

# THERMATEL® Enhanced Model TA2 Software v2.x

## Installation and Operating Manual

*Thermal*

*Dispersion*

*Mass Flow*

*Meter*



## UNPACKING

Unpack the instrument carefully. Make sure all components have been removed from the foam protection. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours. Check the contents of the carton/crates against the packing slip and report any discrepancies to Magnetrol. Check the nameplate model number to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.



These units are in compliance with:

1. The EMC directive 2014/30/EU. The units have been tested to EN61326:1997+A1+A2.
2. The ATEX directive 2014/34/EU. EC-type Examination number FM19ATEX0205X (Ex d). Standards applied: EN IEC 60079-0:2018, EN 60079-1:2014, EN 60079-5:2015, and EN 60529:1991+A1:2000+A2:2013.



Nameplate:  
- partnumber  
- amplifier  
- serial n°  
- tag n°

Serial number probe

## SPECIAL CONDITIONS FOR ATEX/IECEx SAFE USE

### Integral Enhanced Transmitter/Remote Housing with Thermal Probe

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. To maintain the applicable temperature code care shall be taken to ensure the "Enclosure Temperature" does not exceed 70 °C.
3. The risk of electrostatic discharge shall be minimized at installation, following the direction given in the instructions.
4. Contact the original manufacturer for information in the dimensions of flameproof joints.
5. For Installation with ambient temperature of 70 °C, refer to the manufacturer's instructions for guidance on proper selection of conductors.
6. The T4...T3 temperature code is based on the max process temp listed below:

T-Code	Maximum process temperature
T4	+135 °C
T3	+200 °C

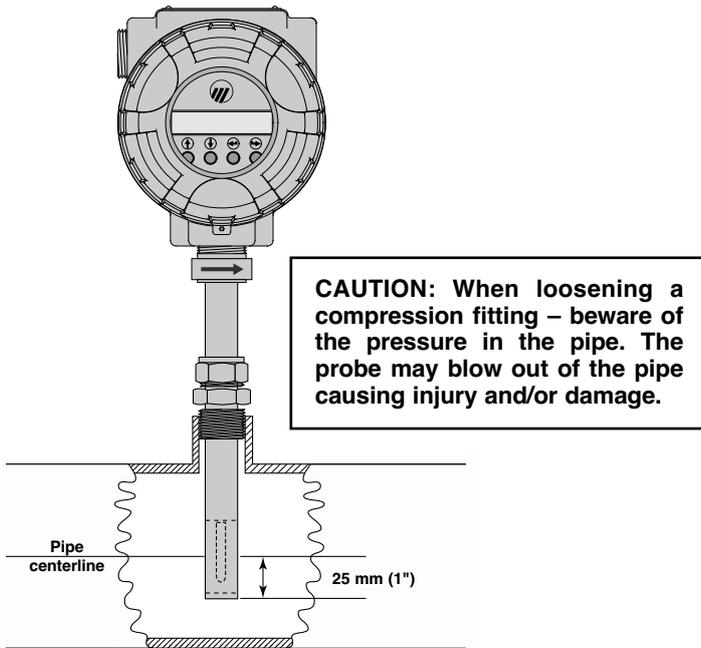
### Enhanced Thermal Transmitter

1. The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction. Care must be taken during installation and use to prevent impact or friction.
2. To maintain the applicable temperature code care shall be taken to ensure the "Enclosure Temperature" does not exceed 70 °C.
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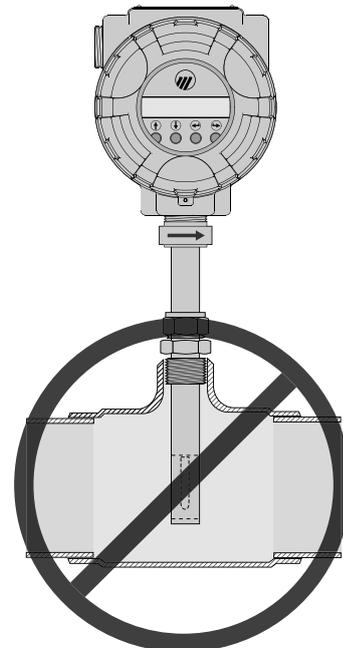
### Probe

1. The Thermal Probe is only for use with the TA2 Thermal Transmitter.
2. The T4...T3 temperature code is based on the max process temp listed below:

T-Code	Maximum process temperature
T4	+135 °C
T3	+200 °C



See Appendix A for recommended straight run and flow conditioning plate installation details (if applicable).



**Probe installation into a tee fitting is not recommended**

**Recommended probe installation**

Proper installation of the probe in the pipe or duct is essential for accurate air or gas flow measurement. Normal procedures for installing any type of flow element should be followed.

A flow arrow is etched on the sides of the probe to designate flow direction. The instrument is calibrated with the flow in this direction. Ensure that the flow arrow is aligned in the direction of flow. The instrument is unable to recognize flow direction if inserted with the flow arrow in the wrong direction.

It may be necessary to rotate the head of the instrument to view the display while maintaining the proper flow orientation.

It is generally recommended that the sensor be located in the center of the pipe. This location provides less sensitivity to changes in flow profile. Sensors mounted through compression fittings have the ability to field adjust the sensor to the desired location.

Various methods of mounting the probe include compression fittings, threads, and flanged connections. Refer to probe model numbers. The insertion probe can be installed through a compression fitting. The use of a bored-through fitting with 3/4" or 1" NPT connection for 3/4" outside diameter tube is recommended.

**NOTE: Do not install the probe in locations where condensed moisture can be present. The unit may cause a false high flow indication. In some cases heat tracing or insulation of the pipe must be considered to avoid moisture condensation.**

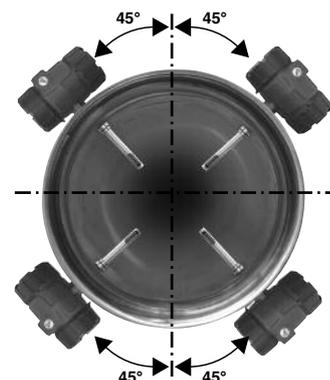
Install the TA2 sensor at a 45° angle to minimize moisture drip. Use of different TA2's as shown is recommended to optimize the accuracy in a larger pipe dia.

The use of Teflon® ferrules should be considered if repeated reposition of the sensor is considered. The stainless steel ferrule can only be tightened once as it makes a permanent indentation on the probe. If using a compression fitting with stainless steel ferrules, ensure that the probe is in the desired location before tightening.

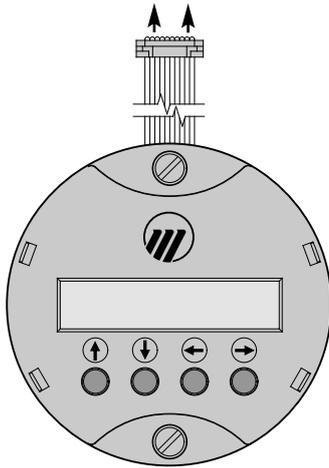
The TA2 flow measurement is based on a fully developed turbulent flow profile in a pipe with the specified inner diameter. Accuracy will be affected if these conditions are not obtained. Installing the probe in a tee is not recommended as the flow profile and the flow area are distorted.

For applications where it is desirable to install or remove the probe without having to shut down the process, Magnetrol's Retractable Probe Assembly (RPA) can be utilized.

The TA2 with an insertion probe provides a point measurement and assumes that the velocity profile (see figures below) is uniform over the entire width of the pipe or duct. The user has the ability to compensate the flow measurements based upon flow profile considerations under the Advanced Configuration section of the software.

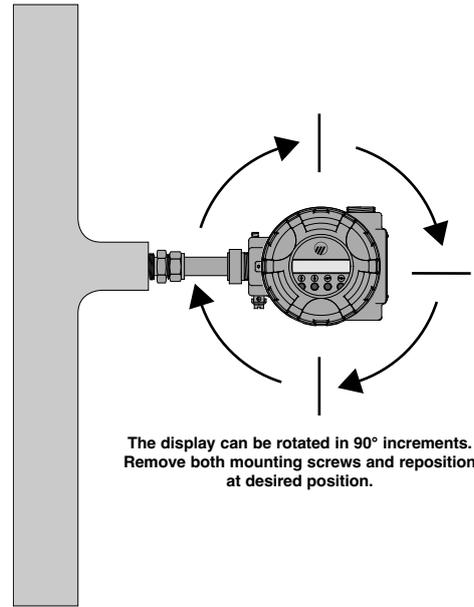


Connects to J1 on the logic board



The TA2 has a plug in display (ordered with the unit or separately).

**CAUTION: Switch power off when connecting/disconnecting the display**



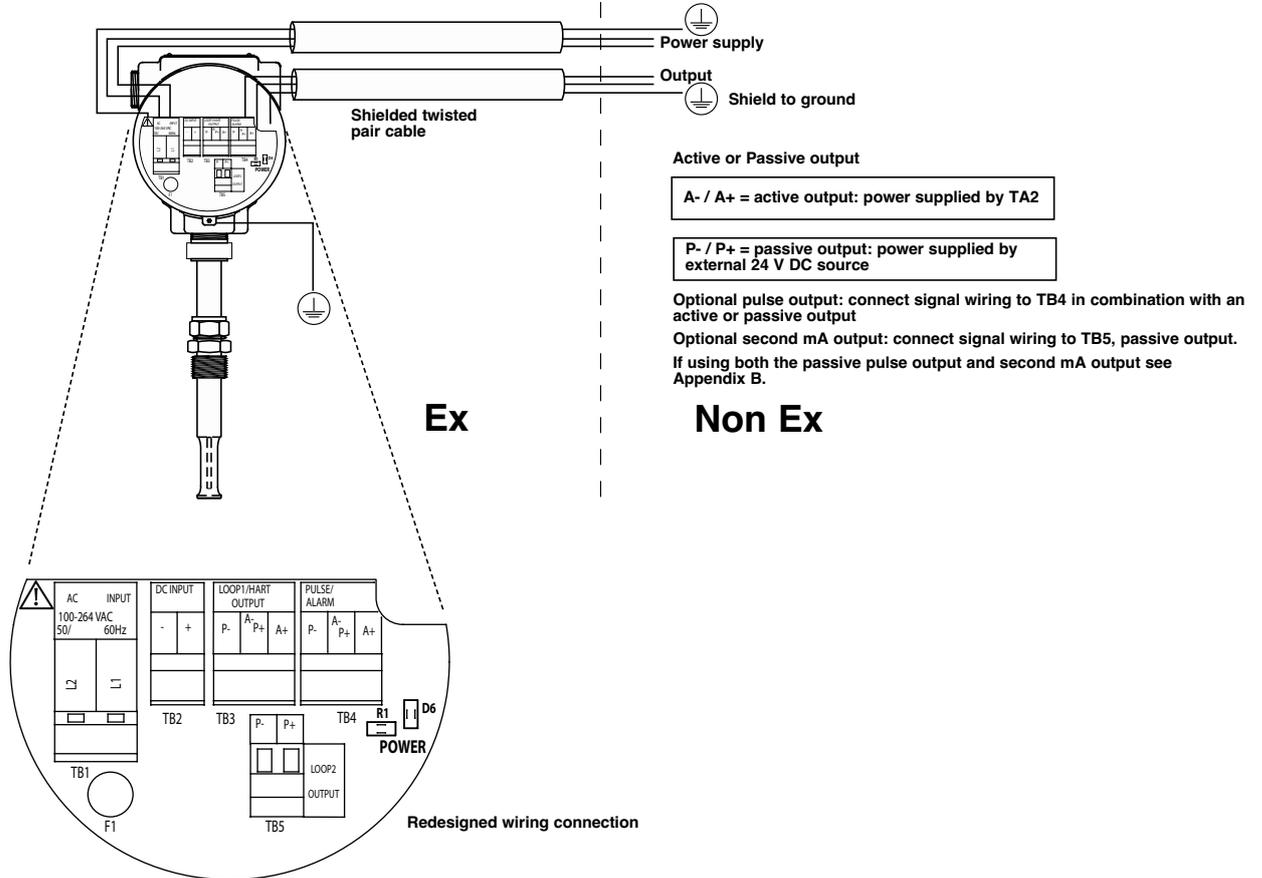
The display can be rotated in 90° increments. Remove both mounting screws and reposition at desired position.

# WIRING

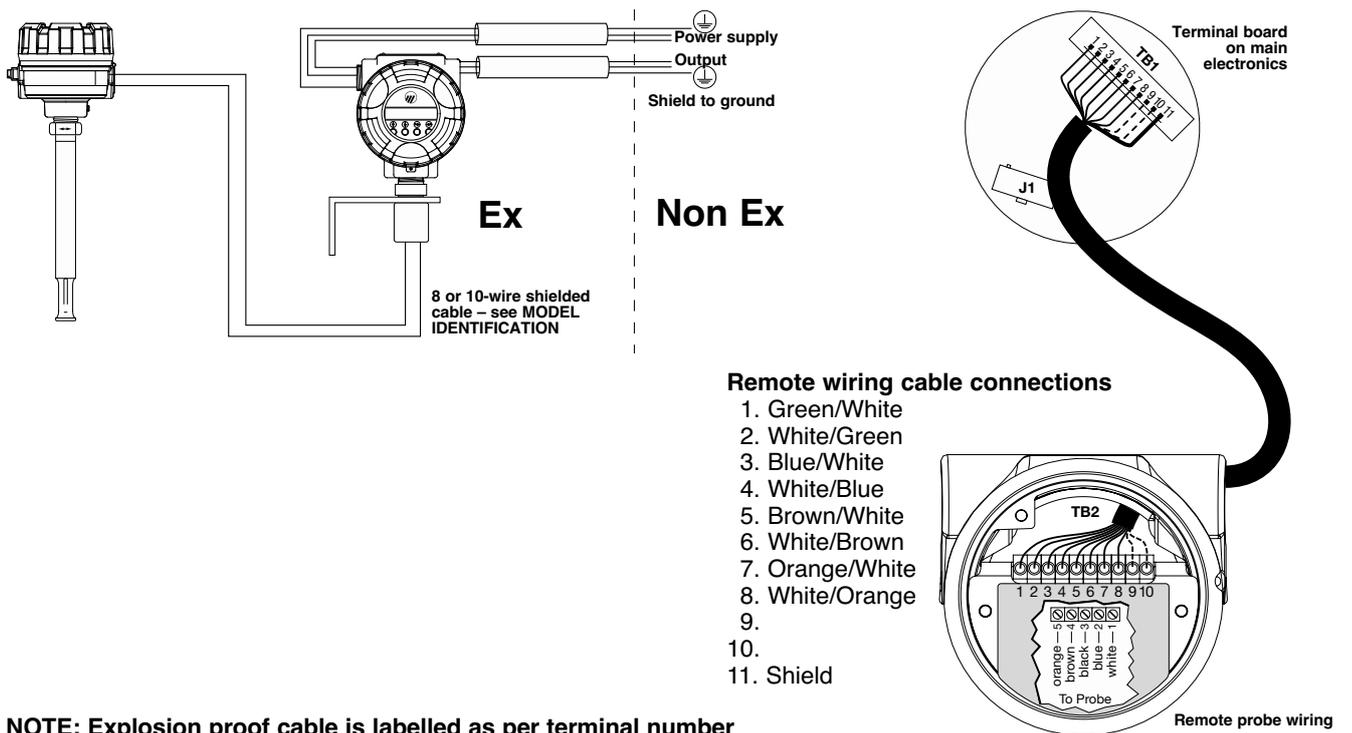
**CAUTION:** In hazardous area, do NOT power the unit until the cable gland is sealed and the housing cover of the wiring compartment is screwed down securely / housing locking screw is fastened – disabling the removal of the cover.

**NOTE:** Wiring for Ex d and Ex d +i is identical. This means that for use in Zone 0 an Ex d device has to use Ex d cabling.

## Integral electronics



## Remote electronics

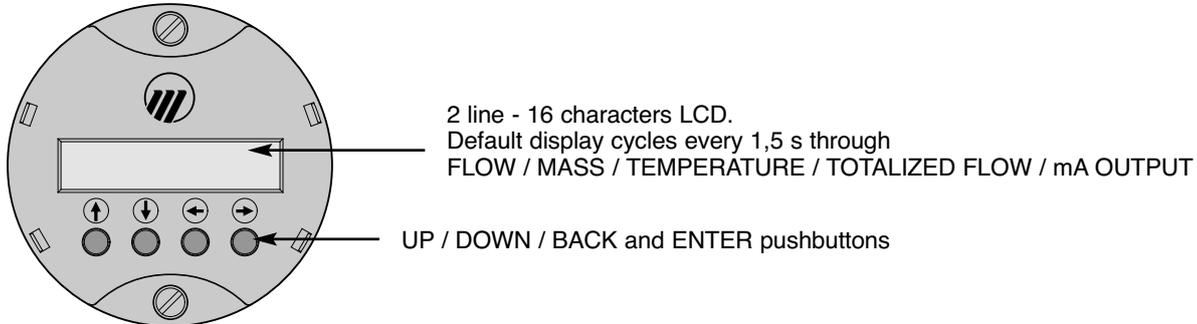


**NOTE:** Explosion proof cable is labelled as per terminal number

## CONFIGURATION

**IMPORTANT: TA2 units are pre-configured from factory (as per order specifications). Only modify configuration settings in case needed.**

**NOTE: When power is first applied to the TA2 there is an initialization period for the sensor to reach stabilization. During this time the TA2 will output a 4 mA signal and the display (if provided) will read «Initializing TA2». Only after the sensor has stabilized and a valid flow measurement is obtained will the display show a flow measurement, the output signal will be active and the totalizer will begin counting.**



Keys	Comment
↑ (Up)	Scroll to the previous selection/menu in the list or increase a value (behind decimal/negative values show "-") or scroll forward through graphical characters or digits. If held down; the characters scroll until the pushbutton is released.
↓ (Down)	Scroll to the next selection/menu in the list or decrease a value (behind decimal/negative values show "-") or scroll backward through graphical characters. If held down; the characters scroll until the pushbutton is released.
← (Back)	Moves back one level to the previous higher branch or menu level without changes or moves the cursor to the left to delete an entry.
→ (Enter)	Enters into the lower level branch. Accepts the selection and returns to the menu traversal mode. Moves the cursor to the right to quit/save a selection (cursor must be in a blank position).

## PASSWORD

### Access Menu

When attempting to enter a selection setting, the unit will display:

Display	Item	Action
USR PASSWORD REQ'D PRB PASSWORD REQ'D	User password required Probe password required*	Unit shows an encrypted value. Enter "0" (factory default password or any modified user password (001 - 255))

\* only needed when original probe was replaced – factory default is "0"

### Select a new Password

Move to *ADV CONFIG* menu-selection

Display	Item	Action
CHANGE PASSWORD → to select	Change password	Enter old password <i>ENTER OLD PASSWORD</i> Enter new password <i>ENTER NEW PASSWORD</i> (any value between 001 - 255)

### Add new Password for probe replacement

Move to «Factory Config» menu-selection

Display	Item	Action
PROBE PARAMS → to select	Probe parameters	Scroll through entries (factors are provided with the new probe)

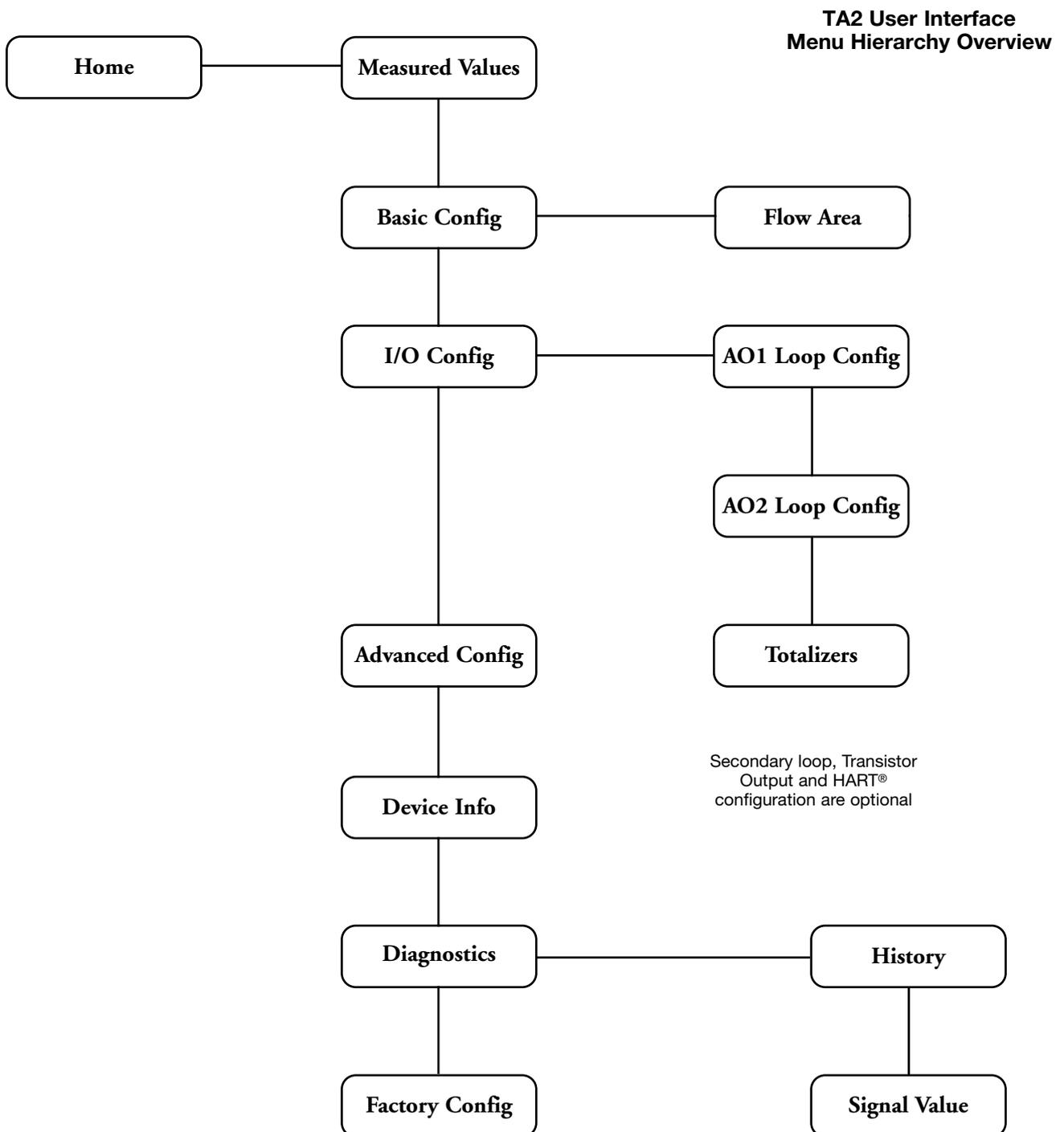
**Password forgotten/lost** – consult factory for assistance, your password can be recovered via the encrypted value displayed when the Password is asked for (see Access Menu).

# CONFIGURATION

## Main Menu

The main menu is used to access the various subroutines. From the Run mode, press any key to enter the Main Menu. The following chart defines the various selections available.

