



## PRODUCT DESCRIPTION

The AMETEK MODCAL II System is a microprocessor-based calibration system that can be used with pressure, temperature, flow and other forms of process instrumentation. The system is capable of measuring, simulating and calibrating instruments used in critical process control and custody transfer applications. The MODCAL II System is easy-to-use and an ideal solution for complying with ISO9000 and other international quality standards. The system supplies calibration accuracy at  $\pm 0.05\%$  of reading traceable to NIST and other international standards and with its data logging capability supplies the user with objective evidence of the instrumentations' compliance with quality standards. Typical calibrations include:

- |                                    |  |
|------------------------------------|--|
| <input type="checkbox"/> I to P    | <input type="checkbox"/> Flow              |
| <input type="checkbox"/> P to I    | <input type="checkbox"/> DP                |
| <input type="checkbox"/> Millivolt | <input type="checkbox"/> Thermocouple      |
| <input type="checkbox"/> Volt      | <input type="checkbox"/> RTD               |
| <input type="checkbox"/> Current   | <input type="checkbox"/> Liquid Level      |
| <input type="checkbox"/> Pneumatic | <input type="checkbox"/> Gauges & Switches |

The MODCAL II System is designed for fast, convenient and accurate field testing. The self-contained modular system is Year 2000 compliant and packaged in a rugged, weather-resistant housing with everything needed for field test procedures: power supply, pressure source, pressure regulator, RS232C serial data communications, tubing, connectors and carrying strap. The unit is ideal for laboratory use and may be supplied in a panel-mount version for permanent installations.

## MODCAL® II Multi-Function Calibrator & Documentation System

- "Instrument Shop In A Box"**
  - Accuracy  $\pm 0.05\%$  of Indicated Reading
  - Excellent for On-Site Calibrations
- Calibrate and Data Log All Process Instruments:**
  - Pressure, Temperature, Frequency
- Modular Architecture Expands As Your Needs Grow**
- Stores Up to 200 Customized Calibration Programs to Automate the Calibration Process**
- Stores Over 2000 Calibration Records**
- WINDOWS®-based Software for Communication and Data Management**
- Lightweight, Compact, Rugged and Weather Resistant- Portable or Panel-Mount Version**

The MODCAL II System has a modular architecture that allows the user to add functionality and incrementally expand system capabilities as their calibration needs grow. System functionality is achieved by installing calibration modules to the basic system. The following functions are available with the MODCAL II System:

- Battery and/or AC Line Power
- Read transmitter electrical or pneumatic output and provide transmitter excitation
- Check loop continuity, resistance, voltage and current
- Simulate transmitter output, as well as volt, millivolt and milliamp signals
- Supply, Control and Measure Pressure
- Measure and Simulate Temperature
- Measure Frequency and Provide a Frequency Source
- Log records of measurement, simulation and calibration
- Transfer logged data to a personal computer using RS232 serial data communications and WINDOWS-compatible software
- Enter data from an external source
- Calibrate pressure and temperature switches
- Pass/Fail and As Found/As Left on screen indicators
- On-line Calculations
- Calibrate Pressure and Temperature Gauges



## SYSTEM ARCHITECTURE

The MODCAL II System can be comprised of many combinations of calibration modules. The primary system consists of a main chassis assembly which houses the Stationary Display Module. The Stationary Display Module includes the power supplies, LCD Display, membrane keypad, multimeter, transmitter simulator, frequency and datalogging functions. The keypad and LCD display are the main interface with the system. The keypad offers both tactile and audio feedback. The LCD display is a 128 x 128 pixel dot matrix LCD and can display four lines of data simultaneously, e.g. input, output, ideal output and percent of error.

The MODCAL II System can be panel mounted or supplied in an impact-, water- and dust-resistant case which is impervious to many chemicals. The case contains the Stationary Display Module and has slots for housing up to four additional modules. These modules can be combined in any combination of pressure, temperature, regulator or pump modules. A 9 pin RS232C connector is also provided for serial communications to peripherals such as a personal computer or printer.

The Multimeter used in the MODCAL II System is also part of the Stationary Module. Voltage, ohm, frequency and current input posts are located on the instruments front panel. The output posts are also located on the front panel. The multimeter inputs are electrically isolated from all other functions of the system.

