Installation and Operation Manual

MODEL IT375

FIELD MOUNTED RATE INDICATOR AND TOTALIZER

SPONSLER, INC.

Flow Measuring Devices and Controls

IDEX CORPORATION

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1. INTRODUCTION

The **Model IT375** Rate Totalizer is a microprocessor-based instrument that accepts a sinewave or pulse input from Sponsler Company, Inc. Precision Turbine Flowmeters. The instrument displays 5 digits of Flowrate, 7 digits of Resettable Total and an Accumulated Total. The displayed rate and total values can be in different engineering units.

The instrument is compatible with a wide range of flowmeters. Links on the input board enable the circuit to be configured for millivolt signals, reed switches, pulse trains and most other signal types.

Although three different versions of the **Model IT375** are available, No.3 is the standard.

1. A Battery Powered Version with no outputs.
2. A DC Powered Version with either:
   i. high and low flow alarms or
   ii. a low flow alarm and pulse output.
3. A Loop Powered Version with 4-20mA output and alarms as above.

The instrument is fully programmable from the front panel; the user can program timebase, K-factors, alarm and 4-20mA setpoints, decimal placements and filter constants.

The **Model IT375** features many improvements, a few are listed below:

The output board can have both **ALARMS** and a **4-20mA OUTPUT**.
The voltage drop across the alarm outputs is only **0.8 VOLTS.**
The voltage supply for the DC and loop powered versions can go **AS LOW AS 9 VOLTS**.
Overall lower current consumption with an improved battery life - **5 YEARS BATTERY LIFE** is typical regardless of the duration of totalizing activity
4-20mA output **ACCURACY is 0.05%** of span and the **LINEARITY is 0.05%** of span at 25°C.
The millivolt input can accept signals AS LOW AS 15mVp-p.
Wide input frequency range - **0.01Hz to 10kHz.**
Wide Kfactor range - Kfactors from **0.000001 to 999,999** can be programmed.
Available in a **PANEL MOUNT** version.

The **Model IT375** Rate Indicator and Totalizer conforms to the EMC-Directive of the Council of European Communities 89/336/EEC and the following standards:

Generic Emission Standard EN 50081-1	Residential, Commercial & Light Industry Environment.
Generic Emission Standard EN 50081-2	Industrial Environment.
Generic Immunity Standard EN 50082-1	Residential, Commercial & Light Industry Environment.
Generic Immunity Standard EN 50082-2	Industrial Environment.

In order to comply with these standards, the wiring instructions in Section 9.5 must be adhered to.

1.1 MODEL NUMBER DESIGNATION

The Model Number of the **IT375** describes the power & output options installed and the mounting options.

Model IT375i . 4 0 L

Intrinsically Safe — **Linearized**

Mounting Options:
SR = Strain relief cable entry
PM = Panel Mount
WM = Wall mount
4 = Turbine Adaptor(standard)
XP = Explosion proof

Versions:
0 = Battery Powered Version
3 = DC powered with battery backup and alarm outputs
4 = Loop powered with 4-20mA output, alarm outputs and back up batteries

The above sample part number is the standard **IT375** unit.

1.2 INTRINSIC SAFETY CONSIDERATIONS

The **Model IT375i** is certified for use in hazardous areas and has both CENELEC and CSA NRTL/C approvals.

The **Model IT375i** certification details are:

CENELEC Approval:	Kema.
Type of Protection:	Ex ia.
Group:	IIB.
Temperature Class:	T4 at ambient temperature of 60°C.
CSA NRTL/C Approval	
File Number:	LR 104 840-5.
Type:	Class 1, Groups C and D.

When installing in hazardous areas, the instrument must be installed according to the guidelines in Section 8 and in accordance with standards for wiring and installation in hazardous areas.

4-20mA/DC Power:

The input can be connected to IS circuits with the following maximum values:

Ui = 28V
Ii = 93mA
Pi = 653mW

The internal capacitance and inductance seen on these terminals is 0.1uF and 0mH.

Relay Outputs:

The outputs can be connected to IS circuits with the following maximum values:

Ui = 28V
Ii = 93mA
Pi = 653mW

The internal capacitance and inductance seen on these terminals is 0.1uF and 0mH.

Flowmeter Input:

Entity parameters on the flowmeter enable connection to a wide range of approved sensors.

Input parameters are:

Ui = 24V
Ii = 20mA
Pi = 320mW

The internal capacitance and inductance seen on these terminals is 0.002uF and 0mH.

Output parameters are:

Uo = 10.0V
Io = 9.0mA

Maximum allowed external capacitance is 60µF.
Maximum allowed external inductance is 1.5H.

2. SPECIFICATION

General:

Display:	LCD which is continuously powered.
Resettable Total:	7 digits with 10mm (0.4") high digits. Resettable from front panel.
Accumulated Total:	Displayed when the ACCUM TOTAL button is depressed.
Rate:	5 digits with 8.5mm (0.33") high digits.
K-factor:	The pulses per unit of measure (eg. pulses/gallon) is programmable in the range 0.000001 to 999,999.
Decimal Points:	Decimal point positions are fully programmable for both rate and total.
Timebase:	Rate can be displayed in units per second, minute, hour or day.
Frequency Range:	0.01Hz to 10kHz.
Signal Type:	Link settable for sinewave (15mV P-P minimum), open collector, reed switch, pulse or Namur proximity switch.

Battery Powered Version:

Type:	Two lithium battery packs.
Battery Life:	5 years typical.

Loop Powered 4-20mA Output Version:

Scale:	The 4mA and 20mA points are programmable.
Resolution and Linearity:	0.05% of span.
Accuracy:	0.05% of span at 25°C. 0.1% (typ) of span, full temperature range.
Update Time:	0.5 second.
Connection:	Two-wire.
Loop Power Supply:	9-28 Volts.
Supply Backup:	Lithium battery

DC Power/Alarm Version:

Outputs:	Two optically isolated open collector outputs suitable for driving DC solenoids or external relays. The outputs can be programmed to provide high and low flow alarms or pulse output and low flow alarm.
Saturation:	.8Volts
Switching Power:	200mA. 30VDC maximum.
DC Power Input:	9-28 Volt at 4mA maximum.
Supply Backup:	Lithium battery.
Output Pulse Frequency:	500Hz Maximum
Output Pulse Duration:	1ms if CAL0 = 2 (unscaled pulse output). If CAL0 = 1 (scaled pulse output) the duration of the pulse automatically adjusts to the output frequency: a. 1ms if output > 50Hz. b. 10ms if output = 5...50Hz. c. 100ms if output < 5Hz.

Physical:

Temperature:	Operating temperature: -20°C to 60°C.
Dimensions:	97mm (3.8") high x 150mm (5.9") wide x 41mm (1.6") deep (cable glands not included).
Protection:	Sealed to Nema 4X or IP67 standards.
Cable Entry:	By cable glands.
Turbine Meter Adaptor:	An optional mounting stem is available for mounting the Model IT375 directly on turbine flowmeters which have a 1" NPT boss or 1" BSP boss.
Optional Mounting:	
Wall:	Universal mounting bracket supplied as standard.
Pipe:	A galvanized metal bracket is available which enables the Model IT375 to be attached to a 2" vertical or horizontal pipe.
Panel:	Supplied with mounting brackets. Terminals accessible from rear. **The panel mount version is not watertight.**
Cutout:	141mm (5.6") wide x 87mm (3.4" high).

3. OPERATION

The **Model IT375** Rate Indicator and Totalizer accepts a sinewave or pulse input from a wide range of flowmeters. The instrument is fully programmable with all operating parameters and calculation constants programmable from the front panel. The setup parameters are stored in a non-volatile memory and are retained for at least 40 years in the event of a power loss.

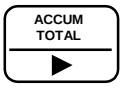
3.1 DISPLAY

The **Model IT375** displays:

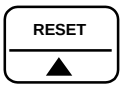
Rate
Resettable Total
Accumulated Total

Both the Rate and Resettable Total are displayed continuously. The Accumulated Total is displayed only when the **ACCUM TOTAL** key is depressed.

The keys on the front of the **IT375** have the following functions:



Depressing this key will display the Accumulated Total.



Depressing this key resets the Resettable Total at any time.

