

# Calibrators

Product Selection Guide



## JOFRA calibrators

*- because calibration is a matter of confidence*



## 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. Our main brands are JOFRA for calibration instruments, FP for industrial temperature sensors, and M&G for pumps and deadweight testers.

AMETEK Calibration Instruments has its headquarters in Denmark and consists of two production facilities: AMETEK Denmark A/S which is based in Allerød, Denmark, and Mansfield & Green based in Largo, Florida, USA. Both locations have R&D, production, sales, and service facilities. Furthermore the company operates through a worldwide network of sales and service offices and distributors.

Calibration means that the performance of the measuring instrument is compared to a known reference. In this way, all sources of errors are analyzed and provided with numerical values. Increasing quality demands have continuously resulted in a growing number of industry customers requesting calibration of their measuring equipment.

For over 25 years, AMETEK has solved a multitude of calibration problems. The experience therefore 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.

Instruments from AMETEK Calibration Instruments are tested in our own accredited laboratory where precision calibration also takes place. All calibrations are documented by means of a certificate being our customers documentation to third parties. Our calibration laboratory is accredited according to ISO17025.



## JOFRA RTC Series – Reference Temperature Calibrator

We are proud to introduce our new top models RTC-156, RTC-157, and RTC-700, which all are more sophisticated than any existing calibrator.

The RTC series comes in three different models:

- RTC-A reference temperature calibrator
- RTC-B reference temperature calibrator with input for reference sensor, DLC sensor and sensors-under-test
- RTC-C reference temperature calibrator with input for reference sensor and DLC sensor

The RTC-156/157 calibrator features the active dual-zone temperature control and the RTC-700 features our innovative triple-zone technology. Both technologies improve the homogeneity in the well by adjusting the temperature in the top of the well to the same temperature as in the bottom. The dual-/triple-zone keeps this difference at a minimum.

To bring our dual-/triple-zone technology to an even higher level, we have developed the patent pending DLC system.

The DLC sensor improves the homogeneity even more by controlling the homogeneity not only in the well, but also inside the insert, where the sensors-under-test are placed during calibration. The DLC sensor measures the temperature homogeneity in the insert and provides feedback to the active dual-zone/triple-zone system, which now compensates the temperature difference to a minimum inside the insert. In this way, the DLC system makes the homogeneity independent of the different loads of the insert.

All of this makes the RTC series "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 - Up to  $\pm 0.04^{\circ}\text{C}$
  - RTC-700 - Up to  $\pm 0.11^{\circ}\text{C}$
- Temperature range
  - RTC-156:  $-30$  to  $155^{\circ}\text{C}$  /  $-22$  to  $311^{\circ}\text{F}$
  - RTC-157:  $-45$  to  $155^{\circ}\text{C}$  /  $-49$  to  $311^{\circ}\text{F}$
  - RTC-700:  $33$  to  $700^{\circ}\text{C}$  /  $91$  to  $1292^{\circ}\text{F}$
- Stability
  - RTC-156/157: to  $0.005^{\circ}\text{C}$
  - RTC-700: to  $0.008^{\circ}\text{C}$
- Patent pending DLC, Dynamic Load Compensation system, for perfect temperature uniformity in the insert
- USB connector for communication
- JOFRACAL calibration software
- Input for external reference sensor
- Input for sensor-under-test
- Unique intelligent sensors for plug'n'play connection
- Auto-stepping and thermo switch test functions
- New multi-hole insert kits covering all the most used sensor sizes
- Active dual- zone or innovative triple-zone
- Easy-to-read color VGA display with perfect overview of the actual status
- New functional carrying case design
- MVI stability circuitry



## JOFRA ATC series – Advanced Temperature Calibrator

This is a complete, stand-alone, on-site, documenting test laboratory with timesaving automatic functions. The ATC series offers a wide temperature calibration range from -90 to 650°C. The ATC employs a unique active dual-zone heating/cooling block ensuring optimum temperature homogeneity in the calibration zone of the block. With the ATC-140 and ATC-250, it is also possible to calibrate even more sensors at the same time and to calibrate large and odd sized sensors in either a large diameter dry-block or in a liquid bath.



