Turbine Flow Meters, Display Modules and BTU Measurement Products

Effective July 8, 2013
Revision A

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TURBINE FLOW METER APPLICATION GUIDE

IMPORTANT POINTS TO CONSIDER REGARDING ONICON TURBINE FLOW METERS

1. **General** - Typically used for conductive, low viscosity liquids in full, pressurized pipes (with filters or strainers in open loops.)
2. **Specifications** - Review engineering specifications carefully to determine if LCD display and/or 316 SS wetted components are specified for the project. Many specifications based on industrial meters will require these features.
3. **Output Signals** - The models shown below are most commonly used in these applications. However, any available output signal can be used for any application. With the System-10 BTU Meter, we typically use frequency output flow meter models.
4. **PVC or SS Pipe** - Insertion turbine flow meters must have 316 SS option to prevent galvanic corrosion. Also, use of PVC or SS pipe may indicate a process application with chemical compatibility or low conductivity to consider.

APPLICATION	LOCATION & PIPE SIZE	MODEL (SIGNAL TYPE)	REQUIRED OPTIONS	DISPLAY / BTU METERS
HVAC APPLICATIONS				
Chilled Water	¾”- 1” (0.8 to 38 gpm)	F-1310 (analog)	None	System-10
Hot Water (280°F)	1¼” - 2”	F-1110 (analog)	316 SS for HW over 250°F 316 SS for non-metallic pipe Check project specifications for required features	
Condenser Water* (closed loop)	2½” and up with developed flow (long pipe runs)	F-1110 (analog)		
	2½” and up with undeveloped flow due to short pipe runs	F-1210 (analog)		
Primary / Secondary Bypass	Any bi-directional application in 2½” and larger pipes	FB-1210 (analog)		D-100
Stratified Thermal Storage	Any bi-directional application in 2½” and larger pipes	FB-1210 (analog)		System-10
Make-up Water	1¼”- 2”	F-1130 (pulse)	316 SS wetted metal components are required for insertion type meters in these applications.	D-100
Domestic Hot Water **Domestic Cold Water**	Choose single or dual based on straight pipe run	F-1130 or F-1230 (pulse)		
Steam Condensate	Typically small pipes	F-1130 or F-1330 (pulse)	316 SS wetted metal components are required for insertion type meters in these applications.	
Boiler Feed Water (to 280°F)	Typically small pipes	F-1130 (pulse)		
MUNICIPAL WATER				
Municipal Water	1¼” and up with developed flow (long pipe runs)	F-1111 (iso-analog)	316 SS wetted metal components required.	D-100
	2½” and up with undeveloped flow due to short pipe runs	F-1211 (iso-analog)		
PROCESS APPLICATIONS				
Process Water **Process Cooling**	1¼” - 2”	F-1111 (iso-analog)	316 SS wetted metal components typically required.	D-100
	2½” and up with developed flow (long pipe runs)	F-1111 (iso-analog)		
	2½” and up with undeveloped flow due to short pipe runs	F-1211 (iso-analog)		
Process Cooling Low Conductivity	1¼” and up with developed flow (long pipe runs)	F-1111 (iso-analog)	Requires 316 SS welded construction and low conductivity option.	

*** Note regarding open loop condenser water applications:**
Open loop cooling towers may introduce debris that could foul turbine meters.
Please consider Model F-3500 insertion electromagnetic type flow meter for open loop applications.

I. MODEL NUMBERING SYSTEM

Format: F(B)-XX YY

SERIES (XX)

F - 11	Single Turbine, Insertion Type
F - 12	Dual Turbine, Insertion Type
FB - 12	Bidirectional, Insertion Type
F - 13	Inline Turbine Meter (¾" and 1")

Example: An **F-1210** is a:

- Dual Turbine, Insertion Type
- Analog Output

OUTPUT SIGNAL (YY)

00 **Frequency Output (15 V pulse):** For connection to ONICON display or BTU meter only. Signal is too fast for most building control systems (0-300 Hz).

10 **Analog Output (non-isolated):** Provides both 4-20 mA and 0-10 V outputs. Most commonly used output type (3-wire connection).

11 **Isolated Analog Output:** Provides both 4-20 mA and 0-10 V outputs. Signal ground is isolated from power supply and pipe ground (4-wire connection).

20 **Divided Output (dry contact):** Provides an isolated binary/digital output. Signal is divided to limit the maximum frequency. For rate/totalization.

30 **Scaled Output (dry contact):** Provides an isolated binary/digital output scaled to provide one pulse per desired unit volume (i.e. 1 pulse = 10 gallons). Ideal for totalization applications.

II. INSTALLATION HARDWARE

Purchase of installation kit with the insertion type flow meter is strongly recommended to prevent installation problems. Installation hardware kits are listed on pages 7 - 10.

III. CALIBRATION DATA

ONICON flow meters are custom calibrated for each application. Pipe size, material, flow range, etc. are required for all meters. Use order form and email directly to customerservice@onicon.com. Order forms can be downloaded from ONICON's web site. You may also use your own spreadsheet, etc. to submit calibration data. Contact ONICON for assistance with calibration data questions.

IV. PERIPHERAL DEVICES AVAILABLE

Display Modules: See D-100 and D-1200 Series Display Modules.
BTU Meters: See System-10 and System-30 Series BTU Meters (different order forms for these.)

V. APPLICATIONS ASSISTANCE

Contact ONICON or your local sales representative for applications questions.

