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**User's  
Manual**

**ADMAG *AE***

**Model AE14  
Magnetic Flow Converter  
[Style:S1]**

IM 1E7C1-E

IM 1E7C1-E  
13th Edition

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# 1. INTRODUCTION

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This instrument has been already adjusted at the factory before shipment.

To ensure correct use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

## ■ Regarding This Manual

- This manual should be passed on to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa's written permission.
- Yokogawa makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors are found, please inform Yokogawa.
- Yokogawa assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, Yokogawa assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

## ■ Safety Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. YOKOGAWA Electric Corporation assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.

The following safety symbol marks are used in this manual and instrument;



### WARNING

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A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

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### CAUTION

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A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

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### IMPORTANT

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A IMPORTANT sign denotes an attention to avoid leading to damage to instrument or system failure.

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### NOTE

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A NOTE sign denotes a information for essential understanding of the operation and features.

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Protective grounding terminal.



Function grounding terminal. This terminal should not be used as a "Protective grounding terminal".



Alternating current.



Direct current.

## ■ Warranty

- The guaranteed term of this instrument is described in the quotation. We repair the damages that occurred during the guaranteed term for free.
- Please contact with our sales office when this instrument is damaged.
- If the instrument has trouble, please inform us model code, serial number, and concrete substances or situations. It is preferable to be attached a outline or data.
- We decide after the examination if free repair is available or not.
- Please consent to the followings for causes of damages that are not available as free repair, even if it occurred during the guaranteed term.

A: Unsuitable or insufficient maintenance by the customer.

B: The handling, using, or storage that ignore the design and specifications of the instrument.

C: Unsuitable location that ignore the description in this manual.

D: Remaking or repair by a person except whom we entrust.

E: Unsuitable removing after delivered.

F: A natural disaster (ex. a fire, earthquake, storm and flood, thunderbolt) and external causes

## ■ For Safety Using

For safety using the instrument, please give attention mentioned below.



### WARNING

#### (1) Installation

- The instrument must be installed by expert engineer or skilled personnel. The procedures described about INSTALLATION are not permitted for operators.
- The Magnetic Flowmeter is a heavy instrument. Please give attention to prevent that persons are injured by carrying or installing. It is preferable for carrying the instrument to use a cart and be done by two or more persons.
- In case of high process temperature, care should be taken not to burn yourself because the surface of body and case reach a high temperature.
- When removing the instrument from hazardous processes, avoid contact with the fluid and the interior of the flow tube.
- All installation shall comply with local installation requirement and local electrical code

#### (2) Wiring

- The instrument must be installed by expert engineer or skilled personnel. The procedures described about WIRING are not permitted for operators.
- Please confirm voltages between the power supply and the instrument before connecting the power cables. And also, please confirm that the cables are not powered before connecting.
- The protective grounding must be connected to the terminal  $\oplus$  in order to avoid personal shock hazard.

#### (3) Operation

- Wait 10 min. after power is turned off, before opening the covers.

#### (4) Maintenance

- Please do not carry out except being written to a maintenance descriptions. When these procedures are needed, please contact to nearest YOKOGAWA office.
- Care should be taken to prevent the build up of drift, dust or other material on the display glass and data plate. In case of its maintenance, soft and dry cloth is used.

#### (5) Explosion Protected Type Instrument

- For explosion proof type instrument, the description in Chapter 11 "EXPLOSION PROTECTED TYPE INSTRUMENT" is prior to the other description in this user's manual.
- Only trained persons use this instrument in the industrial location.
- The protective grounding  $\oplus$  must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

## ■ ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöohjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellänne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

## 2. HANDLING PRECAUTIONS

This instrument has been already tested thoroughly at the factory. When the instrument is delivered, please check externals and make sure that no damage occurred during transportation.

In this chapter, handling precautions are described. Please read this chapter thoroughly at first. And please refer to the relative matter about other ones.

If you have any problems or questions, please make contact with Yokogawa sales office.

### 2.1 Checking Model and Specifications

The model and specifications are shown on the Data Plate. Please confirm the specifications between the instrument that was delivered and the purchase order (refer to the chapter 10. Outline).

Please let us know Model and Serial No. when making contact with Yokogawa sales office.

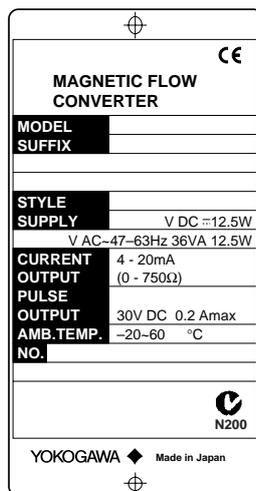


Figure 2.1 Data Plate

### 2.2 Accessories

When the instrument is delivered, please make sure that the following accessories are in the package.

