PRODUCT DATA SHEET

Stationary
Ultrasonic Flowmeter

UFL-30

TOKYO KEIKI INC.
1. **Outline**

1) Transit times of ultrasonic pulses transmitted in a liquid vary with the flow velocity of the liquid and ultrasonic flowmeters utilize this characteristic to measure flow.

2) Regardless of whether the liquid is electrically conductive or non-conductive, ultrasonic flowmeters can measure various types of liquids such as potable water, river water, industrial water, agricultural water, wastewater, seawater, and pure water.

3) Transducers are clamped on to the outside of the pipe so it is not necessary to cut pipes or stop flow for installation and there is no pressure loss.

4) Flow measurements are possible over a wide range, -30m/s to +30m/s.

5) Economical measurements of flow from 25mm to 6000mm can be obtained.

6) Easy Operation through PC configuration software. Through graphical user interface, it is very simple and useful for everyone to input all data.

2. **Features**

1) **Transit-Time**
   - High Accuracy ± 1.0% R.D. measurement

2) **Wide Measuring Coverage**
   - Pipe dia : DN25mm ~ DN6000mm
   - Velocity : -30m/s ~ +30m/s

3) **Multi-Path System**
   - 4-Path System Capability

4) **Variety Output**
   - 2 ports : RS232C digital output
   - 4 ports : Contact output
   - 2 ports : Analog output

5) **Easy Configuration**
   - Menu driven 4-keys input
   - Graphical PC Configuration
# 3. Configuration

**Flowmeter components**

<table>
<thead>
<tr>
<th>Component</th>
<th>Model</th>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Main unit</td>
<td>UFL-30</td>
<td>1 pc</td>
<td>Flowmeter main unit</td>
</tr>
<tr>
<td>2. Transducers</td>
<td>25mm-250mm Pipe 1MHz Sensor</td>
<td>1 path measurement: 2 pcs 2 paths measurement: 4 pcs 4 paths measurement: 8 pcs(*)</td>
<td>Ultrasonic transmit and receiving transducers and pipe-mounting fixtures for transducer (integrated transducer cable; length: 5m (standard))</td>
</tr>
<tr>
<td></td>
<td>300mm-6000mm Pipe 0.4MHz Sensor</td>
<td>1 MHz Sensor</td>
<td>Connection cable between flowmeter main unit and transducers (max. cable length: 300m)</td>
</tr>
<tr>
<td>3. Coaxial cable</td>
<td>5C-2WAE</td>
<td>1 path measurement: 2 pcs 2 paths measurement: 4 pcs 4 paths measurement: 8 pcs(*)</td>
<td>Channel expansion junction box for 4 paths measurement</td>
</tr>
<tr>
<td>4. Multi-path Junction Box (*)</td>
<td>1 unit</td>
<td>Channel expansion junction box for 4 paths measurement</td>
<td></td>
</tr>
</tbody>
</table>

(*) Multi-path measurement and multi-path Cable Junction unit for 4 paths are optional specifications.

1MHz transducer (pipe dia. less than 300mm) components are as follows.

<table>
<thead>
<tr>
<th>Components</th>
<th>Transducer (single set standard qty)</th>
<th>Material</th>
<th>Weight (appx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Transducer</td>
<td>1pair (2pcs) 2pair (4pcs) 4pair (8pcs)</td>
<td>Case material SCS13</td>
<td>1.4kg / 2pcs</td>
</tr>
<tr>
<td>2. Mounting bracket</td>
<td>1pc 2pcs 4pcs</td>
<td>SUS304</td>
<td>2.9kg / pc</td>
</tr>
<tr>
<td>3. Clamp (*1)</td>
<td>125mm-250mm 3pcs</td>
<td>SUS304</td>
<td>35g / pc</td>
</tr>
<tr>
<td></td>
<td>25mm-100mm 2pcs</td>
<td>SUS304 t:0.6mm</td>
<td>0.5kg / pc</td>
</tr>
<tr>
<td>4. Cover (*4)</td>
<td>1pc 2pcs 4pcs</td>
<td>SUS304 color: 5Y7/1</td>
<td>0.5kg / pc</td>
</tr>
</tbody>
</table>

SCS and SUS is notation by Japanese Industrial Standard for kind of stainless steel material.

