

# MXD70 SERIES

Instrumentation to meet your Process Requirements



## Features

The innovative MXD70 series of process instruments brings a new dimension to analytical process measurements with a modular design to meet ever changing process requirements.

- MXD73 Compact 96 DIN IP66 Panel mount option
- MXD75 IP66 Surface / Pipe mount version
- 3¾" QVGA Backlit LCD display provides clear indication as single or multiple measurements
- Parameters include: Contacting and Electrodeless Conductivity, pH / Redox, Dissolved Oxygen, Suspended Solids, Turbidity and 4-20mA Current Input
- Up to 3 measured parameters with temperature readings can be displayed together
- User selectable bar graph display option
- Plug and play card detection for simple measurement and output expansion upgrades
- SD card interface allows trouble free saving of configuration and simplifies software updates
- Base models include 2 relay outputs and a single isolated 4-20mA current output
- Can be expanded up to 6 relay outputs and 6 isolated 4-20mA current outputs
- Relays are fully configurable including on/off, time or pulse proportional operation
- 8 Independent programmable digital inputs with user selectable operations
- Power fail alarm
- Dedicated error page provides up to date controller status
- Modbus RS485 Communications interface
- Data logging and live trending
- Measurement Calculation functions
- 85-265v or 18-32v Supply options (AC or DC)
- User configurable measurement channel identification tag

# MXD73 Instrument Specification

## Input Expansion Slots

3 slots, user configurable with any combination of available input add-in cards.

## Output Expansion Slots

1 slot, user configurable with an additional output option add-in card.

## Ambient Operating Temperature

-20°C to +50°C (-4°F to +122°F) for full specification.

## Display

3¼" QVGA back lit LCD module.

## Buttons

5 tactile feedback, micro-switched, silicone rubber.

## Alarm LED

2 Yellow LEDs located above the main display area for instrument alarm status, a lit LED indicates an alarm condition.

## Digital Inputs

8 separate inputs for remote activation of user defined operations. Can be configured to operate in normally open or normally closed modes.

## Current Output Options

1 0/4-20mA as standard, expandable up to a total of 4 or 6 0/4-20mA outputs depending on the number of relay outputs.

## Current Output Specification

Each selectable 0-20mA or 4-20mA into 1000 ohms max, fully isolated to 2kV. Expandable up to 5% of any operating range and offset anywhere in that range.

## Current Output Adjustment

±0.01mA, 3 point 0-4-20 mA for remote monitor calibration.

## Setpoints and Control

### Relays Options

2 change over relays as standard, expandable up to a total of either 4 change over relays, or 4 change over relays + 2 normally open relays depending on the number of current outputs.

### Setpoints and Control

#### Relays Specification

Fully configurable setpoints with volt free contacts for each relay. Rated at 5A at 30V DC / 5A at 250V AC.

## Setpoint LED

6 Red LEDs located above main display area for setpoint status indication, a lit LED indicates the relay is energised.

## Setpoint Modes

On/Off, Time Proportioning, Pulse Proportioning, Band and Latch.

Delay timer adjustable from 00:00 to 59:59 mm:ss.

Hysteresis 0 to 9.9%.

Dose alarm timer, with supplementary initial charge function. Both adjustable from 00:00 to 59:59 mm:ss.

Adjustable cycle time and proportional band in proportional modes.

## Setpoint Cleaning

Cleaning mode with adjustable duration (max 10 minutes) and interval times (max 24 hours), auto offline function with recovery timer.

## Setpoint Alarm

Unit or channel alarm mode, whereby the relay can be energised under certain set conditions.

## Modbus RS485 Interface (Optional)

Supports RTU and ASCII formats

Node Address: 1 to 247

Baud Rates (Bits Per Second): 300, 600, 1200, 2400, 4800, 9600, 19200, 31250, 38400

Parity Options: Even, Odd, None

## SD Card Interface

Enables backing up and restoring of instrument configuration, logging of the sensor readings and instrument status (optional extra) and on-site upgrading of instrument software.

SD, SDHC and SDXC-FAT32 cards supported.

## EMC

2004/108/EC using BS EN 61326-1: 2013.

## Low Voltage Directive

2006/95/EC using BS EN 61010-1: 2010.

## Power Supply

Universal 80-265v AC or DC, 15W max. LV Option 18-32v AC or DC, 20W max.

## Instrument Housing

UL 94-V0 PC/ABS.

## Ingress Protection Rating

IP66 to the front when panel mounted.

## Weight

Maximum 880 grams (instrument only).

## Dimensions Front

128 x 116 x 23 mm (H, W, D).

## Dimensions Rear

89 x 89 x 161 mm (H, W, D), including connectors.



# MXD75 Instrument Specification

## Input Expansion Slots

3 slots, user configurable with any combination of available input add-in cards.

## Output Expansion Slots

1 slot, user configurable with an additional output option add-in card.

## Ambient Operating Temperature

-20°C to +50°C (-4°F to +122°F) for full specification.

## Display

3¼" QVGA back lit LCD module.

## Buttons

5 tactile feedback, micro-switched, silicone rubber.

## Alarm LED

2 Yellow LEDs located above the main display area for instrument alarm status, a lit LED indicates an alarm condition.

## Digital Inputs

8 separate inputs for remote activation of user defined operations. Can be configured to operate in normally open or normally closed modes.

## Current Output Options

1 0/4-20mA as standard, expandable up to a total of 4 or 6 0/4-20mA outputs depending on the number of relay outputs.

