

General Specifications

US300PM Ultrasonic Flowmeter, Portable type

GS 01G05B02-01E

■ GENERAL

The model US300PM is a portable ultrasonic flowmeter for measuring liquid flow in a fully filled pipe. With the advanced signal processing and correlation detection method, US300PM provide fast, accurate, and no-zero-offset flow measurements in clean to dirty fluids.

It can be used not only for the maintenance and the check of your facilities but also for the measurement at laboratories or manufacturing lines.

The measuring principle is based on the influence of the flowing fluid to the traveling time of sound. The sound is transmitted through the pipe and the transit time difference between the forward and backward directions is used to determine the flow velocity (transit time method).

Because of its clamp-on transducers, no cutting of the pipe is necessary and the measurement is independent of liquid pressure or conductivity.

■ FEATURES

● Quick and Easy Setup with Calibrated No-Zero-Offset Transducers

The transducers are matched-pair and factory-calibrated one by one, realizing no-zero-offset transducers with our latest electronics design, thus enabling quick and easy setup.

● High Accuracy Realized by our Exclusive Measuring Technology

The accuracy through process calibration is as high as 0.5% of reading realized by our patented digital signal processing for the correlation detection method.

● Stable Measurement against Air Bubbles

The measurement against air bubbles or entrained solids in the fluid has been improved greatly than was previously possible with our signal noise suppression technique.

● Dual-Channel / Dual-Path Inputs with Two Sets of Transducers for a Variety of Applications

The dual-channel enables two measurements in two separate pipes with one meter. The dual-path enables the measurement in a single pipe that reduces the effect of flow profile distortions. Addition / subtraction on two flow inputs are also available for specific systems.

● Dual Current Outputs as Optional

Maximum two current outputs are available as optional with free assignment of any flow value. When necessary, it is also possible to assign sound velocity and ultrasonic signal amplitude during the measurement.

● Wide and Simple Fluid Temperature Ranges for Transducers

The fluid temperature ranges for transducers are as wide and simple as -30° to 130°C / -30° to 200°C (-22°



Ultrasonic flowmeter, portable type
US300PM (*)
(* equipped with transportation case)

to 266°F / -22° to 392°F), enabling the measurement for wide temperature range heating/cooling systems.

● Data Logging Function for Site Trend Analysis

Data storage capacity of 27,000 values as standard and maximum 100,000 values as optional. Stored values can be transferred to a personal computer for analysis and storage via RS232 serial communication port.

● Built-in Wall Thickness Measurement Capability

With the built-in wall thickness measurement software in every meter, optional wall thickness probe enables you to measure the pipe wall thickness for proper setup of the transducers.

● Long Hour Battery Operation

Built-in battery for maximum around 10 hour continuous measurement is standard. The operation by AC power supply adaptor is provided as well.

■ STANDARD SPECIFICATIONS

● General

Fluid:

Liquid (Turbidity < 10,000 mg/L, Sound velocity 800 to 3,500 m/s, Temperature -30° to $+200^{\circ}\text{C}$ / -22° to $+392^{\circ}\text{F}$)

Measured Quantities:

- Volume flow, mass flow (by setting density), flow velocity, sound velocity in the fluid
- Wall thickness of the pipe (available when optional wall thickness probe is provided)

Measuring Principal:

Transit time method using ultrasonic signal

Pipe Sizes:

25 to 6,500 mm (1 to 255 inches)
(covered by three types of transducers)

Pipe and Lining Materials:

Carbon steel, Stainless steel, Grey cast iron, Ductile iron, Copper, Glass, PVC, etc

Note: When the pipe material is ductile iron, or when the inner surface of the pipe may have any rust, corrosion, or scale, select the transducers of "large type" (suffix code CG or CH) even when the pipe size is between 100 to 400mm (4 to 16 inches). When the pipe condition is unknown, please consult us. If the measurement will take place at the various types of pipe for checking or maintenance purposes, we recommend you to purchase the transducers of both "medium type" (suffix code BG or BH) and "large type" (suffix code CG or CH).

