



Virtec Instruments Inc.

User Manual



VIR-832-M-Clamp-On



VIR-832-M-Insertion



VIR-832-M-In-Line



VIR-832-Clamp-On



VIR-832-M-Insertion



VIR-832-M-In-Line

Transit Time UltraSonic Flow / Heat Meters

VIR-832 Series-Installation & User Guide

The documentation is only complete when used in combination with the relevant documentation for the signal converter.

User Guide

Transit Time Ultrasonic Flow / Heat Meters

VIR-832 SERIES -Clamp on Type

DESCRIPTION

The VIR-832 transit time ultrasonic flow meter/heat meter measures volumetric flow and cooling energy rates in chilled water applications. VIR-832 flow and energy meters clamp onto the outside of pipes and do not contact the internal liquid.



BENEFITS

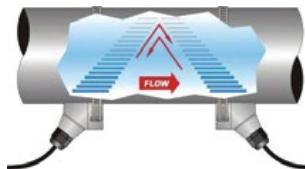
By clamping onto the outside of pipes, the meters have inherent advantages over other flow meter technologies, including:

- Reduced installation time and cost
- Non-Invasive, non-contact measurement
- Continued operation during installation-no need to shut down the process
- No pressure head loss
- No moving parts to maintain or replace



FEATURES

- Large, bi-directional flow measuring range.
- Data Logger
- Modbus RTU or BACnet MS/TP over EIA-485, Modbus TCP/IP BACnet/1P; connectivity options with Kamstrup Make Multical 603.



Ultrasonic speed and temperature compensation Large, easy-to-read graphical display Suitable for harsh environments

APPLICATIONS

The VIR-832 meter is available in a variety of configurations that permit the user to select a meter with features suitable to meet particular application requirements.

The VIR-832 meter is available in two versions:

A flow meter for water delivery, sewage, cooling water, water-glycol mixtures, alcohols and chemicals

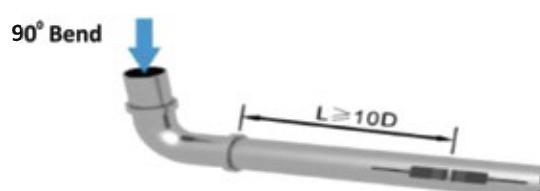
A heating/cooling energy flow meter used in conjunction with dual insertion or clamp-on RTDs for temperature measurement-ideal for hydronic process and HVAC applications

OPERATION

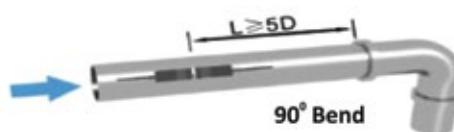
Transit time flow meters measure the time difference between the travel time of an ultrasound wave going with the fluid flow and against the fluid flow. The time difference is used to calculate the velocity of the fluid traveling in a closed-pipe system. The transducers used in transit time measurements operate alternately as transmitters/receivers. Transit time measurements are bidirectional and are most effective for fluids that have low concentrations of suspended solids and are sonically conductive.

An ultrasonic meter equipped with heat flow capabilities measures the rate and quantity of heat delivered or removed from devices such as heat exchangers. By measuring the volumetric flow rate of the heat exchanger liquid, the temperature at the inlet pipe and the temperature at the outlet pipe, the energy usage can be calculated.

Straight length of upstream piping



Straight length of downstream piping



Product Data Sheet

VIR 832 Ultrasonic Clamp-On Type: Flow & Heat Meter		
Main Unit	Accuracy	Better than $\pm 1\%$
	Repeatability	Better than 0.2%
	Principle	Transit-time measuring principle
	Measurement Period	500ms
	Display	LCD with backlight, display accumulated flow/heat, instantaneous flow/heat, velocity, time etc.
	Output	Analog output: 4-20mA or 0-20mA current output. Impedance 0.1kw. Accuracy 0.1%
		OCT output: Frequency signal (1-9999HZ)
		Relay output: Programmable (no signal, reverse flow etc.)
		RS 485 serial port
	Input	Three analog input
	RTD For Heat Meter only	Two 2-wire, 3-wire Pt100/Pt1000/Pt 500 RTD 12-bit inputs; Range of -40...200°C; Clamp-on resistor kits available
	Other functions	Automatically record the totaliser data up to 5 years and 16 years Option
	Energy total (Heat Meters)	British Thermal Unit (Btu), MWH KWH
	Heat/cooling rate (Heat Meters)	Btu/hour, Kilowatts, Megawatts,
	Temperature (Heat Meters)	Fahrenheit, Celsius
	Power loss mode	The power-on time and corresponding flow rate of the last 64 power on and off events. Allow manual or automatic flow loss compensation
Pipe	Material	Steel, Stainless steel, Cast iron, Cement pipe, Copper, PVC, Aluminium, FRP etc. Liner is allowed
	Size	15-6000mm
	Straight pipe section	In the upstream it must be beyond 10D, in the downstream it must be beyond 5D. In the upstream the length must be beyond 30D from the access of the pump. (D Stands for pipe diameter)
Liquid	Types	Water, sea water, industrial sewage, acid and alkali liquid, alcohol, beer, all kinds of oils which can transmit ultrasonic single uniform liquid
	Temperature	Standard : -10°C - 160°C
	Turbidity	Less than 10000ppm, with a little bubble
	Flow Direction	Bi-directional measuring, net flow/heat measuring
Environment	Ambient Temperature	Main Unit: -4...140°F (-20...60°C)
	Altitude Restriction	Up to 2000 m (6561 ft)
	Humidity	Main Units: 0...85%, non-condensing Transducer : water-immersible, water depth less than 3m
Cable	Twisted pair line, standard length of 20m, can be extended to 500m (not recommended); Contact the manufacturer for longer cable requirement. RS-485 interface, transmission distance up to 1000m	
Power Supply	AC220V or DC24V	
Power	Less than 1.5W	
Protocols	MODBUS-RTU Protocol Standard. Option of BACnet MS/TP -IP with MC-603 Kamstrup Make Calculator available.	



| Optional Transducers |

Please choose the suitable transducer, according to different liquid pipe condition and installation method, (please refer to the measuring diagram).

Types	Picture	Spec.	Model	Measurement Range	Temperature	Dimension
Clamp on		Small Size	TS-2	DN25~DN100	-30~90°C	45×25×32mm
		Medium Size	TM-1	DN50~DN700	-30~90°C	64×39×44mm
		Large Size	TL-1	DN300~DN6000	-30~90°C	97×54×53mm
High temp clamp on		Small Size	TS-2-HT	DN25~DN100	-30~160°C	45×25×32mm
		Medium Size	TM-1-HT	DN50~DN700	-30~160°C	64×39×44mm
		Large Size	TL-1-HT	DN300~DN6000	-30~160°C	97×54×53mm
Insertion		Standard	TC-1	DN80~DN6000	-30~160°C	190×80×55mm
		Lengthen	TC-2	DN80~DN6000	-30~160°C	335×80×55mm
Pipe		π type	G1	DN15~DN32	-30~160°C	SUS304 thread connection
		Standard	G2	DN40~DN1000	-30~160°C	carbon steel thread connection

Thank you for choosing Virtec Energy Meter.

This instruction manual contains the important using and operation information of the flowmeter. Please read carefully the reference manual before operations to make your portable ultrasonic flow meter exert the best performance.

If the operation is wrong, it will affect the normal operation of the flow meter, reduce the service life of it or cause some malfunctions.

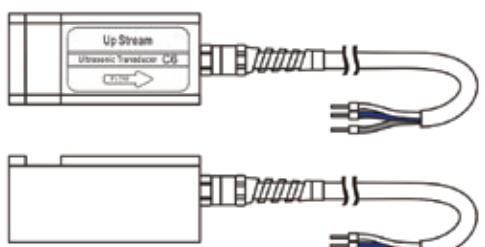
This manual will present how to use the flow meter step by step. Beginning with the product component, installation, wiring, quick setting and so on which will let you very easily operate the flow meter.

By knowing more menu settings, the powerful function options and output functions of the flow meter can meet your higher requirements.

Note: Some content in this manual may be different from the flow meter you purchased, depending on the optional configuration requirements at the time of purchase. On the other hand, due to the design changes and upgrade needs of the product, there is no indication in the manual. Please pay attention to the version number and the added.

Product Component-VIR 832

Inspection should be made before installing the Flow meter. Check to see if the spare parts are in accordance with the packing list. Make sure that there is no potential damage to the enclosure due to a loose screw or loose wire, which occurred during transportation. Any questions, please contact your representative as soon as possible. Transmitters offered in VIR-832 series which are 230v AC and VIR-832-M series which are 24 DC. All functionality and features remains same.

Transmitter	
 <p>230v ac</p>	 <p>24v DC(SMPS required)</p>
Clamp on transducer	Insertion transducer
 <p>The diagram shows two views of a clamp-on ultrasonic flowmeter. The top view is a side profile of the probe assembly, labeled "Up Stream" and "Ultrasonic Transducer CB". The bottom view is a front view showing the probe tip pointing downwards.</p>	 <p>The diagram shows a side view of an insertion probe assembly. It consists of a probe tip, a mounting base, and a flexible cable.</p>
<p>Accessory:</p> <ul style="list-style-type: none"> • Pipe strap • Coupling compound <p>Temperature sensor-OPTIONAL</p>	<p>Accessory:</p> <ul style="list-style-type: none"> • Mounting base • Teflon tape • Temperature sensor-OPTIONAL

Transmitter Installation-VIR-832

Inspection should be made before installing the Flow meter. Check to see if the spare parts are in accordance with the packing list. Make sure that there is no potential damage to the enclosure due to a loose screw or loose wire, which occurred during transportation. Any questions, please contact your representative as soon as possible.