(*1) 125mm ~ 250mm: pipe dia. (more than 125mm, less than 250mm) 25mm ~ 100mm: pipe dia. (more than 25mm, less than 100mm)

(*2) 2 or 4 paths measurement is optional specifications

(*3) Multiple paths measurement for pipe diameter less than 100A is required application specific mounting fixture. Consult Manufacturer.

(*4) Cover, optional specifications
0.4MHz transducer (pipe diameter more than 300mm) components are as follows.

<table>
<thead>
<tr>
<th>Components</th>
<th>Transducer (single set standard qty)</th>
<th>Material</th>
<th>Weight (appx.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1path measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2paths measurement (*1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4paths measurement (*1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Transducer</td>
<td>1pair (2pcs)</td>
<td>Case material</td>
<td>2.0kg / 2pcs</td>
</tr>
<tr>
<td></td>
<td>2pair (4pcs)</td>
<td>SCS13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 pair (8pcs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Mounting bracket</td>
<td>2pcs</td>
<td>SUS304</td>
<td>1.9kg / 2pcs</td>
</tr>
<tr>
<td></td>
<td>4pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Tightening fixture</td>
<td>Less than 1600mm</td>
<td>SUS304</td>
<td>5.2kg / 2pcs</td>
</tr>
<tr>
<td></td>
<td>2pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than 1600mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Wire rope</td>
<td>Less than 1600mm</td>
<td>Stainless</td>
<td>180g / 1m</td>
</tr>
<tr>
<td></td>
<td>4pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>More than 1600mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8pcs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Transducer cover (*2)</td>
<td>2pcs</td>
<td>SUS304</td>
<td>0.7kg / 2pcs</td>
</tr>
<tr>
<td></td>
<td>4pcs</td>
<td>Color: 5Y7/1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8pcs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SCS and SUS is notation by Japanese Industrial Standard for kind of stainless steel material.

(*1) 2 or 4 paths measurement is optional specifications.

(*2) Transducer cover is optional specifications.
### 4. Specifications

#### 4-1. Overall Specifications

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Fluids</th>
<th>Homogeneous and sonically conductive fluids (water, waste water, industrial water, river water, sea water, pure water, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>-20°C to +115°C (depend on transducer)</td>
<td>Note: 1) above also applicable to ambient temperature 2) For main unit, -10°C to +60°C</td>
</tr>
<tr>
<td>Turbidity</td>
<td>10000 mg/L or less</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pipes</th>
<th>Material</th>
<th>Materials which allow stable transit of ultrasonic waves such as Carbon steel, Stainless steel, Castings, Ductile casting, PVC, FRPM, GRP, HDPE, PE, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Note: Applicable diameters may vary with material.)</td>
<td></td>
</tr>
<tr>
<td>Diameters</td>
<td>DN25mm to DN6000mm</td>
<td></td>
</tr>
<tr>
<td>Lining</td>
<td>None, tar epoxy, mortar, etc.</td>
<td></td>
</tr>
</tbody>
</table>

| Measurement Range | Converted to flow velocity: -30 m/s to +30 m/s |
| Measurement Cycle | 60 ms |

| Measurement Accuracy | D ≥300mm, ±1% of reading, however ±0.008m/s for velocities less than 0.8m/s. D<300mm, ±1% of reading, however ±0.02m/s for velocities less than 2m/s. |
| Note: 1) For volumetric flow rate. 2) Fully developed and rotationally symmetrical flow profile required. 3) Calibrated accuracy defined on project specification as Option. |

| Calibrated Accuracy | ± 0.5% of reading |
| Note: 1) According to our standard. 2) Velocity 0.5 m/s |

| Repeatability | ±0.5% |
| Range ability | 1 : 300 |

| Measurement Method | Ultrasonic pulse transit time difference method |

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**Diagram: Ultrasonic Flow Meter Installation**