Flow Velocity Range:

± 0.01 to ± 25 m/s (± 0.033 to ± 82 ft/s)

Resolution:

0.025 cm/s (0.01 in/s)

Repeatability:

0.15% of reading ± 0.01 m/s (0.033 ft/s)

Accuracy:

(Note) Under fully developed rotationally symmetrical flow profile

Volumetric flow:

± 1 to 3% of reading ± 0.01 m/s (0.033 ft/s) depending on pipe geometry and accuracy of entered pipe dimensions.

Flow velocity:

$\pm 0.5\%$ of reading ± 0.01 m/s (0.033 ft/s) over sonic path

Measuring Cycle:

100 to 1000 Hz (per one channel)

Straight Pipe Run in the Upstream:

10 to 50 pipe diameters, depending on the kind of flow disturbances

● Ultrasonic Flowmeter, Main Unit**Housing Material:**

Aluminum

Painting:

Powder coating

Dust and Water-proof:

- IP54 (EN60529)
- JIS C 0920 IPX4, splash-proof

Measuring Input (flow / wall-thickness):

Two as standard (Channel A, Channel B). Both flow transducers and a wall thickness probe can be connected freely to whichever channel.

Current Output:

- None (standard), one, or two (optional)
- Range 4 to 20 mA (Load resistance 0 to 500 Ω)

Note: The current outputs may temporarily turn unstable during the switch-on sequence and parameter display / setting mode. Take care of your process not to be affected by this behavior.

Frequency Output:

- None (standard), or one (optional)
- Range 0 to 1 kHz
- Contact type: Open-collector, 24 V / 4 mA

Binary Output:

- None (standard), one, or two (optional)
- Contact type: Open-collector, 24 V / 4 mA

Input / Output Terminal Configuration:

Round socket connectors for flow and wall-thickness measuring inputs on the front panel. Banana plug jacks (+,-) for current, frequency, and binary outputs in the rear panel.

LCD Display:

2 line x 16 character LCD display with backlight that can be switched on/off.

Configurable to display two measured values (e.g., flow rate and total flow) simultaneously, or to display values from dual input channels alternately.

LED Lamp:

SIGNAL Lamp (green/red):

Indicates input signal status with green/red light, equipped for each channel.

BATTERY Lamp (red):

Indicates battery charging status with red light.

Keyboard:

15 keys (numerical, functional, or both) including four arrow-shaped keys for cursor operation, enabling easy access through its interactive menu structure.

Display Language:

Czech, Danish, Dutch, English (default), French, German, Norwegian, Polish, Turkey

Flow Measurement:

Flow velocity, Volume flow, Mass flow

Sound Velocity / Signal Amplitude Measurement (On-line):

Sound velocity and signal amplitude in the fluid available on-line simultaneously with flow measurement.

Totalization Function:

Totalizes the volume flow or mass flow. Ten-digit number for both forward/reverse directions of each channel.

Damping Function:

Time constant 0 to 100 seconds, moving average.

Sound Velocity Measurement (Off-line):

Measures the sound velocity of unknown fluid starting from its estimated sound velocity. The result can be transferred to the current fluid parameter.

Wall Thickness Measurement (Off-line):

Measures the wall thickness of unknown pipe (material-known) using optional wall thickness probe. The result can be transferred to the current pipe parameter.

Arithmetic Operation on Dual-Channel / Dual-Path Inputs:

Arithmetic operations get the outcomes for calculation channel Y and Z by taking sum, average, or difference of two flow values from input channel A and B. Taking absolute values of each input independently in the calculation is also possible.

Note: Two sets of transducers are necessary.

Pulse Output (optional):

Available via optional binary outputs.

- Pulse value: 0.01 to 1000 of totalization unit
- Pulse width: 100 to 1000 ms ($\pm 20\%$)
- Maximum output rate: 2pps (pulse/second) $\pm 20\%$

Alarm Output (optional):

Available via optional binary outputs where each alarm item is assigned one-to-one. Alarm properties are also selectable for each alarm one-by-one.

- Alarm items: High limit, Low limit, Flow direction change, Quantity limit (for batch operation), and Error (measurement impossible)
- Alarm properties: Normal open / Normal close, Non-hold / Hold (at the alarm detection)

Output Signal Configuration:

Freely configurable including independent dual flow value outputs.

- Current / frequency outputs: Flow velocity, Volume flow, Mass flow, Sound velocity, or Signal amplitude
- Binary outputs: Pulse or Alarm

Data Logging Function:

Data storage capacity of 27,000 values (standard) or 100,000 values (optional).

