

## General Specifications

### Overall

Measurement	Fluids	Homogeneous and sonically conductive fluids (water, waste water, industrial water, river water, sea water, pure water, etc.)
	Temperature range	-20°C to +115°C (depend on transducer)  Note: 1) above also applicable to ambient temperature 2) For main unit, -10°C to +60°C
	Turbidity	10000 mg/L or less
Pipes	Material	Materials which allow stable transit of ultrasonic waves such as steel, SUS, castings, ductile casting, PVC, FRPM, etc.  Note: Applicable diameters may vary with material.)
	Diameters	DN300mm to DN6000mm
	Lining	None, tar epoxy, mortar, etc.
Measurement Range	Converted to flow velocity: -30 m/s to +30 m/s	
Measurement Cycle	60 ms	
Calibrated Accuracy	±0.5% R.D. ( $V \leq 0.5\text{m/s}$ )* <sup>1</sup> *1: According to our standard.	
Repeatability	±0.5%	
Range ability	1 : 300	
Measurement Method	Ultrasonic pulse transit time difference method	

European Compliance (CE marking)	<p>EMC Directive 2004/108/EC          Harmonized Standard / EN61326-1:2006          Separation into group / Group I          Division into classes / Class A          Location intended for use / In industrial locations</p> <p>Low Voltage Directive 2006/95/EC          Harmonized Standard / EN61010-1:2001          Over voltage category II          Pollution degree II          Altitude up to 3000m</p>
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## Main Unit

Analog output	St'd/option	Standard
	Output	<p>Instantaneous flow rate</p> <p>Number of outputs: 2</p> <p>Output pattern: 1 system parallel output, 8 types 2 system output, 10 types Special output, 1 type</p> <p>Note:</p> <p>1) Instantaneous flow rate will change to velocity value in case of velocity mode.</p> <p>2) Ch2 output will be the same type as ch1 output when 1 system or special output is selected. (parallel output)</p>
	Output format	<p>4 - 20mA (1 system / 2 system output)</p> <p>0.8 - 20mA (special output)</p> <p>20.8mA (Burnout when no echo received or during failure warning (span +5%) output possible)</p> <p>Max. allowable load resistance 1 K ohm, insulated outputs</p>
Terminal panel	Screw less Terminal (0.08~2.5mm <sup>2</sup> cable applicable)	

Contact point output	St'd/option	Standard
	Output	<p>For each of the 4 contact points, output selection allocation as follows. (parallel output possible)</p> <ol style="list-style-type: none"> <li>1. Forward flow totalized pulse</li> <li>2. Backward flow totalized pulse</li> <li>3. No echo received warning</li> <li>4. Equipment failure warning</li> <li>5. Equipment failure or no echo received warning</li> <li>6. Upper limit warning</li> <li>7. Lower limit warning</li> <li>8. Forward flow detection</li> <li>9. Backward flow detection</li> <li>10. High range detection</li> <li>11. Low range detection</li> <li>12. Not used</li> </ol> <p>Note:</p> <p>1) Pulse width of contact is selectable from 1000,500,100 or 20ms. But not for both forward and backward.</p> <p>2) Each default setting is "ON" at work, but "OFF at work is also selectable.</p>
	Output format	Photo coupler (insulated)
	Contact point capacity	DC48V, 0.4A
	Notes	<p>Totalize units</p> <p>0.01L, 0.1L, 1L, 10L, 100L, 1m<sup>3</sup>, 5m<sup>3</sup>, 10m<sup>3</sup>, 100m<sup>3</sup>, 1000m<sup>3</sup>, 10000m<sup>3</sup></p> <p>1g, 10g, 100g, 1kg, 10kg, 100kg, 1t, 10t, 100t, 1kt, 10kt, 100kt</p> <p>ft<sup>3</sup>,kft<sup>3</sup>,Mft<sup>3</sup>, bbl, kbbl, Mbbl, gal, kgal, Mgal, acf, kacf, Macf</p> <p>Valid units may be limited depending upon the selected flow unit.</p>
Terminal panel	Screw less Terminal (0.08~2.5mm <sup>2</sup> cable applicable)	

