Eldridge Products, Inc.

Master-Touch™

Thermal Gas Mass Flow Meters

Firmware v7.x

Series 8000MP–8200MP, Series 8600MP–8800MP

Series 9100MP–9200MP, Series 9700MP–9800MP

Approved for use in Hazardous locations

CSA/CUS, ATEX, IECEx, KOSHA

Series 8000MPNH–8200MPNH, Series 8600MPNH–8800MPNH

Series 9100MPNH–9200MPNH, Series 9700MPNH–9800MPNH

Approved for use in Ordinary (Non-Hazardous) locations

CSA/CUS

Display/Keypad Menu System Manual

80202501 (Rev. 2.051)

CE

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Series 8000MP–8200MP, 8600MP–8800MP
Series 9100MP–9200MP, 9700MP–9800MP

English

For use in hazardous area locations:

CSA/CUS – FOR USE IN HAZARDOUS AREA LOCATIONS; CLASS I GROUP B,C,D; CLASS II GROUP E,F,G; CLASS III; ENCL TYPE 4X; CLASS I ZONE I; AEx d IIB+H2 IP66; Ex d IIB+H2 IP66; T2 OR T3 OR T4 AS MARKED; Ta = 0°C TO 50°C

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

IECEx – FOR USE IN HAZARDOUS AREA LOCATIONS; T2 OR T3 OR T4 AS MARKED; Ta = 0°C TO 50°C;; Ex d IIB+H2 T2...T4 Gb IP66; Ex tD A21 IP66 T135°C...T300°C; IECEx CSA 11.0014

KOSHA – FOR USE IN HAZARDOUS AREA LOCATIONS; T2 OR T3 OR T4 AS MARKED; Ta = 0°C TO 50°C; Ex d IIB+H2 T2...T4 Gb IP66; Ex tD A21 IP66 T135°C...T300°C

CAUTION: Disconnect from supply before opening. Keep covers tight while circuits are alive. Certified conduit seals/stopping boxes with filling compound must be installed within [18" (450mm), 25mm Ex d], of the enclosure per local installation requirements. Refer to the gas/dust surface temperature rating as marked "X" on the product label (T2, T3 or T4). Connect power supply as marked "X" on the product label (24 VDC @ ¼ A or 120 VAC @ 1/8 A or 240 VAC @ 1/16 A & 50/60 Hz). The maximum working pressure is 500 PSIG (3.4MPa) when properly installed. Attach by suitable means to prevent unintentional product removal and/or leaks.

Finnish

Käyttö räjähdysvaarallisissa tiloissa:

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

VAROITUS: Kytke laite jännitteettömäksi ennen kannen avaamista. Käyttötilanteessa on kannen aina oltava kiinni. Vain Ex d –hyväksyttyjä kaapelin läpivientejä saa käyttää [18" (450mm), 25mm Ex d]. Tarkista ettei ympäröivän kaasun lämpötila ylitä merkkikilvessä olevia arvoja (T2, T3 tai T4). Kytke syöttöjännite riviliittimiin 24 VDC/ 0,25 A tai 240 VAC / 0,062 A 50/60 Hz. Maksimi käyttöpaine on 3,4 MPa.

French

Pour utilization dans des locations/zones classifiées dangereuses:

CSA/CUS – FOR USE IN HAZARDOUS AREA LOCATIONS; CLASS I GROUP B,C,D; CLASS II GROUP E,F,G; CLASS III; ENCL TYPE 4X; CLASS I ZONE I; AEx d IIB+H2 IP66; Ex d IIB+H2 IP66; T2 OR T3 OR T4 AS MARKED; Ta = 0°C TO 50°C

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

AVERTISSEMENT : Débrancher l'alimentation avant d'ouvrir. Ne pas ouvrir le couvercle lorsque les circuits sont alimentés. Conduits électriques certifiés joints et/ou les barrières contre les gaz avec enduits devrons être installés dans une limite de [18 pouces (450mm), 25mm Ex d], du boitier selon les recommendations locales. Veillez vous référer à la classification de température de surface gaz/poussiere indiquée par un X sur l'étiquette du produit (T2, T3 or T4). Brancher le bloc d'alimentation tel qu'indiqué par un X sur l'étiquette du produit (24 VDC @ ¼ A or 120 VAC @ 1/8 A or 240 VAC @ 1/16 A & 50/60 Hz). La pression maximum de travail est 500 PSIG (3.4 Mpa) lorsque l'installation est adéquate. Fixer convenablement afin d'éviter le déplacement inutile et/ou afin d'éviter les fuites.

German

Zur Verwendung in explosionsgefährdeten Bereichen:

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

ACHTUNG: Vor dem öffnen Spannung abschalten. Gehäusedeckel bei eingeschalteter Spannung verschlossen halten. Eine zertifizierte Leitungsdurchführung mit Füllmasse muss im Abstand von [18 Zoll (450 mm), 25mm Ex d], zum Gehäuse montiert werden. Die Temperatureinstufung (T-Klasse) der maximalen Oberflächentemperatur ist als „X" auf dem Typenschild gekennzeichnet (T2, T3 oder T4). Die Spannungsversorgung ist ebenfalls als „X" auf dem Typenschild gekennzeichnet (24 VDC @ ¼ A oder 120 VAC @ 1/8 A oder 240 VAC @ 1/16 A & 50/60 Hz). Der maximale Betriebsdruck beträgt 500 PSIG (3.4MPa) bei korrekter Installation. Befestigung mit geeigneten Mitteln um unbeabsichtigte mechanische Beanspruchung bzw. Bewegung des Gerätes und/oder Leckage zu vermeiden.

Itallian

Per uso in area classificata:

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

ATTENZIONE: Interrompere l'alimentazione prima dell'apertura. Mantenere la custodia chiusa quando i circuiti sono alimentati. In caso di installazione in campo, i giunti di bloccaggio certificati, riempiti con sigillante, devono essere installati entro [18 pollici (450 mm), 25mm Ex d], dalla custodia. Verificare la classificazione della temperatura superficiale del gas o delle polveri dichiarata sulla targhetta dello strumento (T2, T3 oppure T4). Alimentare come dichiarato sulla targhetta dello strumento (24 VDC @ ¼ A oppure 120 VAC @ 1/8 A oppure 240 VAC @ 1/16 A & 50/60 Hz). Con una installazione corretta la Massima Pressione Operativa è pari a 500 psi g (3.4 MPa rel.) . Fissare lo strumento con mezzi appropriati per prevenirne la rimozione accidentale e/o eventuali perdite.

Polish

Do stosowania w strefach zagrożonych wybuchem:

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

OSTRZEŻENIE: Bezwzględnie odłączyć urządzenie od zasilania przed otwarciem obudowy. Przy aktywnych obwodach wyjściowych obudowa musi być zamknięta. Należy stosować wyłącznie certyfikowane przepusty kablowe uszczelnienia i skrzynki połączeniowe zgodnie z lokalnymi wymaganiami instalacyjnymi dla urządzeń Ex d [18” (450mm), 25mm Ex d]. Należy stosować tylko dla gazów/pyłów o temperaturze powierzchni oznaczonej „X” na etykiecie urządzenia (T2, T3 lub T4). Należy stosować wyłącznie napięcie zasilania oznaczone na tabliczce znamionowej urządzenia (24 VDC @ ¼ A lub 120 VAC @ 1/8 A lub 240 VAC @ 1/16 A & 50/60 Hz). Przy prawidłowym montażu maksymalne ciśnienie robocze wynosi 500 PSIG (3.4Mpa). Dodatkowo należy zastosować środki chroniące przed przypadkowym demontażem urządzenia lub przeciekami.

Spanish

Para usar en localidades peligrosas entre estas líneas:

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

PRECAUCION: Desconecte del suministro eléctrico antes de abrir. Mantenga las tapas y/o cubiertas ajustadas mientras los circuitos están cargados. Conduit y sellos certificados/cajas de paro con relleno compuesto deberán ser instaladas a [18" (450mm), 25mm Ex d], la cubierta requiere instalación local. La "X" marcada en la etiqueta del producto se refiere a gas/polvo y rango de temperatura de la superficie (T2, T3 o T4). Conecte al suministro eléctrico marcado con "X" en la etiqueta del producto (24 VCD @ 1/4 A, 120VCA @ 1/8 A, 240VCA 1/16 A, Y 50/60 Hz). La máxima presión de trabajo es de 500 PSIG (3.4MPa) cuando ha sido instalado apropiadamente. Adjunto por medio disponible para prevenir el movimiento intencional del producto y/o fuga.

Swedish

För användning i risk klassade utrymmen enligt:

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

VARNING: Matningsspänningen måste brytas innan mätaren öppnas. Kåpor och tätningar skall vara monterad så länge som strömmen ej är bruten. Certifierade/klassade genomföringstätningar måste användas inom ett avstånd av [18” (450 mm) , 25mm Ex d], från varje installerad utrustning. Klassningen av yttemperaturen för gas/damm skall beaktas. Markeras med ett ” X ” på produktens etikett (T2, T3 eller T4). Anslut matningsspänningen som markeras med ett ” X ” på produktens etikett (24 VDC @ ¼ A eller 120 VAC @ 1/8 A eller 240 VAC @ 1/16 A & 50/60 Hz). Maximalt arbetstryck är 34 bar ö (3,4 Mpa) vid installation enligt anvisning. Ansluts på ett sådant vis, så att läckor förebyggs och att utrustningen ej oavsiktligt kan demonteras.

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Section A Introduction

Introduction

Your Master-Touch™ flow meter includes a flow sensing element, temperature sensing element, analog bridge board, digital controller board and a transmitter enclosure. The flow sensor is mounted in an insertion probe support / averaging tube or in an inline flow section. Depending upon your requirements, all of these components may be integrated into one flow transmitter assembly or you may have a flow transmitter and a second, remote electronics enclosure. In either configuration, the digital controller converts the nonlinear input signal received from the flow sensor to linear 0–5 VDC & 4–20 mA output signals. RS485 Modbus RTU communications are embedded in the firmware. HART and Profibus DP-compatible modules are optionally available.

Unpacking Your Instrument

Your Master-Touch™ thermal mass flow meter is a precision piece of electronic flow instrumentation. Although these instruments are rugged, they should be inspected upon delivery to assure that no damage has taken place during transit. *If upon inspection it is found that damage has occurred, notify the carrier immediately and place a claim for damaged goods*. The shipping container or crate should be handled with care and carefully opened to avoid possible damage to the contents. After the container is opened the contents should be carefully removed and the individual pieces checked against the packing list. Please note that the packing list will show all of the options that were ordered for your instrument. Many, if not all, of those options will be incorporated into the flow meter itself and will not be separate components. The last verification is to check that the equipment and calibration range as shown on the flow averaging tube's documentation match your purchase order specifications. *If you discover a discrepancy or have any questions about what you have received, contact EPI immediately*.

Power Requirements

Power requirements for Master-Touch™ flow meters with the "-DC24" option are user-supplied 18 to 24 Volts DC @ 250 mA.

Power requirements for Master-Touch™ flow averaging tubes with the "-AC115" option are 115 VAC 50/60 Hz standard, or 220 VAC 50/60 Hz with the "-AC230" option. If conduit is used to enclose the power input line, it should be suitable for the application, electrically conductive, and connected within the enclosure to the earth ground. Our recommendation on wire size is 18 Ga. stranded for all AC wiring.

If the flow meter includes a remote electronics assembly, then the flow transmitter power is provided by the connection to the remote assembly (see the wiring instructions in Section G which correspond to your configuration). Ten feet of two wire connection cable is provided with the remote assembly. If more cable is required, the 10' length should be replaced with a four- or six-wire, twisted pair shielded cable (depending on signal requirements). The transmitter is independent of cable length and won't suffer any signal degradation with length changes. The 4–20mA analog output wire should be sized for no more than 5 Ohms resistance across the loop and not less than 22 AWG.

All wiring and conduits shall be installed per the local requirements as appropriate for the application and conditions.

