

signal



- 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
- Fixed step function
Allows you to easily calibrate linear or flow transmitters and valve positioners
- Manual or automatic stepping function
You can choose to use either method and have 10 to 30 seconds between steps
- 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

ISO 9001 Manufacturer

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JOFRA™ mAcal

milli A mp

cal ibrator

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 and it is delivered **with traceable certification.**



PRODUCT DESCRIPTION

The JOFRA mAcal keypad is easy-to-use and provides positive tactile feedback to the user. 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. Plus, the unit is 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 Loop Calibrator 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 Loop Calibrator also reduces the time and complexity often associated with loop calibration. The instrument features special fixed steps or 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®
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).

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.

Mains adapter

Connection to mains adapter. 6 VDC, 230 mA.
Note: The mains adapter does not charge rechargeable batteries.

FUNC

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

ON/OFF

Switching instrument on/off. Auto shut-off to extend battery life (user programmable).

Step

The STEP function is activated or de-activated.

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.

Up arrow

Functions to increase entered values or to scroll up.

Auto

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

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: -45V to +45 VDC
 Resolution: 0.1 VDC
 Accuracy: ± 0.5 VDC
 Input impedance: 10M ohm

PHYSICAL SPECIFICATIONS

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)

OTHER 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
 Warranty: 2-year Factory Warranty



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.

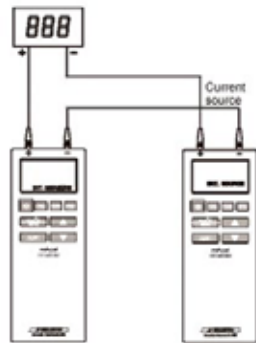


Fig. 2

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

Part No.	Description
75-MACAL	mAcal Calibrator with standard accessories

STANDARD DELIVERY

mAcal Calibrator:

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

ACCESSORIES

Part no.	Description
103964	120 VAC Adapter (US / Japan)
103950	230 VAC Adapter (Euro)
103957	230 VAC Adapter (UK)
124716	4 x 1,5 Volt rechargeable batteries
124718	Charger for 124716 batteries - 115/230 VAC



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

JOFRA Temperature standards
Portable precision thermometer. Dry-block and liquid bath calibrators: 4 series, with more than 20 models - featuring speed, portability, accuracy and advanced documenting functions with JOFRACAL temperature calibration software.

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.

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.

...because calibration is
a matter of confidence

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