



# ***TEK-CLAMP 1200A-100H*** ***Handheld Ultrasonic Flow Meter***

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## **Instruction Manual**

Document Number: IM-1200A-100H



[www.tek-trol.com](http://www.tek-trol.com)

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**NOTICE**

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product.

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## 1 Safety Instructions

### 1.1 Intended Use

Tek-Clamp 1200A-100H is a Handheld Ultrasonic Flow Meter are used only for measure 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.

#### 1.2.4 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

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

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#### CAUTION

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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.

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#### NOTE

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

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### 1.2.5 Packaging, Transportation and Storage

#### 1.2.5.1 Packaging *The original package consists of*

1. Tek-Clamp 1200A-100H Handheld Ultrasonic Flow Meter
2. Documentation



1



2



#### NOTE

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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.

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### 1.2.6 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-100H 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.

## 2 Product Description

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

### 2.1 Introduction

Tek-Clamp 1200A-100H Handheld Ultrasonic Flow Meter is a completely non-invasive Ultrasonic Flow Meter. The flow meter uses the ultrasonic signal to measure the flow rates with the transit time method. It consists of the built-in data logger for over 2000 lines of data and is optional as an external data logger. Tek-Clamp 1200A-100H has a pair of transducers capable of measuring flow rates in pipes from 1/2" (12.5 mm) to 28" (700 mm) at temperatures of between 32 °F (0 °C) to 320 °F (160 °C). This flow meter can be virtually applied to a wide range of measurements. A variety of liquid applications contain potable water, cooling water, river water, raw sewage, reclaimed water, plant effluent, ultra-pure liquids, chemicals.

### 2.2 Measuring Principle

When the ultrasonic wave is transmitted through the flowing liquid, the difference between the upstream and downstream transit time (travel time or time of flight) can be calculated, which is proportional to flow velocity.

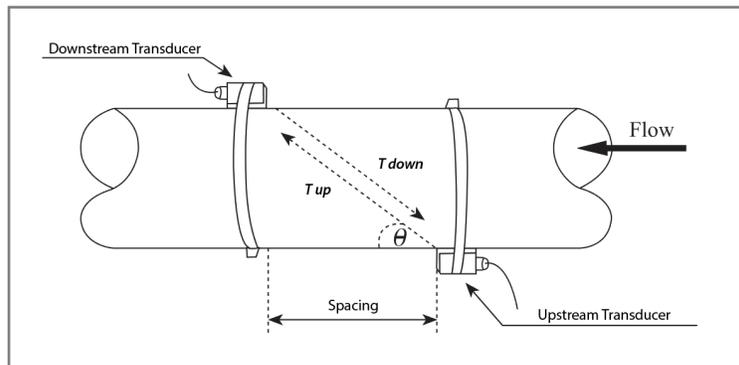


Fig 1: Tek-Clamp 1200A-100H Handheld Ultrasonic Flow Meter

The formula for calculating velocity is:

