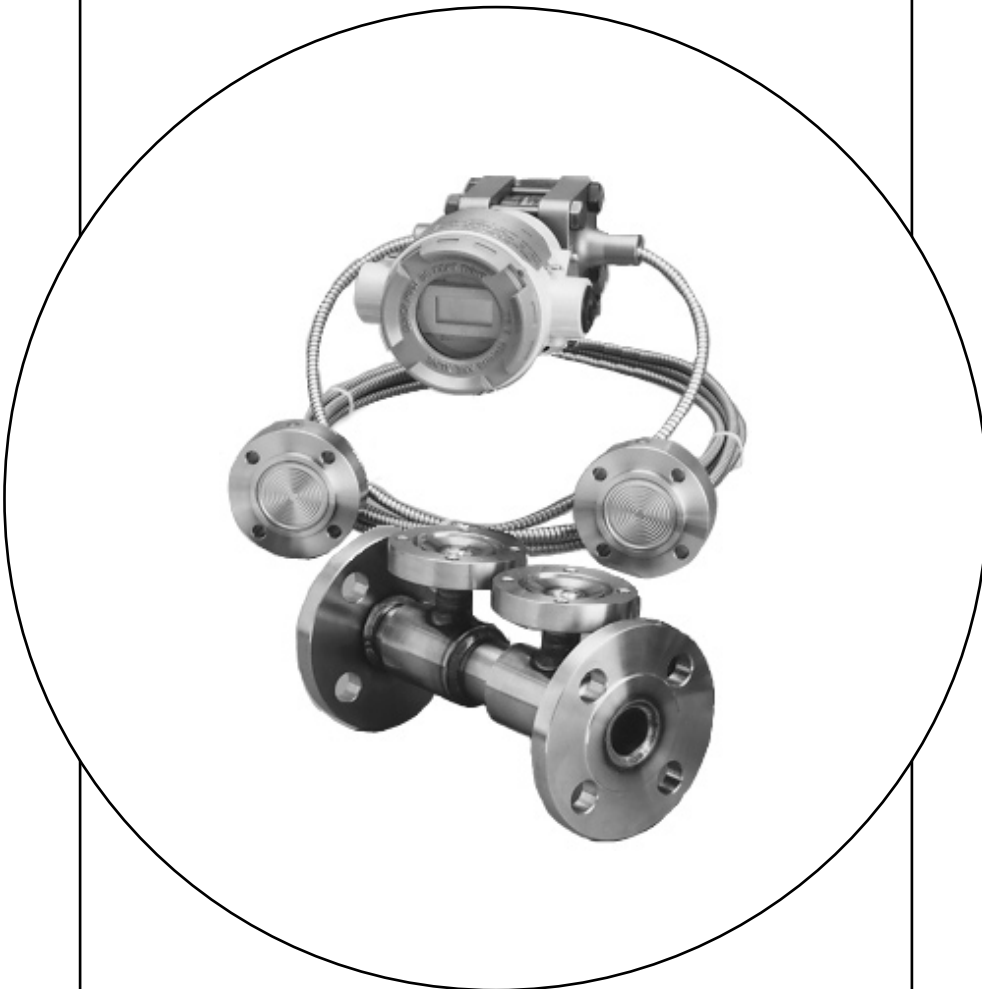


**Elliptic Throat Flow Meter  
(Sensor Terminal)  
Model SDR11F  
User's Manual**



Azbil Corporation

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**Introduction**

Thank you for purchasing our elliptic throat flow meter. This is a differential pressure sensor element of high performance and high reliability developed with our ample experience and knowhow in differential pressure flow meters. The elliptic-shaped tapered restrictor provided in the flow channel is a sensor element designed to detect differential pressure at low pressure loss. This flow meter ensures accurate measurements even for those gases, liquids, and steams that have been regarded difficult to measure.

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# Unpacking, Checking, and Storage

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## Unpacking

This is a precision instrument. Unpack it carefully to prevent an accident and damage.