	MODEL	DESCRIPTION
Insertion Single Turbine	F-1100	**Frequency Output:** Single Turbine Insertion Flow Meter (Basic meter for use with ONICON BTU Meters or display modules)
	F-1110	**Analog Output:** Single Turbine Insertion Flow Meter
	F-1111	**Isolated Analog Output:** Single Turbine Insertion Flow Meter
	F-1120	**Divided Output:** Single Turbine Insertion Flow Meter
	F-1130	**Scaled Output:** Single Turbine Insertion Flow Meter
Insertion Dual Turbine	F-1200	**Frequency Output:** Dual Turbine Insertion Flow Meter (Basic meter for use with ONICON BTU Meters or display modules)
	F-1210	**Analog Output:** Dual Turbine Insertion Flow Meter
	F-1211	**Isolated Analog Output:** Dual Turbine Insertion Flow Meter
	F-1220	**Divided Output:** Dual Turbine Insertion Flow Meter
	F-1230	**Scaled Output:** Dual Turbine Insertion Flow Meter
Insertion Bi-directional	FB-1200	**Frequency Output:** Bi-directional Dual Turbine Insertion Flow Meter (Basic meter for use with ONICON BTU Meters or display modules)
	FB-1210	**Analog Output:** Bi-directional Dual Turbine Insertion Flow Meter
	FB-1211	**Isolated Analog Output:** Bi-directional Dual Turbine Insertion Flow Meter
	FB-1220	**Divided Output:** Bi-directional Dual Turbine Insertion Flow Meter
	FB-1230	**Scaled Output:** Bi-directional Dual Turbine Insertion Flow Meter
3/4" and 1" Brass Inline	F-1300	**Frequency Output:** Inline Turbine Flow Meter (Basic meter for use with ONICON BTU Meters or display modules)
	F-1310	**Analog Output:** Inline Turbine Flow Meter
	F-1311	**Isolated Analog Output:** Inline Turbine Flow Meter
	F-1320	**Divided Output:** Inline Turbine Flow Meter
	F-1330	**Scaled Output:** Inline Turbine Flow Meter
		DESCRIPTION (Insertion Turbine Flow Meter Only)
Flow Meter Options	F-1199-STANLS	Upgraded wetted metal components to 316SS (Single Turbine)
	F-1299-STANLS	Upgraded wetted metal components to 316SS (Dual Turbine)
	FB-1299-STANLS	Upgraded wetted metal components to 316SS (Bi-directional Turbine)
	F-OPT9-SUBMER	Submersible electronics enclosure (316SS also required)
		DESCRIPTION (Insertion and Inline Flow Meters)
Accessory Items	F-OPT10-DIN	Standard DIN connector set w/ 10ft cable: Specify PVC or plenum rated (Substitute 25, 50 or 100 ft cable lengths by also ordering cable additional cable option below)
	F-OPT11-DIN	Same as above except for used with bi-directional flow meter
	F-OPT1-CONDUIT	10 ft. liquid-tight flexible conduit with connectors
	F-OPT12-25FT	Additional 25 ft PVC jacketed or plenum rated cable (For DIN connector or as additional unterminated cable, specify type)
	F-OPT13-50FT	Same as above except with 50 ft PVC jacketed or plenum rated cable
	F-OPT14-100FT	Same as above except with 100 ft PVC or plenum cable

Notes:
1. Insertion meter 316 SS upgrades are required for all domestic water applications.
2. Hot water meters receive high temperature configuration at no additional cost.
3. Standard flow meter enclosure NEMA 4 rated.

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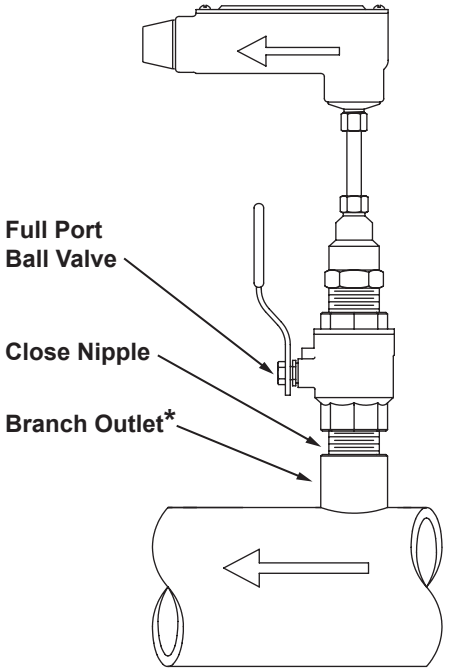
All ONICON insertion type meters can be installed and removed via a 1” or larger full port ball valve without a system shutdown. The terms “Standard” and “Hot Tap” refer to the installation method of the isolation valve kit only.

Standard Installation Hardware: For new construction or scheduled shutdown. Once kit is installed, the flow meter can be installed or removed a without system shutdown.

Hot Tap Installation Hardware: For applications that require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating.

The most commonly ordered installation kits are listed below. For a complete list of installation kits offered by ONICON refer to the next two pages.



* Weld-on fitting, copper tee or saddle

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Carbon Steel/Black Iron	**Standard** flow meter installation kit for 1¼” and larger welded steel pipe	• 1” full port bronze ball valve • 1” brass close nipple • 1” weld-on carbon steel branch outlet	F-STD-INSTL1
	Standard flow meter installation kit for 1¼” to 2½” threaded steel pipe	• 1” full port bronze ball valve • 1” brass close nipple • (pipe dia x 12” long) threaded nipple with 1” NPT outlet	F-STD-INSTL7
	Hot tap flow meter installation kit for 1¼” and larger welded steel pipe	• 1¼” full port bronze ball valve • 1¼” brass close nipple • 1¼” x 1” brass reducing bushing • 1¼” weld-on carbon steel branch outlet	F-STD-INSTL2
Copper Tube (priced by size)	**Standard** flow meter installation kit for 1” to 2” copper tube Items comply with NSF61.	• 1” full port bronze ball valve • 1” copper street adapter with MNPT threads • Copper tee with 1” outlet *1” kit includes tee with 1¼” outlet and bushing	F-STD-INSTL3
	Standard flow meter installation kit for 2½” to 3” copper tube Items comply with NSF61.	• 1” full port bronze ball valve • 1” copper street adapter with MNPT threads • Copper tee with 1” outlet	F-STD-INSTL4
	Standard flow meter installation kit for 4” copper tubeItems comply with NSF61.	• 1” full port bronze ball valve • 1” copper street adapter with MNPT threads • 1” copper tee with 1” outlet	F-STD-INSTL9
	Hot tap flow meter installation kit for 2½” to 6” copper tube	• 1¼” full port bronze ball valve • 1¼” brass close nipple • 1¼” x 1” brass reducing bushing • SS clamp-on saddle with 1¼” outlet	F-STD-INSTL22

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STANDARD INSTALLATION HARDWARE FOR INSERTION FLOW METERS

All ONICON insertion flow meters can be installed and removed via a 1” or larger full port ball valve without a system shutdown.
The terms “Standard” and “Hot Tap” refer to the installation kit types only.

How to use this price list:
1. Select the type of installation hardware required, either Standard (pg 8) or Hot Tap (pg 9-10).
2. Choose the pipe material.
3. Choose the Installation Kit based on material preference and/or pipe size.

- **Standard Installation Hardware:** For new construction or scheduled shutdown. Once the kit is installed, the flow meter can be installed or removed without a system shutdown.
- **Hot Tap Installation Hardware:** For applications which require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating.