Note: Contact the manufacturer for pump, valve, pipe, and other equipment with any specific requirements or questions.
### 4-2. Main Unit

<table>
<thead>
<tr>
<th>Analog output</th>
<th>St’d?option</th>
<th>Standard</th>
</tr>
</thead>
</table>
| Output        | Instantaneous flow rate  
Number of outputs: 2  
Output pattern: 1 system parallel output, 8 types  
2 system output, 10 types  
Special output, 1 type  
Note:  
1) Instantaneous flow rate will change to velocity value in case of velocity mode.  
2) Ch2 output will be the same type as ch1 output when 1 system or special output is selected. (parallel output) | |
| Output format | 4 - 20mA (1 system / 2 system output)  
0.8 - 20mA (special output)  
20.8mA (Burnout when no echo received or during failure warning (span +5%) output possible)  
Max. allowable load resistance 1 K ohm, insulated outputs | |
| Terminal panel | Screw less Terminal (0.08~2.5mm² cable applicable) | |

<table>
<thead>
<tr>
<th>Contact point output</th>
<th>St’d?option</th>
<th>Standard</th>
</tr>
</thead>
</table>
| Output               | For each of the 4 contact points, output selection allocation as follows. (parallel output possible)  
1. Forward flow totalized pulse  
2. Backward flow totalized pulse  
3. No echo received warning  
4. Equipment failure warning  
5. Equipment failure or no echo received warning  
6. Upper limit warning  
7. Lower limit warning  
8. Forward flow detection  
9. Backward flow detection  
10. High range detection  
11. Low range detection  
12. Not used  
Note:  
1) Pulse width of contact is selectable from 1000,500,100 or 20ms. But not for both forward and backward.  
2) Each default setting is "ON" at work, but "OFF at work is also selectable. | |
| Output format | Photo coupler (insulated) | |
| Contact point capacity | DC48V, 0.4A | |
| Notes | Totalize units  
0.01L, 0.1L, 1L, 10L, 100L, 1m3, 5m3, 10m3, 100m3, 1000m3, 10000m3  
1g, 10g, 100g, 1kg, 10kg, 100kg, 1t, 10t, 100t, 1kt, 10kt, 100kt ft³, kft³, Mft³, bbl, kbbl, Mbbl, gal, kgal, Mgal, acf, kacf, Macf  
Valid units may be limited depending upon the selected flow unit. | |
<p>| Terminal panel | Screw less Terminal (0.08~2.5mm² cable applicable) | |</p>
<table>
<thead>
<tr>
<th>Digital output</th>
<th>St’d/option</th>
<th>Standard</th>
</tr>
</thead>
</table>
| Output 1       | **One-way output mode** | Following data is output per set output cycle: Instantaneous flow rate, forward/backward flow totalized value and various warnings. (flow meter mode: linear flow rate and various warnings)  
Note: Instantaneous flow rate will change to velocity value in case of velocity mode. No totalized values available. |
| Output 2       | **Intercommunication mode** | Connection to PC enables setting of flowmeter unit, setting menu and reading of measurement values and operation status. |
| 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. |

<table>
<thead>
<tr>
<th>Multi-path measurement</th>
<th>St’d/option</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>2 path or 4 path</td>
<td></td>
</tr>
</tbody>
</table>
| Details                | 2 path:  
- 1 additional pulser module required and installed in main unit (total 2 modules).  
- Transducer, fixture, extension cable for each path required.  
4 path:  
- External multi-path junction box is required and 2 special coaxial composite cables are connected to the flowmeter main unit.  
- Transducer cable connected in junction box by BNC connector.  
- 3 additional pulser modules required and installed in main unit. (Total 4 modules).  
- Transducer, fixture, extension cable for each path required. |
### Data setting

<table>
<thead>
<tr>
<th>Setting method</th>
<th>PC connected to Digital Output port 2, setting through PC with configuration software (LCD 4-keys entry is available, but limited).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting items</td>
<td>Indication, Unit (Flow rate and Totalizing) Flow Range and various settings</td>
</tr>
</tbody>
</table>