Make sure that the following items are in the package:

- Main unit
  - Standard accessories (Gaskets and bolts come with differential pressure output model number “S”.)
- 

## Checking the specifications:

The specifications are shown on the name plate on the flow meter. Referring to Appendix A “Standard Specifications and Model Number Structure,” make sure that the specifications on name plate agree with your order. Please be sure to check the following items:

- Diameter
  - Main unit material
  - Flange rating
  - Pressure port flange type
- 

## Contact point for inquires:

Direct any inquiry concerning the specifications to the contact point given at the end of this manual. Make an inquiry with information about the model number and the product number. The product number is engraved on the main unit of the instrument.

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## Storage instructions:

In storing this instrument immediately after delivery, observe the following instructions:

- Store it in an indoor environment of normal temperature and normal humidity where the instrument is not exposed to vibration or shock.
- Store it in the state of factory packaging.

In storing this instrument after using it, observe the following instructions:

1. Rinse out the fluid completely from the main unit and dry it.
  2. Package the instrument to the state of factory packaging.
  3. Store it in an indoor environment of normal temperature and normal humidity where the instrument is not exposed to vibration or shock.
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# Safety Instructions

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## Introduction

Correct installation and operation and appropriate maintenance are essential to use this instrument safely. Read the safety instructions in the manual carefully to gain an accurate understanding before starting installation, operation, and maintenance work.

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## Symbol marks

The following symbol marks are used in this manual to ensure safety of operation:



This symbol is used when failure to observe an instruction may result in death or serious injury.



This symbol is used when failure to observe an instruction may result in slight injury or physical damage.

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# Structure and Contents of the Manual

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## **Structure and contents**

This manual provides operating instructions in the following order:

### **Section 1:**

This section is concerned with the structure of the flow meter and the names of its parts.

### **Section 2:**

This section is concerned with installation and cabling. Those who are in charge of installation, piping, and cabling are asked to refer to this section.

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# Section 1 Configuration of Measuring System and Structure

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## Overview of section

This section is concerned with the configuration of a measuring system using this instrument.

- The structure of the flow meter and the names and functions of its parts are also explained.

## 1.1. Structure and Functions of Parts

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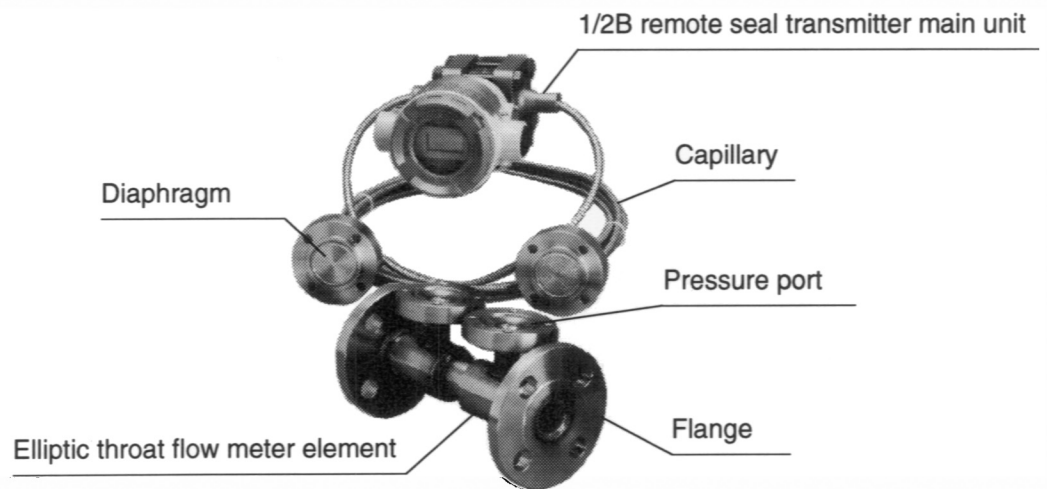
### Explanation

The elliptic throat flow meter has the following function and structure:

- The elliptic throat flow meter has an elliptic tapered restrictor in the flow channel. It measures the flow rate by obtaining the differential pressure between the both sides of the restrictor.

### Parts names of flow meter

Figure 1-1 shows the structure and the parts names of the elliptic throat flow meter.



**Figure 1-1. Detailed structure of elliptic throat flow meter**


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**Parts names and explanation**

The parts are explained in the following table.

