

Analyzer/Transmitter



THORNTON

Leading Pure Water Analytics

770MAX Multiparameter Analyzer/Transmitter

Inputs for up to six sensors

Low cost per measurement point

Quick-connect smart sensors

Self-contained analog outputs & relays



Multiparameter Analysis Compact & Comprehensive

METTLER TOLEDO

770MAX

Multiparameter Analysis

Extensive Measurement Capabilities

- 6 channels: 4 Smart Sensors, including conductivity/resistivity, temperature, flow, pH, ORP, dissolved oxygen, TOC, dissolved ozone, level and pressure, plus 2 pulse flow sensors
- Display 16 measurements on 4 line screen with auto or manual scrolling
- Metric, S.I., and English units for direct measurements; calculated values for % Rejection, % Recovery, difference, sum, ratio, power industry pH and CO₂ from conductivity, and DI capacity. Custom names identify all measurements

Alarm/Control and Outputs

- 16 Setpoints for high, low, USP, EP and reset (for totalizer) alarms
- 4 SPDT relay option within the 1/4 DIN case with individual hysteresis and time delay (optional)
- 2 Discrete outputs for logic circuits
- 4 powered analog outputs (0/4-20 mA) standard, 8 optional
- RS232 serial output
- 2 discrete inputs for totalizer reset

Highest Accuracy and Easiest Calibration

- Unique 4-wire resistance measurement technique for highest installed accuracy
- Thornton's temperature compensation provides highest accuracy for UPW, cation and ammonia conductivity
- NIST-traceable automatic meter calibration system
- Direct one and two-point sensor calibration
- Smart Sensors retain factory and user calibration data
- pH automatic buffer recognition during calibration

Compact Size

- 1/4 DIN cutout, case only 12 cm deep
- Sealed NEMA 4X panel mount standard, entire unit sealed with optional back cover
- Panel, wall, pipe mounting options

Cost Effective

- Low cost per measurement point, with 6 sensor inputs
- One panel cutout replaces 6 for single function devices
- One instrument - reduces training and spares
- Plug-in sensor connections reduce wiring time



770MAX liquid crystal display option
(vacuum fluorescent display shown on cover)

Plug-in patch cords eliminate all terminal wiring for Smart Sensors, at both ends. Gone are the possibilities for sensor wiring errors and extensive documentation. Other inputs and outputs are to pluggable terminals which snap out for ease of installation and servicing.

Unsurpassed temperature compensation algorithms to handle specific applications are user selectable. The renowned Thornton/Light ultrapure water compensation algorithm uses the best available data for the properties of pure water, while providing compensation for more conductive solutions.

Cation and ammonia/ETA compensation correct for the unique properties of cycle chemistry samples in power plants. Comprehensive temperature compensation functions for HCl, NaOH, and H₂SO₄ are used for DI regeneration. Compensation for glycol and IPA solutions meets the needs of microelectronics applications. Adjustable linear temperature compensation is also available.

Non-temperature compensated measurement is required for monitoring pharmaceutical grade waters by USP (645). Further, Stage 1 USP conductivity limits can be alarmed by an application-specific program that also includes a user selectable safety margin.

pH temperature compensation is provided for both the conventional Nernst effects of the sensor as well as for the effects of changing ionization in pure water, with adjustable solution temperature compensation.

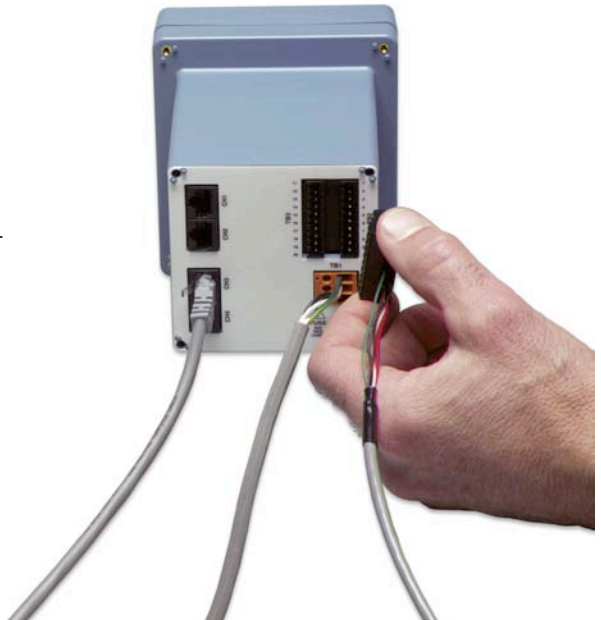
Custom names allow assignment of any 6-character label to directly identify each measurement on the display. The names carry through the menu structure for clarity when making settings. Custom names can eliminate the need for special panel legends and can be changed at any time.

Analog Output Signals (4 standard, 4 more - optional) are isolated and include 0-20 or 4-20 mA ranges, with choices of linear, logarithmic, bi-linear or dual output scaling. Linear allows conventional setting of high and low limits. Other scalings allow high resolution under normal operating conditions but also keep the measurement on-scale for tracking during upsets. Logarithmic allows setting the high end and number of decades. Bi-linear provides separate scaling for the lower and upper halves of the signal range. Dual scaling switches to a second scaling range when the first range is exceeded and activates a relay for range indication.