Depressing this key advances the Program Mode scroll

3.2 TEST MODE

The **IT375** has a **Test Mode** which can be entered by simultaneously depressing all 3 front panel keys. The tests and results are as follows:

Low Test — Depressing the **ACCUM TOTAL** key, the low alarm output (if installed) will go low. If a 4-20mA option is installed, the output will go to 4mA.

High Test — Depressing the **RESET** key, and depending on the programmed pulse output mode, the high alarm output (if installed):
a. will go low if CAL0 = 0 (low and high alarms)
b. will output 100ms pulses every 0.5 sec if CAL0 = 1 (scaled pulse output).
c. will output 1ms pulses every 0.5 sec if CAL0 = 2 (unscaled pulse output).
If a 4-20mA option is installed, the output will go to 20mA.

Display Test — Depressing the **PROGRAM** key, all segments of the display will flash.

To exit the **Test Mode**, simultaneously depress all three front panel keys.

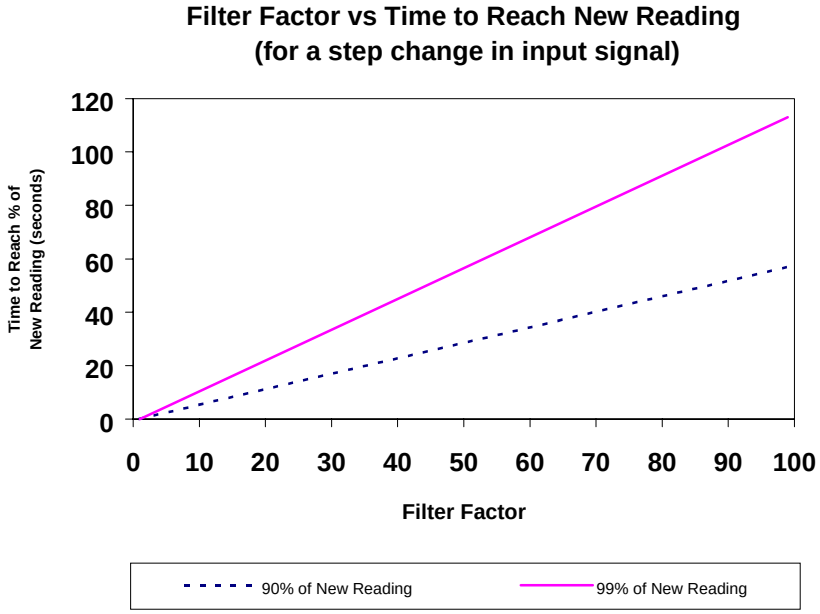
3.3 FILTERING

Frequency fluctuations caused by pulsating flow through a flowmeter can interfere with the precision of the displayed rate. For this reason, the **Model IT375** has a programmable digital filter which will average out these fluctuations and enable accurate, stable readings.

The degree of filtering of the input signal can be adjusted depending on the magnitude of fluctuation and the particular application. Values from 1 to 99 can be programmed **where 1 corresponds to no filtering and 99 corresponds to heavy filtering.** Such flexibility in filtering allows each application to be addressed on it's merits.

When programming the degree of filtering, it is advisable to start with no filtering (the factor equals 1) and gradually increase until a steady reading is obtained. It is important that the filtering is not too heavy because this will cause an overdamped (slow) response to changes in the flowrate.

The following graph shows the time to reach 90% and 99% of a new reading for a step change in input signal.



3.4 CALCULATION OF RATE

The flow rate, R, is calculated as follows:

$$R=\frac{f \times H}{K}$$

where f is the input frequency in Hz (pulses/second).
H is the timebase of rate and is 1 for seconds, 60 for minutes, 3600 for hours and 86,400 for days.
K is the Kfactor (pulses/unit volume).

The Kfactor is flowmeter dependent and is supplied with the flowmeter. It will be either on a calibration certificate or stamped on the body of the meter.

The user programs the Kfactor and selects the timebase during the programming procedure.

3.5 TOTAL CONVERSION

The Total Conversion Factor is programmed to enable the **rate** to be displayed in one engineering unit and the **totals** to be displayed in another. For example, the rate can be displayed in gallons/minute and the totals in barrels.

The Total Conversion Factor is a division factor which is used to convert the totals to a different engineering unit than the rate unit. Therefore, it only affects the totals (both resettable and accumulated).

Example:
If the Rate is required in gallons/minute:

1. The Kfactor would be programmed as pulses per gallon.
2. The Timebase would be programmed as minutes.

If the Totals are required in barrels:

1. The Total Conversion Factor is programmed as 42 because there are 42 gallons in a barrel. All totals will now totalize in barrels.

Below is a table containing common units and their corresponding Total Conversion constants:

Rate/Unit Time	**Totals**	**Total Conversion Factor**
Gallons (US)/Unit Time	Barrels (oil)	42.000
Litres/Unit Time	Kilolitres	1000
Litres/Unit Time	m^3	1000
ml/Unit Time	Litres	1000
Mgallons/Unit Time	Acre-feet	0.32587

Equivalency $\leq$ 1 rate unit $\div$ equivalency
Equivalency $\geq$ 1 rate unit $\div$ reciprocal of equivalency (1/equivalency)

3.6 FREQUENCY CUTOFF

A frequency cutoff can be programmed below which flow rate is not registered.

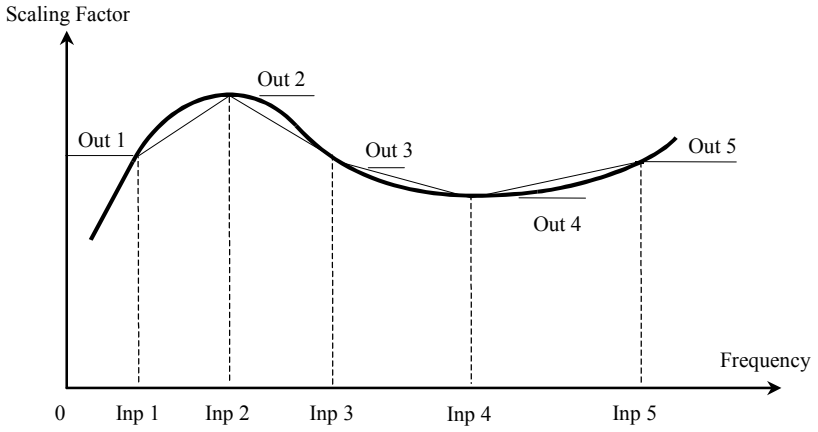
Input frequencies at or below the cutoff are totalized, however, the rate is displayed as zero.

The frequency cutoff has a default value of 0.25Hz. The cutoff should be left as 0.25Hz unless the flowmeter in use has a lower frequency.

Note that the lower a cutoff frequency the correspondingly longer response time for flow rate to update. For example, if the cutoff is set to 0.01Hz the **Model IT375** will continue to display the flow rate for 100 seconds even if the signal stops. This is because a cutoff frequency of 0.01Hz means that the time interval between signals is 100 seconds (period = 1/frequency), therefore, the **Model IT375** must wait 100 seconds before it can determine that the flow has actually stopped.

3.7 LINEARIZATION

The following diagram graphs the change in K-factor with frequency for a hypothetical flowmeter. The heavy black line represents the actual K-factor of the flowmeter, while the light black line is the approximation used in the instrument.



Up to 10 frequencies and K-factors can be programmed. Frequencies must be programmed in ascending order. Linear Interpolation is used between points. If an input frequency is less than the first (lowest) or greater than the last (highest) programmed frequency, the K-factor will remain a constant value.

Note: Display update time increases to 1sec if the linearizer is enabled in the battery powered version of the Model IT375.

4. PROGRAMMING

The **Model IT375** is fully programmable with all parameters being stored in non-volatile memory.

The **Program Mode** can be entered in one of two ways:

1. By removing the lower cover strip (ie. the dark grey strip along the bottom of the enclosure) and reversing it's left – right orientation. This brings a small magnet on the inside of the cover strip in contact with a reed switch inside the instrument.

2. By removing the front section of the enclosure which contains the main processor board and batteries.

The **PROGRAM** key is used to step through the program (CAL sequences) and the **ACCUM TOTAL** and **RESET** keys on the front panel are used to change and increment the flashing digits.
Note that only flashing digits can be changed.