## Current Output Specification

Each selectable 0-20mA or 4-20mA into 1000 ohms max, fully isolated to 2kV. Expandable up to 5% of any operating range and offset anywhere in that range.

## Current Output Adjustment

±0.01mA, 3 point 0-4-20 mA for remote monitor calibration.

## Setpoints and Control

### Relays Options

2 change over relays as standard, expandable up to a total of either 4 change over relays, or 4 change over relays plus 2 normally open relays depending on the number of current outputs.

### Setpoints and Control

#### Relays Specification

Fully configurable setpoints with volt free contacts for each relay. Rated at 5A at 30v DC / 5A at 250v AC.

## Setpoint LEDs

6 Red LEDs located above main display area for setpoint status indication, a lit LED indicates the relay is energised.

## Setpoint Modes

On/Off, Time Proportioning, Pulse Proportioning, Band and Latch.

Delay timer adjustable from 00:00 to 59:59 mm:ss.

Hysteresis 0 to 9.9%.

Dose alarm timer, with supplementary initial charge function. Both adjustable from 00:00 to 59:59 mm:ss.

Adjustable cycle time and proportional band in proportional modes.

## Setpoint Cleaning

Cleaning mode with adjustable duration (max 10 minutes) and interval times (max 24 hours), auto offline function with recovery timer.

## Setpoint Alarm

Unit or channel alarm mode, whereby the relay can be energised under certain set conditions.

## Modbus RS485 Interface (Optional)

Supports RTU and ASCII formats

Node Address: 1 to 247

Baud Rates (Bits Per Second) : 300, 600, 1200, 2400, 4800, 9600, 19200, 31250, 38400

## SD Card Interface

Enables backing up and restoring of instrument configuration, logging of the sensor readings and instrument status (optional extra) and on-site upgrading of instrument software.

SD, SDHC and SDXC-FAT32 cards supported.

## EMC

2004/108/EC using BS EN 61326-1: 2013.

## Low Voltage Directive

2006/95/EC using BS EN 61010-1: 2010.

## Power Supply

Universal 80-265V AC or DC, 15W max. LV Option 18-32 V AC or DC, 20W max.

## Instrument Housing

UL 94-V0 PC/ABS.

## Ingress Protection Rating

IP66.

## Weight

Maximum 2.7 kilograms (instrument only).

## Dimensions

331 x 242 x 110 mm (H, W, D) excluding mounting brackets.



## Contacting Conductivity Measurement

- “ Displays conductivity, resistivity, ppm and temperature units
- “ Measured process & temperature can be displayed together
- “ Compliant with current USP requirements
- “ Full ultra pure water temperature compensation
- “ Ultra pure water to solution concentration measurement
- “ Auto range, remote range or single range operation

The contacting conductivity input allows connection with LTH contacting conductivity cells with a cell constant of  $K= 0.01, 0.1, 1.0$  and  $10$ . It is also possible to use other manufacturer's conductivity cells with a cell constant between  $K= 0.01$  and  $10$ . This offers a wide operating range of conductivity measurement from ultra pure water at  $0.055\mu\text{S}/\text{cm}$  (Microsiemens/cm) to solution concentration measurements of up to  $1000\text{mS}/\text{cm}$  (Millisiemens/cm). The MXD70 series can be set for single range, auto range or remote ranging via external digital inputs.

The digital inputs can be allocated to the Contacting Conductivity channel and one of the following functions can be selected: Off line, Range change, Switch Set Up, Interlock, Flow switch input, Tank Level switch.

The relays can be configured for operation on either Sensor or temperature input or as an Alarm relay. The relay can trigger as a High, Low, Band, Latch High, Latch Low or USP operation. Under USP operation this allows the transmitter to alarm when water is non-compliant.

Automatic temperature compensation is available as standard on all versions. For applications where temperature compensation needs to be applied to the measurement the linear slope is adjustable for changes due to dissolved salts and a fixed curve for the pure water contribution.

For applications where temperature compensation is not required it can be switched out.

## Conductivity Input Card Specification

### Conductivity Sensor

Any LTH conventional conductivity cell. Other manufacturer's cells can be accommodated.

### Connection Cable

Up to 100 metres of LTH 54D cable.

### Ranges of Measurement

0-0.999  $\mu\text{S}/\text{cm}$  to 0-999.9  $\text{mS}/\text{cm}$  ( $K= 0.01$  to  $10.0$ ).

0-99.99  $\text{K} / \text{cm}$  to 0-99.99  $\text{M} / \text{cm}$  ( $K= 0.01$  to  $1.0$ ).

0-0.999 ppm to 0-99.99 ppt. (parts per thousand).

See the following range / cell constant table for further information.

### Cell Constant Adjustment

$\pm 50\%$  of nominal cell constant.

### Conductivity Accuracy

$\pm 0.5\%$  of range.

### Linearity

$\pm 0.1\%$  of range.

### Repeatability

$\pm 0.1\%$  of range.

### Operator Adjustment (Conductivity)

$\pm 10\%$  slope (gain) adjustment for solution calibration.

### Temperature Sensor

Pt100 or Pt1000 RTD. Up to 100 metres of cable. Temperature sensor can be mounted in the conductivity cell or separately.

### Range of Temperature Measurement

$-50^\circ\text{C}$  to  $+160^\circ\text{C}$  ( $-58^\circ\text{F}$  to  $+320^\circ\text{F}$ ) for full specification.

### Temperature Accuracy

$0.2^\circ\text{C}$  (When using a 4 wire PT1000).