*** Saddles may include a 1” bushing.**

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Carbon Steel/ Black Iron (welded pipe)	Installation kit for 1¼” and larger welded steel pipe	• 1” full port bronze ball valve • 1” brass close nipple • 1” weld-on carbon steel branch outlet	F-STD-INSTL1
	Stainless steel installation kit for 1¼” and larger welded steel pipe	• 1” full port SS ball valve • 1” SS close nipple • 1” weld-on carbon steel branch outlet	F-STD-INSTL5
Carbon Steel/ Black Iron (threaded pipe)	Installation kit for 1¼” - 2½” threaded steel pipe	• 1” full port bronze ball valve • 1” brass close nipple • (pipe dia. x 12” long) threaded nipple with 1” NPT outlet	F-STD-INSTL7
	Stainless steel installation kit for 1¼” to 2½” threaded steel pipe	• 1” full port SS ball valve • 1” SS close nipple • (pipe dia. x 12” long) threaded nipple with 1” NPT outlet	F-STD-INSTL8
Copper Tube	Installation kit for 1” to 2” copper tube Items comply with NSF61.	• 1” full port bronze ball valve • 1” copper street adapter with MNPT threads • Copper tee with 1” outlet *1” kit includes tee with 1¼” outlet and bushing	F-STD-INSTL3
	Installation kit for 2½” to 3” copper tube Items comply with NSF61.	• 1” full port bronze ball valve • 1” copper street adapter with MNPT threads • Copper tee with 1” outlet	F-STD-INSTL4
	Installation kit for 4” copper tube Items comply with NSF61.	• 1” full port bronze ball valve • 1” copper street adapter with MNPT threads • Copper tee with 1” outlet	F-STD-INSTL9
Cement-Lined Ductile Iron	Installation kit for 3” to 6” cement-lined ductile iron pipe	• 1” full port bronze ball valve • 1” brass close nipple • Bronze/ductile iron saddle with 1” outlet*	F-STD-INSTL10
	Installation kit for 8” to 16” cement-lined ductile iron pipe	• 1” full port bronze ball valve • 1” brass close nipple • Bronze/ductile iron saddle with 1” outlet*	F-STD-INSTL11
	Stainless steel installation kit for 3” to 6” cement-lined ductile iron pipe	• 1” full port SS ball valve • 1” SS close nipple • Ductile iron saddle with 1” outlet*	F-STD-INSTL12
	Stainless steel installation kit for 8” to 16” cement-lined ductile iron pipe	• 1” full port SS ball valve • 1” SS close nipple • Ductile iron saddle with 1” outlet*	F-STD-INSTL12A
PVC	Installation kit for 1½ ” to 6” PVC pipe	• 1” full port bronze ball valve • 1” brass close nipple • Ductile iron saddle with 1” outlet*	F-STD-INSTL13
	Installation kit for 8” to 12” PVC pipe	• 1” full port bronze ball valve • 1” brass close nipple • Ductile iron saddle with 1” outlet*	F-STD-INSTL14
	Stainless steel/PVC installation kit for 2” to 4” PVC pipe (for process and industrial applications)	• 1” full port SS ball valve • 1” SS close nipple • Sch. 80 PVC saddle with 1” outlet	F-STD-INSTL15
	Stainless steel/PVC installation kit for 6” PVC pipe (for process applications)	• 1” full port SS ball valve • 1” SS close nipple • Sch. 80 PVC saddle with 1” outlet	F-STD-INSTL16
	Stainless steel installation kit for 8” to 12” PVC pipe	• 1” full port SS ball valve • 1” SS close nipple • SS clamp-on saddle with 1” outlet*	F-STD-INSTL17
Stainless Steel	Stainless steel installation kit for stainless steel pipe	• 1” full port 316 SS ball valve • 1” 316 SS close nipple • 1” 316 SS weld-on branch outlet	F-STD-INSTL18

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HOT TAP INSTALLATION HARDWARE FOR INSERTION FLOW METERS

All ONICON insertion flow meters can be installed and removed via a 1" or larger full port ball valve without a system shutdown.
The terms "Standard" and "Hot Tap" refer to the installation kit types only.

How to use this price list:
1. Select the type of installation hardware required, either Standard (pg 8) or Hot Tap (pg 9-10).
2. Choose the pipe material.
3. Choose the Installation Kit based on material preference and/or pipe size.

- **Standard Installation Hardware:** For new construction or scheduled shutdown. Once the kit is installed, the flow meter can be installed or removed without a system shutdown.
- **Hot Tap Installation Hardware:** For applications which require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating. *** Saddles may include a 1¼" bushing.**

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Carbon Steel/ Black Iron (welded pipe)	Hot tap installation kit for 1¼" and larger welded steel pipe	• 1¼" full port bronze ball valve • 1¼" brass close nipple • 1¼" x 1" brass reducing bushing • 1¼" weld-on carbon steel branch outlet	F-HTAP-INSTL2
	Stainless steel hot tap installation kit for 1¼" and larger welded steel pipe	• 1¼" full port SS ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • 1¼" weld-on carbon steel branch outlet	F-HTAP-INSTL6
Steel or PVC Pipe w/ Saddles	Hot tap installation kit for Sch Std, Sch 40 or Sch 80 steel or PVC pipe (1½" - 6")	• 1¼" full port bronze ball valve • 1¼" brass close nipple • 1¼" x 1" brass reducing bushing • Ductile iron saddle with 1¼" outlet	F-HTAP-INSTL19A
	Hot tap installation kit for Sch Std, Sch 40 or Sch 80 steel or PVC pipe (8" - 12")	• 1¼" full port bronze ball valve • 1¼" brass close nipple • 1¼" x 1" brass reducing bushing • Ductile iron saddle with 1¼" outlet	F-HTAP-INSTL19B
	Hot tap installation kit for Sch Std, Sch 40 or Sch 80 steel or PVC pipe (14" & up)	• 1¼" full port bronze ball valve • 1¼" brass close nipple • 1¼" x 1" brass reducing bushing • Ductile iron saddle with 1¼" outlet	F-HTAP-INSTL19C
	Stainless steel hot tap installation kit for Sch Std, Sch 40 or Sch 80 steel or PVC pipe (1½" - 6")	• 1¼" full port SS ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • Bronze/ductile iron saddle with 1¼" outlet	F-HTAP-INSTL20A
	Stainless steel hot tap installation kit for Sch Std, Sch 40 or Sch 80 steel or PVC pipe (8" - 12")	• 1¼" full port SS ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • Bronze/ductile iron saddle with 1¼" outlet	F-HTAP-INSTL20B
	Stainless steel hot tap installation kit for Sch Std, Sch 40 or Sch 80 steel or PVC pipe (14" & up)	• 1¼" full port SS ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • Bronze/ductile iron saddle with 1¼" outlet	F-HTAP-INSTL20C
PVC Pipe w/ Stainless Steel Saddles	Stainless steel hot tap installation kit for 2" to 6" PVC pipe Items comply with NSF61	• 1¼" full port SS ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • SS saddle with 1¼" outlet*	F-HTAP-INSTL29
	Stainless steel hot tap installation kit for 8" to 12" PVC pipe Items comply with NSF61	• 1¼" full port SS ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • SS saddle with 1¼" outlet*	F-HTAP-INSTL30
Copper Tube	Hot tap installation kit for 2" copper tube Items comply with NSF61	• 1¼" full port bronze ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • Ductile iron or SS saddle with 1¼" outlet	F-HTAP-INSTL21
	Hot tap installation kit for 2½" to 6" copper tube Items comply with NSF61	• 1¼" full port bronze ball valve • 1¼" SS close nipple • 1¼" x 1" SS reducing bushing • SS saddle with 1¼" outlet*	F-HTAP-INSTL22

Continued on next page

HOT TAP INSTALLATION HARDWARE FOR INSERTION FLOW METERS

All ONICON insertion flow meters can be installed and removed via a 1” or larger full port ball valve without a system shutdown. The terms “Standard” and “Hot Tap” refer to the installation kit types only.