Display	Item	Action if → is pressed
MEASURED VALUES	Measured values	Enter Measured Values menu
BASIC CONFIG	System configuration	Enter System Configuration menu
I/O CONFIG	I/O configuration	Enter Input/Output Configuration menu
ADV CONFIG	Advanced configuration	Enter Advanced Configuration menu
DEVICE INFO	Device information	Enter Device Information menu
DIAGNOSTICS	Diagnostics	Enter Diagnostic menu
FACTORY CONFIG	Factory configuration	Enter Factory Configuration menu



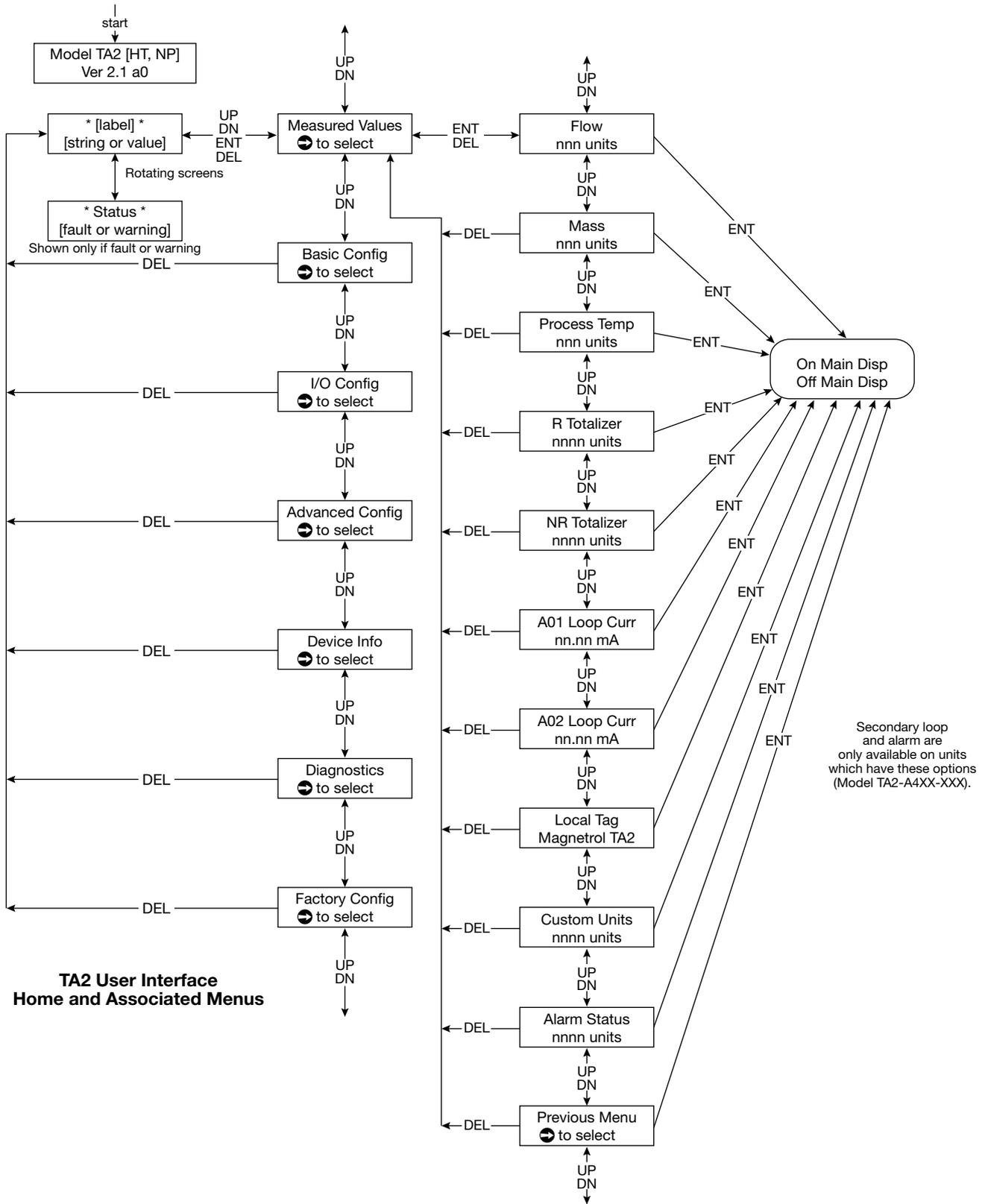
## CONFIGURATION

### Measured Values

The Measured Values menu is used to display the current values measured by the TA2 and determine which parameters will be shown on the display during run mode. Enter this section by pressing → when *MEASURED VALUES 1* is displayed from the Main Menu.

Display	Item	Action	Comments
<i>FLOW</i> <i>NM3/H</i> → to select	Volume Flow	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	
<i>MASS</i> <i>KG/H</i> → to select	Mass Flow	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	
<i>PROCESS TEMP</i> <i>CELSIUS</i> → to select	Temperature	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	Temperature measurements are not accurate at velocity below 0,25 Nm/s
<i>R TOTALIZER</i> <i>NM3</i> → to select	Totalized data	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	Resetable totalized data
<i>NR TOTALIZER</i> <i>NM3</i> → to select	Totalized data	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	Non resetable totalized data
<i>ROI LOOP CURR</i> <i>MA</i> → to select	Loop current 1	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	
<i>ROI LOOP CURR</i> <i>MA</i> → to select	Loop current 2	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	Only available as an option
<i>LOCAL TAG</i> → to select	Device tag name	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	
<i>CUSTOM UNITS</i> → to select	Customized units	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	
<i>ALARM STATUS</i> <i>DISABLED</i> → to select	Alarm status	Press ↑ or ↓ to cycle between On main display <i>ON MAIN DISPLAY</i> and Off Main Display <i>OFF MAIN DISPLAY</i> ; press →	Only available as an option
<i>PREVIOUS MENU</i> → TO SELECT → to select	Previous Menu		Returns to previous menu

# CONFIGURATION



## CONFIGURATION

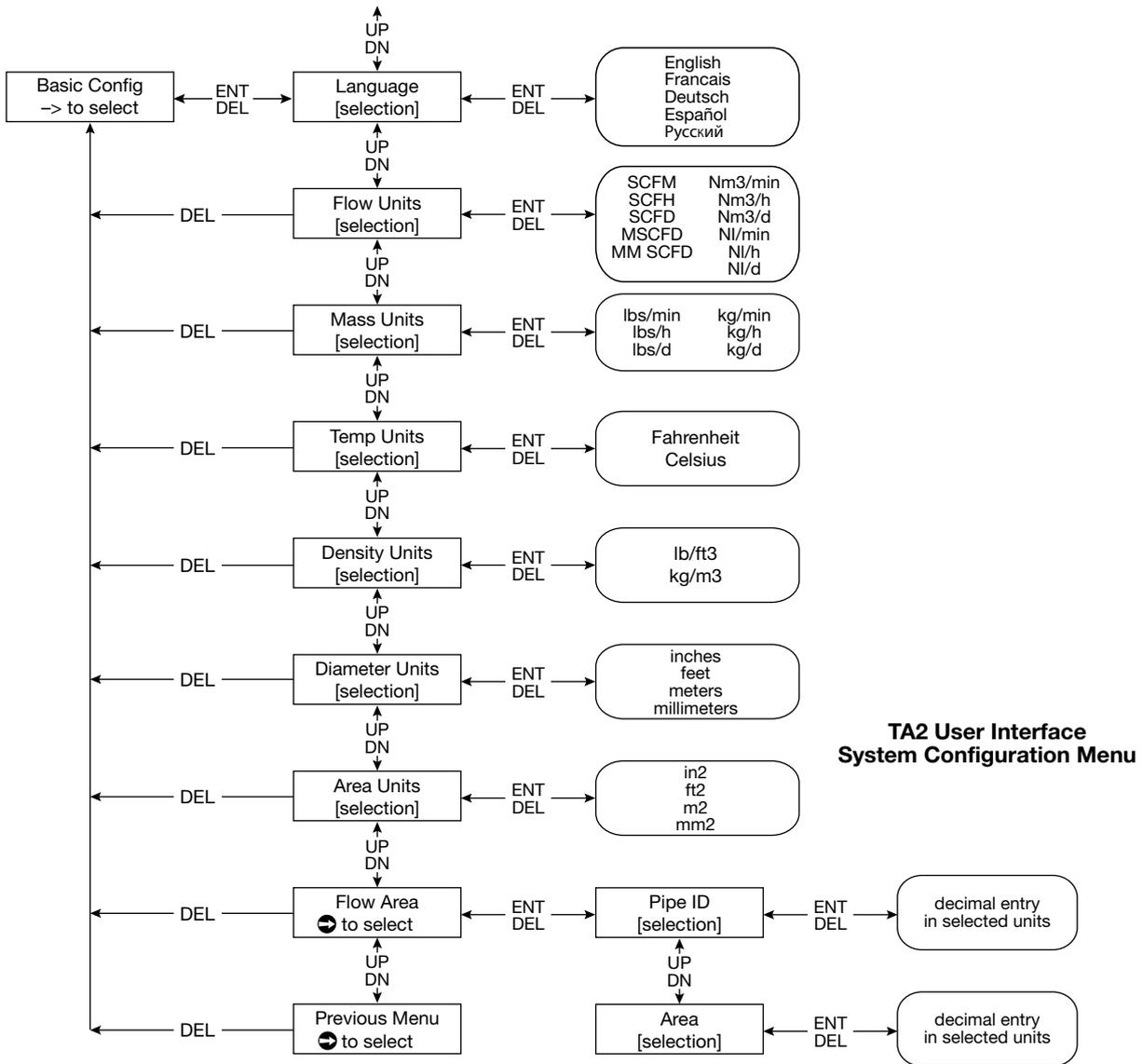
### Basic Configuration Menu

The Basic Configuration menu is used to select the display units and enter specific information for the application. Access this section by pushing  $\rightarrow$  when Basic Config is displayed from the Main Menu.

To calculate the flow or mass, it is necessary to accurately enter the inside area of the pipe or duct. If the pipe or duct is circular, simply enter the value of the inside diameter; the cross sectional area of the pipe is automatically calculated. If the duct is rectangular, skip over the entry of diameter, and directly enter the cross sectional area in the area section. The instrument will then back calculate an equivalent diameter.

Display	Item	Action	Comments
LANGUAGE $\rightarrow$ to select	Language	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Choice of English <i>ENGLISH</i> , French <i>FRAN A15</i> , German <i>DEUTSCH</i> , Spanish <i>ESPA OL</i> or Russian <i>Русский</i>
FLOW UNITS M <sup>3</sup> /H $\rightarrow$ to select	Flow Units	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Choice of standard cubic feet per minute <i>SCFM</i> / per hour <i>SCFH</i> / per day <i>SCFD</i> , thousand standard cubic feet per day <i>MSCFD</i> , million standard cubic feet per day <i>MM SCFD</i> , normal cubic meters per minute <i>M<sup>3</sup>/MIN</i> / per hour <i>M<sup>3</sup>/H</i> / per day <i>M<sup>3</sup>/D</i> , normal liters per minute <i>NL/MIN</i> / per hour <i>NL/H</i> / per day <i>NL/D</i> . For other units, the <b>Custom Unit</b> feature can be used in the Advanced Configuration Menu
MASS UNITS KG/H $\rightarrow$ to select	Mass Units	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Choice of pounds per minute <i>LBS/MIN</i> / per hour <i>LBS/H</i> / per day <i>LBS/D</i> , kilograms per minute <i>KG/MIN</i> / per hour <i>KG/H</i> / per day <i>KG/D</i> . For other units, the <b>Custom Unit</b> feature can be used in the Advanced Configuration Menu
TEMP UNITS CELSIUS $\rightarrow$ to select	Temperature Units	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Choice of <i>FAHRENHEIT</i> , <i>CELSIUS</i>
DENSITY UNITS KG/M <sup>3</sup> $\rightarrow$ to select	Density Units	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Choice of pounds per cubic foot <i>LB/FT<sup>3</sup></i> , kilograms per cubic meter <i>KG/M<sup>3</sup></i>
DIAMETER UNITS MM $\rightarrow$ to select	Diameter Units	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Choice of inches <i>INCHES</i> , feet <i>FEET</i> , meters <i>METERS</i> , millimeters <i>MILLIMETERS</i>
«AREA UNITS M <sup>2</sup> » $\rightarrow$ to select	Area Units	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Choice of square inches <i>IN<sup>2</sup></i> , square feet <i>FT<sup>2</sup></i> , meters squared <i>M<sup>2</sup></i> , millimeters squared <i>MM<sup>2</sup></i>
FLOW AREA $\rightarrow$ TO SELECT» $\rightarrow$ to select	Flow Area	Press $\uparrow$ or $\downarrow$ to scroll between selections; press $\rightarrow$	Enter the cross sectional area of the pipe or duct, or the inside diameter
		Diameter <i>DIAMETER</i> xxx units	Enter the inside diameter (if circular), press $\rightarrow$ to accept or press $\uparrow$ or $\downarrow$
		Area <i>AREA</i> xxx units	The cross sectional area is calculated based on the diameter. If rectangular enter the flow area
PREVIOUS MENU $\rightarrow$ TO SELECT» $\rightarrow$ to select			Returns to previous menu or cycle through System Configuration

# CONFIGURATION



## CONFIGURATION

### I/O Configuration Menu

The I/O Configuration menu is used to set up the operations of 4–20 mA output, the totalizer, and the pulse/alarm output. Access this section by pushing → when *I/O CONFIG* is displayed.

#### 4-20 mA

To access the 4-20 mA signal, scroll ↑ or ↓ until the display shows *RD1 LOOP*, press →.

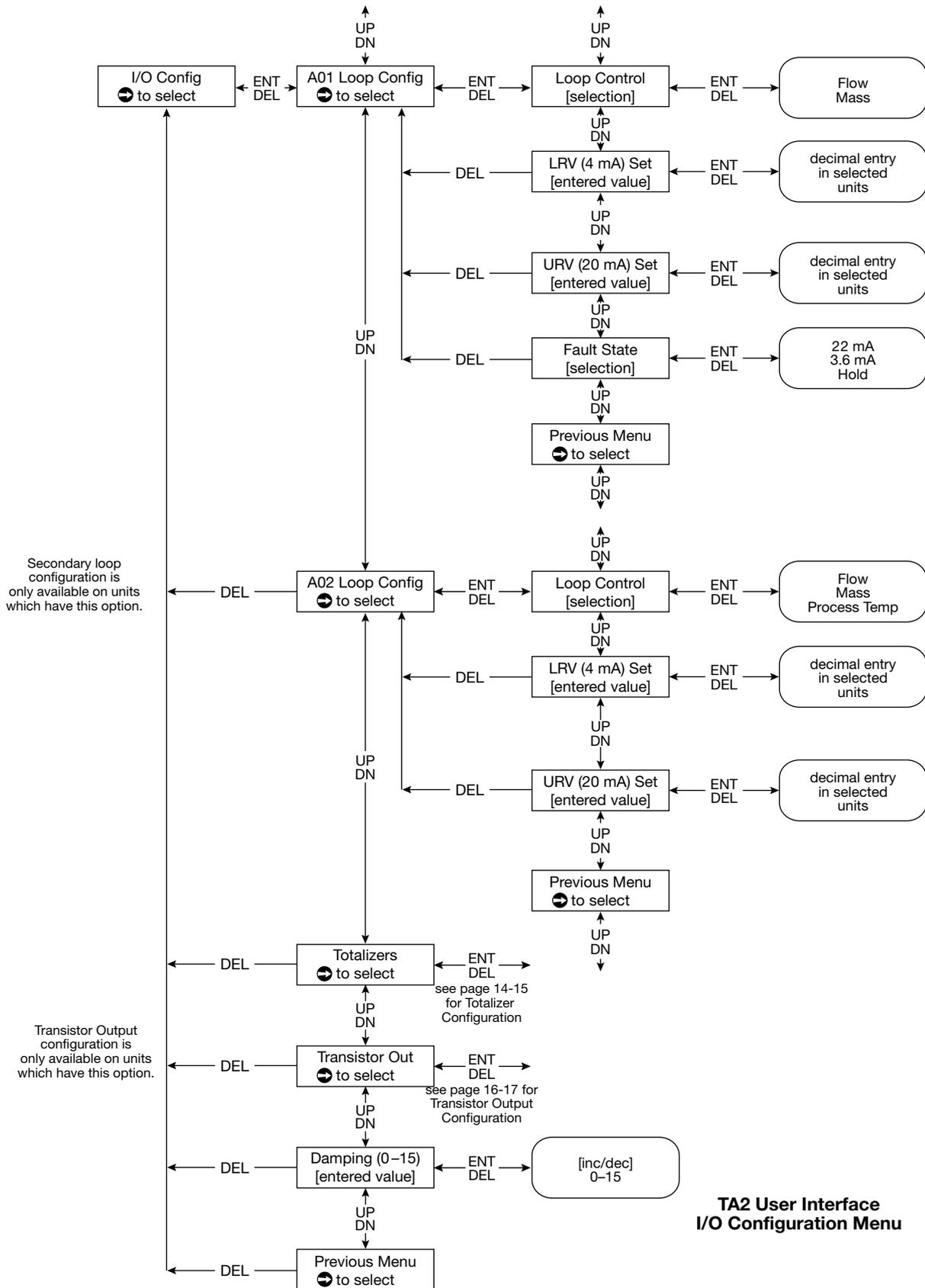
Display	Item	Action	Comments
<i>LOOP CONTROL FLOW</i> → to select	Controlled by flow	Press ↑ or ↓ to cycle between options	Choice is Flow <i>FLOW</i> or Mass <i>MASS</i>
<i>LRV (4 MA) SET</i> <i>XXXXX UNITS</i> → to select	4 mA set point xxxxx units	Set mA point using keypad	Enter value for 4 mA point. Units are based upon selection <i>LOOP CONTROL</i>
<i>URV (20 MA) SET</i> <i>XXXX UNITS</i> → to select	20 mA set point xxxxx units	Set mA point using keypad	Enter value for 20 mA point
<i>FAULT STATE XX MA</i> → to select	Fault mode xx mA	Press ↑ or ↓ to cycle between <i>22 MA</i> , <i>3.6 MA</i> or <i>HOLD</i>	Select status of 4-20 mA loop in event of fault
<i>PREVIOUS MENU</i> → TO SELECT> → to select	Previous menu		Returns to previous menu

#### 4-20 mA, Optional loop

To access the 4-20 mA signal, scroll ↑ or ↓ until the display shows *RD2 LOOP*, press →.

Display	Item	Action	Comments
<i>LOOP CONTROL FLOW</i> → to select	Controlled by flow	Press ↑ or ↓ to cycle between options	Choice is Flow <i>FLOW</i> , Mass <i>MASS</i> or Process Temperature <i>PROCESS TEMP</i>
<i>LRV (4 MA) SET</i> <i>XXXXX UNITS</i> → to select	4 mA set point xxxxx units	Set mA point using keypad	Enter value for 4 mA point. Units are based upon selection <i>LOOP CONTROL</i>
<i>URV (20 MA) SET</i> <i>XXXX UNITS</i> → to select	20 mA set point xxxxx units	Set mA point using keypad	Enter value for 20 mA point
<i>PREVIOUS MENU</i> → TO SELECT> → to select	Previous menu		Returns to previous menu

# CONFIGURATION



## CONFIGURATION

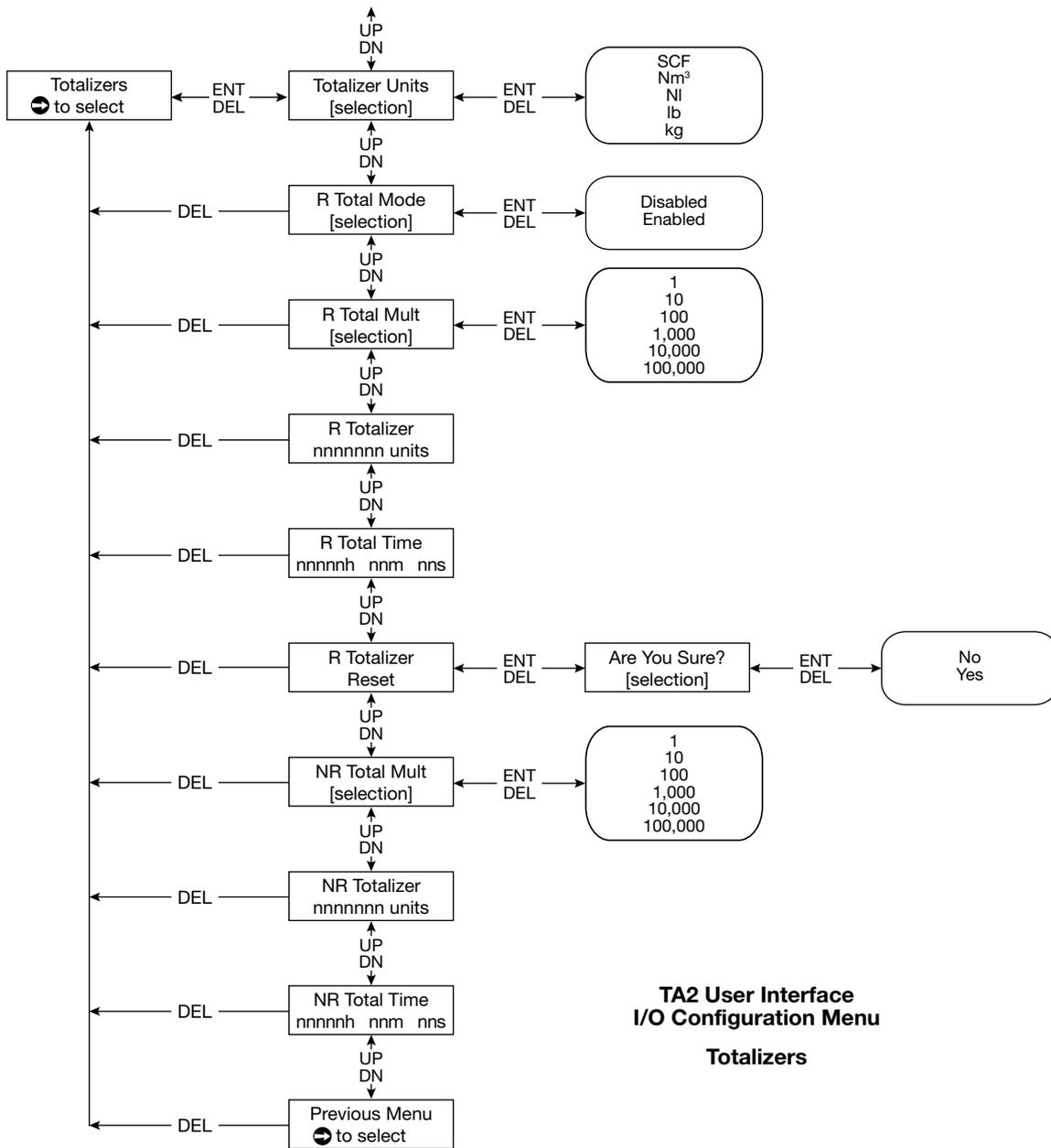
### Totalizer

The totalizer maintains a continuous, running total of the flow in selectable units. It also provides elapsed time since the last totalizer reset. The totalizer utilises eeprom memory, eliminating the need for a battery backup. The totalizer can be reset to zero via the software configuration menu or by the HART communication. When power is interrupted, the totalizer will restore to its last saved value.

To configure the Totalizer operation, scroll  $\uparrow$  or  $\downarrow$  until the display shows *TOTALIZER*, press  $\rightarrow$ .