### Measurement display

<table>
<thead>
<tr>
<th>Display method</th>
<th>LCD (16 character x 2 lines), with backlight Over 5 years life (by 25°C)</th>
</tr>
</thead>
</table>
| Display content| Switchable display of following:  
  - Instantaneous flow rate, warnings, check mode and totalizing status.  
  - Instantaneous flow velocity value, warnings check mode and totalizing status.  
  - Forward flow totalized value, warnings, check mode and totalizing status.  
  - Backward flow totalized value, warnings, check mode and totalized status.  
  - Status1 (AGC, Range, Warnings and Check mode)  
  - Status2 (Number of R-OFF warning & Disturbance Elimination function worked.) |

**Note:**  
1) During power failure, displayed screen component is memorized and displayed when power is again introduced.  
2) Instantaneous flow velocity of each path can be indicated on display in case of multi-path installation.  
3) Counter can be reset by keypad operation.

<table>
<thead>
<tr>
<th>Display digits</th>
<th>Instantaneous flow rate:</th>
<th>Dependent on max. flow rate for Analog output setting. Max. 7 digits including sign, decimal point.</th>
</tr>
</thead>
</table>
|                |                        | Forward Max. 7 digits Including Decimal point  
Range: 0 to 99999.0 |
|                |                        | Backward Max. 7 digits including Sign and  
Decimal point  
Range: -99999 to 0 |
| 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.
<table>
<thead>
<tr>
<th>Measurement display (cont.)</th>
<th>Display content</th>
</tr>
</thead>
</table>
| **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.  

<table>
<thead>
<tr>
<th>Function</th>
<th>Low flow cut</th>
<th>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.</th>
</tr>
</thead>
</table>
| No Echo receiving warning | If measurement cannot be made when no echo is received continuously over the setting time (determined transition time), status is changed to  
- Selected analog output type  
  Selectable analog output transition status as follows.  
  - 0% (4mA), hold, 100% (20mA), burnout (20.8mA)  
  - Display "R" on LCD.  
  - Contact output of warning if set. | Note:  
1) Measurement values and analog output will be restored when echo is received continuously over the setting time (determined restore time).  
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.  
3) If measurement can be made for even 1 path, measurement will be continued for only this path. |
| Disturbance detection | Check whether processing values are measured properly or not and if determined to be disturbed conditions then measuring values are eliminated.  
- Display “D” on the display  
- Count up as history on status 2 | |
| 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) | Rapid flow rate changes would be smoother by this filter for 1 to120 sec. (Default 15sec)  
Note: This value is meaning the time until measuring flow rate reaches 90% by step-up increment. | |
| Self-diagnostics and failure processing | Self-diagnostics is run periodically. If failure is diagnosed on following items, transitions to be selected status. Diagnostic checks:  
1) Memory Area check (for totalizing and setting parameter)  
2) Parameter check  
3) Time measurement counter malfunction  
4) Transmitter malfunction  
5) Receiver malfunction  
- Selected analog output transition status as follows.  
  - 0% (4mA), hold, 100% (20mA), burnout (20.8mA)  
- Display "ERR***" on LCD. (** is error number.)  
- Contact output of warning if set. | Note: "AND", "OR" condition is selectable in accordance with fault tolerance function setting. |
| 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. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog output check</td>
<td>Output can be freely changed depending on analog output setting. Setting every 0.1% of flow span range (-120.0 to + 120.0) possible.</td>
<td></td>
</tr>
<tr>
<td>Path fixing</td>
<td>Measurement of specified path can be fixed and flow checked for every path when using multi-paths.</td>
<td></td>
</tr>
<tr>
<td>Automatic Gain adjustment (AGA Function)</td>
<td>Receiver gain can be set as ideal amplitude by automatically or manually. (Manual gain setting is done conventionally by monitoring receiving echo with oscilloscope)</td>
<td></td>
</tr>
<tr>
<td>Analog output range switching</td>
<td>Analog output range is automatically switchable when double range mode.</td>
<td></td>
</tr>
</tbody>
</table>
| 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  
|                   | φ 5.2x20 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         | -10 to +60°C (for main unit ambient)  
| temperature range |  
| Storage           | -20 to +70°C  
| temperature range |  
| Operating         | Less than 95% RH, non-condensation  
| humidity range    |  
| Main unit         | Protection Degree IP65 (IEC 60529)  
| construction      |  
| Wiring connection | Cable gland, 7 pcs, O.D.6~12mm cable applicable  
| port              |  
| Case material     | Aluminum  
| Coating           | Melamine  
| Color             | Munsel 10YR9.4/0.5  
| Weight            | Approx. 8kg  
| Dimensions        | 260mm x 394mm x 155mm  
| European          | EMC Directive 2014/30/EU  
| Compliance (CE     | Harmonized Standard / EN61326-1:2013  
| marking)          | Separation into group / Group I  
|                   | Division into classes / Class A  
|                   | Location intended for use / In industrial locations  
|                   | Low Voltage Directive 2014/35/EU  
|                   | Harmonized Standard / EN61010-1:2010  
|                   | Over voltage category II  
|                   | Pollution degree II  
|                   | Altitude 3000m or less  
|                   | RoHS Directive 2011/65/EU  
|                   | Harmonized Standard / EN 50581:2012  