- 12-month accuracy to  $\pm 0.04^{\circ}\text{C}$  /  $0.07^{\circ}\text{F}$
- Temperature range -90 to 650°C / -130 to 1202°F
- Stability to  $\pm 0.01^{\circ}\text{C}$  /  $0.018^{\circ}\text{F}$
- 14 different models
- MVI stability circuitry
- 100% automatic calibration
- RS232 interface and JOFRACAL calibration software
- Input for external reference sensor
- Input for sensor-under-test
- Auto-stepping and thermo switch test functions
- Interchangeable inserts including multi-hole designs
- Active dual zone



## JOFRA ITC series – Industrial Temperature Calibrator

This calibrator combines the demand for small physical dimensions with high accuracy and stability. The ITC contains a dual-zone heating block and offers 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.



- 3 different models
- Temperature range -23 to 650°C / -9 to 1202°F
- 12-month accuracy to  $\pm 0.18^{\circ}\text{C}$  /  $0.32^{\circ}\text{F}$
- Stability to  $\pm 0.01^{\circ}\text{C}$  /  $0.02^{\circ}\text{F}$
- MVI stability circuitry
- Stability indicator
- RS232 interface and JOFRACAL calibration software
- Auto-stepping and thermo switch test functions
- Central dual zone



## JOFRA CTC series – Compact Temperature Calibrator

This is the economical, timesaving, and reliable solution for on-site true temperature calibration. The applications are generally critical process control but can vary based on calibration and testing requirements. The JOFRA CTC series consists of six different models that differ in temperature ranges and immersion depths. Two of the models have especially deep immersion depths.



- 6 different models
- Temperature range -17 to 1205°C / -1 to 2200°F
- 12-month accuracy to  $\pm 0.4^{\circ}\text{C}$  /  $0.7^{\circ}\text{F}$
- Stability to  $\pm 0.05^{\circ}\text{C}$  /  $0.09^{\circ}\text{F}$
- MVI stability circuitry
- Stability indicator
- RS232 interface and JOFRACAL calibration software
- Deep immersion depth versions
- Auto-stepping and switch test functions



## JOFRA ETC series – Easy Temperature Calibrator

The ETC series may be the fastest dry-block temperature calibrator on the market as it completes a dual-point test in less than 10 minutes. One model, the ETC-400 R is designed for calibration of infrared thermometers, where the 36 mm (1.4 in) target provides the optimum size for reliable calibration of infrared thermometers in the process industry. The small handheld physical size makes the ETC easy to fit into a toolbox and you can bring it almost anywhere.



- 3 different models, including an infrared version
- Temperature range -10 to 400°C / 14 to 752°F
- 12-month accuracy to  $\pm 0.5^{\circ}\text{C}$  /  $0.9^{\circ}\text{F}$
- Stability to  $\pm 0.05^{\circ}\text{C}$  /  $0.09^{\circ}\text{F}$
- Heats up as quickly as  $100^{\circ}\text{C}$  /  $210^{\circ}\text{F}$  per minute
- Stability indicator
- RS232 interface and JOFRACAL calibration software
- Auto-stepping function



## JOFRA HPC series – Handheld Pressure Calibrator

Our 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.

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 mathematic functions.

HPC600 includes a complete mA loop calibrator with all common features.

HPC500/502 and HPC600 can be combined with more than 60 different external pressure modules.

HPC600 has a built-in electrical pump system for generation of pressure and vacuum by a touch of a single key!

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. Furthermore a dedicated zero test button to provide convenient zero before test and ensures better accuracy.

- Accuracy  
HPC400:  $\pm 0.05\%$  F.S.  
HPC500/502:  $\pm 0.025\%$  of reading, + 0.01% F.S.  
HPC600:  $\pm 0.02\%$  of reading, + 0.015% F.S.
- HPC400 and HPC500/502 are available as indicators or in complete systems
- HPC500/502 and HPC600 can be extended with one of 60 different external pressure modules
- HPC500 is equipped with one internal sensor, HPC502 is equipped with two internal sensors to be chosen by the customer
- Dedicated zero button available to provide convenient zero before test
- Unique built-in electric pump in the HPC600
- HPC400: 3 different pressure ranges up to 20 bar/300 psi  
HPC500/502: 16 different pressure ranges up to 700 bar/ 10,000 psi  
HPC600: 4 different pressure ranges up to 10 bar/150 psi
- Special designed HPC softcase which is included with the HPC600. Optional for HPC400 and HPC500/502



Built-in electrical pump

## JOFRA DPC-500 – Documenting Pressure Calibrator

The DPC-500 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 up to 1,000 bar/15,000 psi (vacuum, gauge, compound, absolute)
- Interchangeable DPC-J reference sensor (up to 5 sensors per instrument)
- 15 standard pressure units and 1 user specified
- RS232 interface and JOFRACAL calibration software



## JOFRA IPI – Industrial Pressure Indicator

The IPI pressure 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 of the IPI rivals a pressure calibrator and is temperature compensated for shop or machine room applications.

