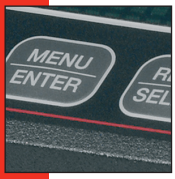
AMETEK®
TEST & CALIBRATION INSTRUMENTS

User Manual

Industrial Pressure Indicator

AMETEK JOFRA IPI Mk. II





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1.0 Introduction

The IPI Mk. II combines the high accuracy of digital electronics with the convenience and ease of use of an analog test gauge. Accurate to ± 0.05% FS, the IPI Mk. II can be used as a calibration reference, or in any application where high accuracy pressure measurement is required.

Many user configurable functions have been designed into the IPI Mk. II including sampling rate, TARE, damping, auto shut off, and min-max. Once the gauge is configured, settings can be locked and password protected to prevent unauthorized changes to configuration.

Optional data logging software.

IPILOG Software extends the functions of the JOFRA IPI Mk.II.

The Software lets you:

- Set up data logging configuration in IPI Mk.II
- Upload logged data from IPI Mk.II, including export of run data to text, comma separated values (CSV), and Excel files
- Clear logged data in IPI Mk.II

1.1 Contacting Ametek

Sales & Service Offices:

AMETEK MCT (North America)
Tel: +1 (727) 536 7831 • chatillon.fl-lar@ametek.com

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AMETEK Lloyd Instruments (UK)
Tel: +44 (0)1243 833 370 • uk-far.general@ametek.co.uk

1.2 Standard Equipment

Check to see that your IPI Mk. II has arrived intact. Batteries are factory installed. Save the packing materials at least until you have verified that there is no concealed damage.

1.3 Safety information

A Warning identifies conditions and actions that pose hazard(s) to the user; a Caution identifies conditions and actions that may damage the Calibrator or the equipment under test.

1.4 Symbols Used

The following table lists the International Electrical Symbols. Some or all of these symbols may be used on the instrument or in this manual.

Symbol	Description
	Power OFF
	Power ON
	Earth ground
	Risk of Danger. Important information. Refer to manual.
	Battery
	Hazardous Voltage
	Conforms to ATEX requirements
	Certified by CSA as conforming to relevant Canadian and USA standards
	Conforms to relevant European Union directives.
	Wheeled bin, conforms to EC directive 2002/96/EC

Hazard Location Information/Approvals

⚠ *Ex Hazardous Areas* ⚠

An Ex-hazardous area as used in this manual refers to an area made hazardous by the potential presence of flammable or explosive vapors. These areas are also referred to as hazardous locations, see NFPA 70 Article 500.

 ® LR110460
Class I, Div. 2, Groups A-D

II 3 G EEx nA IIB T6
KEMA 06ATEX0014 X
Ta=–10°C... +55°C

1.5 Special Conditions for Safe Use:

Misuse

Should the IPI Mk. II be exposed to overpressure or sudden physical shock (i.e. being dropped) it should be examined for any damage that may cause a safety concern. If in doubt please return the unit for evaluation to Ametek. Please refer to the Customer Service Section for contact information.

