

**Instromet<sup>®</sup>**

# ELECTRONIC VOLUME CORRECTOR MODEL 555



The Instromet Model 555 Electronic Volume Corrector is a high performance low power volume corrector. Advanced technology allows the user to configure the corrector to the operating requirements.

## GENERAL

The 555 Electronic Volume Corrector is designed to correct the uncorrected volume derived from a gas meter to corrected volume using active inputs for pressure and temperature. The corrector is a low power microprocessor based unit which can be wall or meter mounted.

It is powered from a standard replaceable lithium battery housed in a removable battery unit. An internal lithium battery provides data retention during battery changes.

The corrector is approved as intrinsically safe and can be located in either the hazardous area or the safe area. Optional accessories are available to provide interfaces with the hazardous area and the safe area.

The gas compressibility is calculated by the corrector in accordance with the European GERG standard or the American Gas Association (AGA) Report No.8 Gross Characterisation Method using values of heating



value, molar percentage carbon dioxide, relative density and the gas temperature and pressure. Alternatively a fixed compressibility factor can be used.

The pressure sensor is characterised for both linearity and ambient temperature effects to give maximum accuracy in volume measurement over a wide pressure

and temperature range. The characterisation constants are stored within the pressure sensor to allow it to be changed without the need for calibration. The temperature sensor is a platinum resistance element characterised within the software of the corrector.

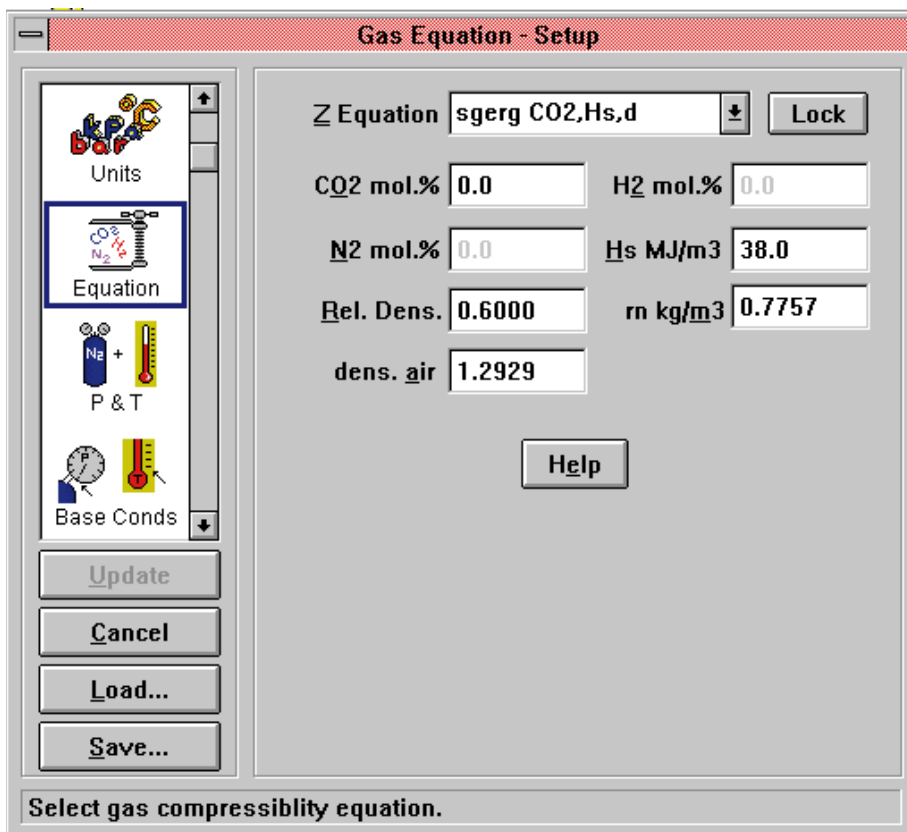
The corrector can be supplied to operate in either units of bar.a, Kpa or Kg/cm<sup>2</sup> and °C or °K for pressure and temperature. Pressure is measured with an absolute pressure sensor.