Spare fuse can be applied only to this product.

- Fuse (250V,2A time lag) : 1-piece  
\*The spare fuse is taped to the converter.
- Mounting hardware
- Data sheet : 1-sheet
- Unit labels : 1-sheet

- Plug (for DC power supply only) : 1-piece
- Hexagonal wrench : 1-piece  
(for special screw of hazardous duty type converter.)

### 2.3 Storage Precautions

In case the instrument is expected to be stored over a long term, please give attention to the followings;

- The instrument should be stored in its original packing condition.
- The storage location should be selected according to the following conditions:
  - 1) The location where it is not exposed to rain or water.
  - 2) The location where there is few vibration or shock.
  - 3) Temperature and humidity should be:  
Temperature: -20 to 60°C (-4 to 140°F)  
Humidity: 5 to 80% RH (no condensation)  
Preferable ambient temperature and humidity are 25°C(77°F) and about 65% RH.

### 2.4 Installation Location Precautions

Please select the installation location considering the following items to ensure long term stable operation of the flow tube.

- Ambient Temperature:  
Please avoid to install the instrument at the location where temperature changes continuously. If the location receives radiant heat from the plant, provide heat insulation or improve ventilation.
- Atmospheric Condition:  
Please avoid to install the instrument in an corrosive atmosphere. In case of installing in the corrosive atmosphere, please keep ventilating sufficiently and prevent rain from entering the conduit.
- Vibration or shock:  
Please avoid to install the instrument at the location where there is heavy vibration or shock.

# 3. INSTALLATION

## WARNING

This instrument must be installed by expert engineer or skilled personnel. The procedures described in this chapter are not permitted for operators.

## 3.1 Installing Magnetic Flow Converter

A signal cable (AM011) is used between the remote type flow tube and the converter. The maximum signal cable length is 30m (98ft).

The converter is mounted on a 2 inch (60.5mm outer dia.) vertical or horizontal pipe. See Figure 3.1.1

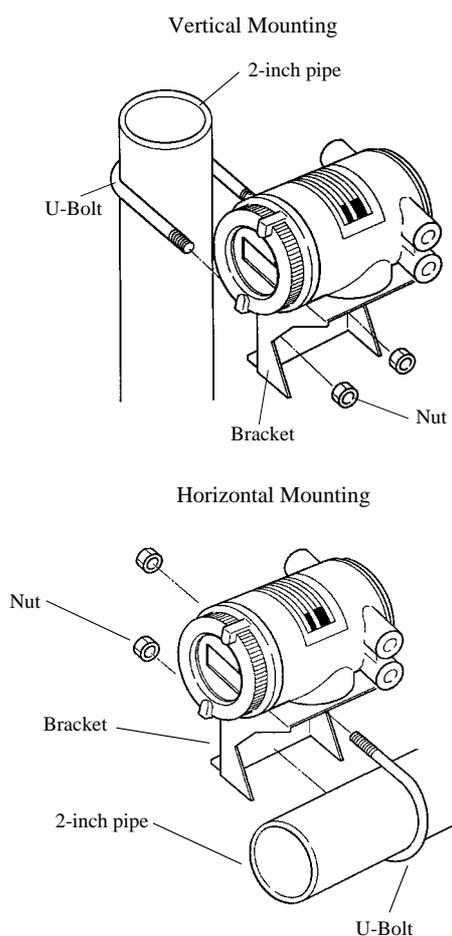


Figure 3.1.1 Magnetic Flow Converter Installation

## 3.2 Wiring Precautions

### CAUTION

Please confirm that all connections are correct before applying power to the instrument. Improper wiring may damage the flowmeter.

The external signal wirings are connected into the terminal inside the converter. Please connect to each terminal (Please refer to Figure 3.2.1) by taking off a cover backside the converter.

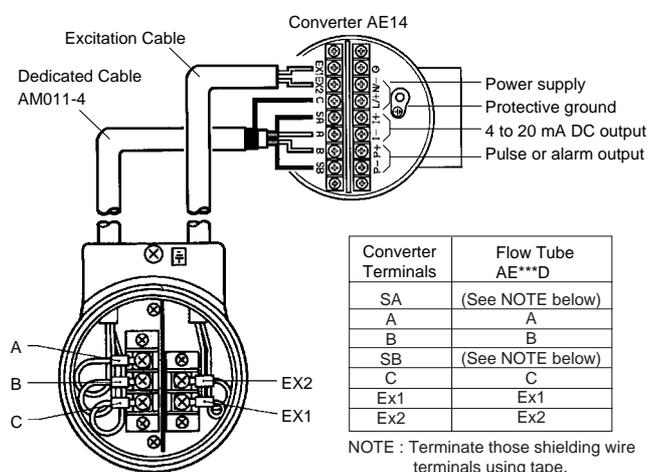


Figure 3.2.1 Wiring

### 3.2.1 Protective Grounding

#### CAUTION

Please be sure to connect protective grounding of ADMAG AE with cable of 2mm<sup>2</sup> or larger cross section in order to avoid the electrical shock to the operators and maintenance engineers and prevent the influence of external noise. And further connect the grounding wire to the  $\ominus$  mark (100 $\Omega$  or less).