WARNING

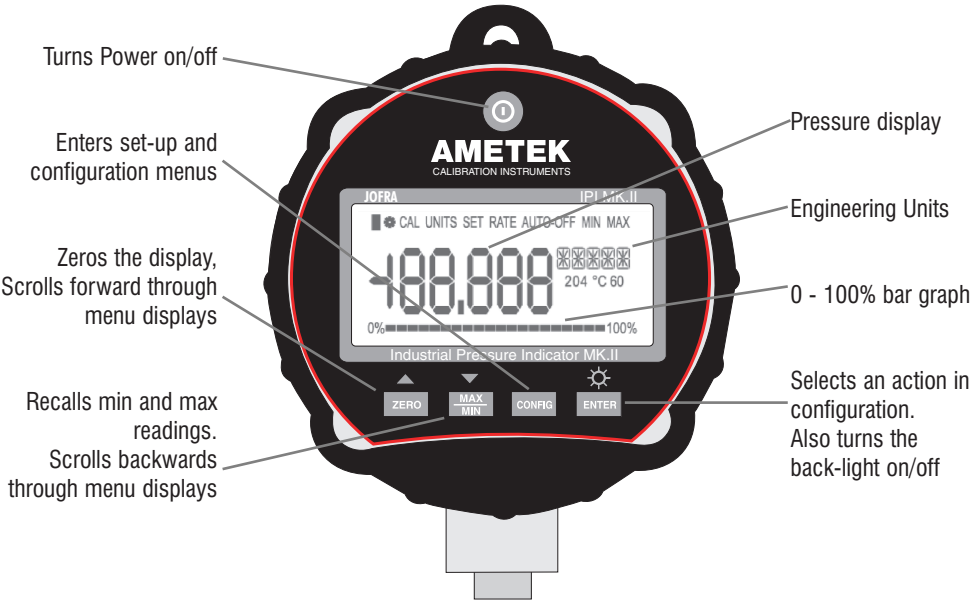
The IPI Mk. II is not intended for use with flammable substances and is intended for installation only in locations providing adequate protection against the entry of solid foreign objects or water capable of impairing safety.

Caution

To avoid possible damage to calibrator or to equipment under test:

- If the message changes to "OL" the range limit is exceeded and the pressure source must immediately be removed from the IPI Mk. II to prevent damage to the pressure transducer inside.
- Maximum torque allowed is 13,5 Nm = 10 ftlbs. NEVER exceed the torque allowed.

2.0 IPI Mk. II Display and Controls



3.0 Operation

Power: The standard IPI Mk. II is supplied with 3 AA batteries installed. Push the power button momentarily to turn the unit on. Push it again to turn it off.

Set-up and configuration:

Push the CONFIG button to access the user-settable functions on the gauge. Each time the CONFIG button is pressed; the display advances to the next function. Once a function has been set, press ENTER to exit the configuration menu, or CONFIG to continue with further configuration. In order, the configuration menu and operation is as follows:

1. **Engineering Units set**. The unit is shipped configured to display PSI. By pressing the ▲ and ▼ (ZERO and MAX/MIN) keys you can scroll forward and backwards through the 18 standard engineering units plus a one custom unit/scale. When the desired unit is displayed, press ENTER or CONFIG. Pressure will now be displayed in the chosen engineering units.

   See the Specifications section of this manual for a list of available engineering units. See the Supervisory Mode section for details on setting up custom units.

2. **Set Auto Off**. The auto-shut off can be set in 1 minute increments from 1 to 30 minutes or “off” (continuous operation). The unit is shipped set for 30 minutes. Use the ▲ and ▼ keys to set the desired interval. The “off” setting is at the low end of the choices, below 1 minute.
3. **Display battery voltage**. Actual voltage and a percent of life bargraph indicate battery condition
4. **Display actual temperature**. The IPI Mk. II is temperature compensated, this displays the temperature measured by the internal sensor. The value can be set to degrees F or degrees C using the arrow keys.
5. **Set damping**. Choices are “on” and “off” set with the ▲ and ▼ keys. Turning damping on will smooth readings from pulsating pressure sources.
6. **Set sample rate**: This determines how often pressure is sampled and the display is updated. Choices are 0.5, 1, 3, and 10 samples/ second. Note that 10/sec provides the fastest response time.
7. **Set TARE**. This allows you to set a constant offset value, which is then subtracted from the measured pressure. For example if a TARE is set at 30 PSI, and the measured pressure is 37 PSI, the displayed value will be 7 PSI.
   A pressure of 27 PSI would be displayed as –3 PSI.

   The tare value is set manually with the ▲ and ▼ keys, and is based on the engineering units and resolution selected for display. TARE value can be set to the maximum range of the gauge.