Name	Explanation
1/2B remote seal transmitter main unit	<ul style="list-style-type: none"> <li>• This is a remote seal type transmitter that is connected to a flow meter to take out pressure from the pressure port. It can be mounted directly or via a stop valve.</li> </ul>
Pressure port	<ul style="list-style-type: none"> <li>• A stop valve or a remote seal transmitter is directly mounted on this part. Differential pressure is taken out from this port.</li> </ul>
Elliptic throat flow meter element	<ul style="list-style-type: none"> <li>• It is a differential pressure sensor having an elliptic restrictor in the flow channel. The pressure loss is only about 1/2~1/4 of the orifice.</li> </ul>

 <b>Warning</b>
<ul style="list-style-type: none"> <li>• Do not disconnect any device from the pressure port while the flow meter is connected to a pipe. (Steam or fluid in the pipe may gush to cause injury.)</li> </ul>



## Section 2 Installation

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# 2

### **Overview of section**

This section provides installation instructions with focus on the following:

- Flow meter installation
- Zero point adjustment
- Remarks related to installation

## 2.1. Instructions Related to Flow Meter Installation

### Selecting installation direction:

Table 1 provides instructions related to installation of a flow meter on a horizontal pipe.

Change the differential pressure output direction according to the fluid type.

Table 1.

	Fluid type	Differential pressure output direction
Mounting on a horizontal pipe	Liquid without solids	Straight downward or downward
	Liquid with solids (without cohesive property)	Continuous process 6 Upward
		Batch process 6 Lateral
	Gas	Upward
Steam	Upward	
Mounting on a vertical pipe	All fluids excluding adhesive liquids	Lateral

#### ⚠ Caution

- The elliptic throat flow meter element is made of SUS316 or SUS316L. Avoid using corrosive fluids.

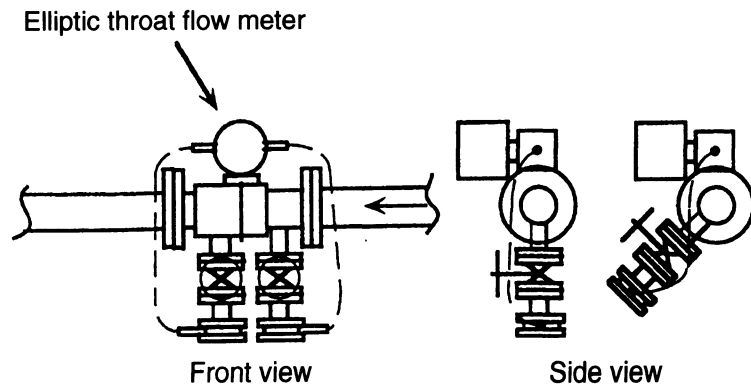
#### ⚠ Caution

- Concerning the operating instructions and settings of the differential pressure transmitter, refer to its manual.

#### 1. Example of straight downward or downward installation

Liquid without slurry

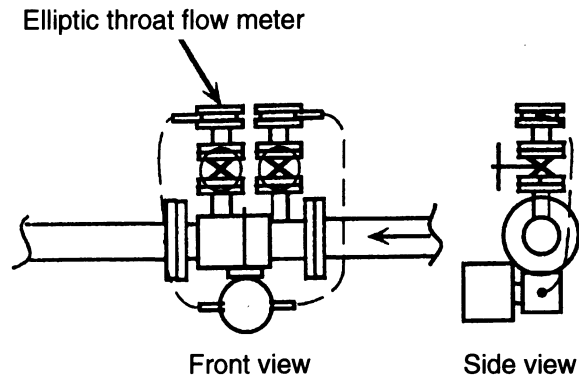
Example: Pure water, water, oil, organic solvent, food without CIP



GL

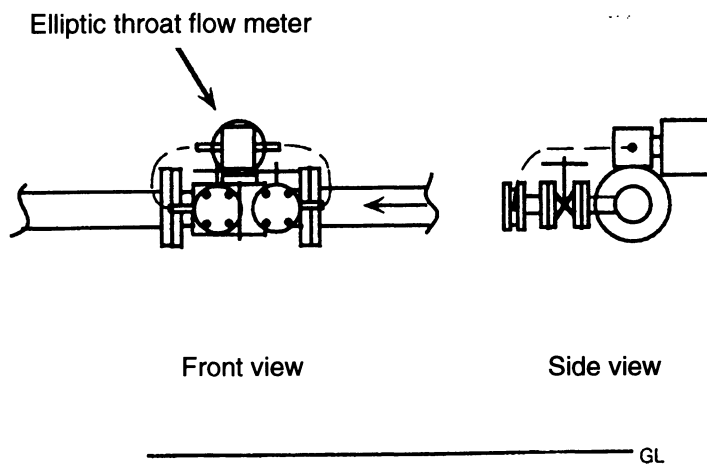
**2. Example of straight upward installation**

