



TEK-CLAMP 1200A

Ultrasonic Clamp-On Flowmeter

Instruction Manual

Document Number: IM-1200A



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1 Safety Instructions

1.1 Intended Use

Tek-Clamp 1200A is an Ultrasonic Clamp-on Flowmeter are used only for measuring the flow of liquids in closed pipes, e.g.: Clean water, wastewater etc.

The manufacturer is not liable for damage caused by improper or non-designated use.

1.2 Safety Instructions from the Manufacturer

This meter was calibrated at the factory before shipment. To ensure correct use of the meter, please read this manual thoroughly.

1.2.1 Disclaimer

The manufacturer will not be held accountable for any damage that happens by using its product, including, but not limited to direct, indirect, or incidental and consequential damages.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer has the right to modify the content of this document, including the disclaimer, at any time for any reason without prior notice, and will not be answerable in any way for the possible consequence of such changes.

1.2.2 Product Liability and Warranty

The operator shall bear authority for the suitability of the device for the specific application. The manufacturer accepts no liability for the consequences of misuse by the operator. Wrong installation or operation of the devices (systems) will cause the warranty to be void. The respective Terms and Conditions of Sale, which forms the basis for the sales contract shall also apply.

1.2.3 Information Concerning the Documentation

To prevent any injury to the operator or damage to the device it is essential to read the information in this document and the applicable national standard safety instructions. This operating manual contain all the information that is required in various stages, such as product identification, incoming acceptance and storage, mounting, connection, operation and commissioning, troubleshooting, maintenance, and disposal.

1.3 Safety Precautions

You must read these instructions carefully prior to installing and commissioning the device. These instructions are an important part of the product and must be kept for future reference. Only by observing these instructions, optimum protection of both personnel and the environment, as well as safe and fault-free operation of the device can be ensured.

Warnings and Symbols Used

The following safety symbol marks are used in this operation manual and on the instrument.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.



NOTE

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.

1.4 Packaging, Transportation and Storage

1.4.1 Packaging

The original package consists of

1. Tek-Clamp 1200A Ultrasonic Clamp-on Flowmeter
2. Documentation



i NOTE

Unpack and check the contents for damages or signs of rough handling. Report damage to the manufacturer immediately. Check the contents against the packing list provided.

1.4.2 Transportation

- Avoid impact shocks to the device and prevent it from getting wet during transportation.
- Verify local safety regulations, directives, and company procedures with respect to hoisting, rigging, and transportation of heavy equipment.
- Transport the product to the installation site using the original manufacturer's packing whenever possible.

1.4.3 Storage

The Tek-Clamp 1200A-100F1 is designed for installation and usage purpose in typical commercial/industrial environments. The following considerations must be observed in selecting a location for the meter:

- The ambient operating temperature range is -22 °F (-30 °C) to 176 °F (80 °C)
- Do not expose the meter to corrosive liquids or fumes
- Avoid installation locations that are close to strong sources of electrical interference
- Avoid installing the electronics enclosure in direct sunlight

- Avoid installation locations where the transducers will be exposed to vibrations in the piping system
- Always run transducer cables in a dedicated conduit separate from signal and power cables
- Allow sufficient space for daily inspection, wiring, etc.
- Avoid installing the meter at a place subjected to, or at risk of, flooding

1.4.4 Nameplate

The nameplate lists the order number and other important information, such as design details and technical data



NOTE

Check the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

Tek-Clamp 1200A Clamp-On Ultrasonic Flow Meter

Model No: 1200A-100

Power Supply: 8 to 36VDC



Crystal Lake, IL 60014 USA
www.tek-trol.com

2 Product Description

This section covers the reference and specification data, as well as ordering information.

2.1 Introduction

Tek-Clamp 1200A Ultrasonic Clamp-on Flowmeter is designed to measure the velocity of liquid in a full/closed pipe. It operates according to the difference in the Transit Time of Flight measured, and determines the flow velocity by measuring the travel time of a pulse from one transducer to the next. Electroacoustic transducers receive and emit brief ultrasonic waves through the liquid in the pipe. Transducers are vertically placed at both sides of the measured pipe and fastened by means of a clamp. The Tek-Clamp 1200A can be used for metallic, plastic and rubber tubes.

2.2 Measuring Principle

When the ultrasonic waves are transmitted through the flowing liquid, there will be a difference between the upstream and downstream transit time (travel time or time of flight), which is proportional to flow velocity. Ultrasonic waves travelling in the same direction as that of the flow takes lesser time to reach the second transducer than that of the waves which travels in the opposite direction of the flow.

The formula for calculating velocity is:

$$V = \frac{MD}{\sin 2\theta} \times \frac{\Delta T}{T_{up} \times T_{down}}$$

Where,

θ is the include angle to the flow direction

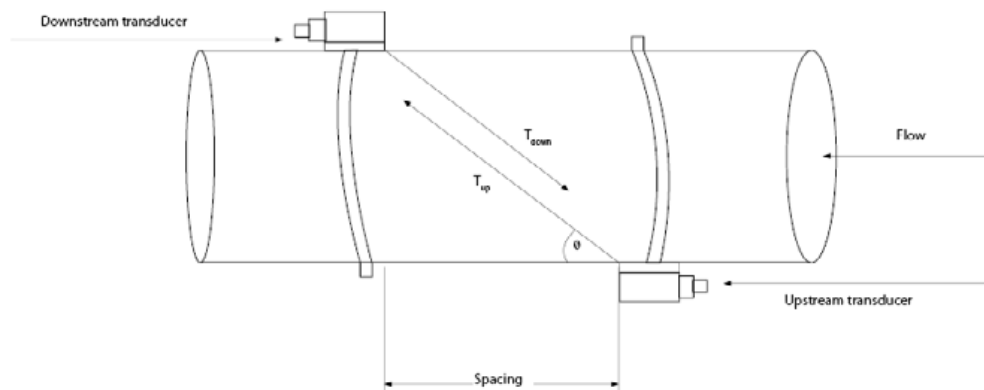
M is the number of times that the ultrasonic beam travels

D is the pipe diameter

T_{up} is the time for the beam to travel from upstream transducer to the downstream

T_{down} is the time for the beam to travel from downstream transducer to the upstream