### 3.2.2 General Precautions

Please give attention to the followings in wiring.

### CAUTION

- Please pay attention to avoid the cable is bended excessively.
- Please do not connect cables outdoors in case of rain to prevent damages from dew formation and to keep insulation inside the terminal box of the flowmeter.
- The all cable ends are to be provided with round crimp-on terminal.
- The power cables and signal cables must be routed in separate steel conduit tubes or flexible tubes.(except 4-core 24VDC cable wiring.)
- When waterproof glands, union equipped waterproof glands are used, the glands must be properly tightened to keep the box watertight.
- Please install a external switch or circuit breaker as a means of power off (capacitance; 15A, conform to IEC947-1 and IEC947-3). The preferable location is either near the instrument or other places to easy operation. Furthermore, please indicate "power off equipment" on the those external switch or circuit breaker.
- Please be sure to fully tighten the terminal box cover before the power is turned on.
- Please be sure to turn off the power before opening the terminal box cover.
- In case of DC power supply, a plug is attached. When 4-core cable is used, please put that plug into unused electrical connection port.

### 3.2.3 Cable Types

#### (1) Dedicated Signal Cable(AM011)

The flow signal is transmitted via this dedicated cable. The cable is constructed with double shielding over the two conductors, and used heat-resistant vinyl as the outer jacket material.

|                      |                  |
|----------------------|------------------|
| Finished diameter:   | 10.5 mm (0.413") |
| Maximum length:      | 30 m (98 ft)     |
| Maximum temperature: | 80°C (176°F)     |

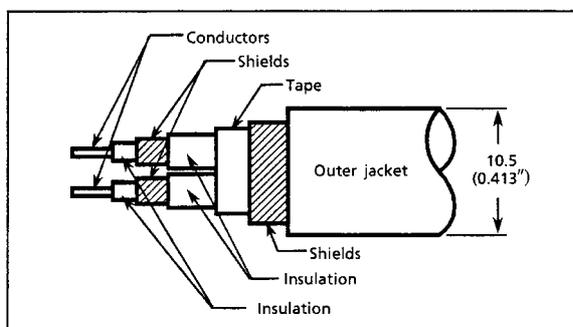


Figure 3.2.2 Dedicated Signal Cable AM011

### IMPORTANT

If the cable is longer than required, cut off any extra length, rather coiling it up, and terminate the conductors as shown in Figure 3.2.3. Avoid using intermediate terminal boards to extend the cable length, or this will interrupt the shielding.

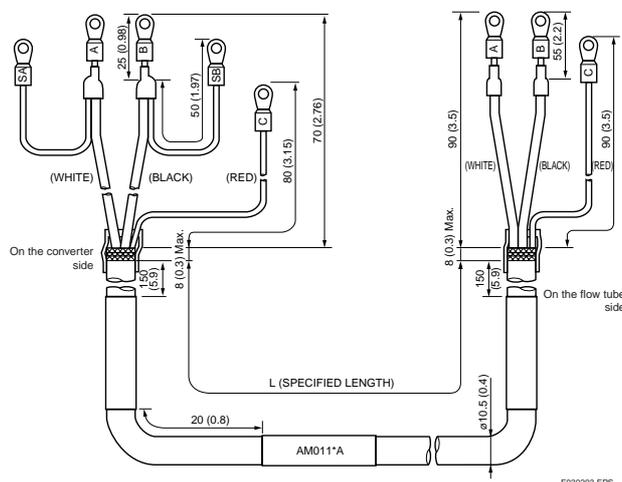


Figure 3.2.3 Treatment of Dedicated Signal Cable

### CAUTION

Since A, B, SA, SB, and C all operate at different electrical potentials, securely insulate them from each other so they do not touch.

The shields must not be allowed to touch each other or to touch the case.

Cover each shield with vinyl tube or wrap in vinyl tape.

### NOTE

Conductors A and B carry the signal from the electrodes, and C is at the potentials of the liquid it self (signal common) . Shields SA and SB are kept at the same potentials as the individual electrodes (these are actively driven shields). This is done to reduce the effect of the distributed capacitance of the cable at long cable length. Note that, since the signals from the individual electrodes are impedance converted inside the converter, errors will result if they come in contact with any other component. Great care must be taken in the cable end treatment.

