



# TECHNICAL GUIDANCE

UP GRADED FOR MORE FRIENDLY OPERATION  
Ultra clean

## UL600N ULTRASONIC FLOWMETER (CLAMP ON TYPE)

### GENERAL

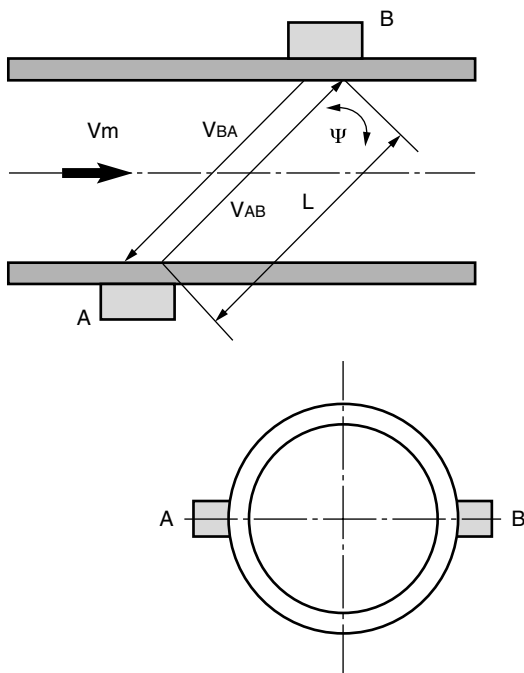
**UL600N** is Ultrasonic flowmeter for liquids using Time Flight measuring theory. The sensors, which are required for measurement, are installed outside of the process piping by Clamp-on fittings and perfect non-contact measurement from measuring medium has been achieved. This arrangement eliminates the possibility of introduction of metallic ions and producing of harmful particles into the process liquids. Thus, UL600N is very suitable for the flow rate measurement of pure and ultra pure water lines in semi-conductor production process.

### FEATURES

- 1) Perfect non-contact flow measurement guarantees the elimination of possibility of introduction of metallic ions and harmful particles into process lines.
- 2) No moving parts and no obstacles are provided in the flow path and no pressure drop is produced.
- 3) Measurement is free from density, pressure, viscosity, conductivity and other physical characteristic of measuring medium.
- 4) No moving parts guarantee long time durability and stability.
- 5) Alternative indication of flow rate and total flow as well as analog and pulse output are provided as standard.



### MEASURING PRINCIPLE



As shown in Fig.1 an ultra sonic is transferred from A to B and B to A in turn with a angle of  $\Psi$ . The required durations of transfer of two directions are different when measuring medium is moving from up stream to down stream. The durations of transfer are expressed by the following formula.

$$t_{AB} = L / (C_0 + V_m \cos \Psi)$$

$$t_{BA} = L / (C_0 - V_m \cos \Psi)$$

Where

L: Distance between A and B

$V_m$ : Average velocity of medium

$C_0$ : Sonic speed in stable medium

$t_{AB}, t_{BA}$ : Duration of transfer of Ultra Sonic from A to B and B to A

By measuring the difference of the transfer duration, the average velocity of medium can be calculated. The calculation is done by the following formula:

$$2V_m \cos \Psi = L / t_{AB} - L / t_{BA}$$

$$\Psi = L(t_{BA} - t_{AB}) / (t_{BA} \times t_{AB})$$

$$V_m = L(t_{BA} - t_{AB}) / (2 \cos \Psi \times t_{BA} \times t_{AB})$$

The distance between A and B (L) and the angle ( $\Psi$ ) are known, and the average velocity is mathematically calculated.

Fig.1

## STANDARD SPECIFICATION

- Measuring method : Time flight type
- System components : 2 × sensors, convertor, 2 × Exclusive cable (with BNC connector), grounding cable
- Installation of sensors : Clamp-on type
- Measuring medium : Liquids (Not suitable for liquids contains much bubbles and solids)
- Medium temperature: Maximum 90°C at surface of pipes on which sensors are installed.
- Pipe material : SGP, Stainless steel, PP,PVC, PvdF, others (Lining materials are also acceptable. Consult factory for details.)
- Measuring pipe size :
 

Standard	Min.50mm Max.1000mm Measurement of larger sizes than 1000mm is also possible. Consult factory for details.
Option	40mm Installation supervision and adjustment by our field engineer is required. (Sanitary pipe is excluded)
Option	25mm~32mm Ultrasonic sensors are installed onto pipe piece and delivered. (Only resin pipe)
- Measuring range : Min. scale setting 0.5m/s velocity  
Max. scale setting 10m/s velocity (Scales range is freely programmable through key board operation on front panel of convertor)