Storage rate is selectable from 1s, 10s, 1min, 10min, 30min, 1h, or any other rate between 1s to 43200s (12h) by the second. For each period of measurement, stored values are grouped by a user-defined measuring point name.

Stored values can be transferred to a personal computer via RS232 serial communication port.

Communication Function:

Transfers the measured values to a personal computer or a serial printer. Both on-line/off-line transfer during/after the measurement available.

- Output item: Flow value (flow velocity, volume flow, or mass flow), Totalization (forward, reverse), Sound velocity, Signal amplitude
- Output format setting: Spacing (for printer), Decimal point character, Data delimiter
- Communication interface: RS232
- Communication port: D-sub 9-pin, male

Time-Programmable Measurement Function:

Automatic start / stop of the measurement without human operation using internal clock for specific systems. Can be used with current output, binary output, data logging function, and/or communication function for recording the measurement.

Site Parameters Storage Function:

Eliminates the necessity of re-entering parameters for additional measurement on a site.

Totally 80 sets of site parameters for pipe/fluid settings are available with user-defined site names. Additionally, 14 sets of separate site parameters for not only pipe/fluid but also output-options setting in sets available.

Material / Fluid List Customization Function:

The lists of material / fluid in the parameter menu are editable. Unnecessary items can be cut off from the menu for user's convenience. Registration of new material / fluid data is also possible totally up to 13 items with user-defined names.

Power Supply:

Power supply system:

- Built-in rechargeable battery (6V/4Ah)

- Power supply adapter (Input: 100 to 240VAC, 50/60Hz, works also as battery charger)

Battery operating time (with full charge):

Maximum around 10 hour continuous measurement at room temperature (20°C / 68°F)

Power consumption: Less than 15W

Safety and EMC Standard:

General safety: EN61010 (CE marking)

EMC regulation: EN61326 (CE marking)

AS/NZS 2064 (C-Tick mark)

Operating Conditions:

Ambient temperature: -10° to +60°C (14° to 140°F)

● Transducers**Basic Construction:**

A set of transducers are composed of a pair of sensor elements (often called just as "transducers"), and transducer cables with a connector at one end, which is to be inserted into the measuring input sockets in the front panel of US300PM main unit. The transducer cables are armed with stainless steel flexible tube.

(Note) Fixing hardware (mounting fixtures, chains) and acoustic couplant are usually included in a set of transducers, specified in its model code by their kinds or with/without.

Material:

Case of sensor elements:

Stainless steel EN/DIN 1.4571

(JIS SUS 316Ti, AISI 316Ti SS equivalent)

Sensing surface of sensor elements:

General temperature type: PEEK (Poly Ether Ether Ketone)

High temperature type: Polyimide

Dust and Water-proof:

General type: IP65 (EN60529)

JIS C 0920 IPX5, jet-proof

Immersible type: IP67 (EN60529)

JIS C 0920 IPX7, watertight

Applicable Pipe Sizes (inner diameter):

Medium type: 25 to 400 mm (1 to 16 inches)

Lager type: 100 to 2,500 mm (4 to 98 inches)

Very large type: 2,000 to 6,500mm (78 to 255 inches)

(Note) Only "6,500mm" above is the size for outer diameter.

Fluid Temperature Range:

General temperature type:

-30° to +130°C (-22° to +266°F)

High temperature type:

-30° to +200°C (-22° to +392°F)

Note: Pay attention also to temperature specification of the couplant you choose.

Mounting Fixture Variety and Usage:

Retaining clip:

Inserted into the groove on the upper side of transducers. Transducers are fixed onto the pipe by fixing chains hooked at the retaining clip.

Mounting fixture standard type:

Consisted of two metal blocks with a slide-in ruler to hold transducers in place and adjust their distance easily. Transducers are fixed onto the pipe by fixing chains hooked at the mounting fixture.

Mounting fixture magnetic type:
Pieces of magnet are attached onto both sides of blocks for the "standard type" above. When the pipe material is what magnet pulls, transducers are fixed onto the pipe by magnetic power eliminating the use of fixing chains. If necessary, magnet pieces can be easily added for stronger magnetic power.