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

Where,

θ: Includes angle to the flow direction

M: Travel times of the ultrasonic beam

D: Pipe diameter

$T_{up}$ : Time for the beam from upstream transducer to the downstream one

$T_{down}$ : Time for the beam from downstream transducer to the upstream one

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

## 2.3 Specifications

<b>Accuracy</b>		±1% of reading at rates >0.2 mps
<b>Velocity</b>		0.03 to 100ft/sec
<b>Repeatability</b>		0.2%
<b>Measurement Period</b>		0-999 seconds, user-configurable
<b>Measurement Principle</b>		Transit Time Ultrasonic Flow Meter
<b>Weight</b>		Portable transmitter weight 514g Package with accessories weight 6kg Volume weight for whole package 12kg
<b>Power</b>	<b>100H</b>	3 AAA built-in Ni-MH batteries 1.2V (for over 12 hours of operation) 90V-260V AC adapter
<b>Power Consumption</b>		1.5W
<b>Environment Temperature</b>		Convertor: -4°F to 140 °F (-20 to 60°C) Flow Transducer: -22°F to 320°F ( -30 to 160°C)
<b>Environment Humidity</b>		Convertor: 85% RH
<b>Protection Class</b>		Flow Transducer: IP67
<b>Clamp-On</b>		HS-type: for pipe size ½" - 4" (12.5mm -100 mm) HM-type: for pipe size 2" - 28" (50mm- 700 mm) Other pipe size available on request
<b>Types</b>		Following Liquids transmit sound wave: <ul style="list-style-type: none"> <li>• Single liquid such as, Water (Hot water, Chilled water, City Water, Sea Water, Wastewater, etc.)</li> <li>• Sewage with small particle content</li> <li>• Oil (crude oil, lubricating oil, diesel oil, fuel oil, etc.)</li> <li>• Chemicals (alcohol, etc.)</li> <li>• Plant Effluent</li> <li>• Beverage</li> <li>• Ultra-pure liquids</li> </ul>
<b>Process Temperature</b>		-22°F to 320°F ( -30°C to 160°C)
<b>Pipe Material</b>		Steel, Stainless Steel, Cast Iron, Copper, Cement Pipe, PVC, Aluminum, Glass Steel Product, Liner is allowed
<b>Pipe Size</b>		1/2" to 28"
<b>Pipe Straight Run</b>		Transducer installation should be satisfied: upstream10D, downstream 5D, 30D from the pump
<b>Dimensions</b>		8"X 3¾" X 1¼" (200 X 93 X 32mm) (Convertor)