Display	Item	Action	Comments
<i>TOTALIZER UNITS</i> $\rightarrow$ to select	Totalizer mode disabled	Press $\uparrow$ or $\downarrow$ to scroll through the options	Permits selection of the units for both resettable and non resettable totalizers
<i>R TOTAL MODE</i> $\rightarrow$ to select	Resettable mode enabled	Press $\uparrow$ or $\downarrow$ to scroll through the options	Enable or disable <i>R TOTAL MODE</i>
<i>R TOTAL MULT</i> $\rightarrow$ to select	Sets a multiplier	Press $\uparrow$ or $\downarrow$ to scroll through the options	Permits use of a multiplier
<i>R TOTALIZER</i> $\rightarrow$ to select			Read only screen displaying the present value of the resettable totalizer
<i>R TOTAL TIME</i> $\rightarrow$ to select			Read only screen displaying the elapsed time since resettable totalizer was reset
<i>R TOTALIZER RESET</i> $\rightarrow$ to select	Resets total flow and elapsed time	Second change <i>ARE YOU SURE</i> ; press $\uparrow$ or $\downarrow$	Select <i>YES</i> or <i>NO</i> for resetting
<i>«NR TOTAL MULT»</i> $\rightarrow$ to select	Sets a multiplier for the non-resettable totalizer	Press $\uparrow$ or $\downarrow$ to scroll through the options	Permits use of a multiplier
<i>NR TOTALIZER</i> $\rightarrow$ to select			Read only screen displaying the present value of the non-resettable totalizer
<i>NR TOTAL TIME</i> $\rightarrow$ to select			Read only screen displaying the elapsed time since non-resettable totalizer was reset
<i>PREVIOUS MENU</i> $\rightarrow$ TO SELECT $\rightarrow$ to select	Previous menu		Returns to previous menu

# CONFIGURATION



**TA2 User Interface  
I/O Configuration Menu  
Totalizers**

## CONFIGURATION

### Transistor output

The optional transistor output can be configured to provide a pulse output proportional to the flow rate or an alarm indication where the output can serve as a low flow or a high flow alarm indication. When used as a pulse output a multiplier factor can be applied. A selection of maximum frequency ensures that the pulse output from the TA2 does not exceed the maximum allowable frequency of any external counter. The default is 10 KHz.

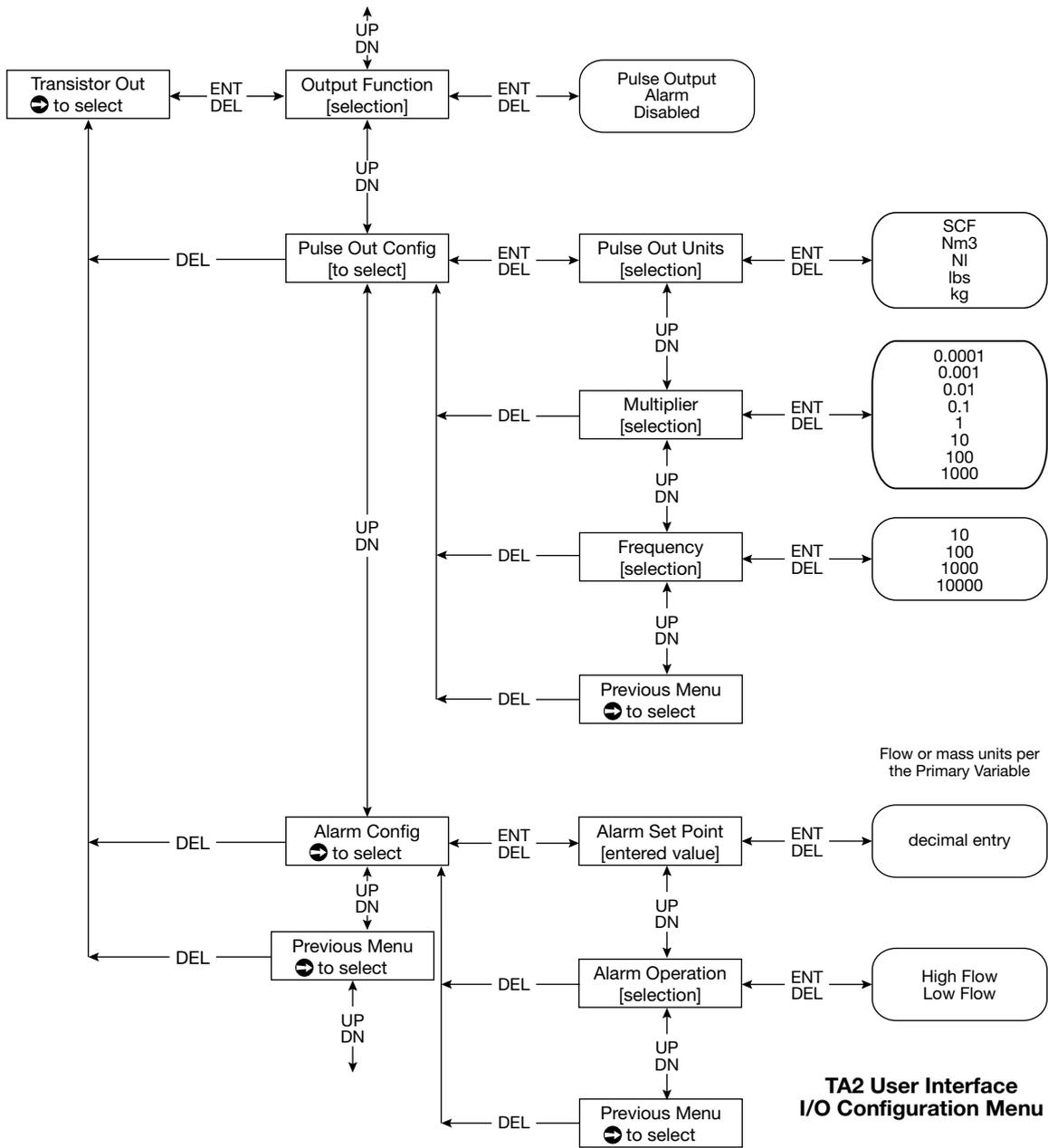
Display	Item	Action	Comments
<i>OUTPUT FUNCTION</i> → to select	Output function disabled	Press ↑ or ↓ to scroll through the options	Can be set up for <i>PULSE OUTPUT</i> , <i>ALARM</i> or <i>DISABLED</i>
<i>PULSE OUT CONFIG</i> → TO SELECT» → to select	Pulse Output Configuration		Pulse rate calculation example: see appendix C
		<i>PULSE OUTPUT UNITS</i>	Choice between Standard Cubic Feet <i>SCF</i> , Normal cubic meters <i>NM<sup>3</sup></i> , Normal liters <i>NL</i> , pounds <i>LB</i> or kilograms <i>KG</i> Press →; press ↑ or ↓ to scroll through the options
		<i>MULTIPLIER XXXX</i>	Lowest 0.0001; highest 1000 Press →; press ↑ or ↓ to scroll through the options
		Frequency output <i>FREQUENCY XXXX</i>	Should match the maximum input frequency of the external counter/totalizer. Press → to confirm
		Return to previous menu <i>PREVIOUS MENU</i> , press → to confirm	
« <i>ALARM CONFIG</i> → TO SELECT» → to select	Alarm configuration	Press ↑ or ↓ to scroll	
		<i>ALARM SET POINT XXXX</i>	Enter the set point. Units will be the same as chosen in AO1. Press → to confirm
		<i>ALARM OPERATION</i> → to select	Choice between <i>LOW FLOW</i> or <i>HIGH FLOW</i> , press → to confirm
		<i>PREVIOUS MENU</i> → TO SELECT» → to select	Returns to previous menu
<i>PREVIOUS MENU</i> → TO SELECT» → to select	Previous menu		Returns to previous menu

### Damping

Increasing the Damping will smooth the TA2 display and the loop output. This may be used in cases when turbulence is causing fluctuations in the measurement.

The damping value is expressed in time constants. A one-second time constant means that with a step change in flow, the measured flow value will reach approximately 63 % of the new value in one second and approximately 99 % of the new value in five seconds. The lower limit is 0 which means no damping (other than the inherent response time of the sensor); the upper limit is 15 seconds.

# CONFIGURATION



## CONFIGURATION

### Advanced Configuration

The Advanced configuration menu sets advance parameters not normally used in the operation of the instrument. To access Advanced Configuration, scroll ↑ or ↓ until the display shows *ADV CONFIG*, press →.

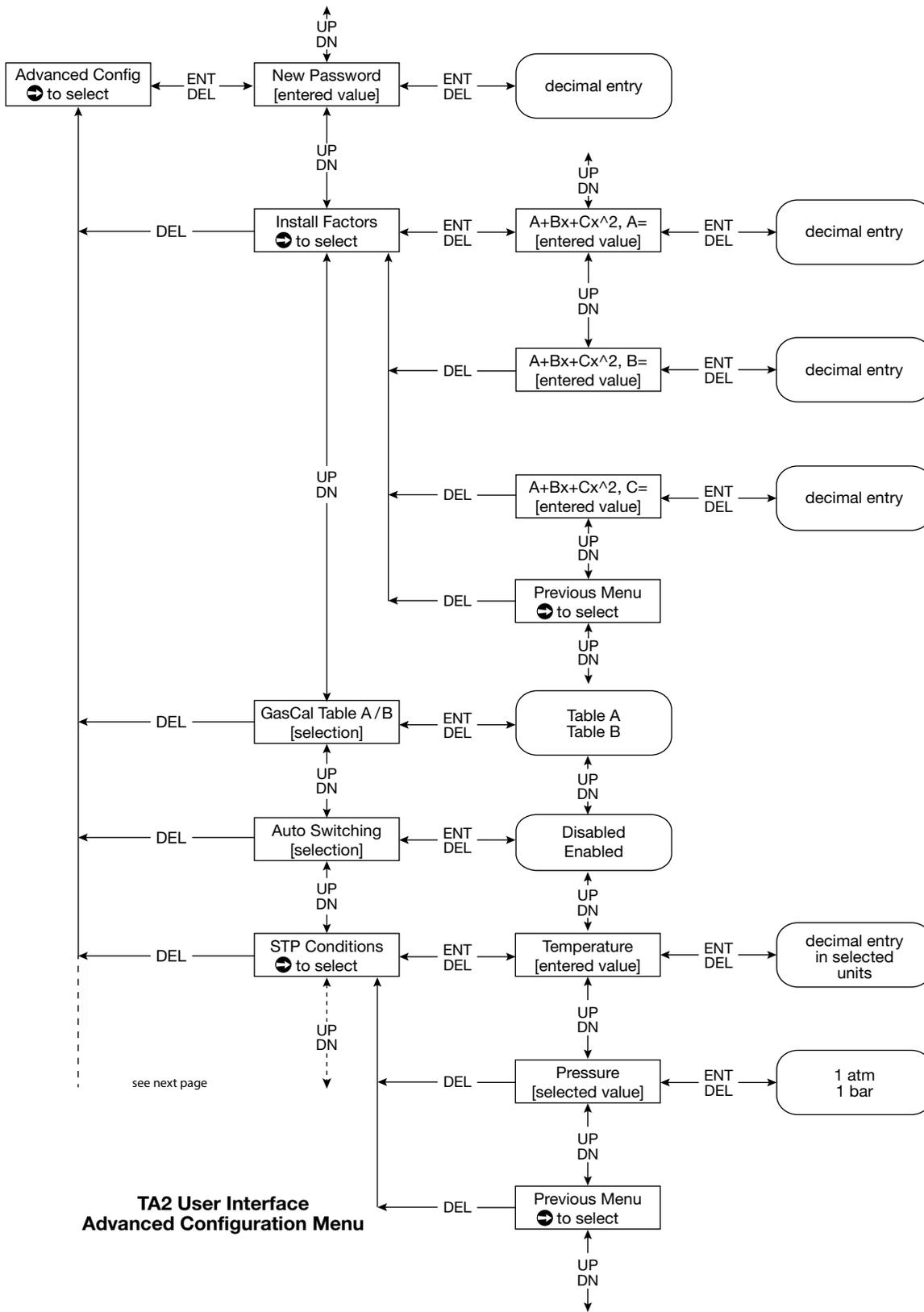
Display	Item	Action	Comments
<i>NEW PASSWORD</i> → TO SELECT» → to select	Change password	Enter New Password	Change the instrument password
<i>INSTALL FACTORS</i> → TO SELECT» → to select	Install factors	Enter new values for A, B & C	Permits user to adjust flow measurement*
<i>GASCAL TABLE A/B</i> → TO SELECT» → to select	Gas calibration	↑ or ↓ to choose A or B	Allows selection for 2 different gasses or 2 different ranges for the same gas
<i>AUTO SWITCHING</i> → TO SELECT» → to select	Allow automatic switching between a low flow Table A and a high flow Table B.	↑ or ↓ to choose Disabled/Enabled	It is necessary to have a dual calibration and distinct flow rate differences between tables in order to perform switching function.
<i>STP CONDITIONS</i> → TO SELECT» → to select	Standard temperature and pressure conditions	Enter value for Standard Temperature and select Standard Pressure value	Permits user to change STP (Standard Temperature and Pressure) conditions
<i>CUSTOM UNIT</i> → TO SELECT» → to select	Customised input	Press ↑ or ↓, then → to enter option	
		<i>CUSTOM UNITS TEXT</i> , enter max 6 characters	Allows the user to create any desired units of flow measurement
		<i>CUSTOM UNITS MULT</i>	Allows the user to calculate the <i>CUSTOM UNIT</i> value
		<i>PREVIOUS MENU</i> → TO SELECT» → to select	Return to previous menu
<i>D/A TRIM AD1</i> → TO SELECT» → to select		Press ↑ or ↓, then → to enter and adjust 4 mA or 20 mA point	Allows to fine tune the 4mA and 20 mA points for the first gas or first range using the ↑ or ↓
<i>D/A TRIM AD2</i> → TO SELECT» → to select		Press ↑ or ↓, then → to enter and adjust 4 mA or 20 mA point	Allows to fine tune the 4mA and 20 mA points for the second gas or second range using the ↑ or ↓
<i>PREVIOUS MENU</i> → TO SELECT» → to select	Previous menu		Returns to previous menu

\* **Installation factor:** Changes in flow profile will affect the measurements of the TA2. Advanced users have the ability to adjust the measurements for changes in flow profile using a polynomial relationship in the form of:

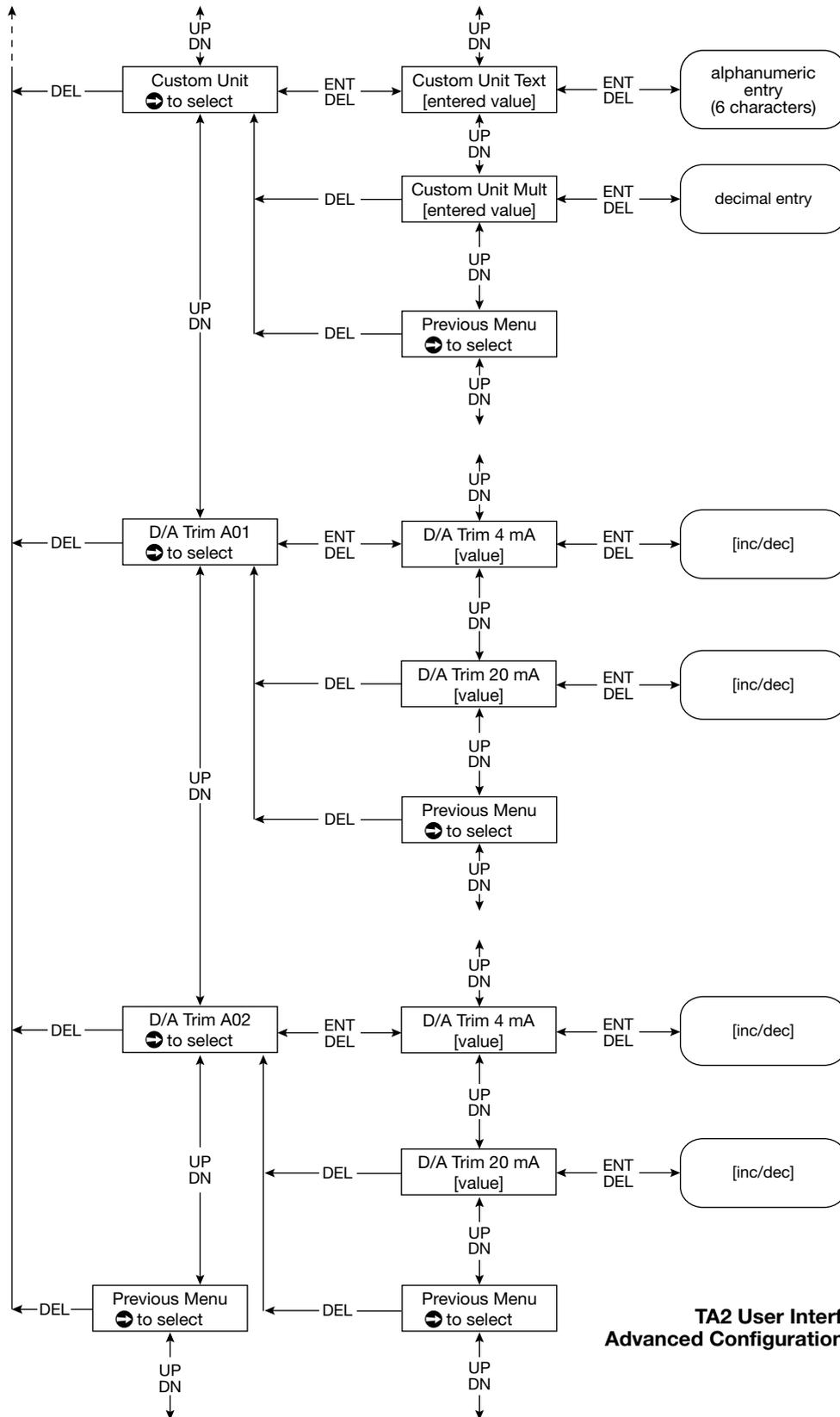
$$\text{Corrected flow} = A + Bv + Cv^2$$

v = velocity in SFPM (Standard feet/min.). Contact Magnetrol for calculations to determine these factors.

The default is B = 1; and A and C = 0. To use the correction factor, develop a relationship between the flow measured by the TA2 and the flow measured by a second flowmeter. Curve fit the second order polynomial (above) using the output of the TA2 and the output of the second flowmeter for corrected flow. Then enter the appropriate values in the Advanced Configuration menu.



**TA2 User Interface  
Advanced Configuration Menu**



Secondary loop configuration is only available on units which have this option.

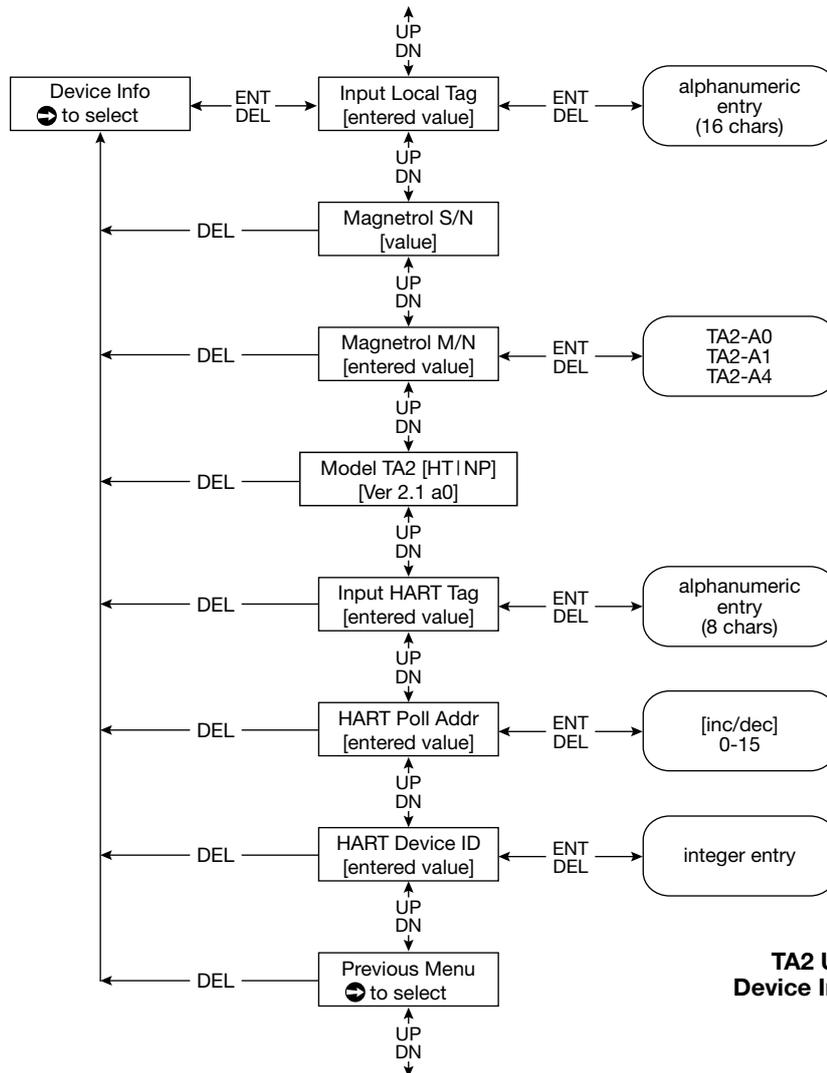
**TA2 User Interface  
Advanced Configuration Menu (cont)**

# CONFIGURATION

## Device information

The menu is used to display information about the device.

Display	Item	Action	Comments
INPUT LOCAL TAG	Magnetrol TA2	Press → to change the tag	The default can be changed to describe the application or transmitter number. Max.16 characters
MAGNETROL S/N	Magnetrol serial number		This number is needed if information on the device is needed in the future.
MAGNETROL M/N	Magnetrol Model number		Displays the number that is used by the firmware.
MODEL TA2 ( )	Firmware version		Displays the firmware version used.
INPUT HART TAG	HART Tag	Press → to add HART Tag	Max. 8 digits and only visible on units with HART.
HART POLL ADDR	HART Poll Address	Press → to add the address	Number from 0 to 15. Enter 0 for a single installation. Enter 1-15 for a multi-drop installation. Default value is 0. Only visible on units with HART.
HART DEVICE ID	HART identification number	Press → to add identification number	Required for units with HART. Only visible on units with HART
PREVIOUS MENU → TO SELECT» → to select	Previous menu		Returns to previous menu



HART configuration is available on units which have HART on the primary loop.

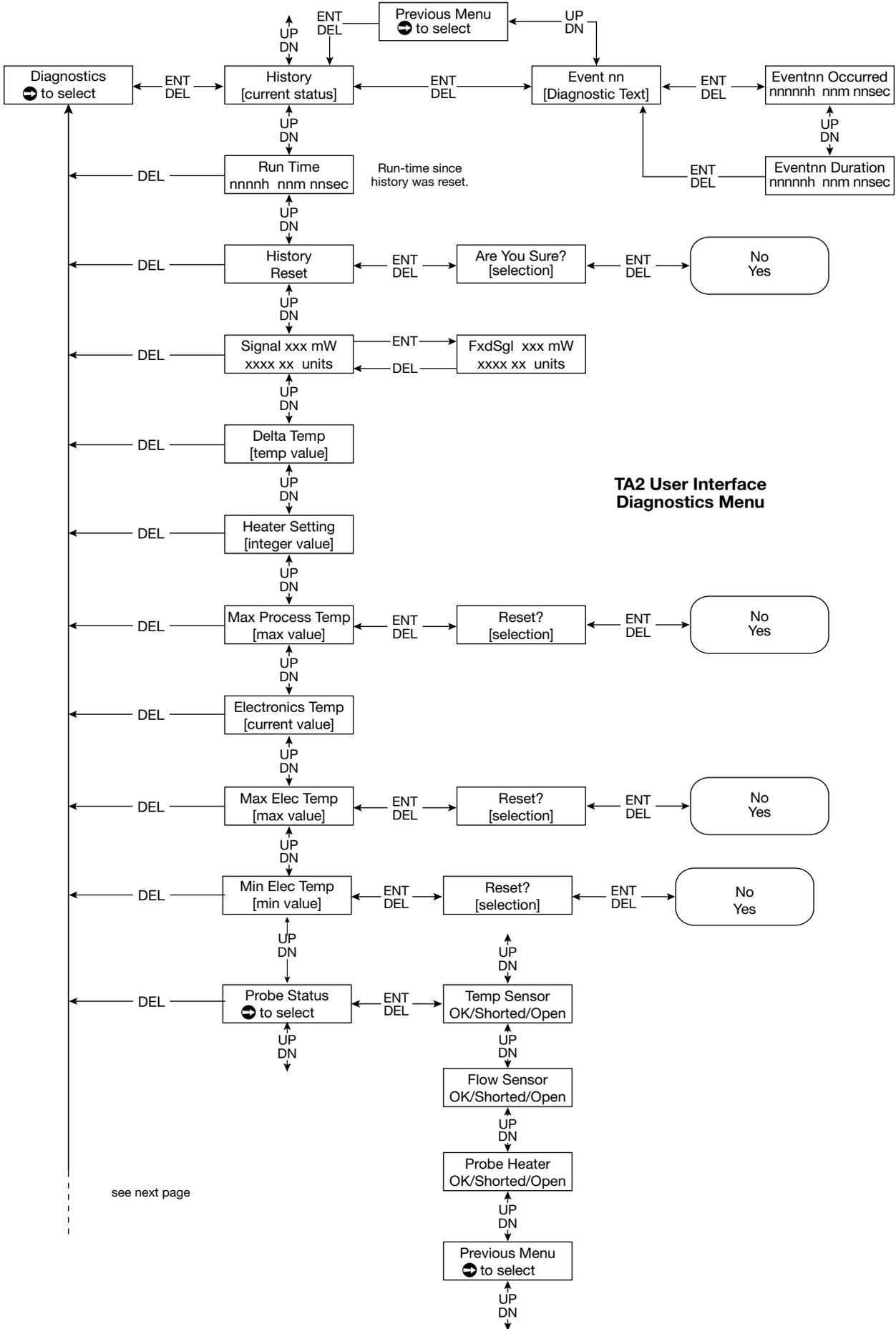
### TA2 User Interface Device Information Menu

## CONFIGURATION

### Diagnostics Menu

The *DIAGNOSTICS* menu contains both informational items and diagnostic screens that can assist in obtaining information on the operation of the unit and troubleshooting if faults or warnings occur.