$$\Delta T = T_{up} - T_{down}$$

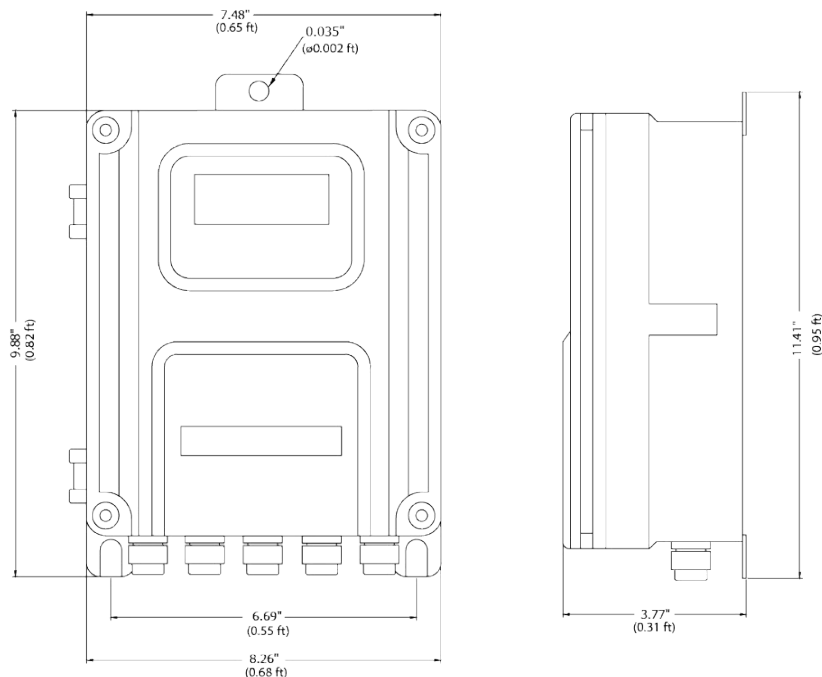


Working of Ultrasonic Flowmeter

2.3 Specifications

Parameters			Specification
Main Unit	Accuracy		Better than ± 1.0 %
	Repeatability		0.2%
	Measurement Period		0.5 Seconds
	Measurement Principle		Transit-time measurement principle
	Display		LCD with backlight. 2 x 20 letters
	Output	100F1	Modbus RS485 4-20 mA, Pulse
		100M	Modbus RS485 4-20 mA, Pulse
		100H	None
	Input		Two three wire system PT100 platinum resistor input loop. For BTV process monitoring
	Other Functions		Automatically stores the memory of the positive, negative, net totalizer flow rate and heat quantity of the last 512 days, 128 months, 10years
	Power	100F1	85 to 264 VAC or 8 to 36 VDC
		100M	8 to 36 VDC
		100H	Rechargeable nickel metal hydride battery
	Power Consumption		Less than 1.5W
	Environment Temperature		-22 °F to 176 °F (-30 °C to 80 °C)
	Environment Humidity		85% RH
Transducers	Clamp-On		S2-type: for pipe size ½"- 4" (DN0.04-DN0.33 ft) M2-type: for pipe size 2"- 28" (DN0.16-DN2.33 ft) HS-type: for pipe size ½"- 4" (DN0.04-DN0.33 ft) HM-type: for pipe size 2"- 28" (DN0.16-DN2.33 ft)
	Protection Class		IP65 (Tek-Clamp 1200A-100F1) IP57 (Tek-Clamp 1200A-100M and 1200A-100H)
Liquids	Types		Virtually all commonly used clean liquids. Liquids with small quantity of tiny particles may also be applicable. Particle size should be less than 75 um, particle concentration less than 20,000 ppm. Liquids should contain no or very minor air bubbles.
	Process Temperature		-40 °F to 320 °F (-40 °C to 160 °C)
Pipe	Pipe Material		All metals ,most plastics, fiber glass, etc.
	Pipe Size		½" – 28" (DN0.04 ft-2.33 ft))
	Pipe Straight Run		More than 10 D for upstream, more than 5 D for downstream, 30 D if a pump is near upstream, where D is pipe diameter.

2.4 Dimensional Drawing



2.5 Model Chart

Model Number	Description
Note: Controller, Sensors, and Options are all ordered individually	
Controllers	
1200A-100F1	Wall Mount Ultrasonic Flowmeter
1200A-100M	Low Cost DIN Mount Flowmeter
1200A-100H	Hand Held Ultrasonic Flowmeter (with carrying case)
Transducers	
1200A-S2	½" to 4" Pipe (Wall and DIN Controller)
1200A-M2	2" to 28" Pipe (Wall and DIN Controller)
1200A-S2H	½" to 4" Pipe (Hand Held)
1200A-M2H	2" to 28" Pipe (Hand Held)
1200A-HSH	½" to 4" Pipe, Bracket Mounted Sensors (Hand Held)
1200A-HMH	2" to 28" Pipe, Bracket Mounted Sensors (Hand Held)
Accessories	
1200A-TM8812	Ultrasonic Thickness Gauge
1200A-SEYV75-2-5	Junction box and two 16' Extention Cables
1200A-Gel	Coupling Gel

3 Installation

This section covers instructions on installation and commissioning. Installation of the device must be carried out by trained, qualified specialists authorized to perform such works.



CAUTION

- When removing the instrument from hazardous processes, avoid direct contact with the fluid and the meter
 - All installation must comply with local installation requirements and local electrical code
-

3.1 Selection of Installation Place

Careful attention should be given while selecting the place of installation for system components as it will help the operators with the initial installation, reduce the start-up problems and make further installations easier.

For example: Do not install the Tek-Clamp 1200A-100F1 flowmeter where it will be difficult for the personnel to perform periodic maintenance.

When selecting a site for mounting the system components, consider the criteria under Section **1.4.3. Storage**.

3.2 Installation of the Wall Mount Enclosure

- Find an easily accessible location where wire connections can be made and flowmeter readings can be taken from floor level
- Mount the enclosure on a vibration-free surface
- Avoid sites such as the plenum of a fan coil, heat exchanger, or other housings containing motors
- Avoid mounting the enclosure in close proximity to VFD's, electric motors or other strong sources of electrical interference



NOTE

Secure at least 4 inch (0.33 ft) of space between the flow transmitter and nearby wall. Also secure a space for opening the front cover for maintenance. Secure a cable wiring space under the enclosure

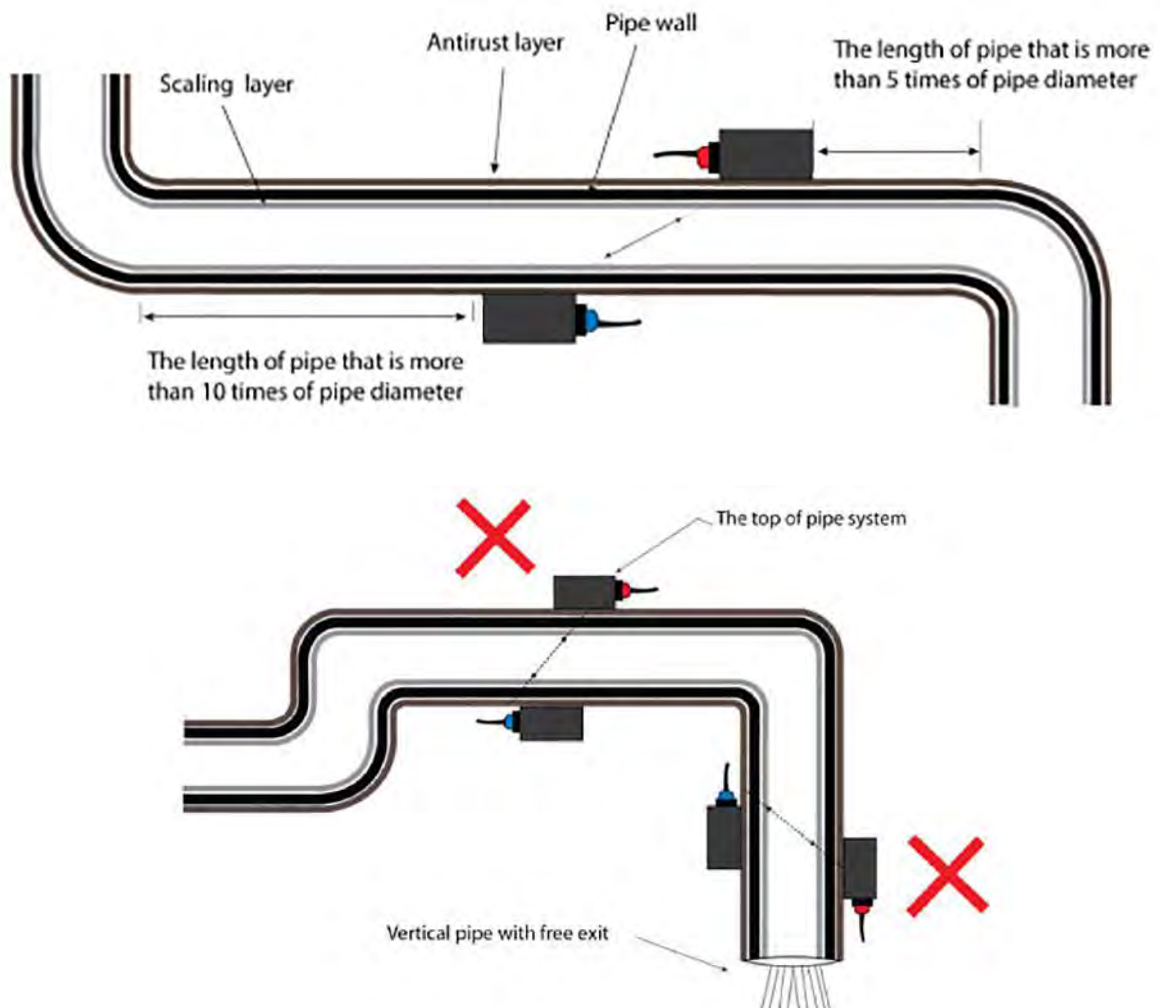
3.3 Installation of the Transducer

Installation of Tek-Clamp 1200A-100F1 series is the easiest and convenient way in the installation of all flowmeters. Just choose a suitable measurement point, input the pipe parameters of this pipe point to the flowmeter, and then fix the transducers on the pipe.