Slurry liquid (continuous process) or adhesive liquid



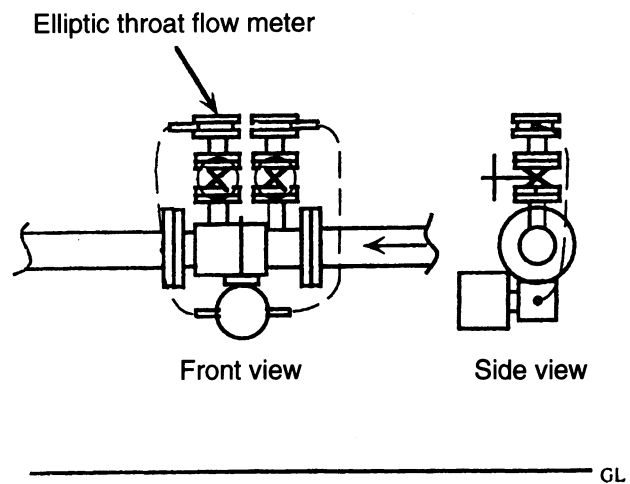
**3. Example of lateral installation**

Slurry liquid (batch process)



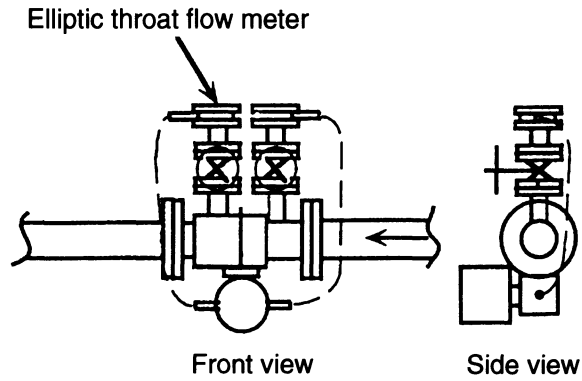
**4. Example of straight upward installation**

Oil and oil slurry of 180°C or higher temperature



**5. Example of straight upward installation**

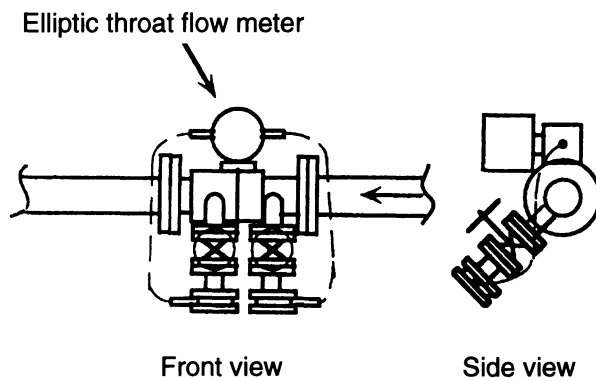
Gas and steam (up to 280°C depending on the transmitter specifications)



GL

**6. Example of downward installation at angle**

Steam of 180°C or higher (up to 280°C depending on the transmitter specifications)



GL

**⚠ Caution**

- Perform zero adjustment after gathering drain in the pressure receiving part or prevent gathering of drain at the pressure output by means of warming.

Inquire us about other installation methods.

## 2.2. Zero Point Adjustment Procedure

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### 1. Liquid without solids

Stop the process when the pipe is filled with liquid and then perform zero adjustment.

- Performing zero adjustment without filling the pipe will cause an error.
  - A flow meter installed in the straight downward or oblique downward position does not require air venting. Perform zero adjustment after venting air when a flow meter cannot be installed in the recommended position due to some restrictive piping conditions or when an adaptor for a 1/2B remote seal transmitter is mounted.
- 

### 2. Liquid containing solids (including a process in which liquid is heated to prevent adhesion)

#### 2.1 Continuous process

Stop the process when the pipe is filled with liquid and then perform zero adjustment. Perform zero adjustment after venting air when an adaptor for a 1/2B remote seal transmitter is mounted.