Up to eighteen CAL steps are accessible depending on which options are installed. The CAL number is displayed in the lower right display and the parameter is displayed above it.

Parameters in **Program Mode** that consist of whole numbers and digits after the decimal point are restricted to a maximum of 6 digits combined. Therefore, the number of significant digits entered as whole numbers will determine the number of available digits after the decimal point.

Example:
The entry of 1, 100 and 10,000
000001 in the whole numbers leaves 5 digits available after the decimal point
000100 in the whole numbers leaves 3 digits available after the decimal point
010000 in the whole numbers leaves 1 digit available after the decimal point

4.1 PROGRAM STEPS

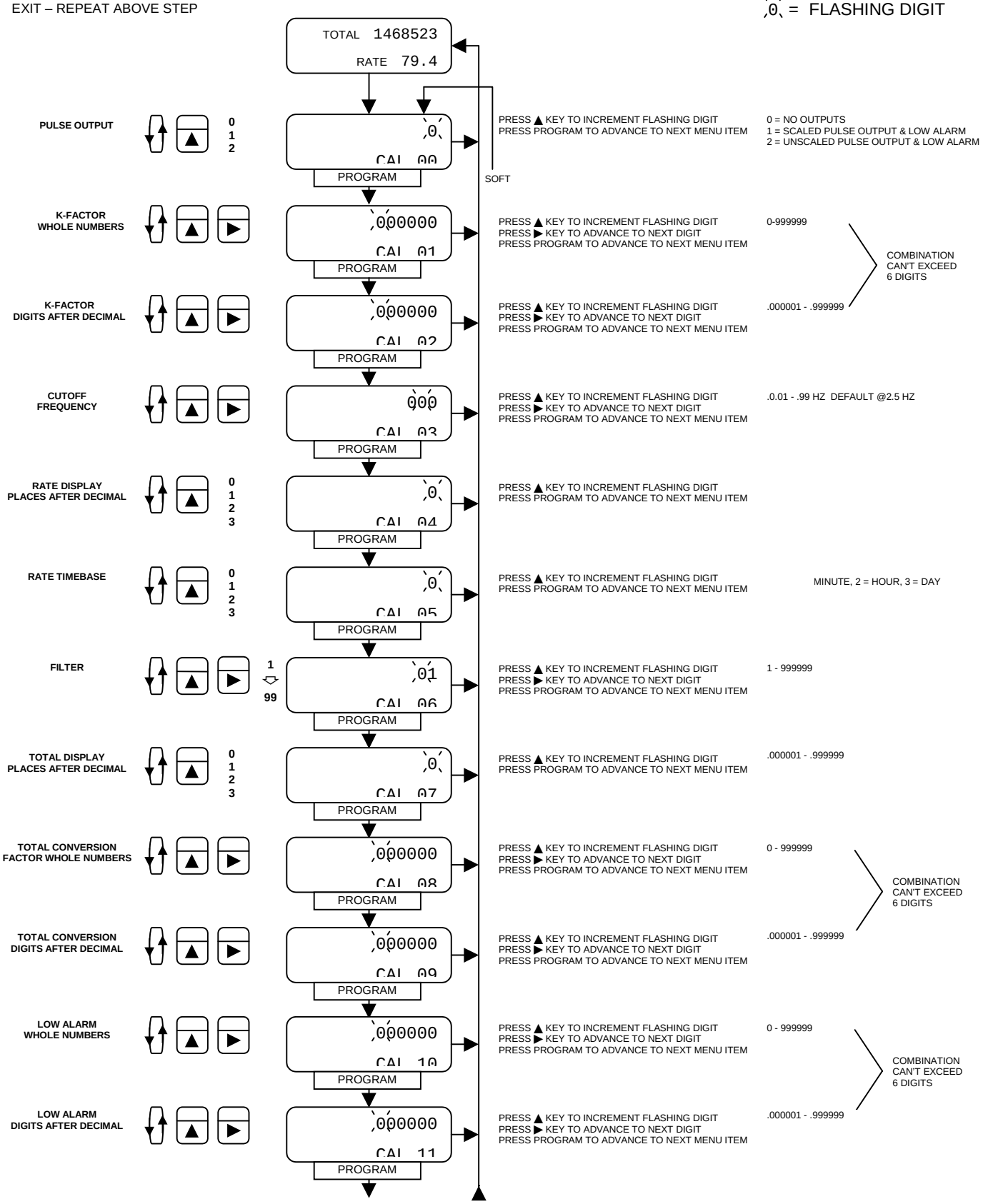
Step	Comment
CAL 00	**Pulse Output (applies to DC Power/Alarm version only).** 0 = No pulse output, low and high alarms. 1 = Scaled pulse output and low alarm. 2 = Unscaled pulse output and low alarm.
CAL 01	**Kfactor - whole numbers.**
CAL 02	**Kfactor - digits after the decimal point.** The Kfactor is the pulses per unit of measure (eg. pulses/litre, pulses/gallon, etc). The Kfactor can be programmed in the range of 0.000001 - 999,999. See Section 3.4.
CAL 03	**Cutoff Frequency.** This determines the cutoff frequency in the range of 0.01 - 0.99Hz. The default setting is 0.25HZ. **Note that care must be taken when programming this value because a low value may cause a slow update time.**
CAL 04	**Decimal Point for Rate Display.** The flow rate can be displayed with 0, 1, 2 or 3 places after the decimal point.
CAL 05	**Timebase for Rate.** The rate can be displayed in units per second, minute, hour or day. 0 = second 1 = minute 2 = hour 3 = day
CAL 06	**Filter.** The filter constant for filtering the input signal. 1 No filtering. to 99 Very heavy filtering.
CAL 07	**Decimal Point for Total Display.** The totals can be displayed with 0, 1, 2 or 3 places after the decimal point.
CAL 08	**Total Conversion Factor - whole numbers.**
CAL 09	**Total Conversion Factor - digits after the decimal point.**
CAL 10	**Low Alarm - whole numbers.**
CAL 11	**Low Alarm - digits after the decimal point.**

Step	Comment
	CAL 10 & 11 program the flow rate below which the low alarm relay will close. The value can be programmed in the range 0 to 999,999.
CAL 12	**High Alarm or Pulse Output Factor - whole numbers.**
CAL 13	**High Alarm or Pulse Output Factor - digits after the decimal point.**
	CAL 12 & 13 program the flow rate above which the high alarm relay will close. The value can be programmed in the range 0 to 999,999. If the scaled pulse output is selected (CAL0 = 1), then the value will represent the total per pulse, eg. 5 liters per pulse.
CAL 14	**4mA Setpoint- whole numbers.**
CAL 15	**4mA Setpoint- digits after the decimal point.**
	CAL 14 to CAL 15 represent the flow rate at which 4mA will be output. If the 4-20mA output is not installed, these parameters can be ignored.
CAL 16	**20mA Setpoint- whole numbers.**
CAL 17	**20mA Setpoint- digits after the decimal point.**
	CAL 16 & 17 represent the flow rate at which 20mA will be output. If the 4-20mA output is not installed, these parameters can be ignored.
CAL 18	**Number of linearization points.** 00 = linearizer disabled xx = number of points
INP 01	**Point #1 Frequency – whole numbers.** Input points must be programmed in ascending frequency order
INP.01	**Point #1 Frequency – digits after the decicmal**
OUT 01	**Point #1 Kfactor – whole numbers.** Kfactors can never be zero
OUT.01	**Point #1 Kfactor – digits after the decimal.**
SOFT	**Software Version.**