- Accuracy up to  $\pm 0.05\%$  F.S.
- Available as an indicator or in a complete system
- Pressure range vacuum to 700 bar/10,000 psi
- 17 different pressure units and 1 user specified
- Min/max readings
- RS232 interface and JOFRACAL calibration software
- ATEX and CSA certified and designed for use in potentially explosive environments



## JOFRA APM – Advanced Pressure Module

The APM pressure modules extend the usage of the HPC calibrators as well as the ASC300 and AMC910 multi function signal calibrators. The modules are available in series of accuracies, ranges, units and pressure references from vacuum to absolute pressure.

- Accuracy up to  $\pm 0.01\%$  F.S.
- Pressure range vacuum to 700 bar/10,000 psi
- 62 different modules
- Rugged and dependable for field or lab use
- Gauge, absolute, vacuum, differential and combination modules
- Supplied with fittings for NPT and BSP threads



*Accuracy includes hysteresis, nonlinearity, repeatability and reference standard uncertainty, 1 Year typical long-term stability, operated inside the rated temperature span and pressure range. Specification sheets can be found at [www.jofra.com](http://www.jofra.com)*

## Ready-to-use pressure systems for the HPC400, HPC500, HPC502, DPC-500 and IPI

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.

For all pressure systems, the pump and the indicator are separate systems. Therefore, a replacement of the pump does not mean that you have to send a complete system for repair. Maintenance of the instrument is also made easy. Recalibration of the unit can be performed locally with an accurate pressure reference: No need to send the unit back to us for recalibration. If you do require a factory calibration, the pump and indicator are independent and only the indicator needs to be returned.

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.

All pumps are also available separately.



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

### Pump System A



- DPC-500, HPC400, HPC500, HPC502 and IPI
- 0 to 40 bar
- 0 to 580 psi

### Pump System B



- DPC-500, HPC400, HPC500, HPC502 and IPI
- Vacuum to 40 bar
- Vacuum to 580 psi

### Pump System C



- DPC-500, HPC500, HPC502 and IPI
- 0 to 350 bar
- 0 to 5,000 psi

### Pump System D



- DPC-500, HPC500, HPC502 and IPI
- 0 to 350 bar
- 0 to 5,000 psi

### Pump System E



- DPC-500, HPC500, HPC502 and IPI
- 0 to 700 bar
- 0 to 10,000 psi

### Pump System F



- DPC-500, HPC500, HPC502 and IPI
- 0 to 1,000 bar
- 0 to 15,000 psi



### JOFRA ASM - Advanced Signal Multi-scanner

The ASM signal multi-scanner adds flexibility and time-saving features to your calibration routines, as the ASM is delivered in 3 versions, enabling you to calibrate different kinds of sensors and to calibrate up to 8 sensors with one ASM. Connecting three ASMs makes it possible to perform automatic calibrations of up to 24 sensors at the same time using JOFRACAL calibration software. Furthermore the JOFRALOG software allows the user to use the ASM as a data-logging device.

- 6 different models
- Accuracy to 0.026°C / 0.047°F
- Input: TCs (12 types), RTDs (13 types), 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 calibration software
- STS temperature reference sensor capability



### 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.

- Accuracy to  $\pm 0.003\%$  of reading  $\pm 0.001\%$  F.S.
- Output: 0-100 mA, 0-100 VDC, -10-100 mV, TCs (13 types), RTDs (9 types), 5-4000Ω
- Input: -10-75 mV, TCs (13 types), RTDs (10 types), 5-4000Ω
- Isolated input: 0-100 VDC, 0-50 mA
- External JOFRA APM pressure module capability
- STS temperature reference sensor capability
- RS232, IEEE-488 or optional USB interface



### JOFRA ASC300 - Advanced Signal Calibrator

Substantial enough to cover all your needs for a process signal calibrator with superior accuracy and compact enough to fit into your toolbox. Operate the instrument with one hand for easy field service, test, and calibration.

