more than a signal calibrator. Combined with APM pressure modules or a dry block calibrator, it will calibrate pressure and temperature, and used together with JOFRACAL even document it as well.

- Simultaneous read-back
- Input and output: RTD: 14 types, TC: 13 types, Current: 0-24 mA DC, Voltage: 0-20 VDC, Frequency: 0 to 10 KHz, Pulse: train output, Resistance: 5 to 4000 Ohm
- Large ClearBrite™ display
- Fast RTD simulation
- Use with APM pressure modules
- RS232 interface and JOFRACAL



## JOFRA CSC Series - Compact Signal Calibrator

The CSC201 is designed to meet the high-accuracy demands of modern sensors and transmitters. A large number of predefined sensors types are available.

The compact CSC101 fits easily into a technician's hand and is designed to meet the high-accuracy demands of modern sensors and transmitters, offering 1μA resolution.

- CSC101 is a simple, but easy-to-use loop calibrator, with step and ramp functions
- CSC201 calibrates 16 types of RTDs and 13 types of TCs. Plus ohms, mV and customized RTD curves



## JOFRA mAcal Calibrator

This is the economical answer to easy and accurate loop calibration. Test all 4-20 mA loops in the process with this handy calibrator that sources, reads, steps through test points, converts readings to percentages, etc.

- Accuracy to  $\pm 0.05\%$  F.S.
- Auto-stepping and ramping
- 24 VDC loop power
- Measure 0 to 45 volt
- Flow reading function
- Reading in mA, %, VDC or sec



## JOFRA DTI-1000 Reference Digital Temperature Indicator

The DTI-1000 is a fully traceable thermometer recommended as a high accuracy reference instrument to verify true temperature in any type of process or temperature calibrator, liquid bath or dry-block calibrator. Use the DTI-1000 and the JOFRA STS sensors as the working temperature reference in any calibration application or use the set-up directly in custody transfer applications where high accuracy means money.

- Two different models
- Accuracy to  $\pm 0.005^\circ\text{C}$
- Temperature range:  $-200$  to  $750^\circ\text{C}$
- Stability:  
DTI-1000A:  $\pm(6 \text{ ppm rdg} + 1.4 \text{ m}\Omega)$   
DTI-1000B:  $\pm(6 \text{ ppm rdg} + 0.7 \text{ m}\Omega)$
- Two reference sensor inputs
- True Ohm Measurement



## JOFRA DTI050 Digital Temperature Indicator and JOFRA STS-050 Intelligent Reference Sensor

The DTI050 is a small and easy-to-use reference indicator. Combined with a STS reference sensor, it is the perfect handheld reference instrument. The DTI050 is able to automatically read calibration data and sensor type from the STS sensors with redel connector.

- Temperature range:  $-200$  to  $2500^\circ\text{C}$
- Accuracy to  $\pm 0.012^\circ\text{C}$
- Works with both "smart" and standard temperature sensors



## FP Industrial Temperature Sensors

The FP industrial temperature sensor 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.

### Customized RTDs and thermocouple for OEMs

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



## M&G deadweight testers (primary standards)

In 1966, Mansfield & Green introduced the deadweight tester based on the "floating ball" principle. This deadweight tester is an extremely easy-to-use, reliable and accurate primary standard and is now earning its reputation as the "standard of standards". A range of hydraulic deadweight testers are also available, up to 1,000 bar/15,000 psi.

Typical deadweight tester applications are for:

- Laboratory or field use
- Hazardous locations
- Critical process control loops extending the time between calibration due to better accuracy and lower uncertainty
- Calibrating instruments on custody transfer stations thereby reducing the uncertainty of the measurement
- Calibrating portable digital calibrators to achieve the highest possible accuracy and reducing maintenance costs



## JOFRACAL calibration software

JOFRACAL calibration software ensures easy calibration of RTDs, thermocouples, transmitters, thermo switches, pressure gauges and pressure switches. JOFRACAL can be used with all JOFRA calibration instruments. When used with ASM-800 signal multi scanner, JOFRACAL can perform a simultaneous semi-automatic calibration on up to 24 pressure and/or temperature devices under test in any combination.

JOFRACAL software controls the complete calibration procedure, stores the results and provides a calibration audit trail through hard-copy certificates. Calibration data are stored for each sensor to monitor drift and optimize recalibration intervals.



**AMETEK**<sup>®</sup>  
TEST & CALIBRATION INSTRUMENTS

### AMETEK Test & Calibration Instruments

A business unit of AMETEK Measurement & Calibration Technologies Division offering the following industry leading brands for test and calibration instrumentation.

#### JOFRA Calibration Instruments

##### Temperature Calibrators

Portable dry-block calibrators, precision thermometers and liquid baths. Temperature sensors for industrial and marine use.

##### Pressure Calibrators

Convenient electronic systems ranging from -25 mbar to 1000 bar - fully temperature-compensated for problem-free and accurate field use.

##### Signal Instruments

Process signal measurement and simulation for easy control loop calibration and measurement tasks.

### M&G Dead Weight Testers & Pumps

Pneumatic floating-ball or hydraulic piston dead weight testers with accuracies to 0.015% of reading. Pressure generators delivering up to 1,000 bar.

### Crystal Pressure

Digital pressure gauges and calibrators that are accurate, easy-to-use and reliable. Designed for use in the harshest environments; most products carry an IS, IP67 and DNV rating.

### Lloyd Materials Testing

Materials testing machines and software that guarantees expert materials testing solutions. Also covering Texture Analysers to perform rapid, general food testing and detailed texture analysis on a diverse range of foods and cosmetics.

### Davenport Polymer Test Equipment

Allows measurement and characterization of moisture-sensitive PET polymers and polymer density.

### Chatillon Force Measurement

The hand held force gauges and motorized testers have earned their reputation for quality, reliability and accuracy and they represent the de facto standard for force measurement.

### Newage Hardness Testing

Hardness testers, durometers, optical systems and software for data acquisition and analysis.

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