MARINE CALIBRATORS

Product Selection Guide

JOFRA & JF

marine

calibration

instruments

...because calibration is a matter of confidence

CALRIGHT INSTRUMENTS

The Right Source For Your Test & Measurement Needs

2232 Verus Street Suite D San Diego CA 92154 USA
Toll Free: 866.363.6634 Tel: 619.429.4545 Fax: 619.374.7012
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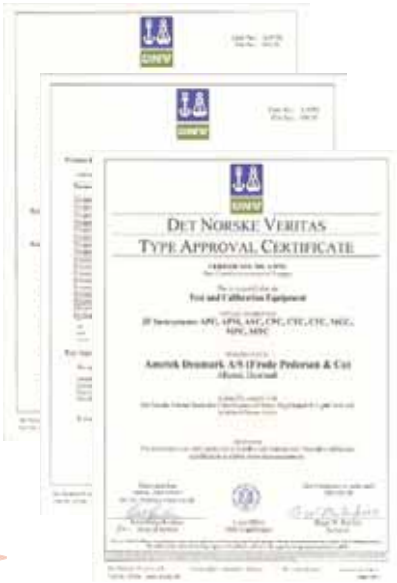
AMETEK®
CALIBRATION INSTRUMENTS
JOFRA™ M&G

Complete marine program

AMETEK Calibration Instruments offers a complete program of marine approved temperature, pressure, and signal calibrators, including temperature sensors

Maintain and calibrate monitoring devices for:
• Turbo-charger lubrication • Lubricating oil systems • Cylinder / piston / fuel valve cooling media • Fuel oil inlet • Scavenge air • Exhaust gas • Sea water cooling • Thrust / shaft plane / stern tube bearings • Crankcase protection • Charge air • Turbine and gear bearings • Uptake gas • Steam • Feed water • Servo oil propeller pitch • Cooling water outlet • Purifiers • Refrigeration systems • Starting air • Gland steam • Hydraulic systems • Condensing system • Oil burner • Main steam • Generators • Condensers • Safety valves

DNV approval
All calibrators in this brochure have a marine type approval certificate from Det Norske Veritas. The temperature sensors from Frode Pedersen have marine approvals from Lloyds Register of Shipping, Germanischer Lloyd, Bureau Veritas, and Det Norske Veritas.



Why calibrate on board a ship?

- To obtain traceability
- To effectively fulfill IMO, SOLAS, ISM codes, etc.
- To fulfill requirements from Det Norske Veritas, Lloyds Register of Shipping, etc.
- To fulfill safety regulations
- To save energy
- To reduce pollution
- To achieve optimum machine operation and efficiency
- To reduce unexpected repair and replacement
- To prevent turndowns of machinery

JF MTC Marine Temperature Calibrator

- 3 different models
- RS232 interface with JOFRACAL software
- Stability indicator
- Exceptionally fast
- Timesaving auto-stepping and thermo-switch test functions
- MVI stability circuitry
- 12-month accuracy to ±0.4°C / 0.7°F
- Interchangeable inserts including multi-holes
- Temperature ranges
  - MTC-140 A -17 to 140°C (-1 to 284°F)
  - MTC-320 A 33 to 320°C (91 to 608°F)
  - MTC-650 A 33 to 650°C (91 to 1202°F)

Type approved temperature calibrators to optimize the performance of your vessel

The MTC series of portable temperature calibrators facilitates correct readings on all of your temperature monitoring devices. You can reach 320°C (608°F) in just 4 minutes and do it safely. The MTC series features a large easy-to-read backlit display that provides icons and information regarding the status of the MTC and the calibration in progress. The MTC series also features an auto-stepping function. Using this function you may stay in the control room or on the bridge and monitor the temperature reading while the calibrator, located in the engine room by the sensor, automatically steps through a number of pre-programmed temperatures and thereby performs a full loop calibration.