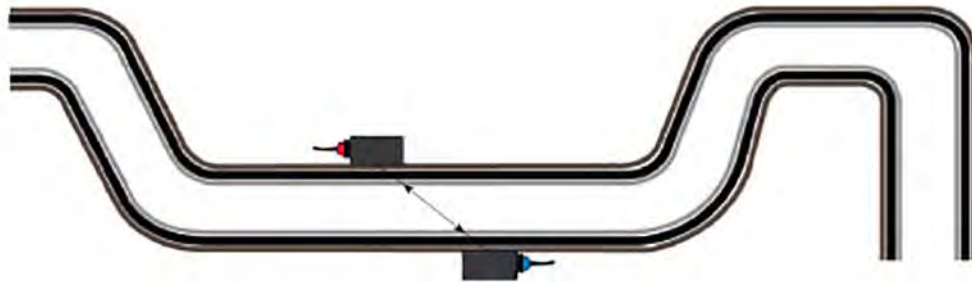
3.3.1 Choosing the Measurement Point

To ensure measurement accuracy and stability, the installation point of transducers should be on the straight pipe full of well-distributed fluid (when installing, the pipe must be full of liquid), and should follow the given points:

- Pipe must be full of liquid that is uniform and easy for the ultrasonic pulse to travel through (vertical pipe or horizontal pipe)
- Avoid installing the transducer at the highest point of the pipe system or on the vertical pipe with free exit (down flow)



- For the open pipe or half full pipe, the transducers should be installed at the bottom of U pipe

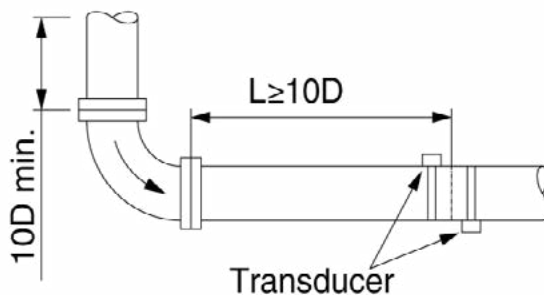


- The temperature and pressure on the installation point should be within the workability of the transducers
- Pay attention to the pipe's inner wall and check for pollution build-up. Select a pipe without any or very little build-up of sediment because it may interfere with the signal
- In case of horizontal piping, mount the detector within 45° from the horizontal plane. Otherwise, the measurement may be impossible if bubbles stay in the upper part of the piping or if deposits are accumulated in the lower part of the piping. In case of vertical piping, the detector may be mounted at any position on its periphery provided that the flow is upward.

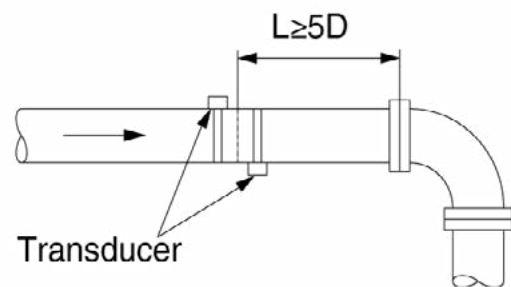
3.3.2 Length of the straight pipe

The length of upstream and downstream straight pipe of the ultrasonic transducer should be long enough to ensure accurate measurements.

- **For 90° bend**

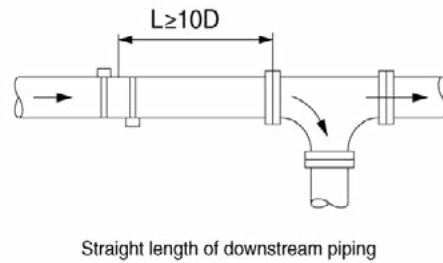
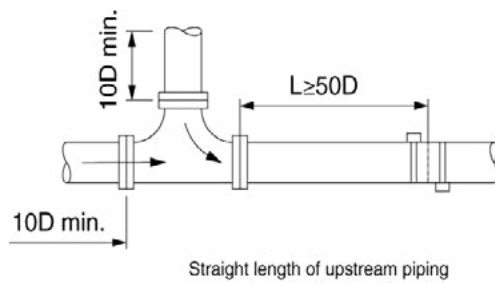


Straight length of upstream piping

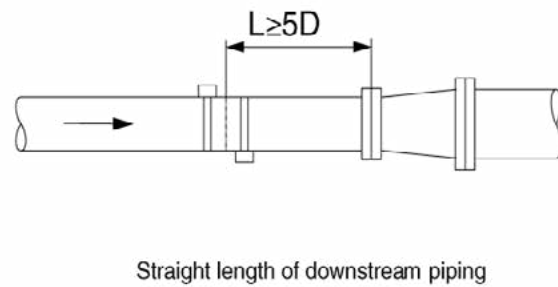
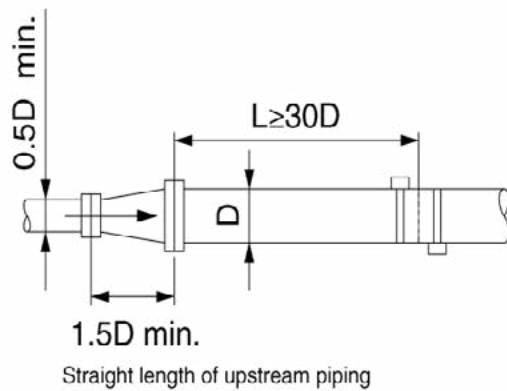


Straight length of downstream piping

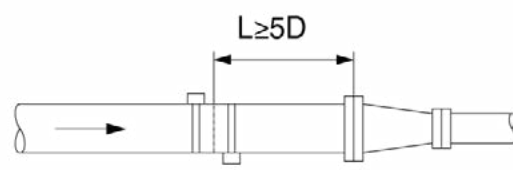
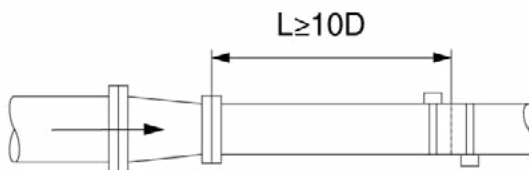
- **For Tee bend**



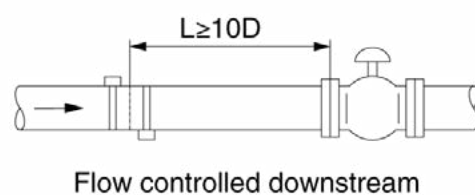
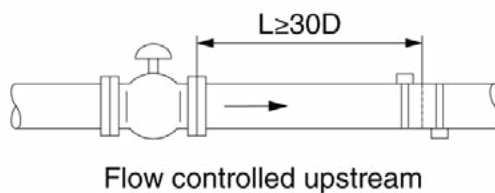
- **For Diffuser**



- **For Reducer**

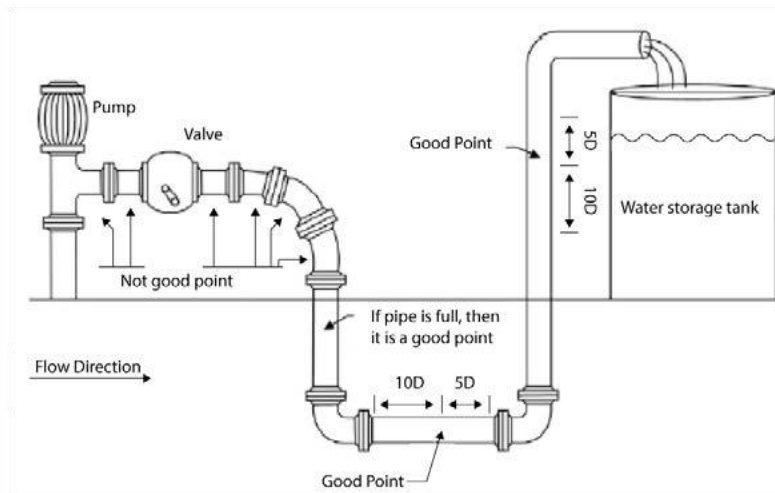
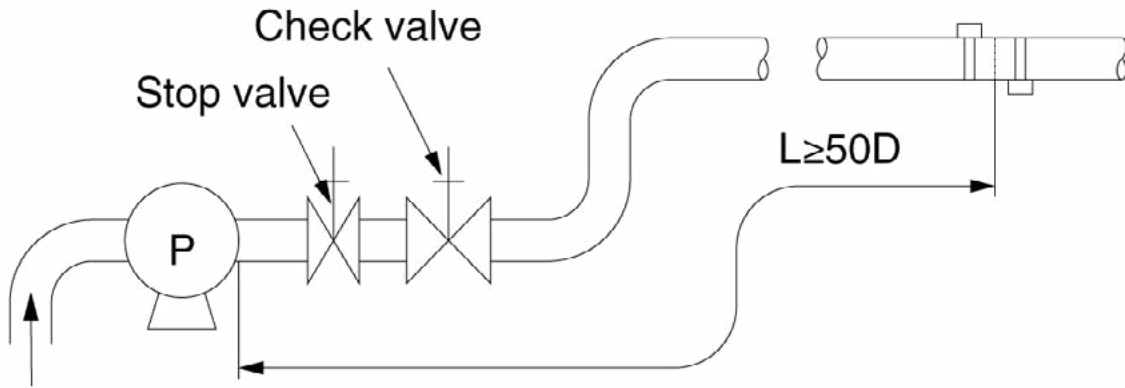