PROGRAMMING

INITIATE – REMOVE & REVERSE BOTTOM STRIP
EXIT – REPEAT ABOVE STEP

`0` = FLASHING DIGIT



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`0` = FLASHING DIGIT

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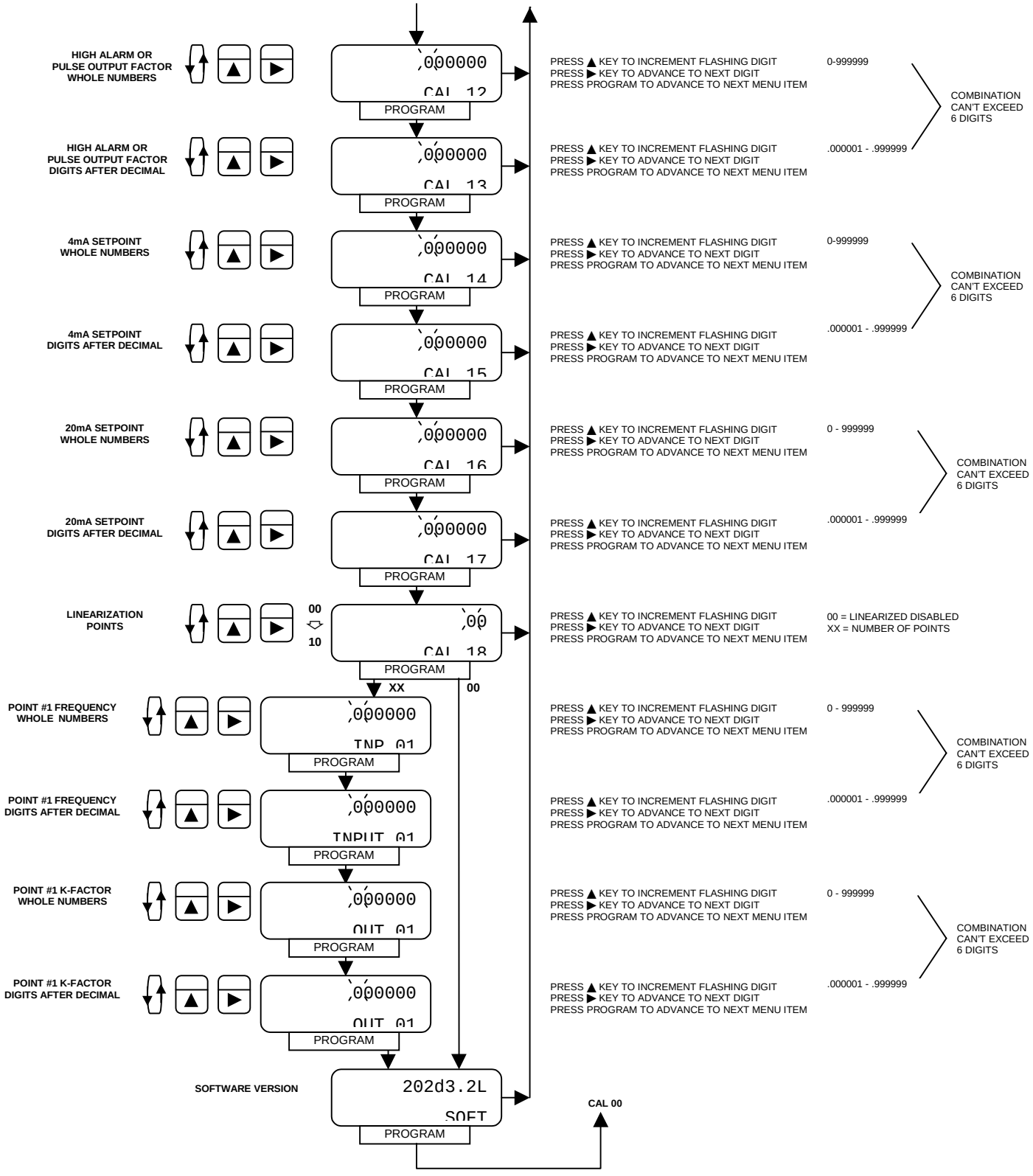


5. EXAMPLE

A typical 2 inch liquid flowmeter has an operating range of 15 – 225 gpm and produces 148.914 pulses per gallon with a maximum output frequency of 563Hz. 3 points of linearization is required. The flow rate is displayed in gallons/min with 1 decimal point and the total in liters with no decimals. A 4-20mA output is installed and 4mA is to represent 15 gallons/min and 20mA is to represent 225 gallons/min The instrument is then programmed as follows:

Calibration mode is entered by removing the lower cover strip (ie. the dark grey strip along the bottom of the enclosure) and reversing it's left right orientation.

The following values are then entered:

Step	Value of Parameter	Description
CAL00	0	No Pulse Output
CAL01	000148	Kfactor (whole numbers)
CAL02	914	Kfactor (decimals)
CAL03	0.25	Cutoff Frequency
CAL04	1	Rate decimal position
CAL05	1	Timebase
CAL06	01	Filter disabled
CAL07	0	Total decimal position
CAL08	000000	Total Conversion (whole numbers)
CAL09	264201	Total Conversion (decimals) (1/3.785)
CAL10	000015	Low Alarm (whole numbers)
CAL11	0000	Low Alarm (decimals)
CAL12	000225	High Alarm (whole numbers)
CAL13	000	High Alarm (decimals)
CAL14	000015	4mA Output (whole numbers)
CAL15	0000	4mA Output (decimals)
CAL16	000225	20mA Output (whole numbers)
CAL17	000	20mA Output (decimals)
CAL18	3	3 point linearization
INP 01	000037	Point #01 frequency (whole numbers)
INP.01	0746	Point #01 frequency (decimals)
OUT 01	000148	Point #01 Kfactor (whole numbers)
OUT.01	085	Point #01 Kfactor (decimals)
INP 02	000268	Point #02 frequency (whole numbers)
INP.02	338	Point #02 frequency (decimals)
OUT 02	000148	Point #02 Kfactor (whole numbers)
OUT.02	073	Point #02 Kfactor (decimals)
INP 03	000563	Point #03 frequency (whole numbers)
INP.03	061	Point #03 frequency (decimals)
OUT 03	000148	Point #03 Kfactor (whole numbers)
OUT.03	080	Point #03 Kfactor (decimals)
SOFT	202d3.2L	Software Version

6. VERSIONS

This table summarizes features of each of the different **Model IT375** versions:

Model Number	**IT375i.X0L**	**IT375i.X3L**	**IT375i.X4L**
Version	Battery powered	DC powered	Loop powered
Power	Lithium batteries	DC powered; 9-28Volts at 4mA maximum	Loop powered; 9-28 Volts with 4-20mA out
Output	None	Alarms - two open collector outputs OR Pulse output and low flow alarm	
Supply Backup	None	Lithium batteries	Lithium batteries

The standard unit is intrinsically safe (i), turbine mounted (4), battery powered (0) and linearized (L)
IT375i.40L

X denotes the mounting options, insert the corresponding number for the preferred option:

SR Strain relief cable entry
PM Panel mount
WM Wall mount (standard)
4 Turbine adaptor
EX Explosion proof

6.1 BATTERY POWERED VERSION

The battery powered version of the **Model IT375** is designed for operation in the field without external power sources. Lithium batteries provide sufficient power to operate the instrument for up to 5 years and the operator is warned of a low power condition by a message on the LCD display.

New batteries can be purchased via Sponsler Company, Inc. or our distributors and replaced in the field without compromising the IS approvals. **There are two battery packs in each instrument and care must be taken to replace only one pack at a time so that there is always power connected to the memory. Failure to do this may result in loss of totals.**

6.2 DC POWER VERSION

The DC power version will operate from an external power source between 9-28VDC and draws no more than 4mA. This enables the instrument to be powered from AC mains with DC adaptors and eliminates the need to run separate DC voltages in the field.

The instrument uses lithium batteries for backup if the DC power is interrupted. **However, alarms and/or pulse outputs are disabled if the DC power is interrupted.**

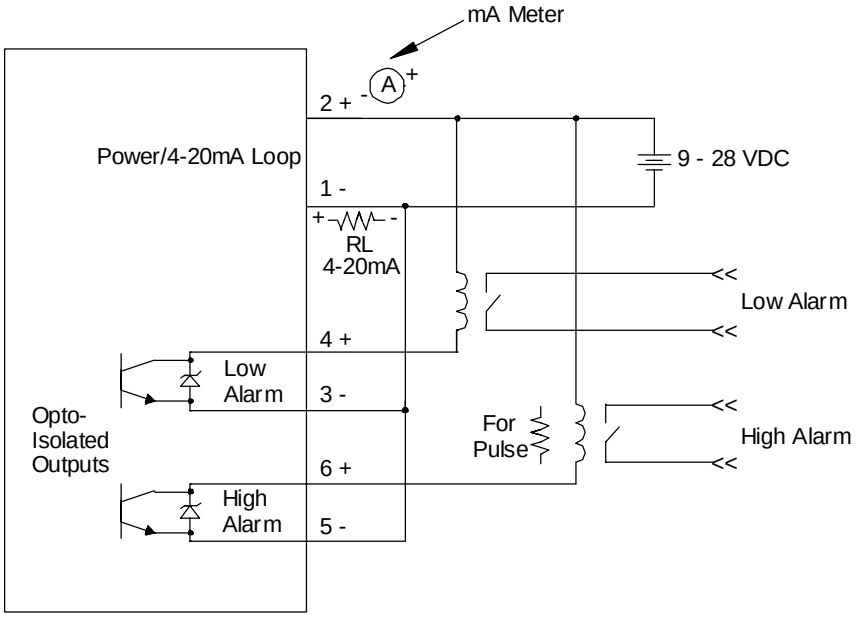
Open collector outputs are also provided for high and low flow rate alarms. If a pulse output is programmed, terminals 5(-) and 6(+) will act as a pulse out. The output can sink up to 200mA and can be used to control external relays, lights or audible alarms. The outputs are internally protected against inductive voltage spikes caused by relay coils etc. Both outputs are independent and optically isolated.