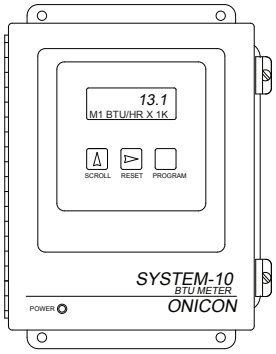
How to use this price list:
1. Select the type of installation hardware required, either Standard (pg 8) or Hot Tap (pg 9-10).
2. Choose the pipe material.
3. Choose the Installation Kit based on material preference and/or pipe size.

- **Standard Installation Hardware:** For new construction or scheduled shutdown. Once the kit is installed, the flow meter can be installed or removed without system a shutdown.
- **Hot Tap Installation Hardware:** For applications which require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating. *** Saddles may include a 1¼” bushing.**

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Cement-Lined Ductile Iron	Hot tap installation kit for 3” to 6” cement-lined ductile iron pipe	• 1¼” full port bronze ball valve • 1¼” brass close nipple • 1¼” x 1” brass reducing bushing • Ductile iron saddle with 1¼” outlet*	F-HTAP-INSTL23
	Hot tap installation kit for 8” to 16” cement-lined ductile iron pipe	• 1¼” full port bronze ball valve • 1¼” brass close nipple • 1¼” x 1” brass reducing bushing • Ductile saddle with 1¼” outlet*	F-HTAP-INSTL24
	Stainless steel hot tap installation kit for 3” to 6” cement-lined ductile iron pipe	• 1¼” full port SS ball valve • 1¼” SS close nipple • 1¼” x 1” SS reducing bushing • Ductile iron saddle with 1¼” outlet*	F-HTAP-INSTL25
	Stainless steel hot tap installation kit for 8” to 16” cement-lined ductile iron pipe	• 1¼” full port SS ball valve • 1¼” SS close nipple • 1¼” x 1” SS reducing bushing • Ductile iron saddle with 1¼” outlet*	F-HTAP-INSTL26
Stainless Steel	Hot tap installation kit for stainless steel pipe	• 1¼” full port 316 SS ball valve • 1¼” 316 SS close nipple • 1¼” x 1” 316 SS reducing bushing • 1¼” weld-on 316 SS branch outlet	F-HTAP-INSTL31

SYSTEM-10 BTU METERS

The System-10 BTU Meter provides highly accurate thermal energy measurement based on signal inputs from two matched temperature sensors (included) and any of ONICON's insertion or inline flow meters (ordered separately). The basic model provides a local indication of energy, flow and temperature data via an alphanumeric display. A dry contact pulse output for energy total is standard on all models. Analog outputs and network communications options are also available.



SYSTEM-10 BASE PRICE INCLUDES:

- Factory N.I.S.T. traceable calibration with written certification
- Matched solid state temperature sensors (1 pair) for applications to 200° F
- LCD display of energy rate and total, flow rate and total, and supply and return temperatures
- Isolated solid state dry contact output for energy total
- Standard System-10 provided with NEMA 13 enclosure
- 24 VAC, 120 VAC or 240 VAC input voltage

Note: Flow meter and thermowell installation hardware kits must be ordered separately.

MODEL	DESCRIPTION
System-10	Microprocessor-based thermal energy meter with LCD display (contact closure output for total energy) **NOTE**: ONICON flow meter is required.
System-10-BAC	Microprocessor-based thermal energy meter with LCD display (includes BACnet® MS/TP or IP serial interface) **NOTE**: ONICON flow meter is required.
System-10-LON	Microprocessor-based thermal energy meter with LCD display (includes LON TP/FT-10F interface) **NOTE**: ONICON flow meter is required.
System-10-MOD	Microprocessor-based thermal energy meter with LCD display (includes MODBUS®-RTU RS485 or TCP/IP interface) **NOTE:** ONICON flow meter is required.
System-10-N2	Microprocessor-based thermal energy meter with LCD display (includes JCI-N2 serial interface) **NOTE**: ONICON flow meter is required.
System-10-P1	Microprocessor-based thermal energy meter with LCD display (includes Siemens-P1 serial interface) **NOTE**: ONICON flow meter is required.
OPTIONS	**DESCRIPTION**
System-10-OPT4	Pair of thermal insulators for CHW thermowells located in high humidity areas (to prevent condensation)
System-10-OPT8	High temperature sensors (1 pair) for applications over 200°F (upgrade to)
System-10-OPT9	One Analog Output (isolated 4-20 mA or 0-10 V): Factory configured to provide energy rate, delta T, flow rate, supply temperature or return temperature
System-10-OPT10	Four Analog Outputs (isolated 4-20 mA, 0-10 V or 0-5 V): Factory configured to provide any four of the following: energy rate, flow rate, supply temperature, return temperature or delta T.
System-10-OPT11	Auxiliary input option (for BACnet, LON, MODBUS, N2 and P1 meters only) with one binary input (pulse or dry contact) added to serial output points list
System-10-OPT12	Upgrade from NEMA 13 to NEMA 4 enclosure (avoid mounting in direct sunlight)
System-10-OPT20	Special configuration (for connection to non-ONICON flow meter)
ACCESSORIES	**DESCRIPTION**
System-10-OPT13	Additional 25ft. of sensor cables
System-10-OPT14	Additional 50ft. of sensor cabless
System-10-OPT15	Additional 100ft. of sensor cables
System-10-OPT17	Additional 25ft. of plenum rated sensor cables
System-10-OPT18	Additional 50ft. of plenum rated sensor cables
System-10-OPT19	Additional 100ft. of plenum rated sensor cables

STANDARD THERMOWELL INSTALLATION HARDWARE KITS FOR SYSTEM-10 BTU METERS

The terms “Standard” and “Hot Tap” refer to the installation kit types only.

How to use this price list:
1. Select the type of installation hardware required, either Standard (pg 12-13) or Hot Tap (pg 14-15).
2. Choose the pipe material.
3. Choose the Installation Kit based on material preference and/or pipe size.

- **Standard Installation Hardware:** For new construction or scheduled shutdown.
- **Hot Tap Installation Hardware:** For applications which require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating.