Signal Interface

All Master-Touch™ flowmeters provide both 0–5 Volts DC and 4–20 mA flow output signals and Modbus RTU communications. Additional communications protocols such as HART, Profibus DP etc. are available as options. Voltage signals should not be sent over long distances due to small currents causing voltage drops across the wire pair. If the voltage is to be sent over a distance (for example 50 feet), the wire AWG should be sized to reduce the voltage drop to acceptable levels. Knowing your load impedance is the only way this calculation may be achieved. Our 4–20 mA signal is provided to prevent this sort of signal loss. Current loops are normally not susceptible to noise and are not affected by voltage drops around the loop. However, it is important when using a current loop not to exceed the level of load resistance that the current loop may drive. Our current loop will drive a load (lead plus load resistance) of 500 ohms.

In our standard configuration, our flow meters are not loop-powered devices. However, this option is available upon request. If a flow meter must be changed from the standard configuration to loop-powered in the field, contact the factory for assistance.

Section B The Master-Touch™ LCD and Key Pad

Master-Touch™ flowmeters typically include a 2-line, 16-character LCD display and keypad to view and control the functions of the full menuing system. Each of the Menus and submenu items are accessible via the key pad, though many functions are more easily used with *EPICommunicator 2.0* software. The software and the instruction manual are available for downloading at no charge from our website, **www.epiflow.com**.

The illustration below shows the LCD Display when the flowmeter is in Run Mode:

Meter Range — indicates the active meter calibration range (1–4), an exclamation point (!) indicates that the flowmeter is operating with menu item 212–Track Hold selected, a box (□) indicates that the flow has exceeded the range of the 0–5VDC and 0–20mA output signals; a "D" indicates that the flowmeter is running the E-Log™ mode;

Relay Status — indicates status of Relays 1 and 2 (∞ = de-energized, * = energized);

Infrared Aperture — allows infrared communications with EPI's LightWIRE modules (the IR capability is available as an option and it must be requested at or before the time of purchase);

Current Flow Rate — indicates real-time flow rate;

Engineering Units — indicates currently selected engineering units for rate and total;

Elapsed Total — indicates real-time total flow since previous reset;

Keypad — four-button key pad for accessing microprocessor settings.

Gas Temperature — Indicates the current and peak temperatures of the gas in degrees F or degrees C depending on the Engineering Units selected

The **SHIFT** key selects menu items for numeric entry, moves the active character position to the left when in numeric entry mode, and accepts or "enters" the specific numeric entry and returns the flowmeter to the selected menu item.

The **MODE** key scrolls the flowmeter through the modes, and moves the active character position to the right when in numeric entry mode.

The **MAX** and **MIN** keys work together to move "forward and backward" through the item menus and through the numeric entry characters:

_ . / - 0 1 2 3 4 5 6 7 8 9 e + : A P M

The flowmeter must be unlocked to make changes to the variable settings. The factory default value for menu item 219-UnLock is "9001". If the numeric entry mode is accessed while the flowmeter settings are still locked, the top line of the LCD display will show "METER LOCKED**" until you press the SHIFT key to exit the numeric entry mode.**

The following pages explain the LCD displays and the presentation of flow information. For step x step instructions to perform many of the most common adjustments to the flowmeter's settings, please see the following section.

100 *Meter* Menu

The 100 *Meter* Menu of the Master-Touch™ flowmeter includes a series of submenu items which allow you to easily change the engineering units for the flow rate and elapsed total, change the scaling of the 0-5VDC and 4-20mA output signals, and reset the stored values for elapsed total, high and low flow rates, timestamps, etc.

The flowmeter settings must be unlocked to change the engineering units, 4-20mA scaling or to reset the stored values (*see menu item 219-UnLock*).

```
1∞∞12.3456   SCFM
9876.54321    SCF
```

RUN MODE

```
100 *Meter*
101-SCFM
```

Press **MODE** one time to advance to the **100 *Meter*** menu. The display shown at left will appear. The top line will always show you that you are in the correct menu. The bottom line presents the specific submenu items.

The following list shows the submenus and assumes that you will use the MAX key to advance through the submenu items. You can use MIN key to go back to an item, or continue to use MAX until the desired submenu appears again.

100 *Meter* Submenus

101-SCFM	Standard Cubic Feet / Minute
102-SCFH	Standard Cubic Feet / Hour
103-LB/M	Pounds / Minute
104-LB/H	Pounds / Hour
105-SCIM	Standard Cubic Inches / Minute
106-SCIH	Standard Cubic Inches / Hour
107-	(unused)
108-LB/D	Pounds / Day
109-SFPM	Standard Feet / Minute
110-SFPS	Standard Feet / Second
111-BTUH	British Thermal Units / Hour
112-BTUD	British Thermal Units / Day
113-	(unused)
114-	(unused)

115-	(unused)
116-	(unused)
117-SLPM	Standard Liters / Minute
118-SCCM	Standard Cubic Centimeters / Minute
119-NCMH	Normal Cubic Meters / Hour
120-NCMM	Normal Cubic Meters / Minute
121-KG/M	Kilograms / Minute
122-KG/H	Kilograms / Hour
123-KG/S	Kilograms / Second
124-SLPH	Standard Liters / Hour
125-NMPS	Normal Meters / Second
126-NMPM	Normal Meters / Minute
127-NMPH	Normal Meters / Hour
128-SCMH	Standard Cubic Meters / Hour
129-NLPM	Normal Liters / Minute
130-NCCM	Normal Cubic Centimeters / Minute
131-NLPH	Normal Liters / Hour
132-	(unused)
140-FScale	This menu item is used to adjust the scaling of the 0 – 5VDC and 4 – 20mA output signals. This value cannot exceed the factory calibrated Maximum Range (*see Menu 814–MaxRange*).
160-Reset!	This menu item is used to reset the stored values for elapsed total flow, high and low flow rates, timestamps, etc.
	(blank)
200 *Utility*	Go to 200 *Utility* Menu
300 *Status*	Go to 300 *Status* Menu
400 *Alarms	Go to 400 *Alarms* Menu
500 *Exit-Reboot	This menu exits the menu system and goes to Run Mode with rebooting the flow meter.
501 *Exit-No Rebo	This menu exits the menu system and goes to Run Mode without rebooting the flow meter.
700 *S-Curve Fit*	Go to 700 *S-Curve Fit* Menu
750 *PW-CurveFit*	Go to 750 *PW-CurveFit* Menu
800 *P-Curve Fit*	Go to 200 *P-Curve Fit* Menu
100 *Meter*	Go to 100 *Meter* Menu

200 *Utility* Menu

The 200 *Utility* Menu of the Master-Touch™ flowmeter includes a series of submenu items which allow you to easily change a wide variety of microprocessor parameters, such as the display update rate, the internal date and time, the analog-to-digital (ADC) and digital-to-analog (DAC) signal conversion filters, etc.

Although most settings are accessible by using the default user password of "9001", some of the parameters require a special password available only by contacting the factory. This has been instituted to prevent the accidental change of critical settings.

```
1∞∞12.3456  SCFM
9876.54321   SCF
```

RUN MODE

```
200 *Utility*
201-DAC Set
```

Press **MODE** two times to advance to the **200 *Utility*** menu. The display shown at left will appear. The top line will show you that you are in the correct menu. The bottom line presents the specific submenu items.

```
Actv Mtr#(1-4)
>1
```

When you select a submenu which supports data entry a brief description of the selected action will appear on the top line and the data entry field will appear on the bottom line. In the example at left, submenu 213-Set Meter has been selected and the flowmeter is displaying the active stored meter range.

The following list shows the submenus and assumes that you will use the MAX key to advance through the submenu items. You can use MIN key to go back to an item, or continue to use MAX until the desired submenu appears again.

200 *Utility* Submenus

201-	(unused)
202-DAC Time	This menu item is used to adjust the Digital-to-Analog converter (DAC) response time interval. The value entered here is multiplied by 50ms to establish the rate at which the DAC generates new output voltages. Acceptable values are 1 – 63.
203-DAC Filter	This menu item provides a smoothed DAC response to compensate for erratic input signals caused by flow fluctuations. Higher values result in greater dampening or smoothing; lower values result in a rapid response to changing signals from the internal curve linearizer. Acceptable values are 1 – 127.
204-DAC Readout	***This menu item requires the Diagnostic Password for access. Consult factory.***
205-ADC Filter	This menu item provides a smoothed Analog-to-Digital Converter (ADC) response to compensate for erratic input sensor signals caused by flow fluctuations. Higher values result in greater dampening or smoothing; lower values result in a rapid response to changing signals. Acceptable values are 1 – 255.
206-ADC Readout	***This menu item requires the Diagnostic Password for access. Consult factory.***

207-Disp Rate	This menu item adjusts the rate at which the rate and totalizer readouts are updated. It is often used to reduce the effect of a rapidly fluctuating flow rate on the LCD display. Any value less than 8 (ms) should be avoided because it will cause updates to the flow rate which will override the correct presentation of the total elapsed flow on the LCD display. ***This menu item only affects the totalizer and flow rate update period, not their accuracy, and does not affect the 0–5VDC or 4–20mA output signals.***
208-Disp Set	This menu item sets the LCD panel contrast value. A value of 128 should display digits at room temperature. Use the **SHIFT + MAX / MIN** keys during Run Mode to fine tune this setting if necessary.
209-	(unused)
210-Modbus Addr	This menu item sets the Modbus address for this flowmeter. A value of 0 disables Modbus protocol from the RS485 communications port and the data sent out the RS485 port is the same as the RS232 port. A value of 1-127 enables the Modbus protocol on the RS485 port and this number is also the flowmeter's Modbus address. The baud rate is set to 19200, No Parity, 2 Stop by the factory. See Modbus manual for more details.
211-Tracking On	This menu item restores the DAC and ADC tracking.
212-Track Hold	This menu item suspends the DAC and ADC tracking. ***This menu item requires the Diagnostic Password for access. Consult factory.***
213-Set Meter	This menu item is used to select the active meter range. All Master-Touch™ flowmeters are capable of storing configuration and parameter data for four separate meter ranges. A specific meter range is selected by entering 1–4 in this menu item. If a flowmeter has only one calibrated meter range, the factory will program it as meter range #1 and meter ranges #2–4 will not contain any valid variables. ***The flowmeter can also be set up to allow external switching between stored ranges by entering "0" at the prompt. However, EPICommunicator 2.0 software must be used for this function as it affects the use of the keypad for access to the menu system.***
214-Set Date	This menu item sets the time stamp functions to the current date for accurate reporting. The menu supports both MM/DD/YY and DD.MM.YY time formats where: • MM = month (01–12) • DD = day (01–31) • YY = year (00–99) Include a slash (/) as the delimiter between values for MM/DD/YY format, or a period (.) as the delimiter between values for DD.MM.YY format. The date will not be set if these formats are not followed exactly.
215-Set Time	This menu item sets the time stamp functions to the current time for accurate reporting. The time prompt indicates HH:MM:SS where: • HH = hour (00–23) • MM = minutes (00–59) • SS = seconds (00–59) • . (period) = AM /PM or 24 hour clock Include a colon (:) as the delimiter between values. The time will not be set if this format is not followed exactly. Example: 01:24:56P = 1:24:56 PM 13:24:56 = 1:24:56 PM displayed in 24 hour clock format.