● **Optional Extension Cable**

Extends the length of transducer cable when the standard length is not enough for the site conditions. Select the extension length from 5m (16ft), 10m (32ft), or 20m (65ft).

● **Wall Thickness Probe**

Specified in the option code of US300PM main unit. Model codes as accessories also available for separate/additional orders (listed later).

Fluid Temperature Range:

General temperature type: -20° to +60°C (-4° to +140°F)
High temperature type: 0° to +200°C (32° to 392°F)

Measuring Performance:

Measuring range: 1.0 to 200 mm (0.04 to 7.8 inches), depends on the material
Resolution: 0.01 mm (0.0004 inch)

● **Accessories**

Standard Accessories for US300PM Main Unit:

Transportation case, Measuring tape, and Built-in battery set always come with US300PM.

Fixing Hardware, Couplant, etc:

Specified in the suffix code of US300FT transducers. Model codes as accessories also available for separate/additional orders (listed later).

● **Data Transfer Software**

General:

The software installed on a personal computer receives one or more records of logging data and parameter sets stored in US300PM main unit via RS232 communication port. Data can be viewed or graphed on a PC monitor, or exported as a text file. This software works while US300PM is off-line (not measuring flow) where current output goes down to zero.

Function:

Displaying Parameter Record:

Display parameter record of selected measuring data set.

Displaying Measured Data in Table:

Display measured data of selected measuring data set in table format.

Displaying Data in Graph:

Display measured data of selected measuring data set in graphic format. Marker type and color for each line of values selectable. Scales for time-axis and value-axis can be changed from default

condition of automatic scaling. Graph printing function embedded.

Displaying Statistical Data:

Display statistical data of the measurement. Total data points, minimum, maximum, average and standard deviation of the measured data can be shown. Data range for statistical processing can be designated if necessary.

Exporting Text File:

Parameter record and measured data can be exported to a text file. Options for exporting items or their formats are available.

Entering Remarks:

User's remarks for each measured data can be entered and edited in the transferred data file on a personal computer. Remarks can be displayed in the main window of the software.

Display Language:

English, German
(Note) Help is available only in English.

Operating Environment:

Personal Computer:

Microsoft® Windows® hardware compatible, one or more RS232 port

Operating System:

Microsoft® Windows® 98, ME, NT, 2000, XP

Standard Accessories:

RS232 cable, RS232 adapter 9/25

* Microsoft® and Windows® are registered trademarks of Microsoft Corporation in the United States and/or other countries.

MODEL AND SUFFIX CODE

Ultrasonic flowmeter, portable type

Model	Suffix code	Specification
US300PM	Ultrasonic flowmeter, portable type
Output	-A0	No current output
	-A1	One current output
	-A2	Two current outputs
Power Supply Adapter and AC cable	1	Japan
	2	USA
	3	Europe
	4	United Kingdom
	5	Australia
	6	South Africa
	-2	Always 2
	-N	Always N
Option	/PU1 ..	One binary (pulse or alarm) output (open-collector) (*1)
	/PU2 ..	Two binary (pulse or alarm) outputs (open-collector) (*1)
	/FQ1 ..	Frequency output (open-collector, 0 to 1kHz)
	/DLX ..	Data logging extension (100,000 values)
	/BGT ..	Tag number on nameplate (in the nameplate label, maximum 16 characters)
	/WTG ..	Wall thickness probe for general temperature (-20° to +60°C / -4° to +140°F)
	/WTH ..	Wall thickness probe for high temperature (0° to +200°C / 32° to 392°F)

T01.EPS

*1: Option /PU1 and /PU2 are exclusive.

Optional extension cable for portable type

Model	Suffix code	Specification
US300PC	Optional extension cable for portable type
Length	-A005	Cable length 5m (16ft)
	-A010	Cable length 10m (32ft)
	-A020	Cable length 20m (65ft)

T02.EPS

Data transfer software

Model	Suffix code	Specification
US300SA	Data transfer software (Windows version) Including connecting kit (RS232 cable for connection, RS232 adapter 9/25)
Language	-1	English / German version
	00	Always 00

T03.EPS

Transducers for portable type (*2)