The display is an alpha numeric LCD type which can be user configured to display any of the required operating parameters, stored parameters and alarm and error conditions. The display is blanked after a selected period to conserve battery power.

The Model 555 has a logging capability enabling parameters to be logged at intervals of one hour; a minimum of 3600 logs can be stored, which approximates to 37 days of hourly readings of four parameters with the time and date of the log.

Data can be accessed through the serial port.

The corrector is housed in an polyester coated aluminium enclosure with silicone rubber seals and is weatherproof to IEC.144:IP66.



## INSTROMET MODEL 555 CORRECTORS' FEATURES

### User configurable

All display and logging functions are selected by the user. Units, base conditions, alarms and outputs are configurable

### Display

An alphanumeric LCD display user configurable to show parameter values with identifying legend.

### Very High Operating Accuracy

Very high accuracy over a pressure range of eight to one and a temperature range of -30° to +60°C.

### Battery Powered

Lithium battery powered by a replaceable battery giving an operating battery life in excess of five years.

### Intrinsically Safe Approval

Intrinsically safe approval allows safe operations in a hazardous gas environment. (CENELEC 50 020 to EEx ia II AT4; BS 5501: Part 7:1977 and BASEEFA No. Ex 97 D2270).

### Calibration

Electronic calibration capability using only two points as sensors are fully characterised for temperature and linearity. Optionally a single point calibration is available for use in field conditions.

### Serial Communications

A serial port for communications remote use is built in.

## INPUT SIGNALS

The Model 555 corrector accepts inputs from gas meters equipped with a low frequency (LF) pulse output (voltage free contacts, transistor or mosfet) with a maximum frequency of 1 Hz. One input pulse defines the quantity of gas from the meter which can be scaled by the uncorrected volume factor giving the quantity of gas indicated on the display.

## PRESSURE INPUT

The pressure is measured by a strain gauge diaphragm pressure sensor mounted internally in the corrector. The sensor is fully characterised for ambient temperature effects and linearity. Constants are stored within the sensor allowing interchangeability without recalibration. Available with the following pressure ranges:-

0-2 bar.a  
0-3.5 bar.a  
0-5 bar.a  
0-7 bar.a  
0-10 bar.a  
0-17 bar.a

The maximum overload pressure is 1.25 times the maximum working range of the sensor. The pressure connection is a 1/4" NPT female threaded stainless steel connector. All wetted parts are stainless steel.

## TEMPERATURE INPUT

The temperature sensor is a platinum resistance element with a nominal resistance of 100 ohms embedded in a stainless steel probe with a maximum pressure rating of 100 bar. The standard probe has 3 meters of stainless steel flexible sheath attached. The gas temperature range is -30°C to +60°C

## DISPLAY

The 2 line by 16 character alpha numeric display can indicate parameters determined by the functions of two display buttons.

The totalized line and corrected volumes can each be configured to show the total with 6, 7 or 8 digits. The totals can also be pre-set enabling the mechanical index of the meter to indicate the same value as the Corrector index. The display will blank after a pre-selected time if the display buttons are not operated. The first line shows the parameter.