216-No Curve Fit	This menu item suspends the factory P-Curve linearization. ***This menu item requires the Diagnostic Password for access. Consult factory.***
217-Curve Fit	This menu item selects the curve fit mode used by the microprocessor to generate the flow readings and output signals. The menu values are: 0 = NO = NO curve adjustment 1 = PO = Primary (factory) curve fit adjustment 2 = PS = Primary & Secondary curve fit adjustments 3 = PW = Primary & Pointwise curve fit adjustments
218-Reset Lock#	This menu allows the four digit numeric password to be changed. The flowmeter must be unlocked prior to accessing this menu item. All flowmeters are shipped with an initial password of 9001 unless otherwise specified at the time of purchase. The range of valid passwords is 9001–9999. ***If you set your own password, save it in a secure place to prevent loss and lockout from user variables.***
219-UnLock	This menu item is used to enter the pre-set four digit password that unlocks the flowmeter's settings. You can access any number of menu items while the settings are unlocked. The settings are locked again when the flowmeter is returned to Run Mode. ***See Page D-1 for detailed instructions on this menu item.***
220-Diagnostic P	This menu item is the factory password for certain menu items which should not ordinarily be accessed by users. These menu items include: 201–DAC Set 216–No Curve Fit 204–DAC Readout 801-812–CoeffTerm A-J (P-Curve coefficients) 206–ADC Readout 814–MaxRange 212–Tracking Off
221-SetCalDate	This menu item can be set to act as a reminder for periodic recalibrations. Enter the date of the next calibration reminder using the MM/DD/YY format, or enter a zero-zero (00) for either the month or day to disable the reminder.
222-Fix Decimal	This menu item controls the number of decimals shown in the flow rate display. Enter a value from zero to six (0 to 6), or enter an "A" for the automatic floating decimal. ***This setting does not affect the total elapsed flow display nor does it affect the accuracy of the flowmeter.***
223-Set WD Timer	This menu item allows the user to change the Watchdog (WD) timer "time-out" period. The factory default setting is 3 which equals 3 minutes. This timer is used to exit all menus after the time-out period. The MP will perform a reset similar to the power down/power up reset. The minimum allowable value is 1; the maximum allowable value is 120.
224-ProtocolOnOff	This menu item allows the flowmeter to use alternate communication protocols such as HART and Profibus DP. The factory default is Protocol Off (0); when HART, Profibus DP or other communication options are installed, the Protocol is On (1). Consult factory for supported protocols. ***When the Protocol is on (1) then EPIcommunicator's RS232 communication is disabled. You must use the flowmeter's keypad or an EPICom II handheld device to turn off the Protocol (0) which will enable the RS232 communications.***

225-SetRS232Baud	This menu item adjusts the baud rate of the RS232 port. 0 = Factory Default (9600) 1 = 9600 2 = 14400 3 = 19200 4 = 28800 5 = 33400 6 = 56000 7 = 57600 8 = 115200 ***EPI's LightWIRE IR communication modules currently require an RS232 baud rate of 9600 and will not function correctly at other baud rates.***
226-SetRS485Baud	This menu item adjusts the baud rate of the RS485 port. 0 = Factory Default (19200) 1 = 9600 2 = 14400 3 = 19200 4 = 28800 5 = 33400 6 = 56000 7 = 57600 8 = 115200 ***RS485 communications require an RS485-to-RS232 protocol converter for connecting the flowmeter to a PC running EPICommunicator or similar software.***
227-Flow0-5,10	This menu item adjusts the Flow Output Voltage from either 0 to 5 or 0 to 10 Volts out: 0 = 0-5V Output;1 = 0-10V Output.
228-Temp0-5,10	This menu item adjusts the Temperature Output Voltage from either 0 to 5 or 0 to 10 Volts out: 0 = 0-5V Output; 1 = 0-10V Output.
229-No LCD Disp	This menu item controls the microprocessor signal to the LCD: 0 = On, 1 = Off.
230-Temp Zero	This menu item sets the temperature value (°F) for the 0 VDC output. ***This value is always entered in °F. The temperature displayed will match the engineering units selected for the flow rate, either Imperial (English) or Metric. The factory default is 0°F. This setting does NOT affect the temperature compensation range for the process gas.***
231-Temp Span	This menu item sets the temperature value (°F) for the 5 VDC output. ***This value is always entered in °F. The temperature displayed will match the engineering units selected for the flow rate, either Imperial (English) or Metric. The factory default is 250°F. This setting does NOT affect the temperature compensation range for the process gas.***
232-No Display T	This menu item controls the temperature display: 0 = On, 1 = Off.
233-RS485Parity	This menu sets the baud rate on the RS 485 communications port; // 0 = No Parity 1 Stop, 1 = Even Parity 1 Stop, 2 = Odd Parity 1 Stop, 3 = No Parity 2 Stop; When Modbus address is selected, the baud rate option is set to 3; Factory default = 3.
234-Control Zero	This menu is Read Only. It displays the bridge voltage value when flow output is zero during calibration
235-Bench Zero	This menu is read only. It displays the bridge voltage value when flow output is zero at the bench.
236-RestoreFact	This menu selection will restore the eeprom values to the factory defaults. A password is required. Contact Factory for details.
237-SetPSWDMode	This menu item is used to change the way the password function works. Mode Definitions: 0 – Normal, Must enter a password to change the password using the change password command. Password required to change other command's data; values 1 – Hybrid, No password required to change the password using the change password command. Password required to change command's data values; 2 – Disabled, No password required to write to command's data values. The unit is always unlocked.

240-BiDir Mode	This menu sets the meter into Bi-Directional mode. This requires a special probe designed specifically for this feature. Contact factory for details. This should be set to 0 for standard meters. ***This menu is only used with EPI's Bi-Directional flow meter design.***
250-Multi Point	This menu sets the meter into Multi-Point mode. This requires a special probe designed specifically for this feature. Contact factory for details. This should be set to 0 for standard meters. ***This menu is only used with EPI's Multipoint flow meter design.***
299-Cust PSWD	This menu allows you set unlock commands that are password protected as they impact the meter's settings. For example command 236. Contact the Factor for details.
	(blank)
100 *Meter*	Go to 100 *Meter* Menu
300 *Status*	Go to 300 *Status* Menu
400 *Alarms	Go to 400 *Alarms* Menu
500 *Exit-Reboot	This menu exits the menu system and goes to Run Mode with rebooting the flow meter.
501 *Exit-NoRebo	This menu exits the menu system and goes to Run Mode without rebooting the flow meter.
700 *S-Curve Fit*	Go to 700 *S-Curve Fit* Menu
750 *PW-CurveFit*	Go to 750 *PW-CurveFit* Menu
800 *P-Curve Fit*	Go to 800 *P-Curve Fit* Menu
200 *Meter*	Go to 200 *Utility* Menu

RS485 Modbus RTU Section

Overview

The intention of this implementation is to communicate the Flow Rate, Gas Temperature, and Flow Total using the Modbus protocol on a RS485 physical layer.

This device is a slave device that supports the Modus RTU protocol. RTU protocol has the command, data, and response bytes sent as HEX value characters and not ASCII characters. It is assumed that the user has a copy of the Modbus specification or is Modbus literate. It is not the intention of this document to explain the specifics of the protocol. However, the document discusses the device's implementation of the specification. This device uses the RS485 physical layer to communicate the protocol.

If any aspect of the implementation does not meet the requirements or your application, please contact the factory regarding upgrading the firmware. Some examples of specifications requiring upgrades would be: different baud rates, commands not currently supported, exceptions handling, device parameter configurations, etc.

RS485 Half-Duplex Physical Layer

This slave device uses a RS485 port that runs at default baud rate of 19200 baud, 1 start bit, 8 data bits, and 1 stop bit. There are no termination resistors connected to the port. The baud rate is selectable via command 226.

Modbus Address

Command 210 enables the Modbus protocol by entering a value greater than 0 and this number represent the Modbus address. This implementation supports address of 1 to 127.

Commands Supported

The protocol is implemented in RTU mode, not ASCII. This means that each data byte is in Hex format and there is no start of message frame character. Start of frame is determined by a 3.5 character silence period followed by the modus address.

The supported commands are:

03 (0x03) Read Holding Registers

Request = Byte 0 = Modbus Address

Byte 1 = 0x03; command number 3

Bytes 2, 3 = 0x00, 0x00; Starting Address

Bytes 4, 5 = 0x00, 0x02; Number of Registers

Bytes 6, 7 = CRC bytes

Response = Byte 0 = Modbus Address

Byte 1 = 0x03; command number 3

Byte 2 = 0x0C; byte count

Byte 3 = 0xYY; MSB Flow Rate

Byte 4 = 0xYY; Flow Rate

Byte 5 = 0xYY; Flow Rate

Byte 6 = 0xYY; LSB Flow Rate

Byte 3 = 0xYY; MSB Gas Temperature

Byte 4 = 0xYY; Gas Temperature

Byte 5 = 0xYY; Gas Temperature

Byte 6 = 0xYY; LSB Gas Temperature

Byte 7 = 0xYY; MSB Flow Total

Byte 8 = 0xYY; Flow Total

Byte 9 = 0xYY; Flow Total

Byte 10 = 0xYY; LSB Flow Total

Bytes 11, 12 = CRC bytes

The above command returns the Flow Rate, Gas Temperature and the Flow Total. These are floating point numbers broken down into 4 bytes each. The user needs to re-assemble the bytes back into floating point numbers.

17 (0x11) Report Slave ID

Request =	Byte 0 = Modbus Address
	Byte 1 = 0x11; command number 17
	Bytes 2, 3 = CRC bytes
Response =	Byte 0 = Modbus Address
	Byte 1 = 0x11; command number 17
	Byte 2 = 0x0C; byte count
	Byte 3 = 0xYY; MSB Serial Number
	Byte 4 = 0xYY; Serial Number
	Byte 5 = 0xYY; Serial Number
	Byte 6 = 0xYY; LSB Serial Number
	Byte 7 = 0xFF; Run Indicator Status
	Bytes 8–14 = Firmware Revision
	Bytes 15, 16 CRC bytes

The above command returns the slave device unique ID that happens to be the Serial Number. For example Serial Number 12345678 = Decimal value 12,345,678 or 0x00BC614E. The Firmware Revision is the ASCII equivalent in Hex. For example = V6.0ARA = 0x56 0x36 0x2E 0x30 0x41 0x52 0x41

Exception Handling

All exception conditions are ignored as if the message was not intended for this device. For example, if the message's CRC value does not match the calculated CRC value, the message is ignored. This device is intended to be configured into a working network or connection. The master should timeout and then resend the message.

300 *Status* Menu

The 300 *Status* Menu of the Master-Touch™ flowmeter presents a series of menu items which allow you to rapidly get important information from the flowmeter.

The following directions assume your flowmeter is in Run Mode and will use the MAX key to advance through the menu items. You can use MIN key to go back to an item, or continue to use the MAX key until the desired item appears again.

```
1∞∞12.3456  SCFM
9876.54321   SCF
```

RUN MODE

```
300 *Status*
100 *Meter*
```

Press **MODE** three times to advance to the 300 *Status* menu. The display shown at the right will appear briefly. The top line will always show you that you are in the 300 *Status* menu. The second line presents the specific menu items.

```
300 *Status*
1> PO 4353 SCFM
```

The display will change automatically to the first Status menu item. The first character indicates which meter range is selected (1–4) or Tracking Off (!). The second and third characters indicate the selected curve fit mode (NO, PO, PS, PW). Each of the next four characters is the last digit of the currently selected condition for Ev1, Ev2, Ev3, and Ev4 (*see 400 *Alarm* section for details*). The final characters indicate the currently selected engineering units for the rate and total information.

```
300 *Status*
HV123.4567  SCFM
```

This display presents the highest flow value since the last start up or reset.

```
300 *Status*
HT=01:23:45PM
```

This display presents the time stamp for the highest flow value.

```
300 *Status*
HD=08/09/98
```

This display presents the date stamp for the highest flow value.

```
300 *Status*
LV 9.8765   SCFM
```

This display presents the lowest flow value since the last start up or reset.

```
300 *Status*
LT = 05:43:21AM
```

This display presents the time stamp for the lowest flow value.

```
300 *Status*
LD = 11/25/98
```

This display presents the date stamp for the lowest flow value.

```
300 *Status*
RT = 10:23:45
```

This display presents the time stamp at which the totalizer was last reset to zero.

```
300 *Status*
RD = 06/23/98
```

This display presents the date stamp at which the totalizer was last reset to zero.

```
300 *Status*
Time 12:34:56AM
```

This display presents the real time clock.

```
300 *Status*
Date  01/01/06
```

This display presents the real time date.

```
300 *Status*
CT=75°F PT=81°F
```

This display presents the current and peak temperatures of the process gas flow.

```
300 *Status*
BV = 0.234 Volts
```

This display presents the flow reference voltage.

```
300 *Status*
Bench BV = 0.000
```

This display presents the voltage when the flow output is zero (0) during the technician's flow calibration process.

```
300 *Status*
Cal BV = 0.000 V
```

This display presents the voltage when the flow output is zero (0) during the flow calibration data collection process.

```
300 *Status*
FS=0.234   Volts
```

This display presents the real-time flow sensor voltage.

```
300 *Status*
TR=0.234   Volts
```

This display presents the real-time temperature reference voltage.

```
300 *Status*
TS=0.234   Volts
```

This display presents the real-time temperature sensor voltage.

```
300 *Status*
TL=0.234   Volts
```

This display presents the real-time temperature lead sense voltage.

```
300 *Status*
FL=0.234   Volts
```

This display presents the real-time flow lead sense voltage.

```
300 *Status*
TRES= 55    Ohms
```

This display presents the real-time temperature lead resistance.

```
300 *Status*
FRES= 55    Ohms
```

This display presents the real-time flow lead resistance.

```
300 *Status*
DAC =0.234 Volts
```

This display presents the real-time digital-to-analog voltage output.

```
300 *Status*
ADC =2.987 Volts
```

This display presents the real-time analog-to-digital voltage output.

```
300 *Status*
SN=12345678
```

This display presents the unique serial number of the flowmeter.

```
300 *Status*
µP PCBA Rev =xx
```

This display presents the microprocessor board revision number.