DICap™ deionization capacity monitoring is a unique Thornton method to predict the timing of DI resin exhaustion, compensating for both flow rate and variable water composition. It measures deionizer feed flow rate and conductivity and then computes the ionic load that has entered the DI bed. The product of flow rate and TDS is integrated over time to yield this cumulative TDS as total grains or total equivalents.

Multi-level security allows separate access to calibration and to other functions. Menus may still be viewed when security prevents change.

Power plant calculations of pH and CO₂ based on specific, cation and degassed conductivity measurements add to the reliability of cycle chemistry monitoring and control programs.



Functional					
Sensor Inputs	4 Smart Sensor channels, 2 pulse flow channels				
Con./Res. Ranges	0.01 Constant 2-E Cell: 0.001 $\mu\text{S}/\text{cm}$ to 2,000 $\mu\text{S}/\text{cm}$; 0.5 k $\Omega\text{-cm}$ to 1,000 M $\Omega\text{-cm}$				
	0.1 Constant 2-E Cell: 0.01 $\mu\text{S}/\text{cm}$ to 3,000 $\mu\text{S}/\text{cm}$; 0.33 k $\Omega\text{-cm}$ to 100 M $\Omega\text{-cm}$				
	10 Constant 2-E Cell: 10 $\mu\text{S}/\text{cm}$ to 200,000 $\mu\text{S}/\text{cm}$				
	50 Constant 2-E Cell: 10 $\mu\text{S}/\text{cm}$ to 1.0 S/cm				
	4-E Cell: 10 $\mu\text{S}/\text{cm}$ to 800,000 $\mu\text{S}/\text{cm}$				
	Readout in S/m is selectable				
	TDS: covers equivalent conductivity ranges				
	Concentrations: HCl: 0-15%, NaOH: 0-13%, H ₂ SO ₄ : 0-20%, by weight				
pH & ORP Ranges	-1 to 15 pH, -1500 to +1500 mV				
D.O. Ranges	0 to 15,000 ppb or $\mu\text{g}/\text{L}$, 0 to 15 ppm or mg/L, with auto-ranging; 0 to 100% saturation				
Ozone Ranges	0 to 5,000 ppb, 0 to 5 ppm or equivalent g/L ranges				
TOC Range	0.05 to 1,000 ppb or $\mu\text{g}/\text{L}$ C				
Temp. Ranges	-40 °C to 200 °C, -40 to 392 °F with Pt1000 RTD or Pt100 RTD				
Flow Ranges	Sensor range in GPM, LPM, m ³ /hr, 0.5-4,000 Hz				
Pressure Ranges	Sensor range in psi, bar, kPa, mmHg, kg/cm ² , inches, feet				
Tank Level (Volume)	Sensor range in gallons, m ³ , liters, % full, psi, inches, feet				
Derived Meas.	Total flow, % rejection, % recovery, sum, difference, ratio, ppm-gallons, total grains, power calculated pH & CO ₂				
Electrical Ranges	Volts, Amps, based on proportional millivolt signal				
Temp. Comp.	Automatic, referenced to 25 °C for resistivity, conductivity, % rejection and TDS. Field selectable for standard high purity (Thornton/Light), cation, ammonia/ETA (power industry), isopropyl alcohol, 50 and 100% glycol, HCl, H ₂ SO ₄ , or Light 84 (special microelectronics applications). pH temperature compensation for Nernst electrode output effects plus adjustable solution temperature compensation for high purity water ionization effects, referenced to 25 °C. DO and ozone temperature compensation for membrane permeability and gas solubility in water.				
Pressure Comp.	Dissolved Oxygen compensation for atmosphere pressure during calibration using barometer in preamp. Pressure read out available in bar or mmHg.				
Discrete Inputs	Two standard, buffered TTL/CMOS level or dry (potential free) contacts for resetting total flow or total grains measurements.				
Outputs					
Setpoints/Alarms	16, set individually as high, low, reset, USP (645), or EP limits on any measurement. Any relay or discrete output can be programmed to operate from multiple setpoints.				
Relays	Optional: 4 SPDT potential-free relays, rated 5 amp max. resistive load up to 30 VDC or 250 VAC				
Discrete Outputs	Two standard, buffered TTL/CMOS level				
Analog Output Signals	Four standard plus four optional, powered 0/4-20 mA outputs, 500 ohm load maximum, isolated from input and from earth ground; accuracy \pm 0.05 mA, typical. Outputs are assignable to any measurement with free scaling in linear, bi-linear, logarithmic, or dual range format. Not for use in powered circuits.				
Serial Output	RS232 standard, maximum distance 50 ft, field selectable up to 38.4 kbaud				
Performance					
Resistance Accuracy	\pm 0.3% of reading, 1,000 ohms to 6 Mohms; \pm 0.5% of reading, 6 M to 10 Mohms; \pm 1% of reading or \pm 0.5 ohm, whichever is greater, 10 to 1,000 ohms (divide by cell constant for resistivity range)				
Volt/Temp. Accuracy	\pm 3 mV, \pm 0.02 pH, \pm 0.2 °C, see sensor specs for dissolved oxygen and ozone				
Frequency Accuracy	\pm 0.1% or \pm 0.001 Hz, whichever is greater				
Repeatability	\pm 0.2% of reading, 1,000 to 10 Mohms; \pm 0.8% of reading, 10 to 1,000 ohms for conductivity/resistivity; \pm 0.05 °C; \pm 0.02 pH; \pm 0.3 mV				
Ratings/Approvals	All models are UL and cUL (CSA Standards) Recognized and CE compliant				
Environmental					
		Configuration		Power Supply	
		Relay	A-Out	115 VAC & 24 VDC	230 VAC
Temp.	Storage: -20 to 80 °C (-4 to 176 °F)	0	4	-10°C to 50°C	-10°C to 50°C
	Operating: see table at right	4	4	-10°C to 50°C	-10°C to 40°C
Humidity	0 to 95% RH, non-condensing	4	8	-10°C to 40°C	-10°C to 40°C
Enclosure/Power					
Display/Keypad	20 character x 4 line backlit LCD or vacuum fluorescent; 20 tactile feedback keys				
Material/Weight	ABS-PC alloy, UV and chemical resistant; 2 lbs. (0.9 kg)				
Rating	NEMA 4X, panel mounting; sealed back cover also available				
Panel Cutout	3.78 x 3.78" (96 x 96 mm) 1/4 DIN				
Wall Mount	With accessory back cover, 8.84 x 4.82" (225 x 123 mm) overall				
Pipe Mount	With accessory bracket for 2" (50.8 mm) pipe				
Sensor Patch	300 ft (91 m) max; 150 ft (45 m) max for pressure and level sensors. Reduced accuracy with 4-E sensors only at				
Cord Length	high conductivity with patch cords > 50 ft (15 m)				
Power	100-240 VAC, 20W max, 47-63 Hz; 20-32 VDC, 30W max. DC power must be isolated and limited to 8A or less. Stored values are retained in non-volatile memory without batteries.				