Model	Suffix code	Specification
US300PT	Transducers for portable type
Usage	-G	General purpose (IP65)
	-W	Immersible (IP67)
Pipe Size / Fluid Temperature (*3)	BG	Medium & General (with 3 m / 9.8 ft cable)
	BH	Medium & High (with 3 m / 9.8 ft cable)
	CG	Large & General (with 4.4 m / 14.4 ft cable)
	CH	Large & High (with 4.4 m / 14.4 ft cable)
	DG	Very large & General (with 12 m / 39.4 ft cable)
	Mounting fixture (*4)	-C
-S		Standard type (set of two blocks, including ruler marked length 330 mm, equivalent to 13 in.)
-M		Magnetic type for general temp. (-30° to +100°C / -22° to +212°F, set of two blocks, including ruler marked length 330 mm, equivalent to 13 in.)
-N		None
Fixing chain (*4)		B
	C	For 1200 to 3000 mm (47 to 118 in.) Fixing chains of 2m / 6.5 ft length (5 x 2)
	D	For 3000 to 6500 mm (118 to 255 in.) Fixing chains of 2m / 6.5 ft length (11 x 2)
	N	None
	Acoustic couplant	G
H		High temperature type (-30° to +200°C / -22° to +392°F)
N		None
Option	/TTP ..	Transducer tag plate (maximum 16 characters)

T04.EPS

*2: Two sets of transducers are necessary when applying dual channel/path measurement.

*3: The alphabetic characters in the suffix code represent pipe sizes and fluid temperature ranges are below.

B: Medium type (25 to 400 mm / 1 to 16 in.)

C: Large type (100 to 2,500 mm / 4 to 98 in.)

D: Very large type (2,000 to 6,500 mm / 78 to 255 in.)

G: General temperature (-30° to +130°C / -22° to +266°F)

H: High temperature (-30° to +200°C / -22° to +392°F)

*4: When selecting code -C or -S for mounting fixture, always select code B, C, or D for fixing chain. When selecting code -M for mounting fixture, fixing chains are optional. When selecting code -N for mounting fixture, select also code N for fixing chain.

Accessories (for ultrasonic flowmeter US300PM)

Model	Description
USPA301	Wall thickness probe for general temperature (-20° to +60°C / -4° to +140°F)
USPA302	Wall thickness probe for high temperature (0° to +200°C / 32° to 392°F)
USPA311	Power supply adapter (100 to 240 V AC input)
USPA321	AC cable (Japan)
USPA322	AC cable (USA)
USPA323	AC cable (Europe)
USPA324	AC cable (United Kingdom)
USPA325	AC cable (Australia)
USPA326	AC cable (South Africa)
USPA331	Battery set (6 V 4Ah) (*5)
USPA341	Transportation case (*5)

T05.EPS

*5: Always comes with US300PM.

Accessories (others)

Model	Description
USPA401	RS232 cable (*6)
USPA402	RS232 adapter 9/25 (*6)
USPA411	Measuring tape (*7)

T06.EPS

*6: Included in data transfer software US300SA as standard.

*7: Included in US300PM as standard.

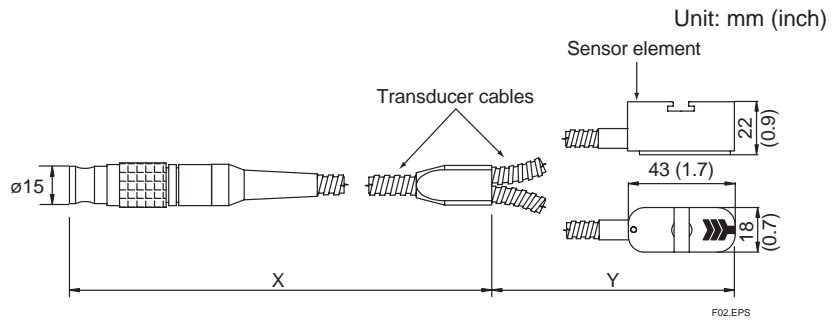
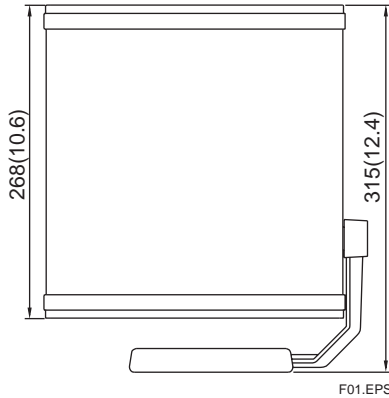
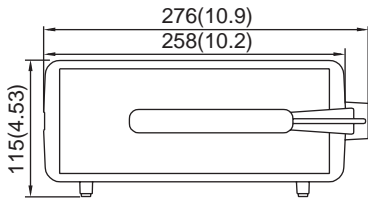
Accessories (for transducers US300PT)