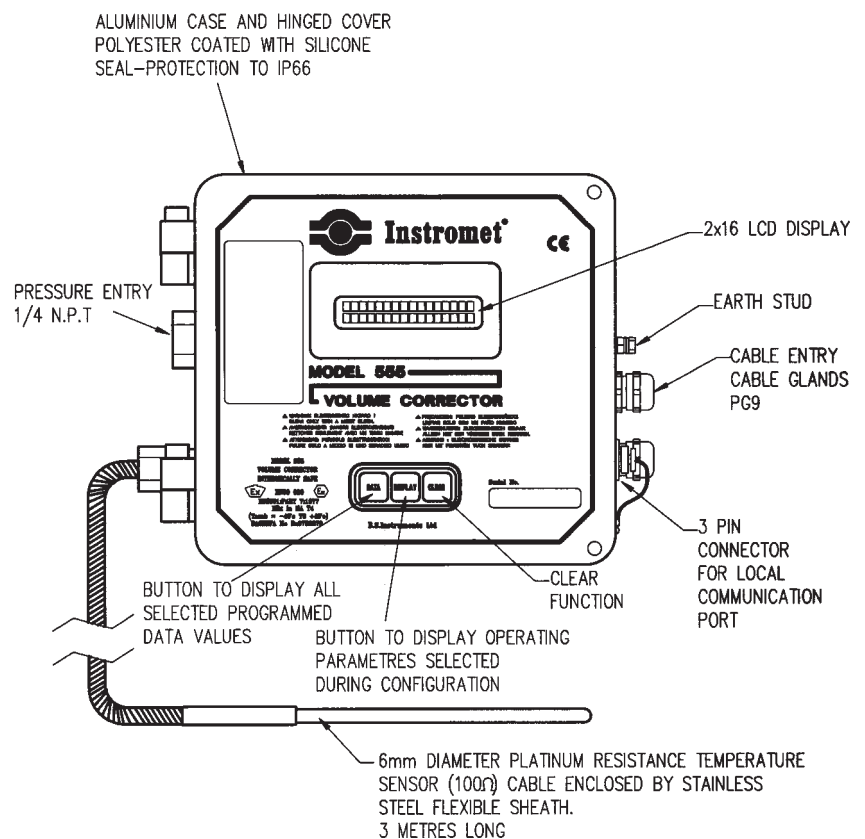
The display buttons have the following functions:

### 1) Data

Can be configured to display any of the pre-set operating programmed data. Each press steps the display to the next parameter. When the end of the data list is reached the display will return to the first item.

### 2) Display

Can be configured to display any of the active operating parameters. Each press steps the display to the next parameter. When the end of the data list is reached the display will return to the first item.



## DATA ENTRY

The Model 555 can be set to user requirements using the serial port connected to a laptop PC to provide the operating and configuration data. Programming software which operates in a Windows™ environment is provided with the corrector. Data can be entered or read from the Model 555 corrector. Security of the pre-set data is maintained by the use of passwords and/or a security switch located inside the corrector and by a unique software protocol used to load the data.

All of the data entry parameters are stored in non-volatile memory except the time, date and totals which are stored in battery backed up memory.

## ALARMS

The alarm output can be programmed to operate if any one or combination of the following conditions occurs:

Battery is low.

Pressure is above the pressure high alarm setting.

Pressure is below the pressure low alarm setting.

Temperature is above the Temperature high alarm setting.

Temperature is below the Temperature low alarm setting.

Pressure is above the maximum allowable value.

Pressure is below the minimum allowable value.

Temperature is above the maximum allowable value.

Temperature is below the minimum allowable value.

A gas meter input pulse occurs before the last output pulse routine has been completed.

A fault condition has been detected.

The output is an optically isolated open collector transistor used as a passive switch.

## DEFAULT VALUES

A default value facility is provided where a pre-set value can be used for an active input in the flow calculation should that input go above or below the values set by the high and low alarm values

The default facility is available for pressure and temperature. The default facility can be deleted.

## ALARM AND FAULT

ALARM is indicated when the input signal for either pressure or temperature is outside its operating range or if a gas meter pulse has occurred before the previous computing cycle has completed.

FAULT is indicated if a failure is detected during the self checking procedures. The programme and data memory are tested by using checksum methods. All entered data is checked for corruption. A watchdog circuit tests for correct microprocessor operation.