Smart Sensors

Smart Sensors used with the 770MAX have sensor type, calibration data and serial number factory-stored in memory for automatic configuration when connected—a great simplification at startup. Smart sensors are available for a wide variety of parameters described below. For further information, see specific sensor data sheets: MLO072 for conductivity; MLO074 for pH, ORP, dissolved oxygen, ozone, pressure, level & temperature, MLO073 for sanitary sensors, MLO116 for non-sanitary flow and MLO103 for TOC.

Conductivity/Resistivity

Thornton provides a full complement of Smart conductivity sensors with NPT or Tri-Clamp sanitary fittings. They include various lengths, cell constants and materials to match the application: titanium concentric electrodes for high purity water; highly polished 316L SS electrodes for pharmaceutical waters; CPVC and PEEK sensors with four flush electrodes for solutions with higher conductivity and/or suspended material. Precise factory calibration of each cell constant and RTD is stored in sensor memory for use by the 770MAX when connected. Optimized 4-wire measuring circuitry provides exceptional rangeability and accuracy, eliminating cable effects.

pH & ORP

pH and ORP (oxidation-reduction potential) sensors utilize a compact preamplifier with VP cable to prevent signal loss over long cable runs. A wide variety of Mettler-Toledo pH electrodes with VP connection can meet diverse application requirements. The high purity pH assembly uses a shielded flow chamber and self-pressurized reference electrode for stable measurement.

Total Organic Carbon (TOC)

The 5000TOC sensor utilizes UV Oxidation and differential conductivity in conjunction with the 770MAX instrument to perform ppb-level TOC measurements. Smart technology is employed

allowing interface with the TOC sensor through standard 770MAX patch cables. Sensor functionality is completely controlled through a standard 770MAX instrument. Along with TOC, sample conductivity or resistivity and temperature can be measured and displayed.

Dissolved Oxygen

Thornton provides a choice of reliable Smart dissolved oxygen sensors especially for measurement in high purity ranges. The high-performance sensor provides especially high accuracy and fast down-scale response. The long life sensor is an industry-proven design that can operate several years without any internal maintenance and does not experience errors in the presence of dissolved hydrogen. Sensor preamplifiers include barometric pressure measurement and correction during calibration.

Dissolved Ozone

To assure sanitization of pharmaceutical, semiconductor and bottled waters using ozone, the Thornton Smart Ozone Sensor provides reliable, accurate monitoring. Its drop-in replacement membrane design allows simple, inexpensive maintenance.

Flow

Smart Sensors for flow include a variety of paddlewheel, vortex shedding, and sanitary turbine types to meet the needs of most applications. Smart flow sensors convey their precalibrated values to 770MAX for ease of installation and startup. A choice of English or metric flow units may also be totalized, with internal or external reset. Flow comparisons between two sensors include sum, difference, ratio, and % recovery.

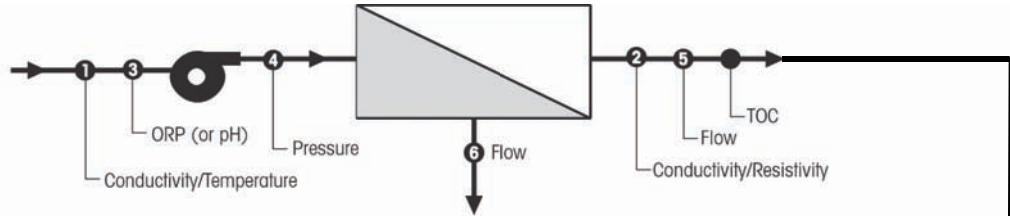
Pressure and Tank Level

Smart level and pressure sensors are available with sanitary and NPT connections. The 770MAX allows very convenient calibration after installation. Level units can be % full, height or volume in a wide variety of English and metric units.