Transmitter



- Fixing the Mounting bracket with the screws;
- Place Mounting bracket on the wall and drill four holes of 5.5mm diameter & 50mm deep;
- Insert a plastic bushing into each of the holes;
- Put the instrument in the bracket and tighten the screws.



When installing please make sure that the installing face can afford the flow meter to avoid falling off.
And make sure the installing face is dry.

Power Supply Connecting

Customers should pay special Caution to specify the desired power supply when placing an order. Factory standard power supply is 230V AC.

Observe the following precautions for installation procedures outlined in this chapter:

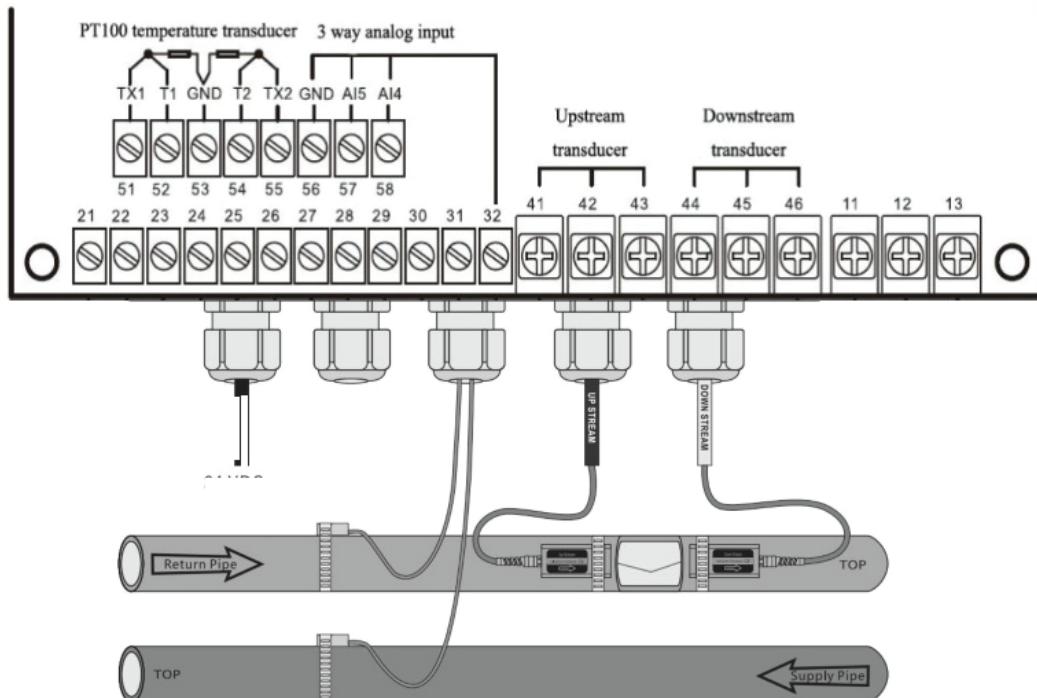
Ensure that power connections are made in accordance with the indications shown on the connection terminals.

Transmitter Wiring

Once the electronics enclosure has been installed, the flow meter wiring can be connected. Pin the cover details can be found at the left lower side. Connect to ac power terminal.

As per wiring diagram to connect: Relay Output, OCT Output, RS485, 4-20mA & Analog Input, Upstream transducer, Downstream transducer.

For double-shielded transducer cable: "+" on the blue wire, "-" on the white wire and "shield" on the shield.



CAUTION

Please Wiring when power off. Before using please grading the instrument.

Measurement Site Selection

When selecting a measurement site, it is important to select an area where the fluid flow profile is fully developed to guarantee a highly accurate measurement. Please follow these guidelines for selecting a proper measurement installation site:

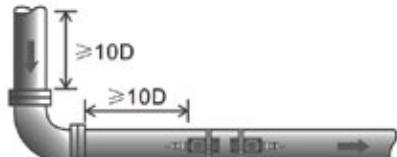
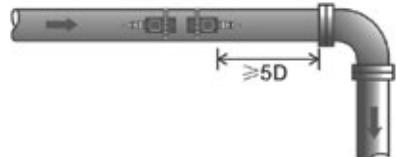
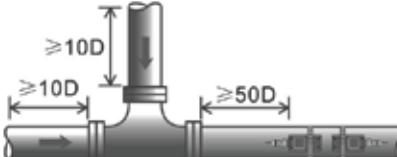
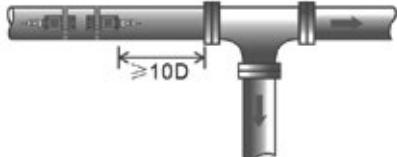
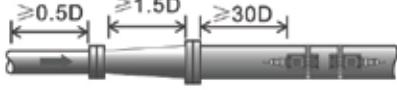
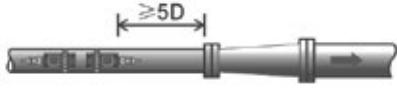
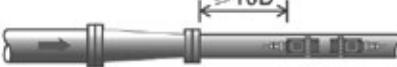
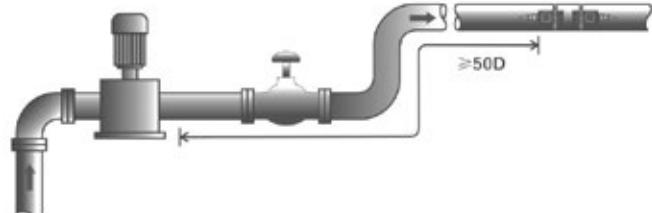
Choose a section of pipe, which is always full of liquid, such as a vertical pipe with flow in the upward direction or a full horizontal pipe.

Make sure that the pipe surface temperature at the measuring point is within the transducer temperature limits.

Consider the inside condition of the pipe carefully. If possible, select a section of pipe where its inside is free excessive corrosion or scaling.

Examples acceptable measurement site selection are shown in the figure below.

"D" is the pipe section diameter, for example, for a pipe section with a diameter of 110mm, 10D is 10 times the pipe section diameter, that is, 1100mm.

Site	Installation point front straight section	Straight pipe section after installation point
Elbow		
Tee		
Expanded pipes		
Reducing pipe		
Valve		
Pump		

Transducer Installation

Before installing the transducers, clean the pipe surface where the transducers are to be mounted. Remove any rust, scale or loose paint and make a smooth surface. Choose a section of sound conducting pipe for installing the transducers. Apply a wide band of sonic coupling compound down the center of the face of each transducer as well as on the pipe surface, and then attach the transducers to the pipe with the provided racks and tighten them firmly.

Note:

The two transducers should be installed at the pipe's center line of horizontal pipeline. Make sure that the transducer installation direction is parallel with the flow.

During the installation, there should be no air bubbles or particles between the transducer and the pipe surface. On horizontal pipes, the transducers should be installed in the 3 o'clock and 9 o'clock positions of the pipe section in order to avoid any air bubbles inside the top portion of the pipe. If the transducers cannot be installed horizontally symmetrically due to limitation of the real installation conditions, it may be necessary to install the transducers at a location where there is a guarantee full pipe condition (the pipe keeps full of liquid).

Transducer spacing

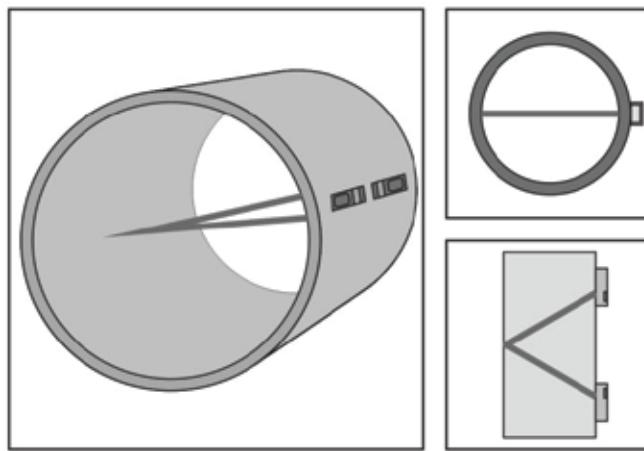
After entering the required parameters, the spacing between the tops of the two transducers is considered as the standard transducer spacing. Check the data displayed in "Setup Menu – Pipe parameter" and reserve the spacing for the transducers' installation.

Transducer Mounting Methods

Four transducers installation methods are available: V method, Z method, N method and W method. The V method is mainly used for small diameter pipelines (100mm~400mm, 4"~16"). The Z method is used in applications where the V method cannot work due to poor signal or no signal detected. In addition, the Z method usually works better on larger diameter pipes (larger than 300mm, 12") or cast iron pipes. The N method and the W method are not commonly used methods. They are used for smaller diameter pipes (less than 50mm, 2").