Digital output	St'd/option	Standard
	Output 1	<p><b>One-way output mode</b></p> <p>Following data is output per set output cycle</p> <p>Instantaneous flow rate, forward/backward flow totalized value and various warnings.</p> <p>(flow meter mode: linear flow rate and various warnings)</p> <p>Note: Instantaneous flow rate will change to velocity value in case of velocity mode. No totalized values available.</p>
	Output 2	<p><b>Intercommunication mode</b></p> <p>Connection to PC enables setting of flowmeter unit, setting menu and reading of measurement values and operation status.</p>
	Output type	RS232C (non-insulated output)
	Output cycle	1 to 3600 seconds possible. (output 1 only)
	Communication speed	4800 bps, 9600 bps or 19200 bps selectable
	Data bit length	8 bit/1 stop bit
	Parity check	EVEN
	Format	Original Format (ASCII) MODBUS (Selectable; only for Output1)
	Synchronization	Asynchronous
Cable length	Up to 3m	
		Note: To comply with EC directives, use less than 3m cable.

Multi-path measurement	St'd/option	Option
	Quantity	2 path or 4 path
	Details	<p>2 path:</p> <ul style="list-style-type: none"> <li>- 1 additional pulser module required and installed in main unit (total 2 modules).</li> <li>- Transducer, fixture, extension cable for each path required.</li> </ul> <p>4 path:</p> <ul style="list-style-type: none"> <li>- External multi-path junction box is required and 2 special coaxial composite cables are connected to the flowmeter main unit.</li> <li>- Transducer cable connected in junction box by BNC connector.</li> <li>- 3 additional pulser modules required and installed in main unit. (total 4 modules).</li> <li>- Transducer, fixture, extension cable for each path required.</li> </ul>

Data setting	Setting method	PC connected to Digital Output port 2, setting through PC with configuration software (LCD 4-keys entry is available, but limited).
	Setting items	Indication, Unit (Flow rate and Totalizing) Flow Range and various settings

Measurement display	Display method	LCD (16 character x 2 lines), with backlight Over 5 years life (by 25°C)			
	Display content	Changeable display of following: <ul style="list-style-type: none"> <li>• Instantaneous flow rate, warnings, check mode and totalizing status.</li> <li>• Instantaneous flow velocity value, warnings check mode and totalizing status.</li> <li>• Forward flow totalized value, warnings, check mode and totalizing status.</li> <li>• Backward flow totalized value, warnings, check mode and totalized status.</li> <li>• Status1 (AGC, Range, Warnings and Check mode)</li> <li>• Status2 (Number of R-OFF warning &amp; Disturbance Elimination function worked.)</li> </ul> <p>Note:</p> <ol style="list-style-type: none"> <li>1) During power failure, displayed screen component is memorized and displayed when power is again introduced.</li> <li>2) Instantaneous flow velocity of each path can be indicated on display in case of multi-path installation.</li> <li>3) Counter can be reset by key pad operation.</li> </ol>			
	Display digits	Instantaneous flow rate:	Dependent on max. flow rate for Analog output setting. Max. 7 digits including sign, decimal point.		
			Forward	Max. 7 digits Including Decimal point Range: 0 to 99999.0	
			Backward	Max. 7 digits including Sign and Decimal point Range: -0 to -99999	
		Instantaneous flow velocity:	sign section	1 digit	
integer section			2 digits		
decimal fraction	3 digits fixed				
Totalized flow:	7 digits				
During exceeding Max. range of flow rate for Analog output setting, indication would be "Instantaneous flow rate" and alternated flickering with "FS" (Full Scale) mark.					

Measurement display	Display content	
(cont.)	Warnings	Backup battery remaining life - "B" displayed when battery voltage falls below prescribed value. Not detectable when battery would not be equipped itself.
		No Echo received warning - "R" displayed during processing when no wave received.
		Disturbance Detection - "D" displayed when the measuring condition disturbed by air bubbles, solids or other factors.
		Over Range - "O" displayed when the measuring value exceeds upper or lower limitation setting.
	Check	"←A→", "←R→", "←M→" displayed during various check operations. (A: 4-20 check; R: range check; M: multi-path check) "←ARM→" appears during combined display.
	Totalizing Status	"I" displayed blinking when totalizing function operated.
	Failure warning	"ERR01" to "ERR63" displayed during equipment failure. Check operation display is replaced by this failure display.
	Status 1	"AGC" displayed in case of AGC function on.
		"LO-RNG" displayed in case of low range output.
		"HI-RNG" displayed in case of high range output.
	Status 2	Number of "R-OFF warning" function worked.
Number of "Disturbance Elimination" function worked.		