Model	Description
USPA001	Fixing strap (10 m / 32 ft length)
USPA002	Fixing strap (20 m / 65 ft length)
USPA011	Fixing clips (medium type, for pipe size 40 to 100 mm / 1.5 to 4 in., set of two clips)
USPA012	Fixing clips (large type, for pipe size 100 to 6500 mm / 4 to 255 in., set of two clips)
USPA021	Fixing bands (only for pipe size 25 to 50 mm / 1 to 2 in.)
USPA032	Fixing chains (set of two extensible chains) (2 m / 6.5 ft length, equal to 600 mm / 23 in. diameter)
USPA033	Repair set for fixing chains
USPA034	Retaining clips (set of two clips, used with fixing chains)
USPA036	Fixing chains (set of two extensible chains) (0.5m / 1.6 ft length, equal to 150mm / 5.9 in. diameter)
USPA037	Fixing chains (set of two extensible chains) (1m / 3.2 ft length, equal to 300mm / 11.8 in. diameter)
USPA053	Mounting fixture short ruler type (for transducers medium pipe size type, temperature range -30° to +200°C / -22° to +392°F, set of two blocks with 120mm / 4.7 in. ruler)
USPA054	Mounting fixture standard type (for transducers medium pipe size type, temperature range -30° to +200°C / -22° to +392°F, set of two blocks with 330 mm / 13 in. ruler)
USPA055	Mounting fixture magnetic general temperature type (for transducers medium pipe size type, temperature range -30° to +100°C / -22° to +212°F, set of two blocks with 330 mm / 13 in. ruler)
USPA057	Mounting fixture standard type (for transducers large or very large pipe size type, temperature range -30° to +200°C / -22° to +392°F, set of two blocks with 330 mm / 13 in. ruler)
USPA058	Mounting fixture magnetic general temperature type (for transducers large or very large pipe size type, temperature range -30° to +100°C / -22° to +212°F, set of two blocks with 330 mm / 13 in. ruler)
USPA073	Additional magnets for mounting fixture magnetic general temperature type (for transducers medium pipe size type, temperature range -30° to +100°C / -22° to +212°F, set of two magnets)
USPA075	Additional magnets for mounting fixture magnetic general temperature type (for transducers large or very large pipe size type, temperature range -30° to +100°C / -22° to +212°F, set of two magnets)
USPA081	Ruler for mounting fixture (marked length 120 mm, equivalent to 4.7 in.)
USPA082	Ruler for mounting fixture (marked length 330 mm, equivalent to 13 in.)
USPA091	Acoustic couplant general temperature type (100 g, -30° to +130°C) (0.22 lb, -22° to +266°F)
USPA092	Acoustic couplant high temperature type (100 g, -30° to +200°C) (0.22 lb, -22° to +392°F)

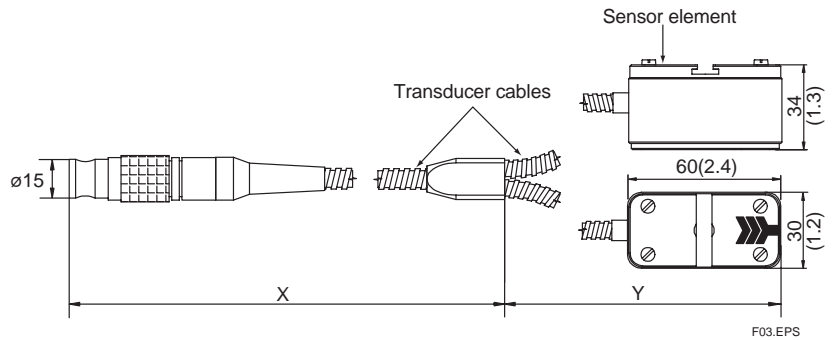
F07.EPS

DIMENSIONAL DRAWINGS

Ultrasonic flowmeter US300PM



Transducers US300PT-□C□, US300PT-□D□



Weight: 3.9 kg (8.60 lb)
(incl. battery set)