Membrane Process

A single 770MAX can handle pretreatment and all important membrane performance measurements including % rejection and % recovery.

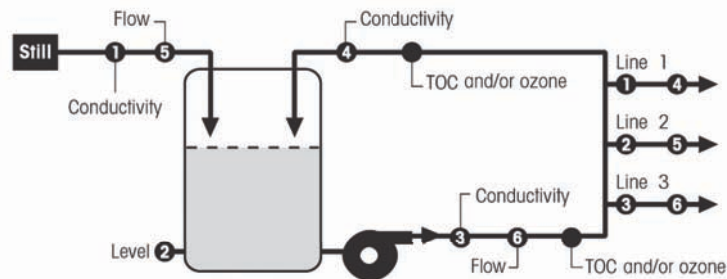


Sensor/Channels	Display Measurements	Setpoints	Relays
1 Conductivity	A Feed Resistivity B Feed Temperature C Feed TDS	• High Feed Conductivity • High pH or ORP • Low pH or ORP • Low Pressure	• High/Low pH or ORP • High Product Conductivity • Low % Rejection • Low Product Flow
2 Conductivity	D % Rejection E Product Conductivity	• High Product Conductivity • Low % Rejection • Low Product Flow	
3 pH or ORP	F Feed pH or ORP (Chlorine)		Analog Outputs • Product Conductivity • % Rejection • Product Flow • Reject Flow
4 Pressure	G Membrane Pressure		
5 Flow	H Product Flow I % Recovery		
6 Flow	J Reject Flow		

● TOC measurement also available to monitor organic levels of product water from some membrane processes.

Pharmaceutical Waters

A single 770MAX monitors a still & distribution system. Additional 770MAX units can monitor conductivity & flow at each production area, to ensure compliance with USP or EP requirements. 770MAX simultaneously measures temperature, temperature compensated and uncompensated conductivity, which can be alarmed by the limits contained in 770MAX software as specified by USP (645) or EP.



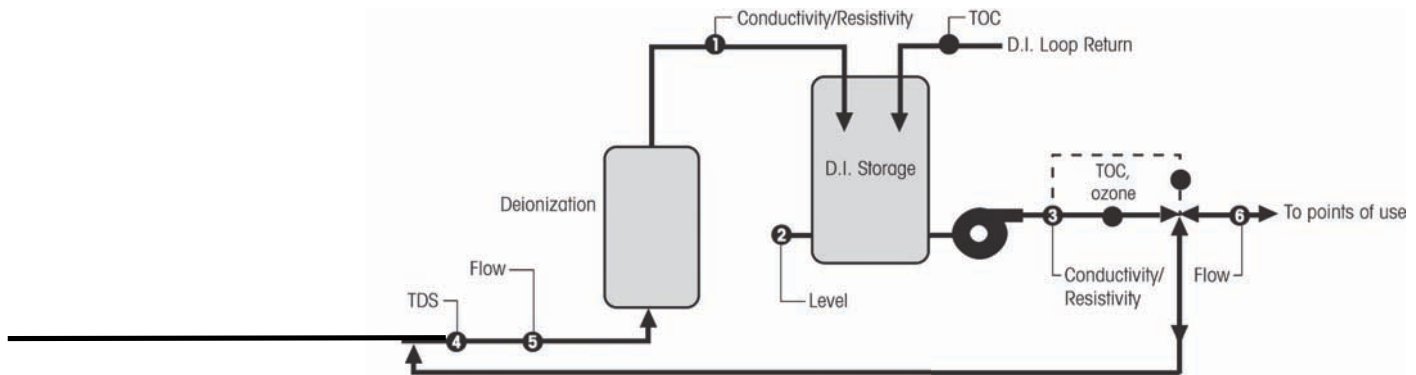
770MAX - Unit 1 Sensor/Channels	Display Measurements	Setpoints	Relays
1 Conductivity	A Distillate Conductivity B Distillate Conductivity U C Distillate Temperature	• USP Still Conductivity • Low Level • High Level	• High Still Conductivity • Low Level • USP Supply or Return Conductivity • Low Supply or Return Temperature
2 Level	D Storage Level		
3 Conductivity	E Supply Conductivity F Supply Conductivity U G Supply Temperature	• USP Supply Conductivity • USP Supply Temperature • Low Return Conductivity • Low Return Temperature • Low Still Flow	Analog Outputs • Still Flow • Supply Conductivity • Supply Flow • Return Conductivity
4 Conductivity	H Return Conductivity I Return Conductivity U J Return Temperature		
5 Flow	K Distillate Flow L Total Distillate Flow		
6 Flow	M Supply Flow		

● TOC and/or Ozone measurement, also available to monitor in distribution loop water supply & return.

U = Non-temperature Compensated Conductivity as specified in USP (645).

Deionization Process

770MAX readily monitors & controls deionization process. Ionic loading on the DI resin can be tracked by Thornton's unique DICap™ deionization capacity monitoring which integrates flow & TDS to yield total grains or total equivalents.