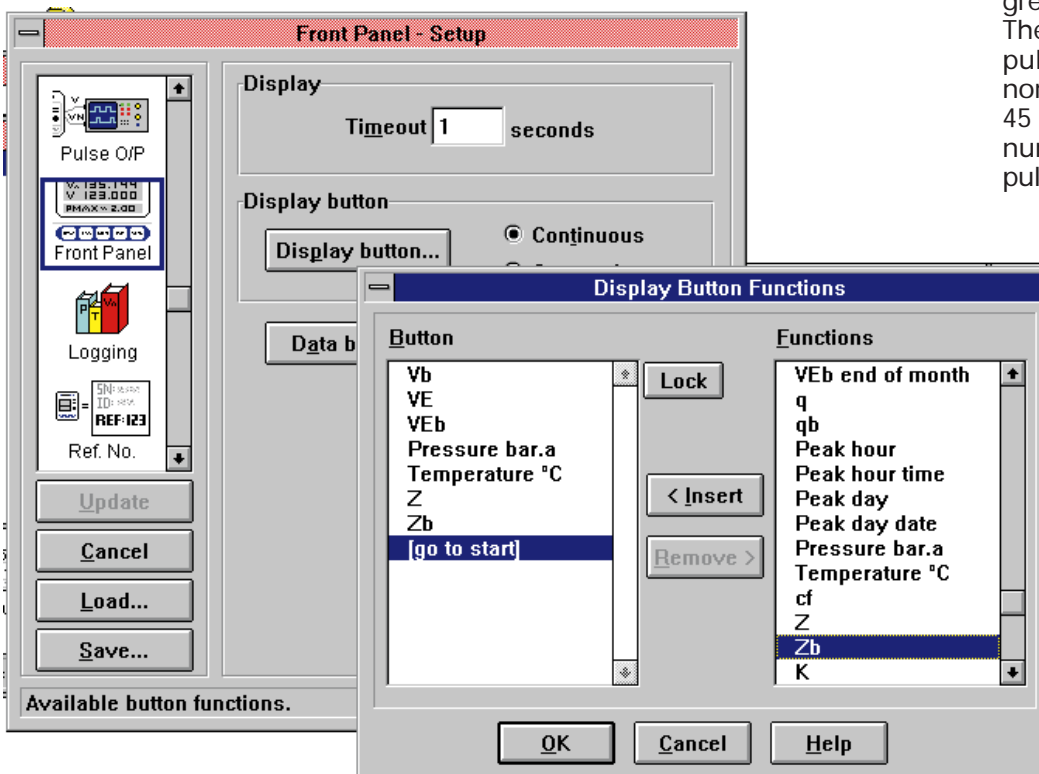
## PULSE OUTPUTS

The Model 555 corrector has two optically isolated passive open collector outputs which can be configured for either uncorrected and corrected volume; two corrected volume or two uncorrected volume outputs; or error outputs. The uncorrected volume output gives a pulse per gas meter pulse. For the corrected volume the number of output pulses is given by the integer of:

$$\frac{\text{correction factor}}{\text{totalising factor}}$$

for each gas meter pulse. The residual is retained and added to the next volume calculation and put out when the accumulation is greater than 1.

The on and off period for each pulse can be selected to have a nominal duration of either 10 mS, 45 mS, or 360 mS. The maximum number of pulses per gas meter pulse is 15.



## DATA LOGGING

The corrector can be configured to store up to 3600 logs at a time interval of 1 hour which equates to 37 days of hourly readings of 4 different parameters with the time and date of the log. Up to 10 different parameters can be selected to be logged.

Logging can be started and stopped. Logged data can be read via a serial port.

## CALIBRATION

The corrector will meet its specified accuracy without the need for calibration. If it is required to make adjustments to accommodate the uncertainty in the measuring system, then a software calibration facility is provided. The pressure and temperature sensors can be software calibrated with a PC computer connected to the serial communications port.

The software allows a choice of calibration method of either single point calibration or two point calibration.

Single point calibration allows only the zero value (offset) to be changed. Two point calibration allows both zero and range to be calibrated independently.