## 2.4 Dimensional Drawings

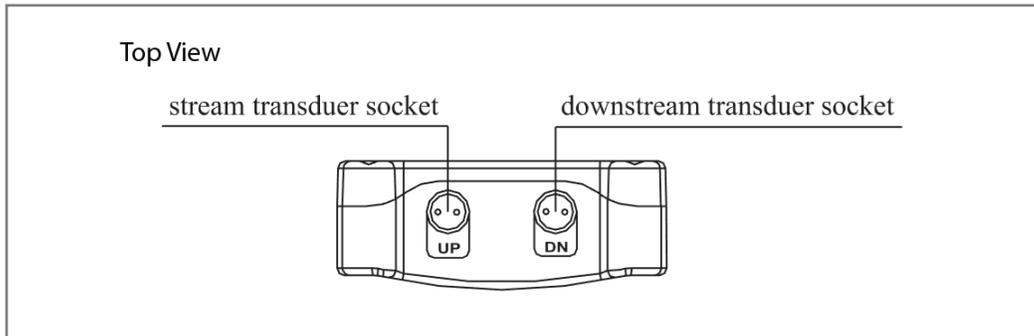


Fig 2: Top View of 1200A-100H Handheld Ultrasonic Flow Meter

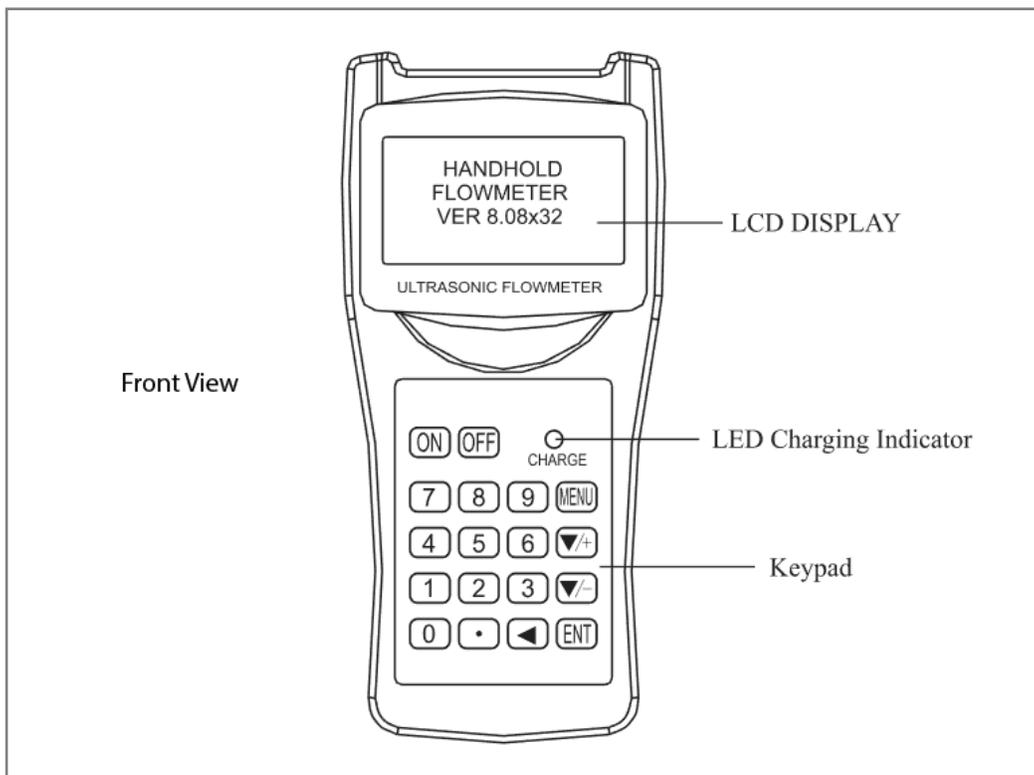


Fig 3: Front View of 1200A-100H Handheld Ultrasonic Flow Meter

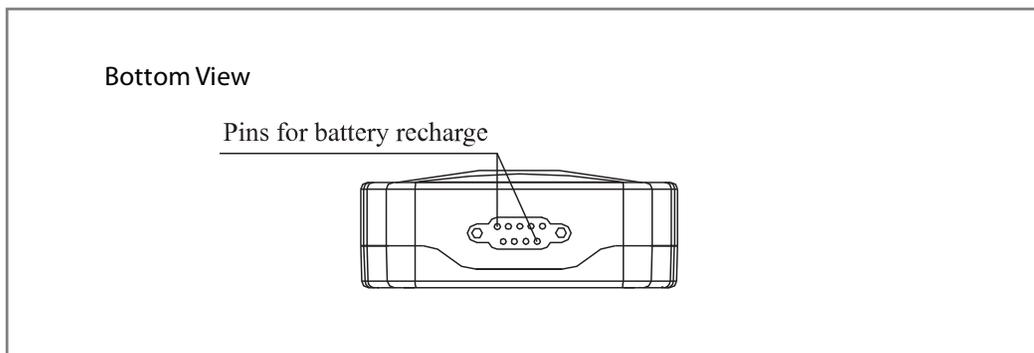


Fig 4: Bottom View of 1200A-100H Handheld Ultrasonic Flow Meter

### 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 Correct Mounting Point

The correct mounting point is a major factor for the installation of a flow Meter. Installation at wrong point may influence measuring accuracy or flow meter service life, or even damage the flow meter.

The axis for measuring electrode shall be approximate to horizontal direction.

Tek-Clamp 1200A-100H Handheld Ultrasonic Flow Meter can simplify the ultrasonic flow meter installation process, by shortening installation time and improving installation accuracy. Tek-Clamp 1200A-100H Handheld Ultrasonic Flow Meter installed by two methods:

##### 3.1.1 Clamp on Transducer:

Install the Tek-Clamp 1200A - 100H Handheld Ultrasonic Flow Meter (with magnet) on the pipe. It can help finish the flow measurement without any pressure drop. The need for cutting the pipe is eliminated.