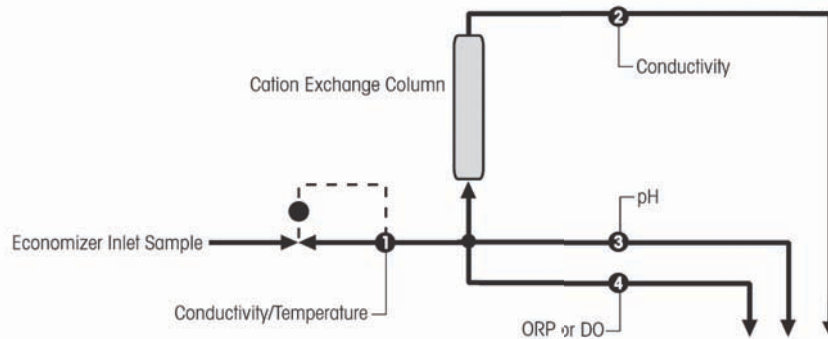


Sensor/Channels	Display Measurements	Setpoints	Relays
① Conductivity/Resistivity	A DI Conductivity or Resistivity	• Low DI Conductivity	• High DI Conductivity
② Level	B DI Level	• High Level	• Level Control
③ Conductivity/Resistivity	C Process DI Resistivity	• Low Process Resistivity	• Recirc. Process Resistivity
④ Conductivity	D Feed Temperature	• High TDS	• High Total Grains or High TDS
	E Feed TDS	• High Total Grains	
	F DICap™ Total Grains	• Reset Total Grains	
⑤ Flow	G Feed Flowrate		
⑥ Flow	H Flowrate		

Analog Outputs	
•	DI Resistivity
•	Feed Flow
•	Feed TDS
•	Total Grains

Power Plant Cycle Chemistry Monitoring

770MAX measures the common parameters of cycle chemistry samples in a single unit. Highly accurate cation conductivity temperature compensation assures close surveillance of this most important parameter.

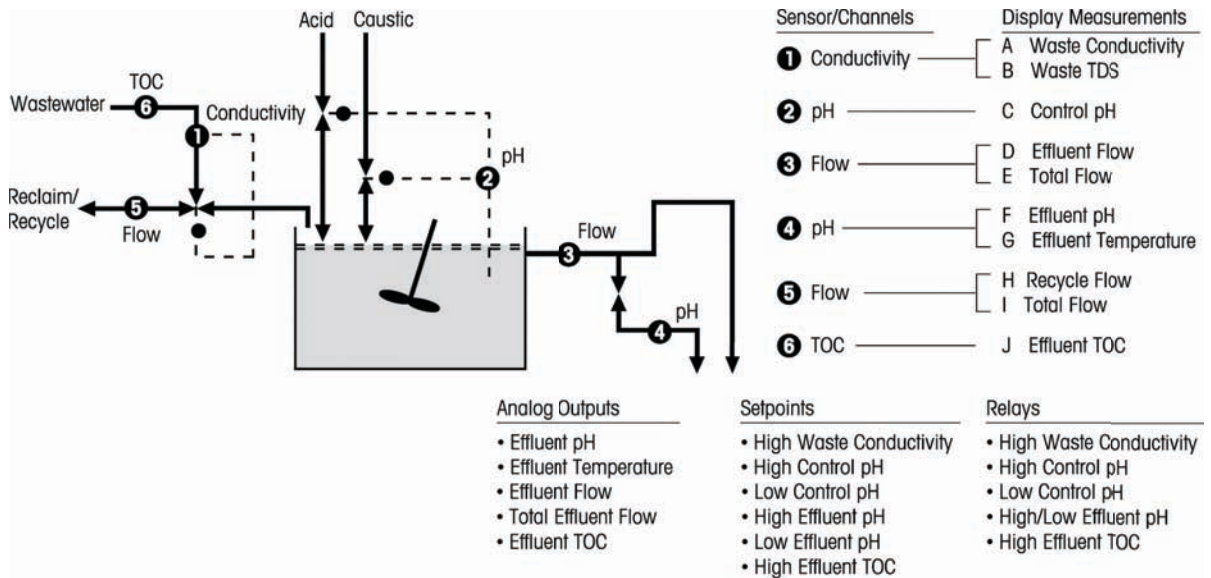


Sensor/Channels	Display Measurements	Setpoints	Relays
① Conductivity	A Specific Conductivity	• High Specific Conductivity	• High/Low Specific Conductivity
	B Temperature		
② Conductivity	C Calculated pH	• High Temperature	• High Cation Conductivity
	D Cation Conductivity	• High Cation Conductivity	• pH Deviation
③ pH	E pH	• Low pH	
④ ORP or DO	F ORP or Dissolved Oxygen	• High pH	
		• pH - calculated pH	

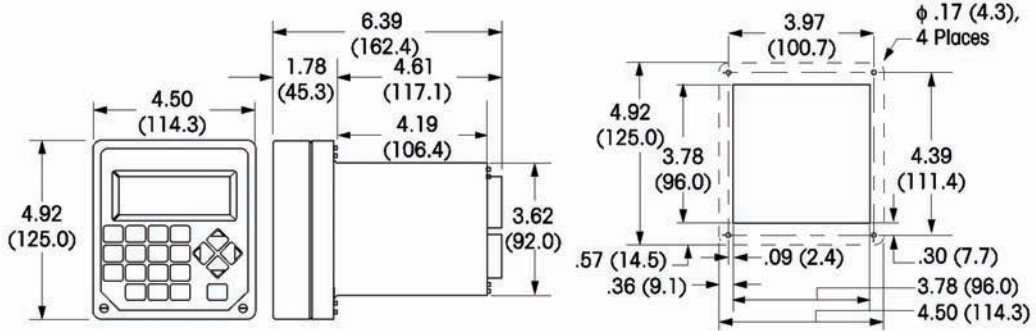
Analog Outputs	
•	Specific Conductivity
•	Cation Conductivity
•	pH
•	ORP or DO
•	Calculated pH