## SERIAL PORT

The serial port is used for the initial configuration and data entry to the corrector, and to give access to the logged data. To enter or extract data from the corrector it is necessary to use the software provided with the corrector and a PC computer. The software works in a Windows™ environment.

The port is connected through a 3 pin Fischer connector at the side of the corrector. The serial port is passive and can be interfaced to a PC computer using the Model 999 Programming Cable which also provides the safety barrier when the corrector is located in a hazardous area.

## BATTERY POWER SUPPLY

The power for the corrector is provided by a battery unit which contains two replaceable "D" size

lithium cells. When fitted with "D" cells of 18 AHr rating the unit will provide a nominal five years operation when the gas meter frequency is 0.5 Hz.

During the period the batteries are being replaced the corrector is inoperative but the stored and displayed data is retained by a lithium back-up battery with a capacity such that replacement should not be necessary during the life of the corrector. The lithium battery will provide back-up for up to 1000 hours without the main batteries being connected.

Lo bat-indication is shown on the LCD display when the main batteries require replacing. The indication is given when power for approximately 1 month's operation remains.

## DATA ENTRY PARAMETERS

- Units of pressure which can be:- Bar.a, kPa.a or kg/cm<sup>2</sup>.
- Units of Temperature which can be:  
Degrees Celsius  
Degrees Kelvin
- Pressures below the value entered which will cause an error condition.
- High pressure alarm and low pressure alarms
- Default pressure is used when a pressure high or low alarm or error occurs. The default function can be disabled.
- Maximum temperature; above this value an error condition is given.
- Minimum temperature; below this value an error condition is given.
- High temperature alarm and low temperature alarms
- Default temperature is used when a temperature high or low alarm or error occurs. The default function can be disabled.
- The heating value, relative density of the gas and molar percentages of carbon dioxide are used for compressibility calculation.
- Base pressure and base temperature.
- The totalising factor defining the quantity of gas for corrected totalised volume and uncorrected volume show on the display.
- Compressibility ratio when a fixed compressibility is required instead of a calculated value.
- The uncorrected volume factor defining the volume of gas represented by a gas meter pulse.
- Logging time to define the 24 hour period for peak day value.
- Pre-set line and corrected volume register
- Pre-set line and corrected volume error register
- Set the totalisers for corrected and uncorrected volume to either stop when an error or alarm occurs or to continue totalising.
- Set the alarms and errors which stop the corrected and uncorrected volume totalisation.
- Set pulse output totalising factor
- Set pulse output function
- Set pulse output period.

## SELECTABLE LOGGED PARAMETERS

Any of the following parameters can be logged:

- Uncorrected volume
- Corrected volume
- Instantaneous pressure
- Instantaneous temperature
- Correction factor
- Compressibility factor
- Uncorrected flow rate
- Corrected flow rate
- Totalised Corrected Volume in an Alarm Condition
- Totalised Line Volume in an Alarm Condition
- Time and date are automatically logged with the parameters selected.

## SELECTABLE DISPLAY PARAMETERS

- All pre-set data programmed in the corrector memory
- Corrected Volume with Remainder
- Uncorrected Volume with Remainder
- Corrected Volume with Remainder in an alarm condition
- Uncorrected Volume with Remainder in an alarm condition
- Current Day Corrected Volume
- Current Day Uncorrected Volume
- Previous Day Corrected Volume
- Previous Day Uncorrected Volume
- Current Day Corrected Volume in an alarm condition
- Current Day Uncorrected Volume in an alarm condition
- Previous Day Corrected Volume in an alarm condition
- Previous day Uncorrected Volume in an alarm condition
- Current Month Corrected Volume
- Current Month Uncorrected Volume
- Previous Month Corrected Volume
- Previous Month Uncorrected Volume
- Corrected Volume Flow Rate
- Uncorrected Volume Flow Rate
- Peak Hour Flow Rate
- Time and Date of peak hour flow rate
- Peak Day Flow Rate
- Date of Peak Hour Flow Rate
- Pressure in Bar.a, or kPa or kg/cm<sup>2</sup>
- Temperature in °C or °K
- Correction Factor
- Compressibility Factor
- Compressibility at Base Conditions
- Compressibility Ratio (Z/Zn)
- Alarm Status
- Low Battery Power
- Fault Condition
- Time and Date

## TERMINAL CONNECTIONS

External wiring to the corrector is by plug-in screw terminal assemblies. This enables the terminations to be attached to the cables before being connected to the corrector, simplifying installation.