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JOFRA CTC Compact Temperature Calibrator

- 6 different models
- RS232 interface with JOFRACAL software
- Stability indicator
- Exceptionally fast
- Deep immersion depth versions
- Auto-stepping and switch test functions
- MVI stability circuitry
- 12-month accuracy to ±0.4°C / 0.7°F
- Interchangeable inserts including multiholes
- Temperature ranges
  - CTC-140A -17 to 140°C / -1 to 284°F
  - CTC-320A 33 to 320°C / 91 to 608°F
  - CTC-320B 33 to 320°C / 91 to 608°F
  - CTC-650A 33 to 650°C / 91 to 1202°F
  - CTC-650B 33 to 650°C / 91 to 1202°F
  - CTC-1200 300 to 1205°C / 572 to 2200°F

This is the economical, timesaving, and reliable solution for on-site true temperature calibration

The CTC series is equal to the MTC series, but with deep-well versions offering the capability to accommodate longer sensors. The CTC-320 B and CTC-650 B models offer a deeper immersion depth of 190 mm / 7.9 in. If you have liquid-filled sensors or other sensors that require a deeper immersion depth, i.e. the ones for the exhaust, look for the B versions. The CTC-1200 A is not approved for marine use.

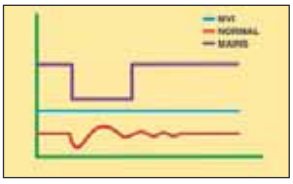
JOFRA ETC Easy Temperature Calibrator

- 3 different models, incl. an infrared version
- Timesaving auto-stepping function
- RS232 interface with JOFRACAL software
- Heats up as quickly as 100°C / 210°F per minute
- Stability indicator
- Clear, backlit dual-information display
- 12 month accuracy to ±0.5°C / ± 0.9°F
- Temperature ranges
  - ETC-125 A -10 to 125°C / 14 to 257°F
  - ETC-400 A 28 to 400°C / 82 to 752°F
  - ETC-400 R 28 to 400°C / 82 to 752°F

A fast and small handheld calibrator easy to fit into a toolbox and take almost anywhere

Heats up by up to 100°C (212°F) per minute and completes a full dual-point test in less than 10 minutes, including stability time. The small size and light weight make it a perfect instrument to verify sensors in difficult-to-reach places. With the JOFRA ETC-400 R it is also possible to calibrate infrared thermometers. The 36 mm (1.4 in.) target provides the optimum size for reliable calibration of infrared thermometers in the marine industry as it is designed for high accuracy and long-term stability while maintaining speed. The ETC-400 R is supplied with an additional software JOFRA IR-LAB, which enables you to calculate emission factors and thereby also at which temperatures you need to calibrate.

Standard features and delivery for temperature calibrators



MVI ensures stable temperatures for on-site calibrations
The MVI circuitry is standard on most JOFRA dry-blocks (except the ETC series). MVI removes the stability problem caused by an unstable mains supply. MVI identifies the variations immediately and maintains a constant energy flow to the heating block. The result is a problem-free calibration, with a temperature stability that the operator can trust.

JOFRACAL temperature calibration software
All JOFRA and JF marine temperature calibrators are delivered with the JOFRACAL calibration software program. JOFRACAL saves the operator time on the lengthy documentation work. This software supports not only all JOFRA and JF dry-block calibrators, the JOFRA DTI-1000 reference thermometer and the JOFRA multi-signal calibrator ASC300, but also the use of liquid baths, ice points, or other manual dry-block heating sources.

JOFRA and JF marine temperature calibrators are as standard delivered with: Mains power cable - Traceable certificate (temperature performance) - Insert (user specified) - Tool for insertion tubes - User manual - Test cables - Insulation plugs for the calibrators going below ambient - RS232 cable and JOFRACAL software. For the MTC series an aluminum carrying case is also standard. For the CTC and ETC series it is optional, but recommended for storage and transport.