Display	Item	Action	Comments
<i>HISTORY</i>	History	Press → to view diagnostics	Each event is indicated with an event number. The most recent event is shown first
<i>RUN TIME</i>			Elapsed time since <i>HISTORY</i> was last reset
<i>HISTORY RESET</i>	Resetting history log	Press → to reset	
<i>SIGNAL</i>	Live signal reading	Press → to view <i>FIXED SIGNAL</i> . Then pressing ↑ or ↓ permits to change the signal.	Provides a mW reading and the calculated flow rate
<i>DELTA TEMP</i>	Temperature difference		Displays the temperature difference between the 2 RTD's
<i>HEATER SETTINGS</i>	Current value		Current value as sent to the heater
<i>MAX PROCESS TEMP</i>	Maximum process temperature	Press → to reset the recorded temperature	Displays the maximum temperature recorded by the sensor
<i>ELECTRONICS TEMP</i>	Electronics temperature		Displays current temperature in the enclosure
<i>MAX ELEC TEMP</i>	Recorded maximum temperature	Press → to reset the maximum recorded temperature	Displays the maximum temperature in the housing
<i>MIN ELECT TEMP</i>	Recorded minimum temperature	Press → to reset the minimum recorded temperature	Displays the minimum temperature in the housing
<i>PROBE STATUS</i> → TO SELECT>> → to select	Probe status		<i>OK</i> means the probe is operational, <i>SHORTED</i> or <i>OPEN</i> means there is a problem. Consult Magnetrol if a problem is noted.

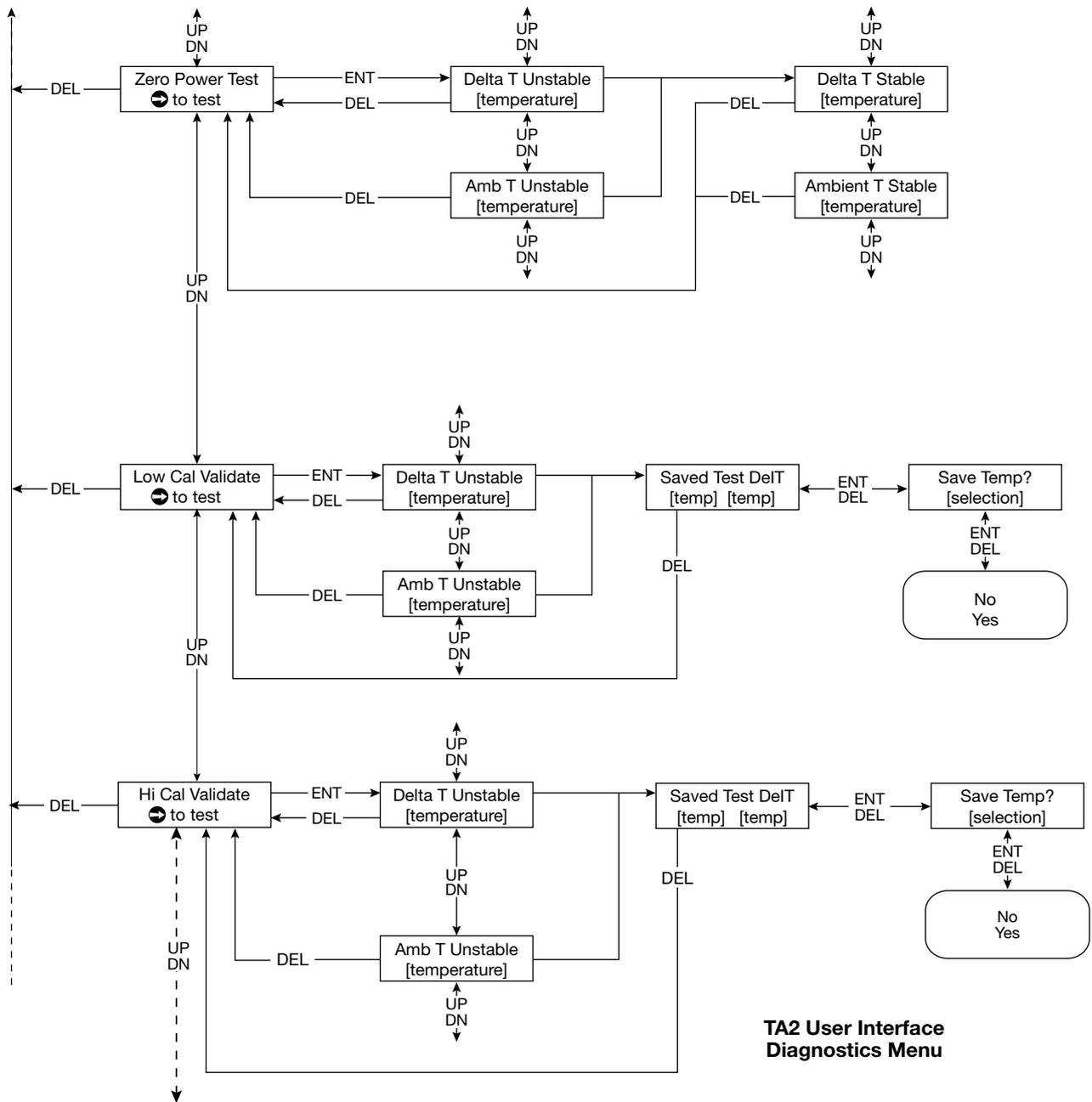


# CONFIGURATION

## Diagnostics Menu

The *DIAGNOSTICS* menu contains both informational items and diagnostic screens that can assist in obtaining information on the operation of the unit and troubleshooting if faults or warnings occur.

Display	Item	Action	Comments
ZERO POWER TEST → TO TEST» → to select			Output signals will be disabled and the heater turned off. Temperature difference between the sensors will be shown.
LOW CAL VALIDATE → TO TEST» → to select	Low calibration validation	Press → to display temperature differences	Verifies that the heat transfer characteristics have not changed and the unit is still within calibration.
HI CAL VALIDATE → TO SELECT» → to select	Hi calibration validation	Press → to display temperature differences	

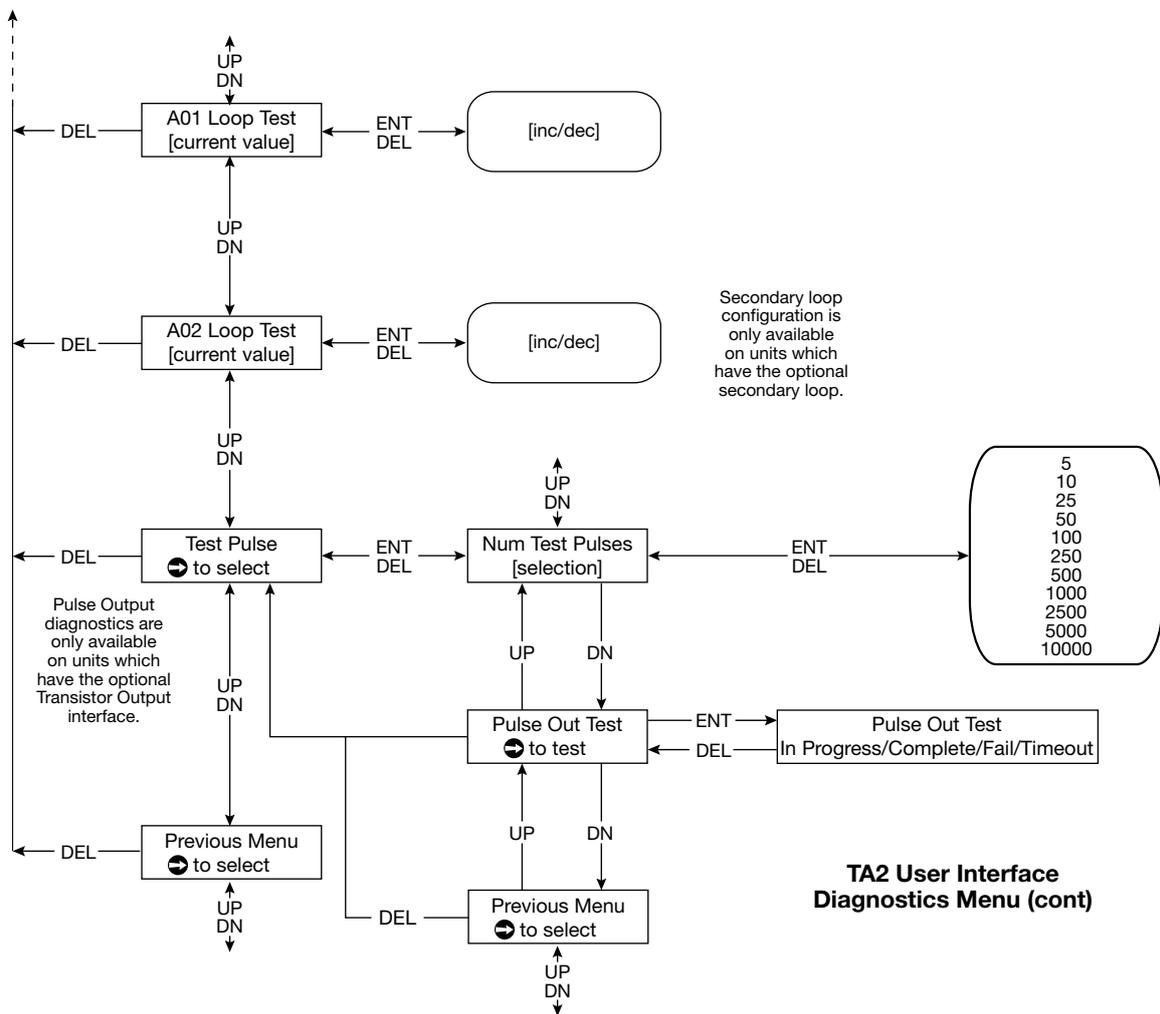


# CONFIGURATION

## Diagnostics Menu

The *DIAGNOSTICS* menu contains both informational items and diagnostic screens that can assist in obtaining information on the operation of the unit and troubleshooting if faults or warnings occur.

Display	Item	Action	Comments
<i>A01 LOOP TEST</i> » → to select	mA Value output	↑ or ↓ to change output signal	
<i>A02 LOOP TEST</i> » → to select	mA Value output	↑ or ↓ to change output signal	Only shown on units that have the optional second mA loop.
<i>TEST PULSE</i> → TO SELECT» → to select	Pulse output signal	↑ or ↓ to set the number of pulses; then → to confirm. Press → to conduct test.	When the test is completed the number of pulses will be shown. Press two times → to return to previous menu. The device will <i>TIME OUT</i> and return to normal operation after 5 minutes.



## CONFIGURATION

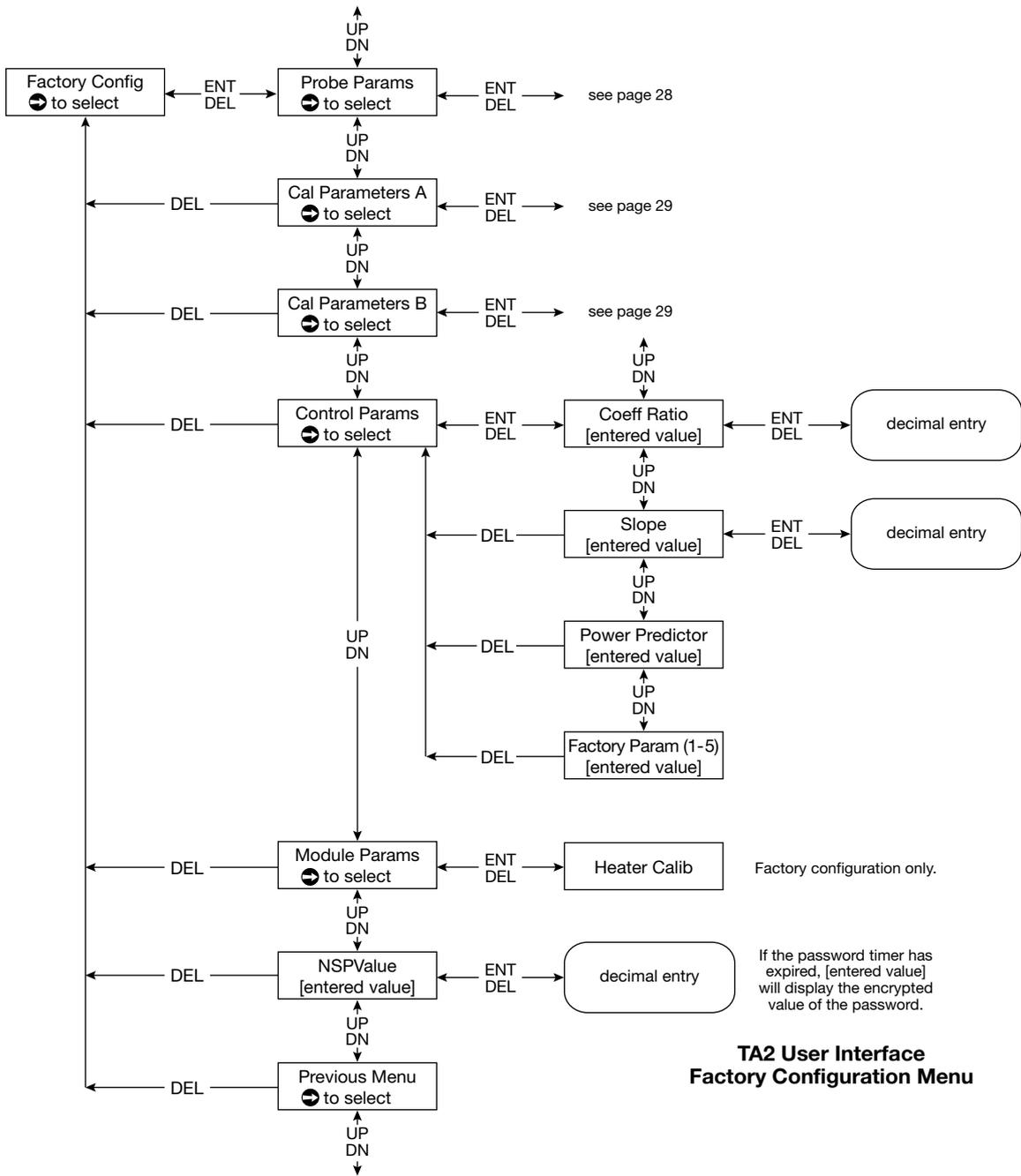
### Factory Configuration

The Factory Configuration is used during initial calibration of the instrument; access to this section is generally only required for review of the information.

To access Factory Configurations, scroll  $\uparrow$  or  $\downarrow$  until the display shows *FACTORY CONFIG*, press  $\rightarrow$ .

Replacement of either the probe or the logic circuit board will require re-entry of calibration data. A replacement probe will be accompanied with a new calibration certificate which will provide the new calibration information. Replacement of the logic circuit board will require re-entry of the original calibration data from the initial calibration certificate.

Display	Item	Action	Comments
<i>PROBE PARAMS</i> $\rightarrow$ TO SELECT $\gg$ $\rightarrow$ to select	Probe parameters	$\uparrow$ or $\downarrow$ to scroll through entries	These factors will require changing if probe is replaced.
<i>CAL PARAMETERS A</i> $\rightarrow$ TO SELECT $\gg$ $\rightarrow$ to select	Parameters gas A	$\uparrow$ or $\downarrow$ to scroll through entries and compare against data on the calibration certificate	These factors will require changing if probe is replaced.
<i>CAL PARAMETERS B</i> $\rightarrow$ TO SELECT $\gg$ $\rightarrow$ to select	Parameters gas B or second range	$\uparrow$ or $\downarrow$ to scroll through entries and compare against data on the calibration certificate	These factors will require changing if probe is replaced.
<i>CONTROL PARAMETERS</i> $\rightarrow$ TO SELECT $\gg$ $\rightarrow$ to select	Control parameters	$\uparrow$ or $\downarrow$ to scroll through entries and compare against data on Calibration Certificate	These factors will require changing if probe is replaced.
<i>MODULE PARAMS</i> $\rightarrow$ TO SELECT $\gg$ $\rightarrow$ to select	Module parameters	Scroll through entries	These are factory set values and should not be changed.
<i>NSP VALUE</i>	Password		Set by Magnetrol
<i>PREVIOUS MENU</i> $\rightarrow$ TO SELECT $\gg$ $\rightarrow$ to select	Previous menu		Returns to previous menu or cycle through Factory Configuration.



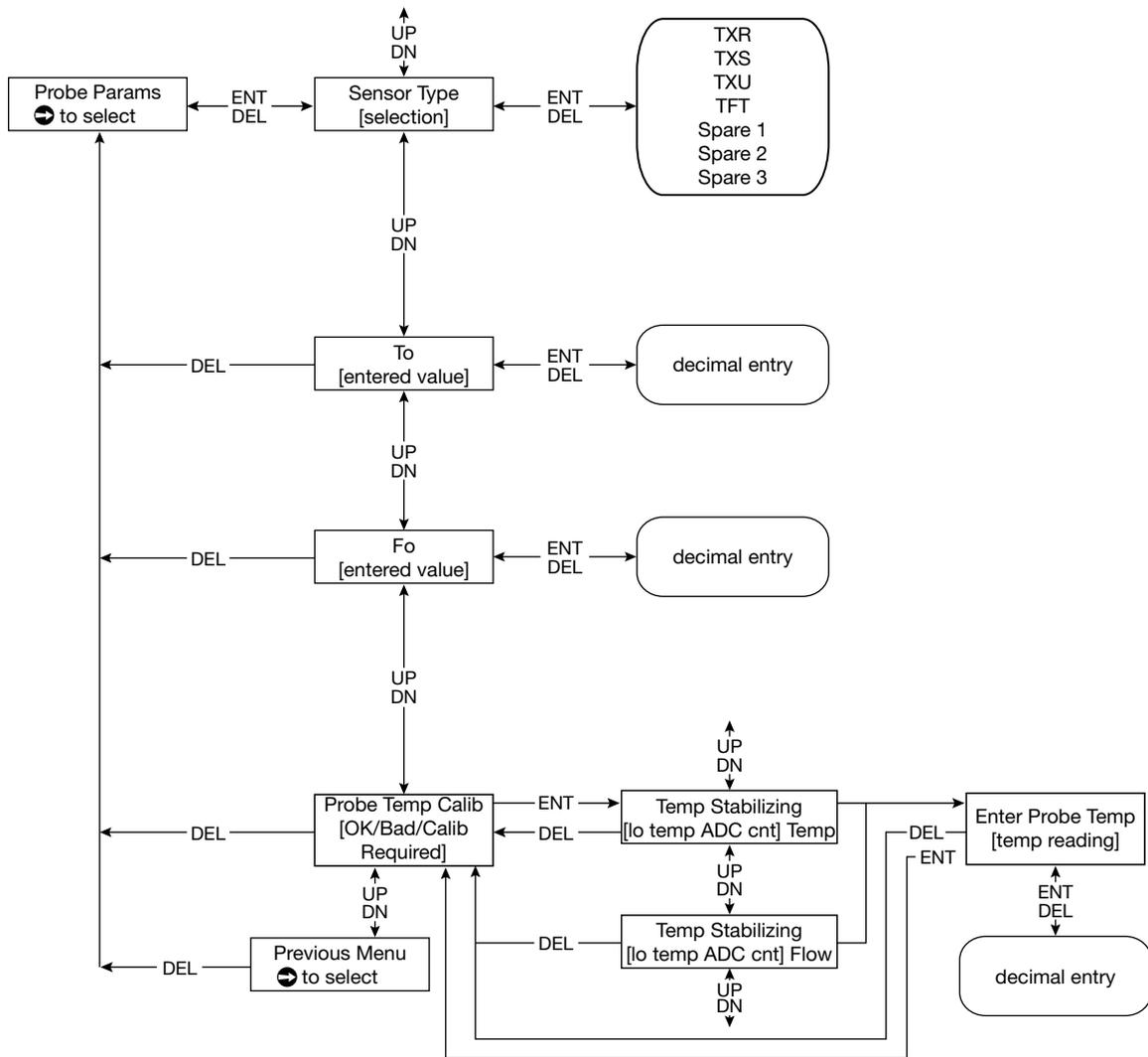
**TA2 User Interface  
Factory Configuration Menu**

# CONFIGURATION

## Probe parameters

To access Probe parameters first enter Factory Configuration, then ↑ or ↓ until the display shows *PROBE PARAMS*, press → to enter.