### Pressure Module

The Pressure Module is removable and fits into any of the four available slots provided in the system. The module comes as a single unit with autoranging. Pressure ranges are available from 150" H<sub>2</sub>O to 10,000 PSIG ( 400 mBar to 650 Bar) including compound and absolute ranges. Available ranges include:

| Model Code | Range                        |                |
|------------|------------------------------|----------------|
| 600        | 0 - 150 in. H <sub>2</sub> O | 0 - 400 mbar   |
| 610        | 0 - 240 in. H <sub>2</sub> O | 0 - 600 mbar   |
| 620        | 0 - 30 PSIG                  | 0 - 2 bar      |
| 621        | vac - 30 PSIG                | vac - 2 bar    |
| 622        | 0 - 45 PSIA                  | 0 - 2300 mm Hg |
| 630        | 0 - 150 PSIG                 | 0 - 10 bar     |
| 632        | 0 - 145 PSIA                 | 0 - 7400 mm Hg |
| 640        | 0 - 500 PSIG                 | 0 - 35 bar     |
| 650        | 0 - 2500 PSIG                | 0 - 160 bar    |
| 660        | 0 - 5000 PSIG                | 0 - 350 bar    |
| 670        | 0 - 10000 PSIG               | 0 - 700 bar    |

The module is controlled using the keypad and LCD display on the Stationary Module. Selection of engineering units, zero offset and added features are included. The Pressure Module may be set for the following engineering units:

- PSI** (pounds per square inch)
- mbar** (millibars)
- in Hg** (inches of Mercury @ 0°C)
- mm Hg** (millimeters of Mercury @ 0°C)
- in WC** (inches of water @ 20°C)
- kg/cm<sup>2</sup>** (kilograms per square centimeter)
- bar** (bars)

- kPa** (KiloPascals)
- mm WC** (millimeters of water @ 20°C)
- ft WC** (feet of water @ 20°C)
- cm WC** (centimeters of water @ 20°C)
- in WC6** (inches of water @ 60°F)
- mPa** (milliPascals)
- in WC4** (inches of water @ 4°C)
- ft WC4** (Feet of water @ 4°C)
- %** (Percent of full scale)
- 4-20** (4-20mA calculated units)
- 1-5V** (1-5Vdc)
- Cust** (Custom units)
- Flow** (Square root function for DPs)

### Temperature Module

The Temperature Module is also removable and it also fits into any of the available four slots provided in the system. This module measures and simulates thermocouples and RTD temperature probes. The Temperature Module is programmed with the mV/temperature equations for the appropriate thermocouple types and the ohms/temperature equations for the appropriate RTD type as established by NIST and DIN standards. The input signals may be displayed in Celsius, Fahrenheit, Rankin or Kelvin.

The Temperature Module uses standard banana plug connections for 2-, 3- and 4-wire RTDs, and either a thermocouple plug or banana plug connection for thermocouples. The thermocouple input is either on a thermocouple plug connection or on two input posts located on the front of the Temperature Module. RTD input is provided on four posts located on the Temperature Module's front panel. Cold junction compensation for thermocouple measurements is either automatic at ambient temperature or manually set to another temperature. All control and output display data are done from the keypad and display on the Stationary Display Module. The display format allows an operator to set temperature ranges, to designate the RTD or thermocouple being used, and to select calculated values to aid in instrument calibration. Selection of engineering units of measure, zero offset and other features are included. Various temperature engineering units may be selected using the Temperature Module including:

- C** (Temperature displayed in degrees Centigrade)
- F** (Temperature displayed in degrees Fahrenheit)
- K** (Temperature displayed in degrees Kelvin)
- R** (Temperature displayed in degrees Rankin)
- W/mV** (Ohms or millivolts)
- Cjct** (Cold Junction)
- JTC** (J Type Thermocouple)
- KTC** (K Type Thermocouple)
- TTC** (T Type Thermocouple)
- ETC** (E Type Thermocouple)
- RTC** (R Type Thermocouple)
- STC** (S Type Thermocouple)
- R48TC** (R Type Thermocouple 1948 NIST Curve)
- S48TC** (S Type Thermocouple 1948 NIST Curve)
- BTC** (B Type Thermocouple)
- Pt100** (Platinum RTD, 100 Ohms, 0.385 Alpha)
- P200A** (Platinum RTD, 200 Ohms, 0.385 Alpha)
- P200B** (Platinum RTD, 200 Ohms, 0.392 Alpha)
- Ni100** (Nickel RTD, 100 Ohms)

### Pump Module

The Pump Module is available in 100 PSI (7 Bar) or 200 PSI (14 Bar) ranges. The Pump Module provides two pressure outputs. One output is used to sense the pressure using a Pressure Module and the other output is connected to the instrument under test.