Selection Guide	ETC-125 A	CTC-140 A	MTC-140 A	ETC-400 R	ETC-400 A	CTC-320 A	MTC-320 A	CTC-320 B	CTC-650 A	MTC-650 A	CTC-650 B
Temperature range @ ambient 23°C / 73°F											
-10 to 125°C / -14 to 257°F	X										
-17 to 140°C / 1 to 284°F		X	X								
28 to 400°C / 82 to 752°F				X	X						
33 to 320°C / 91 to 608°F						X	X	X			
33 to 650°C / 91 to 1202°F									X	X	X
Temperature stability											
±0.05°C / ±0.09°F	X	X	X								X
±0.1°C / ±0.18°F						X	X	X	X	X	
±0.15°C / ±0.27°F					X						
±0.3°C / ±0.54°F				X							
Accuracy											
±0.4°C / ±0.70°F		X	X								
±0.5°C / ±0.9°F	X				X	X	X	X			
±0.6°C / ±1.08°F											X
±0.9°C / ±1.62°F									X	X	
0.4% of reading ±1.0°C / ±1.8°F				X							
Immersion depth											
190 mm / 7.9 in								X			X
115 mm / 4.5 in		X	X								
110 mm / 4.3 in	X					X	X		X	X	
105 mm / 4.1 in					X						
Insertion tube diameter											
26 mm / 1 in						X	X	X	X	X	X
19 mm / 0.75 in		X	X								
12 mm / 0.5 in	X										
36 mm / 1.4 in infrared target				X							
Technology											
Special fast dry-block	X	X	X	X	X	X	X		X	X	
Stable emissivity factor for infrared				X							
12-month specifications	X	X	X	X	X	X	X	X	X	X	X
MVI Mains power Variance Immunity	X	X	X			X	X	X	X	X	X
CE labelled and DNV approved	X	X	X	X	X	X	X	X	X	X	X
Sensor-under-test input											
Switch input		X	X			X	X	X	X	X	X
Documenting software JOFRACAL											
RS232 and JOFRACAL calibration software	X	X	X	X	X	X	X	X	X	X	X
Certificate printout via JOFRACAL	X	X	X	X	X	X	X	X	X	X	X
Complete database via JOFRACAL	X	X	X	X	X	X	X	X	X	X	X
Design											
Multi-information display	X	X	X	X	X	X	X	X	X	X	X
Interchangeable insertion tube	X	X	X			X	X	X	X	X	X
Multi-hole and single-hole insertion tubes	O	O	O		O	O	O	O	O	O	O
Aluminium carrying case	O	O	X	X	O	O	X	O	O	X	O
Rugged alu-profile casing	X	X	X	X	X	X	X	X	X	X	X
One-key-one-function operation	X	X	X	X	X	X	X	X	X	X	X
Timesaving features											
Auto-stepping	X	X	X	X	X	X	X	X	X	X	X
Automatic thermo-switch test		X	X			X	X	X	X	X	X
Stability indicator	X	X	X	X	X	X	X	X	X	X	X
Countdown timer before unit is stable	X	X	X	X	X	X	X	X	X	X	X
Programmable maximum temperature	X	X	X	X	X	X	X	X	X	X	X
Fast simulation/training mode	X	X	X	X	X	X	X	X	X	X	X
Re-calibration/adjustment from keyboard	X	X	X	X	X	X	X	X	X	X	X

Engine rooms - testing the temperature in exhaust gas

Savings

The exhaust gas temperature is a very important factor. If the temperature is too low, too little fuel is let into the cylinder, and if the temperature is too high, too much fuel is let into the cylinder.
Often a range of ±10°C (50°F) is allowed, before an alarm is activated. However, if calibration is performed more often, this range could be reduced and a more economical combustion could be achieved.

Engine rooms - testing the temperature in exhaust gas

Application

On each cylinder, a thermometer has been placed close to the exhaust gas outlet to measure the temperature of the exhaust gas. This thermometer breaks very often due to the impact of the exhaust gas. As a consequence the temperature indication is often inaccurate.