Wastewater Treatment

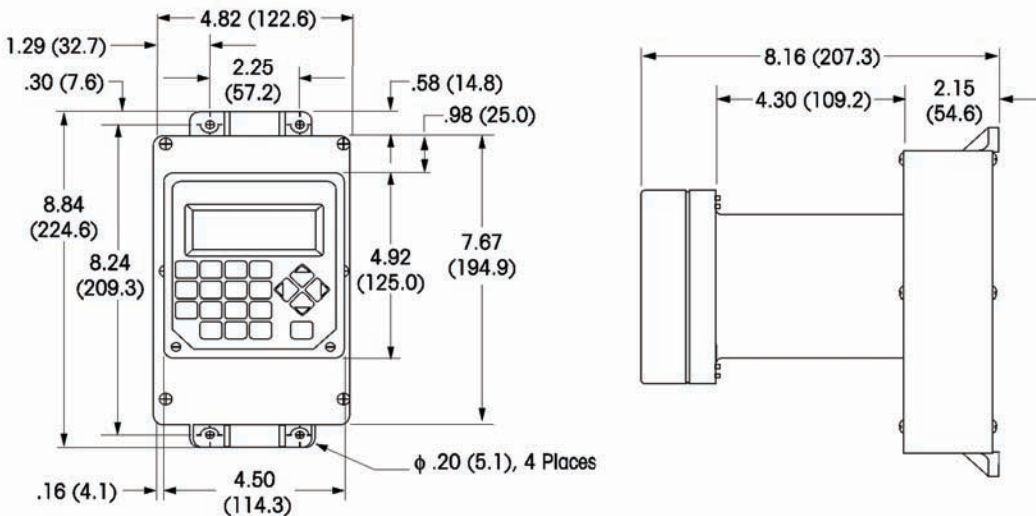
770MAX can divert reusable water before treatment based on conductivity and/or TOC. It can control neutralization and monitor effluent, to meet discharge requirements—all using the same instrument.



770MAX Panel Cutout Dimensions



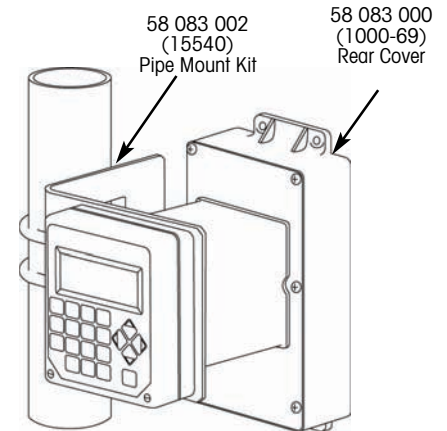
770MAX with Sealed Rear Cover



Dimensions: inches (mm).

770MAX Model Numbers

Description				US & Canada Part No.	International Part No.
Display	Power	Analog Outputs	Relays		
LCD	AC	4	0	775-LA0	58 000 000
LCD	AC	4	4	775-LA1	58 000 001
LCD	AC	8	4	775-LA2	58 000 002
VFD	AC	4	0	775-VA0	58 000 003
VFD	AC	4	4	775-VA1	58 000 004
VFD	AC	8	4	775-VA2	58 000 005
LCD	DC	4	0	775-LD0	58 000 006
LCD	DC	4	4	775-LD1	58 000 007
LCD	DC	8	4	775-LD2	58 000 008
VFD	DC	4	0	775-VD0	58 000 009
VFD	DC	4	4	775-VD1	58 000 010
VFD	DC	8	4	775-VD2	58 000 011



Sensor Patch Cords

Description	US & Canada Part No.	International Part No.
1 ft (0.3 m)	1001-79	58 080 000
5 ft (1.5 m)	1005-79	58 080 001
10 ft (3 m)	1010-79	58 080 002
15 ft (4.5 m)	1015-79	58 080 003
25 ft (7.6 m)	1025-79	58 080 004
50 ft (15.2 m)	1050-79	58 080 005
100 ft (30.5 m)	1100-79	58 080 006
150 ft (45.7 m)	1115-79	58 080 007
200 ft (61 m)	1120-79	58 080 008
300 ft (91 m)	1130-79	58 080 009

Patch cord with connector at both ends, for 770MAX and Smart Sensors.
Not used with pulse input flow sensors.
Observe length limitations for some sensors.

Ozone Sensor Patch Cords

Description	US & Canada Part No.	International Part No.
5 ft (1.5 m)	1005-70	58 080 011
10 ft (3 m)	1010-70	58 080 012
15 ft (4.5 m)	1015-70	58 080 013
25 ft (7.6 m)	1025-70	58 080 014
50 ft (15.2 m)	1050-70	58 080 015
100 ft (30.5 m)	1100-70	58 080 016
150 ft (45.7 m)	1115-70	58 080 017
200 ft (61 m)	1120-70	58 080 018
300 ft (91 m)	1130-70	58 080 019