### Operator Adjustment (Temperature)

$\pm 50^\circ\text{C}$  or  $\pm 122^\circ\text{F}$ .

### Range of Temperature Compensation

$-10^\circ\text{C}$  to  $+150^\circ\text{C}$  ( $+14^\circ\text{F}$  to  $+302^\circ\text{F}$ ) for full specification.

### Temperature Compensation Type

Fixed UPW curve plus variable slope  
0 -  $3.9\%/^\circ\text{C}$  over  $-10$  to  $+150^\circ\text{C}$ .  
Selectable In or Out.

### Temperature Compensation Base

Selectable at  $20^\circ\text{C}$  or  $25^\circ\text{C}$ .

### USP Function

USP monitoring available on associated setpoints. USP pre-trigger facility also available.

### Input filter

Filter sensor reading by taking running average over time period selected (User selectable 10 seconds to 5 minutes).

## Range & Sensor Compatibility Tables

CONDUCTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 $\mu\text{S}/\text{cm}$				
0 to 99.99 $\mu\text{S}/\text{cm}$				
0 to 999.9 $\mu\text{S}/\text{cm}$				
0 to 9.999 $\text{mS}/\text{cm}$				
0 to 99.99 $\text{mS}/\text{cm}$			Note 1	
0 to 999.9 $\text{mS}/\text{cm}$				Note 1

RESISTIVITY RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 99.99 k $\Omega\text{-cm}$				
0 to 999.9 k $\Omega\text{-cm}$				
0 to 9.999 M $\Omega\text{-cm}$				
0 to 99.99 M $\Omega\text{-cm}$				

TOTAL DISSOLVED SOLIDS RANGE	NOMINAL CELL CONSTANT			
	0.010	0.100	1.000	10.00
0 to 9.999 ppm				
0 to 99.99 ppm				
0 to 999.9 ppm				
0 to 9999 ppm				
0 to 99.99 ppt				

Note 1: The maximum measurement range will be limited by the solution temperature.

With the temperature compensation slope set to 2%/ $^{\circ}\text{C}$ , this will derate linearly from full scale at 25 $^{\circ}\text{C}$  to 50% of scale at 100 $^{\circ}\text{C}$ .



## Electrodeless Conductivity Measurement

- “ Displays conductivity, % solution concentration, salinity and temperature units
- “ Able to simultaneously display conductivity, % solution concentration, salinity and °C
- “ Ideal for cooling tower bleed, rinse water and solution concentration applications
- “ Preset curves stored for common chemicals and salinity
- “ 2 independent custom curves offering up to 9 points can be entered
- “ Adjustable temperature compensation slope

Covering a wide range of conductivity measurement, from water (200  $\mu\text{S}/\text{cm}$ ) to solution concentration measurements (1,000  $\text{mS}/\text{cm}$ ), it is possible to display the readings in conductivity and/or % concentration. Preset curves are stored in the instrument for common acids, alkalis or salinity and there is also the facility to program two independent custom curves into the instrument. The unit can be set for single range, auto range or remote ranging via an external switch, allowing automatic selection between different chemicals. The instrument can be used with any LTH Electrodeless conductivity sensor.

The digital inputs can be allocated to the Electrodeless Conductivity channel and one of the following functions can be selected: Off-line, Range change, Switch Set Up, Interlock, Flow switch input, Tank Level switch.

The relays can be configured for operation on either sensor or temperature input or as an alarm relay. The relay can trigger as a High, Low, Band, Latch High, Latch Low.

Both measurement inputs and current outputs can be individually calibrated from the front key pad. The user can optimize readings using the sensor solution calibration which enables the user to adjust the sensor reading to match a known standard solution or a titrated solution concentration. An off-line facility allows the instrument to be adjusted without disturbing external processes.

Automatic temperature compensation can be applied to the measurement using an adjustable linear slope. In the solution concentration mode the instrument automatically sets the correct solution slope. For applications where temperature compensation is not required it can be switched out. Alternatively a manual temperature can be entered, if required.



# Electrodeless Conductivity Input Card Specification

## Measurement Input

ECS20 or ECS40 Series electrodeless conductivity sensor.

## Connection Cable

Up to 100 metres LTH 54E or 54H cable.

## Ranges of Measurement

0-999.9 $\mu$ S/cm,  
0-9.999mS/cm,  
0-99.99mS/cm,  
0-999.9mS/cm.

0-999.9 ppm, 0-9999 ppm.

0-99.99 ppt (parts per thousand).

0 to 16.00% NaOH . Sodium Hydroxide.

0 to 30.00% NaCl . Sodium Chloride.

0 to 15.00% HCl . Hydrochloric Acid.

0 to 25.00% H<sub>2</sub>SO<sub>4</sub> . Sulphuric Acid.

0 to 25.00% H<sub>3</sub>PO<sub>4</sub> . Phosphoric Acid.

0 to 25.00% HNO<sub>3</sub> . Nitric Acid.

0 to 41.00 ppt Salinity.

0 to 99.9% Custom range. Defined by a user entered 2 to 9 point curve.

(Two independent curves per ECS channel).

## Range Selection

Internal single or auto range, or external range selection via digital inputs.

## Cell Constant Adjustment

Fully adjustable from K=00.00 to 10.00.

## Conductivity Accuracy

$\pm$ 1% of range.

## Linearity

$\pm$ 0.1% of range.

## Repeatability

$\pm$ 0.1% of range.

## Operator Adjustment (Conductivity)

Conductivity  $\pm$ 10% slope.