X = Delivered as standard
O = Optional accessories

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JOFRA ASC300 Advanced Signal Calibrator

- Simultaneous input and output
- Fuseless protection on all inputs
- Input and output: TCs (13 types), RTDs (14 types), 0-20 VDC, 0-24 mA, 5-4000 □, 0-10 kHz, and pulse trains
- APM pressure module input
- Fully integrated in the JOFRACAL software
- Isolated read-back circuit with 24 VDC loop power

A multi signal calibrator with superior accuracy and compact enough to fit into your toolbox

The JOFRA ASC300 combines a full numerical keypad with a series of function keys and a graphical user interface making it easy to perform various tasks in a short period of time. As the instrument is compatible with the JOFRA APM pressure modules it offers true multi-function operability. There are two channels of operation providing the user with an isolated read-back circuit. The JOFRA ASC300 has full fuseless protection to 240 VAC, which is an important feature as most failures in signal calibrators result from over-voltage conditions.

JOFRA CSC Compact Signal Calibrator

CSC100:
- mA and voltage input/output
- Sources and reads loop voltage and current
- Accuracy to ±0.015% of reading
- Fuseless protection on all imputs

CSC200:
- TC and RTD input / output
- Reads and simulates temperature
- Accuracy to ±0.2°C / 0.36°F
- Fuseless protection on all inputs

Signal calibrators offering an easy way to operate interface including a knob for precise and rapid adjustment

The CSC line of signal calibrators is dedicated units designed to make your calibration and maintenance tasks easier to perform. The JOFRA CSC100 is engineered for instrument loop calibrations and is specifically manufactured for 4 to 20 mA loops. The CSC100 also offers features such as an auto-stepping function and fuseless protection. The JOFRA CSC200 is engineered for calibration of temperature instruments offering the ability to measure and simulate several different types of 2, 3, or 4-wire RTDs and thermocouples.

JOFRA mAcal Calibrator

- Accuracy to ±0.05% F.S.
- Auto-stepping and ramping
- 24 VDC loop power
- Measures to ±45 VDC and 24mA
- Flow reading function
- Reads in mA, %, or VDC

Compact loop calibrator ideal for field use

The mAcal milliamp calibrator is an economical and easy-to-use calibration device for sourcing and measuring mA signals. The instrument is designed specifically for 2-wire transmitter loops with 4 to 20 mA signals. The instrument features special fixed steps for performing linear and flow transmitter or valve positioner calibrations. The instrument has seven different built-in current values and the user may choose between manual or automatic steps with 10 or 30 seconds between steps. You can perform an entire test by placing the mAcal in the process loop and taking readings from the control room.

Standard delivery for signal calibrators

JOFRA signal calibrators are as standard delivered with: Battery set - Manual - Set of test leads - Soft carrying case and shoulder strap - NIST traceable certificate

JF MGC Marine Gauge Calibrator

- 2 different models
- Pressure range 0 to 300 bar
- Pressure units bar and kg/cm ^{2}, dual scale
- Dual scale and easy-to-read gauges
- Hydraulic pumps
- Accuracy to ±0.6% F.S. of connected gauge
- Pressure ranges
  - MGC-HIGH 0 to 4300 psi / 0 to 300 bar
  - MGC-LOW 0 to 1450 psi / 0 to 100 bar

Flexible pressure calibration systems to optimize the performance of your vessel

The MGC series is using quality mechanical gauges as pressure reference. Connect the reference gauge and the unit-under-test to the hydraulic pump and calibrate.

The JF model MGC-LOW consists of 2 dual-scaled precision pressure gauges with ±1% F.S. accuracy and a hydraulic handpump fitted with hose, valve, and couplings. The JF Model MGC-HIGH consists of 3 or 4 dual-scaled precision pressure gauges with ±0.6% F.S. accuracy and a hydraulic jack pump fitted with hose, valve and couplings. The gauges provide the user with a clear indication of pressure for comparison to the unit-under-test. The operator can then identify the extent of any error; it is possible to compensate for or note the error and thus only replace faulty pressure indicators.