The alarm setpoints can be programmed. The low flow alarm will switch on whenever the flow rate drops below the programmed low flow rate setpoint. Similarly, the high alarm switches on whenever the flow exceeds the high flow rate setpoint.

If a scaled pulse output is programmed, a pulse will be output every preset value of the **total**. For example, if the total is in liters, then programming 5 will output one pulse every 5 liters. If an unscaled pulse output is programmed, output pulses will occur at the flowmeter input frequency.

Specification for Alarm Outputs

Maximum Current):	200mA. (sink)
Maximum Voltage:	30Vdc.
Saturation Voltage:	0.8Vdc across outputs when in the "on" state.
Isolation:	Both outputs are separately isolated.
Pulse Frequency:	500Hz maximum.
Pulse Duration:	1ms if CAL0 = 2 (unscaled pulse output). If CAL0 = 1 (scaled pulse output) the duration of the pulse automatically adjusts to the output frequency: a. 1ms if output > 50Hz. b. 10ms if output = 5...50Hz. c. 100ms if output < 5Hz.



6.3 RELAY AND 4-20mA OUTPUT VERSION

This version combines features of the DC powered with a 4-20mA output.

The 4-20mA output provides a two-wire retransmission of the flow rate. Both the 4mA and 20mA setpoints are fully programmable so that the output can span either the entire operating range or only a portion.

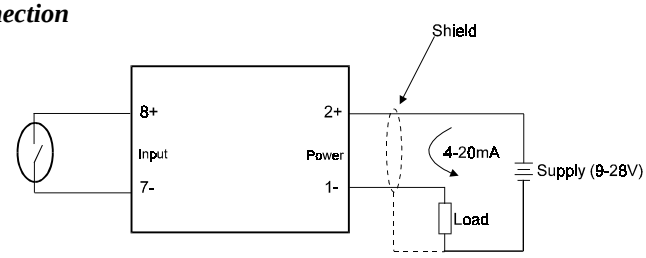
The instrument draws its operating power from the 4-20mA loop and uses the internal lithium batteries for backup if the 4-20mA loop is interrupted. The alarm/pulse outputs are disabled if the 4-20mA loop is interrupted.

Specifications:

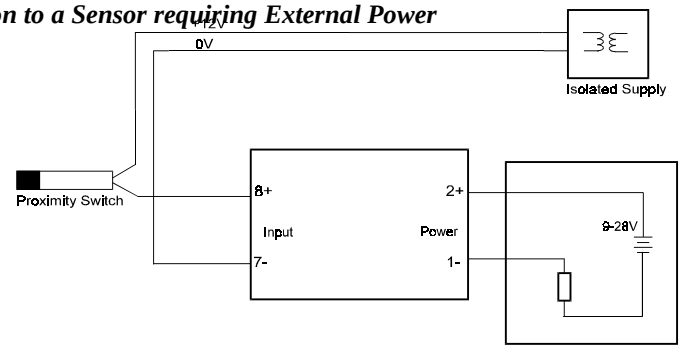
Resolution and Linearity:	0.05% of span.
Accuracy:	0.05% of span at 25°C.
	0.1% (typ) of span, full temperature range.
Response (4-20mA):	0.5 second.
Loop Power Supply:	9-28 Volts.

Since the 4-20mA output is designed to provide power to the **Model IT375**, it is not isolated from the input. Hence, all sensors **must** be self-powering (such as reed switches and coils). If external power is required to power the sensor (eg. Namur switches, Hall effect sensors or opto-sensors), the power supply delivering the external power must be isolated from the 4-20mA loop supply.

Typical Connection



Connection to a Sensor requiring External Power



7. FLOWMETER INPUT

The **Model IT375** has an input conditioning circuit which will accept signals from most **sinewave** or **pulse** producing flowmeters. Links on the rear panel enable the input circuit to be configured for different signal types.

The input will interface directly to:

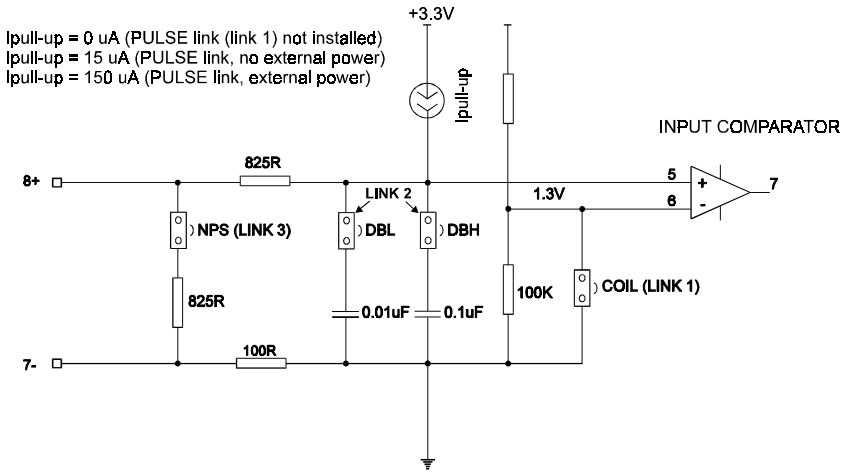
Turbine flowmeters.
Open collector outputs.
Reed switches.
Logic signals.
Two-wire proximity switches.

The following pages give examples of interfacing to various signal inputs. A circuit diagram of the input is also provided.

For pulse or logic type signals, the input switching threshold is 1.3 volts. That is, the input signal must have a "low" voltage of less than 1.2 volts and a "high" voltage of greater than 1.4 volts.

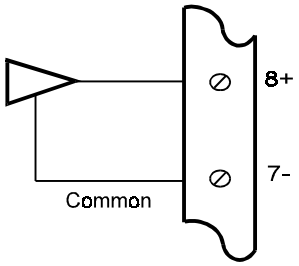
For flowmeters with reluctance type coils, the minimum input voltage is 15mVp-p

All inputs are protected for overvoltage up to 28 volts.

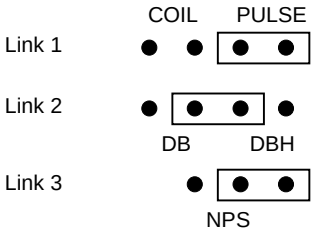


SIMPLIFIED FREQUENCY INPUT CIRCUIT

1. Squarewave, CMOS or Pulse



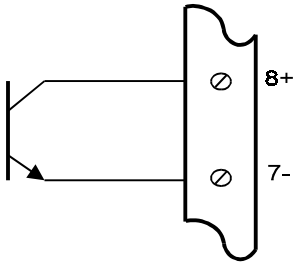
Link Settings



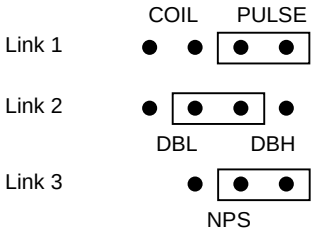
Switching threshold voltage is 1.3 volts.