Accessories

Description	US & Canada Part No.	International Part No.
Rear Cover for wall mounting and rear seal (requires Cable Grip Kit, 1000-80, or conduit)	1000-69	58 083 000
Cable Grip Kit – One kit seals two cables into the rear cover above, with fittings large enough to accept patch cord connector or other cable 0.546 (13.8 mm) maximum diameter.	1000-80	58 083 001
Pipe Mounting Bracket for 2" (50 mm) pipe	15540	58 083 002
Automatic Smart Calibrator Kit (for 770MAX)	1875	58 082 000
Portable Conductivity/Resistivity Calibration System (for system including sensor)	1885	58 082 010

For 770MAX Sensors, see data sheets:

ML0072	Conductivity/Resistivity Sensors
ML0074	pH, ORP, dissolved oxygen, dissolved ozone, flow, pressure, level, temperature Sensors
ML0073	Sanitary Tri-Clamp Sensors
ML0116	Non-Sanitary Flow Sensors
ML0103	5000TOC Sensor

1875 Automatic Smart Calibrator

At the push of a button, the 1875 calibrator automatically steps through NIST-traceable reference resistances, voltages and frequencies to calibrate and verify all ranges of the 770MAX to meet QA requirements and ensure highest accuracy performance. Digital communication conveys precise calibration values to the instrument and confirms that verification values are measured within tolerance.* Results of sequential 770MAX calibrations are retained in the calibrator's memory with a real time clock to allow subsequent downloading to a PC for printout of calibration certificates. Software and cables are included.

An interconnect cable is supplied to connect the calibrator to the instrument. The 770MAX 4-wire resistance measuring technique eliminates patch cord resistance effects.

* US Patent No. 5,248,933

Performance Specifications

Description	
Resistance Accuracy	± 0.05% except ± 0.075% for 1-10 Mohm
Temperature Accuracy	± 0.1 °C
Frequency Accuracy	± 0.03%
Voltage Accuracy	± 0.5 mV
NIST Traceability	Documented on certificate of calibration for calibrator
Ambient Temperature	20-40 °C for rated accuracy
Memory Capacity	20 channels of calibration and/or verification (770MAX has 4 smart channels per instrument)
Power Supply Rating	90-264 V, 47-63 Hz; CE compliant, CSA rated, UL Listed.
Dimensions	7.7 x 4.0 x 1.6" (195 x 100 x 40 mm)



The 1875 Kit (Part No. 58 082 000) Includes:

Description	
Smart Automatic Calibrator with certificate of calibration	
Calibrator-to-770MAX Cable, connects to smart channel input, 5 ft (1.5 m)	
RS232 DB9 cable for connection to computer port	
770MAX Certificate Management Program for Windows 95 or higher on CDROM	
Modular power supply and cable, used when Calibrator is not connected to a 770MAX during download to the computer	

*** Certificate of Recalibration ***

Thorston Inc., an ISO9001 certified company, hereby certifies that the item below will meet or exceed all published measurement specifications when calibrated in accordance with the referenced procedure as indicated by Pass/Fail below. The calibration procedure for the Smart Calibrator comply with ISO 10012. The standards used are traceable to the National Institute of Standards and Technology (NIST).

DATE OF CAL: _____
 MODEL NUMBER: _____
 SERIAL NUMBER: _____
 MEASUREMENT CHANNEL: 1

CAL. REFERENCE PER: Factory Procedure TP97201 or User Manual 84386

SERIAL#	RES/TEMP ACCURACY	VOLTAGE ACCURACY	FREQUENCY ACCURACY	DOE DATE
387053	± 0.050%	± 0.075%	± 0.03%	08-Apr-02

RANGE (Ohms)	VALUE	DEVIATION	BEFORE	P/F	AFTER	VALUE	DEVIATION	LIMIT	P/F
1	3976194.0	0.00%	3976194.0	PASS	3976194.0	0.00%	+/- 0.30%	PASS	
2	157574.0	0.00%	157574.0	PASS	157574.0	0.00%	+/- 0.30%	PASS	
3	498.6	-0.01%	498.6	PASS	498.6	0.00%	+/- 0.30%	PASS	
4	498.6	-0.01%	498.6	PASS	498.6	0.00%	+/- 0.30%	PASS	
TEMP (Ohms)	1001.1	0.00%	1001.1	PASS	1001.1	0.00%	+/- 0.20%	PASS	
VOLTAGE (Volts)	1.3350	0.01%	1.3350	PASS	1.3350	0.00%	+/- 2.00V	PASS	
FREQUENCY (Hz)	99.992	0.00%	99.992	PASS	99.992	0.00%	+/- 0.03%	PASS	

RANGE (Ohms)	VALUE	DEVIATION	BEFORE	P/F	AFTER	VALUE	DEVIATION	LIMIT	P/F
1	157574.0	-0.00%	157574.0	PASS	157574.0	0.00%	+/- 0.30%	PASS	
2	24924.9	0.00%	24924.9	PASS	24924.9	0.00%	+/- 0.30%	PASS	
3	199.6	-0.03%	199.6	PASS	199.6	0.00%	+/- 0.30%	PASS	
4	199.6	-0.03%	199.6	PASS	199.6	0.00%	+/- 0.30%	PASS	
TEMP (Ohms)	1001.1	0.00%	1001.1	PASS	1001.1	0.00%	+/- 0.20%	PASS	
VOLTAGE (Volts)	0.6679	0.30%	0.6679	PASS	0.6679	0.00%	+/- 2.00V	PASS	
FREQUENCY (Hz)	500.3	0.00%	500.3	PASS	500.3	0.00%	+/- 0.03%	PASS	

Note: Measurement certification consists of one page per channel.