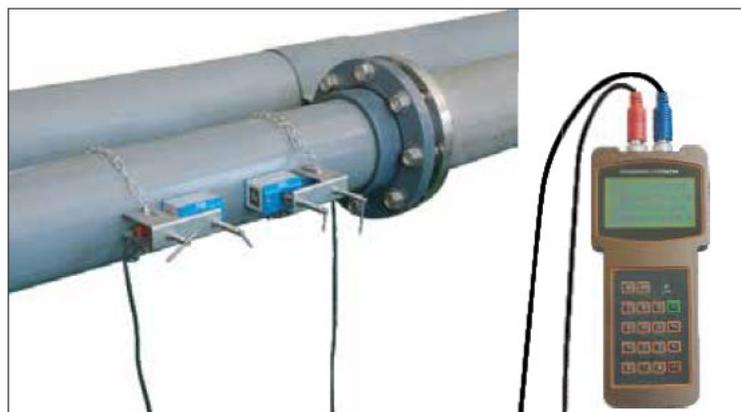


Fig 5: Tek-Clamp 1200A-100H Handheld Ultrasonic Flow Meter

### 3.1.2 Clamp on mounting bracket transducer

- Install Tek-Clamp 1200A - 100H on the pipe, to finish the flow measurement. The need for cutting pipe gets eliminated.
- Several types of bracket Tek-Clamp 1200A - 100H are used to measure pipe size from 1/2" to 28".
- Several types of bracket Tek-Clamp 1200A - 100H are used to measure temperature range from -22°F to 320°F (-30°C to 160°C)

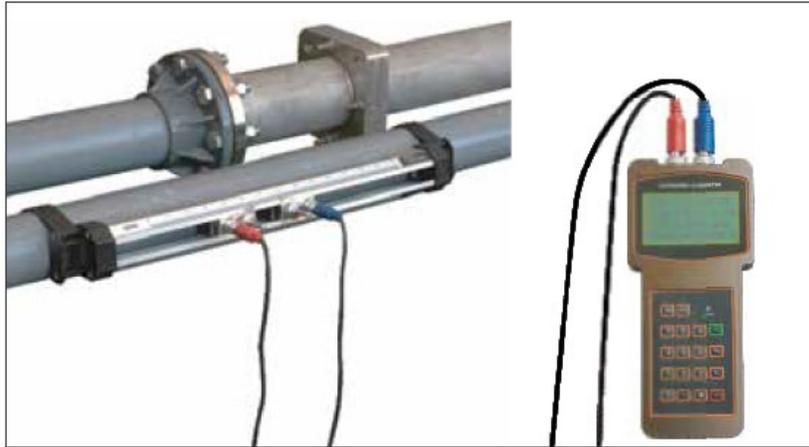


Fig 6: Tek-Clamp 1200A-100H Handheld Ultrasonic Clamp-on mounting bracket transducer

### 3.2 Requirements for Measuring Flow meter Accuracy

- Medium must be conductive.
- The pipe should be completely filled with the medium.
- Medium conductivity should be homogeneous to avoid severe disruption. If chemical substances need be injected into the pipe, the injection should be operated at upstream side of flow meter.
- Magnetic flow meter system should be connected to the ground.
- There must be a straight pipe run no less than 5DN at flow meter upstream and 2DN at flow meter downstream. (DN is the internal diameter of the pipeline).
- Do not install the flow meter near large electrical machine or transformer in order to avoid the electromagnetic interference.



#### NOTE

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Do not expose the electronic unit box to direct sunlight; in case of outdoor installation, use a suitable protection shield.

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### 3.3 Installation Condition

#### 3.3.1 V-method Installation:

V-method installation is the most widely mode for daily measurement with pipe inner diameters ranging from 15 mm to 400 mm (½" to 16"). It is also called reflective mode.