Transducer Installation

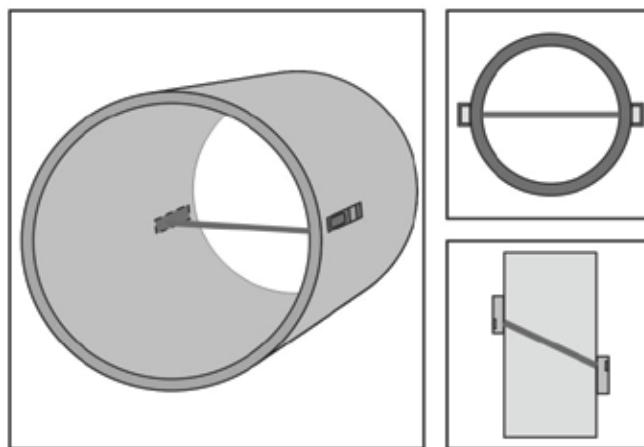
The V method is considered as the standard method. It usually gives a more accurate reading and is used on pipe diameters from 50mm to 400mm (2"~16"). It is convenient to install, but still requires proper installation of the transducers. It is in contact with the pipeline at the center line of the pipeline, and the spacing on both sides of the center line is equal.



Z Method

The signal transmitted with Z method installation gets less attenuation than a signal transmitted with the V method. This is because the Z method utilizes a directly transmitted (instead of reflected) signaling which transverses the liquid only once.

The Z method is able to measure pipe diameters from 200mm to 2000mm (8"~80"). Therefore, we recommend the Z method for pipe diameters over (300mm, 12").



4~20mA Current Loop Calibration

With a current loop output exceeding 0.5% accuracy, the flow meter is programmable and configurable with multiple output modules such as 4~20mA. Select "Setup Menu - Input and Output setting"

In this window, to calibrate 4mA flow value and 20mA flow value. For example:
If the flow range is between 0~1000m³/h, input 0 and 1000.

If the flow range is from -1000~0~2000m³/h, tum to configure the 20~4~20mA module till the flow direction is rectified. input -1000 and 2000.

Analog Output Calibration

Each flow meter has been calibrated strictly before leaving factory. It is unnecessary to carry through this step except when the current value (detected while calibrating the current loop) displayed in "Setup Menu - Input and output setting" is not identical with the actual output current value.

Appendix 1: Transducer Installation

Before installing the transducers, clean the pipe surface where the transducers are to be mounted. Remove any rust, scale or loose paint and make a smooth surface.

Select the mounting position, weld a mounting seat at that position, open the hole with an drill tools, then insert the wetted transducer into the mounting hole and tighten it securely.

Note:

The two transducers should be installed at the pipe's centerline of horizontal pipeline. Make sure that the transducer installation direction is parallel with the flow.

On horizontal pipes, the transducers should be installed in the 3 o'clock and 9 o'clock positions of the pipe section in order to avoid any air bubbles inside the top portion of the pipe. If the transducers cannot be installed horizontally symmetrically due to limitation of the real installation conditions, it may be necessary to install the transducers at a location where there is a guarantee full pipe condition (the pipe keeps full of liquid).

Install tools and accessories

When installing the transducer, can sue the mounting tools are required, and HD35-specific drills tools can be used for pressure positioning and drill a hole.

If it is carbon steel pipe can be weld directly, if it is stainless steel pipe, it is necessary to order stainless steel mounting seat, then good welding.

When installing pipes such as cast iron, fiberglass, PVC, cement pipes, special saddles need to be ordered for installation, and the exact outer diameter of the pipes is required to prevent leakage during installation.

Transducer spacing

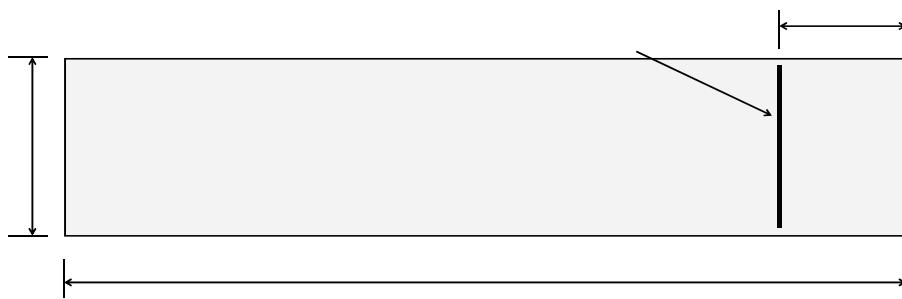
After entering the required parameters, the spacing between the tops of the two transducers is considered as the standard transducer spacing. Check the data displayed in "Setup Menu - Pipe parameter" and reserve the spacing for the transducers' installation.

Install Transducer

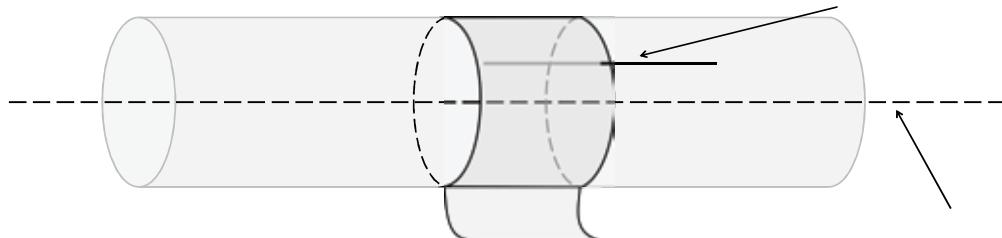
(for example, horizontal pipe V method installation)

Step 1: Depending on the transducer spacing shown by the flow meter, the installation point needs to be identified at 3 or 9 o'clock in the direction of the pipe.

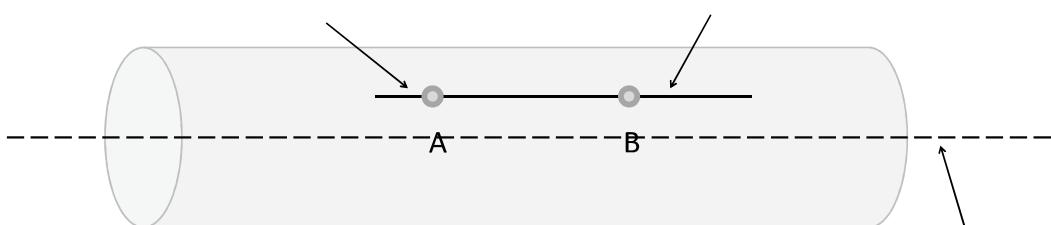
A rectangular tape is required, with an "indicator line" about 100mm from the edge, as shown below:



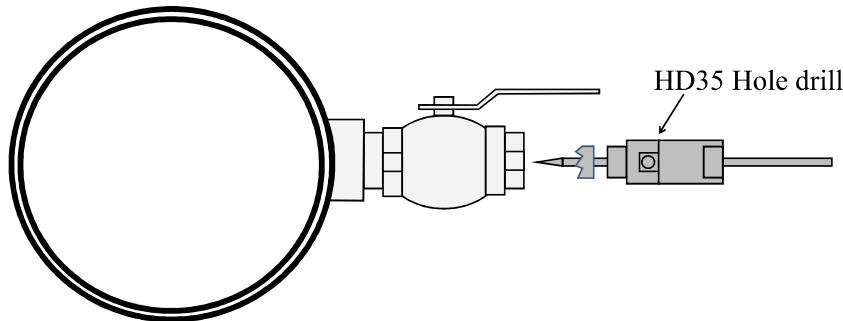
Step 2: Wrap the tape around the surface of the installation pipe so that the sides of the paper align and re-align to ensure that the line of the tape is parallel to the pipe axis, and then extend the line. Here's the picture:



Step 3: Remove the tape, reversely extend the indicator line on the pipe, and then, according to the installation distance of the transducer, mark two points (A, B) on the pipe, which is the center point of the welding mount. Here's the picture:



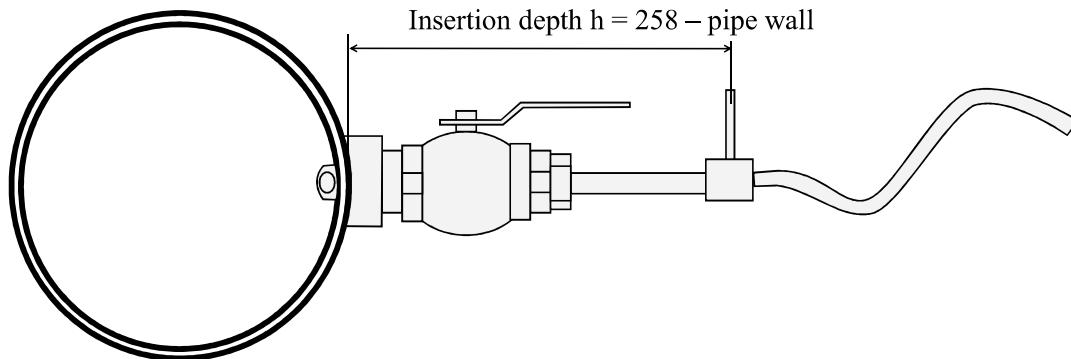
Step 1: Welding mount (requires welding qualified personnel to operate) and then opening the hole. Install the brass ball valve on the mounting base, then open the ball valve and load the HD35 hole drill, as shown below:



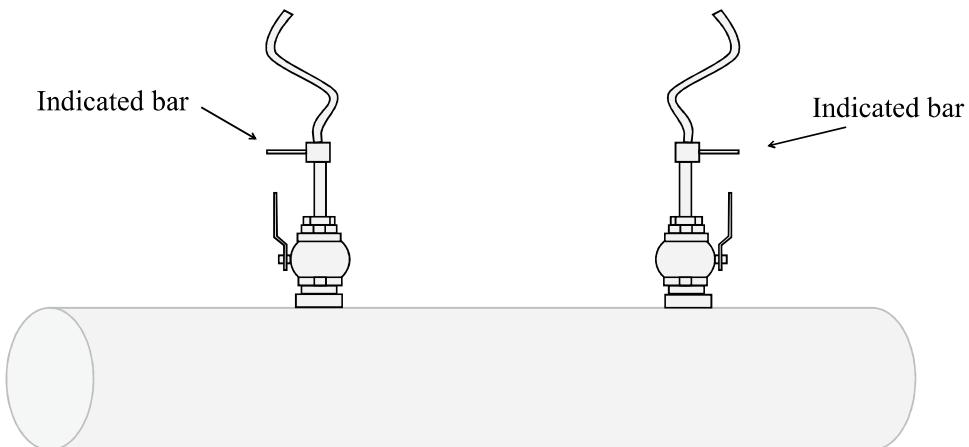
HD35 hole drills use impact drills or electric drills as power (round head handles) for most electric drill tools. After drilling through the pipe can exit the drill, close the ball valve, and then unload the HD35 opening drill, complete the operation with pressure opening.