400 *Alarms* Menu

Alarm Relay Overview

Master-Touch™ flowmeters have two 1-amp SPDT relays that provide four relay Events (Ev1–Ev4):

- Relay 1 OFF (**Ev1**): the relay coil is de-energized with the Common and Normally Closed connected
- Relay 1 ON (**Ev2**): the relay coil is energized with the Common and Normally Open connected
- Relay 2 OFF (**Ev3**): the relay coil is de-energized with the Common and Normally Closed connected
- Relay 2 ON (**Ev4**): the relay coil is energized with the Common and Normally Open connected

These events can be used to activate other devices in response to a set of user-defined flow conditions, or to provide pulsed outputs based on the current flow rate or the elapsed flow total. There are a number of user-selectable conditions which will trigger an alarm relay response from a Master-Touch™ flowmeter. Some of the most commonly used response conditions are:

- **Trip High** — an alarm relay is triggered by a flow rate that is higher than the preset value;
- **Trip Low** — an alarm relay is triggered by a flow rate that is lower than the preset value;
- **Total** — an alarm relay is triggered by an accumulated flow total that is higher than the preset value;
- **Timer** — an alarm relay is triggered after a preset time delay value;
- **Proportional Pulse Output** — an alarm relay is triggered by a flow rate that is equal to a preset proportion of the value in menu item **140-FScale**;
- **Pulse Output** — an alarm relay is triggered after an preset value of accumulated flow total;
- **MAX Key** — an alarm relay is reset by momentarily pressing the **MAX** key on the LCD panel;
- **MIN Key** — an alarm relay is reset by momentarily pressing the **MIN** key on the LCD panel;
- **ESD/EMI Rst** — an alarm relay is triggered by electromagnetic impulse noise.
- **Flow Hold 1 & 2** — the ADC input voltage is maintained at constant value, typically during gas purge cycle

The alarm relays can also be reset externally by using the Mode 1 or Mode 2 and Ground connections on Terminal Block One (TB1). Mode 1 is the same as using the MAX key; Mode 2 is the same as using the MIN key. Momentarily grounding the appropriate Mode connection resets the alarm relay. In addition, the alarm relays can be **disabled** so they do not trigger on any Event. The Disabled function is also used to latch or hold the relay at its current condition. If no Event programming has been requested at the time of purchase, Disabled is the default condition for the alarm relays.

The flowmeter settings must be unlocked to change the alarm relay parameters (*see menu item 219-UnLock*).

```
1∞∞12.3456  SCFM
9876.54321   SCF
```

RUN MODE

```
400 *Alarms*
401-Set Event
```

Press **MODE** four times to advance to the **400 *Alarms*** menu. The display shown at left will appear. The top line will show you that you are in the correct menu. The bottom line presents the specific submenu items.

```
Event#(1-4)
>1
```

When you select a submenu which supports data entry a brief description of the selected action will appear on the top line and the data entry field will appear on the bottom line. In the example at left, submenu 401-Set Event has been selected and the flowmeter is displaying the Alarm.

The following list shows the submenus and assumes that you will use the MAX key to advance through the submenu items. You can use MIN key to go back to an item, or continue to use MAX until the desired submenu appears again.

400 *Alarms* Submenus

401-Set Event	This menu item selects the specific relay Event (Ev1–Ev4) to which a response condition is assigned.
402-Disabled	This menu item causes the current active Event to ignore all response conditions.
403-Trip High	This menu item sets the current active Event to respond to a flow rate that is higher than the preset value.
404-Trip Low	This menu item sets the current active Event to respond to a flow rate that is lower than the preset value.
405-Max Button	This menu item sets the current active Event to respond when the MAX key on the LCD panel is pressed or when Mode 1 is grounded.
406-Min Button	This menu item sets the current active Event to respond when the MIN key on the LCD panel is pressed or when Mode 2 is grounded.
407-Timer	This menu item sets current active Event to respond to a time duration, such as a pulsed output. Enter the desired preset duration value in units of 50ms.
408-Frequency Ou	(not implemented in this release)
409-Total	This menu item sets the current active Event to respond to an elapsed total. Enter the desired preset value in the current engineering units (whole numbers only – no decimals).
410-PulseOut	This menu item sets the current active Event to respond to an elapsed total. This function is used with remote data collection systems which count the pulses to generate an elapsed flow total. Enter a value to activate a relay for every X number of units on the totalized flow, i.e., every 1 unit, 12 units, 50 units, etc. Any whole number between 1 and 2,000,000 may be entered at the prompt (>), but we recommend decimal values (1, 10, 100, . . .). A timer function must be associated with this menu item to release the relay from the active state (*see menu item 407–Timer*). The timer must be set fast enough to release the relay before the next preset total value is reached.
411-Trip Delay	This menu item sets the response delay for the current active Event. Enter the desired value in increments of 50ms (20 = 1 second). The acceptable values are 1– 255.
412-ESD/EMI Rst	This menu item detects LCD errors caused by power supply noise or other electromagnetic interference. A value in increments of 50ms must be entered to determine the duration of such interference before the relay responds. A value of one (1) will cause a response to the shortest disturbance. Consult factory for additional information and a diagram of required wiring of input power to implement this function.
413-Flow Hold1	This menu item holds the ADC input value while Relay 1 Event 2 is on. When the value is set to one (1), it will hold the ADC input at its current value. A value of zero (0) will disable this feature.

414-Flow Hold2	This menu item holds the ADC input value while Relay 2 Event 4 is on. When the value is set to one (1), it will hold the ADC input at its current value. A value of zero (0) will disable this feature.
415-Degrees High	This menu item sets the gas temperature value for the high temperature trip point.
416-Degrees Low	This menu item sets the gas temperature value for the low temperature trip point.
417-BiDir Relay	This menu item is used to indicate which direction the flow is traveling and when it changes direction. ***This menu is only used with EPI's Bi-Directional flow meter design.***
418-Sensor Fault	This menu item is used to indicate that a sensor has a fault outside of the programmed parameters ***This menu is only used with EPI's Bi-Directional flow meter design.***
	(blank)
100 *Meter*	Go to 100 *Meter* Menu
200 *Utility*	Go to 200 *Utility* Menu
300 *Status*	Go to 300 *Status* Menu
500 *Exit-Reboot	This menu exits the menu system and goes to Run Mode with rebooting the flow meter.
501 *Exit-NoRebo	This menu exits the menu system and goes to Run Mode without rebooting the flow meter.
700 *S-Curve Fit*	Go to 700 *S-Curve Fit* Menu
750 *PW-CurveFit*	Go to 750 *PW-CurveFit* Menu
800 *P-Curve Fit*	Go to 800 *P-Curve Fit* Menu
400 *Utility*	Go to 400 *Utility* Menu

Alarm Programming

The alarm relays only operate while the flowmeter is the Run Mode. To select and program alarm relay Events, use the 400 *Alarms* menu items. First, select the specific Event (Ev1-Ev4) in menu item **401-Set Event**. After selecting an Event, a condition is assigned (Timer, Max, PropPOut, etc.). With the exception of setting the **MAX** or **MIN** keys for manual operation or to **disable** an Event, each condition requires a numeric value to control the response. Depending upon the selected condition, these values refer to 50 millisecond (ms) increments or to the currently selected engineering units.

The flowmeter accepts settings for the Event until it returns to Run Mode, or until another Event is selected by returning to menu item 401. Therefore, if a mistake is made while setting the parameters for an Event, such as selecting Trip High instead of Trip Low, there is no need to undo the previous settings — simply select the correct menu item and continue entering the settings.

The following are examples of the steps required for two typical uses of the Master-Touch™ alarm relays:

Example 1 — Set Alarm Relay 2 to activate for each accumulated flow total of 100 SCF with a 100 millisecond pulse width:

- Unlock the flowmeter settings and go to the **400 *Alarms*** menu;
- Select menu item **401-Set Event**, then enter **3** at the prompt (3 = Ev 3, Relay 2 OFF);
- Select menu item **407-Timer**, then enter **2** at prompt (2 x 50ms = 100ms);
- Select menu item **401-Set Event**, then enter **4** at the prompt (4 = Ev 4, Relay 2 ON);
- Select menu item **410-PulseOut**, then enter **100** (SCF) at menu prompt;
- Select menu item **500 *Run Mode*** to lock the flowmeter and return to Run Mode.

Example 2 — Set Alarm Relay 1 to activate if the flow rate falls below 10 SCFM for a period of four seconds:

- Unlock the flowmeter settings and go to the **400 *Alarms*** menu;
- Select menu item **401-Set Event**, then enter **1** at the prompt (1 = Ev 1, Relay 1 OFF);
- Select menu item **407-Timer**, then enter **20** at prompt (20 x 50ms = 1s);
- Select menu item **401-Set Event**, then enter **2** at the prompt (2 = Ev 2, Relay 1 ON);
- Select menu item **404-Trip Low**, then enter **10** (SCFM) at menu prompt;
- Select menu item **411-Trip Delay**, then enter **80** at prompt (80 x 50ms = 4s);
- Select menu item **500 *Run Mode*** to lock the flowmeter and return to Run Mode.

As an example of the results of this programming, assume that during Run Mode, the flow reads approximately 18 SCFM. Therefore Relay 1 is inactive. Then the flow decreases to 8 SCFM for 1.25 seconds but returns to 18 SCFM 1 second later. No alarm is generated because the total duration of the increased flow was less than the Trip Delay value (4 seconds). If the duration of the low flow (i.e., < 10 SCFM) exceeded 4 seconds, Relay 1 would activate for 1 second (the value for menu item 407–Timer) and then reset. The alarm relay will not be activated again until the flow increases above 10 SCFM and then falls below 10 SCFM.

450 *E-Log* Menu

The Master-Touch™ 5.0 software supports the E-Log™ data logger module. The E-Log™ functions are accessible through the use of the 4-button keypad. Although data logging can be started and stopped at any time, the microprocessor settings must be unlocked using **Menu 219-UnLock** to make changes to the data logging options. The following list shows the submenus and their functions. Some titles may be truncated on the display due to the limitations of the 16 characters per line.

```
450 *E-Log*
451-Set StartDat
```

RUN MODE

451—Set StartDat	This menu item is used to set the date to start collecting the data snapshots. It uses the MM/DD/YY format.
452—Start Time(2	This menu item is used to set the time to start collecting the data snapshots. It uses the HH:MM:SS format.
453—Set Stop Dat	This menu item is used to set the date to stop collecting the data snapshots. It uses the MM/DD/YY format.
454—Stop Time(24	This menu item is used to set the time to stop collecting the data snapshots. It uses the HH:MM:SS format.
455—Interval Tim	This menu item is used to set the time interval for each data snapshot. It uses the HH:MM:SS format.
456—Option Date	This menu item is used to include the current date in the data snapshot. (0 = No; 1 = Yes)
457—Option Time	This menu item is used to include the current time in the data snapshot. (0 = No; 1 = Yes)
458—Option Flow	This menu item is used to include the current flow rate in the data snapshot. (0 = No; 1 = Yes)
459—Option Total	This menu item is used to include the current elapsed total in the data snapshot. (0 = No; 1 = Yes)
460—Option High	This menu item is used to include the highest flow rate in the data snapshot. (0 = No; 1 = Yes)
461—Option Low	This menu item is used to include the lowest flow rate in the data snapshot. (0 = No; 1 = Yes)
462—Option Relay	This menu item is used to include the status of Relay #1 in the data snapshot. (0 = No; 1 = Yes)
463—Option Relay	This menu item is used to include the status of Relay #2 in the data snapshot. (0 = No; 1 = Yes)
464—Start Elog N	This menu item is used to manually start collecting the data snapshots.
465—Stop Elog No	This menu item is used to manually stop collecting the data snapshots.
466—Start Timer	This menu item is used to start the internal timer for the programmed Start and Stop options (Menus 451 — 454) .