Function	Low flow cut	Cuts (zeros) flows when flow falls below prescribed instantaneous flow rate. Used in order to avoid output of flow values other than 0 when measurement value during still flow becomes disordered.
	No Echo receiving warning	<p>If measurement cannot be made when no echo is received continuously over the setting time (determined transition time), status is changed to</p> <ul style="list-style-type: none"> <li>- Selected analog output type     Selectable analog output transition status as follows.     0% (4mA), hold, 100% (20mA), burnout (20.8mA)</li> <li>- Display "R" on LCD.</li> <li>- Contact output of warning if set.</li> </ul> <p>Note:</p> <ol style="list-style-type: none"> <li>1) Measurement values and analog output will be restored when echo is received continuously over the setting time (determined restore time).</li> <li>2) In case of multi-paths, processing can be selected to change output for no echo receiving for 1 path or for all paths.     Initial setting value is for no echo receiving for all paths.</li> <li>3) If measurement can be made for even 1 path, measurement will be continued for only this path.</li> </ol>
	Disturbance detection	<p>Check whether processing values are measured properly or not and if determined to be disturbed conditions then measuring values are eliminated.</p> <ul style="list-style-type: none"> <li>- Display "D" on the display</li> <li>- Count up as history on status 2</li> </ul>
	Zero Shift compensation	Zero point can be independently compensated (shifted) for forward and backward flow rate.
	Span compensation	Slope of span line can be independently compensated for forward and backward flow rate in the range 0.100 to 2.000.
	Filtering (Smoothing)	<p>Rapid flow rate changes would be smoother by this filter for 1 to 120 sec. (Default 15sec)</p> <p>Note: This value is meaning the time until measuring flow rate reaches 90% by step-up increment.</p>
	Self-diagnostics and failure processing	<p>Self-diagnostics is run periodically.</p> <p>If failure is diagnosed on following items, transitions to be selected status.</p> <p>Diagnostic checks:</p> <ol style="list-style-type: none"> <li>1) Memory Area check (for totalizing and setting parameter)</li> <li>2) Parameter check</li> <li>3) Time measurement counter malfunction</li> <li>4) Transmitter malfunction</li> <li>5) Receiver malfunction</li> </ol> <ul style="list-style-type: none"> <li>- Selected analog output transition status as follows.     0% (4mA), hold, 100% (20mA), burnout (20.8mA)</li> <li>- Display "ERR**" on LCD. (** is error number.)</li> <li>- Contact output of warning if set.</li> </ul> <p>Note: "AND" , "OR" condition is selectable in accordance with fault tolerance function setting.</p>

Function (cont.)	Data retention	Totalized flow values and all setting parameters are retained in memory with lithium battery even if power failure.  Note: 1) Setting Parameters are retained in nonvolatile memory. 2) Totalized flow value and ROFF/Disturbance detection history are retained in memory which hold by Back-up Battery. 3) Data retained in memory which hold by Back-up Battery clears if battery removed without power supply. 4) 5 year life at room temperature. 5) No battery recharging function.
	Analog output check	Output can be freely changed depending on analog output setting. Setting every 0.1% of flow span range (-120.0 to + 120.0) possible.
	Path fixing	Measurement of specified path can be fixed and flow checked for every path when using multi-paths.
	Automatic Gain adjustment (AGA Function)	Receiver gain can be set as ideal amplitude by automatically or manually. (Manual gain setting is done conventionally by monitoring receiving echo with oscilloscope)
	Analog output range switching	Analog output range is automatically changeable when double range mode.
	Automatic gain control (AGC Function)	Receiver gain is automatically adjusted to the optimum level in response to changes in receiver sensitivity during measurement.  Note: Not available in case of containing air bubble or nearby flow control valve.
	Forward / Backward flow change processing	Hysteresis can be set by time in order to avoid flapping of direction detection contact points when there are back and forth, plus and minus changes in measurement values during still water condition.
	Totalized value preset	Totalized values can be freely preset. Preset Range: 0 to 9999999
	Basic data display	Following internal data can be referenced. - Fluid sonic velocity (unit, m/s) - Reynolds Number - Amp. Gain
	Error historic counter	Count "No Echo receiving warning" & "Disturbance detection" when it occurred.