Step 1: After installing the transducer, the insertion depth should be adjusted to determine the h value according to the thickness calculation of the pipe wall,

as shown below:

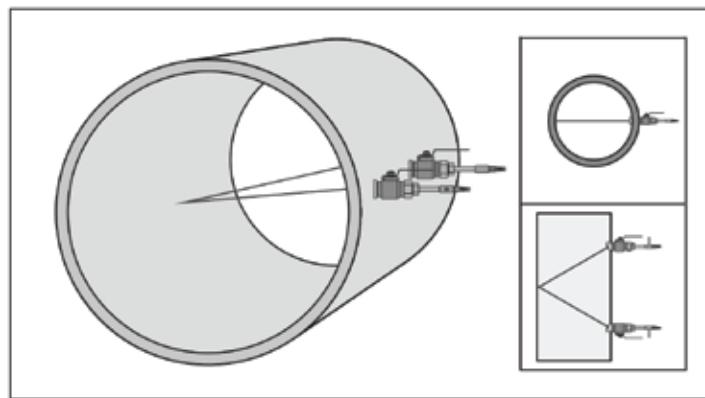


Note: The transducer indicates the direction to the outside, as shown below:



V Method

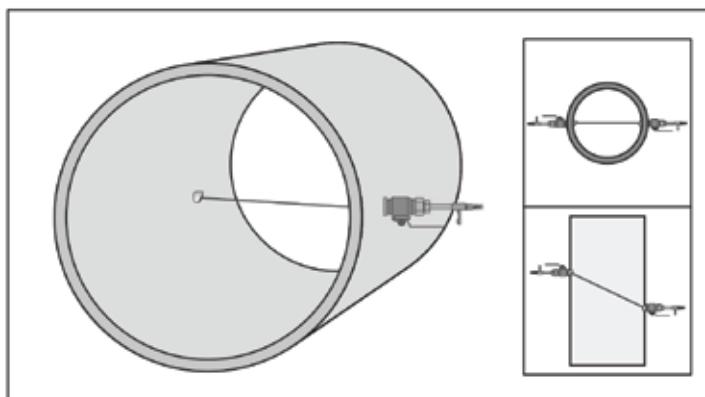
The V method is considered as the standard method. It usually gives a more accurate reading and is used on pipe diameters ranging from 100mm to 400mm (4"~16") approximately. Also, it is convenient to use, but still requires proper installation of the transducer, contact on the pipe at the pipe's centerline and equal spacing on either side of the centerline.



Z Method

The signal transmitted in a Z method installation has less attenuation than a signal transmitted with the V method. This is because the Z method utilizes a directly transmitted (rather than reflected) signaling which transverses the liquid only once.

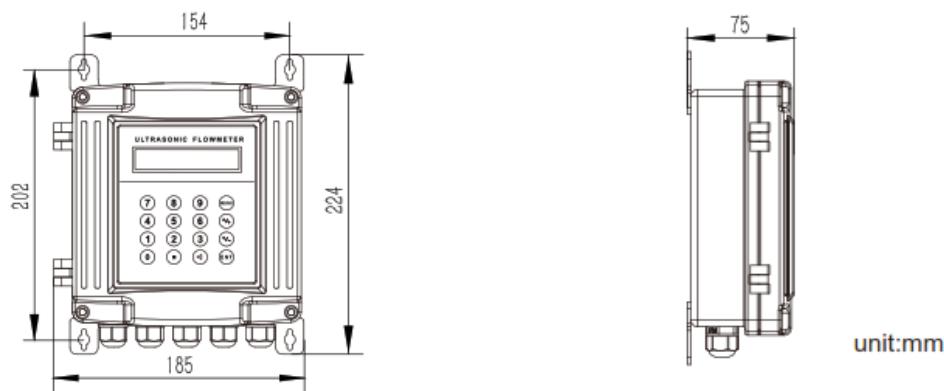
The Z method is able to measure on pipe diameters ranging from 200mm to 2000mm (8"~80") approximately. Therefore, we recommend the Z method for pipe diameters over 300mm (12").



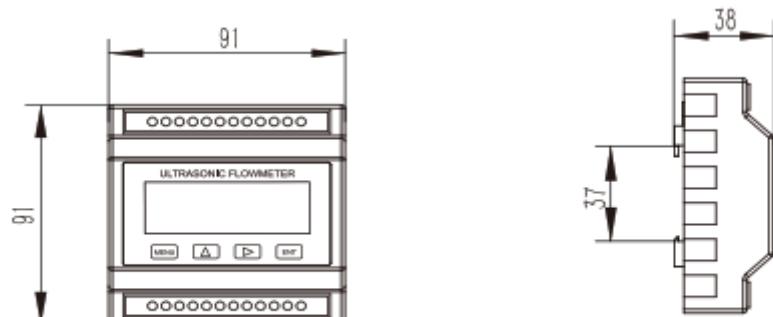
1. VIR-832 Converter Installation and Wiring Diagram

Separated Mounting

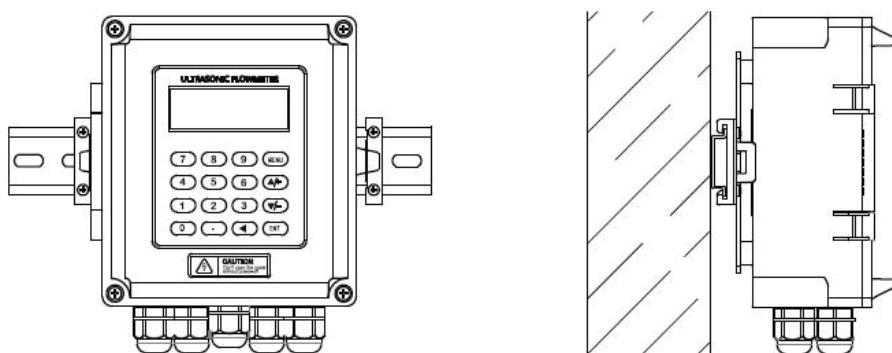
- Installation Instruction- Refer Panel drawing if supplied with Kamstrup BTU meter MC-603