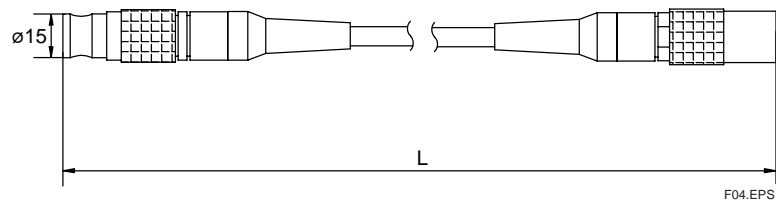
Transducers US300PT-□B□

Length / Weight

Transducers	X m (inch)	Y m (inch)	X+Y m (inch)	Weight kg (lb)
US300PT-□B□	2.0 (78.7)	1.0 (39.4)	3.0 (118.1)	0.6 (1.32)
US300PT-□C□	2.0 (78.7)	2.4 (94.5)	4.4 (173.2)	1.2 (2.65)
US300PT-□D□	5.0 (196.9)	7.0 (275.6)	12.0 (472.4)	2.2 (4.85)

T08.EPS

Optional extension cable US300PC-A□□□



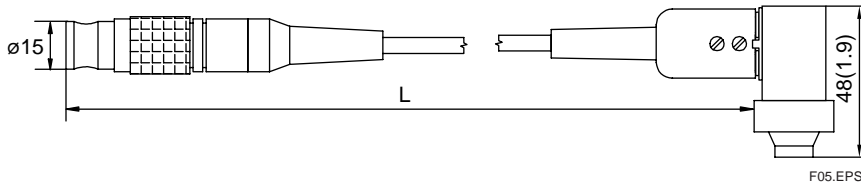
Length / Weight

Optional extension cable	L m (inch)	Weight kg (lb)
US300PC-A005	5.0 (196.9)	0.4 (0.88)
US300PC-A010	10.0 (393.7)	0.6 (1.32)
US300PC-A020	20.0 (787.4)	1.6 (3.53)

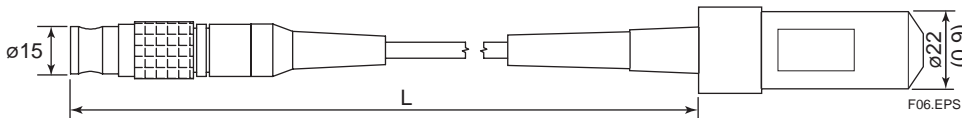
T09.EPS

Wall thickness probe for general temperature (-20° to +60°C / -4° to +140°F)
 (option /WTG or model USPA301)

Unit: mm (inch)



Wall thickness probe for high temperature (0° to +200°C / 32° to 392°F)
 (option /WTH or model USPA302)



Length / Weight

Wall thickness probe	L m (inch)	Weight kg (lb)
/WTG or USPA301	1.5 (59.1)	0.17 (0.37)
/WTH or USPA302	1.2 (47.2)	0.19 (0.42)

T10.EPS

Ordering Information

Specify the following when ordering.

1. Model, suffix and option code

- (1) First, specify the main unit US300PM and the transducers US300PT (one set of transducers when using only one channel or two sets when using two channels). The transducers can be added later.
- (2) US300PM main unit is not normally equipped with current outputs, pulse outputs, or alarm outputs as standard. Specify the corresponding code when necessary like -A01 or -A02 for current outputs, and /PU1 or /PU2 for pulse or alarm output.
- (3) Specify the wall thickness probe if necessary in the option code for the main unit US300PM (code /WTG or /WTH). They can be purchased later as model USPA301 or USPA302.
- (4) Specify the optional extension cable if necessary.
- (5) Specify the accessories when necessary or suitable. For example we may use "fixing strap" instead of "fixing chain" to fix the transducers to the pipe. Please consult us for the details.

2. Tag number (when necessary)

Maximum sixteen (16) characters for the cases below.

- (1) In the nameplate label of the main unit US300PM (necessary to specify the option /BGT at the same time)
- (2) In the tag plate for the transducers US300PT (necessary to specify the option /TTP at the same time)