Note: CE Marking will be applied only for EU market.
### 4-3. Transducers

<table>
<thead>
<tr>
<th>Transducers</th>
<th>Large diameter</th>
<th>SE044040NC</th>
<th>(-20°C to + 65°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large diameter narrow space</td>
<td>SE042140NC</td>
<td>(-20°C to + 65°C)</td>
</tr>
<tr>
<td></td>
<td>Large diameter high temperature</td>
<td>SE044040N-HT</td>
<td>(+60°C to +115°C)</td>
</tr>
<tr>
<td></td>
<td>Small diameter</td>
<td>SE104720</td>
<td>(-20°C to + 60°C)</td>
</tr>
<tr>
<td></td>
<td>Small diameter high temperature</td>
<td>SE104020N-HT</td>
<td>(+60°C to +115°C)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note</th>
<th>Water proof performance (IEC 60529)</th>
<th>Protection Degree IP67 (Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>One piece construction with 5m cable</td>
<td>Coaxial cable with double shielded</td>
</tr>
<tr>
<td>Cable</td>
<td></td>
<td>insulation between sheaths</td>
</tr>
<tr>
<td>Cable max. length</td>
<td></td>
<td>300m</td>
</tr>
</tbody>
</table>

### 4-4. Accessories

<table>
<thead>
<tr>
<th>Cable Junction box</th>
<th>St’d/option</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>IEC 60529 Protection Degree IPX4</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Aluminum casting</td>
<td></td>
</tr>
<tr>
<td>Connection port</td>
<td>4 locations (2 locations each side)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multi-Path Junction box</th>
<th>St’d/option</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>IEC 60529 Protection Degree IP66</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Aluminum casting</td>
<td></td>
</tr>
<tr>
<td>Connection port</td>
<td>10 locations (2 for Main Unit side &amp; 8 for Transducers side)</td>
<td></td>
</tr>
<tr>
<td>Cables</td>
<td>Included 1m Special Composite Coaxial Cable with Connector to Main unit.</td>
<td></td>
</tr>
</tbody>
</table>

| Power Cable (*1)               | St’d/option | Prepared by User |
| Model name                     | OLFLEX Classic 100 | multi-conductor, flexible power and control cable |
| Part Number                    | 10060       |                  |
| Manufacturer                   | LAPP KABEL |                  |
| Details                        | 3 Conductors | AWG16, 1.5 mm² |
|                                | Nominal Outer diameter 8.1 mm |        |

(*1) Power cable is specified to comply with EC directive.
## 5. Analog output profiles

Table 1: Analog Output Profile Table

### (1) Single System Output 1/2

<table>
<thead>
<tr>
<th>Profile Description</th>
<th>CH1,CH2 Common Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>One-Way Single Range</td>
<td><img src="image1.png" alt="Graph" /></td>
</tr>
<tr>
<td>Two-Way Single Range</td>
<td><img src="image2.png" alt="Graph" /></td>
</tr>
<tr>
<td>One-Way Double Range</td>
<td><img src="image3.png" alt="Graph" /></td>
</tr>
<tr>
<td>Automatic Double Range</td>
<td><img src="image4.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