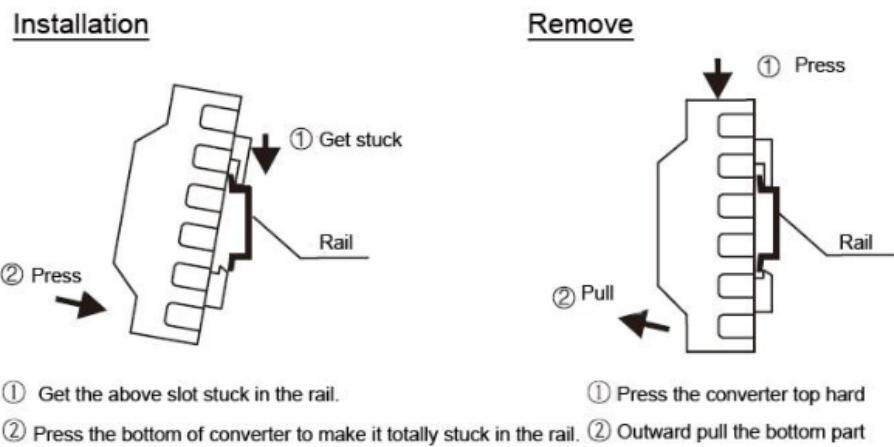
24v DC version



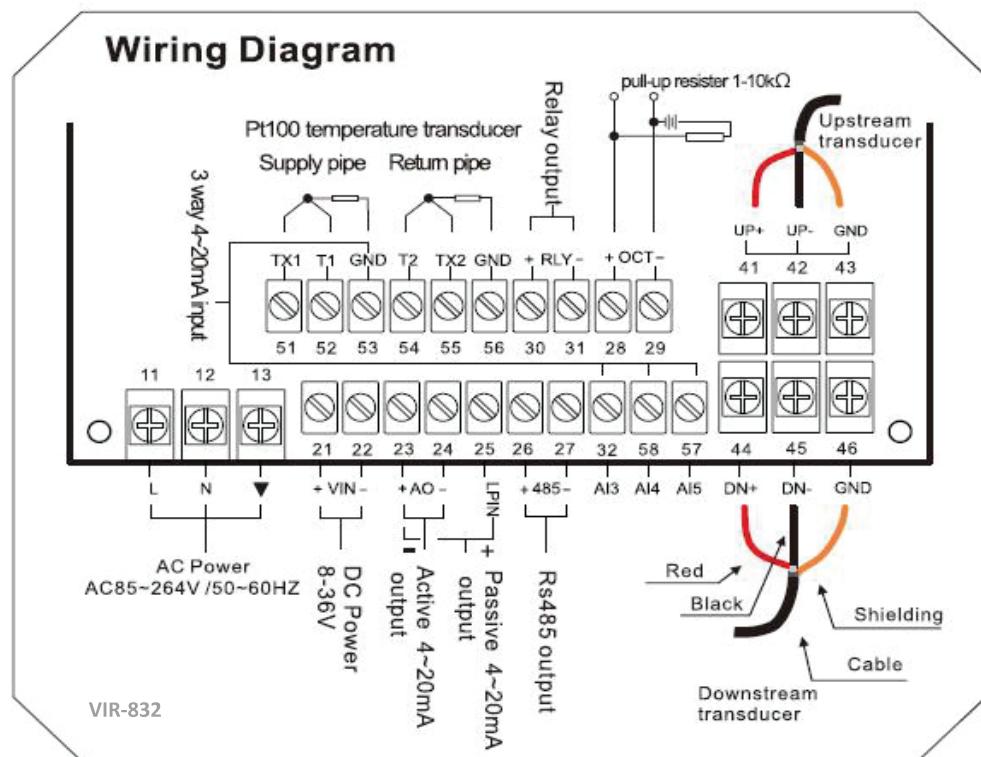
- DIN-rail mounting by using rail fixing clamps.



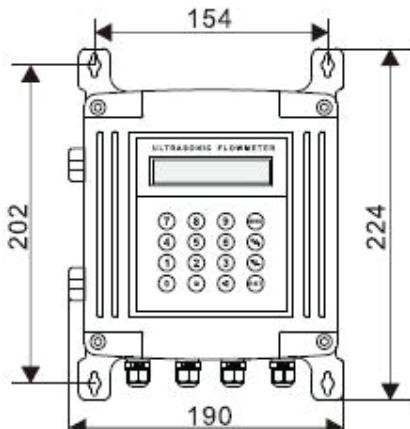
- DIN-rail mounting by using PCB bracket



- VIR-832 Wiring Diagram

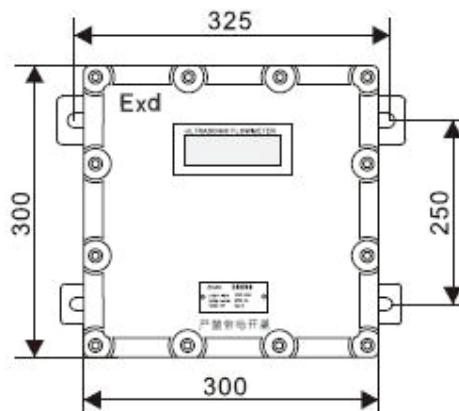


- Installation Instruction



Thickness: 75mm

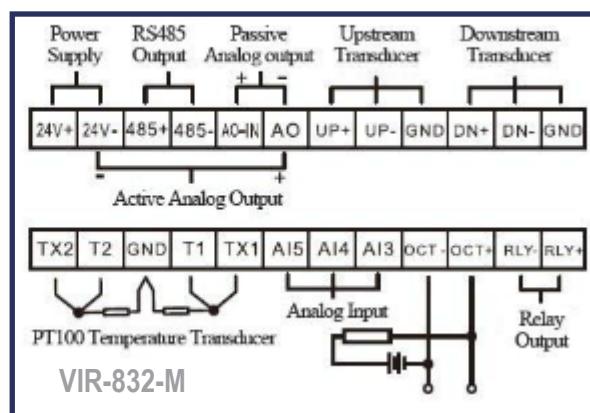
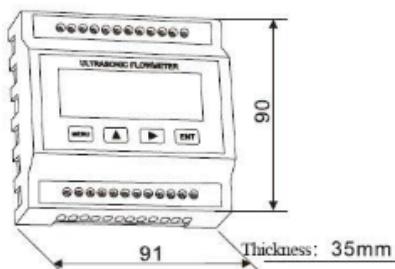
Wall mounting: Fix the converter with 4 cD 6 expansion bolts.



Thickness: 165mm

Explosion-proof grade: DII BTS
Fix the converter with 4 cD 8 expansion bolts.

VIR-832-M WIRING

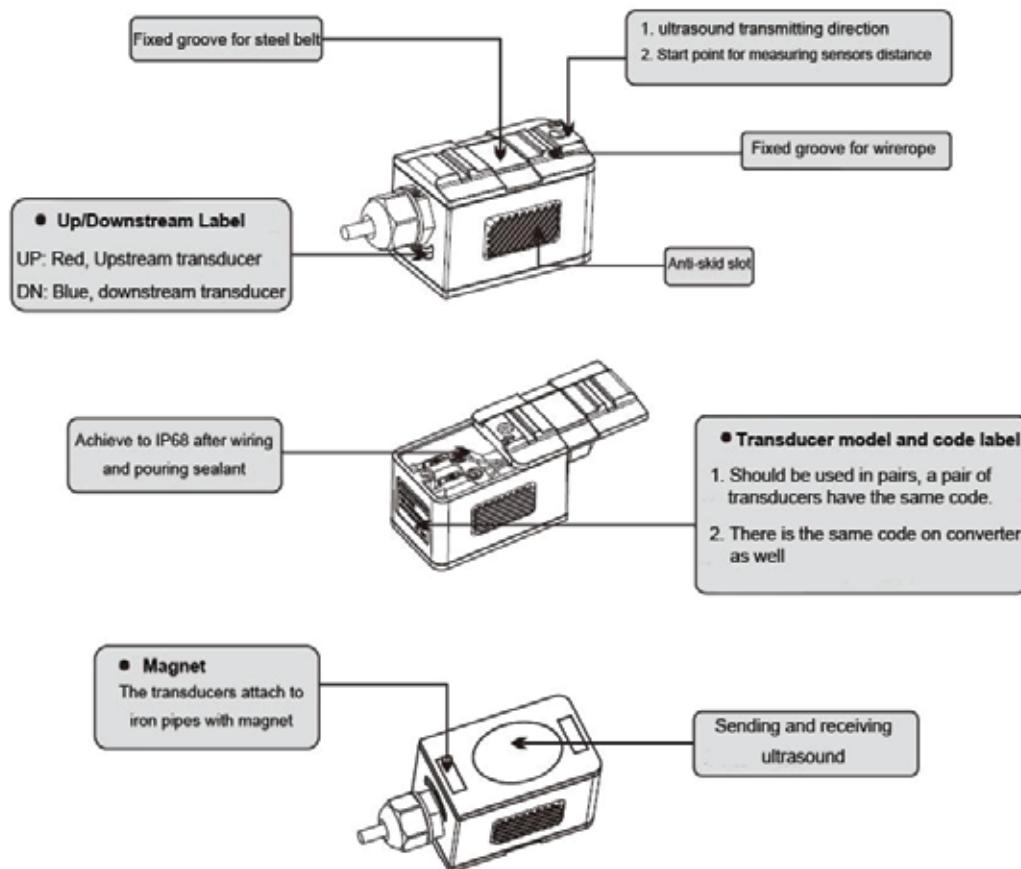


Open the flip cover and complete the wiring. To avoid leaking, please tighten the water joint and screws of the back cover after wiring, then pot gel inside to reach IP68 protection class.

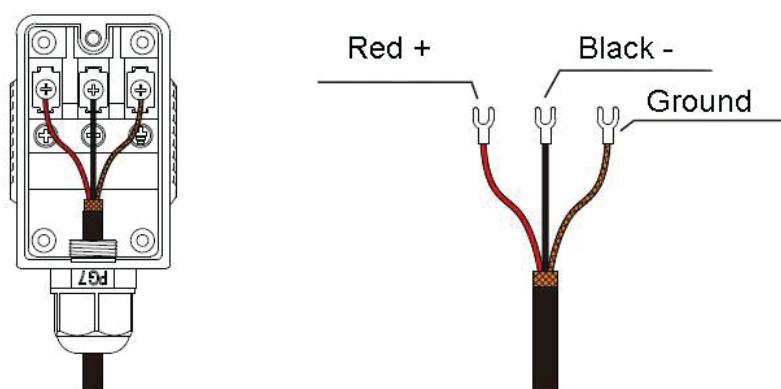
5. Transducer Introduction and Wiring Diagram

VIR-832 Clamp on type transducer

- **Introduction**



- **Wiring Diagram**



6.3 Menu Details

Menu No.	Details
M00	Display flow rate and NET totalizer. Unit selection in M30~M32.
M01	Display flow rate and velocity. Unit selection in M30~M32.
M02	Display flow rate and POS(positive) totalizer. Unit selection in M30~M32.
M03	Display flow rate and NEG(negative) totalizer. Unit selection in M30~M32.
M04	Display date and time, flow rate.
M05	Display heat flow rate and total heat. Unit selection in M84 and M88.
M06	Display temperatures, inlet T1, outlet T2
M07	Display analog inputs, AI3/AI4
M08	Display system error codes. 'R' stands for normal.
M09	Display today's total NET flow
M10	Input outer perimeter.
*M11	Input outer diameter. Available range is 0 to 18000mm.
*M12	Input pipe wall thickness
*M13	Input inner diameter.
*M14	Select pipe material.
M15	Input sound velocity of the pipe material.
M16	Select lining material.
M17	Input sound velocity of the lining material.
M18	Input the lining thickness.
M19	Input the absolute roughness of pipe inner wall.
*M20	Select the liquid type.
M21	Input sound velocity of the liquid.
M22	Input viscosity of the liquid.
*M23	Select the transducer type. Over 20 types can be selected.
*M24	Select the mounting method of transducer.
*M25	Display the transducer mounting distance.
*M26	<p>0 Use RAM setting: A switch for the parameters in flash memory will be loaded when power is turned on. The default option is that the parameters will be loaded. If this switch is not turned on, the system will try to use the parameters in the system RAM, if these parameters are OK, otherwise the system will load the parameters in flash memory</p> <p>1 Solidity setting: Function to store the current parameters into the flash memory, so that these parameters will be solidified and will be loaded as the default parameters every time when power is turned on.</p>
M27	To save the installation point parameter.
M28	Maintain the last good value when poor signal condition occurs. YES is the default setup.