### Pressure Regulator Module

The Regulator Module is available in ranges of 2, 10, 30 and 100 PSI (100 mBar, 700mBar, 2 Bar, 7 Bar). The Regulator provides two pressure outputs. One output is normally connected to a Pressure Module to sense the pressure. The other output is connected to the instrument under test.

### Excitation/Simulate/Loop Output

In the Excitation mode, the MODCAL II System may be a programmable voltage, current or frequency source. In the Simulate mode, the instrument simulates a current transmitter by controlling the current in an external circuit. In the Loop mode, the system generates its own 24Vdc current loop circuit to power and monitor current loop transmitters. The loop current is sensed for display in the main system. The output is supplied on the two posts located on the front panel.

### Calculator

The MODCAL II System includes a calculator function. The Calculator will take the displayed reading from the Meter, Excitation or one of the modules and perform a numerical calculation. The result of this calculation will be displayed including a Pass/Fail indication based on user-defined error limits.

The Calculator has two options: Percent Error and Custom. The Percent Error is a calculation based on the instrument under test output and the reference measurement. The reference measurement is the calculated output or theoretical output for the instrument under test.

Custom allows the user to input equations using: Addition, Subtraction, Multiplication, Division, Raise to the Power, Cosine, Sine, Sign function, Absolute, Square Root and Negation. The maximum amount of characters that may be entered into an equation is 99.

### Data Logger

The Data Logger is an available option. The Data Logger records ambient temperature, date and time as well as the data displayed by the Stationary Display Module's LCD display. It allows for the transferring of instrument data using an ASCII format. Data is stored on-board the MODCAL II System with 256K of allocated memory- sufficient to store up to 2048 records. The data is protected by a 3-year lithium battery and are unaffected by any power loss from the AC line or from the system's rechargeable NiCad batteries.

Data may be logged for AS-FOUND data, AS-LEFT data or other measurements. The records provide objective evidence of calibration to meet requirements from customers, quality management and external quality systems including ISO, FDA, etc.

Data logging may be done manually by the user, or may be done unattended by the automatic data logging feature. This feature allows the unit to record any number of readings for any time unit, e.g., one record per hour. Available time units are seconds, minutes, hours, days, weeks and periods. Period is a variable time unit related to a "Start Logging Time" and "Stop Logging Time".

### Bi-directional Interface Software

The MODCAL II System is equipped with a bi-directional interface software package called MC LINK II. This is an enhanced version of the former MC LINK software which allowed only the downloading of the data from the MODCAL II device. MC LINK II Software is Year 2000 Compliant. The former MC LINK Software is not Year 2000 Compliant and should be replaced by the newer version.

MC LINK II Software is greatly enhanced over the MC LINK software. Using the MC LINK II WINDOWS®-based software, the user can store instrument data and organize data by instrument tag, technician, location, date, etc. Using this information, users can automate the calibration schedule within the MODCAL II System. The MODCAL II System can then be used to generate calibration work orders for the technicians on a daily basis or a user-defined schedule. Using the tag identification, the technician can "call up" the instrument to be calibrated, perform the calibration based on pre-programmed parameters, and record the instrument's as-found/as-left data, time, date of calibration and ambient temperature with a single push of a button. The MODCAL II System with MC LINK II software eliminates problems such as lost records or transposition errors. Customers with non-data logging units may utilize MC LINK II Software only to prepare calibration record formats on the personal computer and for downloading these formats to the MODCAL II System.