Display	Item	Action	Comments
<i>SENSOR TYPE</i> → to enter	Sensor type	↑ or ↓ to select type	<i>TXR</i> , <i>TXS</i> , <i>TXU</i> , <i>TFT</i> , <i>SPARE 1</i> , <i>SPARE 2</i> , <i>SPARE 3</i> can be selected
<i>TO</i>			Calibration parameter determined when calibrating the RTD's
<i>FO</i>	Low calibration validation	Press → to display temperature differences	Calibration parameter determined when calibrating the RTD's
<i>PROBE TEMP CALIB</i>	Hi calibration validation	Press → to display temperature differences	Used during calibration of the RTD's
<i>PREVIOUS MENU</i> → TO SELECT» → to select	Previous menu		Returns to previous menu



**TA2 User Interface  
Factory Configuration Menu  
Probe Parameters**

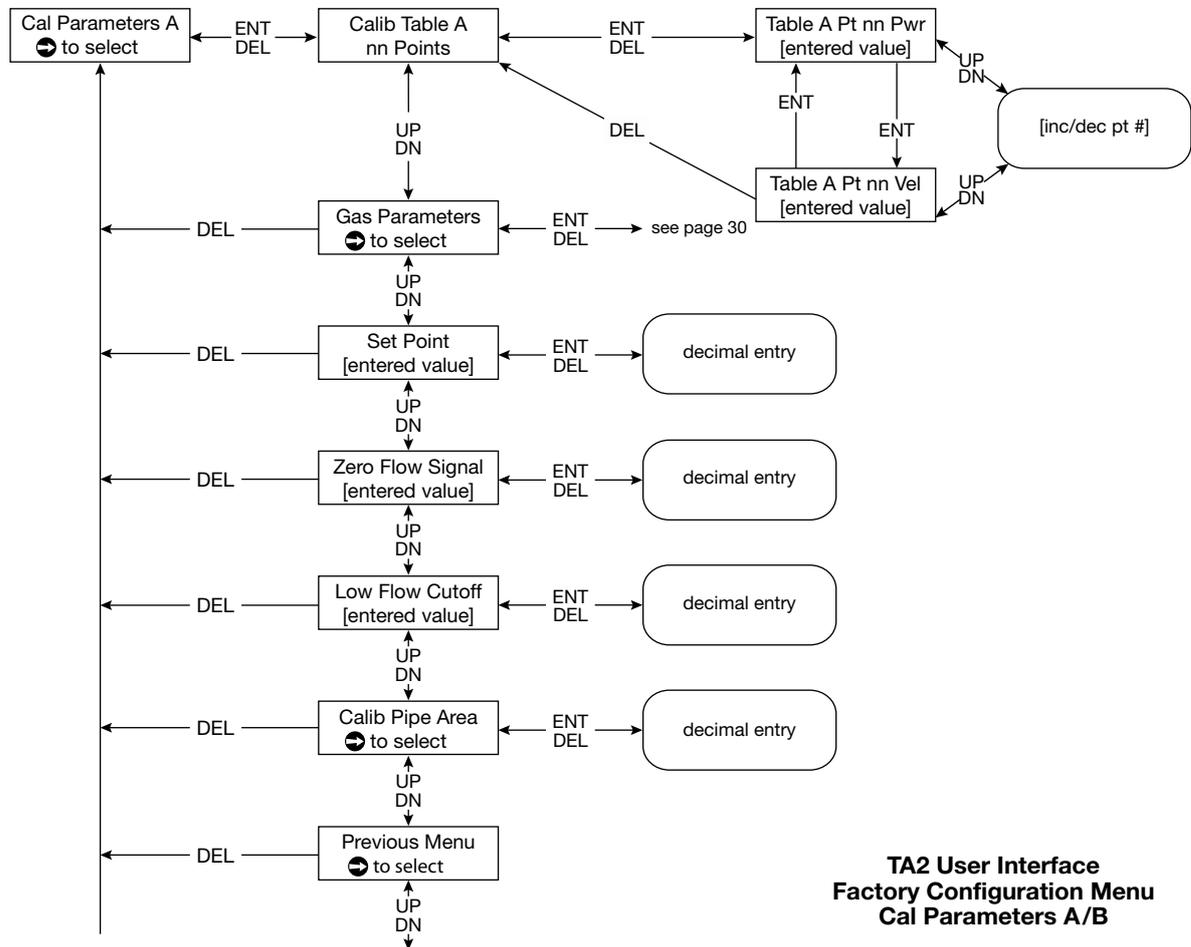
# CONFIGURATION

## Calibration parameters

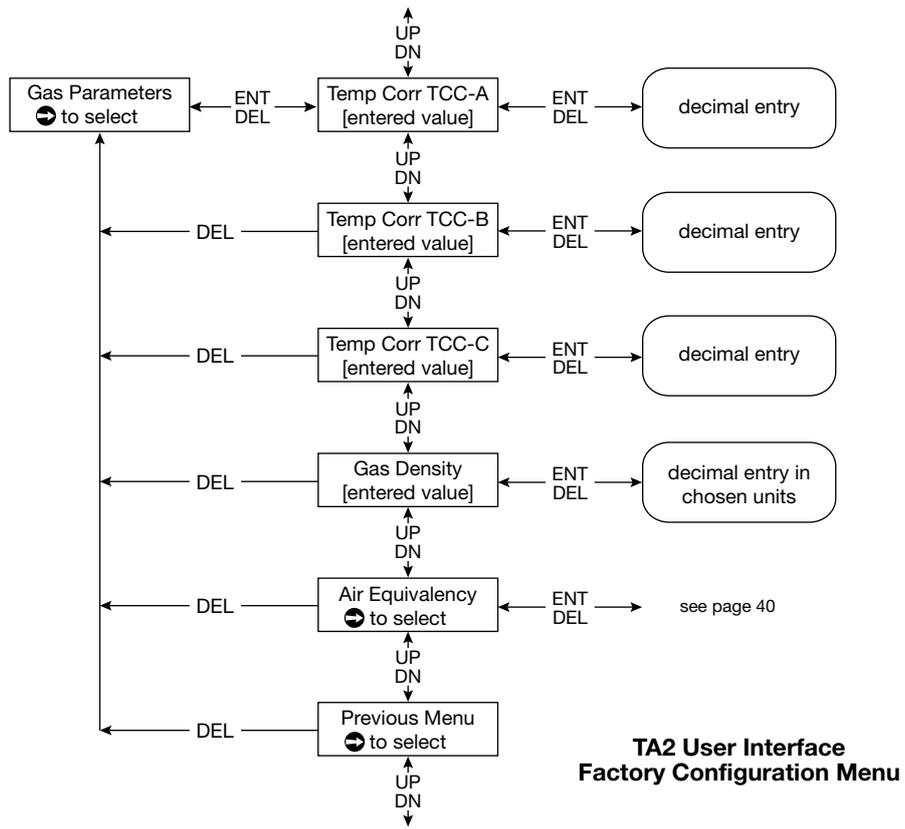
There are two separate menus for calibration parameters titled *CAL PARAMETERS A* and *CAL PARAMETERS B*. These two different sets of calibration are used when the TA2 is calibrated on two gases or two different ranges. If the unit is calibrated for air, then only *CAL PARAMETERS A* is used. If calibrated for a different gas then the calibration parameters for the specified gas is contained in *CAL PARAMETERS A*, the air calibration is contained in *CAL PARAMETERS B*.

*CAL PARAMETERS A* and *CAL PARAMETERS B* have an identical menu structure.

Display	Item	Action	Comments
<i>CALIB TABLE A</i> nn POINTS	Calibration table respective gas		Provides actual calibration data points
<i>GAS PARAMETERS</i> → TO SELECT» → to select		↑ or ↓ to scroll through parameters	
		TEMP CORR TCC-A , TEMP CORR TCC-B , TEMP CORR TCC-C	Gas specific factors for temperature compensation
		GAS DENSITY	Provides gas density at STP conditions
		AIR EQUIVALENCY	Factors relating the relationship of the gas flow to the flow of air
SET POINT → to select	Temperature differ- ence	Only to be changed by Magnetrol	Indicates temperature difference the device is attempting to maintain
ZERO FLOW SIGNAL → to select	Zero flow data point		Used to adjust data point for applica- tion specific related issues
LOW FLOW CUTOFF → to select	Low flow limit	Enter the limiting value using ↑ or ↓. Confirm by pressing two times →.	Flow rates below this value will be ignored.
CALIB PIPE AREA	Calibration of the pipe area	Enter the flow area using ↑ or ↓. Confirm by pressing two times →.	
PREVIOUS MENU → TO SELECT» → to select	Previous menu		Returns to previous menu



**TA2 User Interface  
Factory Configuration Menu  
Cal Parameters A/B**

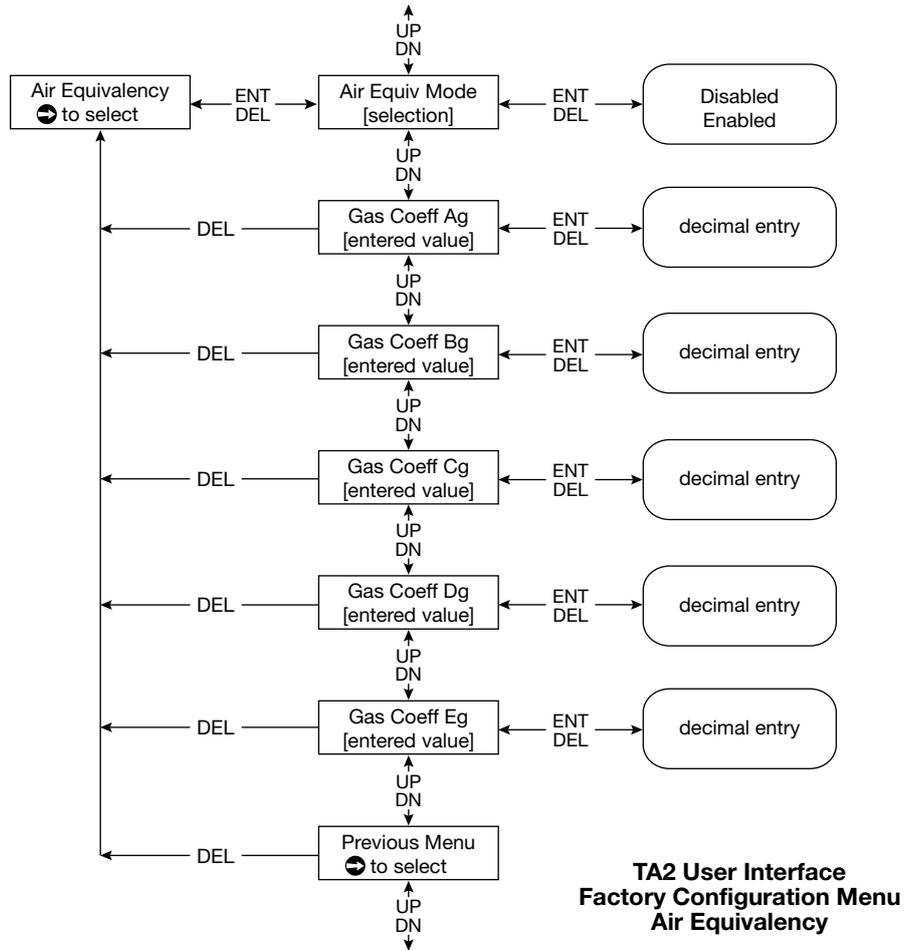


Gas Parameters menu exists for both Gas A and Gas B

**Air equivalency**

To access *AIR EQUIVALENCY* , press →.

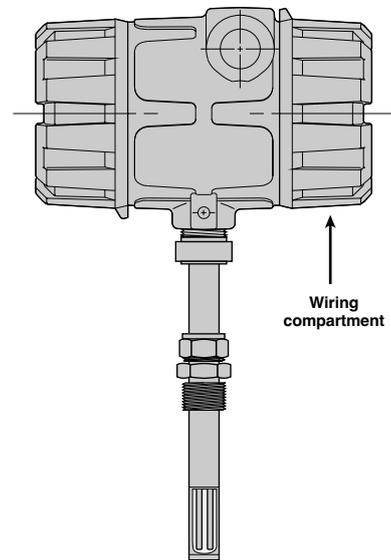
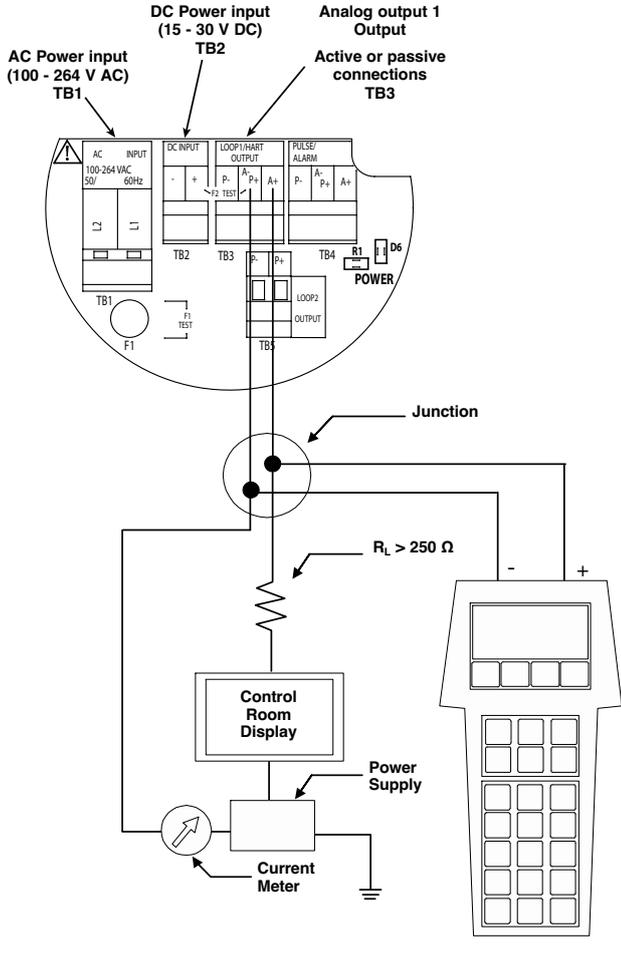
Display	Item	Action	Comments
<i>AIR EQUIV MODE</i> → to enter	Air equivalency mode	↑ or ↓ to enable or disable the mode	
<i>GAS COEFF AG</i> To <i>GAS COEFF EG</i> → to enter		Enter values using ↑ or ↓	Polynomial equation used: $A+Bv+Cv^2+Dv^3+Ev^4$ where v is mass velocity. Contact Magnetrol for factors.



Air Equivalency menu exists for both Gas A and Gas B

**CONNECTIONS**

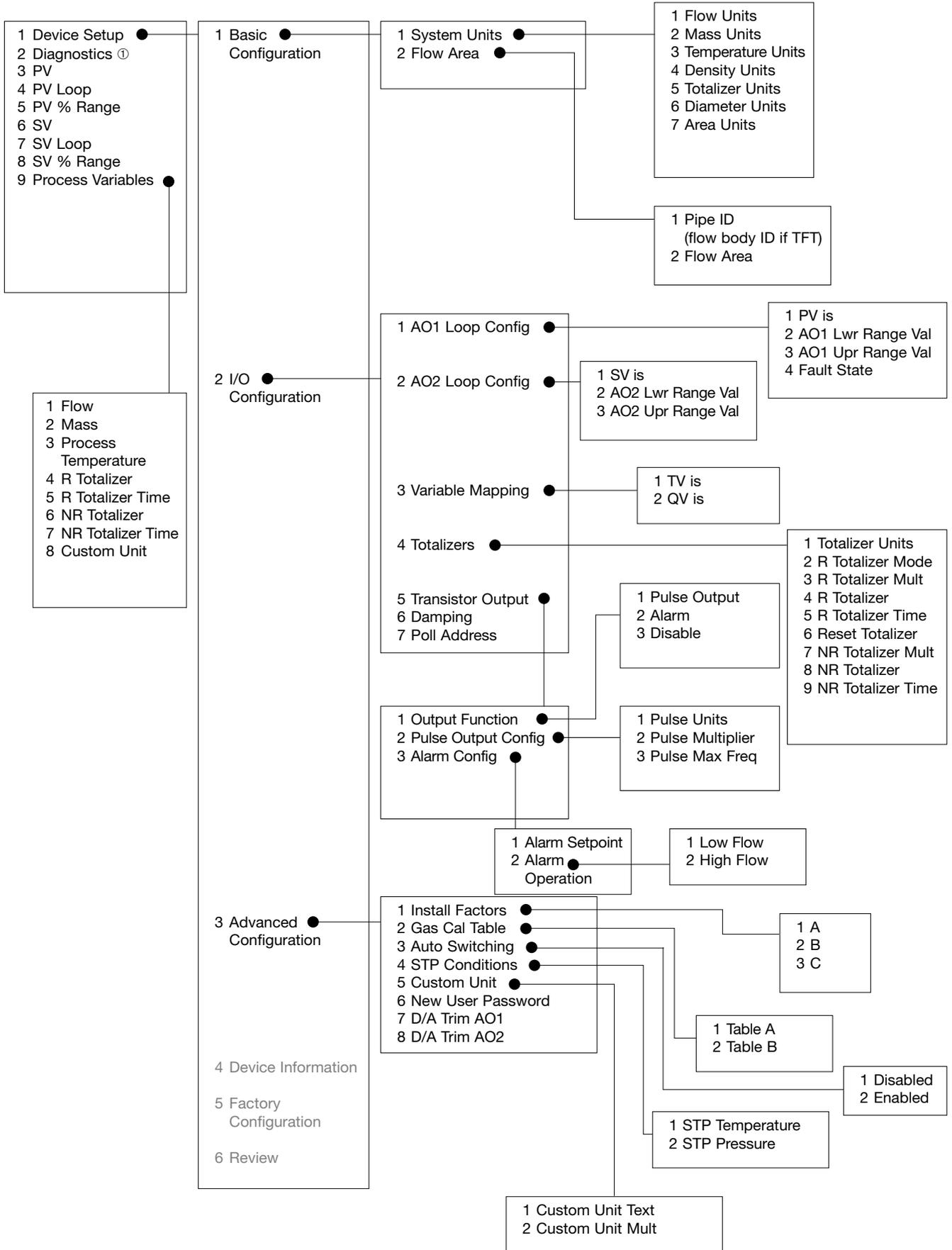
**IMPORTANT:** The digital HART® communication is superimposed on the 4-20 mA output and requires a min. load resistance of 250 Ω and a max load resistance of 1000 Ω.



To confirm HART® handheld communications, attach the unit as shown in the illustration. If the communicator reads GENER-IC on the first two lines, then the HART® handheld does not contain the current DDs (Device Descriptions) for the TA2 meter. Contact your local HART® Service Center

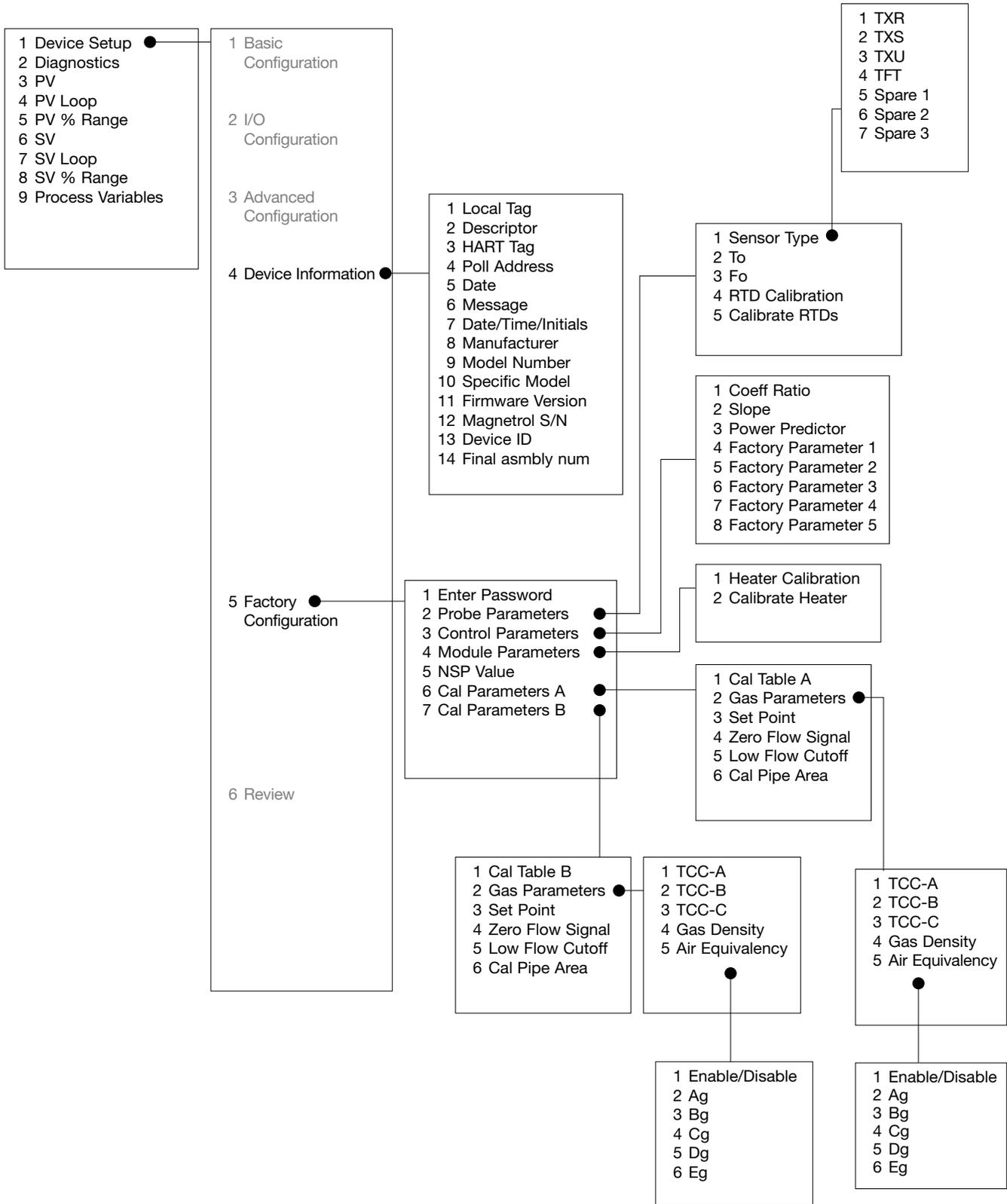
HART Version	HCF Release Date	Compatible with TA2 Software
Dev V2 DD V1	February 2016	Version 2.1b0 and later

**HART® MENU**



① See page 36

**HART® MENU**



**HART® MENU**

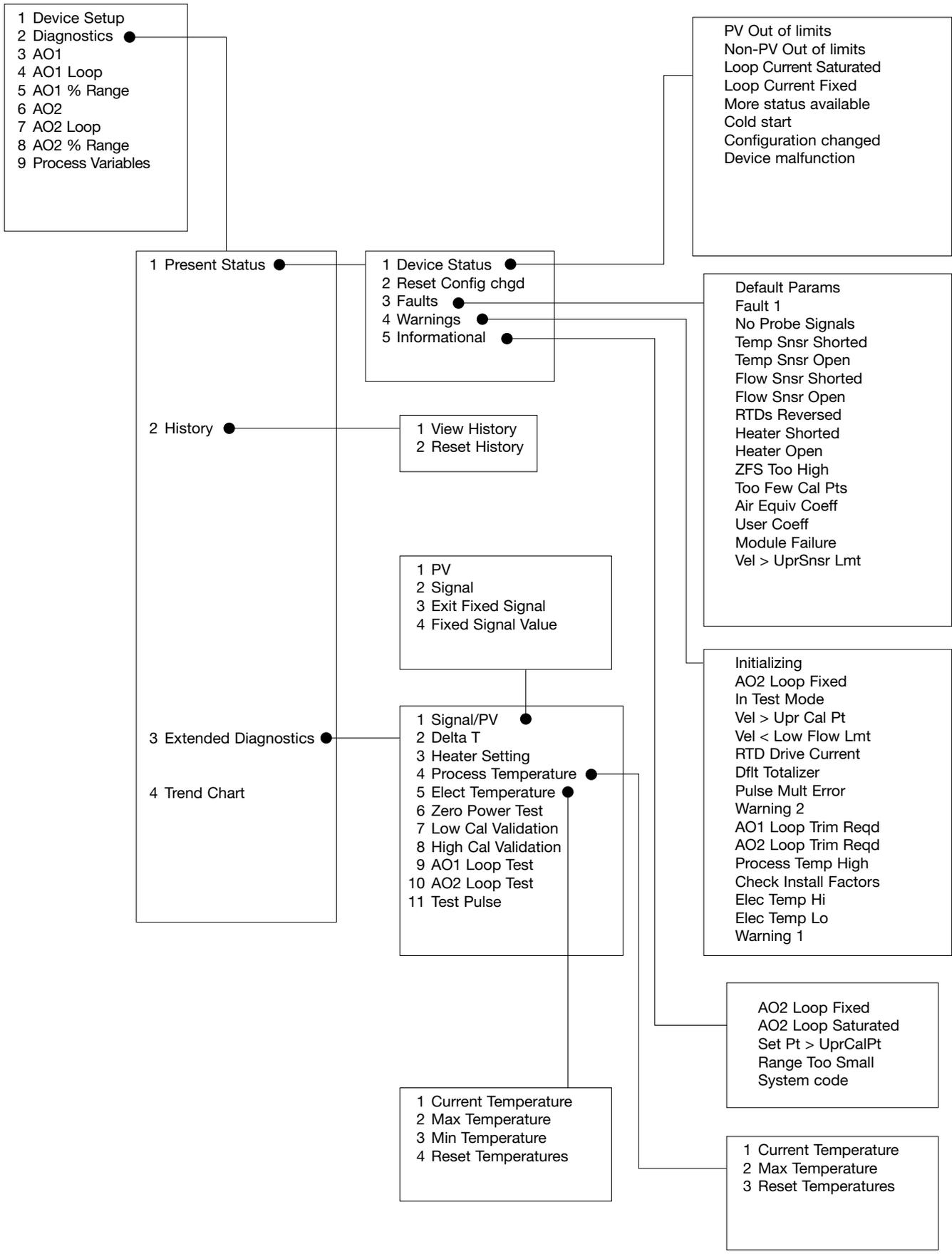
- 1 Device Setup ●
- 2 Diagnostics
- 3 PV
- 4 PV Loop
- 5 PV % Range
- 6 SV
- 7 SV Loop
- 8 SV % Range
- 9 Process Variables

- 1 Basic Configuration
- 2 I/O Configuration
- 3 Advanced Configuration
- 4 Device Information
- 5 Factory Configuration
- 6 Review ●

- 1 Model
- 2 Manufacturer
- 3 Magnetrol S/N
- 4 HART Tag
- 5 Descriptor
- 6 Firmware Version
- 7 Date
- 8 Message
- 9 Final assembly num
- 10 Device ID
- 11 Poll Address
- 12 Date/Time/Initials
- 13 Universal rev
- 14 Fld Dev rev
- 15 Software rev
- 16 Num req preams
- 17 PV is
- 18 SV is
- 19 TV is
- 20 QV is
- 21 Pipe ID
- 22 Flow Area
- 23 AO1 Lwr Range Value
- 24 AO1 Upr Range Value
- 25 Fault State

- 26 Damping
- 27 AO2 Lwr Range Value
- 28 AO2 Upr Range Value
- 29 R Totalizer Mode
- 30 R Totalizer Mult
- 31 NR Totalizer Mult
- 32 Output Function
- 33 Pulse Units
- 34 Pulse Multiplier
- 35 Pulse Max Freq
- 36 Alarm Setpoint
- 37 Alarm Operation
- 38 Install Factor A
- 39 Install Factor B
- 40 Install Factor C
- 41 Gas Cal Table
- 42 STP Temperature
- 43 STP Pressure
- 44 Custom Unit Text
- 45 Custom Unit Multiplier
- 46 AO1 4mA Trim value
- 47 AO1 20mA Trim value
- 48 AO2 4mA Trim value
- 49 AO2 20mA Trim value

HART® MENU



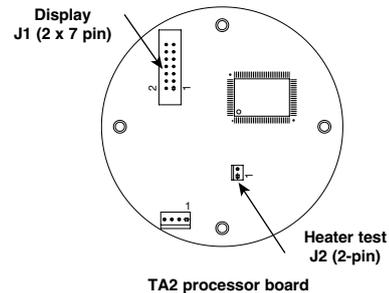
## DIAGNOSTICS TEST

The TA2 has several diagnostics tests which may be routinely performed. When conducting these tests, the reported flow rate will be zero.