### (2) Single System Output 2/2

<table>
<thead>
<tr>
<th>Profile Description</th>
<th>CH1,CH2 Common Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-Way Double Range</td>
<td><img src="image5.png" alt="Graph" /></td>
</tr>
<tr>
<td>Automatic Double Range</td>
<td><img src="image6.png" alt="Graph" /></td>
</tr>
<tr>
<td>Special</td>
<td><img src="image7.png" alt="Graph" /></td>
</tr>
</tbody>
</table>
### Table 1 (continued)

#### (3) Dual System Output 1/2

<table>
<thead>
<tr>
<th>Profile Description</th>
<th>CH1 Output</th>
<th>CH2 Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-Way Single Range</td>
<td><img src="image1" alt="" /></td>
<td><img src="image2" alt="" /></td>
</tr>
<tr>
<td>One-Way Double Range Internal Switching</td>
<td><img src="image3" alt="" /></td>
<td><img src="image4" alt="" /></td>
</tr>
</tbody>
</table>

#### (4) Dual System 2/2

<table>
<thead>
<tr>
<th>Profile Description</th>
<th>CH1 Output</th>
<th>CH2 Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-Way Double Range FW/BW</td>
<td><img src="image5" alt="" /></td>
<td><img src="image6" alt="" /></td>
</tr>
<tr>
<td>One-Way Double Range HI/LO Internal Switching</td>
<td><img src="image7" alt="" /></td>
<td><img src="image8" alt="" /></td>
</tr>
</tbody>
</table>
6. Transducer installation

- To minimize measurement errors arising from flow profile, a straight pipe run is necessary for transducer installation.
- Liquid should fill the pipes completely and transducers should be installed in locations which have no air bubbles.
- For measurements in underground piping, the usual means is to locate the flowmeter in a pit to facilitate transducer installation, maintenance, and testing.

<table>
<thead>
<tr>
<th>Structural condition</th>
<th>Upstream straight pipe length</th>
<th>Downstream straight pipe length</th>
</tr>
</thead>
<tbody>
<tr>
<td>90°bend</td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td>T shape joint</td>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td>Increasing Diameter</td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td>Reducing Diameter</td>
<td><img src="image7" alt="Diagram" /></td>
<td><img src="image8" alt="Diagram" /></td>
</tr>
<tr>
<td>Control Valves</td>
<td><img src="image9" alt="Diagram" /></td>
<td><img src="image10" alt="Diagram" /></td>
</tr>
<tr>
<td>Pump</td>
<td><img src="image11" alt="Diagram" /></td>
<td><img src="image12" alt="Diagram" /></td>
</tr>
</tbody>
</table>

[Refer to JEMIS 032-1987 ]

D : Pipe Diameter
7. Dimensions

Main Unit Dimension
Transducer Dimensions (Pipe Dia more than 300mm)

Mounting Fixture for Transducers

Mounting Example
Mounting Example

Mounting Fixture
Cross Section of Pipe
Transducer

Std. Cable Length 5m
Coaxial Cable

Transducer Dimensions (Pipe Dia less than 300mm)

Mounting Bracket
Mounting Fixture for Transducers

Coaxial Cable

Mounting Example

Cross Section of Pipe
8. Wiring Connection

8-1. Output connection

- Terminal for Transducer cables Path 1 and Path 2
- Clamp for cable shield of transducer & GND
- Ports for Relay Output CH1-4
- Complex Cable for Analog Output : CH1
- Complex Cable for Analog Output : CH2
- Protective Earth Terminal

8-2. Cable entry port

- Cable entry for transducer cable for CH1
- Cable entry for transducer cable for CH2 or I/O cables
- Cable entry for power cable
- Functional earth terminal (Grounding requires Type D or higher)
- Housing bottom
- Cable entry for I/O cable
9. System Wiring Connection

