signal

JOFRA calibration

milliAmp Calibrator

mAcal

» Sources and measures current
Allows for calibration of transmitters in a two-wire loop

» Stable source
Internal 24 VDC supply for consistent loop power

» High resolution
Read to 0.001 mA in the measurement mode

» % of full scale reading
Displays a percentage to provide for easy analysis of results

» Timesaving features
Fast one-key-one-function access to the features such as the step function or loop supply power

» Large display
Includes large numbers for unit reading, a percentage display, and dedicated icons for calibrator status including a low battery indicator

» Traceable calibration
For your confidence, the unit is supplied with a calibration certificate that is fully traceable to a national standards lab such as NIST or NPL

» Complete marine program
Part of a complete program of marine approved temperature, pressure and signal calibrators; including temperature sensors

ISO 9001 Manufacturer

Specification Sheet, SS-MACAL

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 and it is delivered with traceable certification.

The keypad is easy-to-use and provides positive tactile feedback. Each key is labeled for easy operation. A large, high-contrast, 5-digit LCD display indicates numeric values in mA, %, V or sec. The resolution is 0.001 mA in measurement mode. The user can change the display to read in % of Full Scale and flow readings are shown in % of Flow.

The display also indicates error codes. Visual warnings are displayed for loop mismatch, reverse polarity and over range. And is also equipped with a user adjustable automatic shut-off feature that prevents accidental battery discharge when the unit is not in use. A built-in, permanent fuse eliminates the need to replace the fuse in the case of overloads: no need to return the unit to the factory to reset or replace the fuse.

The mAcal provides loop power in the range of 0 to 45 VDC and the instrument is designed to generate a stable 24 VDC supply for the loop. The mAcal also reduces the time and complexity often associated with loop calibration. 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 take readings from the control room.

AMETEK®
TEST & CALIBRATION INSTRUMENTS

PWR

Switch between external and internal loop power supply EXT. (the +24 VDC of the current loop is generated by an external power supply) and INT. (the +24 VDC of the current loop is generated by the mAcal itself).

Mains adapter

Connection to mains adapter. 6 VDC, 230 mA.

Note : The mains adapter does not charge rechargeable batteries.

ON/OFF

Switching instrument on/off.

Auto shut-off to extend battery life (user programmable).

mA/% / setup

Alternating between readout in mA and %. If the key is held down for more than 2 sec., a change to SETUP takes place. Under SETUP this key is used to select next parameter.

Auto

AUTO ramp or AUTO-STEP function is started or stopped.

Connection

Connection of + test lead

Connection

Connection of - test lead

Display

Shows numerical value in mA, %, V or sec., and for readout of error codes etc.

FUNC

This key allows for changing functions between SOURCE mA, MEASURE mA and MEASURE Volt function.

Step

The STEP function is activated or de-activated.

Up arrow

Functions to increase entered values or to scroll up.

Down arrow

Functions to decrease entered values or to scroll down.

JOFRA mAcal in softcase

The mAcal calibrator is available separately and are supplied in a handy softcase that allows for complete operation of the unit while in the case. The convenient internal arrangement offers you the space to store test leads.

FUNCTIONAL SPECIFICATIONS

Current source

Range .....0 to 24 mA
Resolution .....0.01 mA
Accuracy (k=2): .....±0.05% of F.S.
Maximum load..... 900 ohm
Temperature coefficient .....0.005% per °C (-10 to 40°C)
.....0.003% per °F (-14 to 104°F)

Current measurement

Range .....0 to 24 mA
Resolution .....0.001 mA
Accuracy (k=2) .....±0.05% of F.S.
Input impedance ..... 10 ohm
Temperature coefficient .....0.003% per °C (-10 to 40°C)
.....0.002% per °F (-14 to 104°F)

Voltage measurement

Range:. ..... 0 to +45 VDC
Resolution ..... 0.1 VDC
Accuracy ..... 0.5 VDC
Input impedance ..... 10M ohm

PHYSICAL SPECIFICATIONS

Power supply

120 VDC Mains Adapters: ....103964, 6 VDC / 240 mA US/
.....Japan - 1.3mm DC female connector
Batteries ..... 4 Type LR6, AA, 1.5 VDC Alkaline
Battery life .....200 hours with external loop power
..... 20 hours with 12 mA output/internal loop power

Instrument weight (incl. batteries, leads and case)

Weight ..... 0.8 lbs /355g

Instrument dimensions (incl. batteries, leads and case)

Size: L x W x H.....6.85 x 2.6 x 1.0 in / 174 x 66 x 26 mm

Miscellaneous

Operating (ambient) temperature-14 to 104°F (-10 to 40°C)
Storage (ambient) temperature .....-4 to 122°F (-20 to 50°C)
CE Conformity.....89/336/EEC, EN50081-1, EN50081-2,
.....EN50082-1. EN50082-2, (91/157/EEC)
The JOFRA mAcal is type approved by Det Norske Veritas.
Find the certificate at www.jofra.com
Approval, Certificate no. A-10549

Fig. 1

Adjusting the instrument

Connect the mAcal to an external reference instrument as shown in Fig. 1.

The mAcal now carries out a self-calibration and adapts its circuits to that measured. Switch on the mAcal. It is now adjusted and ready for use.

Note: The mAcal can only be adjusted in mA. Adjustment of the VDC function is not possible.

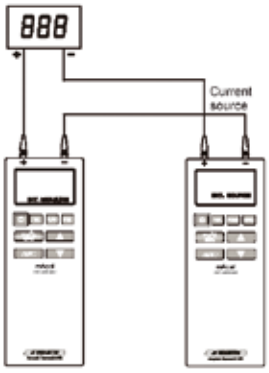

Fig. 2

Calibrating the instrument (measure mA)

Connect the mAcal to an external reference instrument and a current source as shown in Fig. 2.

Calibration is carried out in the following points: 0 mA, 4 mA, 8 mA, 12 mA, 16 mA, 20 mA and 24 mA. If the mAcal displays EEEEE when measuring the 24 mA, you must turn down the current until the EEEEE disappears.

Calibration must subsequently be carried out at a lower value (e.g. 23.995 mA).

The deviation between the read value of the mAcal and the read value of the reference instrument must be 8 µA at a maximum.

Fig. 3

Calibrating the instrument (source mA)

Connect the mAcal to an external reference instrument as shown in Fig. 3.

Calibration is carried out in the following points: 0 mA, 4 mA, 8 mA, 12 mA, 16 mA, 20 mA and 24 mA. The deviation between the adjusted value of the mAcal and the read value of the reference instrument must be 8 µA at a maximum.

ORDERING INFORMATION

75-MACAL mAcal Calibrator with standard accesories

STANDARD DELIVERY

- mAcal Calibrator:
- mAcal
- Soft carrying case
- 2 test leads with crocodile clip
- 4 batteries, type LR6, AA
- User manual

ACCESSORIES

103964	Mains adapter for mAcal - US / Japan
103950	Mains adapter for mAcal - Europe
103957	Mains adapter for mAcal - UK
124716	4x 1,5 Volt rechargeable batteries
124718	Charger for rechargeable batteries - 115/230 VAC

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 ranges from -90°C(-130°F) to 1205°C(2200°F). 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 Pressure 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.

Lloyd Instruments
Materials testing machines and software from Lloyd Instruments guarantees expert materials testing solutions. The comprehensive program also covers 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 Testing Instruments
Hardness testers, durometers, optical systems and software for data acquisition and analysis.

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