### Heater setting

The amount of current flowing to the heater is displayed under Diagnostics/Heater Setting. This value can be verified by connecting a multi-meter across the Heater Bypass terminals (J2). This board can be accessed by opening the cover and removing the display module.

The measured value should match the value shown on the display. Any difference between the two values indicates that the heater calibration is incorrect. If the heater circuit is open, a nominal current value will be displayed, but the measured current will be zero.



### Zero power test

This test checks that the resistances of the RTDs have not changed. The heater is turned off and the temperature difference between the two sensors is compared. The test should be performed in a water bath (preferred) or under flowing conditions. Conducting this test in still air will cause the test to time out and provide inconclusive results.

The temperature difference between the two sensors is displayed. Typical values will match within 0.15 °C. Temperature difference may be as high as 0.5 °C depending upon test conditions. If greater than this value, contact the factory as drift in the RTDs may have occurred.

### Calibration verification procedure

The TA2 measures heat transfer. These procedures are designed to permit the user to verify the calibration by checking the heat transfer characteristics of the sensor. If the heat transfer characteristics are approximately the same when the test is conducted compared with when the same data was collected at the factory during the initial calibration, the unit remains in calibration.

The procedure is performed under two different sets of conditions. Both tests should be conducted at "room temperature"; approximately +21 °C to +30 °C (+70 °F to +85 °F). The test can be performed using the keypad and display, HART®, or PACTware™ through the Diagnostics menu. During the test, the display (or HART® or PACTware™) will provide an indication of the measured temperature difference and if the Delta T measurement is stable.

Low Flow Validate—Simulates a low flow condition.

1. Cover sensor tips to isolate from air currents. During the test, the heater power is set and the Delta T (temperature difference) between the two RTDs is measured.
2. After completion of the test, the value of the temperature difference measured during the test is compared against the previously stored value. (The original value obtained when the units were initially calibrated can be found on the original calibration certificate.)
3. The value from the test should compare with the stored (or original calibration value) within 1,5 °C. This variation in part is due to potential variations of the ambient temperature during the test and differences in test methods.

High Flow Validate—Simulates a high flow condition.

1. Support the TA2 vertically in a water bath. See picture below. During the test, the heater power is set and the Delta T (temperature difference) between the two RTDs is measured.
2. After completion of the test, the value of the temperature difference measured during the test is compared against the stored value. (The original value obtained when the units were initially calibrated can be found on the original calibration certificate.)
3. The value from the test should compare with the stored (or original calibration value) within 1,5 °C. This variation in part is due to potential variations of the ambient temperature during the test and differences in test methods.

If the temperature difference measured during the test is greater than the recommended temperature difference indicated above in item "3", then the overall accuracy of the TA2 may be affected. Contact Magnetrol Technical support.



Watch the video for this procedure at [www.magnetrol.com/en/downloads/videos](http://www.magnetrol.com/en/downloads/videos)

**Troubleshooting**

Symptom	Problem	Solution
No output signal No display	No input power	Verify that LED D6 on the input wiring board is on. If not, check wiring connections. Check F1 test and F2 test to check fuses protecting input wiring.
No output signal	4–20 mA output not operational	Verify that 4–20 mA connections are made to the correct terminals on TB3.
Flow measurement on display is correct but output signal always 4 mA	HART poll address is not 0	Change HART Poll Address to 0.
Totalizer not operating	Totalizer is disabled	Ensure that the totalizer operation is enabled.
Flow is measured under a no flow condition	Increased heat transfer. This can occur under no flow with increased pressure.	Increase the low flow cutoff to a value greater than the displayed flow rate. The TA2 will ignore readings lower than this value. Optionally, increase the zero flow signal to match the value indicated under signal value.
Flow rate too high or too low	Instrument configuration does not match actual application	Check values entered for flow area under basic configuration. Check if install factors are entered under advanced configuration. Check STP conditions under advanced configuration.
	Buildup on sensor	Depending on type and size of buildup, flow readings may either increase or decrease. Clean sensor.
Flow rate too high	Flow profile considerations	The TA2 assumes a specific fully developed flow profile. User can correct for variations in flow profile using the install factors found under advanced configuration
Flow rate too high, output spiking	Moisture in the gas	Condensed moisture will cool the sensor more than gas flow. This will temporarily indicate a higher than expected flow rate.

**Error messages**

The TA2 Mass Flow Meter utilizes a 3-level hierarchy for reporting diagnostics information: FAULTS, WARNINGS, and INFORMATION. Faults and Warnings can be reviewed on the rotating screen in the Home menu. These screens capture only current conditions. Historic diagnostic information can be viewed in the HISTORY screen of the Diagnostics Menu.

**FAULT:** The highest level in the hierarchy of diagnostics. A Fault indicates a defect or failure in the circuitry or software, or a calibration condition that makes reliable measurement impossible. The mA value defaults to 3.6 mA, 22 mA, or HOLD and a message is displayed on the rotating screen. Further error information can be obtained by reviewing the Diagnostic Menu screen.

**WARNING:** This is the second level in the hierarchy of diagnostics. A Warning indicates conditions that are not fatal but may affect the measurement. A message will appear on the Home (rotating) screen when a Warning is detected but will not affect the output current. Further error information can be obtained by reviewing the Diagnostic Menu screens.

**INFORMATION:** This is the lowest level in the hierarchy of diagnostics. Information messages are for conditions that provide operational factors that are not critical to the measurement. Further error information can be obtained by reviewing the Diagnostics Menu.

**Error messages**

**FAULT**

<b>Diagnostic</b>	<b>Fault Description/Corrective Action</b>	<b>LCD Message</b>
<b>Non-Volatile Memory corruption</b>	Partial corruption of the Non-Volatile memory stored in the EEPROM. Data may revert to Default conditions. Re-verify that all calibration and configuration factors in the TA2 match the calibration certificate.	Default Params
<b>No signal from Probe</b>	There is no signal from the sensor. Check the wiring between the probe and the electronics.	No Probe Signals
<b>Temperature Sensor Failure</b>	A short has occurred in the RTD measuring the process temperature or in the interconnecting wiring (if remote electronics). Check wiring to the probe.	TempSnsr Shorted
<b>Temperature Sensor Failure</b>	There is an open circuit in the RTD measuring the process temperature or in the interconnecting wiring (if remote electronics). Check wiring to the probe.	Temp Sensor Open
<b>Flow Sensor Failure</b>	A short has occurred in the RTD measuring the heated sensor or in the interconnecting wiring (if remote electronics). Check wiring to the probe.	FlowSnsr Shorted
<b>Flow Sensor Failure</b>	There is an open circuit in the RTDs measuring the heated sensor or in the interconnecting wiring (if remote electronics). Check wiring to the probe.	Flow Sensor Open
<b>RTDs Reversed</b>	The wiring connecting the RTDs is reversed. Check probe wiring or interconnecting cable (if remote electronics)	RTDs Reversed
<b>Heater Shorted</b>	The heater has developed a short either in the probe or in the interconnecting cable (if remote electronics). Check probe wiring.	Heater Shorted
<b>Heater Open</b>	There is an open circuit in the wiring going to the heater. Check wiring. Also, check if the two-pin jumper is missing.	Heater Open
<b>Zero Flow Signal is too high</b>	Zero Flow Signal (power) is greater than second data point in the Calibration Table. Check value entered under Factory Config/Cal Parameters/Zero Flow Signal.	ZFS Too High
<b>Too Few Calibration Points</b>	The calibration table does not contain sufficient number of data points for the flow range. Minimum of ten points is required.	Too Few Cal Pts
<b>Air Equivalency Coefficients incorrect</b>	The Air Equivalency factors used result in a non-monotonically increasing curve over the operating range. Check factors.	Air Equiv Coeffs Bad
<b>Install Factors incorrect</b>	Install factors entered under Advanced Configuration result in a non-monotonically increasing curve. Check factors.	User Instl Coeffs Bad
<b>Module Failure</b>	No readings received from the ADCs, or the values out of range. Indicates failure of Analog to Digital converters. Requires replacement of processor board or return of unit to factory.	Module Failure
<b>Velocity is greater than the Upper Sensor Limit</b>	The velocity is greater than established values. Contact Magnetrol.	Vel > UprSnsrLmt

**Error messages**

**WARNING MESSAGES**

Diagnostic	Warning Description	LCD Message
Initialising	Initialisation in progress. The TA2 will begin making flow readings at completion of cycle.	Initializing
AO2 Loop current fixed	The second 4–20 mA loop (AO2) is not responding. The mA signal may be saturated at 20.5 mA or may be fixed and non-responsive. Check informational messages.	AO2 Loop Fixed
TA2 is running diagnostics test	The operator has put the TA2 into one of several diagnostics tests. The mA output is 4 mA.	In Test Mode
Velocity too high	The Flow rate exceeds the calibration range of the instrument. Instrument will continue to operate. Accuracy is uncertain; flow measurements will be repeatable.	Vel > Upr Cal Pt
RTD drift	The RTD drive circuit current has drifted since last calibration. The drift is outside expected range. The TA2 has compensated for the drift, continued drift may affect accuracy. Repeatability will remain.	RTD Drive Ckt
Totalizer Error	There is an error in the Totalizer operation—the Totalizer and Elapsed Time indicator are reset to 0.	Dflt Totalizer
Pulse Multiplier Error	The maximum pulse output exceeds the maximum frequency selected. Increase the Pulse Multiplier.	Pulse Mult Error
Current loop(s) require trimming	The D/A Trim values are factory defaults. Perform D/A Trim of AO1 or AO2 under Advanced Configuration menu.	AO1 Loop Trim Reqd AO2 Loop Trim Reqd
Temperature Limit Exceeded	The temperature measured by the sensor exceeds the rated temperature. Continued operation will damage sensor.	Process Temp Hi
Install Factor Error	Check and recalculate the install factors. This message may occur if the units of measurement were changed after install factors were entered.	Check Inst Factors
Electronic Temperature Exceeded	The temperature of the microprocessor board is above +176° F (+80° C) or below –40° F (–40° C)	Elec Temp Hi Elec Temp Lo

**INFORMATION MESSAGES**

Diagnostic	Information Description	LCD Message
AO2 Loop not responding	The second 4–20 mA loop (AO2) is fixed and not responding. Check mA output. This informational message will also be activated if the second mA loop output is saturated at 20.5 mA. Check I/O Config/AO2 Loop Config/LRV and URV.	AO2 Loop Fixed
AO2 Loop Saturated	The second 4–20 mA loop (AO2) is saturated at 20.5 mA. Check I/O Config/AO2 Loop Config/URV.	AO2 Loop Saturated
Upper Range Value Error	The Upper Range Value is greater than the Upper Calibration Point.	SetPt > UprCalPt
Insufficient Span	The URV (Upper Range Value) is too close to the LRV (Lower Range Value). Increase separation.	SetPts Too Close
System Warning	Non-fatal firmware exception. Advise Magnetrol with system code number.	System Code

**Circuit board replacement**

The input wiring board and display module can be replaced without any effect on the performance and operation of the TA2. The processor board contains the calibration information and is matched with the probe. If this circuit board is replaced, re-entry of all the original calibration and configuration information is required. This information is contained on the calibration certificate which can be supplied by MAGNETROL. Use of PACTware™ is recommended for re-entry of this data.

1. Make sure the power source is turned off.
2. The input wiring board is contained in the rear compartment where the input voltage wiring comes into. The display module, power loop board and processor board are contained in the front compartment.
3. Remove appropriate cover.
4. If removing boards in the front compartment:
  - a. Remove and unplug the display module if provided.
  - b. Remove the two hex head fasteners using a 1/4" socket. This will remove the electronics module containing the processor board and the power loop board.
  - c. Unplug the electrical connection at J1 of the power loop board.
  - d. Probe wiring connections are made to TB1 on the same side of the power loop circuit board.

- e. Connect the probe wires as indicated:

**Integral Electronics**

Wire Color	Connection on TB1
Orange	8
Brown	7
Black	3
Blue	2
White	1

**Remote Electronics**—see page 5.

- f. Reattach the electrical connection to J1.
- g. Reassemble the circuit boards in the enclosure. Make sure that the probe wiring does not get pinched between the standoffs on the circuit board and the attachment lugs in the housing.
- h. Reinstall the display module if provided.
5. If replacing the input wiring board, loosen screws, and remove the electrical connection to J1 on the rear of the circuit board.
  - i. Attach electrical connections to J1 on new circuit board and reassemble.
6. Re-install the cover.
7. Apply power to the instrument.
8. Proceed to section RTD calibration on page 42.

**Probe replacement**

The probe and processor board are calibrated together to form a matched set. If a probe needs to be replaced, Magnetrol will provide a new calibration certificate. The user will be required to re-enter the data from this certificate into the instrument. Use of PACTware™ is recommended for re-entry of this data. A new serial number will be designated to the replacement probe.

**Integral Electronics**

1. Make sure the power source is off.
2. Access the power loop circuit board following procedure in previous section circuit board replacement.
3. Disconnect wiring to the probe.
4. Loosen the two set screws at the base of the housing. One serves as a rotational lock, the other secures the head into place.
5. Unthread the probe.
6. Thread in a new probe.
7. Connect the probe wires to the power loop board as indicated in previous section, step "4.e".
8. Reassemble the electronics following previous section circuit board replacement.
9. Align the enclosure with the desired probe position, making sure that the flow arrow indicates the direction of flow.
10. Retighten the two set screws.
11. Reapply power.
12. Proceed to section RTD calibration on page 42.

**Remote Electronics**

1. Make sure the power source is off.
2. Remove cover of remote electronics housing.
3. Remove bezel.
4. Disconnect the wires from the probe at terminal TB1.
5. Loosen the two set screws at the base of the housing. One serves as a rotational lock, the other secures the head into place.
6. Unthread the probe.
7. Thread in a new probe.
8. Connect the probe wires to Terminal TB1 as shown in the figure on page 5.

Wire Color	Terminal Connection on TB1
White	1
Blue	2
Black	3
Brown	4
Orange	5

9. Retighten the two set screws.
10. Re-assemble the bezel and install cover.
11. Reapply power.
12. Proceed to section RTD calibration on page 42.

**Replacement calibration**

**RTD calibration**

If either the probe or the processor board is replaced in the field, calibration of the RTDs in the probe will return the TA2 to like-new performance. NOTE: If this procedure is not followed, the accuracy will be affected; however, very repeatable flow measurements will be obtained.

Locate the sensor vertically in a water bath with an accurate temperature sensor directly adjacent to the probe tips. It is preferable that the water is stirred during the calibration to ensure the TA2 pins and temperature probe are at the same temperature. Using the keypad and display, select `FACTORY CONFIG\PROBE PARAMS\PROBE TEMP CALIB` and then press the  $\rightarrow$  key. The device will dynamically display the To/Fo readings over a period of time. After 3 minutes, and if the readings are stable enough, the display automatically changes to request entry of a password (126) followed by the ambient water temperature. After the temperature is entered, the device will display if the calibration is OK. The device then automatically resets itself for normal operation. A similar procedure exists for the DD and DTM.

**Set point adjustment**

A new set point must be calculated to complete the reconfiguration.

1. Place the probe in ambient temperature air where there is no flow across the sensor. This can be accomplished by wrapping the sensor tip with a piece of paper.

**Flow recalibration**

Calibration of the TA2 requires a flow bench or other method for determining the flow rate. Using this procedure, the user can re-calibrate the unit himself or use a local flow calibration facility rather than returning the unit to the factory for recalibration. With an insertion probe, it is not necessary to calibrate in the same size pipe as the unit is installed in. The TA2 has internal scale-up factors which adjust the data from the calibration pipe size to the installation pipe size.

Calibration requires the TA2 sensor to be positioned in a test section; the test section should have a sufficient upstream and downstream straight run to ensure the formation of a fully developed flow profile. Calibration should be performed using the same gas which the unit is calibrated for. Optionally, an air equivalency calibration can be performed. In this case, calibrate in air and contact the factory for air equivalency factors and equivalent air calibration rate.

**Recalibration Procedure:**

1. Select the set point; this is the temperature in degrees Celsius which the TA2 maintains between the two sensors. If the unit is re-calibrated for the same application, then it is probably not necessary to change the original value. If it becomes necessary to change the set point due to change in the calibration velocity or the type of gas:
  - a. Record the set point under `FACTORY CONFIG\CAL PARAMETERS (A OR B)\SET POINT`.
  - b. Determine the maximum velocity in SFPM which the unit will operate (SFPM equals the SCFM divided by the flow area of the test section in square feet).
  - c. Install the probe in the test section and flow gas that is equivalent to the maximum velocity in the calibration range.
  - d. Using the display, HART, or PACTware™, obtain the signal value in mW from the Diagnostics menu.
  - e. Calculate a new set point using the formula:  
New set point = old set point x (800/measured signal (mW)). 800 mW is the desired maximum power rating for the TA2.
  - f. Enter new set point in TA2 under `FACTORY CONFIGURATION\CAL PARAMETERS (A OR B)\SET POINT`.

2. Go into `<<DIAGNOSTICS\SIGNAL`. Allow time for the signal to stabilize to within  $\pm 1$  mW and record the new signal.
3. Calculate a new set point by using the following formula:  
New set point = set point x (zero flow signal  $\div$  new signal)  
If replacing the probe, use the set point and zero flow signal (ZFS) shown on the new calibration certificate that came with the probe.  
If replacing the processor board, use the set point and ZFS on the original calibration certificate. If the original calibration certificate is not available, contact Magnetrol with the serial number of the unit found on the nameplate. New signal is the value measured under step 2.

**NOTE: If the TA2 is calibrated for a gas other than air, there are two ZFS values on the certificate. One is for air and the other is for the particular gas. Use the ZFS for air when making the adjustment in air.**

4. Enter this new set point into the TA2 instead of the value on the calibration certificate under `FACTORY CONFIG\CAL PARAMETERS A\SET POINT`.
5. Return to the signal screen, similar to step 2, ensuring there is no flow over the sensor. The signal value should now agree with the original ZFS within 1 %. If desired, steps 2 through 5 can be repeated.

2. Convert the flow rate in the application to the flow rate in the test section using the formula:  
Flow in test section = application flow x (flow area of test section/flow area of application)
  - a. Allow a flow of a known amount of gas through the test section, recording flow rate and TA2 signal (mW). A minimum of 10 and a maximum of 30 data points including a zero flow value should be obtained. One data point should be taken at a flow rate approximately 20 % greater than the expected operating range. The higher the number of data points, the better the overall accuracy of the instrument.
  - b. Convert the flow rate in the test section to mass velocity in SFPM. Use Magnetrol STP conditions of 70 °F and 1 Atmosphere (14.69 psia).
  - c. Enter the Power and the corresponding Mass Velocity into the TA2. This is easily performed using PACTware™ but can also be entered directly into the TA2 using the display and keypad or using HART. These values should be entered in increasing order to ensure a monotonically increasing curve. Note password of 126 is required for entry of calibration data. (Contact Magnetrol if issues using this password.)
  - d. After completion of entry of the calibration data, check the display/HART®/PACTware™ for the number of points accepted (or table length). If this number is less than the actual number of data points entered, then there is an error in the entry of the calibration data. Ensure that the data is entered so the curve is monotonically increasing. The values of mass velocity and power should always be increasing over the calibration range.
  - e. A Fault message will occur if there are fewer than 10 calibration data points in the calibration table.
3. Enter the flow area of the calibration test section. Units of measurement are the same as selected under Basic Config menu. This value is used in calculating the scale-up factor between the calibration test section and the installation.

## REPLACEMENT PARTS

**NOTE:** Replacement of the processor board / electronic module or the sensor requires entry of configuration data from the Calibration Certificate.

### CAUTION: EXPLOSION HAZARD

Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Partn°: 

T	A	2							
---	---	---	--	--	--	--	--	--	--

Serial n°: 

--	--	--	--	--	--	--	--	--	--

Digit in partn°: 

X	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

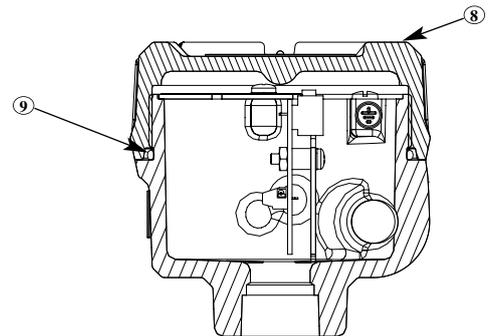
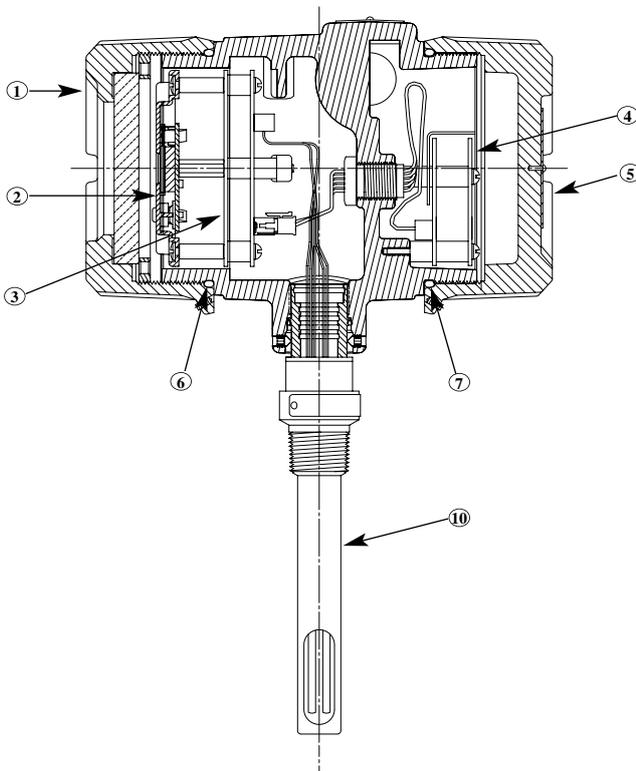
See nameplate, always provide complete partn° and serial n° when ordering spares.