1Path or 2Path System

- Main Unit
- Coaxial Cable 300m Max.
- Mounting Fixture
- Transducers 1path or 2path
- Power Supply: AC100 - 230V ±10% or DC24V ±20% (Option)
- Functional Earth
- Totalizer or Relay Receiver
- Pulse Output
- Contact Relay Output

4Path System

- Main Unit
- Coaxial Cable 300m Max.
- Mounting Fixture
- Transducers 4path
- Functional Earth
- Totalizer or Relay Receiver
- Power Supply: AC100 - 230V ±10% or DC24V ±20% (Option)
- Pulse Output
- Contact Relay Output
- Multi-Path Junction Box
- Special Composite Coaxial Cable (1m)
- 4-20mA Analog Output (Max. Resistance 1K ohm)
10. Building a flowmeter pit

- In principle, when measurement is of underground pipe, it is suggestive to prepare of dedicated flowmeter pit.

- It is not necessary to prepare a flowmeter pit in the case of indoor or outdoor piping, but proper footing should be planned for transducer mounting and equipment adjustments in the case the pipe is located high off the floor or when pipe diameter is large.

Building a flowmeter pit

1. Select pit site (taking into consideration the following points)
   1) Straight section of pipe is required for installation of transducers as explained under Part 5.
   2) Consult manufacturer if an adjustable valve or pump is used.
   3) To prevent noise interference or signal attenuation, coaxial cable used between joining material and main unit should be less than 300m.

2. Size and construction of flowmeter pit
   1) Using above schematic as reference, determine size of flowmeter pit based on actual piping position and conditions. Height of pit should allow person to stand while working. In cases of pipe diameters greater than 800mm, prepare footholds or footing space.
   2) Implement countermeasures for floods such as drainage gutters, etc. (Install water pump where water is liable to accumulate or flood.)
   3) Consult Manufacturer for other specific conditions. (Above dimensions are ideal and not the minimum required.)

Transducer installation

1. Strip paint/coating from piping surfaces at transducer mounting locations and fix transducers on piping using the accessory mounting fixtures. When mounting transducers according to the “V” method, the distance separating the transducers should be about the diameter of the pipe. If the “Z” method is used, the distance should be one half of the diameter.

2. After installing and adjusting the transducers, remove transducer mountings, and coat pipe surface with anti-rust paint.
11. Appendix

Flow and Average Flow Velocity

Flow Volume (m³/h) vs. Velocity (m/s) for different Pipe Diameters (mm):
- 300mm to 1600mm
- 1800mm to 3000mm
- 4000mm to 5000mm

The graph shows the relationship between flow volume and average flow velocity for various pipe diameters.
Required parameters for Inquiry

AA. Pipe Information
1) Process Name : 
2) Line Quantity : Lines(s)/Location(s)
3) Pipe Specification: If possible, send us DWG of pipe diagrams.
   - Diameter Nominal : DN (mm) / Out Diameter mm
   - Pipe Material : / Thickness mm
   - Lining Material : (if any) mm / Thickness mm
4) Required cable length: From Main Unit to Transducer m
5) Straight Pipe-run : From , folds (times) for upstream side
   : From , folds (times) for downstream side

BB. Liquid Information
1) Liquid Name : (main component; if any)
2) Sound Speed of Liquid: (if liquid is special and identified) m/s
3) Liquid Viscosity : (if liquid is special and identified) m²/s
4) Temperature : C deg. ~ C deg.

CC. Extra Information
1) End user name : 
2) Atmospheric conditions : Non-Hazardous / Hazardous requirement ( )
3) Purpose of process : 
4) Existing Flow instruments : (if any)
5) Any other problems at Flow : (if any)
Ultrasonic Flowmeter model UFL-30 Ordering Code List

Component Code

Connecting Transducer
1. Large Diameter (DN300mm to DN600mm) SE044040NC (-20 to +65 deg.C)
2. Large Diameter & Narrow Space SE042140NC (-20 to +65 deg.C)
3. Large Diameter & High Temperature SE044040N-HT (+60 to +115 deg.C)
4. Small Diameter (DN25mm to DN250mm) SE104720 (-20 to +60 deg.C)
5. Small Diameter & High Temperature SE104020N-HT (+60 to +115 deg.C)
X. Special Transducer. Consult to us.