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Carbon Steel Welded	Standard thermowell kit with brass wells for ¾” - 5" welded steel pipe	• 2 Brass thermowells • 2 Weld-on carbon steel branch outlets, ½" • 2 Transmitter enclosures	BTU-ST-INSTL32
	Standard thermowell kit with stainless steel wells for ¾“ - 42" welded steel pipe	• 2 Stainless steel thermowells • 2 Weld-on carbon steel branch outlets, ½" • 2 Transmitter enclosures	BTU-ST-INSTL34
	Standard high temperature (≥ 300°F) thermowell kit with stainless steel wells for 1½” - 42" welded steel pipe	• 2 Stainless steel thermowells • 2 Weld-on carbon steel branch outlets, ½" • 2 High temperature Transmitter enclosure assemblies	BTU-ST-INSTL66
	Standard submersible thermowell kit with stainless steel wells for 1½” - 42" welded steel pipe	• 2 Stainless steel thermowells • 2 Weld-on carbon steel branch outlets, ½" • 2 Submersible transmitter enclosures with 10 ft of cable	BTU-ST-INSTL59
Carbon Steel Threaded	Standard thermowells kit with brass wells for ¾” - 2½" threaded steel pipe (Used with customer supplied tees)	• 2 Brass thermowells • 2 Brass reducer bushings, ½" (Sized for customer supplied threaded tee) • 2 Transmitter enclosures with cover	BTU-ST-INSTL52
	Standard thermowells kit with stainless steel wells for ¾” - 2½" threaded steel pipe (Used with customer supplied tees)	• 2 Stainless steel thermowells • 2 Brass reducer bushings, ½" (Sized for customer supplied threaded tee) • 2 Transmitter enclosures	BTU-ST-INSTL53
Carbon Steel/PVC Saddles	Standard thermowell kit with stainless steel wells and pipe saddles for 1½” - 6" steel or PVC pipe	• 2 Stainless steel thermowells • 2 Stainless steel reducer bushings, 1" x ½" • 2 Ductile iron saddles for Sch std/40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-ST-INSTL45
	Standard thermowell kit with stainless steel wells and pipe saddles for 8 & 10" steel or PVC pipe	• 2 Stainless steel thermowells • 2 Stainless steel reducer bushings, 1" x ½" • 2 Ductile iron saddles for Sch std/40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-ST-INSTL45A
	Standard thermowell kit with stainless steel wells and pipe saddles for 12" steel or PVC pipe	• 2 Stainless steel thermowells • 2 Stainless steel reducer bushings, 1" x ½" • 2 Ductile iron saddles for Sch std/40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-ST-INSTL45B
PVC Slip	Standard thermowell kit with stainless steel wells for 1½” - 6” PVC pipe (Used with customer supplied tees)	• 2 Stainless steel thermowells • 2 PVC SLIP x NPT reducer bushings with ½" outlet Note: 3” - 6" kits provided with 3" x ½" PVC reducer bushing • 2 Transmitter enclosures	BTU-ST-INSTL63

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STANDARD THERMOWELL INSTALLATION HARDWARE KITS FOR SYSTEM-10 BTU METERS

The terms “Standard” and “Hot Tap” refer to the installation kit types only.

How to use this price list:
1. Select the type of installation hardware required, either Standard (pg 12-13) or Hot Tap (pg 14-15).
2. Choose the pipe material.
3. Choose the Installation Kit based on material preference and/or pipe size.

- **Standard Installation Hardware:** For new construction or scheduled shutdown.
- **Hot Tap Installation Hardware:** For applications which require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating.

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Copper Tees	Standard thermowell kit with brass wells for ¾ - 2" copper tube	• 2 Copper tees with ½" outlet • 2 Brass thermowells • 2 Copper street adapter, ½" • 2 Transmitter enclosures	BTU-ST-INSTL36
	Standard thermowell kit with brass wells for 2½ - 3" copper tube	• 2 Copper tees with ½" outlet • 2 Brass thermowells • 2 Copper street adapter, ½" • 2 Transmitter enclosures	BTU-ST-INSTL37
	Standard thermowell kit with brass wells for 4" copper tube	• 2 Copper tees with ½" outlet • 2 Brass thermowells • 2 Copper street adapter, ½" • 2 Transmitter enclosures	BTU-ST-INSTL38
	Standard thermowell kit with stainless steel wells for 1 - 2" copper tube Items comply with NSF61	• 2 Copper tees with ½" outlet • 2 Stainless steel thermowells • 2 Copper street adapter, ½" • 2 Transmitter enclosures	BTU-ST-INSTL83
	Standard thermowell kit with stainless steel wells for 2½ -3" copper tube Items comply with NSF61	• 2 Copper tees with ½" outlet • 2 Stainless steel thermowells • 2 Copper street adapter, ½" • 2 Transmitter enclosures	BTU-ST-INSTL86
	Standard thermowell kit with stainless steel wells for 4" copper tube Items comply with NSF61	• 2 Copper tees with ½" outlet • 2 Stainless steel thermowells • 2 Copper street adapter, ½" • 2 Transmitter enclosures	BTU-ST-INSTL87
Stainless Steel Welded	Standard thermowell kit with stainless steel wells for ¾ - 36" welded stainless steel pipe	• 2 Stainless steel thermowells • 2 Weld-on 316 SS branch outlets, ½" • 2 Transmitter enclosures	BTU-ST-INSTL61

HOT TAP THERMOWELL INSTALLATION HARDWARE KITS FOR SYSTEM-10 BTU METERS

The terms “Standard” and “Hot Tap” refer to the installation kit types only.

How to use this price list:
1. Select the type of installation hardware required, either Standard (pg 12-13) or Hot Tap (pg 14-15).
2. Choose the pipe material.
3. Choose the Installation Kit based on material preference and/or pipe size.

- **Standard Installation Hardware:** For new construction or scheduled shutdown.
- **Hot Tap Installation Hardware:** For applications which require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating.