M29	Setup a signal strength as empty pipe. For example input 65, it means the pipe is treated as empty pipe when the signal is less than 65, and the flow rate display is 0.
M30	Select metric or British system unit.
M31	Select flow rate unit.
M32	Select totalizer flow unit.
M33	Select totalizer multiple factor. The multiplying factor ranges from 0.001 to 10000. Factory default is 1
M34	Turn on or turn off the NET totalizer
M35	Turn on or turn off the POS (positive) totalizer
M36	Turn on or turn off the NEG(negative) totalizer
M37	Restore factory settings. Totalizer reset.
M38	Manual totalizer used for easier calibration. Press a key to start and press a key to stop the manual totalizer.
M39	Language selection. there are Chinese+English+Italian or English+Italian+Turkish
*M40	Damping factor. The damping factor ranges from 0 to 999 seconds. 0 means there is no damping. Factory default is 10 seconds
*M41	Cut-off low flow rate (or zero flow rate) to avoid invalid accumulation.
M42	Zero calibration/Zero point setup. Make sure the liquid in the pipe is not running while doing the setup.
M43	Clear the zero point value, and restore original value.
M44	Manual Zero point . Set up a flow bias. Generally this value should be 0.
M45	Flow rate scale factor. The default value is '1'. Keep this value as '1', when no calibration has been made.
M46	Networks address identification number. Any integer can be entered except 13(0DH, carriage return), 10 (0AH, line feeding), 42 (2AH), 38, 65535. Every set of the instrument in a network environment should have a unique IDN. Please refer to the chapter for communication.
M47	System locker to avoid modification of the system parameters. If password is forgotten, you could send a command 'LOCK0' to the serial input to unlock. Or you can write 0 to REGISTER49-50 under MODBUS protocol.
M48	Entry to linearity correcting data inputs. By using of this function, the non-linearity of flow meter will be corrected. Correcting data shall be obtained by careful calibration.
M49	Displays the input contents for the serial port. By checking the displays, you can know if the communication is OK.
M50	Switches for the built-in data logger. There are as many as 22 different items can be chosen. To turn this function, select 'YES' the system will ask for selecting the items.
M51	Time set for timing output.(data logger or printer)
M52	Data logging direction control. (1) If 'Send to RS485' is selected, all the data produced by the data logger will be transmitted out through the RS-232/RS485 interface (2) If 'To the internal serial BUS is selected, the data will be transmitted to the internal serial bus which allows a thermal printer, or a 4-20mA analog output module, to be connected to it.

M53	Display analog inputs, AI5, current value and its corresponding temperature or pressure or liquid level value.
M54	Pulse width setup for the OCT (OCT1) output. Range from 6 mS to 1000 mS
M55	Select analog output (4-20mA current loop, or CL) mode.
M56	Set the value which corresponds to 4mA or 0mA output current (4mA or 0mA is determined by the setting in M55)
M57	Set the value which corresponds to 20mA output current
M58	Current loop verification Check if the current loop is calibrated correctly.
M59	Display the present output current of current loop circuit.
M60	Setup system date and time. Press ENT for modification.
M61	Display Version information and Electronic Serial Number (ESN) that is unique for each flow meter.
M62	RS-232/RS485 setup. All the devices connected with flow meter should have matched serial configuration.
M63	Select communication protocol. Factory default is ‘MODBUS ASCII’. this is a mode for MODBUS-ASCII, Meter-BUS, Fuji Extended Protocol, Huizhong’s various protocols. If you are going using MODBUS-RTU you have to select ‘MODBUS_RTU’.
M64	AI3 value range. Used to enter temperature/pressure values that are corresponding to 4mA and 20mA input current. The display values have no unit, so that they can present any physical parameter.
M65	AI4 value range. Used to enter temperature/pressure values that are corresponding to 4mA and 20mA input current.
M66	AI5 value range. Used to enter temperature/pressure values that are corresponding to 4mA and 20mA input current.
M67	Setup the frequency range (lower and upper limit) for the frequency output function. Valid range is 0Hz-9999Hz. Factory default value is 0-1000 Hz.
M68	Setup the minimum flow rate value which corresponds to the lower frequency limit of the frequency output.
M69	Setup the maximum flow Rate value that corresponds to the upper frequency limit of the frequency output.
M70	LCD display back light control.
M71	LCD contrast control.
M72	Working timer. It can be cleared by pressing ENT key, and then select YES.
M73	Window to setup the lower limit of flow rate for Alarm#1. When the flow rate is below the set value, Alarm#1 equals ‘on’
M74	Window to setup the upper limit of flow rate for Alarm#1. When the flow rate is above the set value, Alarm#1 equals ‘on’ There are two alarms in the flow meter, and every alarm can be pointed to alarm output devices such as the BUZZER or OCT output or RELAY output. For example, if you want

	the Alarm#1 is to output by the OCT circuit, you need to set M78 at selection item 6.
M75	Window to setup the lower limit of flow rate for Alarm#2.
M76	Window to setup the upper limit of flow rate for Alarm#2.
M77	Buzzer setup. If a proper input source is selected, the buzzer will beep when the trigger event occurs.
M78	OCT (Open Collect Transistor Output)/OCT1 setup By selecting a proper input source, the OCT circuit will close when the trigger event occurs.
M79	Relay or OCT2 setup By selecting a proper input source, the RELAY will close when the trigger event occurs
M80	Window for selecting the trig signal for the built-in batch controller. Available trig sources: 0. Key input (press ENT key to start the batch controller) 1. Serial port 2. AI3 rising edge (when AI3 receives 2mA or more current) 3. AI3 falling edge (when AI3 stop receiving 2mA or more current) 4. AI4 rising edge (when AI3 receives 2mA or more current) 5. AI4 falling edge (when AI3 stop receiving 2mA or more current) 6. AI5 rising edge (when AI3 receives 2mA or more current) 7. AI5 falling edge (when AI3 stop receiving 2mA or more current) 8. Timer periodically (define the start time and interval time in M51) 9. Timer daily (define the start time and interval time in M51) For the input analog current signal, 0 mA indicates "0", 4mA or more indicates '1'. By selecting item #8, the batch totalizer can be started periodically by the internal timer located at Menu51. When the batch totalizer is full, a signal which indicate the batch is full can be direct to either the OCT or the RELAY terminals to stop the pump or other devices. By selecting item #9, the batch totalizer could act as totalizer witch runs for only a period of the day so that a alarm signal could be produced if the total flow during that time period is over a certain amount of. For example, if you want a alarm signal which stand for the total flow is over 100 cubic meters during the period of every day from 20:00 to 06:00, setups is like M51 start time =20:00:00 M51 interval =10:00:00 M51 log times =9999 (means always) M80 select item #9 M81 input 100 (Unit is defined in M30,M31,M32)
M81	The built-in batch controller Set the flow batch value(dose) The internal output of the batch controller can be directed either to the OCT or the RELAY output circuits. M81 and M80 should be used together to configure the batch controller. Note: Because the measuring period is 500mS, the flow for every dos should be keeping

	at 60 seconds long to get a 1% dose accuracy.
M82	<p>View the daily, monthly and yearly flow totalizer and thermal energy totalizer value.</p> <p>The totalizer values and errors for the last 64 days, 32 last 32 months and last 2 years are stored in the RAM memory, To view them, use the ‘ENT’ and ‘UP’ ‘Down’ keys.</p>
M83	<p>Automatic Amending Function for automatic offline compensation.</p> <p>Select ‘YES’ to enable this function, select ‘NO’ to disable it.</p> <p>When the function is enabled, The flow meter will estimate the average flow uncounted (or ‘lost’) during the offline session and add the result to the totalizer.</p> <p>The estimation of the uncounted flow is made by computing the product of the offline time period and the average flow rate, which is the average of the flow rate before going offline and the one after going on line.</p>
M84	Set the thermal energy unit: 0. GJ 1. KC 2.KWh 3. BTU
M85	<p>Select temperature sources</p> <p>0. from T1,T2 (factory default)</p> <p>1. from AI3, AI4</p>
M86	<p>Select the Specific Heat Value.</p> <p>Factory default is ‘GB’. Under this setting, the flow meter will calculate the enthalpy of water based on the international standard.</p> <p>If the fluid is other than water, you should select option ‘1. Fixed Specific Heat’, and enter the specific heat value of the fluid.</p>
M87	Turn on or turn off the Energy totalizer.
M88	<p>Select thermal energy totalizer multiplying factor.</p> <p>Factory default is ‘1’.</p>
M89	<p>1. Display the temperature difference 2. Window for entering the lowest temperature difference.</p>
*M90	<p>Display signal strengths S (one for upstream and one for downstream), and signal quality Q value.</p> <p>Signal strength is presented by 00.0 to 99.9, the bigger the value, the bigger the signal strength will be, and more reliable readings will be made.</p> <p>Q value is presented by 00 to 99, the bigger the better. It should at least be great than 50 for normal operations.</p>
*M91	Displays the Time Ratio between the Measured Total Transit Time and the Calculated time. If the pipe parameters are entered correctly and the transducers are properly installed, the ratio value should be in the range of 100±3%. Otherwise the entered parameters and the transducer installation should be checked.
M92	Displays the estimated fluid sound velocity. If this value has an obvious difference with the actual fluid sound speed, pipe parameters entered and the transducer installation should be checked again.
M93	Displays total transit time and delta time(transit time difference)
M94	Displays the Reynolds number and the pipe factor used by the flow rate measurement program. Pipe factor is calculated based on the ratio of the line-average velocity and the cross-section average velocity.
M95	(1) Display the positive and negative energy totalizers