Key features of the MC LINK II software include:

- ❑ a "Wizard" function allowing users to generate custom calibration record formats and upload them into the MODCAL System
- ❑ ability to export data in database (.dbf) or ASCII comma delimited (.csv) formats
- ❑ a variety of setup options for communications and date/time format
- ❑ ability to SEND, RECEIVE and DELETE data, tags, formats and procedures to/from a MODCAL II calibration device
- ❑ ability to generate standard calibration reports containing "As Found/As Left" data

The recommended hardware requirements for operating the MC LINK II Interface Software are:

#### *Recommended*

- 133 MHz PENTIUM or Greater
- 16MB of RAM
- WINDOWS 95 Operating System

#### *Minimum Requirements*

- 33 MHz 486DX
- 4MB of RAM
- WINDOWS 3.1 Operating System

# FUNCTIONAL SPECIFICATIONS

## General Instrument Specifications

### CASE

**Size (W x H x D):** 14.25 x 11.85 x 7.66-inches  
36.2 x 30.1 x 19.5cm

**Weight:** 16.6 lbs (7.5kg)  
Weight of portable case with Stationary Display Module, two Pressure Modules, a Temperature Module, a Pump Module with cover, charger and accessories.

**Keypad:** Field and alpha increment, decrement, 4 cursor controls, 5 functions, menu, Quit, Help, On/Off and backlight key

**Display:** 128 x 128 pixel dot matrix LCD

**Comm Port:** 9 Pin Connector, RS232C with programmable baud rates from 300 to 19,200

**Datalogger:** 256K memory capable of storing up to 2000 records

**Power Input:** AC 115Vac  $\pm 10\%$  @ 50/60 Hz  
220/250Vac (switchable)  $\pm 10\%$  @ 50/60Hz  
AC input from external charger  
DC 14-18Vdc

**Battery:** 9.2V @ 2.2 ampere hours NiCad rechargeable from external AC/DC input. 15 hours recharge time @ rated line voltage with unit turned off; battery charging indicator; 15 calibration cycles typical per charge

**Battery Life:** 1000 charge/discharge cycles

**Battery Monitor:** System Status Display indicates % remaining

**Operating Temperature:** 32° to 122°F ( 0° to 50°C)

**Storage Temperature:** -4° to 140°F (-20° to 60°C)

**Warm-Up Time:** 15 minutes for rated accuracy



The Stationary Display Module includes the power supplies, LCD Display, membrane keypad, multimeter, transmitter simulator, frequency and datalogging functions. The keypad and LCD display are the main interface with the system. The keypad offers both tactile and audio feedback. The LCD display is a 128 x 128 pixel dot matrix LCD and can display four lines of data simultaneously, e.g. input, output, ideal output and percent of error.

## Pressure Module

### Model Range and Units

| Model | Range and Units                    |
|-------|------------------------------------|
| 600   | 150" H <sub>2</sub> O (400mbar)    |
| 610   | 240" H <sub>2</sub> O (600mbar)    |
| 620   | 30 PSIG (2 bar)                    |
| 621   | 30 PSI Compound (400mbar Compound) |
| 622   | 45 PSIA (2300mm Hg Absolute)       |
| 630   | 150 PSIG (10 bar)                  |
| 632   | 145 PSIA (7400mm Hg)               |
| 640   | 500 PSIG (35 bar)                  |
| 650   | 2500 PSIG (160 bar)                |
| 660   | 5000 PSIG (350 bar)                |
| 670   | 10000 PSIG (700 bar)               |

### Media Compatibility

Air, Nitrogen, Water, Natural Gas, Hydraulic Oil, Alcohol, Glycol plus gases or liquids compatible with 316L Stainless Steel

### Model 600 Only

Limited to media that will not attack polyester, silicon or silicon-based adhesives.

### Accuracy

20 to 100% Full Scale:  $\pm 0.05\%$  of Reading plus 1 count @ 18 to 28°C  
0 to 20% Full Scale:  $\pm 0.02\%$  Full Scale plus 1 count @ 18 to 28°C  
Warmup Time approximately 15 minutes

### Model 632 Only

20% to 100% Full Scale:  $\pm 0.075\%$  of Reading plus 1 count @ 18 to 28°C  
0 to 20% Full Scale:  $\pm 0.03\%$  Full Scale plus 1 count @ 18 to 28°C

### Compensated Temperature

0 to 45°C

### Accuracy Over Temperature

$\pm 0.05\%$  Full Scale. In order to enhance accuracy, full scale is automatically reranged at 100%, 60% and 20% of maximum full scale