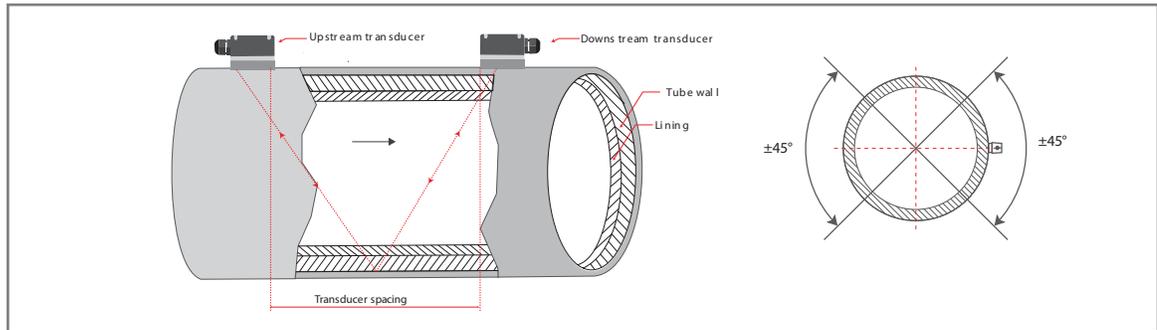


Fig 7: V-method Installation

#### 3.3.2 Z-method Installation

Z-method is commonly used when the pipe diameter is above 8" (200mm).

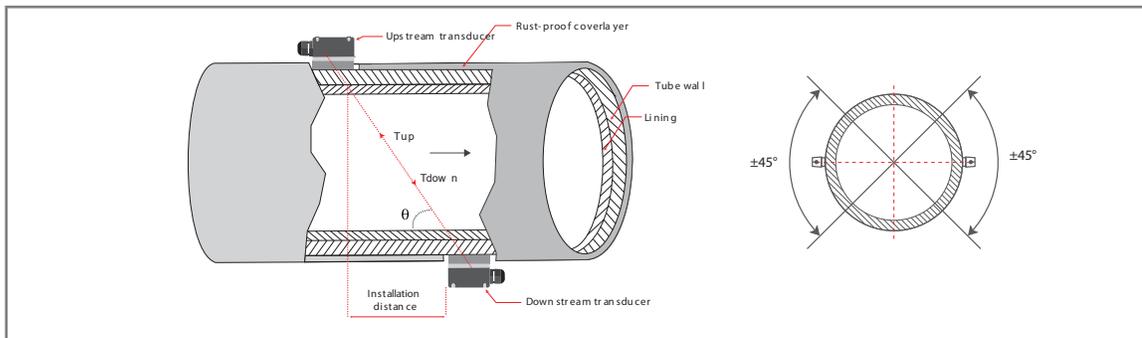


Fig 8: Z-method Installation

#### 3.3.3 W-method Installation

W-method is usually used on plastic pipes with a diameter from 2" (15mm to 50mm).

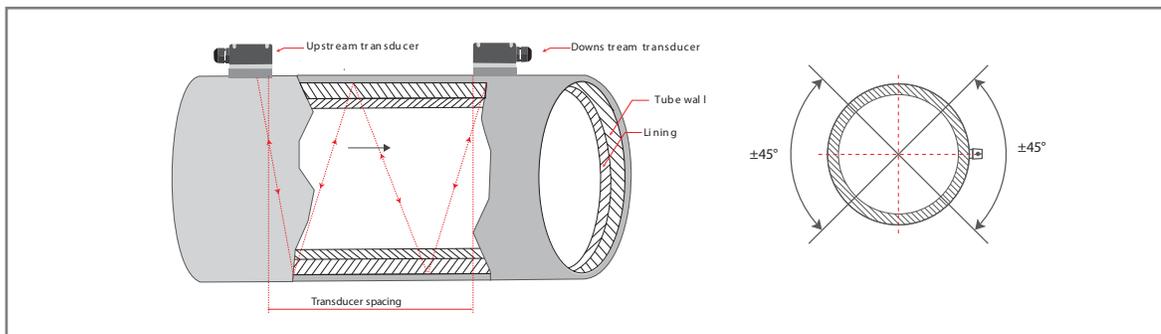


Fig 9: W-method Installation

## 4 Electrical Installations

- Please cut off power supply before connecting the device
- Check the cable model before connecting the cable.
- Follow the procedure for cable into lead collar: -
- At first, loosen the gland nut on lead collar and take off blind, secondly, put gland nut and rubber ring on cable, make the cable through lead collar; finally, straighten out cable, screw gland nut tight to make rubber ring press cable.
- When wire stripping, do not damage insulating layer which should be reserved.