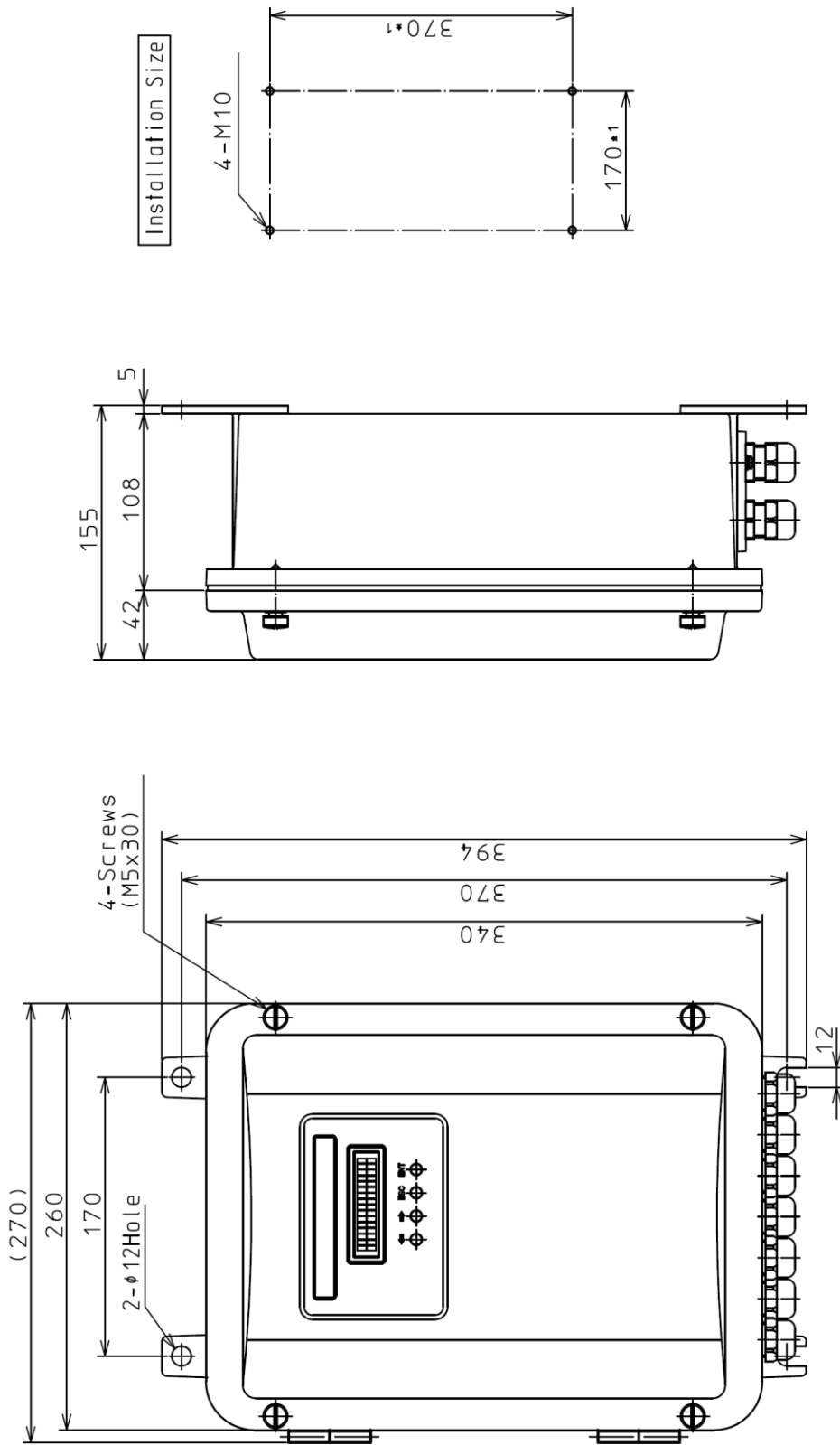
Power supply	AC100 to 230V +/-10% (50/60 Hz±10%) Option : DC24V±20% (This option must be pre-selected)	
	Momentary outage	AC input: 20ms, DC input: 5ms
Power consumption	AC100V: 20VA / AC200V: 27VA DC24V: 10W (Option)	
Fuse	IEC 60127-2 SS5 Cartridge fuse-links φ5.2x20 mm Rating 2A/250V Time-lag High Breaking Capacity (1500A)	
Rush Current	Less than 20A at AC100V / Less than 32A at AC200V Less than 30A at DC24V (Option)	
Operating temperature range	-10 to +60°C (for main unit ambient)	
Storage temperature range	-20 to +70°C	
Operating humidity range	≤ 90% RH, non-condensation	
Main unit construction	Protection Degree IP65 (IEC 60529)	
Wiring connection port	Cable gland, 7 pcs, O.D.6~12mm cable applicable	
Case material	Aluminum	
Coating	Melamine	
Color	Munsel 10YR9. 4/0. 5	
Weight	Appx. 8kg	
Dimensions	260mm x 394mm x 155mm	