467—Display Setu	***This menu item is only for use with EPICommunicator software. The flowmeter will require a Restart if the Shift key is pressed while this submenu is shown on the display.***
468—	(unused)
	(blank)
100 *Meter*	Go to 100 *Meter* Menu
200 *Utility*	Go to 200 *Utility* Menu
300 *Status*	Go to 300 *Status* Menu
500 *Exit-Reboot	This menu exits the menu system and goes to Run Mode with rebooting the flow meter.
501 *Exit-NoRebo	This menu exits the menu system and goes to Run Mode without rebooting the flow meter.
700 *S-CurveFit*	Go to 700 *S-CurveFit* Menu
750 *PW-CurveFit*	Go to 750 *PW-CurveFit* Menu
800 *P-Curve Fit*	Go to 800 *P-Curve Fit* Menu
450 *E-Log*	Go to 450 *E-Log* Menu

700 *S-Curve Fit* Menu

The Master-Touch™ software no longer supports Secondary Curve (S-Curve) functions.

750 *PW-Curve Fit* Menu

The Master-Touch™ 5.0 software supports Pointwise Curve (PW-Curve) adjustments to the linear output to correct for flow profile anomalies which may occur at different flow rates/velocities. The twenty PW-Curve menu items, 751 through 770, are used to assign multipliers to a segment of the linear output. Each segment is 5% of the linear range. Menu **751** adjusts the lowest segment, 0 to 5%; menu **752** adjusts the next segment, 5% to 10%, and so on. Menu **770** represents the highest segment, 95 to 100%. These multipliers are applied as necessary after the global C-Factor (see *menu **811-C-Factor***) has been applied. For example, a flow profile anomaly causes a reading which is 6% too low at 20 to 25% of the linear flow range.

- Unlock the flowmeter settings and go to the **750 *PW-Curve Fit*** menu;
- Select menu item **755**, then enter **"6"** at the prompt;
- Press the Max key to go to menu item **500 *Run Mode*;**
- Press the Shift key to return to Run Mode which will also relock the flowmeter settings.

It is recommended that adjustments be limited to values between +/- 10% of the flow reading. Larger adjustments may produce unwanted shifts at other segments.

```
1∞∞12.3456  SCFM
9876.54321   SCF
```

RUN MODE

```
750 *PW-CurveFit
751-Pointwise 5%
```

Press **MODE** seven times to advance to the **750 *PW-Curve Fit*** menu. The display shown at left will appear. The top line will show you that you are in the correct menu. The bottom line presents the specific submenu items.

```
Pt-Wise 5%
>0.000000
```

When you select a submenu which supports data entry a brief description of the selected action will appear on the top line and the data entry field will appear on the bottom line. In the example at left, submenu 751-Pointwise 5% has been selected and the flowmeter is displaying the current correction value for the first 5% of the calibrated flow range.

The following list shows the submenus and assumes that you will use the MAX key to advance through the submenu items. You can use MIN key to go back to an item, or continue to use MAX until the desired submenu appears again.

750 *PW-Curve Fit* Submenus

751-Pointwise 5%	This menu item is used to adjust the 0 – 5% segment of the flow range.
752-Pointwise 10	This menu item is used to adjust the 5 – 10% segment of the flow range.
753-Pointwise 15	This menu item is used to adjust the 10 – 15% segment of the flow range.
754-Pointwise 20	This menu item is used to adjust the 15 – 20% segment of the flow range.
755-Pointwise 25	This menu item is used to adjust the 20 – 25% segment of the flow range.
756-Pointwise 30	This menu item is used to adjust the 25 – 30% segment of the flow range.
757-Pointwise 35	This menu item is used to adjust the 30 – 35% segment of the flow range.
758-Pointwise 40	This menu item is used to adjust the 35 – 40% segment of the flow range.
759-Pointwise 45	This menu item is used to adjust the 40 – 45% segment of the flow range.

760-Pointwise 50	This menu item is used to adjust the 45 – 50% segment of the flow range.
761-Pointwise 55	This menu item is used to adjust the 50 – 55% segment of the flow range.
762-Pointwise 60	This menu item is used to adjust the 55 – 60% segment of the flow range.
763-Pointwise 65	This menu item is used to adjust the 60 – 65% segment of the flow range.
764-Pointwise 70	This menu item is used to adjust the 65 – 70% segment of the flow range.
765-Pointwise 75	This menu item is used to adjust the 70 – 75% segment of the flow range.
766-Pointwise 80	This menu item is used to adjust the 75 – 80% segment of the flow range.
767-Pointwise 85	This menu item is used to adjust the 80 – 85% segment of the flow range.
768-Pointwise 90	This menu item is used to adjust the 85 – 90% segment of the flow range.
769-Pointwise 95	This menu item is used to adjust the 90 – 95% segment of the flow range.
770-Pointwise 10	This menu item is used to adjust the 95 – 100% segment of the flow range.
780-All PW = 0%	This menu item is used to reset all segments to the factory default of zero (0).
	(blank)
100 *Meter*	Go to 100 *Meter* Menu
200 *Utility*	Go to 200 *Utility* Menu
300 *Status*	Go to 300 *Status* Menu
400 *Alarms	Go to 400 *Alarms* Menu
500 *Exit-Reboot	This menu exits the menu system and goes to Run Mode with rebooting the flow meter.
501 *Exit-NoRebo	This menu exits the menu system and goes to Run Mode without rebooting the flow meter.
750 *PW-CurveFit*	Go to 750 *PW-CurveFit* Menu
800 *P-Curve Fit*	Go to 800 *P-Curve Fit* Menu
750 *PW-CurveFit*	Go to 750 *PW-CurveFit* Menu

800 *P-Curve Fit* Menu

The Master-Touch™ 5.0 software stores the Primary Curve (P-Curve) coefficients which are generated by the factory NIST calibration, as well as the global C-Factor, process line cross-sectional area, etc.

Although most settings are accessible by using the default user password of "9001", some of the parameters require a special password available only by contacting the factory. This has been instituted to prevent the accidental change of critical settings. The P-Curve coefficients and MaxRange values should never be changed without direct factory instructions.

```
1∞∞12.3456  SCFM
9876.54321   SCF
```

RUN MODE

```
800 *P-Curve Fit
801-CoeffTerm A
```

```
Term A Coeff
>0.000000e+00
```

Press **MODE** eight times to advance to the **800 *P-Curve Fit*** menu. The display shown at left will appear. The top line will show you that you are in the correct menu. The bottom line presents the specific submenu items.

When you select a submenu which supports data entry a brief description of the selected action will appear on the top line and the data entry field will appear on the bottom line. In the example at left, submenu 801-CoeffTermA has been selected and the flowmeter is displaying the current coefficient value.

The following list shows the submenus and assumes that you will use the MAX key to advance through the submenu items. You can use MIN key to go back to an item, or continue to use MAX until the desired submenu appears again.

800 *P-Curve Fit* Submenus

801-CoeffTermA	Factory Calibration Coefficient.

through

810-CoeffTermJ	Factory Calibration Coefficient.
811-C Factor	This value is a multiplier used to adjust the P-Curve linearization. It is normally set to 1.0, but may be adjusted based the *Installation Guidelines*, or to correct for aberrations in sensor readings. The C Factor can also be used to change standard conditions (STP) or to apply a density factor (vapor density) when changing the engineering units from volumetric units (SCFM, NCMH, etc.) to gravimetric units (Lbs/Hr, Kg/Hr, etc.) in flowmeters calibrated for gases other than air.
812-Zero Offset	This voltage value is subtracted from the sensor curve linearizer to correct for minor sensor voltage errors. This ensures that zero flow is attained even though some bias voltage may exit which would otherwise prevent an absolute zero reading (*see also menu item 815–Auto Zero*).

813-SetXSect	This value is the cross-sectional area of the flow section or process line. The units of measure are determined by the engineering units selected (*see menu items 101–132*). For example, if the current engineering units are SCFM, then the menu item 813 value must represent square feet (F^2). A value of one (1) may be used if the current engineering units represent velocity (SFPM, NMPS, etc.) or if the flowmeter in an "inline" style with its own flow section.
814-MaxRange	This is the maximum value of the factory NIST calibration. The units of measure are determined by the engineering units selected (*see menu items 101–132*) and the value will change in response to changes to the engineering units. ***Requires Diagnostic Password for access. Consult factory.***
815-Auto Zero	This menu item automatically establishes a new Zero Offset (*see menu item 812–Zero Offset*). Entering a one (1) at the prompt changes the zero offset to the 0–5VDC output voltage of the flowmeter when the selection is made. This is particularly valuable for No Flow zeroing adjustments. Entering a zero (0) at the prompt leaves the existing zero offset value unchanged.
816-FlowCutoff	This menu item is used to set a percentage of the Full Scale value (*menu item 140–FScale*) as the minimum readable flow rate. Actual flow rates below this minimum value will be treated as No Flow. The display will show "0" instead of the real-time flow rate, no additional elapsed flow will be recorded, the 0–5VDC signal will drop to 0VDC, and the 4–20mA signal will drop to 4mA. For example, if the Full Scale is 1000 SCFM, a value of 10 (10%) will cause the flowmeter to ignore flow rates below 100 SCFM or less. When the actual flow rate increases above this value, all of the flowmeter's functions will resume.
	(blank)
100 *Meter*	Go to 100 *Meter* Menu
200 *Utility*	Go to 200 *Utility* Menu
300 *Status*	Go to 300 *Status* Menu
400 *Alarms	Go to 400 *Alarms* Menu
500 *Exit-Reboot	This menu exits the menu system and goes to Run Mode with rebooting the flow meter.
501 *Exit-NoRebo	This menu exits the menu system and goes to Run Mode without rebooting the flow meter.
700 *S-CurveFit*	Go to 700 *S-CurveFit* Menu
750 *PW-CurveFit*	Go to 750 *PW-CurveFit* Menu
800 *P-Curve Fit*	Go to 800 *P-Curve Fit* Menu

Section C Instructions for Specific Actions

Unlocking the Master-Touch™ — Menu Item 219–UnLock

Master-Touch™ flow averaging tubes are shipped from our factory with passkey protection for the variable settings to guard against unwanted or accidental changes. To make "permanent" changes, such as adjusting the Full Scale range or changing the engineering units, the flow averaging tube must be unlocked. Although menu item 219-UnLock can be accessed at any time, the flow averaging tube must be unlocked to make changes to the variable settings. If the numeric entry mode is accessed while the flow averaging tube settings are still locked, the top line of the LCD display will show "****METER LOCKED****" until you press the **SHIFT** key to exit the numeric entry mode:

```
**METER LOCKED**
>1200
```

You can change the passkey for your Master-Touch™ after the flow averaging tube is unlocked by entering a new passkey in menu item 218-Reset Lock. The acceptable range of possible numerical values is 9001-9999. However, EPI cannot recover user-defined passkeys. Therefore, if you set your own passkey code, you should note it in a secure location to prevent loss and lockout from access to the variable settings.

The following directions assume your flow averaging tube is in Run Mode.

Start	**RUN MODE**	`1∞∞12.3456 SCFM` `9876.54321 SCF`
Step 1	Press **MODE** twice to advance to the 200 *Utility* menu.	`200 *Utility*` `201-DAC Set`
Step 2	Press **MAX** or **MIN** to advance to the 200 *Utility* menu item 219–UnLock.	`200 *Utility*` `219-UnLock`
Step 3	Press **SHIFT** to access the numeric entry mode. The blinking character is the active digit. Use **MAX** or **MIN** to change the numerical value.	`Code#(9xxx)` `>9---`
Step 4	Press **MODE** to move the active digit to the right to change the numerical value of the other digits.	`Code#(9xxx)` `>90--`
Step 5	Complete the entry of the passkey (*default factory passkey is 9001*).	`Code#(9xxx)` `>9001`
Step 6	Press **SHIFT** to move active digit to the left until the meter returns to menu item 219–UnLock. The meter is unlocked as indicated by a ">" in the upper right corner of the LCD display.	`200 *Utility* >` `219-UnLock`

Step 7 Press **MAX** or **MIN** to advance to other 200 *Utility* menu items or **MODE** to advance to other mode menus.

```
200 *Utility*  >
400 *Alarms*
```

DO NOT return to RUN MODE —
this will automatically LOCK the meter.