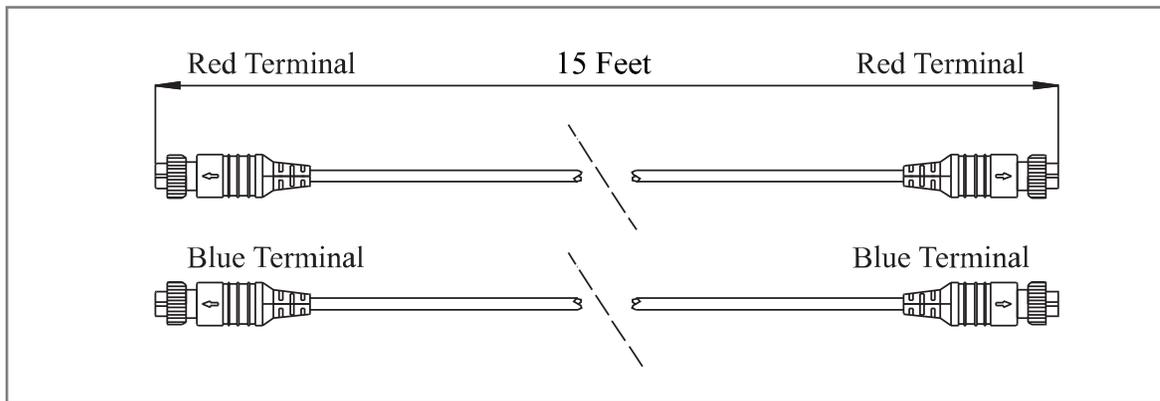


Fig 10: TEK-Clamp 1200A-100H Electrical Connections Cables.

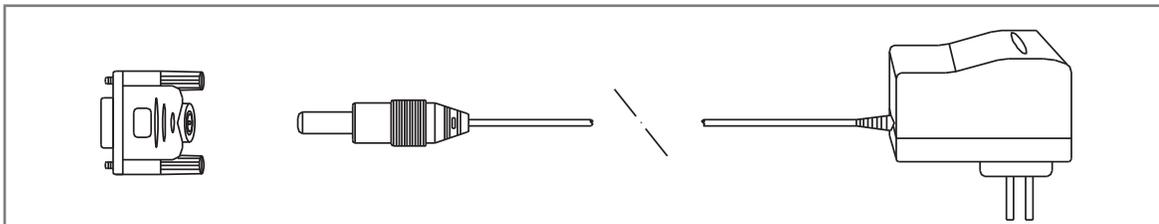


Fig 11: Tek-Clamp 1200A-100H Converted Terminal and AC/DC Adaptor

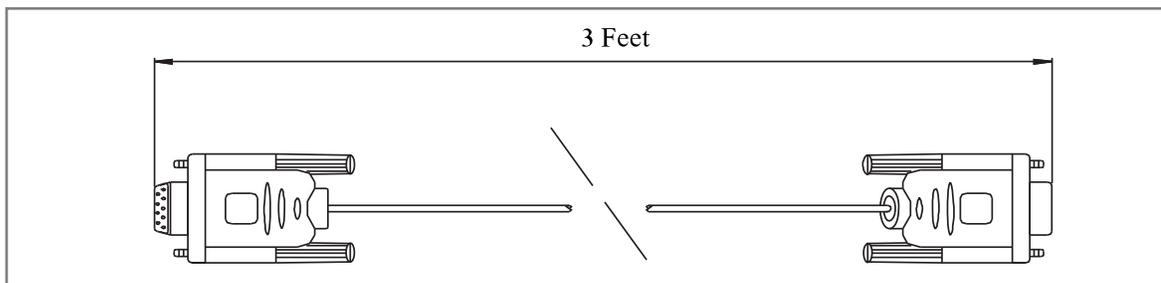


Fig 12: TEK-Clamp 1200A-100H Electrical Connections Cables interface.

## 4.1 Signal Strength

- Signal strength indicates the amplitude of receiving ultrasonic signals by a 3-digit number. [000] means there is no signal detected and [999] refers to the maximum signal strength that can be received.