APC Advanced Pressure Calibrator

- Available as an indicator or with a pump in a complete system
- Accuracy to ±(0.04% of reading + 0.01% F.S.)
- 17 different pressure units
- Computer interface
- Easy front panel operation
- External pressure module capability
- Reads, sources, and scales transmitters
- Pneumatic handpumps from vacuum to 40 bar
- Hydraulic pumps from 0 to 700 bar
- Pressure ranges
  - 0 to 10 psi / 0 to 0.7 bar with vacuum
  - 0 to 30 psi / 0 to 2 bar with vacuum
  - 0 to 200 psi / 0 to 15 bar with vacuum
  - 0 to 500 psi / 0 to 35 bar with vacuum
  - 0 to 1,000 psi / 70 bar
  - 0 to 3,000 psi / 200 bar
  - 0 to 5,000 psi / 350 bar
  - 0 to 10,000 psi / 700 bar

Handheld pressure calibrator offering user-friendly features and superior performance

The APC is available as an indicator or in one of 6 test-ready systems. You can use the APC in applications from safety valve verification to calibration of pressure transmitters. This series is designed to meet high accuracy pressure calibration applications and to make your tasks easier. The APC offers dual information display, transmitter supply, and scalable mA input for % error calculation. The accuracy of the APC calibrators is superior throughout the ranges and is temperature compensated for operations in machine room applications. The JOFRA APM series of pressure modules extends the application base of the APC calibrators by allowing calibrations in ranges other than those of the indicators.

Test-ready pressure systems for the APC, CPC and IPI calibrators

Pump system A
APC, CPC, and IPI

Pump system B
APC, CPC, and IPI

Pump system C
APC and IPI

Pump system D
APC and IPI

Pump system E
APC and IPI

Pump system F
APC and IPI

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CPC Compact Pressure Calibrator

- Available as an indicator or with a pump in a complete system
  - – System A with pneumatic pressure handpump
  - – System B with pneumatic combination handpump (pressure / vacuum)
- Accuracy to ±0.05% F. S.
- 11 different pressure units
- Measures loop current to 24 mA
- Reads pressure and current simultaneously
- Switch test function
- Supplied with fittings for NPT or BSP threads
- Pressure ranges
  - – 0 to 10 psi / 0 to 0.7 bar with vacuum
  - – 0 to 30 psi / 0 to 2 bar with vacuum
  - – 0 to 200 psi / 0 to 15 bar with vacuum

Portable instrument designed for easy and reliable pressure calibration

The JOFRA CPC series is designed for easy and reliable check and calibration of pressure. Use the CPC series in applications such as verification or calibration of pressure gauges, transducers, transmitters, pressure switches, and safety valves. The CPC series is recognized by its high quality and carefully selected features that save time and make calibration tasks easy to perform; e.g. dual information display, transmitter mA reading, min/max recording, peak reading, and semi-automatic pressure switch test finding the closing, opening, and the hysteresis pressure (dead band).

IPI Industrial Pressure indicator

- Available as an indicator or with a pump in a complete system
- Accuracy to ±0.05% of F.S.
- 18 different pressure units
- Ideal for on-site use
- Lightweight and portable with temperature compensation and long battery life
- Pneumatic handpumps from vacuum to 40 bar
- Hydraulic pumps from 0 to 700 bar
- Pressure ranges
  - – 0 to 15 psi / 0 to 1 bar with vacuum
  - – 0 to 30 psi / 0 to 2 bar with vacuum
  - – 0 to 100 psi / 0 to 7 bar with vacuum
  - – 0 to 300 psi / 0 to 21 bar with vacuum
  - – 0 to 500 psi / 0 to 35 bar with vacuum
  - – 0 to 1,000 psi / 70 bar
  - – 0 to 2,000 psi / 140 bar
  - – 0 to 3,000 psi / 200 bar
  - – 0 to 5,000 psi / 350 bar
  - – 0 to 10,000 psi / 700 bar

Pressure indicator offering user-friendly features and reliable performance

JOFRA IPI indicators are the latest addition to our range of pressure instruments. These handy instruments combine 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 even serial communication. The accuracy of the IPI rivals that of a pressure calibrator and is temperature compensated for shop or machine room applications. This versatile unit is available as a stand-alone indicator or in a complete test system.