Size (Inner dia in mm)	Possible setting (m <sup>3</sup> /h)	
	Minimum	Maximum
25	0~ 1.13	0~ 17.6
32	0~ 1.45	0~ 28.9
40	0~ 2.27	0~ 45.2
50	0~ 3.54	0~ 70.6
65	0~ 6.0	0~ 119
80	0~ 9.1	0~ 180
100	0~ 14.2	0~ 282
125	0~ 22.1	0~ 441
150	0~ 31.9	0~ 636
200	0~ 55.7	0~ 1130
250	0~ 88.4	0~ 1767
300	0~ 127.1	0~ 2544
350	0~ 173.2	0~ 3463
400	0~ 226.2	0~ 4523
500	0~ 353.4	0~ 7068
600	0~ 508.7	0~10178
700	0~ 692.7	0~13854
800	0~ 904.7	0~18095
900	0~1145	0~22901
1000	0~1414	0~28273

- Accuracy :
 

For velocity more than 1m/s	±2% of indicated value
For velocity smaller than 1m/s	Error ±2cm velocity (±4% at 0.5 m/s velocity)
- Indication :
  - LCD3 line indication
  - Line 1 Data, 7 segments, 8 digit
  - Line 2 Unit, Message etc. 14 segments, 10 digit
  - Line 3 Mark to identify indication content (▼)
  - Contents of indication
  - Flow rate, total flow. Message etc.
- Output :
  - 1) Analog current output DC4~20mA (Terminal 5/6)
    - Max. load 700Ω
    - Time constant 0.4~3600 sec, adjustable
    - Low cut-off 1~20% of span adjustable
  - 2) Pulse output
    - Pulse rate freely programmable (10~36000000 pulse per hour)
      - Open collector pulse output (Terminal 4.1/4)
        - Rating DC-5~30V, Max. 100mA
      - EMC driving pulse (Terminal 4.2/4.1)
        - DC24V, 100mA Max.

Pulse width

Pulse rate	Pulse width
$f \leq 1\text{Hz}$	500ms
$1 \leq f \leq 10\text{Hz}$	$1000/2 \times f\text{Hz ms}$
$10 \leq f \leq 100\text{Hz}$	Duty factor 1:1
$1000 \leq f \leq 2547\text{Hz}$	160μS
$2547 \leq f \leq 10000\text{Hz}$	50μS

- Data setting :
  - 1) By pressing 3 keys (→, ←, ↑) on front panel of convertor
  - 2) By accessing to corresponding Hall element switch by magnet pin from the outside of the convertor panel without opening the cover
- Additional function :
  - 1) Sonic velocity measurement function
  - 2) Test signal output mode for loop checking
- Cable entry :
  - (For power and output)=3×M20 with water tight glands (Std.)
    - 3×G 1/2 thread
    - 3×G 1/2 thread with water tight glands
    - 3×NPT 1/2 thread
  - (For sensor) =2×BNC connector
- Exclusive cable :
  - Standard 10m cables provided.
  - Max.300m possible on request
- Power supply :
  - AC85-264V, 48-63Hz (Terminal 11/12)
- Power consumption :
  - Max.8W
- Enclosure :
  - Water tight (IP65) both for sensor and convertor
  - Submerge type sensors (IP67) available on request.
  - Consult factory for details.
- Finish :
  - Electro static powder painting (Blue)
- Material :
  - Sensors ;
    - Housing/ Copper alloy (nickel-plating)
    - Surface/Plastics
    - Clamp(Fitting rails)/Aluminum
  - Convertor :
    - Housing/ Aluminum alloy

MODEL CODE

□ SENSORS

Model code					Description
UL600N	-S	-*	-***	-*	
	-S				Sensor
Construction	-5				Water tight (IP65) Std.
	-7				Submerge (IP67) Opt.
Sensor cable length	-010				10m
	-020				20m
	-030				30m
	-□□□				Specified length *1
Sensor installation	-C				Clamp on in field
	-P				Piping place supplied
Additional functions	(BLANK)				NA
	/Z				Involved *2

\*1 : Cable length to be specified in m unit, max.300m  
 \*2 : Full "Z" and describe details if additional function is required.