The following methods are recommended to obtain stronger signals:

- Relocate a more favourable location, if the current location is not good enough for a stable and reliable flow reading, or if the signal strength is lower than 700. Try to polish the outer surface of the pipe and apply more coupler to increase the signal strength.
- Adjust the transducers both vertically and horizontally while checking the varying signal strength, stop at the highest position, and then check the spacing of the transducers to make sure the spacing of the transducers.

### 4.1.1 Signal Quality

Signal quality is indicated by the Q value in the instrument. A higher Q value means high signal to noise ratio (SNR), which provide higher degree of accuracy in measurement. Under normal pipe condition, the Q value is in the range between 600-900, the higher the better.

Disadvantage of lower Q value is as follows:

- 1) Interference of other instruments and devices such as a powerful transmitter working nearby. Try to relocate the flow meter to a new place where the interference can be minimum. Bad sonic coupling for the transducers with the pipe.
- 2) Apply more coupler or clean the surface, etc. Pipes are difficult to be measured. Relocation is recommended.

## 4.2 Transmitter Connections

### 4.2.1 Basic Circuit of the Transmitter

The converter can supply the uncontrollable current to the coil in the sensor of electromagnetic flow meter. The head amplifier amplifies the electromotive force from the sensor and converts it into standard signals of current or frequency so that the signals can be used for displaying, controlling, and processing.

## 4.3 Digital Output

The transmitter has two output signals i.e., frequency and pulse output. The user can choose only one type of output.

### 4.3.1 The Connection of Digital Output

Digital output has two connected points i.e., digital output connected point and digital ground point,



#### CAUTION

- Make sure the sensor connected to the earth.
- Make sure the liquid is still when regulating instruments.
- The electrode and the liquid should be in contact for about 48 hours.

## 4.4 Operation

### 4.4.1 Keys' Function

- [Keys' function in self- testing way](#)

"Down" key	Down button cycles through data displayed on lower lines
"Up" key	Up button cycles through data displayed on lower lines
"Enter" key	Press it to come into the interface measuring
"Compound" & "Enter"	To enter parameter setting
Under measurement status, adjustment of the LCD contract	Push "Down" & "Compound" or "Up" & "Compound"

- Push “Down” & “Compound” or “Up” & “Compound”

“Down” key	Subtract 1 from the number above cursor
“Up” key	Plus 1 to the number above cursor
“Compound” & “Down”	To shift cursor to left
“Compound” & “Up”	To shift cursor to right
“Enter” key	To enter or exit the submenu, pressure for more than 2s to exit to measuring status



**NOTE**

When using the “Compound” key, you should press “Compound” key and “Up” key both or “Compound” key and “Down” key both.

To select the zero correction about the flow directly use “Down” or “Up” to Switch.

To set or correct working parameters, the converter should be running in Parameters Setting Way instead of Measuring Status.

- In Measuring Status, press “Compound” + “Enter” keys getting to the select of parameter and transfer password (0000).
- Correct the password with one of the new passwords that are provided by manufacturer. Finally, press the “Compound” + “Enter” keys to work in Parameters Setting Way.
- There are 6 Passwords in design and among them 4 for deferent operators in secret and 2 are fixed passwords for system operation.

4.4.2 Menu

- Parameters of converters can decide the running status, process and output ways as well as state of output. Correct option and setting of parameters can keep the converters running optimally and get higher accuracies of output both in display and in measurement.
- There are 6 grades of passwords for setting parameters function. Grades 1 to grade 5 of passwords are for users and grade 6 of password is for manufacturer. Users can reset their passwords of grades 1 to 4 in grade 5.
- Users can check converters parameters in any grade of password. However, if users want to change parameters of converters, deferent grade of parameters have to be used by the users.

Steps to Configure the Parameters

1. Pipe outer diameter.
2. Pipe wall thickness.
3. Pipe materials.

4. Linear material and its sound speed and thickness shows half sentence what any linear.
5. For non-standard liquids, the sound speed of the liquid is also needed.
6. Generally, the Standard M1 clamp-on transducers is selected.
7. Generally, Transducer mounting methods are the V-method or Z-method is the common option.
8. Check the space displayed on M25 and install transducer accordingly.