- **For Valve**



- **For Pump**

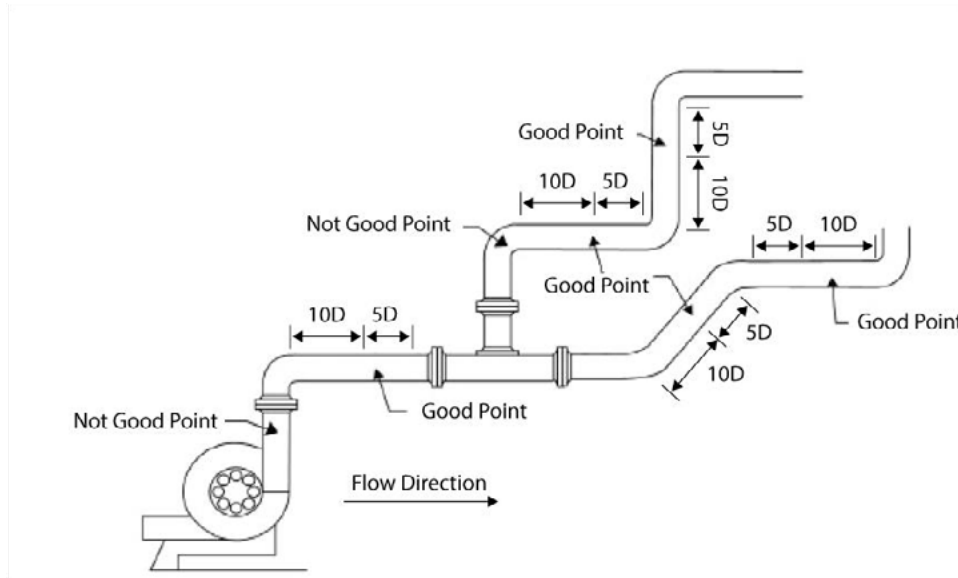
The figure below shows the installation point of transducers when a pump is used in the pipeline.



The above figure shows the installation point of transducers when a compressor is used in the pipeline.

3.3.3 Transducer Installation Method

Before installing, start by cleaning the installation area: remove any rust, paint, and anti-rust layers. Then polish the area using a clean cloth with either alcohol or acetone. Apply a sufficient amount of grease at the installation area and clamp the transducers tightly on the pipe. The grease is used to eliminate any gaps between the transducer and the pipe wall.

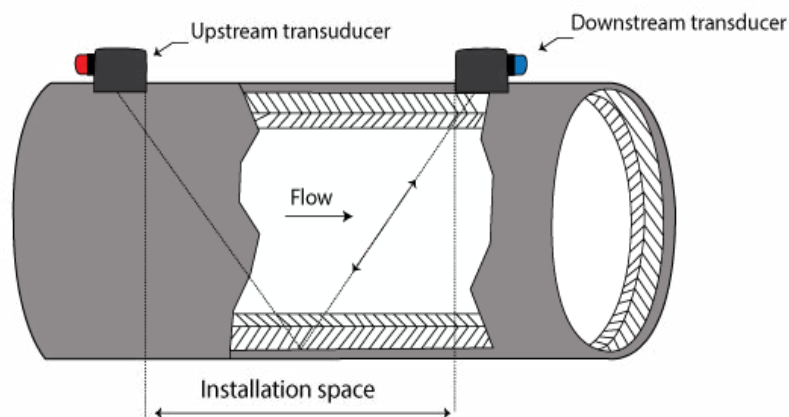


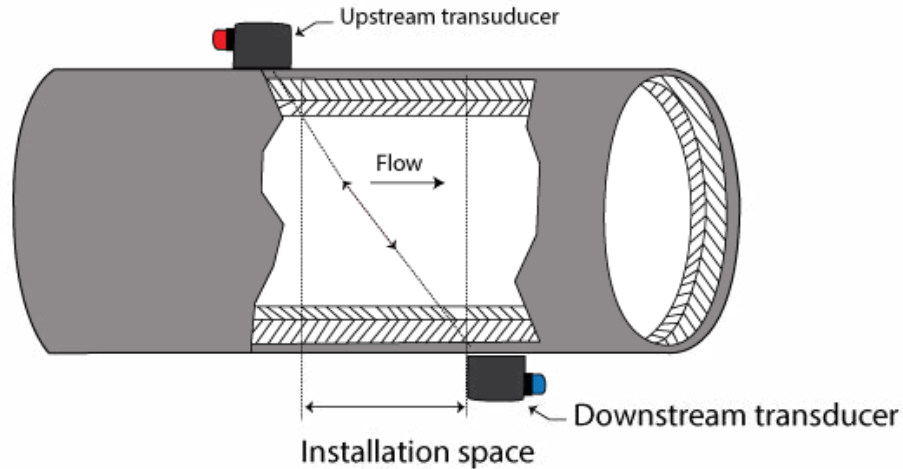
NOTE

If enough grease is not applied or the transducers are not clamped to the wall tightly, the precision of measurement may be effected.

3.3.3.1 Installation Space

Installation space of the clamp-on type transducer is the inner distance between the two transducers when they are facing each other. After giving the input of the required parameters to the menu of the converter, check the display on the parameter M25 to get the installation space.

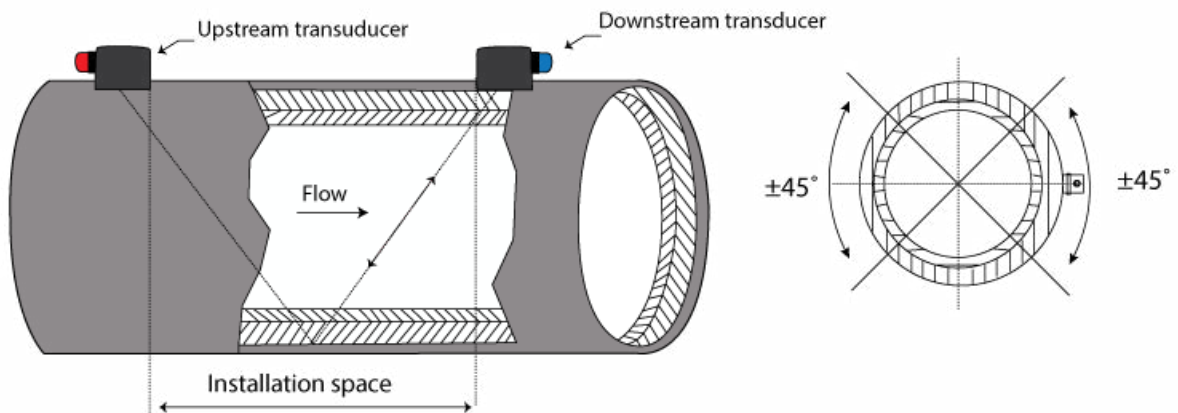




3.3.3.2 Installation Method

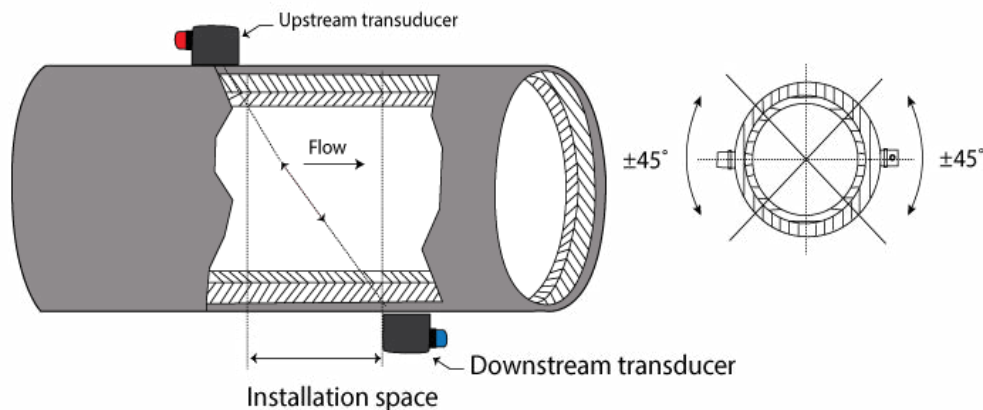
There are two types of the installation methods i.e. the V method and the Z method.

- **V method**



V method is a standard installation method and convenient to use for precise measurement of flow. While installing the two transducers, they're horizontally aligned. They are suitable for pipe diameter range ½" to 16" (DN15 mm-DN400 mm).