Measuring Path
1. 1 Path 1 pair of Transducer
2. 2 Path 2 pairs of Transducer
4. 4 Path 4 pairs of Transducer

Flow Direction & Analog Output Profile
1. One-way & Single Range
2. One-way & Automatic Double Range
3. Two-way & Manual Double Range
4. Two-way & Single Range
5. Two-way & Automatic Double Range
6. Two-way & Automatic Double Range, FW/BW
7. Two-way & Automatic Double Range, HI/LO
8. Two-way & Manual Double Range
A. Two-way & Manual Double Range, HI/LO
N. Not Use

Mounting Style of Main Unit
1. Wall Mount (Standard)
2. Pole Mount (Optional)

Power Supply
A. AC 100-230V +/- 10% (Standard)
B. DC 24V +/- 20% (Optional)

Extension Length of Coaxial Cable
1. No Extension
2. x 10m (up to 300m)
3. In spite of extension, transducers are including 5m cable.

Method of Cable Connection
S. ScotchCast™
J. Junction Box
N. None

Diameter Nominal of installing pipeline
A = cm
B = inch

Optional Component
S. Setup Software for Windows™ operating system
N. Not Use

*1 ScotchCast is trademark of 3M.
*2 Windows is trademark of Microsoft.
Ultrasonic Flowmeter model UFL-30 Ordering Code List

UFL-30-  [Component Code]  -  [Site Condition Code]

Site Condition Code

Pipe Material
1. Steel
2. Ductile Iron
3. Stainless Steel
4. PVC
X Other Material ( )
@ Outside Diameter [mm/inch]
@ Pipe Thickness [mm/inch]

Pipe Material
1. Steel
2. Ductile Iron
3. Stainless Steel
4. PVC
X Other Material ( )
@ Outside Diameter [mm/inch]
@ Pipe Thickness [mm/inch]

Lining Material
1. Tar Epoxy
2. Mortar
X Other Material ( )
@ Lining Thickness [mm/inch]

Lining Material
1. Tar Epoxy
2. Mortar
X Other Material ( )
@ Lining Thickness [mm/inch]

Measuring Liquid
1. Drinking Water, Raw Water
2. Sea Water
3. Sewage Water (after Screening)
4. Lubricant (Oil)
5. Chiller Water, Heated Water
X Other Liquid ( )

Measuring Liquid
1. Drinking Water, Raw Water
2. Sea Water
3. Sewage Water (after Screening)
4. Lubricant (Oil)
5. Chiller Water, Heated Water
X Other Liquid ( )

Contact Output (Up to 4 simultaneous outputs)
1. Forward Totalizing Pulse
2. Backward Totalizing Pulse
3. Receiving Echo Error Alarm (ROFF)
4. Break Down (Unit Failure) Alarming
5. ROFF or Break Down
6. High Limit Alarm
7. Low Limit Alarm
8. Forward Direction
9. Backward Direction
A. High Range
B. Low Range
C. BREAK (Normal Open)
D. MAKE (Normal Close)
N. Not Use

Contact Output (Up to 4 simultaneous outputs)
1. Forward Totalizing Pulse
2. Backward Totalizing Pulse
3. Receiving Echo Error Alarm (ROFF)
4. Break Down (Unit Failure) Alarming
5. ROFF or Break Down
6. High Limit Alarm
7. Low Limit Alarm
8. Forward Direction
9. Backward Direction
A. High Range
B. Low Range
C. BREAK (Normal Open)
D. MAKE (Normal Close)
N. Not Use

Qmax. (Maximum Flow Rate)

# Please show flow rate's unit also. (ex. m³/h)
# This value is related to the setting of maximum range of Analog Output & Indicate-able digits on LCD.

Please fill in forms with actual data.

Please fill in forms with actual data.

Please fill in forms with actual data.