   The bar graph will always display the actual pressure based on the full range of the gauge regardless of the tare setting. This is done for safety to insure that even with a “0” reading that pressure is being applied to the gauge.
8. **Function Lock**: Access to each of the settable parameters above can be turned “off” once set, to prevent unauthorized changes to configuration. This is accomplished through a password protected “supervisory mode”. Press ENTER to access the supervisory mode, or CONFIG to return to normal operation.

4.0 Supervisory Mode

Push the CONFIG button to access the user-settable functions on the indicator. Each time the CONFIG button is pressed; the display advances to the next function. Press CONFIG repeatedly until "FUnC LOCK" is displayed.

Press ENTER when "FUnC LOCK" is displayed, PWRD will be displayed on the gauge. The password to enter supervisory mode is 101, set using the ▲ and ▼ keys. Holding a key continuously will cause the display to advance more quickly for faster setting. The password is factory set and cannot be changed.

1. Your IPI Mk. II is shipped from the factory with all setting access "unlocked" or available to be changed.
2. In supervisory mode each of the parameters can be locked or unlocked using the ▲ and ▼ keys. Select LOC (lock) for those parameters you do not want to be accessible, and UnLOC (unlock) for those can be accessed.
3. In order, the functions that can be unlocked, locked or accessed are:
   - Zero function (enable/disable)
   - Set pressure units (enable/disable)
   - Auto shutdown adjustment (enable/disable)
   - Damping settings (enable/disable)
   - Sample rate setting (enable/disable)
   - Tare setting (enable/disable)
   - Custom engineering units (set scale factor)
4. Use the CONFIG key to scroll through the above choices, and the ▲ and ▼ keys to lock and unlock features. Press CONFIG to continue scrolling through the parameters, pressing ENTER at any point saves your settings and returns the gauge to normal operation.

   When a function is "locked", it cannot be accessed or changed from its current state. To change a locked function, enter the supervisory mode, and unlock the function. Once it is changed, you may enter supervisory mode to lock access again.
5. Setting a custom engineering unit or scale: The last menu choice in supervisory mode is SET FACTR. This allows you to set a multiplier factor from 0.001 to 100, creating a custom scale. The set factor will be multiplied by the PSI measured, the result will be displayed.

   For example: 40 PSI is the equivalent of 1000 lbs of product in a tank. You want to display the product weight , using a 100 PSI gauge. By setting a factor of 25, a 40 PSI pressure would display as 1000 (40 x 25). The engineering unit displayed on the IPI Mk. II will be "Cust".

5.0 Normal Operation

Turning the backlight on and off: Press the ENTER button.

Zeroing the display: Press and hold the ZERO button.

Note: For absolute versions of the gauge pressing the zero key will prompt the user to enter a barometric reference pressure. Use the ▲ and ▼ arrow to adjust the reading as required. Then press ENTER.

MAX/MIN: The IPI Mk. II stores minimum and maximum pressure values in memory. Pressing the MAX/MIN button once will display the minimum pressure from memory. Pressing the MAX/MIN button again will display the maximum pressure from memory. After about 2 seconds, the gauge returns to normal (live display) operation. To clear the MAX/MIN memory registers, press and hold the MAX/MIN button for 2 or more seconds until “CLr” is displayed.

The analog bar graph at the bottom of the display indicates the applied pressure level relative to the full range of the gauge. Keep in mind that if a TARE value has been programmed into the gauge, the displayed pressure will not reflect the true pressure applied.

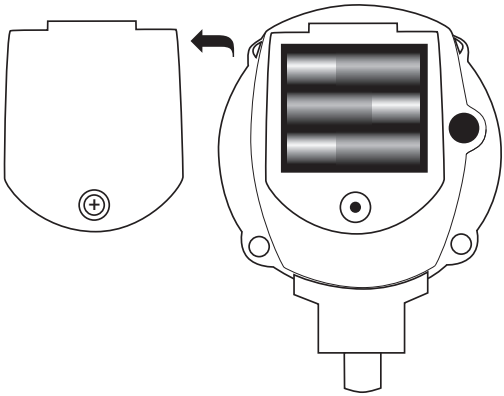
6.0 Changing the Batteries

⚠ WARNING ⚠

Explosion hazard

Batteries must only be changed in an area known to be non-hazardous.