Selecting the Engineering Units — Menu Items 101–132

Master-Touch™ flow meters allow you to choose from a variety of engineering units to measure the flow rate and elapsed total. The menu items 101 through 132 have been designated for this purpose, though not all items are currently assigned. Please note that changing the engineering units from SCFM, NCMH, etc. to Lb/H, Kg/H, etc. requires factory assistance for all gases other than air.

The following directions assume that you have just unlocked the flow averaging tube. However, the 100 *Meter* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start — **Menu item 219–UnLock**

```
200 *Utility*  >
219-UnLock
```

Step 1 — Press **MAX** twice to advance to the 200 *Utility* menu item 100 *Meter*.

```
200 *Utility*  >
100 *Meter*
```

Step 2 — Press **SHIFT** to advance to the 100 *Utility* menu.

```
100 *Meter*    >
101-SCFM
```

Step 3 — Press **MAX** or **MIN** to advance to the 100 *Utility* menu item of the engineering unit you desire. Press **SHIFT** to select the engineering unit.

```
100 *Meter*    >
119-NCMH
```

NOTE — **<u>DO NOT select any blank menu item</u> — this will cause a failure and the flow averaging tube will need to be powered down and powered up again.**

```
100 *Meter*    >
107-
```

Step 4a — <u>If further adjustments are required</u>, press **MAX** or **MIN** to advance to other 100 *Meter* menu items or **MODE** to advance to other main menus.

```
100 *Meter*    >
800 *Factory*
```

DO NOT return to RUN MODE —
this will automatically LOCK the meter.

Step 4b — <u>If no further adjustments are required</u>, press **MAX** to advance to the 500 *Exit-Reboot menu item, then press **SHIFT** to restart the flow meter and return to Run Mode.

```
100 *Meter*    >
500 *Exit-Reboot
```

<u>Or</u> press **MAX** to advance to the 501 *Exit-NoRebo menu item, then press SHIFT to return to Run Mode without restarting the flow meter.

```
100 *Meter*    >
501 *Exit-NoRebo
```

Changing the Full Scale range — Menu Item 140–FScale

Master-Touch™ flow meters allow you to set the Full Scale range to any value less than or equal to the calibrated MaxRange value. For example, if the factory calibration set your Full Scale to 5,000 SCFM and the MaxRange at 6,000 SCFM, the Full Scale can be set as high as 6,000 SCFM or as low as practical for your application. Adjustments to this setting scale the 0-5VDC and 4-20mA output signals to the new Full Scale range.

The following directions assume that you have just unlocked the flow averaging tube. However, the 100 *Meter* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start	**Menu item 219–UnLock**	200 *Utility* > 219–UnLock
Step 1	Press **MAX** twice to advance to the 200 *Utility* menu item 100 *Meter*.	200 *Utility* > 100 *Meter*
Step 2	Press **SHIFT** to advance to the 100 *Utility* menu.	100 *Meter* > 101–SCFM
Step 3	Press **MAX** or **MIN** to advance to the 100 *Utility* menu item 140–FScale.	100 *Meter* > 140–FScale
Step 4	Press **SHIFT** to access the numeric entry mode.	Set Full Scale > >5000
Step 5	The blinking character is the active digit. Use **MAX** or **MIN** to change the numerical value. Use **MODE** to move the active digit to the right and complete the entry of the new Full Scale value.	Set Full Scale > >4500
Step 6	Press **SHIFT** to move active digit to the left until the meter returns to menu item 140–FScale. The Full Scale setting is now changed.	100 *Meter* > 140–FScale
Step 7a	<u>If further adjustments are required</u>, press **MAX** or **MIN** to advance to other 100 *Meter* menu items or **MODE** to advance to other main menus. **DO NOT return to RUN MODE — this will automatically LOCK the meter.**	100 *Meter* >> 800 *Factory*
Step 7b	<u>If no further adjustments are required</u>, press **MAX** to advance to the 500 *Exit-Reboot menu item, then press **SHIFT** to restart the flow meter and return to Run Mode.	100 *Meter* >> 500 *Exit-Reboot
	<u>Or</u> press **MAX** to advance to the 501 *Exit-NoRebo menu item, then press SHIFT to return to Run Mode without restarting the flow meter.	100 *Meter* >> 501 *Exit-NoRebo

Resetting the Flow Rate and Flow Total — Menu Item 160–Reset!

Master-Touch™ flow meters allow you to reset the flow rate and elapsed flow totals to zero at any time. The flow averaging tube must be unlocked for reset these values.

The following directions assume that you are in Run Mode. However, the 100 *Meter* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start	**Menu item 219–UnLock**	`200 *Utility* >` `219–UnLock`
Step 1	Press **MAX** four times to advance to the 200 *Utility* menu item 100 *Meter*.	`200 *Utility* >` `100 *Meter*`
Step 2	Press **SHIFT** to advance to the 100 *Utility* menu.	`100 *Meter* >` `101–SCFM`
Step 3	Press **MAX** or **MIN** to advance to the 100 *Utility* menu item 160–Reset!. Press **SHIFT** to reset the values to zero. The flow averaging tube will automatically return to Run Mode within 1–2 seconds.	`100 *Meter*` `160–Reset!`

Adjusting the Display Rate — Menu Item 207–Disp Rate

Master-Touch™ flow meters allow you to adjust the rate at which the rate and totalizer readouts are updated. This feature is often used to reduce the effect of a rapidly fluctuating flow rate on the LCD display. Values of 20-40 are typically used for this function. The PC terminal and LCD panel receive data in 50 milliseconds intervals — a value of 1 will output data every 50ms; a value of 100 will update the output data every 5000ms (5 seconds). This menu item only affects the totalizer and flow rate update period, not their accuracy.

The following directions assume that you have just unlocked the flow averaging tube. However, the 200 *Utility* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start — **Menu item 219–UnLock:**

```
200 *Utility*  >
219-UnLock
```

Step 1 — Press **MAX** or **MIN** to advance to the 200 *Utility* menu item 207–Disp Rate.

```
200 *Utility*  >
207-Disp Rate
```

Step 2 — Press **SHIFT** to access the numeric entry mode.

```
Disp Updt Rate >
>1
```

Step 3 — The blinking character is the active digit. Use **MAX** or **MIN** to change the numerical value. Use **MODE** to move the active digit to the right and complete the entry of the display update rate.

```
Disp Updt Rate >
>1
```

Step 4 — Press **SHIFT** to move active digit to the left until the meter returns to menu item 207–Disp Rate. The display update rate is now changed.

```
200 *Utility*  >
207-Disp Rate
```

Step 5a — <u>If further adjustments are required</u>, press **MAX** or **MIN** to advance to other 200 *Utility* menu items or **MODE** to advance to other main menus.

```
200 *Utility*  >
201 DAC Set
```

DO NOT return to RUN MODE —
this will automatically LOCK the meter.

Step 5b — <u>If no further adjustments are required</u>, press **MAX** to advance to the 500 *Exit-Reboot menu item, then press **SHIFT** to restart the flow meter and return to Run Mode.

```
200 *Utility*  >
500 *Exit-Reboot
```

<u>Or</u> press **MAX** to advance to the 501 *Exit-NoRebo menu item, then press SHIFT to return to Run Mode without restarting the flow meter.

```
200 *Utility*  >
501 *Exit-NoRebo
```

Changing the Meter Range — Menu Item 213–Set Meter

Master-Touch™ flow meters can store settings for up to four separate calibration curves, or meter ranges. Each meter range will have its own settings for Full Scale, MaxRange, coefficient terms, etc. If your flow averaging tube has a single calibration curve, these values are set up as Meter 1. If your flow averaging tube has additional calibration curves, you can use menu item 213-Set Meter to select the other meter ranges (2–4). Only one meter range is active at a time.

Menu item 213-Set Meter is also used to switch the flow averaging tube to External Mode. This mode allows you to switch between active meter ranges via an external switch (please see the MP Wiring diagrams for the proper electrical connections). To go to External Mode, enter zero (0) as the value for menu item 213-Set Meter.

The following directions assume that you have just unlocked the flow averaging tube. However, the 200 *Utility* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start	**Menu item 219–UnLock:**	`200 *Utility*  >` `219-UnLock`
Step 1	Press **MAX** or **MIN** to advance to the 200 *Utility* menu item 213–Set Meter.	`200 *Utility*  >` `213-Set Meter`
Step 2	Press **SHIFT** to access the numeric entry mode.	`Actv Mtr#(1-4) >` `>1`
Step 3	The blinking character is the active digit. Use **MAX** or **MIN** to enter a number from **1** to **4** to select the new active meter range, or **0** to switch to External Mode.	`Actv Mtr#(1-4) >` `>3`
Step 4	Press **SHIFT** to move active digit to the left to return to menu item 213–Set Meter.	`200 *Utility*  >` `213-Set Meter`
Step 5	**The meter will now restart and return to RUN MODE using the newly selected meter range settings.**	`1∞∞12.3456  SCFM` `9876.54321  SCF`

Setting the Alarms — Menu Items 401–409

Master-Touch™ flow meters allow you to set two alarm relay events. These events can be used to activate other devices in response to user-defined flow conditions, or to provide pulsed outputs based on flow rate or flow total. Please see the EPITerm section of the Instruction Manual for a complete discussion of the alarm relay events.

The example below shows how to set Alarm Relay 1 to activate when flow rate exceeds 120 SCFM (when SCFM are current engineering units), then auto-reset Alarm Relay 1 after 10 seconds. The directions assume that you have just unlocked the flow averaging tube. However, the 400 *Alarms* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start	**Menu item 219–UnLock:**	`200 *Utility* >` `219–UnLock`
Step 1	Press **MAX** three times to advance to the 200 *Utility* menu item 400 *Alarms*.	`200 *Utility* >` `400 *Alarms*`
Step 2	Press **SHIFT** to advance to the 400 *Alarms* menu.	`400 *Alarms* >` `401–Set Event`
Step 3	Press **SHIFT** to access the numeric entry mode for menu item 401–Set Event. The blinking character is the active digit. Press **MAX** or **MIN** to select (Event#) **1**.	`Event#(1-4) >` `>1`
Step 4	Press **SHIFT** to return to menu item 401–Set Event.	`400 *Alarms* >` `401–Set Event`
Step 5	Press **MAX** to advance to menu item 407–Timer.	`400 *Alarms* >` `407–Timer`
Step 6	Press **SHIFT** to access the numeric entry mode for menu item 407–Timer. The blinking character is the active digit. Use **MAX** or **MIN** to change the numerical value. Use **MODE** to move the active digit to the right and complete the entry (200 x 50ms = 10s).	`Duration*50ms >` `>200`
Step 7	Press **SHIFT** to move active digit to the left until the meter returns to menu item 407–Timer. The timer function is now set for 10 seconds.	`400 *Alarms* >` `407–Timer`
Step 8	Press **MIN** to return to menu item 401–Set Event.	`400 *Alarms* >` `401–Set Event`
Step 9	Press **SHIFT** to access the numeric entry mode for menu item 401–Set Event. The blinking character is the active digit. Press **MAX** or **MIN** to select (Event#) **2**.	`Event#(1-4) >` `>2`

Step 10 Press **SHIFT** to return to menu item 401–Set Event.

```
400 *Alarms*   >
401-Set Event
```

Step 11 Press **MAX** to advance to menu item 403–Trip High.

```
400 *Alarms*   >
403-Trip High
```

Step 12 Press **SHIFT** to access the numeric entry mode for menu item 403–Trip High. The blinking character is the active digit. Use **MAX** or **MIN** to change the numerical value. Use **MODE** to move the active digit to the right and complete the entry for **120** (this value correlates to the currently selected engineering units).

```
High Value     >
>120
```

Step 13 Press **SHIFT** to move active digit to the left until the meter returns to menu item 403–Trip High. The high flow value is now set.

```
400 *Alarms*   >
403-Trip High
```

Step 14a <u>If further adjustments are required</u>, press **MAX** or **MIN** to advance to other 400 *Alarms* menu items or **MODE** to advance to other main menus.

```
400 *Alarms*   >
401-Set Event
```

DO NOT return to RUN MODE —
this will automatically LOCK the meter.