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Carbon Steel Welded	Hot tap thermowll kit with stainless steel wells for 1¼ - 42" welded steel pipe (with standard bronze and brass hardware)	• 2 Stainless steel hot tap thermowells with brass hot tap adapters • 2 Full port bronze ball valves, 1" • 2 Brass close nipples • 2 Weld-on carbon steel branch outlets, 1" • 2 Transmitter enclosures	BTU-HT-INSTL33
	Hot tap thermowell kit with stainless steel wells for 1¼ - 42" welded steel pipe (with stainless steel hardware)	• 2 Stainless steel hot tap thermowells with stainless steel hot tap adapters • 2 Full port stainless steel ball valves, 1" • 2 Stainless steel close nipples • 2 Weld-on carbon steel branch outlets, 1" • 2 Transmitter enclosures	BTU-HT-INSTL35
	Hot tap submersible thermowell kit with stainless steel wells for 1¼ - 42" welded steel pipe (with stainless steel hardware)	• 2 Stainless steel hot tap thermowells with stainless steel hot tap adapters • 2 Full port stainless steel ball valves, 1" • 2 Stainless steel close nipples • 2 Weld-on carbon steel branch outlets, 1" • 2 Submersible transmitter enclosures with 10ft cables	BTU-HT-INSTL58
Carbon Steel or PVC w/ Saddles	Hot tap thermowell kit with stainless steel wells and pipe saddles for 1½ - 6" steel or PVC pipe (with standard bronze and brass hardware)	• 2 Stainless steel hot tap thermowells with brass hot tap adapters • 2 Full port bronze ball valves, 1" • 2 Brass close nipples • 2 Ductile iron saddles for Sch std./40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL60
	Hot tap thermowell kit with stainless steel wells and pipe saddles for 8" - 12” steel or PVC pipe (with standard bronze and brass hardware)	• 2 Stainless steel hot tap thermowells with brass hot tap adapters • 2 Full port bronze ball valves, 1" • 2 Brass close nipples • 2 Ductile iron saddles for Sch std./40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL60A
	Hot tap thermowell kit with stainless steel wells and pipe saddles for 1½ - 6" steel or PVC pipe (with stainless steel hardware)	• 2 Stainless steel hot tap thermowells with stainless steel hot tap adapters • 2 Full port stainless steel ball valves, 1" • 2 Stainless steel close nipples • 2 Ductile iron saddles for Sch std./40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL65
	Hot tap thermowell kit with stainless steel wells and pipe saddles for 8 & 10" steel or PVC pipe (with stainless steel hardware)	• 2 Stainless steel hot tap thermowells with stainless steel hot tap adapters • 2 Full port stainless steel ball valves, 1" • 2 Stainless steel close nipples • 2 Ductile iron saddles for Sch std./40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL65A
	Hot tap thermowell kit with stainless steel wells and pipe saddles for 12" -16” steel or PVC pipe (with stainless steel hardware)	• 2 Stainless steel hot tap thermowells with stainless steel hot tap adapters • 2 Full port stainless steel ball valves, 1" • 2 Stainless steel close nipples • 2 Ductile iron saddles for Sch std./40/80 pipe with 1" NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL65B

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HOT TAP THERMOWELL INSTALLATION HARDWARE KITS FOR SYSTEM-10 BTU METERS

The terms “Standard” and “Hot Tap” refer to the installation kit types only.

How to use this price list:
1. Select the type of installation hardware required, either Standard (pg 12-13) or Hot Tap (pg 14-15).
2. Choose the pipe material.
3. Choose the Installation Kit based on material preference and/or pipe size.

- **Standard Installation Hardware:** For new construction or scheduled shutdown.
- **Hot Tap Installation Hardware:** For applications which require the access hole in the pipe to be drilled through the valve using a wet tap drilling machine while the hydronic system is pressurized and operating.

PIPE MATERIAL	KIT DESCRIPTION	ITEMS INCLUDED IN KIT	ITEM NUMBER
Copper Tube w/ Saddles	Hot tap thermowell kit with stainless steel wells and pipe saddles for 2" copper tube (with standard bronze and brass hardware)	• 2 Stainless steel hot tap thermowells with brass hot tap adapters • 2 Full port bronze ball valves, 1” • 2 Brass close nipples • 2 Ductile iron saddles for Sch std./40/80 pipe with 1” NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL39
	Hot tap thermowell kit with stainless steel wells and pipe saddles for 2½ - 6" copper tube (with standard bronze and brass hardware)	• 2 Stainless steel hot tap thermowells with brass hot tap adapters • 2 Full port bronze ball valves, 1” • 2 Brass close nipples • 2 Ductile iron saddles for Sch std./40/80 pipe with 1” NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL40
	Hot tap thermowell kit with stainless steel wells and pipe saddles for 2½ - 6" copper tube (with stainless steel hardware)	• 2 Stainless steel hot tap thermowells with stainless hot tap adapters • 2 Full port stainless steel ball valves, 1” • 2 Stainless steel close nipples • 2 Stainless steel saddles for Copper tube with 1” NPT outlets • 2 Transmitter enclosures	BTU-HT-INSTL92

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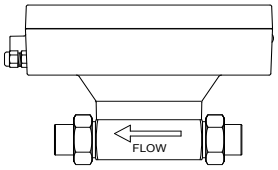
The System-30 provides highly accurate thermal energy measurement based on signal inputs from two integral, matched, temperature sensors and an integral ONICON inline turbine meter. A dry contact pulse output for energy total is standard on all models. This compact system is designed to provide totalized energy for flow rates from 0.8 to 38 GPM. EachSystem-30 is factory calibrated and comes complete with thermowell and flow meter installation hardware.



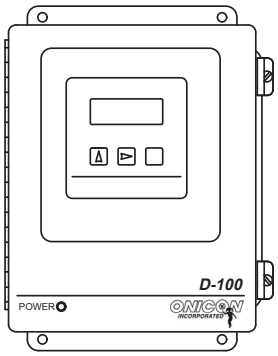
SYSTEM-10 BASE PRICE INCLUDES:

- Factory N.I.S.T. traceable calibration with written certification
- Integral matched solid state temperature sensors (1 pair) for applications to 200° F
- Integral inline flow meter with 1" or 3/4" copper sweat or NPT process connections
- Isolated solid state dry contact output for energy total
- One standard brass thermowell with installation hardware
- System-30 provided with NEMA 13 enclosure
- 24 VAC or VDC input voltage

MODEL	DESCRIPTION
System-30	Compact thermal energy BTU meter complete with integral inline turbine flow meter (38 gpm max), temperature sensors and all required installation hardware (includes dry contact output for energy total)
System-30-AO	System-30 Compact BTU Meter with one analog output (isolated 4-20 mA or 0-10 V), factory configured to provide energy rate, delta T, flow rate, supply or return temperature.
System-30-BAC	System-30 Compact BTU Meter with BACnet® MS/TP serial interface
System-30-MOD	System-30 Compact BTU Meter with MODBUS®-RTU (RS485) serial interface
System-30-LON	System-30 Compact BTU Meter with LON serial interface (LONMARK 3.4 certified)
System-30-N2	System-30 Compact BTU Meter with JCI-N2 serial interface
System-30-P1	System-30 Compact BTU Meter with Siemens P1-FLN serial interface

OPTIONS	DESCRIPTION
System-30-OPT1	LCD Display: Displays energy rate, energy total, flow rate, flow total and supply and return temperature
ACCESSORIES	**DESCRIPTION**
System-30-OPT3	24 VDC, 600mA power supply, 120 VAC input

The D-100 is a totalizing display module that provides a local indication of liquid, gas or steam flow rate and total data. It can also provide a local indication for two additional analog inputs and one pulse input. Network communications options are available to transmit the analog, rate and total data to a building control network. The standard (totalizing) flow input accepts 4-20 mA, pulse or contact closure flow signals. The D-100 can also be configured with up to 4 optional analog outputs.