### Overpressure

300% stability Full Scale

### Pressure Connections

1/4-inch NPT Female

### Response Time

0.5 seconds maximum for 63% Full Scale

### Zero Adjust

$\pm 100\%$  Full Scale of selected range

### Engineering Units

PSI  
mbar  
Bar  
kPa  
MPa  
inches Hg  
mm Hg  
Inches H<sub>2</sub>O 68°F (20°C)  
inches H<sub>2</sub>O 60°F (15°C)  
Feet H<sub>2</sub>O 68°F (20°C)  
Feet H<sub>2</sub>O 40°F (4°C)  
mm H<sub>2</sub>O 68°F (20°C)  
mm H<sub>2</sub>O 40°F (4°C)  
cm H<sub>2</sub>O 68°F (20°C)  
cm H<sub>2</sub>O 40°F (4°C)  
kg/cm<sup>2</sup>

### Specialty Units

% output displayed as percent of FS  
4-20 output in mA displayed as function of input pressure  
1-5 output in volts displayed as function of input pressure  
Flow output in mA displayed as square root function of the input pressure

## Pump Module

### 100 PSI (7 Bar) MODULE

**Operating Pressure**  
100 PSIG (7Bar)

**Burst Pressure**  
150 PSIG (10 Bar)

**Maximum Leak Rate**  
0.05 PSIG per minute (3.5mbar per minute)

**Pressure Connection**  
1/8-inch NPT Female

**Tubing**  
1/8-inch I.D.  
100 PSIG (7 Bar) maximum

### 200 PSI (14 Bar) MODULE

**Operating Pressure**  
200 PSIG (14Bar)

**Burst Pressure**  
250 PSIG (17 Bar)

**Maximum Leak Rate**  
0.1 PSIG per minute (7.0mbar per minute)

**Pressure Connection**  
1/8-inch NPT Female

**Tubing**  
1/8-inch I.D.  
200 PSIG (14 Bar) maximum

## Regulator Module

**Supply Pressure Maximum**  
150 PSIG (10 Bar)

**Regulator**  
2 PSIG (100mBar)  
10 PSIG (700mBar)  
30 PSIG (2 Bar)  
100 PSIG (7 Bar)

**Optimum Supply**  
5 PSIG (350mBar)  
30 PSIG (2 Bar)  
60 PSIG (4 Bar)  
150 PSIG (10 Bar)

**Regulator**  
2 PSIG (100mBar)  
10 PSIG (700mBar)  
30 PSIG (2 Bar)  
100 PSIG (7 Bar)

**Minimum Setting  
(at optimum supply)**  
0 PSIG (0mBar)  
0 PSIG (0 Bar)  
0.5 PSIG (35 Bar)  
2 PSIG (100 Bar)

**Sensitivity**  
0.25" H2O

**Supply Pressure Effect**  
0.2psi/100 PSIG change (10mBar/7 Bar)

**Materials of Construction (In Contact with Media)**  
Aluminum, Stainless Steel, Brass, Cadmium-plated Steel, Buna-N and Dacron, Polyurethane, Copper and Nylon

**Pressure Connections**  
1/8-inch NPT Female



### Modularity, Flexibility

The MODCAL II System features a modular architecture allowing users to add functionality and performance as their needs change and expand. Modules simply “plug into” the MODCAL II System.