## MODEL 999 PROGRAMMING CABLE

A Programming cable is available for use with the corrector and PC

Computer. The Interface derives its power from the PC Computer to provide power for the passive optically isolated local serial output from the corrector. Consideration must be given to safety before a computer is used in the hazardous area.

## MODEL 999 SERIAL INTERFACE UNIT

The Serial Interface Unit converts the passive optically isolated serial output of the corrector to an active

RS232 output. The unit is powered from an external power supply for continuous operation. The Serial Interface Unit provides the function of a safety barrier to the hazardous area and is mounted in the non-hazardous area.

The unit conforms to CENELEC Standards and is approved to [Ex ia]IIC.

## MODEL 900 RELAY UNIT

The Model 900 Relay Unit is used to convert the passive transistor pulse outputs for line and corrected volume of the corrector to voltage free contacts and to provide isolation between the corrector located in the hazardous area and other apparatus in the non-hazardous area.

The Model 900 Relay Unit conforms to CENELEC Standards and is approved to [Ex ia] IIC. The Relay Unit is located in the non-hazardous area; the circuits from the corrector are protected by current and voltage limiting circuits. Isolation is provided by intrinsically safe relays; additional zener barriers and earthed circuits are not required.

The Relay Unit is powered by three D size Lithium Thionyl-chloride batteries.