## Transducers

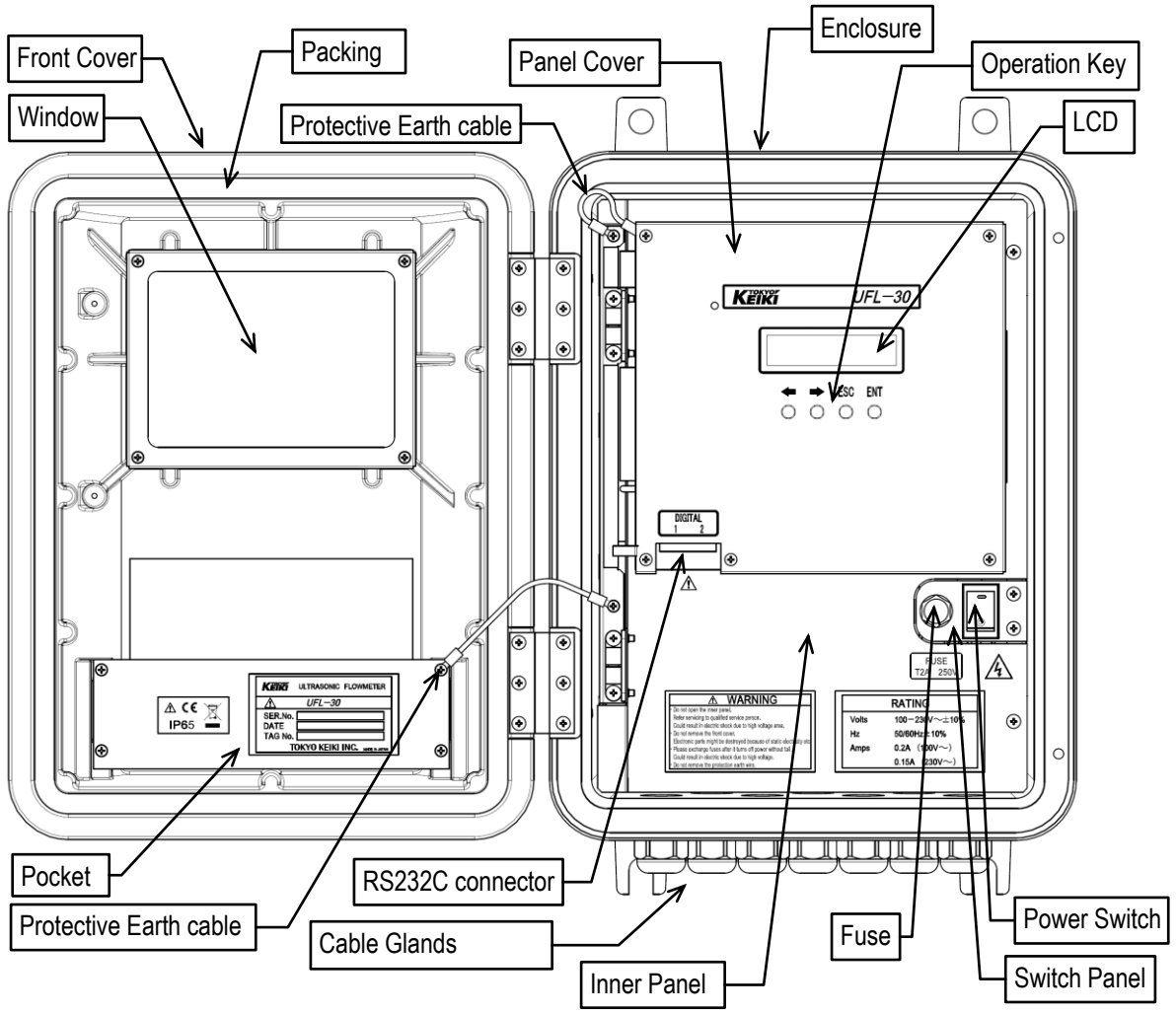
Transducers	Large diameter		SE044040NC	(-20°C to + 65°C)	
	Large diameter narrow space		SE042140NC	(-20°C to + 65°C)	
	Large diameter high temperature		SE044040N-HT	(+60°C to +115°C)	
	Note	Water proof performance	Protection Degree IP67 (IEC 60529) Protection Degree IP68 (IEC 60529)(Option)		
		Construction	one piece construction with 5m cable		
		Cable	coaxial cable with double shielded insulation between sheaths		
		Cable max. length	300m		