- **Z method**



When the pipe diameter is wide, or there are suspended matters in the fluid, or the scaling is too thick and interferes with the normal functioning of the flowmeter and weakens the signal in a V method installation, then Z method installation is used. It is also called the single sound path as it can directly transfer the pulse without any reflection required as is required in case of V method and therefore has less signal attenuation.

i **NOTE**

When installing the transducers, the pipe area where the transducers are to be installed, must be clean

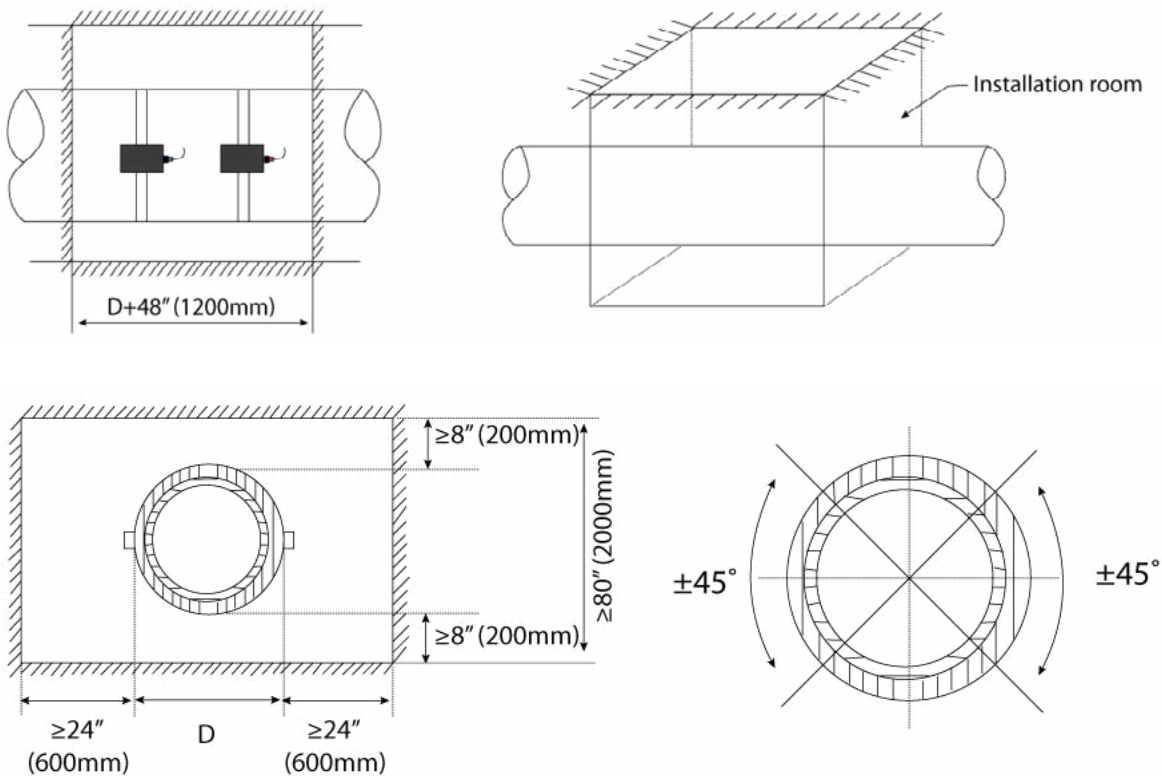
The shield cable must be properly connected and proper sealants must be applied to the transducers to prevent the water from entering inside the transducers

Use stainless steel band straps to fix the transducers and to prevent it from moving

Apply enough couplant around the area, so that transducers touch the pipe and prevent air, sands, and rust that interfere with the pulse transfer

3.4 Instrument Well Construction Requirements

To install transducers in an instrument well, there must be enough installation room and should be convenient for people to stand up and work. Distance between the pipe wall and well wall is at least above 22 inch, width is more than $(D+22 \times 2)$ inch, cement pipe width is more than $(D+28 \times 2)$ inch, and the instrument well axial width L is more than $D+48$ inch. When installing transducers, avoid the placement on the flange, welding line, reducing. Do best to install transducers in the range of $\pm 45^\circ$ of the horizontal position of pipe axis.



3.5 Quick Pipe Parameter Setting

The user must set the parameters when measuring the following:

1. Pipe outer diameter
2. Pipe wall thickness
3. Pipe material
4. Liner parameter (if having liner, then the liner thickness and sound velocity)
5. Fluid types
6. Transducers type
7. Transducers installation method
8. Solidification parameter