D-100 BASE PRICE INCLUDES:
- Factory programming with certification
- Isolated solid state dry contact pulse outputs for totalizing forward and reverse flow
- Isolated solid state dry contact output for indicating flow direction
- LCD display of flow rate and total, present value for analog inputs and present value for auxiliary pulse total
- Standard D-100 provided with NEMA 13 enclosure
- 24 VAC, 120 VAC or 240 VAC input voltage

MODEL	DESCRIPTION
D-100	Microprocessor-based rate/total display with 2 auxiliary analog inputs and contact closure outputs for total flow and flow direction
D-100-BAC	Microprocessor-based rate/total display with 2 auxiliary analog inputs and contact closure outputs for total flow and flow direction (includes BACnet® MS/TP or IP serial interface)
D-100-LON	Microprocessor-based rate/total display with 2 auxiliary analog inputs and contact closure outputs for total flow and flow direction (includes LonWorks® TP/FT-10F interface)
D-100-MOD	Microprocessor-based rate/total display with 2 auxiliary analog inputs and contact closure outputs for total flow and flow direction (includes MODBUS®-RTU RS485 or TCP/ IP serial interface)
D-100-N2	Microprocessor-based rate/total display with 2 auxiliary analog inputs and contact closure outputs for total flow and flow direction (includes JCI-N2 serial interface)
D-100-P1	Microprocessor-based rate/total display with 2 auxiliary analog inputs and contact closure outputs for total flow and flow direction (includes Siemens-P1 serial interface)

OPTIONS	DESCRIPTION
D-100-OPT1	Auxiliary digital pulse input option Additional totalizing input (active pulse or dry contact) displayed and added to serial output points list (for BACnet, LON, MODBUS, N2 and P1 meters only)
D-100-OPT2	**One Analog Output** (isolated 4-20 mA or 0-10 V): Factory configured to replicate Ai2, Ai3 or Ai4 analog input signals
D-100-OPT3	**Four Analog Outputs** (isolated 4-20 mA or 0-10 V): Factory configured to provide up to 4 duplicate signals for Ai2, Ai3 or Ai4 analog inputs
D-100-OPT4	Upgrade from NEMA 13 to NEMA 4 enclosure (D-100)

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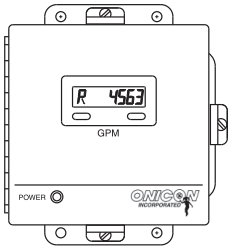
STANDARD DISPLAY MODULES

Each D-1200 Series Display Module includes one or more multi-function LCD indicators that provide a local indication of flow rate and/or total data. Display modules convert flow meters into complete flow monitoring stations. When used with D-1200 Series Display Modules, the flow meters can also support other remote devices such as Btu meters, building control systems, and data acquisition systems.

Enclosure type, input power options and flow meter model compatibility vary by D-1200 model. Consult your ONICON representative for assistance in choosing the best options for you.

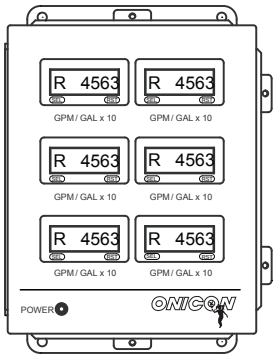
Flow meter models supported by D-1200 Display Modules:

- F-1100 Series Insertion Turbine Meters
- F-1200 Series Insertion Turbine Meters
- F-1300 Series Inline Turbine Meters
- F-3500 Insertion Electromagnetic Meters
- F-5100 Thermal Mass Meters (Totalization only)
- F-5200 Thermal Mass Meters (Totalization only)



6” x 6” x 4” NEMA4 enclosure

MODEL	DESCRIPTION
D-1201-1	**Display Module:** 1 LCD (flow rate and/or total) 24, 120 or 240 VAC
D-1202-2	**Display Module:** 2 LCDs (1 flow rate, 1 total) 24, 120 or 240 VAC
DB-1201	**Bi-directional Flow Display Module For 1 FB-12XX or 1FB3500 Flow Meter:** 1 LCD (flow rate and/or total) and includes flow direction indicators - 24, 120 or 240 VAC
OPTIONS	
D-1299-AUX3	Auxillary scaled output card for D-1201 or DB-1201 only



8” x 10” x 4” NEMA13 enclosure standard

MODEL	DESCRIPTION
D-1202	**Display Module:** 2 flow meters, (1 flow rate and/or total LCD for each) 24, 120 or 240 VAC
D-1203	**Display Module:** 3 flow meters, (1 flow rate and/or total LCD for each) 120 or 240 VAC
D-1204	**Display Module:** 4 flow meters, (1 flow rate and/or total LCD for each) 120 or 240 VAC
D-1205	**Display Module:** 5 flow meters, (1 flow rate and/or total LCD for each) 120 or 240 VAC
D-1206	**Display Module:** 6 flow meters, (1 flow rate and/or total LCD for each) 120 or 240 VAC
DB-1202	**Bi-directional Flow Display Module For 1 FB-12XX or 1FB3500 Flow Meter:** 2 LCDs (1 for flow rate 1 for total) and includes flow direction indicators - 24, 120 or 240 VAC
OPTIONS	
D-1299-NEMA4	Upgrade from NEMA 13 to NEMA 4 enclosure (8”x10”)

Notes: 1. Consult the factory for pricing on display modules with more than six (6) LCDs.

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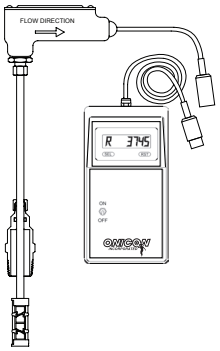
PORTABLE METERING SYSTEMS

D-1400 series Portable Display Modules are battery operated and designed for hand held operation. The internal 9 volt battery powers both the display and the specially modified ONICON insertion turbine flow meter. Together, the flow meter and display form a portable flow measurement system. The D-1400 provides a continuous indication of the flow meter's frequency output. A conversion chart provided with the display allows the user to convert this frequency to a volumetric flow rate for a wide range of commonly used pipe sizes.



MODEL	DESCRIPTION
D-1401	Portable Metering System

D-1401 BASE PRICE INCLUDES:
- Single Turbine Insertion Flow Meter Model F-1100 (modified to allow battery power)
- Small plastic hand-held enclosure with display
- Six digit LCD rate indicator (displays frequency in Hz)
- Conversion chart for common pipe sizes (Hz to GPM)
- 9V battery powered system
- Storage case for flow meter and display

MODEL	DESCRIPTION
D-1402	Portable Metering System

D-1402 BASE PRICE INCLUDES:
- Dual Turbine Insertion Flow Meter Model F-1200 (modified to allow battery power)
- Capability to monitor individual top and bottom turbine rates as well as average rate
- Small plastic hand-held enclosure with display
- Six digit LCD rate indicator (displays frequency in Hz)
- Conversion chart for common pipe sizes (Hz to GPM)
- 9V battery powered system
- Storage case for flow meter and display

UPGRADES	DESCRIPTION
F-1199-STANLS	Upgrade to stainless steel wetted metal components for D-1401
F-1299-STANLS	Upgrade to stainless steel wetted metal components for D-1402
ACCESSORY	**DESCRIPTION**
D-14XX-HDCASE	Upgrade to rugged-duty storage case (lifetime warranty from case manufacturer)
F-OPT12-25FT	Additional 25 ft. sensor cable

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CONDITIONS OF SALE

1. ACCEPTANCE: The following Conditions of Sale apply to all sales of ONICON's products. These provisions shall apply even if ONICON fails to object to provisions appearing on, incorporated by, referenced in, or attached to Buyer's purchase order form. Buyer's acceptance of delivery of ONICON's products constitutes its acceptance of these Conditions of Sale.