Loosen the captive screw on the battery door, then remove the battery door to expose the 3 AA batteries. Replace the batteries as required and then reinstall the battery door and tighten the captive screw.



Battery life

Battery life is about 1500 hours (60 days) of continuous use with the backlight off. With intermittent use, batteries could last a year or more. There is a low battery icon in the upper left of the display. It will appear when battery level is low. Replace batteries per recommendations found in the specifications section of this manual.

RS-232 Interface

An RS-232 interface is standard on the IPI Mk. II. Serial communication can be used for configuration, calibration, and to transfer measurement data from the gauge.

⚠ WARNING ⚠

The RS-232 interface must not be used in hazardous areas.

7.0 Cleaning

To clean the IPI Mk. II use a cloth with a mild cleaning solution.

8.0 Specifications

All specifications cover the temperature range from 0°C to +50°C, unless otherwise noted.

Available Input Ranges

See page 13 for a table of available ranges in PSI plus equivalent ranges and resolution for all engineering units

Accuracy

Positive Pressure: ±0.05% FS

Vacuum:

100, 300, 500 PSI indicator / 7, 21, 35 bar indicator: ±0.25% F.S.

Vacuum:

30 PSI / 2 bar indicator: ±0.1% F.S.

Over Pressure Protection:

Ranges from 15 PSI to 500 PSI/1 to 35 bar: 3X input pressure range

1,000, 3,000, and 5,000 PSI/70 to 350 bar ranges: 2X input pressure range

10,000 PSI/700 bar: 1.5X input pressure range
Overload Alarm (indicate OL on display): 1.2X input pressure range

Temperature Compensation

Full temperature compensated:

0 °C to +50 °C (32 °F to +122 °F) to rated accuracy

Note: For temperatures from –10 °C to 0 °C and 50 °C to 55 °C add .005% F.S./°C

Standard Engineering Units

PSI, Bar, kg/cm^2, inH_2O (4 °C, 20 °C or 60 °F),

ftH_2O (4 °C, 20 °C or 60 °F), cmH_2O (4 °C and 20 °C), mH_2O (4 °C and 20 °C), KPa, mBAR, inHg, mmHg, Torr

One custom unit (user programmable)

Media Compatibility

Liquids and gases compatible with 316 stainless steel

Environmental

Operating Temperature: -10 °C to +55 °C

Storage: -20 °C to +70 °C (-4 °F to +158 °F)

Humidity: 10% to 95% RH Non-condensing

Pollution: Degree II

Mechanical

Dimensions: 11.4 x 12.7 (cm), depth = 3.7 cm (4.5 x 5 (in), depth= 1.5 in)

Pressure Connection: ¼" NPT Male

Housing: cast ZNAL, meets NEMA 4/IP65

Display

5-1/2 Digits, 0.65" (16.53 mm) high

20-Segment bar graph, 0 to 100%

Power

Battery: three (3), size AA alkaline batteries

Battery Life: 1,500 hours without backlight, 2,000 hours at slow sample rate

Low Battery Indicator icon is displayed near the end of battery life

9.0 Service Center Calibration or Repair

Only qualified service personnel should perform calibration, repairs, or servicing not covered in this manual. If the calibrator fails, check the batteries first, and replace them if needed.

Verify that the calibrator is being operated as explained in this manual. If the calibrator is faulty, send a description of the failure with the calibrator. Be sure to pack the calibrator securely, using the original shipping container if it is available.