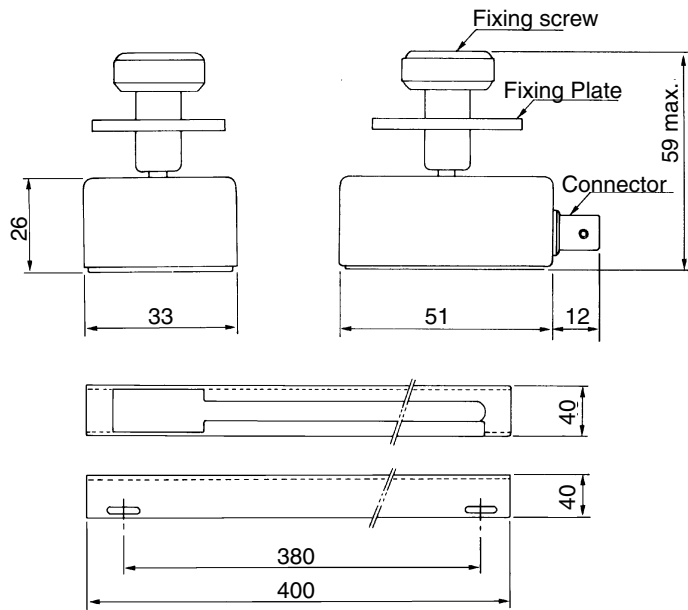
□ CONVERTOR

Model code					Description
UL600N	-C	-A	*	*	
	-C				Convertor
Power supply	-A				AC85~264V 50/60Hz
Installation	1				Wall mount
	2				2" Pipe mount
Cable entry (For power and output)	2				G1/2 thread
	3				G1/2 thread with watertight glands
	4				1/2NPT thread
	6				M20 with watertight glands (Std.)
Additional functions	(BLANK)				NA
	/Z				Involved *1

\*1 : Fill "Z" and describe if additional function is required.