	(2) Upon entering this window, the circular display function will be started automatically. The following windows will be displayed one by one, each window will stay for 8 seconds: M95>>M00>>M01>>M02>>M02>> M03>>M04>>M05>>M06>>M07>>M08>>M90>>M91>>M92>> M93>> M94>>M95. This function allows the user to visit all the important information without any manual action. To stop this function, simply press a key. Or switch to a window other than M95.
M96	This is not a window but a command for the thermal printer to advance 5 lines of paper.
M97	This is not a window but a command to print the pipe parameters. By default, the produced data will be directed to the internal serial bus (thermal printer). You can also direct those data to the serial communication port.
M98	This is not a window but a command to print the diagnostic information. By default, the produced data will be directed to the internal serial bus (thermal printer). You can also direct those data to the serial communication port.
M99	This is not a window but a command to copy the current display window. By default, the produced data will be directed to the internal serial bus (thermal printer). You can also direct those data to the serial communication port. By use of the window copying function, you can hardcopy very window displaying manually by switching windows, or you can obtain the window displaying data by communication.
M+0	Browse the 32 recorded instrument power-on and power-off date and time with the flow rate at the time of power on and off
M+1	Displays the total working time of the flow meter. When the backup battery is removed, the total working time will be reset to zero.
M+2	Displays the last power-off date and time
M+3	Displays the last power-off flow rate
M+4	Displays how many times of has been powered on and powered off.
M+5	A scientific calculator for the convenience of field working. All the values are in single accuracy. The calculator can be used while the flow meter is conducting flow measurement. Water density and PT100 temperature can also be found in this function.
M+6	Set fluid sound speed threshold Whenever the estimated sound speed (displayed in M92) exceeds this threshold, an alarms signal will be generated and can transmitted to BUZZER or OCT or RELAY. This function can used to produce an alarm or output when fluid material changes.
M+7	Displays total flow for this month(only for the time past)
M+8	Displays total flow for this year(only for the time past)
M+9	Display the not-working total time in seconds. The total failure timer will also include the time when power off, if the back-up battery is applied.
M.2	Entry to solidify the zero point. password protected.
M.5	Setup the Q value threshold. If the present Q is below this threshold, flow rate will be set to 0. This function is useful when flow meter is installed in noisy environment or on airy pipes.
M.8	The maximum flow rates for today and this month.

M.9	Serial port tester with CMM command output for very second.
M-0	Entry to hardware adjusting windows only for the manufacturer
M-1	4-20mA output adjustment
M-2	4mA calibration for AI3 input
M-3	20mA calibration for AI3 input
M-4	4mA calibration for AI4 input
M-5	20mA calibration for AI4 input
M-6	4mA calibration for AI5 input
M-7	20mA calibration for AI5 input
M-8	Lower Temperature Zero setup for the PT100
M-9	Higher Temperature Zero setup for the PT100
M-A	Temperature Calibration at 50°C
M-B	Temperature Calibration at 84.5°C

6.4 Quick setup of measured parameters

Accurate measured parameters can have a great influence on measuring precision and reliability. It is suggested to measure the practical perimeter and wall thickness of the pipeline. Ultrasonic thickness gauge can be used to measure the pipe thickness.

Measured parameters setup is from Menul0 to Menu29. Please complete one by one.

>>> Following parameters need to be inputted before measurement:

1. Outer diameter unit: mm
 2. Pipe thickness unit: mm
 3. Pipe material
 4. Lining parameters: thickness and sound velocity (If have lining)
 5. Liquid type
 6. transducer type
 7. transducer mounting type

>> Above parameters setup generally follow the steps below:

1. Press keys [I] / - to enter Mil window to input the pipe outer diameter, and then press IEN] key.
 2. Press key IT / - to enter MI2 window to input the pipe outer diameter and then press 00 key.
 3. Press key IT / - to enter MI4 window, and press 00 key to enter the option selection mode. Use keys IA! + land IT / - to select the pipe material, and then press 00 key.
 4. Press key IT / - to enter MI 6 window, press IEN] key to enter the option selection mode. Use keys I•d and IT / - to select the liner material, and then press ENT key. Select "No Liner",
 5. if there is no liner.
 6. Press key IT / - to enter M20 window, press 00 key to enter the option selection mode. Use keys I•! and IT / - to select the proper liquid, and then press IEN] key.
 7. Press key IT / - to enter M23 window, press 00 key to enter the option selection mode. Use keys I•! and IT / - to select the proper transducer type, and then press IEN] key.
 8. Press key IT / - to enter M24 window, press 00 key to enter the option selection mode. Use keys I•dan T / - to select the proper transducer mounting method, and then press IEN] key.
 9. Press key IT / - to enter M25 window and get the transducer installation distance.
 10. Press W W to store the parameters setup.

>> Scaling

The inside scaling would have bad effect on ultrasonic signal transmission, and would decrease the inner diameter as well. As a result, the measurement accuracy can not be guaranteed. Please try to avoid choosing the installation point with inside scaling.

>>Temperature

The liquid temperature on installation point should be in the working range of transducers. Please try to choose the point with lower temperature. Avoid to choose points like the outlet of boiler water and heat exchanger. Return water pipe would be better.

Temperature range of standard clamp on and insertion transducers: -30 - 90°C Temperature range of high temperature clamp on and insertion transducers: -30 - 160°C

>>Pressure

The maximum pressure for standard insertion and inline transducer is 1.6MPa
Out of this range need customized.

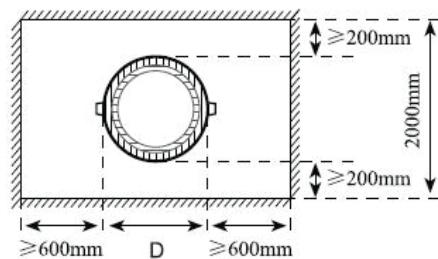
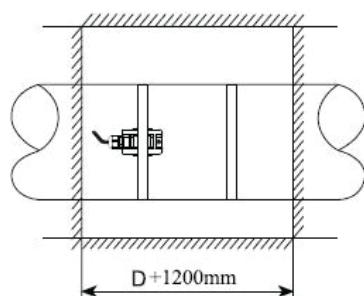
>>EMI (electromagnetic interference)

The ultrasonic flow meter, transducer and signal cable can be easily interfered by interference sources such as frequency changer, radio station, microwave station, GSM base station and high-tension cable. Please try to avoid these interference sources when choosing installation points.

The shield layer of flow meter, transducer and signal cable should be connected to earth.
Better to use isolated power supply. Do not use the same power supply with the frequency converter.

>>Instrument well

When measuring underground pipes or need to protect the measuring points, an instrument well is required. To ensure the enough installation space, the sizes of instrument well should meet the following requirements.



D means the pipe diameter

7.2 Clamp on transducer Installation

8_ Before installation, please verify the parameters of pipeline and liquid. To ensure the installation accuracy

1. Installation procedure

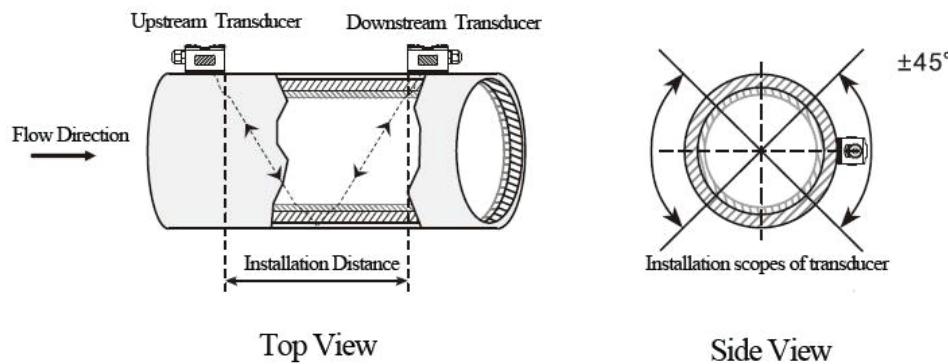
Select an installation method ----> Input the measuring parameters ----> Clean pipe surface>
Install transducers > Check the installation

2. Select an installation method

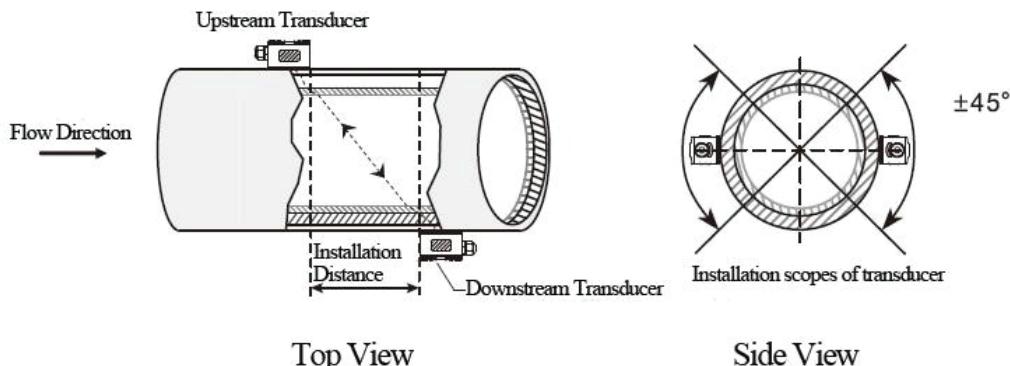
There are two different methods for clamp on transducers: V method and Z method.