Step 14b <u>If no further adjustments are required</u>, press **MAX** to advance to the 500 *Exit-Reboot menu item, then press **SHIFT** to restart the flow meter and return to Run Mode.

```
400 *Alarms*   >
500 *Exit-Reboot
```

<u>Or</u> press **MAX** to advance to the 501 *Exit-NoRebo menu item, then press SHIFT to return to Run Mode without restarting the flow meter.

```
400 *Alarms*   >
501 *Exit-NoRebo
```

Adjusting the C Factor — Menu Item 811–C Factor

Master-Touch™ flow meters allow you to adjust the correction factor setting. The factory default for this value is 1. By changing the value in this menu item, you can rescale the flow averaging tube's curve linearization to correct for aberrations in the sensor readings.

The following directions assume that you have just unlocked the flow averaging tube. However, the 800 *Meter* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start	**Menu item 219–UnLock:**	`200 *Utility*  >` `219–UnLock`
Step 1	Press **MAX** five times to advance to the 200 *Utility* menu item 800 *Factory*.	`200 *Utility*  >` `800 *Factory*`
Step 2	Press **SHIFT** to advance to the 800 *Factory* menu.	`800 *Factory*  >` `801–CoeffTermA`
Step 3	Press **MAX** or **MIN** to advance to the 800 *Factory* menu item 811–C Factor.	`800 *Factory*  >` `811–C Factor`
Step 4	Press **SHIFT** to access the numeric entry mode.	`Set Correction >` `>1.000000e+00`
Step 5	The blinking character is the active digit. Use **MAX** or **MIN** to change the numerical value. Use **MODE** to move the active digit to the right and complete the entry of the new correction factor.	`Set Correction >` `>1.050000e+00`
Step 6	Press **SHIFT** to move active digit to the left until the meter returns to menu item 811–C Factor. The correction factor is now changed.	`800 *Factory*  >` `811–C Factor`
Step 7a	<u>If further adjustments are required</u>, press **MAX** or **MIN** to advance to other 800 *Factory* menu items or **MODE** to advance to other main menus. **DO NOT return to RUN MODE — this will automatically LOCK the meter.**	`800 *Factory*  >` `801–CoeffTermA`
Step 7b	<u>If no further adjustments are required</u>, press **MAX** to advance to the 500 *Exit-Reboot menu item, then press **SHIFT** to restart the flow meter and return to Run Mode.	`800 *Factory*  >` `500 *Exit-Reboot`
	<u>Or</u> press **MAX** to advance to the 501 *Exit-NoRebo menu item, then press SHIFT to return to Run Mode without restarting the flow meter.	`800 *Factory*  >` `501 *Exit-NoRebo`

Setting the Low Flow Cutoff — Menu Item 816–FlowCutoff

Master-Touch™ flow meters allow you to easily set a flow signal cutoff for a full scale flow range that has a low end other than zero (0), i.e., 100-1000 SCFM. This function is controlled by Menu 816-FlowCutoff. The value entered at this menu is the percentage of the Maximum Range that equals the desired cutoff limit (*see menu item 814-MaxRange*). As an example, if the specified flow range is 150-1000 SCFM and the Maximum Range value is 1200 SCFM, then to set the low end limit of 150 SCFM the menu item 816 value must be 12.5 (%) because 1200 x 0.125 = 150. When the flow rate is below this flow cutoff limit, the display reads "LOW" and the output signals will be 0VDC and 4mA. When the flow rate is above the cutoff limit the flow rate will be displayed and the output signals will resume at the correct level.

The following directions assume that you have just unlocked the flow averaging tube. However, the 800 *Meter* menu can be accessed directly from the other mode menus by pressing MODE until it is shown on the LCD display and then pressing SHIFT.

Start	**Menu item 219–UnLock:**	`200 *Utility* >` `219-UnLock`
Step 1	Press **MAX** five times to advance to the 200 *Utility* menu item 800 *Factory*.	`200 *Utility* >` `800 *Factory*`
Step 2	Press **SHIFT** to advance to the 800 *Factory* menu.	`800 *Factory* >` `801-CoeffTermA`
Step 3	Press **MAX** or **MIN** to advance to the 800 *Factory* menu item 816–FlowCutoff.	`800 *Factory* >` `816-FlowCutoff`
Step 4	Press **SHIFT** to access the numeric entry mode. The default in this menu item is always **0**.	`Set Low % >` `>0`
Step 5	The blinking character is the active digit. Use **MAX** or **MIN** to change the numerical value. Use **MODE** to move the active digit to the right and complete the entry of the flow signal cutoff percentage.	`Set Low % >` `>12.5`
Step 6	Press **SHIFT** to return to menu item 816–FlowCutoff. The flow signal cutoff is now set.	`800 *Factory* >` `816-FlowCutoff`
Step 7a	<u>If further adjustments are required</u>, press **MAX** or **MIN** to advance to other 800 *Factory* menu items or **MODE** to advance to other main menus. **DO NOT return to RUN MODE — this will automatically LOCK the meter.**	`800 *Factory* >` `801-CoeffTermA`
Step 7b	<u>If no further adjustments are required</u>, press **MAX** to advance to the 500 *Exit-Reboot menu item, then press **SHIFT** to restart the flow meter and return to Run Mode.	`800 *Factory* >` `500 *Exit-Reboot`

Or press **MAX** to advance to the 501 *Exit-NoRebo menu item, then press SHIFT to return to Run Mode without restarting the flow meter.

```
800 *Factory*  >
501 *Exit-NoRebo
```

Section D Factory Calibration

The factory calibration of an Eldridge thermal gas mass flow averaging tube is a two step process. Our first step is to perform a temperature calibration of each flow sensor. Once this calibration process has been performed, it need not be done again. Secondly, we perform a flow calibration of every flow averaging tube. Although all flow curves are similar, they are different enough to require individual calibrations be run for each flow averaging tube to yield the best accuracy.

Flow calibration is a process of comparing or verifying the meter under test against a meter of better accuracy used as a calibration standard. EPI flow calibrations are traceable to NIST through traceability of the instrumentation and equipment used.

Calibration of the flow averaging tube consists of the following steps. Flow averaging tubes are checked against a calibration standard at many flow points and the data is graphed. From this graph the non-linearity of the flow averaging tube is determined and aligned through our signal processor to yield a linear flow output signal.

Although thermal gas mass flow averaging tubes have good long term stability, EPI recommends a factory calibration and certification be performed on an annual basis to conform to most quality assurance programs. Where quality assurance programs do not require annual recertification, it shall be left at the users' discretion when to recertify.

Section E General Specifications

Series 8000MP and 8000MPNH

Linear signal output	0-5 VDC & 4-20 mA (Flow and Temperature)
Relay Output	Two 1-amp, user-selectable alarm functions
Signal Interface	LCD (flow rate, flow total, gas temperature) RS232 & RS485 Modbus RTU *Optional HART or Profibus DP*
Accuracy* including linearity (Ref.: 21˚C):	±(1% of Reading + 0.5% of Full Scale + GTC)
Repeatability	±0.2% of Full Scale
Sensor response time	1 second to 63% of final value
Turn down ratio	100:1 @ 1500 SFPM/7.6 NMPS minimum FS
Ambient electronics temperature range	-40˚ to 120˚F (-40˚ to 50˚C)
Gas temperature range	32˚to 392˚F (0 to 200˚C) *Consult factory for extended range*
Gas temperature coefficient (GTC)	0.02% of Full Scale/˚C
Gas pressure effect	Negligible over ±20% of absolute calibration pressure
Pressure rating maximum:	
Inline flow meters	500 PSI Std., >500 special
Insertion flow meters (*See note below*)	
.500” OD	125 PSI Std., >125 special
.750” OD	55 PSI Std., >55 special
1.000” OD	30 PSI Std., >30 special
Transmitter power requirements	5 Watts or less
RAM Back-up	Lithium Battery, 2.5-3.5v, >10 years
Wetted materials:	316SS, including sensor
Standard temperature & pressure (STP)	70˚F & 29.92" Hg (Air .075 lb/cubic foot)
NIST traceable calibration	Standard

*** Accuracy specification applies to the instrument only. EPI is not responsible for measurement errors due to flow profile irregularities caused by installation piping configurations, corrosion on inner pipe surfaces valve placement, etc.**

Specifications are subject to change without notice. Consult factory at time of purchase.

Approvals

MP Series Flow Transmitter —	For use in hazardous area locations (See following page for specific approvals)
MP Series Remote Enclosure —	For use in Ordinary (Non-Hazardous) area locations: Type 4X, IP66 *Consult factory for optional enclosure.*
MPNH Series —	For use in Ordinary (Non-Hazardous) area locations: Type 4X, IP66

Insertion probe PSI assumes proper installation with stainless steel ferrule. Teflon ferrules are not acceptable. Above the listed pressure, flange-mounting is required to eliminate the potential of the probe being forced out of the line during installation or removal under pressure.

Series 9000MP and 9000MPNH

Linear signal output	0-5 VDC & 4-20 mA (Flow and Temperature)
Relay Output	Two 1-amp, user-selectable alarm functions
Signal Interface	LCD (flow rate, flow total, gas temperature) RS232 & RS485 Modbus RTU *Optional HART or Profibus DP*
Accuracy* including linearity (Ref.: 21˚C):	±(1% of Reading + 0.5% of Full Scale + GTC)
Repeatability	±0.2% of Full Scale
Sensor response time	1 second to 63% of final value
Turn down ratio	100:1 @ 15,000 SFPM/76 NMPS minimum FS
Ambient electronics temperature range	-40˚ to 120˚F (-40˚ to 50˚C)
Gas temperature range	40˚to 150˚F (5˚ to 65˚C)
Gas temperature coefficient (GTC)	0.05% Full Scale/˚C @ 40˚ to 100˚F (5˚ to 40˚C) 0.10% Full Scale/˚C @ 100˚ to 150˚F (40˚ to 65˚C)
Gas pressure effect	Negligible over ±20% of absolute calibration pressure
Pressure rating maximum:	
Inline flow meters	500 PSI Std., >500 special
Insertion flow meters (*See note below*)	
.500” OD	125 PSI Std., >125 special
.750” OD	55 PSI Std., >55 special
1.000” OD	30 PSI Std., >30 special
Transmitter power requirements	5 Watts or less
RAM Back-up	Lithium Battery, 2.5-3.5v, >10 years
Wetted materials:	316SS, including sensor
Standard temperature & pressure (STP)	70˚F & 29.92" Hg (Air .075 lb/cubic foot)
NIST traceable calibration	Standard

*** Accuracy specification applies to the instrument only. EPI is not responsible for measurement errors due to flow profile irregularities caused by installation piping configurations, corrosion on inner pipe surfaces valve placement, etc.**

Specifications are subject to change without notice. Consult factory at time of purchase.

Approvals

MP Series Flow Transmitter —	For use in hazardous area locations (See following page for specific approvals)
MP Series Remote Enclosure —	For use in Ordinary (Non-Hazardous) area locations: Type 4X, IP66 *Consult factory for optional enclosure.*
MPNH Series —	For use in Ordinary (Non-Hazardous) area locations: Type 4X, IP66

Insertion probe PSI assumes proper installation with stainless steel ferrule. Teflon ferrules are not acceptable. Above the listed pressure, flange-mounting is required to eliminate the potential of the probe being forced out of the line during installation or removal under pressure.