1885 Portable Conductivity/Resistivity Calibration System

The 1885 Portable Conductivity/Resistivity Calibration System enables verification of in-line sensors, without shutting down the process.

Principal of Operation

It is a standard practice to determine the cell constant of a sensor by comparing the reading of that sensor to the reading of a sensor with a known, certified cell constant. This procedure is described in ASTM D5391 and USP <645>. A key reason that this method is used by these standards organizations is the lack of accurate and stable liquid standards in the pure and ultrapure water ranges (less than 100 $\mu\text{S}/\text{cm}$).

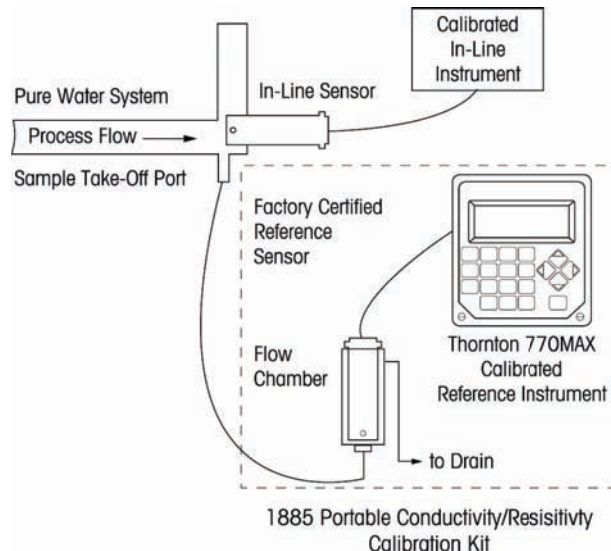
The 1885 Calibration System includes the 230-211 Smart Sensor™ as the reference conductivity sensor, with a certified and traceable cell constant of $\pm 1\%$ and a temperature detector of $\pm 0.1\text{ }^\circ\text{C}$ at 25 $^\circ\text{C}$. This reference sensor, mounted in a sealed flow chamber and connected to a Thornton 770MAX Instrument, measures a sidestream sample, delivered through user-supplied tubing. The 770MAX compensates and displays the sensor signal. The 770MAX would have been previously calibrated using the 1875 Smart Calibrator™ which has $\pm 0.075\%$ or better conductivity accuracy.



The 1885 Kit (Part No. 58 082 010) Includes:

Description	US & Canada Part No.	International Part No.
770MAX with line cord	775-VAO	58 000 003
Smart Conductivity Sensor	230-211	58 031 004
Stainless Steel Flow Chamber with 1/8" NPTF ports	1000-30	58 084 000
2 Patch Cords 5 ft (1.6 m)	1005-79	58 080 001
Automatic Smart Calibrator	1875	58 082 000
Carrying Case	13339	-
System Calibration, with report	CAL-40	58 082 540

The user supplies appropriate fittings and tubing between the flow chamber and the process take-off port. The length should be as short as possible, less than 3 ft (1 m).



Thornton Factory Calibration

Thornton has an extensive ISO 9001 controlled QC procedure for certifying reference conductivity sensors and temperature compensators. First, cell constants for Thornton's transfer standard sensors are determined by using ASTM D1125 standard solutions C and D at 25 $^\circ\text{C}$. Then, these cell constants are verified in a flowing high purity water loop at three precisely measured temperatures (15, 25 and 40 $^\circ\text{C}$), which are effectively three different high purity standards. While in the loop, the RTDs in the transfer standard cells are calibrated at 25 $^\circ\text{C}$, based on NIST-traceable temperature sensors.

Next, production conductivity sensors are installed into the high purity loop, where temperature is controlled to 25 $^\circ\text{C}$, along side the standard transfer sensors. Each production sensor cell constant is determined. The production sensor RTD is calibrated in the same manner. To complete the calibration process, a dedicated computer logs the readings, calculates the calibration cell constants, and generates a certificate of accuracy.

1885 components are then factory calibrated as a system, resulting in a typical total system accuracy of $\pm 1\%$ of reading near 25 $^\circ\text{C}$.

770MAX Windows® Configuration Software

- Configure on a computer and download to a 770MAX
- Configure a 770MAX and upload settings to a computer
- Collect measurement data into an Excel®-compatible file

770MAX Windows® Configuration Software enables easy configuration of a 770MAX instrument using RS232 serial communication from a personal computer running the Microsoft Windows® operating system. It simplifies the selection of all parameters for measurements, analog outputs, setpoints, relays, display, security, etc. The software allows storing any number of configurations for download to multiple instruments. It is a great time-saver and will ensure reliability of configuration for system fabricators. Configuration data can also be uploaded to a computer from a 770MAX to provide backup security for installed systems.

In addition, this software includes a data log feature that can collect all measurement data from a single 770MAX into a CSV file compatible with Excel. The data collection interval can be set from 4 to 999 seconds and comments can be written into the data file at any time.

This software is available for individual customer use or as a site license for a specific company and its employees. Full optimization of this software requires 770MAX version 3.0 (August, 2003) or later.



Description	Part No.
770MAX Windows® Configuration Software on CD-ROM for use with 770MAX and Microsoft Windows®	58 077 000
770MAX Windows® Configuration Software on CD-ROM plus site license for limited on-site use or use by a specific company and its employees	58 077 001

www.mt.com/thornton

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