Solution  $\pm$ 20% offset.

## Temperature Sensor

Pt1000 RTD input. Up to 100 metres of cable. Temperature sensor can be mounted in the sensor or separately.

## Range of Temperature Measurement

-50°C to +160°C (-58°F to +320°F)

for full specification.

## Temperature Accuracy

0.2°C (When using a 4 wire PT1000).

## Operator Adjustment (Temperature)

$\pm$  50°C or  $\pm$  122°F.

## Range of Temperature Compensation

-10°C to +150°C (+14°F to +302°F)

for full specification.

## Temperature Compensation Type

Variable slope 0 - 3.9%/°C over -10 to +150°C. Selectable In or Out.

## Temperature Compensation Base

Selectable at 20°C or 25°C.

## Input filter

Filter sensor reading by taking running average over time period selected (User selectable 10 seconds to 5 minutes).



## pH/ Redox Measurement

- “ Differential input for excellent noise rejection
- “ Accepts pH glass or Antimony and Redox (ORP) Electrodes
- “ Able to simultaneously display the pH reading, temperature and electrode mv
- “ Dose alarm timer prevents overdosing
- “ Automatic sensor cleaning

By providing the user with the flexibility to select either glass or Antimony pH sensors or Redox input and operating with single ended or differential inputs, means a single instrument may be used for the majority of pH and Redox applications. Temperature compensator selection of Pt100 or Pt1000 allows the instrument to be used with almost any pH sensor system.

Both measurement inputs and current output can be individually calibrated from the front panel. An off-line facility allows the instrument to be adjusted without disturbing external processes.

The digital inputs can be allocated to the pH/Redox channel and one of the following functions can be selected: Off line, Switch Set Up, Interlock, Flow switch input, Tank Level switch, Clean.

The relays can be configured for operation on either sensor or temperature input or as an alarm relay. The relay can trigger as a High, Low, Band, Latch High or Latch Low operation.

Both measurement inputs and current outputs can be individually calibrated from the front panel. The MXD70 series offers a choice of Automatic or Manual pH Electrode calibration. For applications requiring accurate measurements it is possible to calibrate the instrument and sensor to either a standard solution or a titrated solution concentration. An off-line facility allows the instrument to be adjusted without disturbing external processes.

For applications which require automatic sensor cleaning, set point relays can be configured as a clean initiator.

The clean duration, recovery time and interval period are all programmable. During the clean and recovery periods it is possible for the instrument to go off-line and hold the current outputs and disable the control relays. The clean cycle and off-line mode may also be initialised remotely via the digital input.

Automatic temperature compensation can be applied to the measurement using an adjustable linear slope. For applications where temperature compensation is not required it can be switched out. Alternatively a manual temperature can be entered, if required.



## pH / Redox Input Card Specification

### Measurement Input

Single ended or differential with solution ground.

### Connection Cable

Up to 100 metres (No preamp required). LTH type 54E or LN10 cable.

### pH

Separate glass and reference electrode pair. Combination electrode.

### Redox

Separate glass and reference electrode pair. Combination electrode.

Other manufacturer's sensors can be accommodated.

### Ranges of Measurement

0.00-14.00pH, 0.000 to 14.000pH, -1999 to +1999mV.

### Accuracy

± 0.050pH, ±3mv.

### Linearity

±0.1% of range.

### Repeatability

±0.1% of range.

### Operator Adjustment

	Slope	Offset
pH	60-120%	3 to 11pH
Antimony	60-120%	-4 to +4pH
Redox	NA	-400mV to +400mV

### Calibration Methods

Automatic 4pH / 9pH Buffer Calibration.

Manual Slope and Offset Adjustment.

Both methods indicate post-calibration electrode condition.

### Custom Buffer

13 point 4pH / 9pH custom buffer entry pre-loaded with standard LTH buffers.

### Calibration Timer

Inbuilt calibration count down timer which will trigger an alarm when calibration interval has expired.

### Sensor Input filter

Adjustable filter that averages the sensor input over a user selectable time (10 seconds to 5 minutes).

### Temperature Sensor

Pt100, Pt1000 RTD input. Up to 100 metres of 4 wire cable. Temperature sensor can be mounted in the sensor or separately.

### Range of Temperature Measurement

-50°C to +160°C (-58°F to +320°F) for full specification.

### Temperature Accuracy

±0.2°C

(When using a 4 wire PT1000).

### Operator Adjustment (Temperature)

±50°C or ±122°F.

### Temperature Compensation Type

Automatic or manual -20°C to +160°C.

### Input filter

Filter sensor reading by taking running average over time period selected (User selectable 10 seconds to 5 minutes).



## Dissolved Oxygen Measurement

- “ Measurement of % saturation, ppm and temperature
- “ Able to simultaneously display % saturation, concentration, temperature and pressure
- “ Accepts virtually any Galvanic or Polarographic dissolved oxygen sensor
- “ Active or manual pressure compensation
- “ Adjustable membrane compensation along with bias voltage
- “ Salinity compensation
- “ Automatic sensor cleaning

For quick configuration two default set-ups are stored within the instrument for operation with either a galvanic or a polarographic sensor.

By providing the user with the flexibility to select either galvanic (Mackereth) or polarographic (Clark) sensors, temperature compensator selection of Pt100, Pt1000, 1K ohm or 22K ohm thermistor and providing software selection of bias voltage and membrane co-efficient, a single instrument may be used with virtually any dissolved oxygen sensor.