Standard delivery for pressure calibrators

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 the complete system for repair. Maintenance of the instrument is also made easy. Re-calibration of the unit can be performed locally with an accurate pressure reference: No need to send the unit back to the manufacturer for recalibration. If you do require a factory calibration, the pump and indicator are independent and only the indicator needs to be returned.

JOFRA and JF marine pressure calibrators are as standard delivered as individual indicators or as a complete calibration systems ready for use in a carrying case, including pump, hose, connectors, battery set, test leads, user manual, and traceable calibration certificate.

Frode Pedersen marine sensors - 1800 series

Under the brand name Frode Pedersen AMETEK Denmark offers a series of temperature sensors which are type approved by **classifi**cation societies for marine applications such as measuring exhaust gases and cooling water in diesel engines as well as product and room temperatures in refrigeration stores. These marine type sensors are specially designed with high resistance against vibration according to IEC 68-2-6. The temperature sensors are marine approved by Lloyds Register of Shipping, Germanischer Lloyd, Bureau Veritas, and Det Norske Veritas.

Application: Marine industry and diesel engines for generators

1801 - Type UST 1
Thermocouple assembly for exhaust gasses on minor and medium sized diesel engines.

1802 - Type UST 2
Thermocouple assembly for exhaust gasses on bigger diesel engines. Interchangeable insert and with extension cable.

1803 - Type UST 3
Thermocouple assembly for exhaust gasses on bigger diesel engines. Interchangeable insert.

1804 - Type RM 2
Resistance thermometer for refrigeration and cooling storage.

1805 - Type IM
Resistance thermometer. Needle probe for product temperature.

1806 - Type GM
Resistance thermometer. Rubber sealed for cargo rooms.

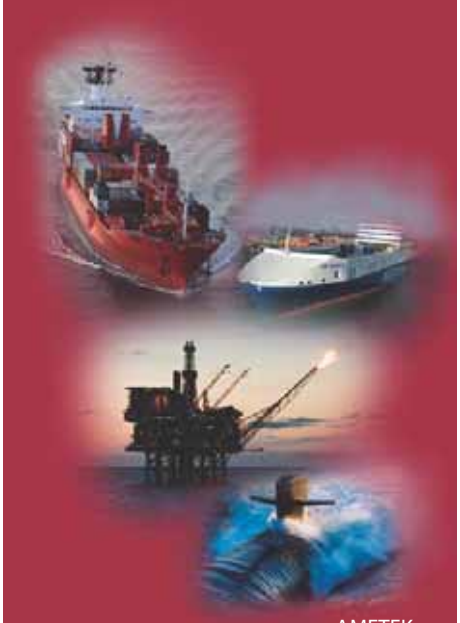
1807 - Type ST
Thermocouple for stern tube bearings.

1808 - Type SM
Resistance thermometer for stern tube bearings.

1809 - Type BFM
Resistance thermometer for ventilation and cooling equipment. Fixed insert with separate pocket.

1810 - Type BM
Resistance thermometer for water, oil etc. Interchangeable insert.

1812 - Type HLM
Resistance thermometer surveillance of bearing temperature on diesel engines.



AMETEK
Calibration Instruments
offers a complete range of calibration equipment for pressure, temperature, and signal - including software.

JOFRA Temperature standards
Portable precision thermometer. Dry-block calibrators: 4 series, more than 20 models - featuring speed, portability, accuracy, and advanced documenting functions.

M&G Primary pressure standards
Pneumatic floating-ball or hydraulic piston deadweight testers - easy-to-use with accuracies up to 0.015% of reading.

JOFRA Pressure standards
Convenient electronic systems ranging from -1 to 700 bar (25 inHg to 10,000 psi) - multiple choices of pressure ranges, pumps, and accuracies, fully temperature-compensated for problem-free and accurate field use.

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

...because calibration is
a matter of confidence

AMETEK is a leading global manufacturer of electrical and electromechanical products for niche markets. Listed on the New York Stock Exchange (AME) since 1930. AMETEK's annual sales exceed $1 billion. Operations are in North America, Europe, and Asia, with about one third of sales to markets outside the United States.