10.0 Available Ranges and Resolution by Engineering Unit

Engineering Unit	Factor											
		1	15	30 [1]	100	300	500	1000	2000	3000	5000	10000
	Burst Pressure	50	500	500	1000	2000	2000	10000	10000	10000	10000	15000
	Proof Pressure	5	30	60	200	600	1000	2000	3000	6000	10000	15000
psi	1	1.0000	15.000	30.000	100.00	300.00	500.00	1000.0	2000.0	3000.0	5000.0	10000
bar	0.06894757	0.0689	1.0342	2.0684	6.8948	20.684	34.474	68.948	137.90	206.84	344.74	689.48
mbar	68.94757	68.948	1034.2	2068.4	6894.8	20684	34474	68948	*	*	*	*
kPa	6.894757	6.8948	103.42	206.84	689.48	2068.4	3447.4	6894.8	13790	20684	34474	68948
Mpa	0.00689476	0.0069	0.1034	0.2068	0.6895	2.0684	3.4474	6.8948	13.790	20.684	34.474	68.948
kg/cm^2	0.07030697	0.0703	1.0546	2.1092	7.0307	21.092	35.153	70.307	140.61	210.92	351.53	703.07
mmHg @ 0°C	51.71508	51.715	775.73	1551.5	5171.5	15515	25858	51715	*	*	*	*
inHg @ 0°C	2.03602	2.0360	30.540	61.081	203.60	610.81	1018.0	2036.0	4072.0	6108.1	10180	20360
cmH_2O @ 4°C	70.3089	70.309	1054.6	2109.3	7030.9	21093	35154	70309	*	*	*	*
cmH_2O @ 20°C	70.4336	70.434	1056.5	2113.0	7043.4	21130	35217	70434	*	*	*	*
mmH_2O @ 4°C	703.089	703.09	10546	21093	70309	*	*	*	*	*	*	*
mmH_2O @ 20°C	704.336	704.34	10565	21130	70434	*	*	*	*	*	*	*
mH_2O @ 4°C	0.703089	0.7031	10.546	21.093	70.309	210.93	351.54	703.09	1406.2	2109.3	3515.4	7030.9
mH_2O @ 20°C	0.704336	0.7043	10.565	21.130	70.434	211.30	352.17	704.34	1408.7	2113.0	3521.7	7043.4
inH_2O @ 4°C	27.68067	27.681	415.21	830.42	2768.1	8304.2	13840	27681	55361	83042	*	*
inH_2O @ 20°C	27.72977	27.730	415.95	831.89	2773.0	8318.9	13865	27730	55460	83189	*	*
inH_2O @ 60°F	27.70759	27.708	415.61	831.23	2770.8	8312.3	13854	27708	55415	83123	*	*
Torr	51.71508	51.715	775.73	1551.5	5171.5	15515	25858	51715	*	*	*	*

1. Also applies to -15 to +30 PSI compound range.
2. Cells noted with * will not be displayed due to limitations on display resolution. In all cases, resolution is limited to 100,000 counts.

11.0 IPI Mk. II Serial Interface Instructions

⚠ Warning

To prevent possible electrical shock, fire, or personal injury, do not use the RS-232 interface in hazardous areas.

Initiating Communication

The terminal communications can be setup using terminal communication software on a PC. The terminal settings need to be set as follows:

- Bits per second: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None
- Local echo on

List of Commands

Command	Description
CAL_START	Puts the calibrator in calibration mode
*CLS	Clears the error queue.
FAULT?	Returns an error code from the error queue
*IDN?	Identification query. Returns the manufacturer, model number, and firmware revision level of the Calibrator.
TARE	Tares the offset pressure of the reading on the calibrator
TARE?	Returns the current tare value
PRES_UNIT?	Returns the pressure unit for the upper display.
PRES_UNIT	Sets the pressure unit for the display
ZERO_MEAS	Zeros pressure of the calibrator
ZERO_MEAS?	Returns the current zero offset value
MINMAX_RST	Resets the minimum and maximum recorded values.
MIN?	Returns the minimum recorded value
MAX?	Returns the maximum recorded value
HC_OFF	Turns unit off
HC_DFLT	Sets auto off defaults
TEMP?	Returns temperature in the chosen units
HC_COMP_OFF	Turns temperature compensation off.