>> V method

V method should be priority selected for pipe sizes DN15 – DN200. Let the pair of transducers horizontal alignment, the central line in parallel with the pipeline axis.



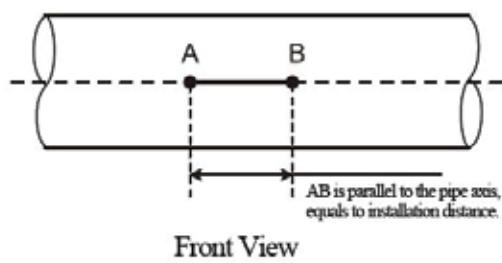
>> Z method



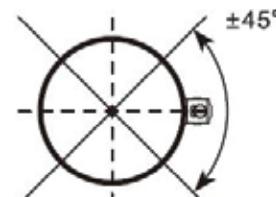
3. Positioning installation points

>> V method

The line between two transducers is parallel to pipe axis, and equal to the distance shown in the converter. As shown, A, B are the two installation points.



Front View



Side View

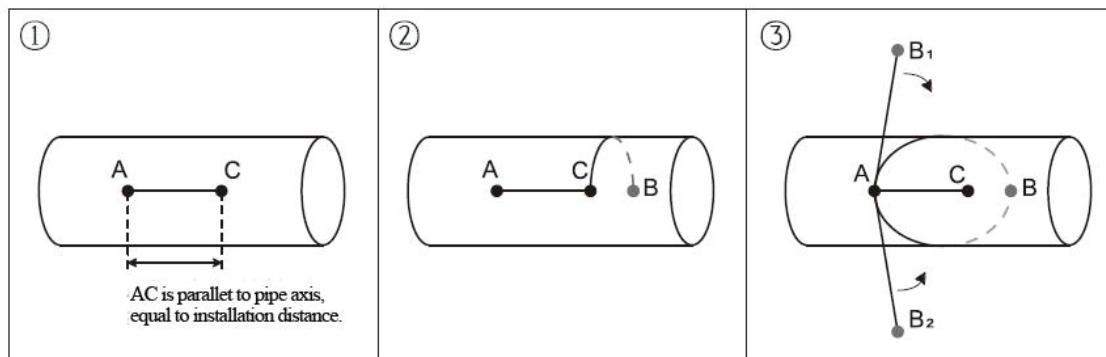
>> Z method

(D) Firstly according to the installation distance shown in converter, positioning two points A, C on the same side of pipeline. AC is parallel to pipe axis.

(1) Perpendicular to the pipe axis, opposite to point C, get Point B.

© Check. Measure the length between A and B from both sides of the pipe, get AB₁ and AB₂. If AB₁ = AB₂, then B is the correct point. If not, need to positioning point B and C again.

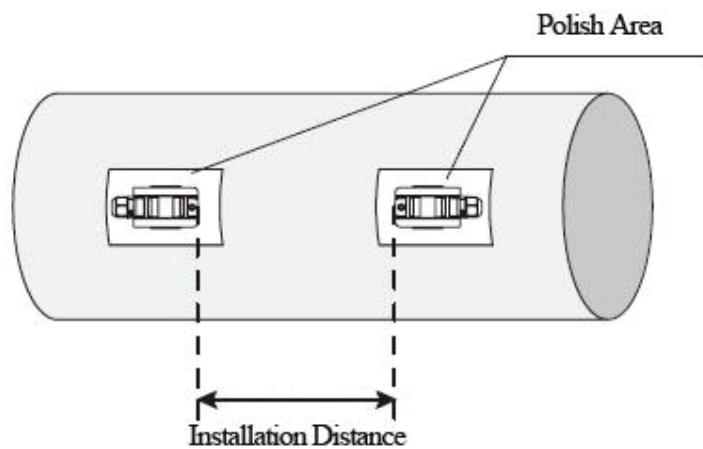
As shown, A, B are the two installation points.



4. Clean the surface of installation points

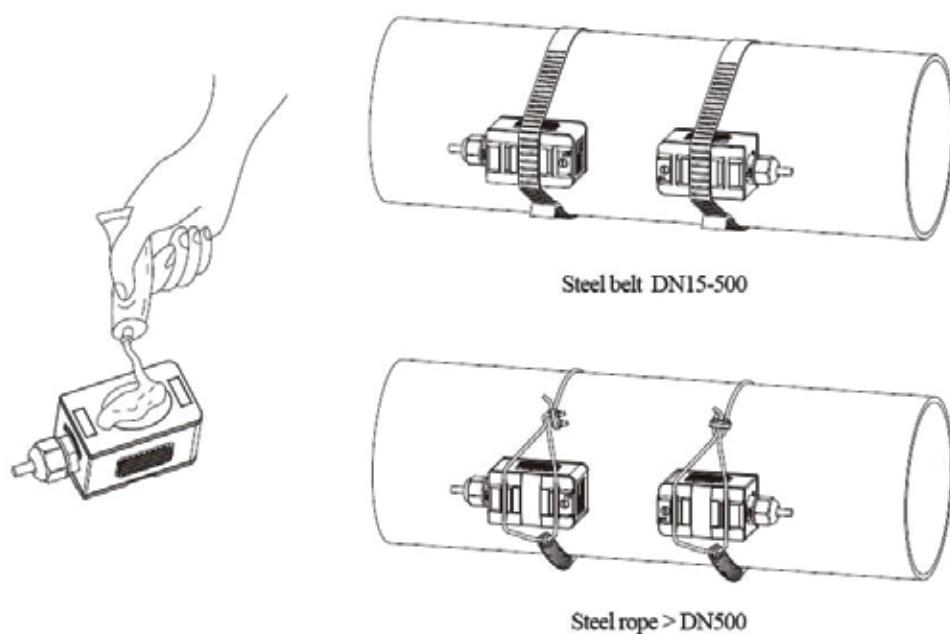
Paint, rust and anti-corrosive coating on installation points need to be cleaned. It's good to use a polishing machine to get the metal luster.

As shown below:



5. Install transducers

After transducer wiring and sealing, please evenly smear 2-3mm couplant on the transducer emitting surface. Then put the transducers on the installation points, fixed with steel belt or steel rope.



5. Check Installation

The flow meter includes the detection ability. M90 is used for checking signal strength and quality. M91 is used for checking the ratio of measured and theoretical transmission time (transmission time ratio).

1) Check signal strength and quality

M90 is used for checking the signal strength and signal quality(Q value) of upstream and downstream transducers.

Signal strength is represented by numbers 00.0 – 99.9, 00.0 means no signal and 99.0 means maximum signal. Generally, the flow meter can work properly when signal strength is > 60.0

Signal quality (Q value) is represented by numbers 00 – 99. 00 means signal is worst and 99 means signal is best. The flow meter can work properly when Q > 60.

During the installation, please adjust the transducer to make the signal strength and signal quality the larger the better. This will ensure the flow meter long term stable operation and lead to accurate measurement.

Signal strength and Q value	Installation Judgement
< 60	Can not work
60~75	Bad
75~80	Good
>80	Excellent

2) Check transmission time ratio

M91 is used for displaying transmission time ratio. It is a percentage ratio between theoretical transmission time and measured transmission time. It shows the relation between setting parameters and actual transducer installation distance. This ratio should be between 97% – 103%. If not in the range of 97%-103%, it means that the parameters and transducer installation distance are inconsistent. Please check separately.

8. Finish Installation

1. Commonly used menus. MO0 or MO2 is for meter reading. M30~M33 is for unit selection. M40 is for selecting damping factor, generally 5~10 sec. M60 is for correcting time and date. M26 is for curing parameters.
2. To avoid signal reduction and improve anti-jamming ability, it is better to use the customized signal cable from flow meter manufacturer.
3. The length of cables between converter and transducer should be as short as possible, cannot exceed 200m.
4. The temperature and humidity of working environment should be in the range of technical specifications. Avoid direct sunlight on LCD.



Setting Trends

Virtec is one of the global leaders providing Heat & Flow management solutions in HVAC & Water applications. The solutions are based on two measuring technologies, Ultrasonic & Electromagnetic principle. Our high-end services and cutting-edge product solutions in this field have made us the leading providers of technologically advanced Heat and Flow measuring instruments.

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