The relays can be configured for operation on either Sensor or temperature input or as an Alarm relay. The relay can trigger as a High, Low, Band, Latch High or Latch Low operation.

New features include the Latch relay operation where the control relay can have a high and a low setting. This is particularly useful where the instrument is controlling an aerator.

In this mode the relay is energised when the dissolved oxygen level falls below the low level and remains energised until the high setting is reached. The relay will not energise again until the level falls back below the low setting.

The isolated current outputs provide retransmission of the measurement as 0/4-20 mA signals and can be configured as % saturation ppm or temperature.

Both measurement inputs and current output can be individually calibrated from the front panel. An off-line facility allows the instrument to be adjusted without disturbing external processes.

The digital inputs can be allocated to the Dissolved Oxygen channel and one of the following functions can be selected: Off line, Switch Set Up, Interlock, Flow switch input, Tank Level switch, Clean and Calibration.



## Dissolved Oxygen Input Card Specification

### Measurement Input

Galvanic (Mackareth) 0-4000 $\mu$ A

or

Polargraphic (Clark) . 0 to 500.0nA.

### Ranges of Measurement

0 . 199.9% Saturation.

0 . 30.00 ppm Concentration.

0 . 9999 mBar pO<sub>2</sub> (Partial Pressure of Oxygen) (Calibration specific).

0 . 999.9 mmHg (Millimetres of Mercury) (Calibration specific).

0-30.00 mg/l Milligrams per Litre.

Sensor Current ( $\mu$ A, nA).

### Sensor Bias Voltage

User defined -1.000V to +1.000V,  $\pm$ 1mV Resolution,  $\pm$ 3mV Output Accuracy.

### Membrane Correction Factor

User defined 0 to 9999.

### Sensor Connection Cable

Up to 100 metres.

### Accuracy

$\pm$ 3 $\mu$ A (Galvanic Mode).

$\pm$ 1.0nA (Polargraphic Mode).

### Linearity

$\pm$ 0.1% of Range.

### Repeatability

$\pm$ 0.1% of Range.

### Calibration

Automatic Zero (offset) and Span (slope) calibration with user entered span calibration point and post-calibration sensor condition indication.

### Calibration Timer

Inbuilt calibration count down timer which will trigger an alarm when calibration interval has expired.

### Sensor Input Filter

Adjustable filter that averages the sensor input over a user selectable time (10 seconds to 5 minutes).

### Temperature Sensor

Pt100, Pt1000 RTD or 1kohm, 22kohm thermistor inputs. Up to 100 metres of 4 wire cable. Temperature sensor can be mounted in the sensor or separately.

### Range of Temperature Measurement

-50°C to +160°C (-58°F to +320°F) for full specification.

### Temperature Accuracy

$\pm$ 0.2°C

(When using a 4 wire PT1000).

### Operator Temperature Adjustment

$\pm$ 50°C or  $\pm$ 122°F.

### Temperature Compensation

Automatic or manual -20°C to +160°C.

### Pressure Compensation

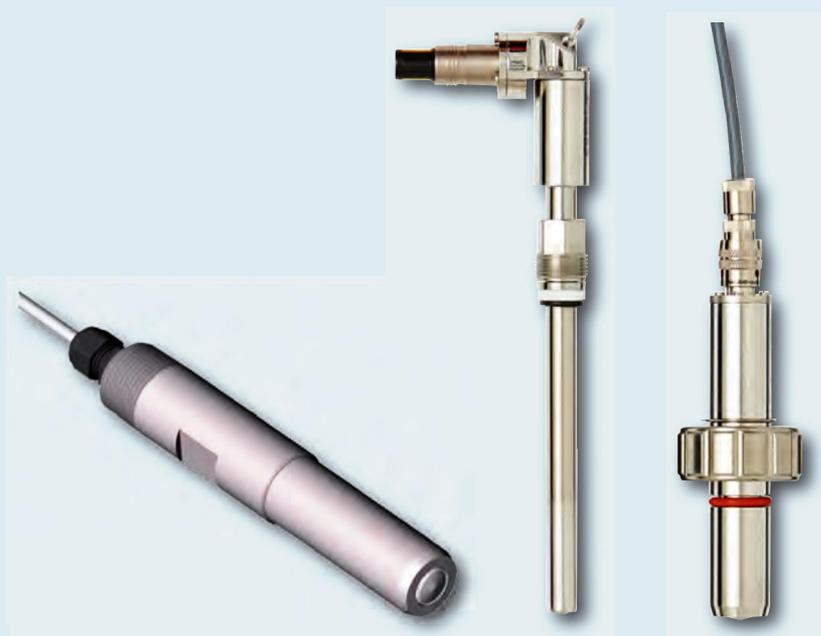
Automatically from external 4-20mA pressure transducer input (Direct or 24V loop powered from the instrument) with user scaling and selectable pressure damping, or manually via user entered value.

### Salinity Compensation

User Programmable from 0-40.0 ppt.

### Input filter

Filter sensor reading by taking running average over time period selected (User selectable 10 seconds to 5 minutes).



## Auxiliary mA Input Card

- “ Accepts 0/4-20mA Industry standard signal
- “ Can be connected to loop powered or self-powered transmitters
- “ User scalable over four different measurement ranges
- “ Custom units up to a maximum of five alpha numeric characters can be selected

The 4-20mA Input card allows the user to connect any device with a 4-20mA current output to the MXD70 series. The 4-20mA devices may be connected either in a loop powered or three wire configuration.