# FUNCTIONAL SPECIFICATIONS

## Temperature Module

### Accuracy

Limits for thermocouples are referenced to 73.4°F (23°C) cold junction

| Type                      | Range                    | Accuracy Over Compensated Temp Range |        |
|---------------------------|--------------------------|--------------------------------------|--------|
| J                         | 2190 to 32°F             | ±1.1°F                               |        |
|                           | 32 to -256°F             | ±1.5°F                               |        |
|                           | 1200 to 0°C              | ±0.6°C                               |        |
|                           | 0 to -160°C              | ±0.8°C                               |        |
| K                         | 2496 to 32°F             | ±1.3°F                               |        |
|                           | 32 to -202°F             | ±1.6°F                               |        |
|                           | 1369 to 0°C              | ±0.7°C                               |        |
|                           | 0 to -130°C              | ±0.9°C                               |        |
| T                         | 750 to 32°F              | ±1.4°F                               |        |
|                           | 32 to -229°F             | ±2.0°F                               |        |
|                           | 399 to 0°C               | ±0.8°C                               |        |
|                           | 0 to -145°C              | ±1.1°C                               |        |
| E                         | 1830 to 32°F             | ±0.9°F                               |        |
|                           | 0 to -211°F              | ±2.1°F                               |        |
|                           | 999 to 0°C               | ±0.5°C                               |        |
|                           | 0 to -135°C              | ±1.2°C                               |        |
| R/S<br>1968               | 3212 to 1292°F           | ±2.9°F                               |        |
|                           | 1292 to 77°F             | ±3.4°F                               |        |
|                           | 1767 to 700°C            | ±1.6°C                               |        |
|                           | 700 to 25°C              | ±1.9°C                               |        |
| R<br>1948                 | 3092 to 1292°F           | ±2.9°F                               |        |
|                           | 1292 to 77°F             | ±3.4°F                               |        |
|                           | 1700 to 700°C            | ±1.6°C                               |        |
|                           | 700 to 25°C              | ±1.9°C                               |        |
| S<br>1948                 | 3200 to 1292°F           | ±2.9°F                               |        |
|                           | 1292 to 77°F             | ±3.4°F                               |        |
|                           | 1760 to 700°C            | ±1.6°C                               |        |
|                           | 700 to 25°C              | ±1.9°C                               |        |
| B                         | 3270 to 1832°F           | ±1.1°F                               |        |
|                           | 1832 to 1112°F           | ±1.6°F                               |        |
|                           | 1112 to 752°C            | ±2.5°C                               |        |
|                           | 752 to 482°C             | ±6.8°C                               |        |
|                           | 1799 to 1000°C           | ±0.6°C                               |        |
|                           | 1000 to 600°C            | ±0.9°C                               |        |
| Pt 100 .385<br>(IEC 751)  | 1560 to -326°F           | ±0.9°F                               |        |
|                           | 849 to -199°C            | ±0.5°C                               |        |
|                           | Pt 200 .385<br>(IEC 751) | 509 to -326°F                        | ±0.9°F |
|                           |                          | 265 to -199°C                        | ±0.5°C |
| Pt 200 .390<br>(IEC 751)  | 509 to -290°F            | ±0.9°F                               |        |
|                           | 265 to -179°C            | ±0.5°C                               |        |
| Ni 100 DIN<br>(DIN 43760) | 354 to -74°F             | ±0.9°F                               |        |
|                           | 179 to -59°C             | ±0.5°C                               |        |

### Compensated Temperature

0 to 45°C

### Output Impedance

<200 Ohms

### Input/Output Resolution

|               |                                   |
|---------------|-----------------------------------|
| Thermocouples | 0.1°C                             |
| RTD           | 0.1°C                             |
| Millivolts    | 0-20mV -0.001mV<br>20-70mV 0.01mV |
| Ohms          | 18-400 Ohms 0.01 Ohms             |
| Units         | °C, °F, K, °R                     |

## Multimeter/Loop/Frequency Module

### Multimeter Accuracy

10 to 100% FS: ±0.05% or reading ±1 count @ 18 to 28°C  
 0 to 10% FS: ±0.01% FS ±1 count @ 18 to 28°C  
 0 to 100% FS: ±0.05% FS ±1 count @ 0 to 18°C and 28 to 45°C

### Input Voltage

0 to 50Vdc/100Vdc maximum  
 200mVdc FS (0.01mV resolution)  
 50Vdc FS  
 0 to 20Vdc (0.001V resolution)  
 20 to 50Vdc (0.01V resolution)

### Input Current (DC)

0 to 55mA/55mA maximum  
 0 to 20mA (0.001mA resolution)  
 20 to 50mA (0.01mA resolution)

### Input Ohms

0 to 2000 ohms (0.1 ohm resolution)  
 2000 to 20000 ohms (1 ohm resolution)

### Input Isolation

300Vdc from meter ground to excitation ground

### Input Frequency

2 Hz to 100 KHz

### Accuracy

±0.05% reading ±1 count

### Range

Hz  
 2 to 1 kHz (0.01 Hz resolution)  
 1 kHz to 50 kHz (0.1 Hz resolution)  
 10 kHz to 100 kHz (1 Hz resolution)

kHz  
 2 Hz to 1 kHz (0.1 Hz resolution)  
 1 kHz to 100 kHz (1 Hz resolution)