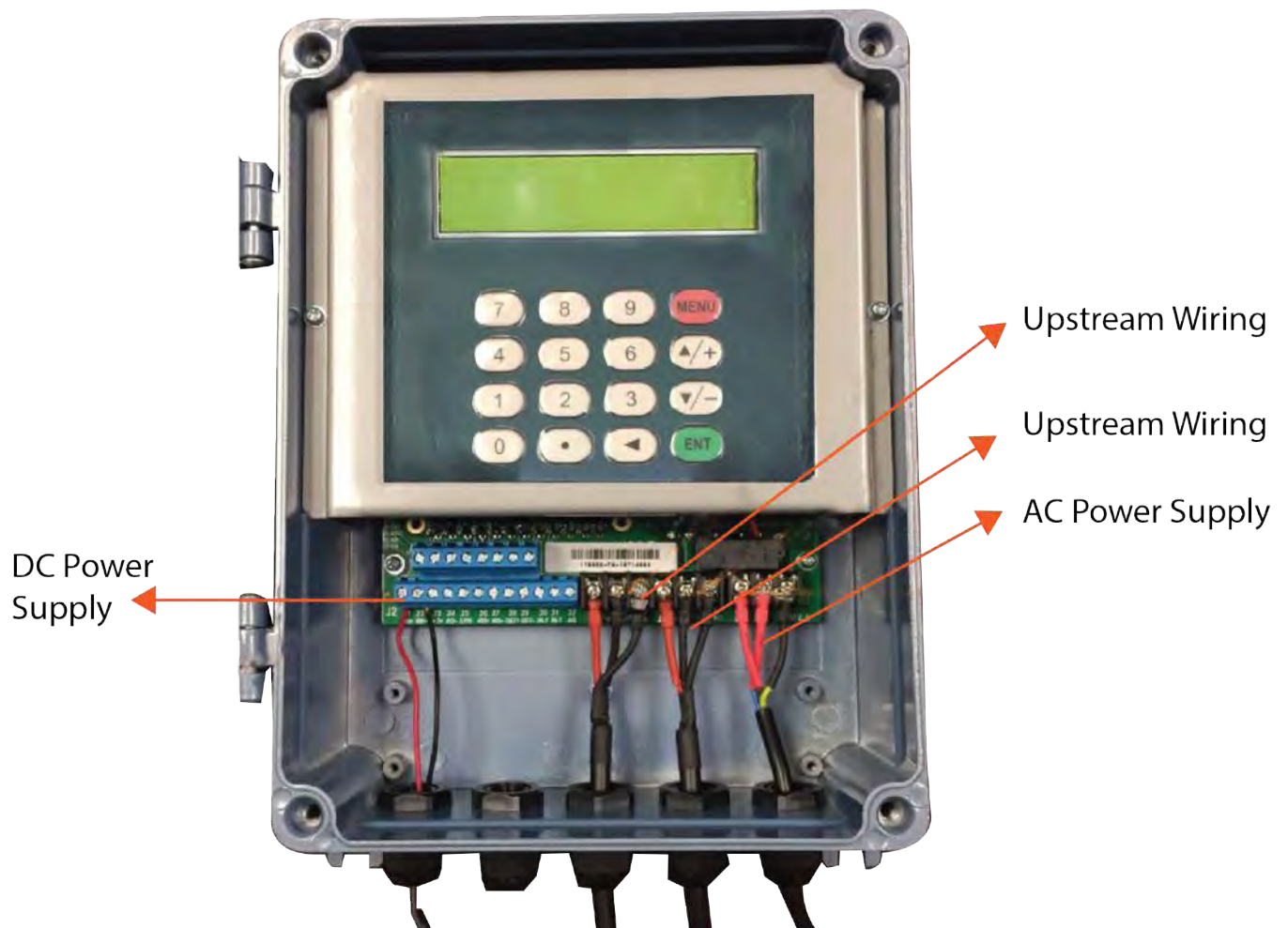
4 Electrical Connections

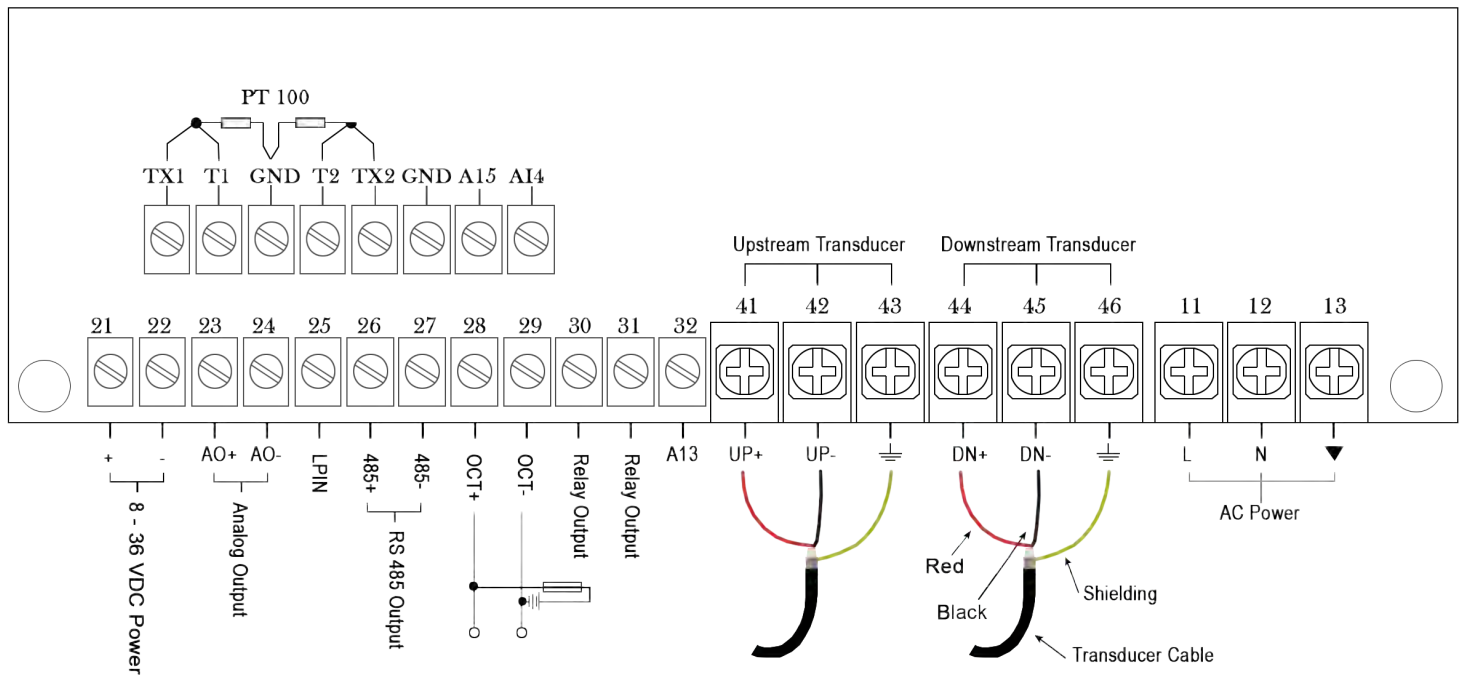
4.1 Basic Requirement

The flowmeter should be connected to the AC or DC power supply.

85 VAC to 264 VAC	Power Consumption: Less than 1.5 W
8 VDC to 36 VDC	Power Consumption: Less than 1.5 W

4.2 Power Supply and Signal Wiring Diagram of Enclosure

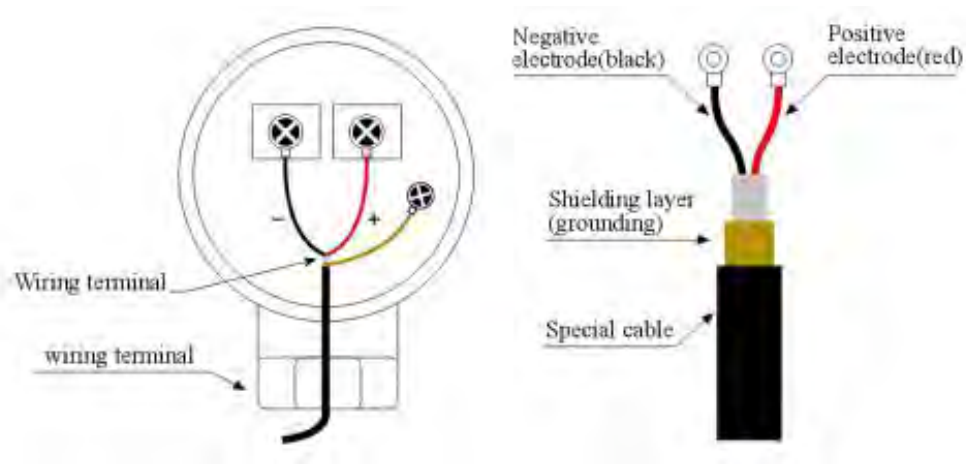




WARNING

- Make sure to connect to ground the power board terminal block

4.3 Transducer Wiring Diagram



4.4 Installation Check-Up

After the completion of transducer installation, the user should check the following items to see whether the installation is suitable, whether the received ultrasonic signal is correct and strong enough that it can make the flowmeter work normally with long-time running. By checking the receiving signal strength (S), the signal quality (Q) value, the delta time and the transit time ratio (R), the user can determine whether the installation point is good or not. Normally, apply couplant on the transducers and attach them on the pipe, so as to obtain measurement results. But it is better to check the following factors to ensure the flowmeter is working properly and the results are reliable and accurate:

4.4.1 Signal Strength (S)

Signal strength S (parameter M90) indicates strength of sending and receiving signals from upstream transducer and downstream transducer by a 3-digit number. [00.0] means there is no signal detected, and [99.9] refers to the maximum signal strength that can be detected. When installing, do your best to adjust the position of transducers and check whether the couplant is sufficient, to make sure to gain the strongest signal. The instrument works well when the signal strength ranges from 60 to 99. When the signal strength is too low, you should check the installation position, installation space, whether the pipe is suitable to install or you need to change the installation to the Z method. Stronger signal strength should be pursued, because a stronger signal means a stable measurement results, with long and reliable running.

4.4.2 Signal Quality (Q)

Signal quality is indicated as the Q value (display on M90) that verifies whether the receiving signal is good or not. Tek-Clamp 1200A-100F1 transmitter uses 00-99 digits to represent signal quality. 00 represents the worst signal, 99 represents the best signal. Normally the signal quality should be above 60. The reason for poor signal quality could be big interference, or bad installation of transducers, or using bad quality signal cable. To get better signal adjust the transducers repeatedly and check whether the couplant applied is enough or not.

4.4.3 Total Transit Time and Delta Time

The total transit time (or traveling time) and delta time are displayed on the menu window M93. They can display whether the installation is suitable or not. They are the basic two parameters for the flowmeter's internal measurement and calculation. When the data of delta time fluctuates too much, the displayed flow rate and velocity will change quickly. If this happens, it means the signal quality is not good; the condition of pipe is not good, unsuitable installation of the transducers, or the wrong parameters were input. Normally the fluctuation of delta time is less than $\pm 20\%$, but when the pipe diameter is too small or there is lower flow velocity, the fluctuation of delta time may be higher.

4.4.4 Transit Time Ratio

Transit-time ratio (parameter M91) is usually used to check whether the transducer installation space is good. If the pipe parameters are correct and the transducers are installed properly, the transit time ratio should be in the range of $100\pm3\%$. When the ratio is over the range, you should check,

- If the entered pipe parameters are correct?
- If the actual space of the transducers is the same as or close to what shown on window M25.
- If the transducers are installed properly in the same axis plane of pipe?
- If the mounting location is good, if the pipe has changed shape, or if the pipe is too old (i.e. too much corrosion or liner inside the pipe)?
- If there is any interference source around the flow meter?



NOTE

- Input pipe parameters must be correct, conform to facts, otherwise the flowmeter will not work.
- When installing clamp on type transducers, apply enough couplant to make the transducers attach on the pipe, check the signal strength and signal quality displayed on the screen while moving the transducers around installation point to receive the best signal and signal quality.
- To ensure whether the flowmeter work normally: check if the signal strength is bigger, signal quality is higher, the displayed flow rate is reliable, and the flowmeter work for a long time. If there is a bigger environment electromagnetic interference or lower receiving signal, then the flow rate displayed is poor, and will not be able to work normally for long time.
- After installation, enter M26 to solidify parameters, power on again, check if the results are correct or not.

5 Operation

The Tek-Clamp 1200A-100F1 Ultrasonic Flowmeter can use the 16 keys keyboard monitor, the 16 keys parallel and serial port keyboard which includes: 10 digit keys, 2 up/down arrow keys, 1 menu key (M), 1 enter key, 1 decimal point key and 1 backspace key. The keyboard allows users to program quickly and easily.