HC_COMP_ON	Turns temperature compensation on.
HC_COMP?	Returns state of temperature compensation.
HC_RD_2410?	Return 2410 ADC counts.
HC_SI_OFF	Turns SI mode off.
HC_SI_ON	Turns SI mode on.
CAL_STORE	Stores calibration data.
HC_AUTO_OFF	Turns auto shutdown off
HC_AUTO_ON	Turns auto shutdown on
CUST_MULT?	Sets the multiplier for the custom unit type
STREAM_OFF	Turns streaming data off
STREAM_ON	Turns streaming data on
HC_TEMP?	Same as TEMP?
VAL?	Returns the measured pressure value in selected units
HC_CMD_LIST	Prints out a command list
TEMP_UNIT	Used to set temperature unit
TEMP_UNIT?	Returns temperature unit

Parameter Units

Units	Meaning
Psi	Pressure in pounds per square-inch
Bar	Pressure in bars
mBar	Pressure in millibars
Kg/cm2	Pressure in kilograms per centimeter squared
InH2O4C	Pressure in inches of water at 4°C
InH2O20C	Pressure in inches of water at 20°C
InH2O60F	Pressure in inches of water at 60°F
mH2O4C	Pressure in meters of water at 4°C
MH2O20C	Pressure in meters of water at 20°C
cmH2O4C	Pressure in centimeters of water at 4°C
cmH2O4C	Pressure in centimeters of water at 20°C
ftH2O4C	Pressure in feet of water at 4°C
ftH2O20C	Pressure in feet of water at 20°C
ftH2O60F	Pressure in feet of water at 60°F
Inhg0C	Pressure in inches of mercury at 0°C

mmhg0C	Pressure in millimeters of mercury at 0°C
kpal	Pressure in kilopascals
Far	Temperature in Farenhiet
Cel	Temperature in Celcius

Error Codes

Error	Description
101	A non-numeric entry was received where it should be a numeric entry
102	Too many significant digits entered
103	Invalid units or parameter value received
105	Entry is above the upper limit of the allowable range
106	Entry is below the lower limit of the allowable range
108	A required command parameter was missing
109	An invalid pressure unit was received
117	An unknown command was received
120	The serial input buffer overflowed
121	Too many entries in the command line
122	Pressure module not connected

12.0 Warranty

According to current terms of sale and delivery.

This warranty only covers defects in manufacture and becomes void if the instrument has been subject to unauthorised intervention and/or misuse.

AMETEK Denmark's liability ceases if:

parts are replaced/repaired using spare parts, which are not identical to those recommended by the manufacturer.

non-original parts are used in any way when repairing the instrument.

AMETEK Denmark's liability is restricted to errors that originated from the factory.

When returning the calibrator to the manufacturer for service, please enclose a fully completed service information form. Simply copy the form on the following page and fill in the required information. The calibrator should be returned in the original packing.

⚠ WARNING ⚠

Substitution of components may impair suitability for hazardous locations.

Service info

Customer data: **Date:**

Customer name and address:_____

Attention and Dept.:_____

Fax no./Phone no.:_____

Your order no.:_____

Delivery address:_____

Distributor name:_____

Instrument data:

Model and Serial no.:_____

Warranty claimed Yes:____ No:_____ Original invoice no.:_____

_____

Temp. calibration	Sensor input	**Service request:**	**This instrument is sent for (please tick off):**
☐	☐	___ Calibration as left	___ Check
☐	☐	___ Calibration as found and as left	___ Service
☐	☐	___ Accredited calibration as left	___ Repair
☐	☐	___ Accredited calibration as found and as left.	

_____

Diagnosis data/cause for return:

Diagnosis/Fault description:_____

_____

Special requests:_____

_____

Safety precautions: if the product has been exposed to any hazardous substances, it must be thoroughly decontaminated before it is returned to AMETEK. Details of the hazardous substances and any precautions to be taken must be enclosed.

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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