↳ X = product with a specific customer requirement

### EXPEDITE SHIP PLAN (ESP)

Several parts are available for quick shipment, within max. 1 week after factory receipt of purchase order, through the Expedite Ship Plan (ESP).

Parts covered by ESP service are conveniently grey coded in the selection tables.



(1) Housing cover	
Digit 6	Replacement part
0	004-9197-007
B	036-4411-001

(2) Display module	
Digit 6	Replacement part
0	not applicable
B	Z30-3614-001

(3) Electronic module		
Digit 5	Digit 9	Replacement part
1	3 or 4	089-7261-002
	E or F	089-7261-005
2	3 or 4	089-7263-001
4	3 or 4	089-7261-003
	E or F	089-7261-006

(4) Wiring PC board	
Digit 5	Replacement part
1	089-7260-001
2	089-7262-001
4	089-7260-002

	Replacement part
(5) Housing cover	004-9206-010
(6) "O"-ring	012-2201-240
(7) "O"-ring	012-2201-240
(10) Sensor	consult factory

(8) Housing cover	
Digit 9	Replacement part
3 or E	not applicable
4 or F	004-9225-002

(9) "O" ring	
Digit 9	Replacement part
3 or E	not applicable
4 or F	012-2201-237

## SPECIFICATIONS

### Electronics specifications

Description		Specification
Power supply		15 – 30 V DC 100 – 264 V AC, 50-60 Hz
Power consumption		DC = 9 W max - AC = 20 VA max
Output		4-20 mA with HART®,
Analog Output	Active	4-20 mA isolated (3,8 – 20,5 mA useable as per NAMUR NE 43) - max 1000 Ω loop resistance
	Passive	4-20 mA isolated (3,8 – 20,5 mA useable as per NAMUR NE 43) - max loop resistance depending power supply
Resolution	Analog	0,01 mA
	Display	0,01 Nm/s
Calibration		Pre-calibrated from factory - ISO 17025 and NIST traceable
Damping		Adjustable 0-15 s time constant
Diagnostic Alarm		Adjustable 3,6 mA, 22 mA or Hold last output
User Interface		HART® communicator, AMS® or PACT <sup>ware</sup> ™, 4-button keypad
Pulse Output		Active connection – 24 V DC Power, 150 mA Passive connection – 2,5 to 60 V DC Power, 1,5 A
Alarm Output		Active connection – 24 V DC Power, 100 mA Passive connection – 2,5 to 60 V DC Power, 1 A
Display		2-line x 16-character backlit LCD
Displayed values		Flow (eg. Nm <sup>3</sup> /h, NI/h) and/or mass flow (eg. kg/h) and/or temperature (°C/°F) and/or loop current (mA) and/or totalized flow (eg. Nm <sup>3</sup> /h, NI/h)
Menu Language		English, French, German, Spanish, Russian
Housing Material		IP 66, Aluminium A 356 (< 0,2 % copper) dual compartment, 316 stainless steel
Approvals		ATEX II 2 G Ex db IIC T6 Gb, flameproof enclosure IEC Ex db IIC T6 Gb, flameproof enclosure Temperature class decreases for process temperatures above +55 °C (+130 °F) Other approvals are available, consult factory for more details
SIL (Safety Integrity Level)		Functional safety to SIL1 as 1oo1 / SIL2 as 1oo2 in accordance to IEC 61508 – SFF: 88,3 %. Full FMEDA report and declaration sheets available at request
Shock/Vibration Class		ANSI/ISA-S71.03 Class SA1 (Shock), ANSI/ISA-S71.03 Class VC2 (Vibration)
Net weight		3,3 kg (7.3 lbs) – electronics with 25 cm threaded probe

### Performance

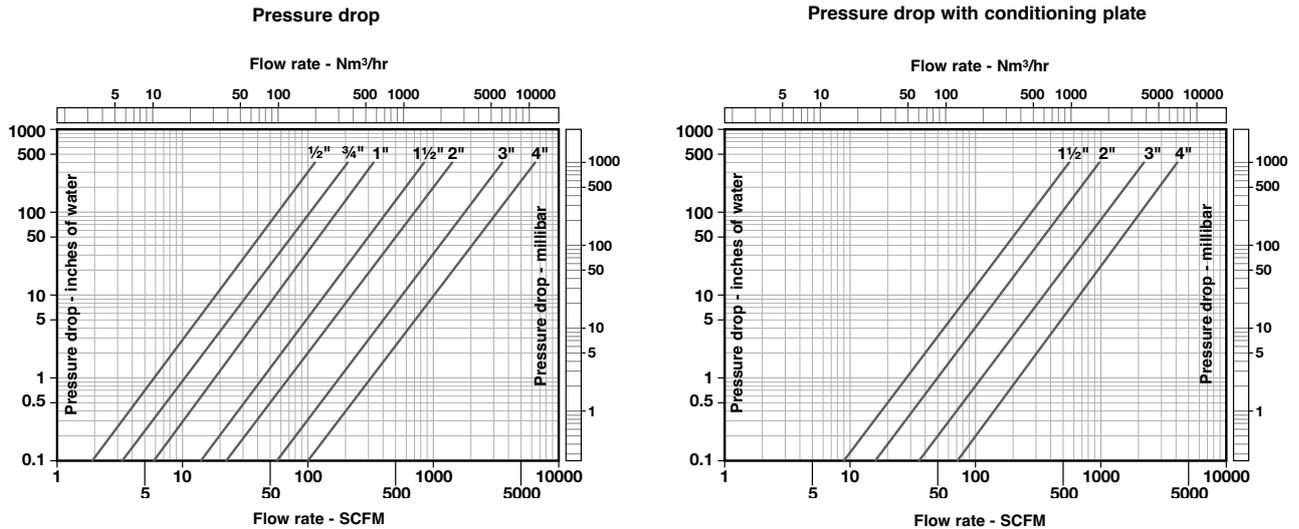
Description		Specification
Turn down ratio		100:1 typical (depending upon calibration)
Flow range	Max	0,05 - 275 Nm/s (10 - 54,000 SFPM) reference of air at STP conditions
	Min	0,05 - 2,5 Nm/s (10 - 500 SFPM) reference of air at STP conditions
Linearity		Included in flow accuracy
Accuracy	Flow	± 1 % of reading + 0,5 % of calibrated full scale
	Temperature	± 1 °C (2 °F)
Repeatability		± 0,5 % of reading
Response time		Time constant of 1 to 3 s
Remote electronics		Max 45 m or 150 m, depending on cable used
Ambient temperature		-40 °C to +80 °C (-40 °F to +176 °F) (ATEX up to +55 °C (+130 °F), IEC up to +70 °C (+160 °F)) Display: -30 °C to +80 °C (-22 °F to +176 °F)
Operating temperature effect		± 0,04 % of reading per °C
Humidity		0-99 %, non-condensing
Electromagnetic Compatibility		Meets CE requirements (EN 61326)

### Probe specifications

Description	Insertion probe	Sensor with flow body
Materials – wetted parts	316/316L (1.4401/1.4404) or Hastelloy® C (2.4819)	Sensor: 316/316L (1.4401/1.4404) Flow body: stainless steel or carbon steel
Mounting	Threaded, compression fitting, ASME-EN flanged or with Retractable probe assembly	Threaded or flanged
Probe length	From 7 cm up to 253 cm (2.6" up to 99.9")	Flow body sizes from 1/2" up to 4"
Max process temperature	Integral electronics: -45 °C up to +120 °C (-50 °F up to +250 °F) -45 °C up to +200 °C (-50 °F up to +400 °F) with 100 mm (4") longer probe serving as heat extension between the electronics and the compression fitting Remote electronics: -45 °C up to +200 °C (-50 °F up to +400 °F)	
Max pressure rating	103 bar @ +20 °C (1500 psi @ +70 °F) 94,8 bar @ +200 °C (1375 psi @ +400 °F) – direct insertion 75,9 bar @ +200 °C (1100 psi @ +400 °F) – with flow body	

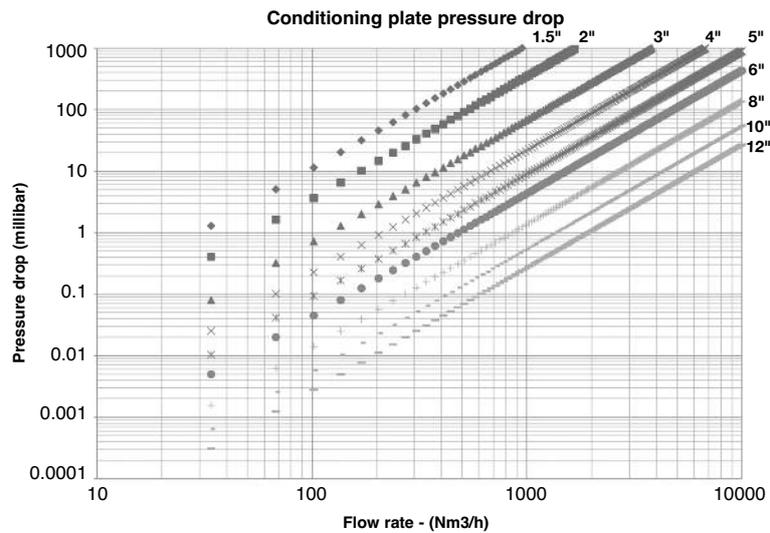
## SPECIFICATIONS

### Pressure drop for sensors with flow body



Pressure drop is based on air at +20 °C (+70 °F) and 1 atmosphere (density = 1,2 kg/m<sup>3</sup> or 0.075 lb/ft<sup>3</sup>). For other gases, pressure or temperatures, estimate pressure drop by multiplying value from chart by actual density in kg/m<sup>3</sup> (at operating conditions) divided by 1,2.

### Pressure drop for flow conditioning plates for use with insertion probes



## MODEL IDENTIFICATION

### A complete measuring system consists of:

1. Thermatel® TA2 mass flow electronics.  
Thermatel® TA2 mass flow meters require an application report for performing pre-calibration from factory. Ask your Magnetrol® contact for assistance when specifying a device.
2. Thermatel® TA2 mass flow insertion probe or Thermatel® TA2 mass flow sensor with flow body.
3. Connecting cable for remote mount Thermatel® TA2 mass flow meters.
4. Options:
  - MACTek Viator USB HART® interface: order code: **070-3004-002**
  - portable display module – order code: **089-5219-002** (for more details see page 49)
  - flow conditioning plate for use with insertion probes – for order code see page 48
  - retractable probe assembly (RPA) – for order code see page 49
  - valve with compression fitting – order code: **089-5218-001** (for more details see page 49)
5. Free of charge: TA2 DTM (PACTware™) can be downloaded from [www.magnetrol.com](http://www.magnetrol.com)

# MODEL IDENTIFICATION

## 1. Code for Thermatel® Enhanced Model TA2 mass flow meter

### 1 - 4 | BASIC MODEL NUMBER

T A 2 - A	Thermatel® TA2 mass flow meter
-----------	--------------------------------

### 5 | OUTPUT

1	4-20 mA with HART® communication
4	4-20 mA with HART® communication, Pulse/Alarm, second mA output

### 6 7 | ACCESSORIES

0 0	Blind transmitter (can receive the plug-in display as future option)
B 0	Plug-in digital display and keypad

### 8 | CALIBRATION ①

#### For TA2 with insertion probe

Actual gas calibration	
0	Special <sup>①</sup> . Specify medium separately
1	Air
2	Nitrogen
3	Hydrogen
4	Natural gas
6	Digester gas <sup>②</sup>
7	Propane
8	Oxygen
Air equivalency / Correlation	
5	Gas correlation <sup>①</sup>
9	Air equivalency

#### For TA2 with sensor with flow body

Actual gas calibration	
A	Special <sup>①</sup> . Specify medium separately
B	Air
C	Nitrogen
D	Hydrogen
E	Natural gas
G	Digester gas <sup>②</sup>
H	Propane
J	Oxygen
Air equivalency / Correlation	
F	Gas correlation <sup>①</sup>
K	Air equivalency

① Consult factory for approval.

② Applies only to digester gas composition of 65 % methane and 35 % CO<sub>2</sub>. All other digester gas compositions require Gas Correlation or Air Equivalency calibrations.

### 9 | MOUNTING/APPROVAL

3	Integral, ATEX II 2 G Ex d IIC T6 Gb, flameproof enclosure
4	Remote <sup>③</sup> , ATEX II 2 G Ex d IIC T6 Gb, flameproof enclosure

③ Bracket for electronics and probe housing included.

### 10 | HOUSING / CABLE ENTRY

1	IP 66, Cast aluminium, M20 x 1,5 cable entry (2 entries - 1 plugged)
0	IP 66, Cast aluminium, 3/4" NPT cable entry (2 entries - 1 plugged)
2	Stainless Steel, 3/4" NPT
3	Stainless Steel, M20 x 1,5



complete order code for Thermatel® Enhanced Model TA2 mass flow meter

→ X = product with a specific customer requirement

## MODEL IDENTIFICATION

### 2. code for Thermatel® Enhanced Model TA2 mass flow insertion probe

#### 1 2 3 | BASIC MODEL NUMBER

T	M	R	Thermatel® TA2 Mass Flow probe - 3/4" diameter						
---	---	---	--	--	--	--	--	--	--

#### 4 | MATERIALS OF CONSTRUCTION

A	316/316L (1.4401/14404) stainless steel
B	Hastelloy® C (2.4819) - not available with 316 (1.4401) stainless steel compression fitting
F	Hastelloy® C (2.4819), NACE
N	316/316L SST, NACE

#### 5 6 7 | PROCESS CONNECTION

0	0	A	Designed for use with compression fitting – min. 11 cm insertion length Compression fitting not included
---	---	---	---

##### Threaded with 316 (1.4401) stainless steel compression fitting included

0	3	A	3/4" NPT compression fitting with Teflon ferrules (max. 6,90 bar)
0	4	A	3/4" NPT compression fitting with stainless steel ferrules (max. 103 bar @ +20 °C, max. 94,8 bar @ +200 °C)
0	5	A	1" NPT compression fitting with Teflon ferrules (max. 6,90 bar)
0	6	A	1" NPT compression fitting with stainless steel ferrules (max. 103 bar @ +20 °C, max. 94,8 bar @ +200 °C)

##### Threaded

1	1	A	3/4" NPT - default selection in combination with a retractable probe assembly (RPA) see page 13
2	1	A	1" NPT
2	2	A	1" BSP (G 1")

##### ASME flanges

2	3	A	1"	150 lbs ASME RF
2	4	A	1"	300 lbs ASME RF
3	3	A	1 1/2"	150 lbs ASME RF
3	4	A	1 1/2"	300 lbs ASME RF
4	3	A	2"	150 lbs ASME RF
4	4	A	2"	300 lbs ASME RF

##### EN flanges

B	B	A	DN 25	PN 16/25/40	EN 1092-1 Type A
C	B	A	DN 40	PN 16/25/40	EN 1092-1 Type A
D	A	A	DN 50	PN 16	EN 1092-1 Type A
D	B	A	DN 50	PN 25/40	EN 1092-1 Type A

#### 8 9 10 | INSERTION LENGTH - consider process connections

##### Min probe length

0	0	7	7 cm (2.6") fixed length - for NPT threaded and flanged
0	0	9	9 cm (3.5") fixed length - for BSP threaded

##### Selectable probe length - specify per cm (0.39") increment

0	0	9	min. 9 cm (3.5") - for NPT threaded and flanged
0	1	1	min. 11 cm (4.5") - for BSP threaded and compression fitting
0	2	5	min. 25 cm (10") - for use with RPA (Retractable Probe Assembly)
2	5	3	max. 253 cm (99.9") - for all probe connections



complete order code for Thermatel® Enhanced Model TA2 mass flow insertion probe

X = product with a specific customer requirement

## MODEL IDENTIFICATION

### 2. Code for Thermatel® Enhanced Model TA2 sensor with flow body

#### 1 2 3 | BASIC MODEL NUMBER

T	F	T	Thermatel® TA2 sensor with mass flow body
---	---	---	---

#### 4 | MATERIALS OF CONSTRUCTION

A	316/316L (1.4401/1.4404) stainless steel body and sensor
1	Carbon steel body / stainless steel sensor

#### 5 6 | THREADED FLOW BODY - ø size and connection

0	1	1/2"	NPT-M
1	1	3/4"	NPT-M
2	1	1"	NPT-M
3	1	1 1/2"	NPT-M
4	1	2"	NPT-M

#### FLANGED FLOW BODY - ø size and connection

0	3	1/2"	150 lbs ASME RF
1	3	3/4"	150 lbs ASME RF
2	3	1"	150 lbs ASME RF
3	3	1 1/2"	150 lbs ASME RF
4	3	2"	150 lbs ASME RF
5	3	3"	150 lbs ASME RF
6	3	4"	150 lbs ASME RF

#### 7 | FLOW CONDITIONING PLATE

A	None
B	Stainless steel flow conditioning plate - For flow body sizes ≥ 1 1/2"

T	F	T					0	0	0
1	2	3	4	5	6	7	8	9	10

**complete order code for Thermatel® Enhanced Model TA2 sensor with flow body**

→ X = product with a specific customer requirement

### 3. Code for connecting cable remote mount Thermatel® Enhanced Model TA2 mass flow meter

#### 1 -7 | BASIC MODEL NUMBER

0	3	7	-	3	3	1	4	Connecting cable for non-hazardous area - 8 wire shielded instrument cable (max 45 m)
0	3	7	-	3	3	2	0	Connecting cable for non-hazardous area - 10 wire shielded instrument cable (max 150 m)
0	0	9	-	8	2	7	0	Connecting cable for ATEX flameproof enclosure - 8 wire shielded instrument cable (max 150 m)

#### 8 9 10 | CABLE LENGTH - specify per m (3.28 ft) increment

0	0	3	min 3 m (9.84 ft) length
0	4	5	max 45 m (148 ft) length (for 037-3314-xxx cable)
1	5	0	max 150 m (492 ft) length (for 037-3320-xxx and 009-8270-xxx cable)

0									
1	2	3	4	5	6	7	8	9	10

**complete order code for connecting cable**

### 4. Code for flow conditioning plate for use with insertion probes

Part Number	Description
004-8986-001	4" 316 stainless steel
004-8986-002	4" carbon steel
004-8986-003	4" PVC
004-8986-004	5" 316 stainless steel
004-8986-005	5" carbon steel
004-8986-006	5" PVC
004-8986-007	6" 316 stainless steel
004-8986-008	6" carbon steel
004-8986-009	6" PVC

Part Number	Description
004-8986-010	8" 316 stainless steel
004-8986-011	8" carbon steel
004-8986-012	8" PVC
004-8986-013	10" 316 stainless steel
004-8986-014	10" carbon steel
004-8986-015	10" PVC
004-8986-016	12" 316 stainless steel
004-8986-017	12" carbon steel
004-8986-018	12" PVC

# MODEL IDENTIFICATION

## 5. Code for retractable probe assembly

### 1 2 3 | BASIC MODEL NUMBER

R	P	A	Retractable probe assembly
---	---	---	----------------------------

### 4 | DESIGN TYPE

E	Low pressure - up to 5,5 bar (80 psi)
F	High pressure - up to 300 lbs service

### 5 | MATERIALS OF CONSTRUCTION

1	Carbon steel with 316 SST (1.4401) seal gland
4	316 SST (1.4401)

### 6 | PROCESS CONNECTION

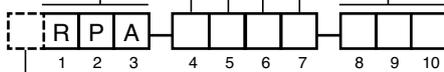
0	1 1/2" NPT	– not available for RPA-E1
1	1 1/2" - 150 lbs RF flange	
2	1 1/2" - 300 lbs RF flange	

### 7 | BALL VALVE

0	No ball valve supplied	
1	Carbon steel ball valve	– select material code 1
2	Stainless steel ball valve	– select material code 4

### 8 9 10 | PROBE LENGTH

0	2	5	min 25 cm (9.84")
1	8	0	max 180 cm (70.87")



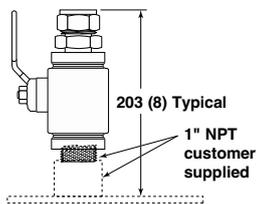
**complete order code for retractable probe assembly**

X = product with a specific customer requirement

## 6. Code for other options

### When ordered separately:

Process Conn. Size	Compression fitting in 316 (1.4401) stainless steel	
	Teflon ferrules Max. 6,89 bar (100 psi)	Stainless steel ferrules Max. 103 bar @ +20 °C (1500 psi @ +70 °F) Max. 94,8 bar @ +200 °C (1375 psi @ +400 °F)
1" NPT	code: <b>011-4719-009</b>	code: <b>011-4719-007</b>
3/4" NPT	code: <b>011-4719-008</b>	code: <b>011-4719-006</b>



1" NPT ball valve in 316 SST with compression fitting (TFE ferrules)  
code: **089-5218-001**

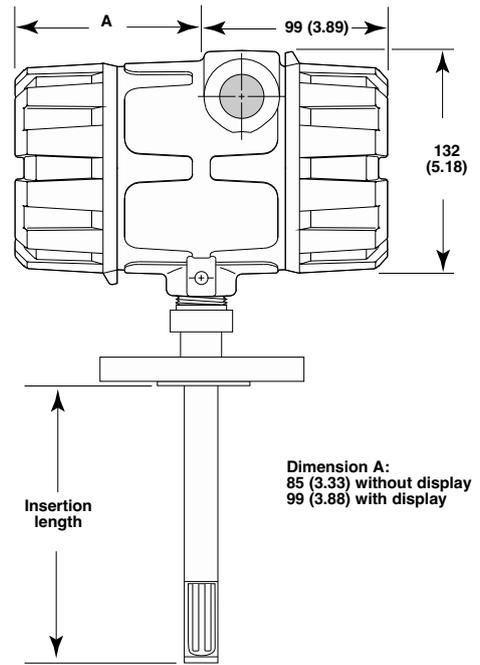
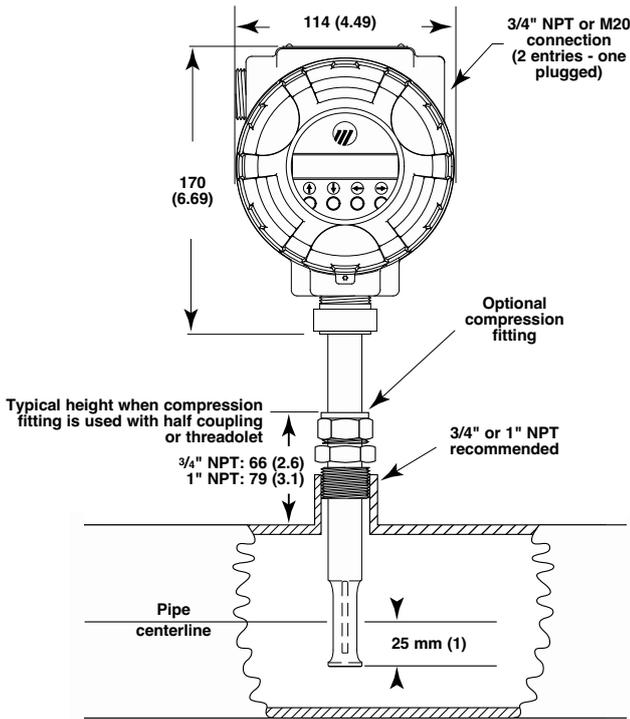


**Portable display module**

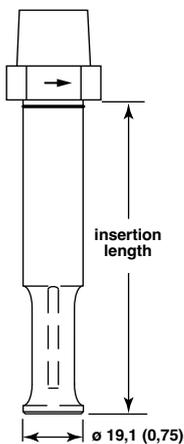
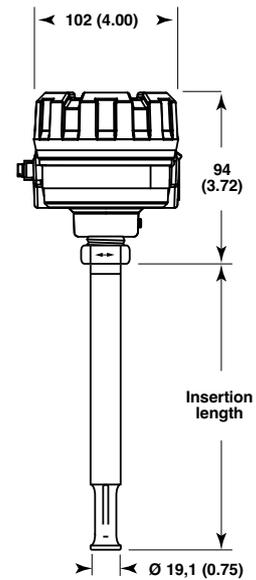
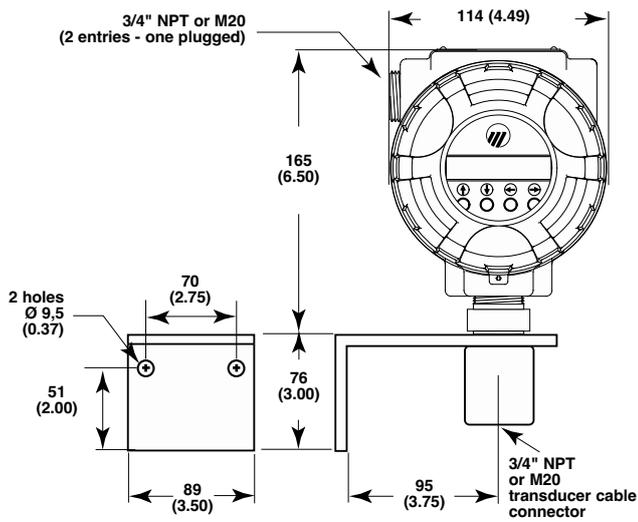
A portable display module for configuration and diagnosis of multiple units is available (code **089-5219-002**). This portable module plugs into the electronics in the same manner as the normal display and uses the same software menu. This module permits the user to reduce installation cost by having one display module with keypad for multiple TA2 units.