The user can set a scale for the 4-20mA input and assign the appropriate measurement units via the front keypad. The internal relay and 4-20mA current outputs may be allocated to the current input card as required.

The input can be configured so that the incoming current is scaled across a 4. 20mA, 0. 20mA or linearized across desired points entered in to one of the two available custom curves.

The Auxiliary mA input provides the user with the facility to enter a custom relationship between the incoming mA measurement and the displayed value.

There is a choice of two Point Calibration . Selected by entering the %Aux mA Input Cal+ menu item in the calibration and a Solution calibration.

The two point calibration allows the user to calibrate a fixed mA input of 0mA, 4mA, or 20mA against a known current source.

The Solution calibration allows the user to adjust the scaled reading to match a known input.

The digital inputs can be allocated to the Auxiliary mA input channel and one of the following functions can be selected: Off line, Switch Set Up, Interlock, Flow switch input and Tank Level switch.

The relays can be configured for operation on the sensor input, clean initiator or as an Alarm relay. The relay can trigger as a High, Low, Band, Latch High or Latch low operation.

For the Clean function, the clean duration, recovery time and interval period are all programmable. During the clean and recovery periods it is possible for the instrument to go off-line and hold the current outputs and disable the control relays. The clean cycle and off-line mode may also be initialised remotely via the digital inputs.

## Auxiliary mA Input Card Specification

### Measurement Input

0 to 24mA input, fully isolated from instrument supply.

### Loop Modes

mA Input . Standard mA input from transmitter, 100  $\Omega$  input impedance, max loop voltage 35V.

Loop Powered . The input card will supply 24V to power the current loop.

3 Wire . The input card can supply an alternative 24V 30mA.

Max output via the 24V+ pin to power a 3 wire transmitter.

### Input Mode

0. 20 mA (Linear)

4. 20 mA (Linear)

2 Custom Curves (Non-Linear)

### Display Ranges

-9999 to +9999,

0 to 999.9,

0 to 99.99,

0 to 9.999.

### Custom Units

Maximum of 5 Alphanumeric Characters.

### Error States

Input under 4mA (when using 4-20mA Input).

Input over 20mA.

### Accuracy

$\pm 0.1\%$  of reading.

### Linearity

$\pm 0.1\%$  of range.

### Repeatability

$\pm 0.1\%$  of range.

### Calibration Methods

Reading Offset Calibration.

Automatic 2 Point 0/4mA and 20mA Calibration.

### Sensor Input filter

Adjustable filter that averages the sensor input over a user selectable time (10sec . 5mins).



## Suspended Solids and Turbidity Measurement

- “ Able to display in NTU<sub>φ</sub>, FTU<sub>φ</sub>, PPM, mg/l, g/l, %, EBC or OD
- “ Immersion and Hygienic style sensors available
- “ Calibration in engineering units
- “ 10 point linearisation curve
- “ Automatic curve entry

The Suspended Solids or Turbidity inputs cards have been designed to work with Quadbeam Technologies suspended solids and turbidity sensors. This allows the MXD70 series to display the measured values in NTU<sub>φ</sub>, FTU<sub>φ</sub>, PPM, mg/l, g/l, %, EBC or OD.

Quadbeam Sensors incorporate engineering improvements to eliminate water ingress and also withstand the rapid temperature cycling (from 10°C to 80°C) which occurs during CIP cleaning cycles. By design, Quadbeam sensors automatically compensate for component ageing, sensor fouling and daylight interference.

The Quadbeam alternating light principle is based on a fundamental method of suspended solids measurement by shining a light of known intensity a fixed distance through a medium at a photocell detector. Suspended solids in the medium attenuate some of the light. The detector current gives a measure of the attenuation that corresponds to the suspended solids and turbidity measurement.

The Quadbeam alternating light principle compensates for variations in light intensity and detector sensitivity by using two detectors and two light sources switched on and off alternatively.

The resulting probe signal can then be converted to appropriate engineering units by using the instruments linearisation curve.

### Linearization Curve Setup

With many solutions the rate of infra-red absorption is non-linear as the solids concentration increases. The purpose of this function is to take the probe signal values from several samples and convert the non-linearity to a straight line output.

In many cases this is the only calibration procedure required. The MXD70 provides two methods for entering the curve data into the instrument . automatic and manual.

### Automatic Curve Entry

Automatic Curve Entry allows the user to set the number of points used in the curve. For each point it is possible to define the engineering value and equate it to a live reading taken from the sensor placed in the desired sample. Note that the points can be sampled in any order as they are sorted into ascending probe signal values within the software.

The digital inputs can be allocated to the Suspended Solids / Turbidity channel and one of the following functions can be selected: Off line, Switch Set Up, Interlock, Flow switch input, Tank Level switch, Clean, Calibration and CIP Input.

When assigned to a suspended solids channel the MXD70 series digital inputs feature a CIP function. The CIP input indicates to the instrument that a CIP event is in progress so that the sensor can be disabled to prevent over stressing of the probe.

The relays can be configured for operation on the sensor input, clean initiator or as an Alarm relay. The relay can trigger as a High, Low, Band, Latch High or Latch low operation. For the Clean function, the clean duration, recovery time and interval period are all programmable. During the clean and recovery periods it is possible for the instrument to go off-line and hold the current outputs and disable the control relays. The clean cycle and off-line mode may also be initialised remotely via the digital inputs.

For the current outputs, it is possible to re-transmit the measurement units and as an alternative the raw probe units from the sensor.