### Input Voltage

2 Hz to 50kHz - 150mV p/p to 10V p/p  
 50 kHz to 100 kHz - 300mV p/p to 10V p/p

### Excitation Accuracy

±0.05% ±1 count of reading @ 0 to 45°C

### Output Voltage

0 to 12Vdc into >2000 ohms  
 0 to 200mV - 0.01mV resolution  
 0 to 12Vdc - 0.001V resolution  
 22 to 26Vdc unregulated @ 55mA

### Output Current

0 to 55mAdc into <400 ohms  
 0 to 20mA - 0.001mA resolution  
 20 to 55mA - 0.01mA resolution

### Output Frequency Accuracy

±0.05% ±1 count of reading @ 0 to 45°C

### Range

5 Hz to 20 kHz  
 5 to 1 kHz (0.01 Hz resolution)  
 1 kHz to 10 kHz (0.1 Hz resolution)  
 10 to 20 kHz (1 Hz resolution)

### Output Increments

±5% of reading

### Output Voltage

0.5V to 12V FS p/p into > 2k ohm load (0.01V resolution)

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## ORDERING INFORMATION

### MODCAL II CALIBRATION SYSTEM

| Order Number | Description  |
|--------------|--|
|              | <b>Base Number - Enclosure Type (Note 1)</b>                             |
| 100          | Portable MODCAL II System with 115Vac Battery Operation                  |
| 100D         | Portable MODCAL II System with Data Logger, 115Vac Battery Operation     |
| 110          | Portable MODCAL II System with 220/250Vac Battery Operation              |
| 110D         | Portable MODCAL II System with Data Logger, 220/250Vac Battery Operation |
| 150          | Panel-Mount MODCAL II System with 115Vac Operation                       |
| 150D         | Panel-Mount MODCAL II System with Data Logger, 115Vac Operation          |
| 160          | Panel Mount MODCAL II System with 220/250Vac Operation                   |
| 160D         | Panel-Mount MODCAL II System with Data Logger, 220/250Vac Operation      |
|              | <b>Function Modules - Temperature Type</b>                               |
| 200          | Temperature Module   |
|              | <b>Function Modules -Pressure Pump Type</b>                              |
| 300          | 100 PSIG (7 Bar)   |
| 310          | 200 PSIG (14 Bar)  |
|              | <b>Function Modules -Pressure Regulator Type</b>                         |
| 400          | 2 PSIG (0.1 Bar)   |
| 410          | 10 PSIG (0.7 Bar)  |
| 420          | 30 PSIG (2 Bar)  |
| 430          | 100 PSIG (7 Bar)   |
|              | <b>Function Modules -Pressure Measuring Type</b>                         |
| 600          | 150" H2O (0.4 Bar)   |
| 610          | 240" H2O (0.6 Bar)   |
| 620          | 30 PSIG (2 Bar)  |
| 621          | Vacuum to 30 PSIG (2 Bar)  |
| 622          | 45 PSIA (2300mm Hg)  |
| 630          | 150 PSIG (10 Bar)  |
| 632          | 145 PSIA   |
| 640          | 500 PSIG (35 Bar)  |
| 650          | 2500 PSIG (160 Bar)  |
| 660          | 5000 PSIG (350 Bar)  |
| 670          | 10000 PSIG (700 Bar)   |

### MC LINK II INTERFACE SOFTWARE

| Order Number | Description  |
|--------------|--|
| 805          | MC LINK II Software for WINDOWS with Format Wizard (See Note 1)  |
| 810          | Application Protocol Interface (API) for WINDOWS (See Note 2)  |
| Note 1:      | MC LINK II Software for WINDOWS with Format Wizard is provided standard with all portable and panel mount MODCAL II Systems. Users can update older version MODCAL II System with this new software if not currently equipped. MC LINK Software users MUST upgrade to MC LINK II Software due to Year 2000 issues. |
| Note 2:      | Application Protocol Interface for WINDOWS provides users with the ability to develop software drivers for the MODCAL II System and their own specific application programs. Please consult AMETEK prior to ordering.  |

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