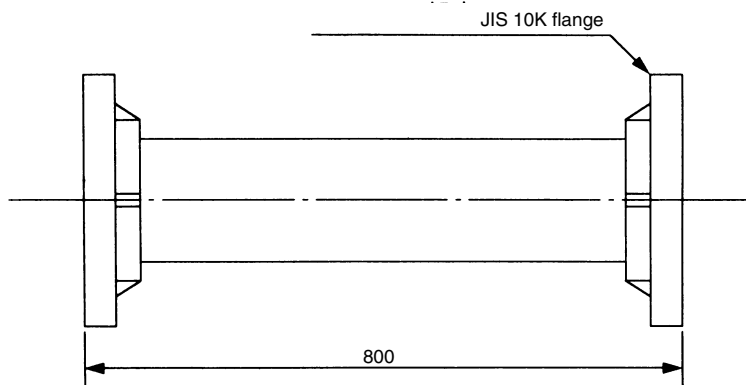
DIMENSION

□ SENSORS

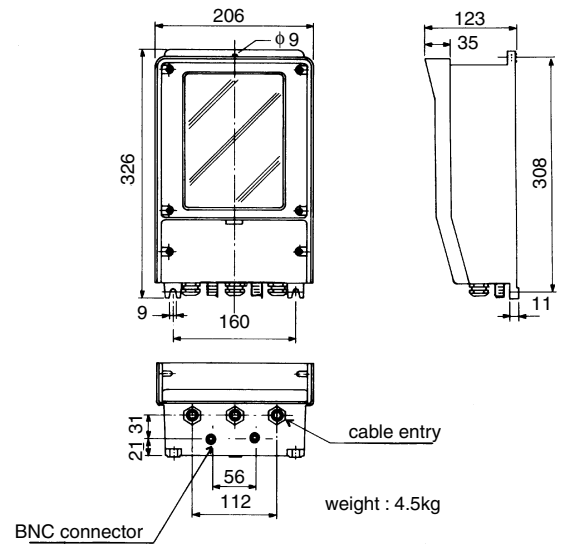


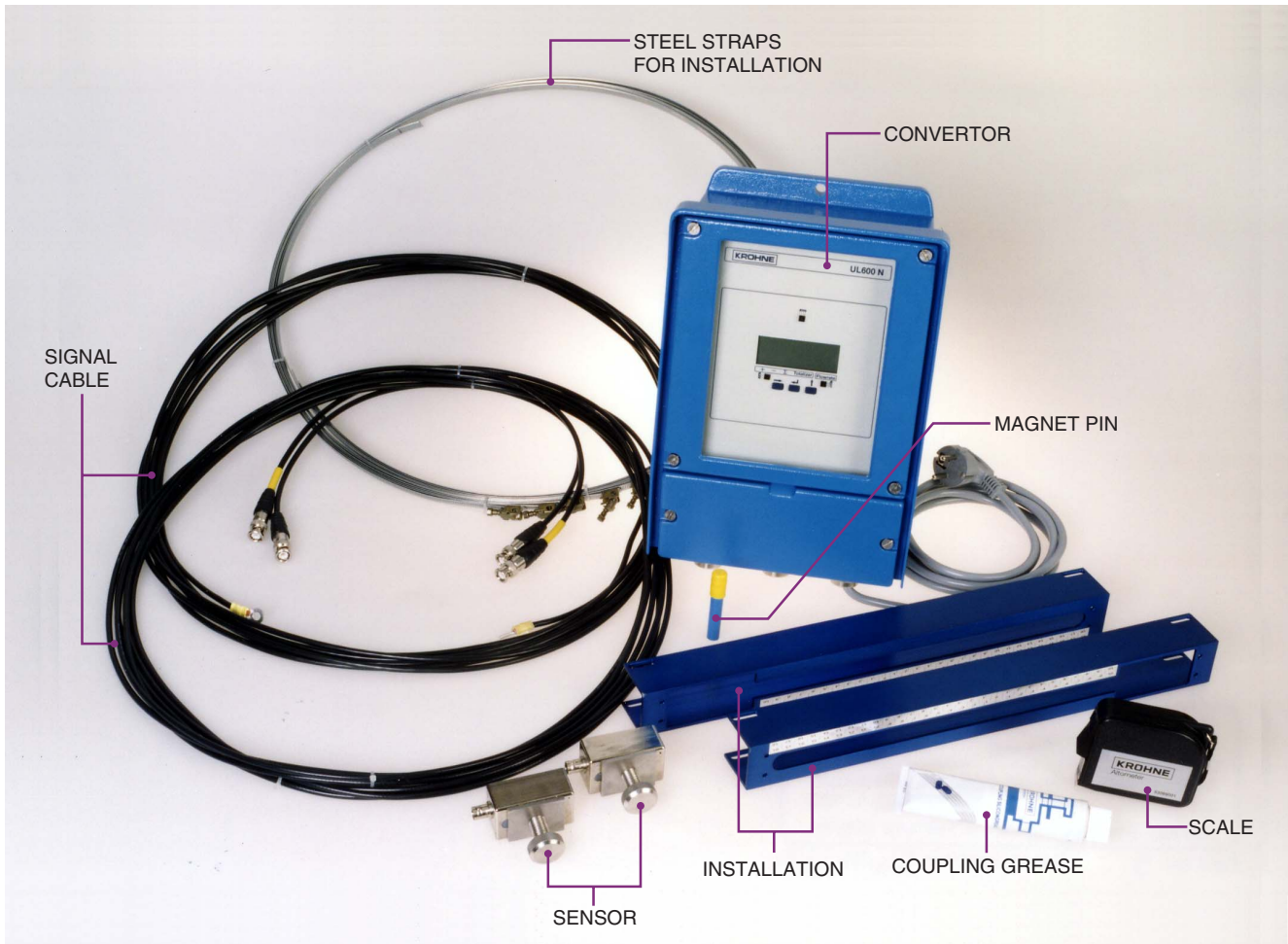
Installation rails

□ Piping piece for 25mm and 40mm



□ CONVERTOR





**SUGGESTIONS**

- 1) Straight length of 10D for up stream and 5D for down stream is required for accurate measurement. In case pumps, valves and/or expanding piping provided at the up stream, 20D straight run is required. (D: inner diameter of process piping)
- 2) Process piping is to be always full of liquid to be measured.
- 3) Max. allowable bubbles are 0.2% (Vol.)
- 4) It is recommended to install control valve at down-stream of sensors.
- 5) It is recommended to provide water tight covers for sensors in case of outdoor installation to avoid problems caused by coupling grease. Special designed water tight covers are available on request. Consult factory for details.

**ORDERING INFORMATION**

- CABLE LENGTH :  10m     20m     30m     \_\_m
- SENSOR TYPE :  Std. Water tight (IP65)  
 Opt. Submerge (IP67), to be discussed!
- INSTALLATION :  Indoor  
 Outdoor  
    └─Water tight cover for sensor  
         Required       Not required
- LINE SIZE :  50-1000mm  
 1000mm~  
 40mm  
 25~32mm (Supplied with pipe piece)  
    └─Pipe Piece material  
         STEEL       304SS       316SS  
         PVC       OTHERS(      )
- CONVERTOR :  Wall Mount     2" Pipe Mount
- INSTALLATION :  M20       G1/2 thread  
 G1/2 with water tight gland  
 NTP1/2

OTHER INSTRUCTION, IF ANY

\* Specification is subject to change without notice.

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