## Suspended Solids and Turbidity Input Card Specification

### SUSPENDED SOLIDS INPUT CARD SPECIFICATION

#### Supported Sensor Types

Quadbeam S Series.

#### Sensor Input

Proportional probe signal from 0 to 16000.

#### Linearization

The incoming probe signal can be converted to standard engineering units using one of two user definable linearization curves consisting of up to 10 points.

#### Sensor Cable Length

Up to 100 metres.

#### Display Units

User selectable from, %, NTU, FTU, mg/l, g/l, ppm, ppt, EBC, OD.

In ranges of 0 . 9.999, 99.99, 999.9 and 9999 (Except % which is 0 . 10.00% and 0 . 100.0%).

#### Repeatability

±10 Probe input signal.

#### Repeatability

± 0.1% of range.

#### Sensor Input filter

Adjustable filter that averages the sensor input over a user selectable time (1 . 32 Seconds).

### TURBIDITY INPUT CARD SPECIFICATION

#### Supported Sensor Types

Quadbeam T Series.

#### Sensor Input

Proportional probe signal from 0 to 32000.

#### Linearization

The incoming probe signal can be converted to standard engineering units using one of two user definable linearization curves consisting of up to 10 points.

#### Sensor Cable Length

Up to 100 metres.

#### Display Units

User selectable from, %, NTU, FTU, mg/l, g/l, ppm, ppt, EBC, OD.

In ranges of 0 . 9.999, 99.99, 999.9 and 9999 (Except % which is 0 . 10.00% and 0 . 100.0%).

#### Repeatability

±10 Probe input signal.

#### Repeatability

± 0.1% of range.

#### Sensor Input filter

Adjustable filter that averages the sensor input over a user selectable time (1 . 32 Seconds).



## SD Card Data Logging with Live Trending

- “ SD Card data logging
- “ Three separate live trend screens
- “ Add to existing MXD70 series controllers

The Data logging additional software function expands the capabilities of the MXD70 series by allowing the user to record over time the status of the instrument. It consists of two separate sections, Live Trending and SD Card Data Logging, which together help the user to analyse and improve the performance of their application.

The MXD70 series features optional software functions which when purchased will expand the instrument's capabilities. These functions by default are locked. They can be unlocked by LTH or your local distributor at the time of order. Alternatively the functions may be ordered after purchase by supplying LTH or your local distributor the serial number of your instrument. In return they will supply you with an 8 digit unlock code that is unique to the instrument and the required function to be unlocked.

Live Trending provides the user with three separate live trend screens adjacent to the front screen with each showing two readings. This enables the user to instantly view the last 50 samples of each reading. The live trend screen also features a review mode where by the user can further analyse the last 200 samples of each reading. If the user finds something of note the software provides the facility to save these 200 readings to an excel compatible file on the SD card.



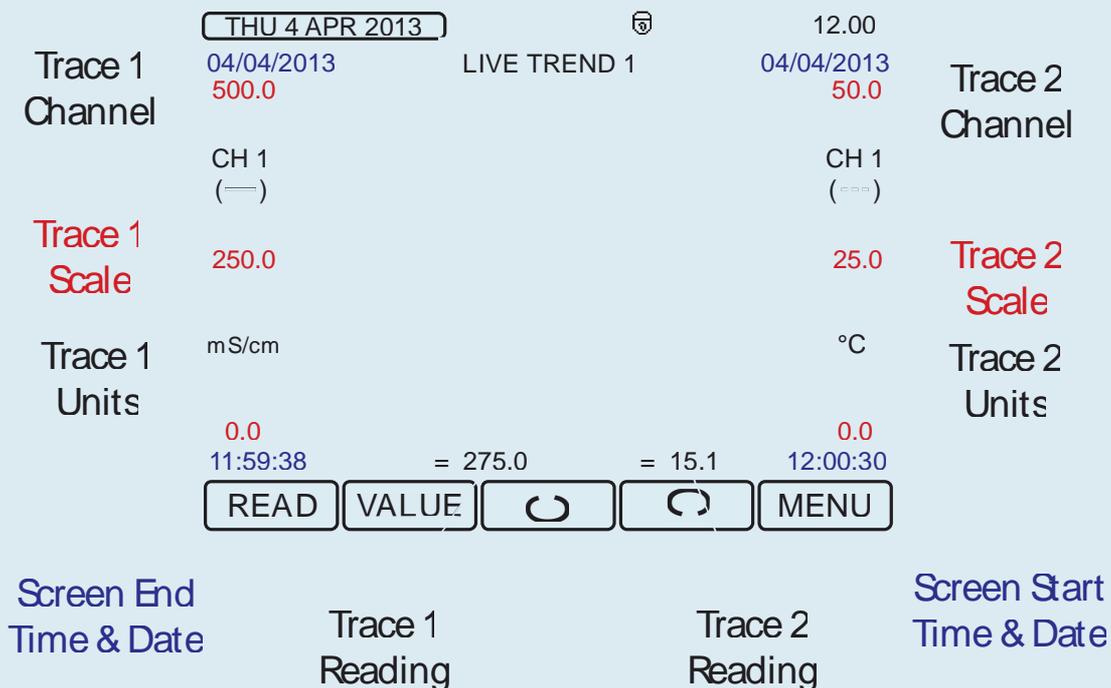
Further analysis is provided by optionally displaying the minimum, maximum and average value of the 200 samples. The number of readings, the source of the readings, the displayed scale and the sample interval rate are all configurable by the user.