Usage of the display module requires that the housing cover be removed during use and thus may not be useable in hazardous areas. In these cases, the HART® option should be utilised.

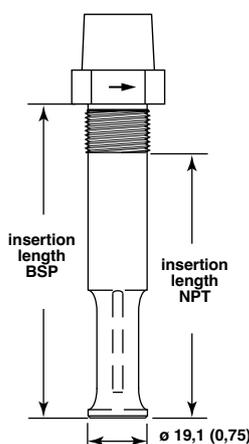
**Integral Mount TA2**



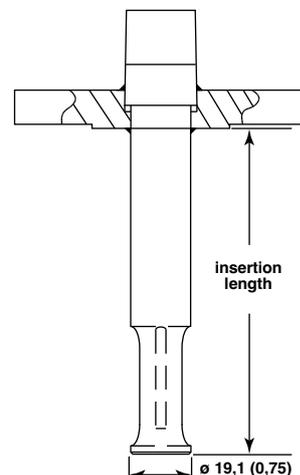
**Remote Mount TA2**



**TMR for mounting with compression fitting**

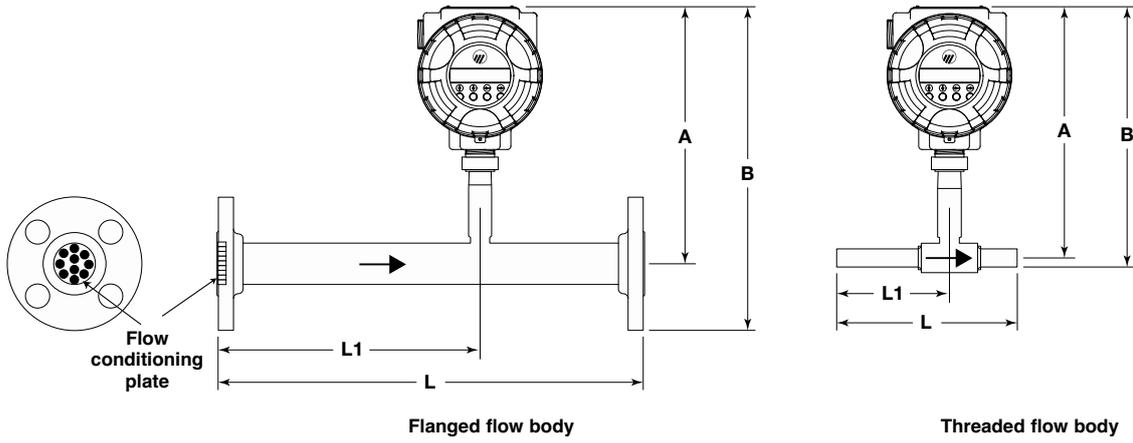


**TMR with threaded connection**



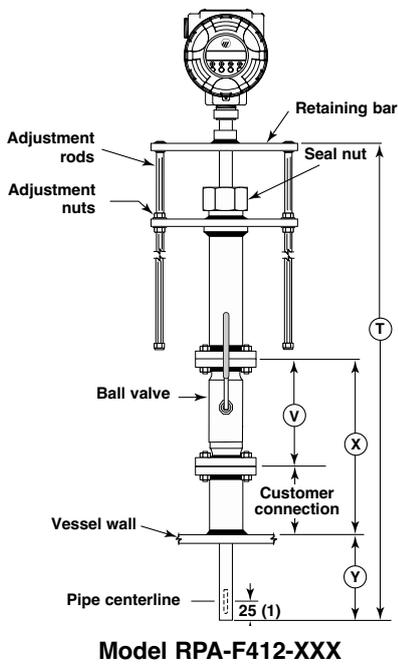
**TMR with flanged connection**

**DIMENSIONS IN mm (inches)**

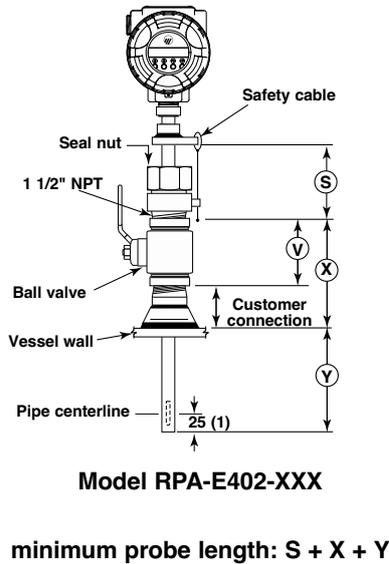


Code	Size	Length (L)		L1		Height to Centerline (A) mm (inches)	Overall Height (B)	
		With Flow Conditioning mm (inches)	Without Flow Conditioning mm (inches)	With Flow Conditioning mm (inches)	Without Flow Conditioning mm (inches)		NPT-M mm (inches)	Flange mm (inches)
0	1/2"	203 (8) <sup>①</sup>	—	127 (5) <sup>①</sup>	—	203 (8.0)	214 (8.4)	248 (9.7)
1	3/4"	286 (11.25) <sup>①</sup>	—	191 (7.5) <sup>①</sup>	—	203 (8.0)	217 (8.5)	251 (9.9)
2	1"	381 (15) <sup>①</sup>	—	254 (10) <sup>①</sup>	—	203 (8.0)	220 (8.7)	257 (10.1)
3	1 1/2"	495 (19.5)	191 (7.5)	305 (12)	95 (3.75)	211 (8.3)	235 (9.3)	274 (10.8)
4	2"	660 (26)	191 (7.5)	406 (16)	95 (3.75)	241 (9.5)	272 (10.7)	318 (12.5)
5	3"	991 (39)	254 (10)	610 (24)	127 (5)	241 (9.5)	N/A	337 (13.3)
6	4"	1321 (52)	305 (12)	914 (36)	152 (6)	241 (9.5)	N/A	356 (14.0)

<sup>①</sup> The upstream length in pipe sizes < 1 1/2" dia. is sufficient to create the flow conditioning effect without need for a flow conditioning plate.



minimum probe length:  $T = 2 (X + Y)$



minimum probe length:  $S + X + Y$

S Dimension	
Threaded connection	102 (4.00)
Flanged connection	127 (5.00)

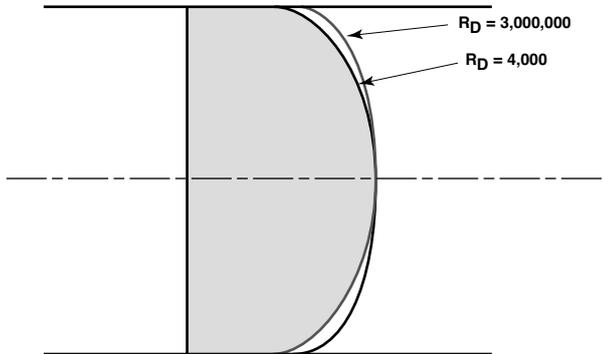
Ball Valve Dimensions*	
Size	V
1 1/2" NPT	112 (4.4)
1 1/2" 150# flange	165 (6.5)
1 1/2" 300# flange	191 (7.5)

\*Dimension of ball valve if supplied by the factory.

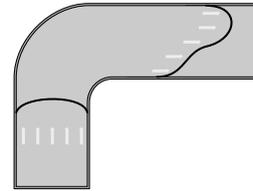
## APPENDIX A

The flow measurement of the TA2 assumes that the end of the probe is 25 mm (1") past the centreline and the presence of a fully developed flow profile. See figure A.

As gas flows in a pipe or duct, the flow profile will change with obstructions and changes in flow direction. As the gas flows around an elbow, the momentum causes the gas velocity on the outside of the elbow to increase and the velocity on the inside to decrease. See figure B.



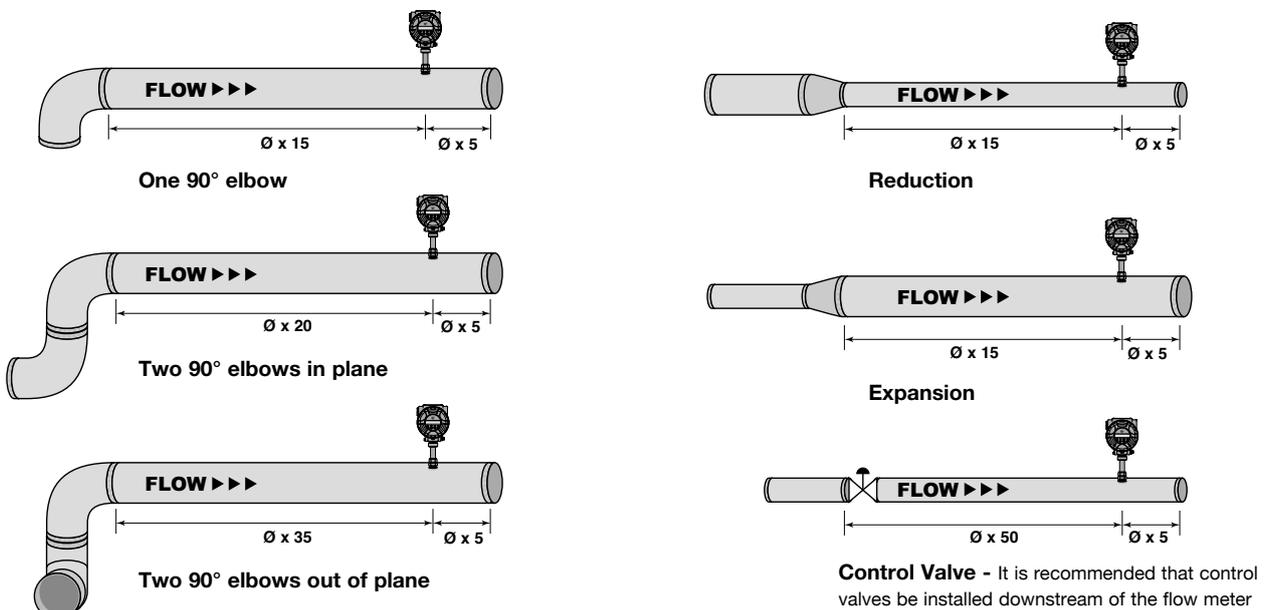
**Figure A**  
Turbulent flow profile



**Figure B**  
Flow profile following single elbow

Figure C indicates the minimum recommended straight run distances required to obtain the desired fully developed flow profile. If these straight-run distances are not available, the overall accuracy of the flow measurement will be affected; however, the repeatability of the measurement will be maintained.

The user has the ability to enter correction factors to compensate for non-ideal flow profile conditions.



**Figure C – Probe Installations**

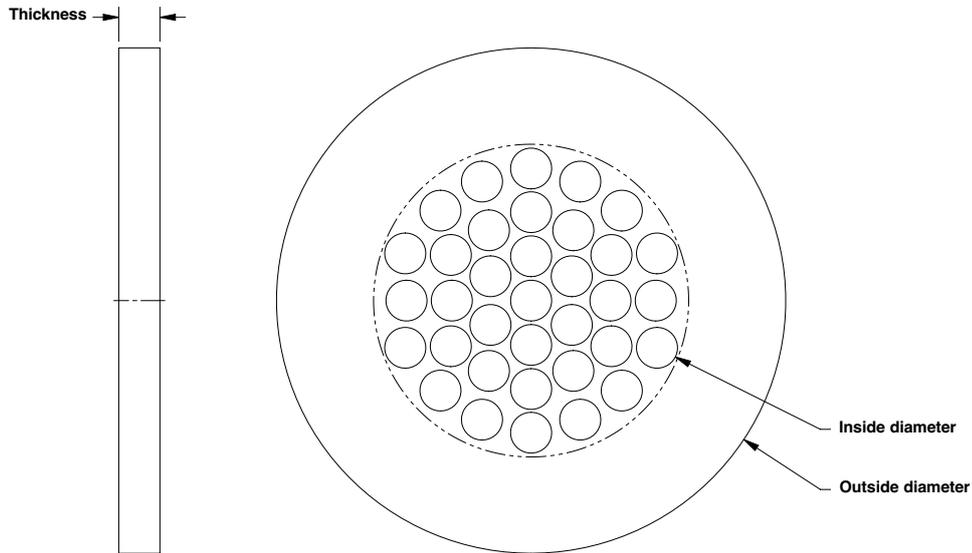
**Conditioning plates**

Flow conditioning plates may be provided in applications where limited straight run is available. Plates are available in flow body type sensor designs (TFT) from 1.5" to 4" pipes. Plates may be purchased separately for pipe sizes 4" to 12" when using insertion probes (TXR).

The plate should be installed 2-5 diameters downstream of the nearest obstruction, change in pipe inside diameter or change in flow direction. For TXR designs, the insertion probe can be installed 8 pipe diameters downstream of the

plate with 5 diameters required downstream of the TXR. For TFT designs with the plate at the entrance, the downstream is provided in the length of the TFT.

Plates are to be fitted with gaskets (customer supplied) in between flanges. If plates are not included and recommended straight run is not adhered to, the TA2 will provide repeatable measurement and the installation factors can be utilized.



Part Number	Description	OD mm (inch)	ID mm (inch)	Thickness mm (inch)
004-8986-001	4" 316 stainless steel	157,2 (6.19)	97,3 (3.83)	12,7 (0.50)
004-8986-002	4" carbon steel	157,2 (6.19)	97,3 (3.83)	12,7 (0.50)
004-8986-003	4" PVC	157,2 (6.19)	97,3 (3.83)	12,7 (0.50)
004-8986-004	5" 316 stainless steel	185,7 (7.31)	122,2 (4.81)	16 (0.63)
004-8986-005	5" carbon steel	185,7 (7.31)	122,2 (4.81)	16 (0.63)
004-8986-006	5" PVC	185,7 (7.31)	122,2 (4.81)	16 (0.63)
004-8986-007	6" 316 stainless steel	215,9 (8.50)	146,3 (5.76)	19,1 (0.75)
004-8986-008	6" carbon steel	215,9 (8.50)	146,3 (5.76)	19,1 (0.75)
004-8986-009	6" PVC	215,9 (8.50)	146,3 (5.76)	19,1 (0.75)
004-8986-010	8" 316 stainless steel	269,7 (10.62)	193,7 (7.63)	25,4 (1.00)
004-8986-011	8" carbon steel	269,7 (10.62)	193,7 (7.63)	25,4 (1.00)
004-8986-012	8" PVC	269,7 (10.62)	193,7 (7.63)	25,4 (1.00)
004-8986-013	10" 316 stainless steel	323,9 (12.75)	242,9 (9.56)	31,8 (1.25)
004-8986-014	10" carbon steel	323,9 (12.75)	242,9 (9.56)	31,8 (1.25)
004-8986-015	10" PVC	323,9 (12.75)	242,9 (9.56)	31,8 (1.25)
004-8986-016	12" 316 stainless steel	381 (15.00)	288,9 (11.37)	38,1 (1.50)
004-8986-017	12" carbon steel	381 (15.00)	288,9 (11.37)	38,1 (1.50)
004-8986-018	12" PVC	381 (15.00)	288,9 (11.37)	38,1 (1.50)

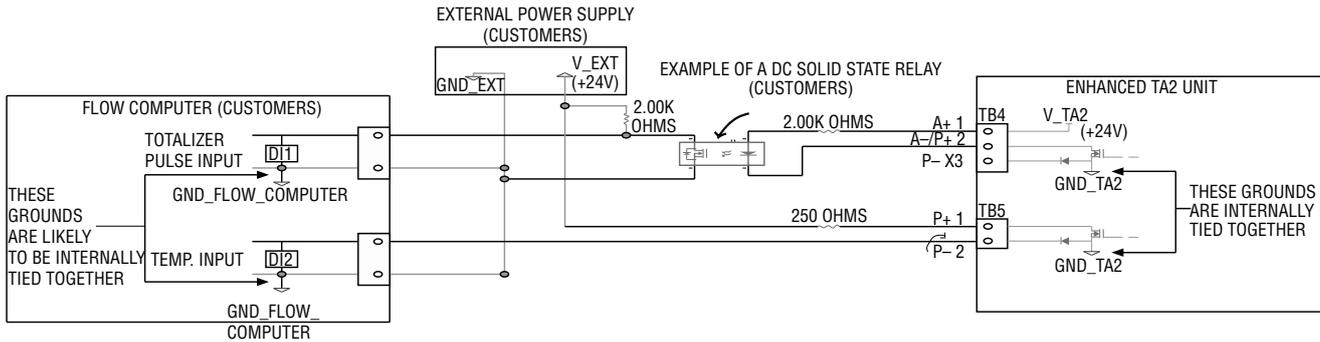
**TA2 Mass Flow Meter – Using both Pulse and 2nd mA connections**

The pulse output and second mA output (commonly used for temperature) in the TA2 share a common ground. They are isolated from the remaining input and output connections of the instrument.

A flow computer or other receiving device may have common ground for the various input signals. This may cause difficulties when using both the TA2 pulse and second mA output with an external power supply or the power supply in the flow computer. Magnetrol refers to the use of a separate power supply as a passive connection from the TA2

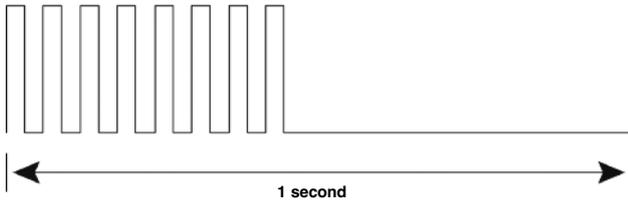
as compared to an active connection where the TA2 provides power for the output signal (sometimes referred to as self-powered).

Isolation problems may be encountered if the user wants to connect both the passive pulse output and the second mA output (always passive connection) from the TA2 to a flow computer or other input device with common grounds. The attached illustration shows a recommended solution using a solid state relay between the flow computer and the active TA2 pulse output.



**Enhanced TA2 Pulse Output**

The Enhanced TA2 has an option for providing a pulse output. The Pulse is an open collector output; the output can be either a powered (active) connection or a passive connection using an external power supply. With an active output the voltage will go from 0 to 24 VDC ( $\pm 10\%$ ) with each pulse. The voltage on the passive connection will depend on the power supply used.



One pulse will correspond to a specific amount of flow. There are several factors which need to be configured to obtain the desired operation.

**Multiplier:** The multiplier value is a factor which relates the amount of flow per pulse. For instance a factor of 0.01 with units set to  $\text{Nm}^3$  means that each pulse will correspond to  $0.01 \text{ Nm}^3$  or conversely there will be 100 pulses for every  $\text{Nm}^3$ .

**Frequency:** Represents the maximum frequency of the pulses. This is selectable from 10 to 10,000 Hz. This value should not exceed the maximum input rate of the device receiving the pulses. If the actual pulse output based on the flow measurement exceeds the maximum frequency selected a Warning Message indicating "Pulse Multiplier error" will appear on the display and be communicated over HART. The pulse width is fixed based on the value selected. For instance with a selected maximum frequency of 1,000 each pulse occur every  $1/1000$  seconds (1 ms). Each pulse is a square wave with a 50% duty cycle; half of each pulse width is on with voltage applied and half off with no voltage. This results in a pulse width of 0.0005 seconds (0.5 ms). The pulses are transmitted at a fixed rate for a fraction of a second with no pulses for the remaining time.

When configuring the frequency, calculate the pulse rate by using a Time Factor which is equivalent to the number of seconds in the time period. If flow rate is in units/minute the Time Factor = 60; if the flow rate is in units/hour the Time Factor = 3600.

The formula for determining the pulse rate is:

$$\text{Pulse rate} = \text{Flow rate} / (\text{Time Factor} * \text{multiplier})$$

Example:

Flow rate =  $200 \text{ Nm}^3/\text{h}$

Time factor = 3600

Multiplier = 0.0001 ( $0.0001 \text{ Nm}^3/\text{h}/\text{pulse}$ )

The frequency will be equal to  $200 / (3600 * 0.0001) = 555 \text{ Hz}$  and the maximum frequency can be set to either 1000 or 10,000.

# IMPORTANT

## SERVICE POLICY

Owners of Magnetrol products may request the return of a control; or, any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Magnetrol International will repair or replace the control, at no cost to the purchaser, (or owner) **other than transportation cost** if:

- a. Returned within the warranty period; and,
- b. The factory inspection finds the cause of the malfunction to be defective material or workmanship.

If the trouble is the result of conditions beyond our control; or, is **NOT** covered by the warranty, there will be charges for labour and the parts required to rebuild or replace the equipment.

In some cases, it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned, will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labour, direct or consequential damage will be allowed.

## RETURNED MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorisation" (RMA) form will be obtained from the factory. It is mandatory that this form will be attached to each material returned. This form is available through Magnetrol's local representative or by contacting the factory. Please supply the following information:

1. Purchaser Name
2. Description of Material
3. Serial Number and Ref Number
4. Desired Action
5. Reason for Return
6. Process details

Any unit that was used in a process must be properly cleaned in accordance with the proper health and safety standards applicable by the owner, before it is returned to the factory.

A material Safety Data Sheet (MSDS) must be attached at the outside of the transport crate or box.

All shipments returned to the factory must be by prepaid transportation. Magnetrol **will not accept** collect shipments.

All replacements will be shipped Ex Works.

UNDER RESERVE OF MODIFICATIONS

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SUPERSEDES: May 2015

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