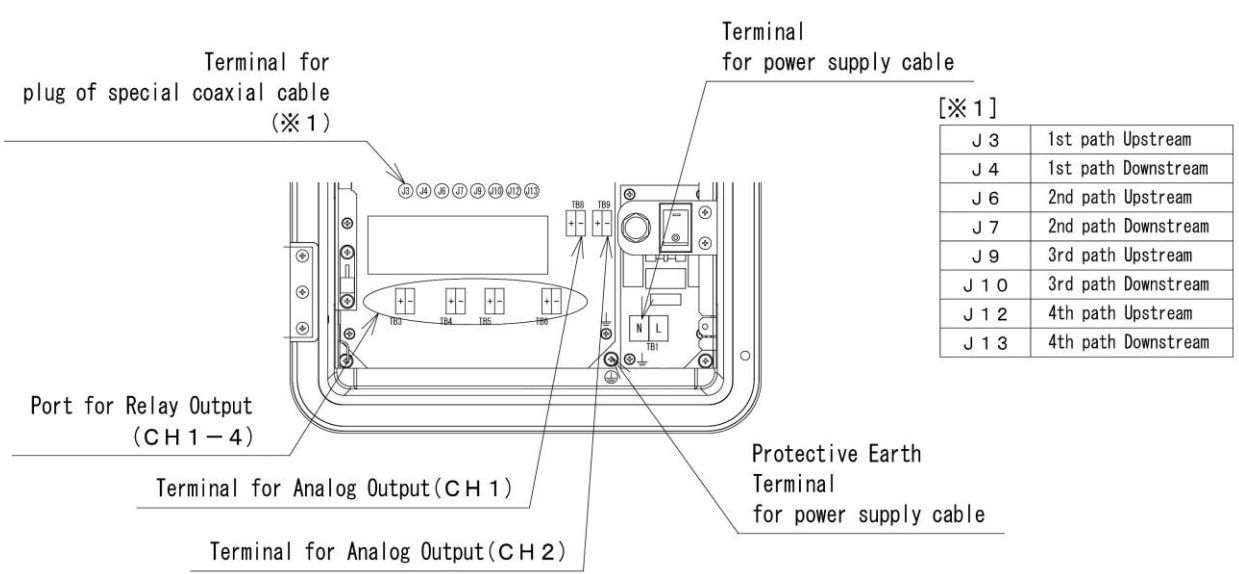
# Dimensions



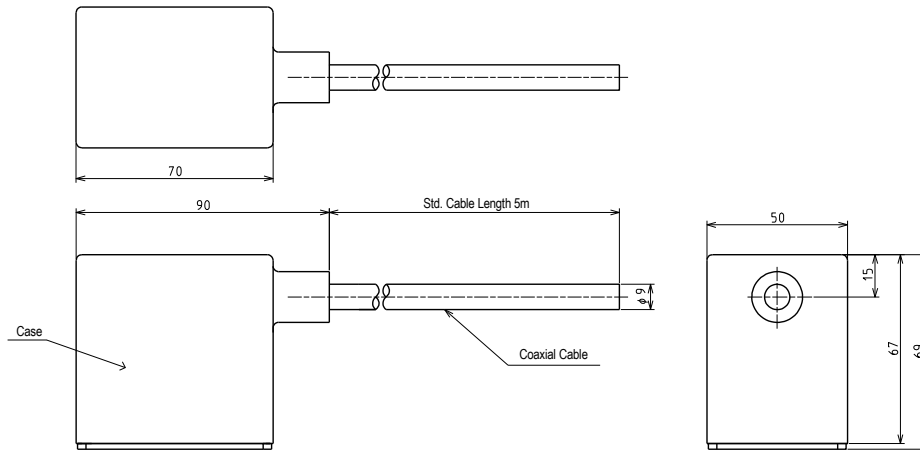
Main Unit



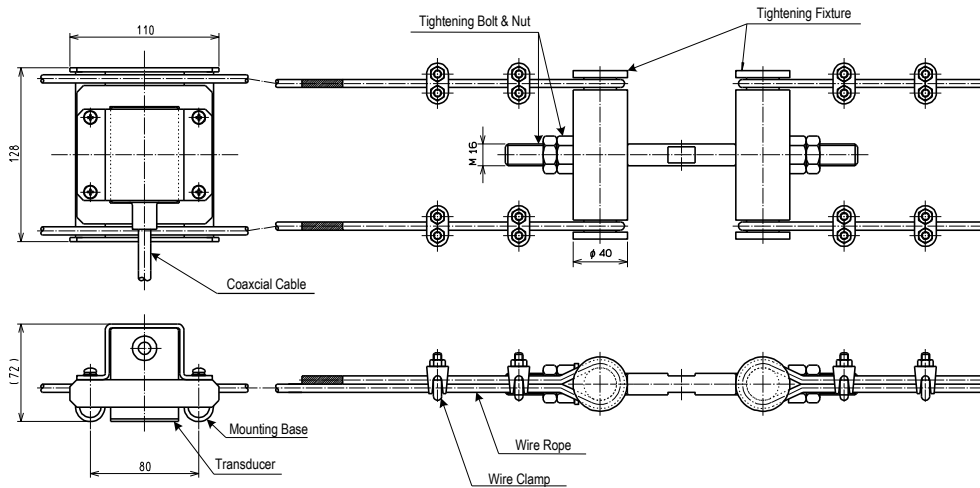
Internal View



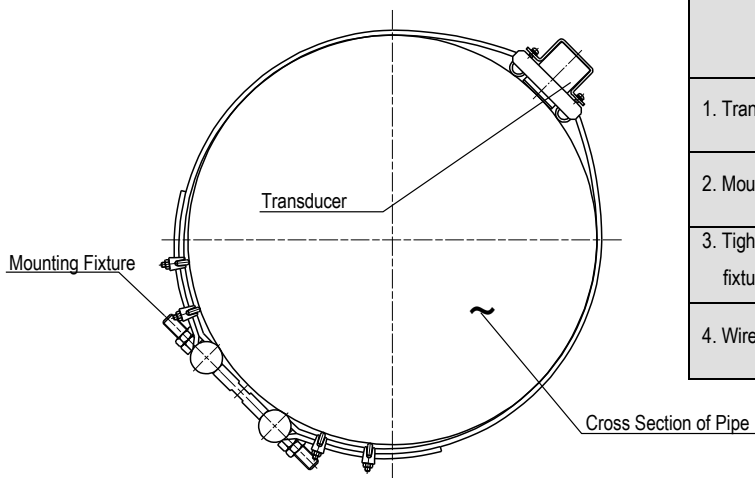
Connection to Main Unit



Transducer Dimensions (Pipe Dia more than 300mm)



Mounting Fixture for Transducers



Mounting Example

Components	Q'ty for 1path	Material	Weight (appx.)
1. Transducer	2pcs	SCS13	2.0kg per 2pcs
2. Mounting bracket	2pcs	SUS304	1.9kg per 2pcs
3. Tightening fixture	Less than 1600mm	SUS304	5.2kg per 2pcs
	More than 1600mm		
4. Wire rope	Less than 1600mm	Stainless	180g per 1m
	More than 1600mm		

# Pipe conditions and required straight pipe length (For 1 path method)

[Refer to JEMIS 032-1987]

Structural condition	Upstream straight pipe length	Downstream straight pipe length
90°bend		
T shape joint		
Increasing Diameter		
Reducing Diameter		
Control Valves	<p>Flow Control at upper side</p>	<p>Flow Control at lower side</p>
Pump		

D : Pipe Diameter