For standard pipe materials and standard liquids, the following detailed step-by-step setup is recommended.

1. Press keys *MENU* diameter, and then press 11 **ENT** to enter M11 window to input the digits for the pipe outer key.
2. Press key ▼/- to enter M12 window to input the digits for the pipe outer diameter and then press **ENT** key.
3. Press key ▼/- (down) to enter M14 window, and press mode. Use keys ▲/+ (Up) and ▼/- (down) to scroll up and down to the intended pipe material, and then press **ENT**.
4. Press key ▼/- (down) to enter M16 window, press **ENT** key to enter the option selection mode, use keys ▲/+ (Up) and ▼/- (down) to scroll up and down to the liner material, and then press key. Select “No Liner”, if there is no liner.
5. Press key ▼/- (down) to enter M20 window, press **ENT** key to enter the option selection mode, use keys ▲/+ (Up) and ▼/- (down) to scroll up and down to the proper liquid, and then press **ENT** key
6. Press key ▼/- (down) to enter M23 window, press key to enter the option selection mode, **ENT** use keys ▲/+ (Up) and ▼/- (down) to scroll up and down to the proper transducer type, and then press **ENT** key.
7. Press key ▼/- (down) to enter M24 window, press use keys ▲/+ (Up) and ▼/- (down) to scroll up and down to the proper transducer mounting method, and then press **ENT** key
8. Press key ▼/- (down) to enter M24 window to install the transducers on the pipe, and then press key to go to M01 for the results.

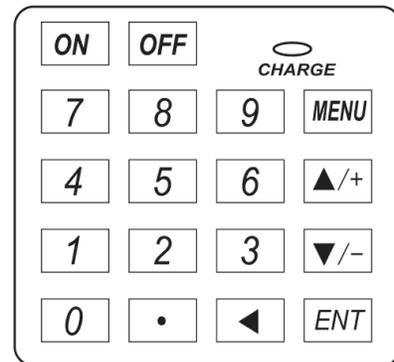


Fig 13: Keypad 1200A-100H

4.4.3 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	Parameter solidifying and setup
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 flow meter will display last correct measured data	

	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 flow meter will think that there is no liquid in the pipe and display the flow value as zero
Flow unit setup	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	Flow meter coefficient, rectification coefficient
	M46	Input Network address identification number (IDN)
	M47	Password protecting operation, after the flow meter 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 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 flow meter 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 flow meter by unit of second.it can reset.	
	M73	Setup lower limit flow of	By adjusting the lower and

		frequency signal output	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 flow meter	
	+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 colour indicates new added or changed functions
- Blue colour means the menus related with heat quantity measurement

## 5 Troubleshooting

This section provides troubleshooting techniques for most common operating problems.

### 5.1 No Display

1. Check the power supply connection.
2. Check the power fuse for faults.
3. Check the contrast of LCD and adjust.

### 5.2 Exciting Alarm

1. Check the connection of the exciting cables.
2. Check the total resistance of sensor's exciting coil resistances (less than 150Ω).
3. If first and second points are OK, then the converter is faulty.

### 5.3 Empty Pipe Alarm

If measured fluid full of testing pipe of sensor:

1. Short circuit three connectors SIG 1, SIG 2, SGND of converter; if no "Empty Alarm" is displayed then the converter works. In this case, it is possible that the conductivity of measured fluid may be limited or the empty threshold of the empty pipe and the range of the empty pipe are incorrectly set.
2. Check if the signal cable is OK or not.
3. Check if the electro-poles are OK or not.
4. Let the flow be zero, then the displayed conductivity should be less than 100%.
5. Resistances of SIG1 to SGND and SIG2 to SGND are all less than 50kΩ (conductivity of water) during measurement operation. (Resistances should be measured by means of multi-meter with the pointer for a better understanding of charging well.)

### 5.4 Measure Flow Disallow

If measured fluid full of testing pipe of sensor, check if the signal cable is OK.



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