Here are some usages of 16 keys keyboard:

- '0-9' and '.' are used to input numerical value and menu number.
- '◀' key is used to left backspace or delete left character.
- '<▲/+>' and '<▼/- >' are used to shift to upper and lower menu. When inputting digits, these are equal to the "plus" or "minus" keys.
- The 'Menu' key brings up the main menu.
- The '<ENT>' key is mainly used to ensure the input digit and chosen content. The other function is to press it to enter "modify" status before setting parameters.
- Select menu M26 to save selected parameters.

5.1 Menu Window Details

	Menu Window No.	Function
Flow rate/flow totalizer display	M00	Display instant flow rate/net totalizer. Adjust the units in M30-M32
	M01	Display instant flow rate/instant flow velocity. Adjust the units in M30-M32
	M02	Display instant flow rate/positive totalizer. Adjust the units in M30-M32
	M03	Display instant flow rate/negative totalizer. Adjust the units in M30-M32
	M04	Display instant flow rate/date time
	M05	Display heat flow rate/total heat quantity. Adjust the units in M84, M88
	M06	Display temperature input T1, T2
	M07	Display present battery voltage
	M07	Display analogue input AI3, AI4
	M08	Display system error code
Initial setup	M09	Display today net totalizer
	M10	Input outside perimeter of pipe
	M11	Input pipe outer diameter, data range:0-18000mm
	M12	Input pipe wall thickness
	M13	Input pipe inner diameter
	M14	Choose the kinds of pipe materials
	M15	Input sound velocity of pipe material
	M16	Choose kinds of liner
	M17	Input the sound velocity of liner
	M18	Input the thickness of liner

	M19	Input inner pipe wall absolute degree of roughness
	M20	Choose kinds of fluids
	M21	Input fluid velocity
	M22	Input fluid viscosity
	M23	Choose the types of transducers, including more than 20 types to use
	M24	Choose transducer installation method
	M25	Display transducer installation space
	M26	Save selected parameters
	M27	Store and read installation parameters on installation point
	M28	When signal set is turning poor, the transmitter keeps the last data. Choosing 'yes' means when the signal is turning poor, the flowmeter will display last correct measured data
Flow unit setup	M29	Input signal strength when the pipe flow is set to be empty. For example: inputting 65 means when the signal strength is lower than 65, the flowmeter will think that there is no liquid in the pipe and display the flow value as zero
	M30	Choose metric or imperial unit
	M31	Choose instant flow rate unit
	M32	Choose totalizer unit
	M33	Choosing the totalizer multiplying factor which function is to multiply totalizer data rang, normally set it as x1
	M34	Net totalizer switch
	M35	Positive totalizer switch
	M36	Negative totalizer switch
	M37	Restore parameters setup before leaving factory and reset totalizer
	M38	Manual totalizer (the key to control on/off)
	M39	Choose operating language, including 8 kinds of different languages for international users to use
	M3•	Setup the LCD display method, inputting 0 or 1 means regular displaying content inputting, 2-39 means automatically cycle displaying method, displaying the previous menu of 2-39, time interval is 8 seconds. When there is no input operation, it will automatically enter cycle displaying status
Choosing Setup	M40	Damper coefficient
	M41	Input low flow velocity cut-off value
	M42	Setup static zero point
	M43	Clear the zero-point value, and restore the solidified zero-point value.
	M44	Set up zero-point deviant by hand

	M45	Flowmeter coefficient, rectification coefficient
	M46	Input Network address identification number (IDN)
	M47	Password protecting operation, after the flowmeter is setup with password, only browse menus without any modification.
	M48	Input degree of linearity broken line rectification data.at most there is 12 segments broken line, used for users to rectify meter nonlinear.
	M49	Network communication tester, on this window to visit the data transferred from upper computer to judge the problems arise during communication.
Scheduled time output	M50	Optional setup of data output at scheduled time, choose output content at scheduled time to print, more than 20 to select
	M51	Setup output time at scheduled time
	M52	Printing data flow direction control.by default printing data will flow directly to the thermal printer hanged inside bus. Setup printing data output to outside serial port (RS485 port)
AI5 setup	M53	Display analogue input AI5(reserved for the Tek-Clamp 1200A mainboard)
Input and output setup	M54	Setup of OCT totalizer pulse output, pulse width, range:6 Ms-1000Ms.
	M55	Choose current loop mode
	M56	Corresponding data to output of current loop 4mA or 0mA
	M57	Corresponding data to output of current loop 20mA
	M58	Verification of current loop output applied to check whether current loop is normal or not.
	M59	Present output of current loop
	M60	Date time and setup of the date time of the new flowmeter is realized by CPU, when upgrading software, time will be slow. So after upgrading, recommended to adjust the date and time to display correctly
	M61	Software version information and Electronic Serial Number (ESN)
	M62	Setup serial port parameter
	M63	Communication protocol choosing (including compatible protocol choosing), two options, choosing MODBUS-RTU means using binary system MODUS-RTU protocol. Choosing MODBUS-ASCII+previous protocol means using ASCII protocol, at this time can support several protocols simultaneously, including MOSBUS-ASCII, previous 7 version protocol, FUJI protocol, Meter-BUSx protocol etc.

	M64	Analogue input AI3	By inputting the measuring range, the flowmeter will turn current signal into data range users need	
	M65	Analogue input AI4		
	M66	Analogue input AI5		
	M67	Setup frequency range of frequency output signal. Frequency signal output represents instant flow rate value by signal frequency value. Default: 0-1000Hz, Max-range:0-999Hz. Output frequency signal by special frequency output unit.		
Input and output setup	M68	Setup lower limit flow of frequency signal output		
	M69	Setup upper limit flow of frequency signal output		
	M70	LCD backlit control		
	M71	LCD contrast ratio control		
	M72	Work timer, logging work time of the flowmeter by unit of second.it can reset.		
	M73	Setup lower limit flow of frequency signal output	By adjusting the lower and upper limit of alarm, confirm a range. When actual flow is over the range set in this window, then it creates an alarm signal output that is transferred to outside by setup OCT or relay.	
	M74	Setup upper limit flow of frequency signal output		
	M75	LCD backlit control		
	M76	LCD contrast ratio control		
	M77	Beeper setup options		
		M78	Setup Open Collector Transistor output(OCT) output options	
		M79	Setup relay(OCT2) output options	
		M80	Choose input signal of batch controller	
	M81	Batch controller		
Heat quantity measuring	M82	Day/month/year totalizer, check the flow rate and heat quantity of the totalizers		
	M83	Automatically replenish flow switch during the period of power off, default status: off this function is not available under special conditions.		
	M84	Choosing heat quantity unit, 1. GJ(default) 2. KCal 3. KW 4.BTU (imperial unit)		

	M85	Choose temperature signal origin, if choosing inputting temperature signal by AI3, AI4, then need temperature transmitter that can output 4-20mA current signal.
	M86	heat capacity, default: GB-CJ128 enthalpy potential method. Temperature difference method is available also.
	M87	heat quantity totalizer switch
	M88	Heat quantity multiplier factor.
	M89	display present temperature difference and setup temperature difference sensitivity.
	M8•	Options of installation of heat meter on supply water pipe or return water pipe
Diagnosis	M90	Display the signal strength and signal quality
	M91	Display the transit time ratio
	M92	Display the calculated fluid sound velocity.
	M93	Display the total transit time and the delta time
	M94	Display the Reynolds number and the pipe coefficient
	M95	Display positive, negative heat quantity totalizer, start cycle display function.
Added menu windows	+0	Display the time of power on/off and flow rate
	+1	Display the total working time of the flowmeter
	+2	Display the last time of power off.
	+3	Display the flow rate of last power off
	+4	Display total times of power on
	+5	Scientific calculator
	+6	Setup threshold value of fluid sound velocity
	+7	Net totalizer of this month
	+8	Net totalizer of this year
	+9	Operating time with trouble (including power off time)
Hardware adjustment menu windows	.2	store static zero point
	.5	setup threshold value of Q value
	.8	max instant flow rate of this day and this month
	.9	serial port testing window with CMM direct output
	-0	circuitry hardware parameter adjusting entrance (only inputting password to enter following windows)
	-1	4-20mA current loop calibration
	-2	AI3 inputting calibration of analogue input 4 mA
	-3	AI3 inputting calibration of analogue input 20mA
	-4	AI4 inputting calibration of analogue input 4mA
	-5	AI4 inputting calibration of analogue input 20mA
	-6	AI5 inputting calibration of analogue input 4mA
	-7	AI5 inputting calibration of analogue input 20mA

	-8	zero-point setup of PT100 at lower temperature (
	-9	PT100 setup zero point at higher temperature (>55°C)
	-A	PT100 standard calibration at 50°C
	-B	PT100 standard calibration at 84.5°C



NOTE

- Violet color indicates new added or changed functions
- Blue color means the menus related with heat quantity measurement

5.2 Work parameter solidification of the Flowmeter and option indication

The new Tek-Clamp 1200A has 3 work parameter areas respectively. They are: **Present parameter data block**, **Solidification parameter data block**, and the **User pipe parameter data block**.