The SD Card Data Logging enables the user to log over long periods the status of the instrument. Variables logged include: the primary sensor readings, any secondary readings, set point status, the current output readings, digital input status and any error messages. This data can be viewed either on the MXD70 series instrument or removed and viewed in Microsoft Excel on a PC. The user can configure which channels are logged and the logging interval. When logging three inputs at one sample per second a 1GB card will allow 40 days of recording.

Once removed place the SD card in a card reader connected to the PC. Open the SD card in the file explorer and browse to either the Data logging folder to view the SD card data logging or the Live Trend folder to view the live trend log saves.

Each file is limited to 65535 logs; when this limit is reached the instrument will automatically create a new file. The instrument will also automatically create a new file if the configuration of the instrument is changed whilst the data logging is active. Each file name contains the date and time of when it was created. The data is stored as a comma separated variable (csv), which can be read by Microsoft Excel.

The MXD70 series supports SDHC and SDXC cards for data logging, back up, re-storing and upgrading of software.



## Modbus RS485

MODBUS is an open application layer messaging protocol, which is deployed in areas of manufacturing automation, process automation and building automation. It provides client/server communication between devices connected over a RS485 connection.

Modbus RS485 networks consist of two different devices, a Master and a Slave.

**Master Device** - Master devices determine the data traffic on the network. They can send data without an external request.

**Slave Device** - Slave devices are peripheral devices. They do not have their own access rights to the data traffic on the network and only send their data due to an external request from a master. The MXD70 Series operates as a slave device on the network.

### Modbus Telegram Structure -

The data is transferred between the master and slave by means of a telegram. A request telegram from the master contains the following four telegram fields:

**Slave address** - The slave address can be in an address range from 1 to 247. The master talks to all the slaves simultaneously by means of the slave address 0 (broadcast message).

**Function code** - The function code determines which read, write and test operations should be executed by means of the MODBUS protocol.

**Data** - Depending on the function code, the following values are transmitted in this data field:

Register start address (from which the data is transmitted), Number of registers, Write/read data, Data length, etc.

**Checksum** - The telegram check sum forms the end of the telegram.

The master can send another telegram to the slave as soon as it has received an answer to the previous telegram or once the time-out period set at the master has expired. This time-out period can be specified or modified by the user and depends on the slave response time.

If an error occurs during data transfer or if the slave cannot execute the command from the master, the slave returns an error telegram (exception response) to the master.

The slave response telegram consists of telegram fields which contain the requested data or which confirm that the action requested by the master has been executed. It also contains a check sum.

### MXD70 Series Modbus

communications is indicated in the top of the screen by the following symbol:



## Calculation

The MXD70 Series features the ability to calculate a measurement from the input of multiple sensor channels. This result can then be used to activate the instruments setpoints / relays and drive the current outputs.

The following mathematical functions are supported:

Function	Calculation Formula	Result Range	Result Units
Difference	$X - Y$ or $Y - X$	Same as input variables	Same as input variables
Average	$\frac{\%+Y+}{+2+}$	Same as input variables	Same as input variables
Ratio	$\frac{\%+}{+Y+}$	-19.99 to 19.99	None
Passage	$\frac{\%+}{+X+} \times 100$	-199.9 to 199.9	%
Rejection	$(1 - \frac{\%+}{+X+}) \times 100$	-199.9 to 199.9	%
Deviation	$(\frac{\%+}{+X+} - 1) \times 100$	-199.9 to 199.9	%



## Order Codes

Type No	Part No	Description
MXD73	7300	MXD73 Series IP66 Panel mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 85-265v supply. Input and output expansion cards to be ordered separately.
MXD75	7500	MXD75 Series IP66 Surface mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 85-265v supply. Input and output expansion cards to be ordered separately.
MXD73	7324	MXD73 Series IP66 Panel mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 18-32v supply. Input and output expansion cards to be ordered separately.
MXD75	7524	MXD75 Series IP66 Surface mounted base instrument fitted with 1 x 4-20mA and 2 x relay outputs. Requires 18-32v supply. Input and output expansion cards to be ordered separately.

Input Card Options		
MXD70CC	1001	Contacting conductivity input PCB.
MXD70EC	1201	Electrodeless conductivity input PCB.
MXD70PR	2001	pH / ORP (Redox) input PCB.
MXD70DO	4001	Dissolved Oxygen input PCB.
MXD70AUX	5001	Auxilliary mA Input PCB.
MXD70SS	6001	Suspended Solids Input PCB.
MXD70TUR	6002	Turbidity Input PCB.

Expansion Card options		
MXD701I2R	7012	1 x 4-20mA / 2 x Relay outputs expansion PCB.
MXD703I	7030	3 x 4-20mA output expansion PCB.
MXD703I4R	7034	3 x 4-20mA / 4 x Relay outputs expansion PCB.
MXD70MB	7104	MODBUS / 4 Relays output PCB
MXD705I2R	7052	5 x 4-20mA / 2 x Relay outputs expansion PCB.
MXD75EK1	7501	MXD75 Expansion kit 1 for use with expansion cards 7012, 7030, 7034. (3x input or any output)
MXD75EK2	7502	MXD75 Expansion kit 2 for use with expansion card 7052 MXD705I2R.

Data Logging and Live Trending		
DATALOG	7000	Datalogging and live trending software (Unlock code)

Ancillaries		
MXD75PMK	7599	MXD75 Series Pipe mounting kit.
SDSDB4	118/809	SD Card 4GB. SDSB-004G-B35
SDSDB8	118/808	SD Card 8GB. SDSB-008G-B35



These products comply with current European Directives

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