- Accuracy to  $\pm 0.2^\circ\text{C}$  /  $0.36^\circ\text{F}$
- Simultaneous input and output
- Input and output: TCs (13 types), RTDs (14 types), 0-20 VDC, 0-24 mA, 5-4000V, 0-10 kHz, and pulse trains
- Isolated read-back circuit with 24 VDC loop power
- External JOFRA APM pressure module capability
- RS232 interface and JOFRACAL calibration software



### JOFRA CSC series - Compact Signal Calibrator

The CSC series is a dedicated calibrator designed to make calibration and maintenance tasks easier to perform.

The CSC200 is engineered for the calibration of temperature instruments offering the ability to measure and simulate several different types of RTDs and TCs.

The CSC100 is engineered for instrument loop calibrations and is specifically manufactured for 4 to 20 mA loops. It can also be used as a signal simulator to test transmitters without the need for actual operation.

- Accuracy  
CSC100: to  $\pm 0.015\%$  of reading  
CSC200: to  $\pm 0.2^\circ\text{C}$  /  $0.36^\circ\text{F}$
- Input/output  
CSC100: mA and voltage  
CSC200: TC and RTD
- CSC100 sources and reads loop voltage and current
- CSC200 reads and simulates temperature
- Fuseless protection on all inputs



### 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 JOFRA DTI-1000 is a fully traceable thermometer recommended as the 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 (low uncertainty) means money. The superior specifications combined with a long history of reliability and low drift have made the DTI-1000 and the STS sensors standard in many National Laboratories worldwide.

- 2 different models
- Accuracy to  $\pm 0.005^{\circ}\text{C}$  /  $\pm 0.009^{\circ}\text{F}$
- Temperature range  $-200$  to  $750^{\circ}\text{C}$  /  $-328$  to  $1382^{\circ}\text{F}$
- Stability
  - DTI-1000A:  $\pm(6 \text{ ppm rdg} + 1.4 \text{ m}\Omega)$
  - DTI-1000B:  $\pm(6 \text{ ppm rdg} + 0.7 \text{ m}\Omega)$
- 2 reference sensor inputs
- True Ohm Measurement



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

The JOFRA DTI050 is a small sized and easy-to-use reference indicator. Combined with an JOFRA STS reference sensor, it is the perfect handheld reference instrument. The DTI050 uses intelligent detection technology for sensors, meaning that it is able to automatically read calibration data and sensor type from a memory chip placed in the JOFRA STS-050, especially developed for the DTI050 indicator.

- Temperature range  $-200$  to  $2500^{\circ}\text{C}$  /  $-328$  to  $4532^{\circ}\text{F}$
- Accuracy to  $\pm 0.012^{\circ}\text{C}$  /  $0.021^{\circ}\text{F}$
- Works with both "smart" and standard temperature sensors



## FP Industrial Temperature Sensors

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

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

### Customized RTD's and thermocouple 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 sensors and calibrators, provides us with a wide 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:

- laboratory or field use
- hazardous locations
- critical process control loops extending the time between calibrations due to better accuracy and 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 RTD's, thermocouples, transmitters, thermoswitches, pressure gauges and pressure switches. JOFRACAL software may be used with the well-known JOFRA temperature calibrators as well as with JOFRA pressure and signal calibrators. Furthermore JOFRACAL functions as a stand-alone product.

JOFRACAL software provides an entirely automatic calibration of sensors and a semi-automatic calibration of the complete process loop by means of a PC. The software handles the comparison between the process readout value and the reference value; a measurement typically required within ISO9000, GMP, or HACCP systems. Additionally, this evaluation may be performed on-site without electrical interruption of the loop.

A variety of screens presents the user with information in an easy-to-read format. This provides the technician with an optimal overview to allow for setting up calibration procedures and performing calibrations. Furthermore, JOFRACAL also includes facilities for generating and printing of detailed certificates.

This feature even comprises tools, which allow the user to customize the certificate content and format to comply with accepted norms and standards including: company-specific information, numbering, and terminology. We have also designed functions to incorporate specific requirements from the ISO program to make documentation a direct part of existing quality systems.

JOFRACAL calibration software can be downloaded free of charge at [www.jofra.com](http://www.jofra.com)



### 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: 5 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 -25 mbar to 1000 bar (0.4 to 15,000 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.

### JOFRA / JF Marine Instruments

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.

### M&G Pressure Testers

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).

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a matter of confidence*

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CALIBRATION INSTRUMENTS

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