2. Open Collector

With 15µA/150µA internal pull up current

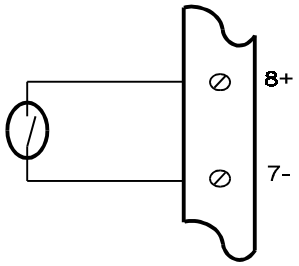


Link Settings

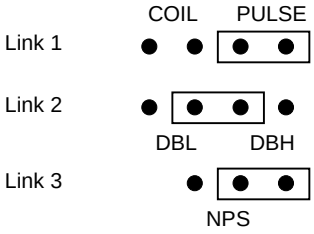


3. Reed Switch - Battery Powered

With 15µA internal pull up current



Link Settings

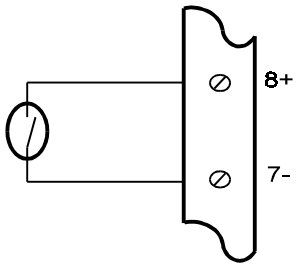


eg. Positive displacement flowmeters
with reed switch outputs.

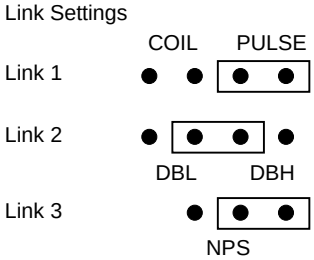
Note: For a switch or reed input with contact bounce link DBL can be switched "on". This will eliminate the effect of switch bounce while limiting the input frequency to 200Hz.

4. Reed Switch - External DC Power

With 150µA internal pull up current

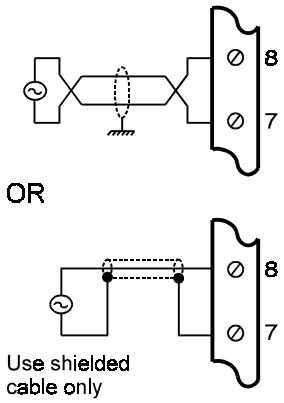


Link Settings

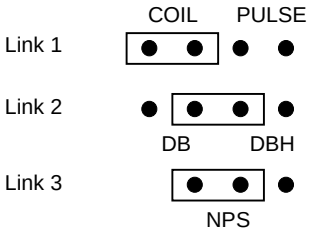


Note: For a switch or reed input with contact bounce link DBH can be switched "on". This will eliminate the effect of switch bounce while limiting the input frequency to 200Hz.

5. Coils



Link Settings

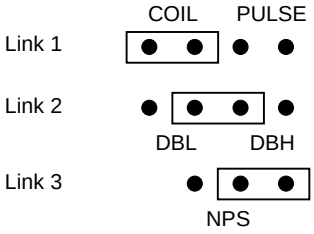


825R input impedance

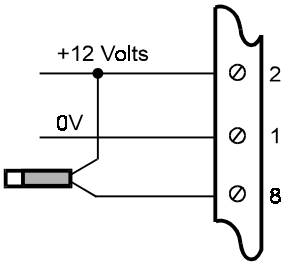
eg. Millivolt signal from paddlewheel or turbine (15mV P-P minimum).

Note: If the input has a very high impedance, the following link settings should be used:

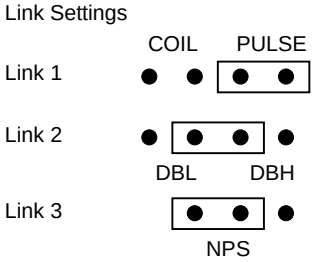
Link Settings



6. Namur Proximity Switch



Link Settings

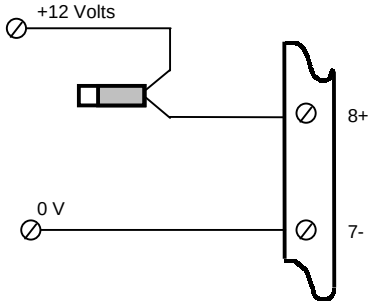


825R input impedance

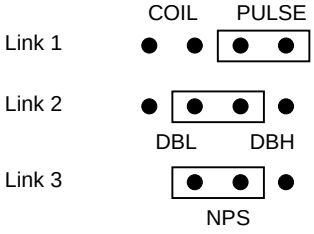
For IS connections of Namur switches see Section 8.

Note: If a 4-20mA output is installed, the supply to the proximity switch must be isolated.

7. Namur Proximity Swith – External DC Power



Link Settings



825R input impedance

For IS connections of Namur switches see Section 8.

Note: Use this connection for battery or loop powered versions of the Model IT375.
If a 4-20mA output is installed, the supply to the proximity switch must be isolated.

8. INTRINSIC SAFETY CONNECTIONS

When installing the **Model IT375** in hazardous areas, the wiring and installation must comply with appropriate installation standards.

The approval uses entity parameters on the input for connections to the flowmeter and associated apparatus type approval for the 4-20mA output. The 4-20mA output must, therefore, only be connected to barriers with the specified safety parameters as shown on the following page.

8.1 COILS

The **Model IT375** will connect directly to a turbine flowmeter or paddlewheel with a certified Intrinsically Safe (IS) coil or other certified IS sensor which produce a pulse input provided they do not exceed the following input parameters:

Ui = 24V
Ii = 20mA
Pi = 320mW

The maximum allowed capacitance and inductance of the pulse or coil including the cabling is:

Cext = 60µF
Lext = 1.5H

The internal capacitance and inductance of the **Model IT375** seen on the input are negligibly small with Ci = 0.002uF and Li = 0mH. The maximum voltage and current produced by the **Model IT375** on its inputs (terminals 1 to 4) are:

Uo = 10.0V (open circuit)
Io = 9.0mA (short circuit)

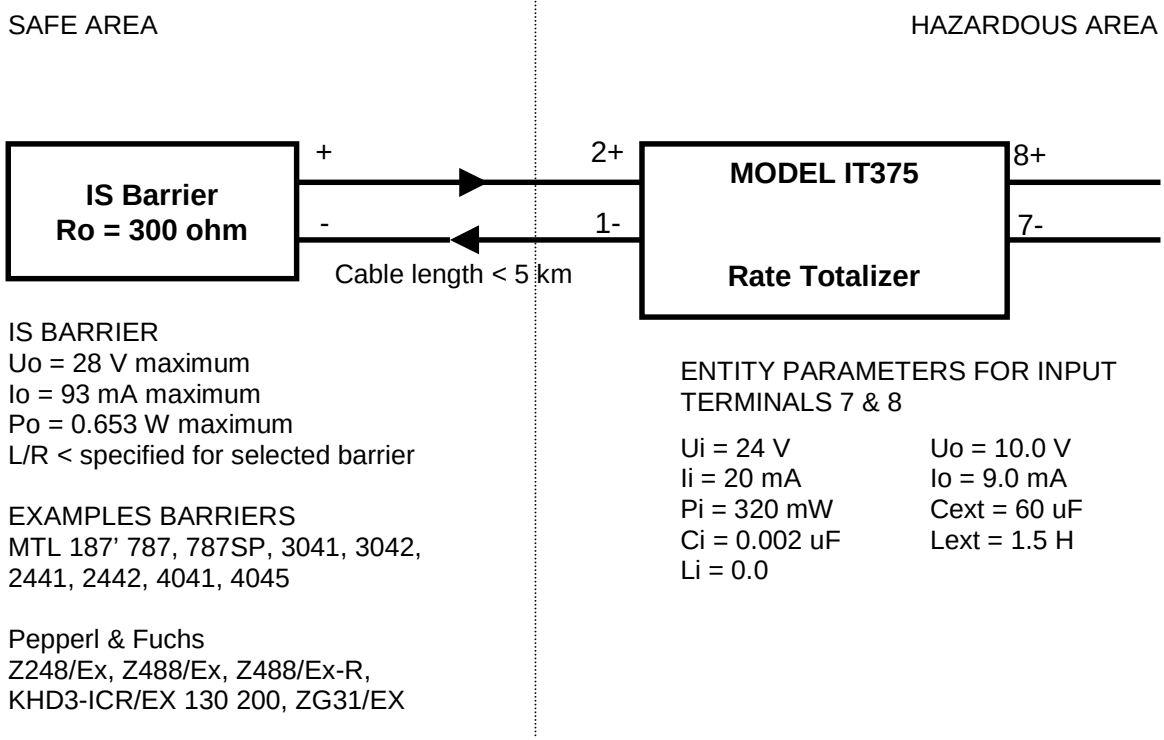
8.2 SIMPLE APPARATUS

Devices such as reed switches which can be classed as "simple apparatus", as defined in the CENELEC standards EN50020, can be connected to the Model IT375 without certification.