Approvals

CSA/CUS – FOR USE IN HAZARDOUS AREA LOCATIONS; CLASS I GROUP B,C,D; CLASS II GROUP E,F,G; CLASS III; ENCL TYPE 4X; CLASS I ZONE I; AEx d IIB+H2 IP66; Ex d IIB+H2 IP66; T2 OR T3 OR T4 AS MARKED; Ta = 0°C TO 50°C

ATEX – Ta = 0°C TO 50°C; IP66; Ex d IIB+H2 T4 Gb/EX t IIIC T135°C Db or; Ex d IIB+H2 T3 Gb/EX t IIIC T200°C Db or; Ex d IIB+H2 T2 Gb/EX t IIIC T300°C Db; SIRA 12ATEX1302

IECEx – FOR USE IN HAZARDOUS AREA LOCATIONS; T2 OR T3 OR T4 AS MARKED; Ta = 0°C TO 50°C;; Ex d IIB+H2 T2...T4 Gb IP66; Ex tD A21 IP66 T135°C...T300°C; IECEx CSA 11.0014

KOSHA – FOR USE IN HAZARDOUS AREA LOCATIONS; T2 OR T3 OR T4 AS MARKED; Ta = 0°C TO 50°C; Ex d IIB+H2 T2...T4 Gb IP66; Ex tD A21 IP66 T135°C...T300°C

Specification Notice

Specifications contained herein are subject to change without notice, EPI cannot guarantee the applicability or suitability of our products in all situations since it is impossible to anticipate or control every condition under which our products and specifications may be used.

Service Work

In the event that service work is required or calibration and recertification is required, call the factory and a return materials authorization (RMA) number will be issued for each job. All units sent in for service work shall include a RMA, work instructions and be shipped prepaid. On receipt of your flow instrumentation, we will inspect the equipment and give a price quotation for service work to be performed, if not already given.

Storage

Equipment and instrumentation shall be stored in an environmentally controlled storage shelter or warehouse when not in use. All openings shall be sealed off to prevent foreign materials from entering the instrumentation.

Limited Warranty

Eldridge Products, Inc. (EPI) warrants its products to be free from defects in materials and workmanship for one year from the date of factory shipment. If there is a defect, the purchaser must notify EPI of the defect within the warranty period. Upon receipt of the defective product, EPI will either repair or replace the defective product at its sole option. EPI MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AS TO THE PRODUCTS. EPI MAKES NO WARRANTY THAT THE GOODS SOLD TO ANY PURCHASER ARE FIT FOR ANY PARTICULAR PURPOSE. FURTHERMORE, EPI MAKES NO WARRANTY OF MERCHANTABILITY WITH RESPECT TO ANY PRODUCTS SOLD TO ANY PURCHASERS. There are no other warranties that extend beyond the description on any brochure or price quote.

Limited Acceptance

Acceptance of any offer is limited to its terms. Acceptances or confirmations that state additional or differing terms from this price quote shall be operative as acceptances, but all additional or differing terms shall be deemed material alterations within the meaning of Commercial Code Section 2207(2)(b), and notice of objection to them pursuant to Commercial Code Section 2207(2)(c) is hereby given. The laws of the State of California govern this contract and venue is Monterey County. Risk of loss passes F.O.B. EPI factory. Payment due in full in US Dollars within credit terms granted from factory shipment. Additional fees shall include interest on unpaid balances that are outstanding for more than granted credit terms, plus all collection costs and attorneys' fees incurred in collecting any outstanding balance. Any and all additional or differing terms do not become part of the contract between EPI and any purchaser.

The terms of any offer are expressly limited to the terms detailed in any product brochure or price quote. Any modification to any of the terms of this offer must be in writing and must be signed by an officer of EPI.

Section F Menu Data Sheet and Menu Interaction

Example of Menu Data Sheet

ELDRIDGE PRODUCTS INC. - Meter Datasheet

```
File Name: X:\EPICOM 2.00 - CUSTOMER\26000000_1.mtr
Firmware Release: v4.1A rA      Serial#: 26000000      uP PCBAssembly#: 0
```

General Meter Settings

```
207 - Update Rate    => 8
208 - LCD Contrast   => 128
214 - Date Format    => 01/12/06
215 - Time Format    => 01:10:45PM
219 - Password       => 9001
221 - Calib. Due     => 01/12/07
202 - DAC Time       => 5
203 - DAC Filter     => 2
205 - ADC Filter     => 2
213 - Selected Meter => 1
```

Alarm Settings

```
402 - Relay#1 OFF => DISABLED      Value =>       0     Delay =>       0
402 - Relay#1 ON  => DISABLED      Value =>       0     Delay =>       0   Hold Flow => False
402 - Relay#2 OFF => DISABLED      Value =>       0     Delay =>       0
402 - Relay#2 ON  => DISABLED      Value =>       0     Delay =>       0   Hold Flow => False
```

Parameters Settings

```
101 - Engineering Units => SCFM
813 - X-Section         => 0.250862
814 - Max Range         => 5000.000000
140 - Full Scale        => 5000.000000
811 - C-Factor          => 1.000000
812 - Zero Offset       => 0.000000
816 - Zero Cutoff %     => 0.00%
```

Curve Fit Settings

```
850 - Curve Fit         => Primary Coefficients Only

801 - Primary Coefficient A => -0.000124000
802 - Primary Coefficient B => 0.173681006
803 - Primary Coefficient C => -0.062231001
804 - Primary Coefficient D => 0.145145997
805 - Primary Coefficient E => -0.037037998
806 - Primary Coefficient F => 0.004101000
807 - Primary Coefficient G => -0.000136000
808 - Primary Coefficient H => 0.000000000
809 - Primary Coefficient I => 0.000000000
810 - Primary Coefficient J => 0.000000000

701 - Secondary Coefficient A => 0.000000000
702 - Secondary Coefficient B => 0.000000000
703 - Secondary Coefficient C => 0.000000000
704 - Secondary Coefficient D => 0.000000000
705 - Secondary Coefficient E => 0.000000000
706 - Secondary Coefficient F => 0.000000000
707 - Secondary Coefficient G => 0.000000000
708 - Secondary Coefficient H => 0.000000000
709 - Secondary Coefficient I => 0.000000000
710 - Secondary Coefficient J => 0.000000000

751 - Point-Wise @   5% => 0.000000000          752 - Point-Wise @  10% => 0.000000000
753 - Point-Wise @  15% => 0.000000000          754 - Point-Wise @  20% => 0.000000000
755 - Point-Wise @  25% => 0.000000000          756 - Point-Wise @  30% => 0.000000000
757 - Point-Wise @  35% => 0.000000000          758 - Point-Wise @  40% => 0.000000000
759 - Point-Wise @  45% => 0.000000000          760 - Point-Wise @  50% => 0.000000000
761 - Point-Wise @  55% => 0.000000000          762 - Point-Wise @  60% => 0.000000000
763 - Point-Wise @  65% => 0.000000000          764 - Point-Wise @  70% => 0.000000000
765 - Point-Wise @  75% => 0.000000000          766 - Point-Wise @  80% => 0.000000000
767 - Point-Wise @  85% => 0.000000000          768 - Point-Wise @  90% => 0.000000000
769 - Point-Wise @  95% => 0.000000000          770 - Point-Wise @ 100% => 0.000000000
```

Menu Item Interaction

One of the strengths of the Master-Touch™ flow averaging tubes is the extensive support for users' adjustments to the menu item settings. Although various menu items, such as the alarm relays, are used in conjunction with one or more other menu items, most of the individual menu item values can be changed without affecting any other settings. However, changing the engineering units (menu items 101–132) or changing the cross-sectional area (menu item 813–SetXSect) will prompt the microprocessor to immediately recalculate the Full Scale (menu item 140–FScale) and Maximum Range (menu item 814–MaxRange) values. In addition, the proper sequence should be followed when making changes such as these:

1) Engineering Units (menu items 101–132),
2) Cross-sectional Area (menu item 813–SetXSect),
3) Full Scale (menu item 140–FScale)

The cross-sectional area of an inline style flow averaging tube must not be changed, and the Full Scale value must not be greater than the re-calculated Maximum Range.

CUSTOMER SATISFACTION REPORT

Eldridge Products, Inc. is interested in your level of satisfaction with the purchase and operation of your new thermal gas mass flow meter(s) or switch(es). Please take a few moments to complete the following form and then either fax or mail it to EPI. Thank you for your cooperation.

Your Name:	Instrumentation Serial Number(s):
Company:	Date:
Fax No.:	Tel. No.:

Sales Order:

Did you receive a confirming Sales Order from Eldridge Products, Inc. for your review that was correct in its details for invoicing, order shipment, and the technical details of the required instrumentation?
Yes ___ No (Please explain):

_____
_____
_____
_____

Order Shipment:

Did you receive all instrumentation as ordered and per the Purchase Order shipping instructions?
Yes ___ No (Please explain):

_____
_____
_____
_____

Instrument Performance:

Did the instrumentation perform in accordance within factory specifications?
Yes ___ No (Please explain):

_____
_____
_____

EC Declaration of Conformity

This is to declare, in accordance with **Directives 2014/34/EU, 97/23/EC, 2004/108/EC, 93/68/EEC, 92/31/EEC, 89/336/EEC**, that the following products are designed and manufactured in accordance with the requirements of the directives. The product has been constructed with sound engineering practice and safety principles. Routine verification and testing has been performed.

Manufacturer:
Eldridge Products, Inc.
465 Reservation Road, Marina, California 93933, USA

Product Description:
Inline style Mass Flowmeters Integral and Remote, Series 8000MP, 8100MP, 8600MP, 8700MP, 9100MP & 9700MP
Insertion style Mass Flowmeters Integral and Remote, Series 8200MP, 8800MP, 9200MP & 9800MP
Note: For remote Flowmeters, flow transmitter is rated for explosive atmospheres, while the remote enclosure is rated for IP66 (Type 4X) ordinary locations.

Certifying Agency:
ATEX Notified Body SIRA 0518:
CSA Group
Unit 6 Hawarden Industrial Park
Hawarden, Deeside
CH5 3US
United Kingdom
Directive: 2014/34/EU
EC-Type Examination Certificate: SIRA 12ATEX1302
EN 60079-0:2012 EN 60079-1:2007 EN 60079-31:2009

Product Certifications:
CE 0518
Ex II 2 G D
Ex d IIB+H_2 T4/T3/T2 Gb (refer to the description for temperature class and surface temperature)
Ex t IIIC T135˚C/T200˚C/T300˚ Db
Ta = 0˚C to +50˚C
Note: Refer to the product temperature code and "T" rating number as stamped on product label.

Pressure Equipment Directive 97/23/EC – As per 3.6 and indent 6 the following products do not exceed Category I as listed below and are covered by Directive 94/9/EC. Directive 97/23/EC tables 6 & 7 have been applied;

Insertion probe flowmeters Series 8200MP, 8800MP, 9200MP, 9800MP are volume-less and are exempt;
In-line Series 8000MP, 8100MP, 8600MP, 8700MP, 9100MP, 9700MP have the following ANSI inch pipe sizes (DN equivalent size) at maximum pressure limits in PSI (Bars).
Example: 1-1/2" @ 361 is a one and one half inch In-line pipe flowmeter with a maximum allowable pressure of 361 PSIG.

Group 1 fluids (Gas: explosive, flammable, toxic, oxidizing): Excluded from Directive 97/23/EC, standard engineering practice applied 1/4" thru 1" (DN10 thru DN25) @ 500(34.5)
Group 1 fluids (Gas: explosive, flammable, toxic, oxidizing): Category I, 1-1/4" (DN32) @ 452(31.2); 1-1/2" (DN40) @ 361(24.9); 2" (DN50) @ 289(19.9); 2-1/2" (DN65) @ 222(15.3); 3" (DN80) @ 180(12.4); 4" (DN100) @ 145(10);
Note: 1) Larger line sizes require insertion probe flowmeters. 2) Higher than listed pressures require insertion probe flowmeters.

Group 2 fluids (Gas: all other non Group 1 nonflammable gases): Excluded from Directive 97/23/EC, standard engineering practice applied 1/4" thru 1-1/4" (DN10 thru DN32) @ 500(34.5)
Group 2 fluids (Gas: all other non Group 1 nonflammable gases): Category I, 1-1/4" (DN32) @ 500(34.5); 1-1/2" (DN40) @ 500(34.5); 2" (DN50) @ 500(34.5); 2-1/2" (DN65) @ 500(34.5); 3" (DN80) @ 500(34.5); 4" (DN100) @ 500(34.5);
Note: 1) Larger line sizes require insertion probe flowmeters. 2) Higher than listed pressures require insertion probe flowmeters.

For and on behalf of Eldridge Products, Inc.

Mark F. Eldridge, President March 16, 2017