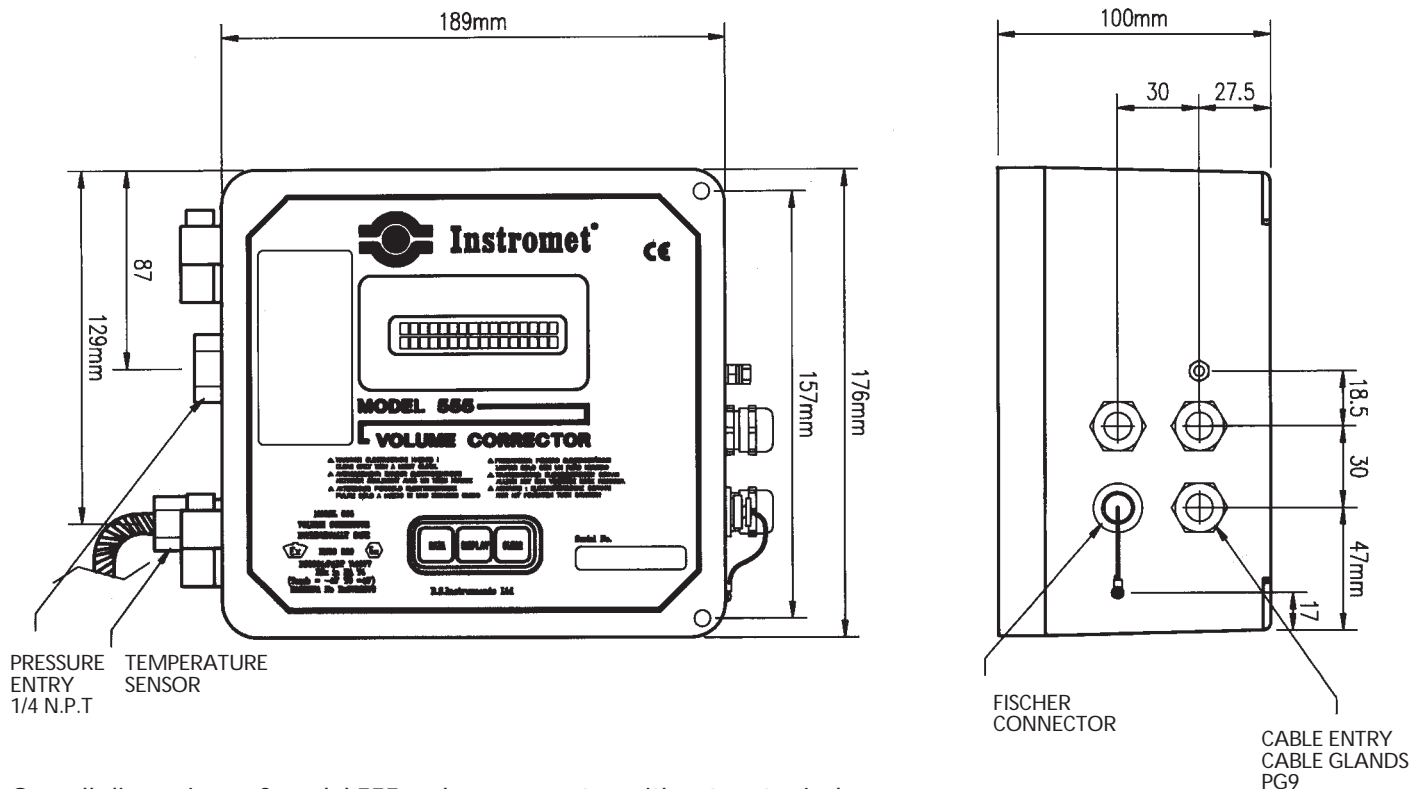
## MODEL 999 FLOW RATE UNIT

The Model 999 Flow Rate Unit provides up to three analogue 4-20mA outputs which can be selected to be proportional to either line flow rate, corrected flow rate, pressure, temperature, correction factor or Z factor.

In addition to the above analogue outputs, the Flow Rate Unit provides relay contacts for the two pulse outputs and the alarm output from the Model 555 correctors. The Flow Rate Unit can be powered from an AC Mains supply of either 240/220V 50Hz or 110V 60Hz., or from a 24 V dc. supply.

The unit conforms to CENELEC Standards and is approved to [Ex ia]IIAT4.

## MOUNTING AND DIMENSIONS



Overall dimensions of model 555 volume corrector without meter index



Instromet Index adapter



Instromet IRM rotary gasmeter with 555 corrector

## MOUNTING

The model 555 corrector can be supplied for either wall or pole mounting or with an integral index adapter on the meter. This adapter has an 8 digit mechanical counter and a reed switch contact to provide a pulse to the corrector. The adapter mounting plate is drilled with a standard pattern for mounting on most meters made in the U.S.A and Canada.

## HOW TO ORDER

The following information will help us determine which corrector best suits your requirements.

- |                    |   |
|--------------------|---|
| Model              | : 555 Volume Corrector                                    |
| Pressure sensor    | : range (select from page 4)                              |
| Units              | : metric/imperial   |
| Temperature sensor | : length 150/ 250 mm                                      |
| Calibration by     | : INSTROMET/<br>Weights and Measures Authority            |
| Documents          | : Calibration certificate<br>Intrinsic Safety certificate |

## Sales Offices:

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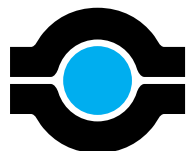
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INSTROMET has a continuing program of product research and development. Technical specifications and construction may change due to improvements. This publication serves as general information only, and all specifications are subject to confirmation by INSTROMET.

## Products & Services:

- Ultrasonic gas meters
- Turbine gas meters
- Rotary gas meters
- Insertion gas meters
- Electronic volume correctors
- Flow computer systems
- Calorimeters
- Gas chromatographs
- Pressure transmitters
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- Gas pressure regulators
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Gas measurement and control equipment