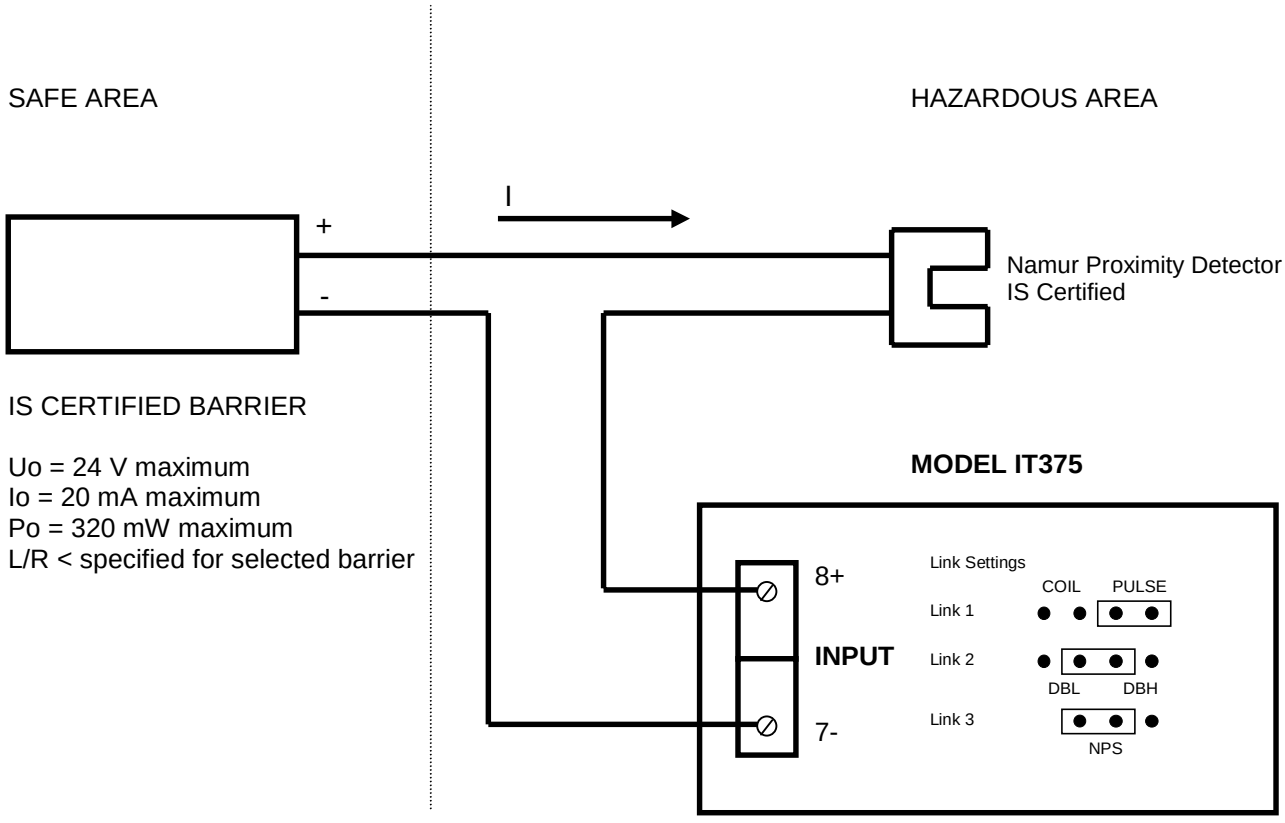
8.3 NAMUR PROXIMITY SWITCHES

Connection to certified Namur proximity switches is permitted as shown on the following page with the following maximum input parameters:

Ui = 24V
Ii = 20mA
Pi = 320mW



Input Parameters
And 4-20mA Retransmission



A Namur Switch Input

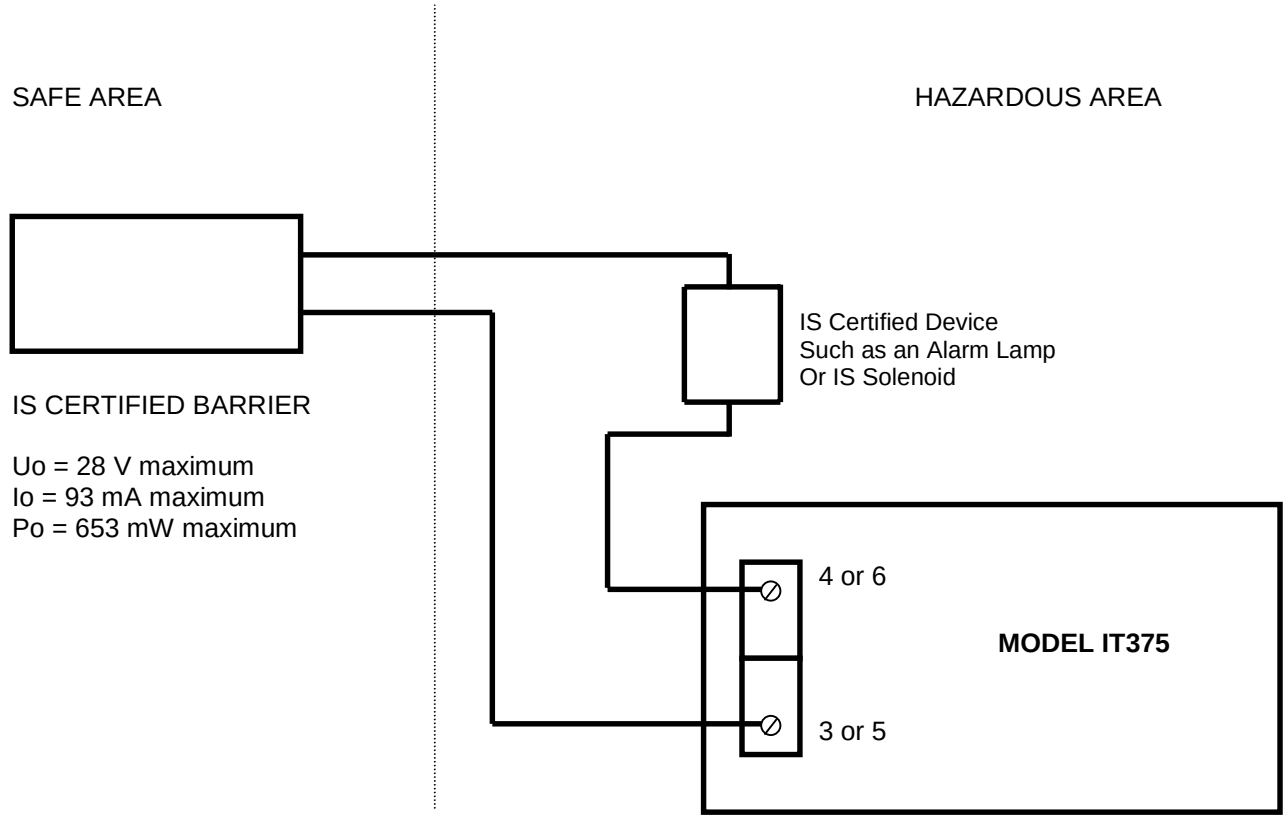
8.4 ALARM OUTPUTS

The low alarm and high alarm/pulse output can be connected to suitably certified devices provided the circuit is protected with a barrier with the maximum safety parameters:

Uo = 28V
Io = 93mA
Pmax = 0.653W

The input capacitance on these terminals is 0.1uF max and the inductance is negligible.

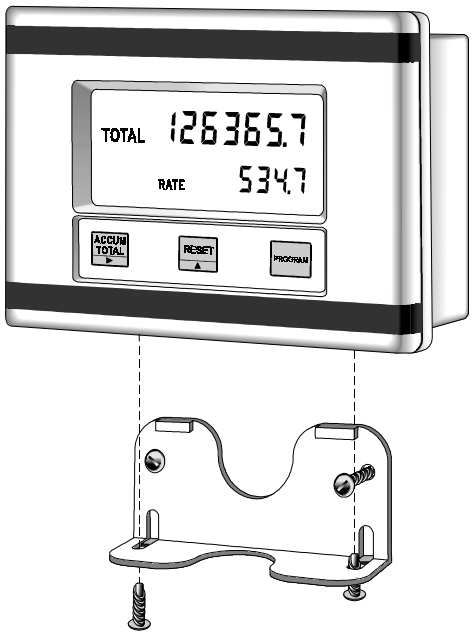
Note: The two alarm outputs must be kept as independent IS circuits and each protected with their own barrier. It is not permissible to connect these circuits via a common barrier.