- Performing zero adjustment without filling the pipe will cause an error.

#### 2.2 Batch process in which the pipe becomes empty after operation

Stop the process after filling the pipe for the first time and then perform zero adjustment. Perform zero adjustment after venting air when an adaptor for a 1/2B remote seal transmitter is mounted.

- The zero point will shift when the pipe becomes empty, but this will not influence measurement accuracy. The zero point shifts due to the difference between the filled and empty state of the pipe.

#### 2.3 Batch process in which the pipe is filled with liquid even after operation

Stop the process when the pipe is filled with liquid and then perform zero adjustment.

Perform zero adjustment after venting air when an adaptor for a 1/2B remote seal transmitter is mounted.

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### 3. Adhesive liquid

Do not vent air because the diaphragm surface is protected with air. Perform zero point adjustment when the pipe is filled with liquid.

- Performing zero adjustment without filling the pipe will cause an error.

Caution: Vertical piping is not possible for adhesive liquid.

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**4. Vertical piping  
(Liquid containing  
no solids, liquid  
containing liquids)**

Stop the process when the pipe is filled with liquid and then perform zero adjustment.

When an adaptor for a 1/2B remote seal transmitter is mounted, perform zero adjustment after venting air.

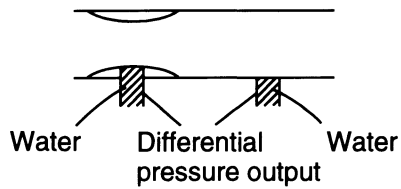
→ Performing zero adjustment without filling the pipe will cause an error.

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**5. Gas and steam**

Horizontal piping: Perform zero adjustment as soon as installing this flow meter.

In measuring the flow rate after gathering drain in the pressure receiving part, make sure that drain is as illustrated below before performing zero adjustment.



Vertical piping: Perform zero adjustment as soon as installing this flow meter.

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## 2.3 Remarks related to installation

### Pipe vibration

Make sure that pipe vibration is below  $19.6 \text{ m/s}^2$  (2G) and within the range of 0~400 Hz. The vibration conditions of the pressure receiving part and the remote seal unit depend on the specifications of the transmitter.

### Flow direction

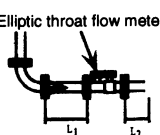
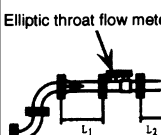
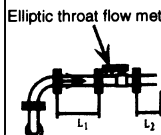
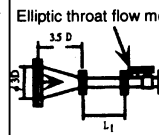
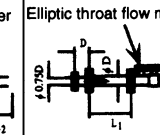
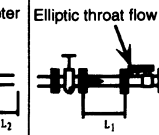
(1) The elliptic throat flow meter has an elliptic restrictor which requires fluid flowing in a fixed direction. Make sure that a fluid flows in the direction of the arrow engraved on the side of the sensor terminal.

(2) In case of vertical piping, run a fluid in the upward direction.

### Straight pipe length

The length requirements of a straight pipe are given in the following table:

It is the minimum length requirement of the straight pipe mounted between an elliptic throat flow meter and a joint on the upstream or downstream side of the flow meter. Each of the figures in the table means a multiple of the pipe diameter.

Diameter ratio $\beta$	Upstream side $L_1$						Downstream side $L_2$
	 One 90°C bend	 Two or more 90°C bends on the same plane	 Two or more 90°C bends on different planes	 Contraction pipe	 Expansion pipe	 Gate valve (full open)	All joints shown on the left
0.40	0.5	1.5	40	2.5	1.5	2.5	
0.50	1.5	2.5	40	5.5	2.5	3.5	1.0
0.60	3.0	3.5	40	8.5	3.5	4.5	1.5
0.70	4.0	4.5	40	10.5	5.5	5.5	2.0

Note 1: The curvature diameter of a bend should be at least equal to the inner diameter of the pipe.

Note 2: The straight pipe length on the upstream side and the downstream side is the distance measured from the upstream and downstream flanges of the elliptic throat flow meter, respectively.



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