- Present parameter data block is built-in internal RAM. If outside power supply and spare battery are shut-off together, then the present work parameter is lost.
- Solidification parameter data block is built-in internal FLASH. Normally it will not lose the data. For stable work application, use the solidification parameter of M26 to solidify the parameter data block in RAM to FLASH and setup recalling the work parameter. FLASH presents the parameter of data block when the flowmeter is powered on each time.
- User parameter data block can store 9 sets of commonly used pipe parameters. The access operation is in M27.

5.3 Zero-Point Setup and Zero-Point Solidification

The new transducers have a “zero point”, it means that when fluid flow velocity is zero, the flowmeter will display a non-zero flow value. This value will repeatedly add to the indicating value of the flowmeter under any flow velocity, for example, assume that the zero-point velocity is 1m³/h, present flow velocity is 10m³/h, then the indicating value of the flowmeter is 11m³/h. So the newly installed or changed transducers normally need to adjust zero-point and log zero-point value.

To adjust zero-point, you’ve to go in menu M42. The zero-point value after adjusting is only stored in RAM parameter area temporarily, and is not solidified in FLASH. If the spare battery is off or choosing the solidification parameters in FLASH as work parameters when the flowmeter is powered on, then the zero-point will lose the stored value. In order to keep the zero-point value forever, users must use M.2 to store the zero-point after adjusting zero-point for each time.

5.4 Factory Use of the Scaling Factor Solidification

Same as the principle of storing zero-point value, the scaling factor needs to be solidified after calibration before leaving the factory. The scaling factor can be edited in M.1. Use two grade passwords to visit.

5.5 Analog Calculating Function Application

When the setup pipe diameter is zero, the instant flow velocity is 1.2345678 m/s (4.0504 ft/s), instant flow rate is equal to zero, and “R” status is displayed. Inputting a set value in M44 can obtain changeable totalizer output and using this function, flowmeters can be tested and network software can be adjusted without connecting the transducers.

5.6 Analogue Input Interface as Digital Input Interface: Method and Introduction

The new Tek-Clamp 1200A series' analogue input interface can work as a digital input interface, but note that the loop input current should not be over 20 mA. When outer digital quantity voltage is 5 V, you should series connect a 1k resistor in return circuit. If the digital quantity voltage is 12 V, then series connect a 2k resistor.

5.7 Introduction of Serial Peripheral Extension Interface

Serial peripheral extension interface is like USB interface. It has input, output, power supply+, power supply-; a total of 4 lines for each measuring. It can also give output of instant flow, instant heat flow, positive total, 4-20 mA value, frequency value and printing data etc. Different function models can take down data according to the requirements. The serial bus use 4800 Baud Rate.

5.8 Realize Medium Identifying Function

For example: application in mixture of oil and water, to judge if the medium in pipe is water or oil. You can input lower limit of water flow in M+6, i.e. 1400 m/s for this example. When the fluid flow velocity measured by the flowmeter is lower than 1400 m/s, an internal signal is created, which is used to indicate that the fluid is another medium. This signal can be given as the output by OCT or read by MODBUS protocol.

5.9 Restoring the Flowmeter to Factory Default

To clear all set parameters and to restore to the original factory default, use only the serial port or parallel port keyboard to enter M37 and click <•><◀>, so that it can restore default set parameters before leaving the factory.



NOTE

This function is only used during the first installation.

6 Maintenance

This section covers maintenance techniques and guidelines.

6.1 Maintenance Service

For operational problems, please contact the technical support department by telephone, fax, email or internet. In most cases, problems should be solved immediately. For any hardware failure of the instrument, we recommend our customers to send back the instrument for service. Please contact the technical support department with the model number and serial number of the unit before sending the unit back to us. Both numbers can be found on the product label. For each service or calibration request, we will issue a Return Materials Authorization (RMA) number. Take note that the cost for repairing can only be determined after receipt and inspection of the instrument. A quotation will be sent to the customer before proceeding with the service. Normally, the buyer is responsible for the transportation of meters and freight.

6.2 Software Upgrade Service

We provide free-of-charge software upgrade services. Please contact the factory for any recently developed software.

6.3 Important Notice for Product Return

Before returning the instrument for warranty repair or service, please read the following carefully:

- If the return item has been exposed to nuclear or other radioactive environment, or has been in contact with hazardous material that could pose any danger to our personnel, the unit cannot be serviced
- If the return item has been exposed to or in contact with dangerous materials, but has been certified as hazard-free device by a recognized organization, you are required to supply the certification for the service
- If the return item does not have a RMA# associated, it will be sent back without any service conducted

7 Troubleshooting

This section provides troubleshooting techniques for most common operating problems.

The Tek-Clamp 1200A shows an error on the corner of the menu window via an identification code in a timely order. All the existing errors are displayed on the parameter M08. Self-diagnosis on hardware is conducted every time the flowmeter is powered on. Some errors can even be detected during normal operation. For the errors that are undetectable due to incorrect settings or improper testing conditions, the flowmeter will display useful information to help the user to quickly debug the error and solve the problems according to the methods listed in the tables below:

Errors displayed of Tek-Clamp 1200A are of two kinds:

- 1) Circuit hardware errors (refer to table 1).
- 2) Measurement errors (refer to table 2).

Table 1. Hardware self-diagnosis errors and solutions

LCD display information	Causes	Solution
ROM Verification Error	ROM operation illegal / error	Contact the
Logger Reading Error	Stored parameters are wrong	Power on again/contact the
System Logger Error	System stored data area has error	Power on again/contact the
Measuring Circuit Hardware Error	Sub-CPU circuit errors	Power on again/contact the
CPU Clock Speed Error	System timer has errors	Power on again/contact the
Date Time Error	System date and time are wrong	Reset date and time
No Display. Erratic or Abnormal Operation	Problem with wiring	Check wiring connections. No influence of measuring normally
No Response to Key Pressing	- Keypad is locked - Bad plug connection	Input password to unlock keyboard, or check wiring connections, no influence of measuring normally

Table 2. Working status errors code causes and solutions

Code	M08 displaying	Causes	Solutions
*R	System works normally	Normal system	-
*J	Circuit Hardware Error	Hardware problem	Contact the
*I	No Signal	• Unable to receive signal • Loose contact or not enough couplant between transducer and pipe surface • Transducers installed improperly • Scaling on inner pipe wall is too thick • New changed liner	• Make sure the transducer is in tight contact with pipe surface, and the couplant is enough • Polish the pipe surface and clean the pipe surface. Clear paint, rust • Check original installation parameter settings • Clear the scaling or change the pipe with thick scaling, normally change to another measurement point that has little scaling, the meter can work normally • Wait until the liner has been solidified and then test
*H	Lower signal strength received	• lower signal • causes are the same with code "I"	Solutions are the same with code "I"
*H	Poor signal quality received	Poor signal quality which includes above all causes	Includes above all solutions
*E	The current of Current Loop is over 20mA (won't influence the measurement, if current output is not being used)	• 4-20 mA current loop output overflow 100% • Improper settings for current loop output	Check current loop settings on M56. Or confirm if the actual flow rate is too high

*Q	Frequency Output is over the set value (won't influence the measurement, if frequency output is not being used)	4-20 mA current loop output overflow 120% - Improper settings for current loop output	Check frequency output settings (refer to M66-M69). or Confirm if the actual flow rate is too high
*F	Listed in table 1	- Find problems when powered on and during self-diagnosis - Permanent hardware errors	Power on again, check the information showed on screen, handled according to table 1, if not solved,
*G	Adjusting Gain >S1 Adjusting Gain >S2 Adjusting Gain >S3 Adjusting Gain >S4 (displayed on M00, M01, M02, M03)	Instrument is in the progress of adjusting the gain to prepare the measurement. If stopped at S1 or S2 or switched between S1 and S2, this means the signal is too low to receive or not a good signal at all	-
*K	Empty the pipe, setup in M29	no liquid in the pipe or wrong setup.	If there is liquid, input 0 value in M29



NOTE

- The codes *Q, and *E displayed do not affect measurement. They only mean current loop and frequency output have problems