9. INSTALLATION

9.1 WALL MOUNTING

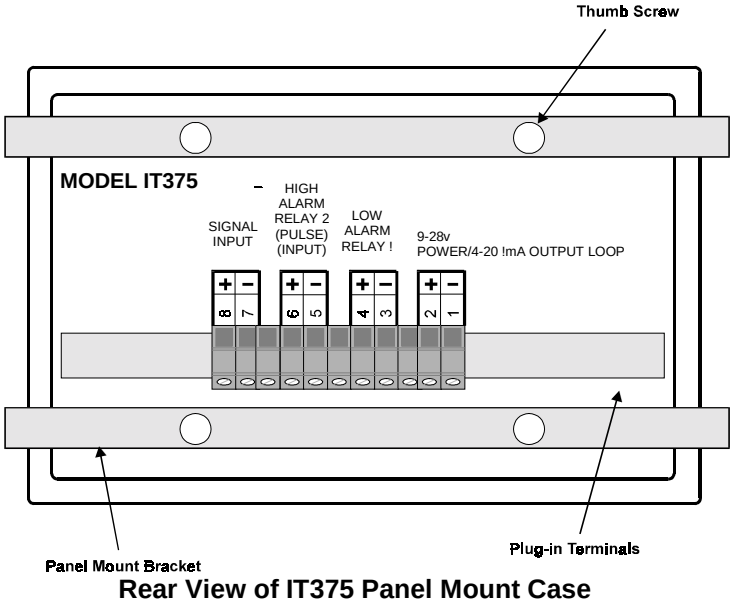
A wall mounting bracket is supplied with each instrument. Round head screws should be used to attach the bracket to the wall (countersunk screws should not be used). The bracket is mounted first with the tray section at the bottom. The instrument is then mounted on the bracket with two screws as shown below.



9.2 PANEL MOUNT VERSION

The panel mount version of the **Model IT375** is supplied with two panel mount brackets and plug-in terminals which are accessible from the rear of the instrument.

A diagram of the rear panel is shown below:



Rear View of IT375 Panel Mount Case

The cutout for the panel mount version is 141mm (5.55") wide x 87mm (3.43") high.

9.3 REMOVING THE FRONT PANEL

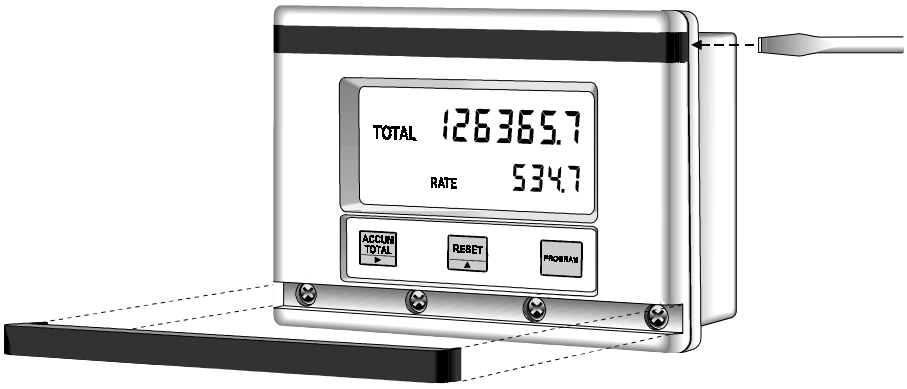
The front panel should be removed as follows:

1. Remove the top and bottom cover strips (ie. the dark plastic strip) by levering a screwdriver under one end.
2. Undo the screws retaining the front. Do not remove the screws, they are retained by O-rings.
3. Remove the front panel from the housing.

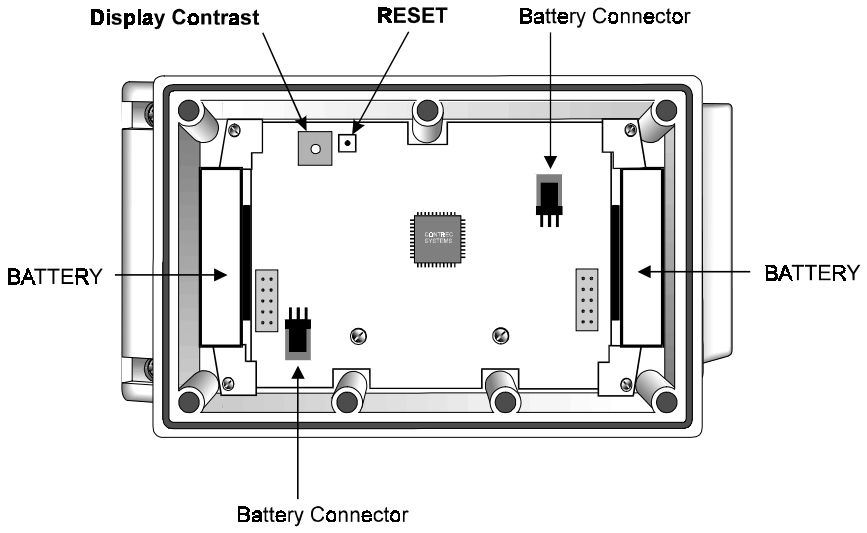
To replace the front cover, reverse the above procedure. Ensure that the front panel is aligned at connector points before tightening the screws.

9.4 THE MAIN ELECTRONICS

The front section of the housing contains the microprocessor and display. It is possible to adjust the display contrast via a small potentiometer on the board. The **Display Contrast** is shown below and this can be adjusted for optimum contrast and clarity.



Adjacent to this control is a **RESET** switch which can be used to reset the microprocessor.
Note: Depressing the **RESET** switch will reset all totals to zero.



9.5 WIRING

When connecting the **IT375** it is good practice to use shielded cable. The shield should be connected to earth at one end of the cable. The other end of the shield should not be connected.

This wiring practice is mandatory in order to comply with the requirements for Electromagnetic Compatibility as per EMC-Directive 89/336/EEC of the Council of the European Community.

9.6 TERMINAL DESIGNATIONS

All versions
8 Pulse (+) / Coil Input
7 Pulse (-) / Coil Input

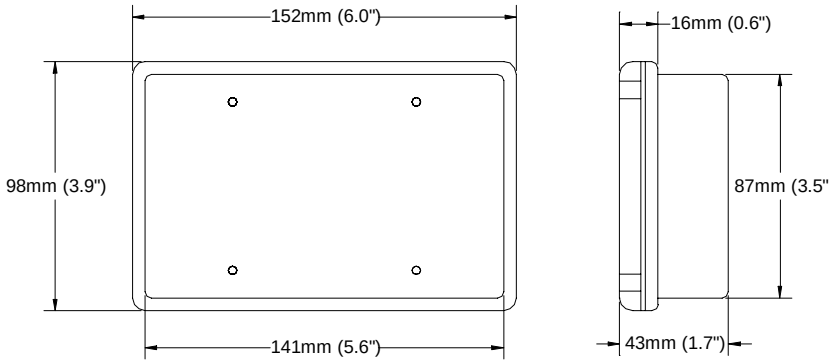
4-20mA and DC Versions
6 High Alarm (+) or Pulse Output (+)
5 High Alarm (-) or Pulse Output (-)

4 Low Alarm (+)
3 Low Alarm (-)

4-20mA Output Version
2 4-20mA (+)
1 4-20mA (-)

DC Power Version
2 DC Power (+) +9 to 28V
1 DC Power (-) 0V

Dimensional Drawing



Terminal Descriptions

All Versions	
No.	
7	Signal Input (-)
8	Signal Input (+)

4-20mA or DC Versions	
No.	
11	4-20mA (-) or OVdc In
2	4-20mA (+) or +9-28Vdc In
3	Low Alarm (-)
4	Low Alarm (+)
5	High Alarm (-) or Pulse (-)
6	High Alarm (+) or Pulse (+)

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