2. DELIVERY AND TITLE: All product shipments are F.O.B. shipping point and title passes to the Buyer at the time ONICON delivers the merchandise to the carrier. Risk of loss or damage to the product passes to the Buyer at the time ONICON delivers the product to the carrier. The Buyer immediately upon receipt should inspect all shipments, and should there be any evidence of damage or loss in transit, Buyer must file claims or tracers upon carrier. ONICON will assist in tracing shipments upon request.

3. LIMITED WARRANTY: ONICON warrants that for a period of two (2) years following the date of original shipment of an ONICON product: (i) the product will conform to ONICON's standard written specifications applicable to such product in effect on the date of Buyer's order, or as modified by ONICON's quotation or Buyer's purchase order accepted by ONICON, (ii) the product will be free from defects in workmanship, and (iii) that ONICON has title to the product prior to shipment to the Buyer; provided, however, that the warranties provided herein shall be void and may not apply in the event Buyer misuses or damages a product, including, but not limited to, any use by the Buyer of a product for an application other than one of a type approved by ONICON. ONICON's sole liability and Buyer's sole remedy for any breach of the foregoing warranty is for ONICON to repair or replace, at ONICON's option, any defective product that is returned to ONICON during the warranty period. EXCEPT AS MAY BE SPECIFICALLY AGREED BY ONICON IN WRITING IN RELATION TO EACH SALE, NO OTHER WARRANTIES SHALL APPLY, WHETHER EXPRESSED, IMPLIED OR STATUTORY, AND THERE SHALL BE NO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

4. REMEDIES: ONICON's OBLIGATION UNDER THE FOREGOING WARRANTIES IS LIMITED SOLELY TO REPAIR OR REPLACEMENT, AT ONICON's OPTION, OF DEFECTIVE OR NONCONFORMING PRODUCTS. ONICON SHALL NOT BE LIABLE FOR CONSEQUENTIAL, INDIRECT, PUNITIVE, INCIDENTAL, OR SPECIAL DAMAGES WHETHER FOUND ON CONTRACT, TORT OR ANY OTHER THEORY OF LAW. No products shall be returned to ONICON without its prior consent and transportation and insurance costs shall be prepaid. Any repair or replacement of ONICON's products under the foregoing warranty will be at no charge to the Buyer provided such repair is done at the ONICON factory or authorized service center. ONICON products that are repaired or replaced under this warranty will be returned to Buyer via the same method of shipment use to return the product to ONICON. Repair or replacement of ONICON products is conditioned upon ONICON's acknowledgement of any alleged defect or nonconformance during the warranty period and issuance of a Return Authorization number. All product returns must reference the Return Authorization number on the outside of the shipping carton and on any paperwork referencing the return.

5. PRICES AND PAYMENT TERMS: The prices set forth in the most recent quote or acknowledgement as applicable, supersede all previous prices or quotations. All quotations are subject to change or withdrawal without notice except as may be specifically noted on the face of the quotation. The prices shown do not include sales, excise or government charges payable by ONICON to Federal, State, or local authority. Any such tax or charge now or hereafter imposed upon the sale or shipment of the products under this contract will be added to the purchase price. Buyer agrees to reimburse ONICON for such tax or charge or provide ONICON with an acceptable exemption certificate. Payment of invoices will be due 30 days from the date of shipment of the products contained therein. In the event that payment of an invoice is not received by the invoice due date, ONICON will assess a late fee not to exceed 1.5% per month or 18% per year, or the maximum allowable by law whichever is lower.

6. CANCELLATION: Buyer may cancel its order, or any part of it, by sending written notice of cancellation to ONICON and paying a reasonable cancellation fee as determined by ONICON. The reasonable cancellation fee will reflect, among other factors, the expenses already incurred and commitments made by ONICON, sales and administrative costs and profit as determined by ONICON. If Buyer received a reduced price based on the quantity of products ordered, but has not purchased the applicable quantity at the time of cancellation, Buyer will pay the price it would have paid had ONICON's sale price been based on the quantity actually purchased.

7. CHANGES: If Buyer makes any changes in its drawings, designs, or specifications applicable in any contract with ONICON that cause an increase or decrease in the cost of performance of the contract, or if such changes result in rework or obsolescence, an equitable adjustment shall be made to the contract. Such changes are subject to ONICON's prior written consent.

8. EXCUSABLE DELAY: ONICON shall under no circumstance be responsible for failure to fill any order or orders when due to: fires, floods, riots, strikes, freight embargoes or transportation delays, shortage of labor, inability to secure fuel, material supplies, or power at current price or on account of shortages thereof, acts of God or of the public enemy, any existing or future laws or acts of the Federal or State Government (including specifically, but not exclusively, and orders, rules or regulations issued by any official or agency of any such government) affecting the conduct of ONICON's business with which ONICON in its judgment and discretion deems it advisable to comply as a legal or patriotic duty, or due to any cause beyond ONICON's reasonable control.

9. PATENTS: ONICON shall defend all suits or proceedings brought against Buyer or its customers arising from claimed infringements of any patent, trademark, service mark or copyright for any product furnished by ONICON and shall indemnify it against all costs, fees, and damages on the condition Buyer promptly notifies ONICON in writing and provides information and assistance to enable ONICON to conduct the defense, provided that ONICON shall have no such obligation in case of infringement resulting from ONICON's conformance to special requirements of Buyer. If ONICON is not able to settle any such suit or proceeding on acceptable terms, ONICON may, at its option, require return of the infringing product and refund the purchase price to Buyer less a reasonable allowance for depreciation or use.

10. FAIR LABOR STANDARDS ACT: ONICON represents that all products delivered under this contract are furnished in accordance with the applicable provisions of the Fair Labor Standards Act as amended.

11. APPLICABLE LAW: This document and any resulting contract shall be governed by and construed in accordance with the laws of the State of Florida. The courts of the State of Florida and the federal courts located in Florida shall have jurisdiction and venue with respect to litigation to this contract. In the event of litigation, the prevailing party shall be entitled to recover attorney's fees and costs from the non-prevailing party, including appellate attorney's fees.

12. MODIFICATIONS: These Conditions of Sale along with the prices, quantities, delivery schedules and other provisions and instructions in applicable quotations by ONICON or Buyer's purchase orders accepted by ONICON shall constitute the entire agreement between ONICON and Buyer pertaining to any resulting contract. They can be modified only in writing.

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