**(2) Power, Excitation, or Output Cable**

**Power Cable**

- Crimp-on Terminal
- Green/Yellow covered conductors shall be used only for connection to PROTECTIVE CONDUCTOR TERMINALS.
- Conform to IEC277 or IEC245 or equivalent national authorization.

**Excitation or Output Cable**

- Please use Polyvinyl chloride insulated and sheathed control cables (JIS C3401) or Polyvinyl chloride insulated and sheathed portable power cables (JIS C3312) or equivalents.

**Outer Diameter**

- 6.5 to 12mm in diameter (10.5 to 11.5 mm for waterproof gland / ECG, /ECU)

**Nominal Cross Section**

- Single wire; 0.5 to 2.5mm<sup>2</sup>, Stranded wire; 0.5 to 2.5mm<sup>2</sup>

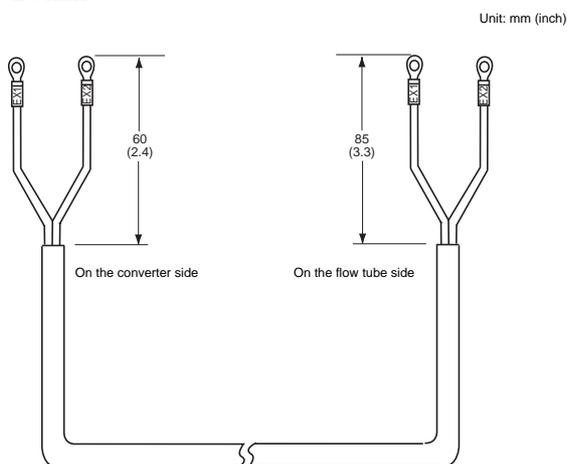


Figure 3.2.4 End Treatment of Excitation Cable

**3.2.4 DC Connections**

**(1)Connecting Power Supply**

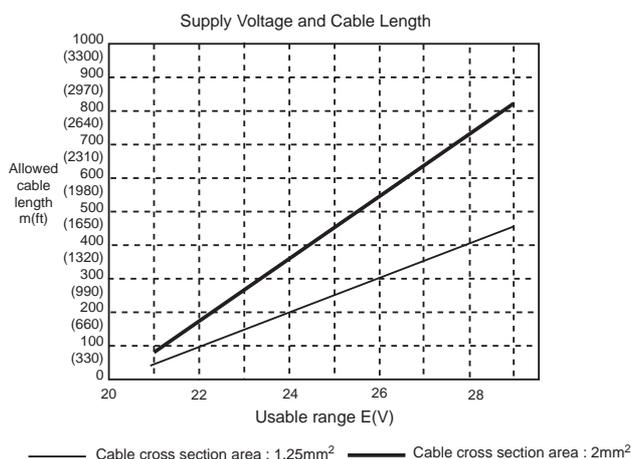
**IMPORTANT**

In case of 24VDC power supply, AC power supplies or reversed polarities cannot be connected. It will cause the fuse to burn out.

**(2)Supplied Voltage Rating for 24VDC**

**IMPORTANT**

In case of 24VDC power supply, the specification for the supply voltage is 24VDC (-15 to +20%), but the input voltage of the converter drops due to cable resistance so it should be used within the following range.



**(3)Setting Power Supply Frequency**

**IMPORTANT**

In case of DC power supply, the frequency of the power supply has to be adjusted. Please adjust for the local power frequency. The power supply frequency is set in parameter B12 (or Power freq for HART). Refer to 5.4 or 6.2.4 for data setting procedure.

**3.2.5 Wiring Ports**

Please select the most suitable standard of wiring procedure for the wiring ports by customer's own.

**(1)Using the Waterproof Gland**

**IMPORTANT**

To prevent water or condensate from entering the converter housing, waterproof glands are recommended. Do not over-tighten the glands or damage to the cables may result. Tightness of the gland can be checked by confirming that the cable is held firmly in place.

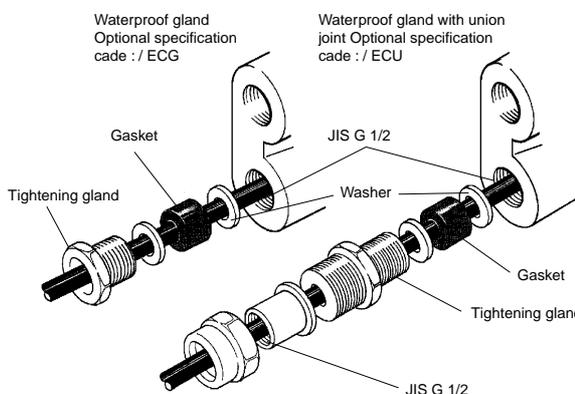


Figure 3.2.5 Waterproof Gland

**(2)Conduit Wiring**

In case of conduit wiring, please use the waterproof gland to prevent water flowing through the conduit pipe into the wiring connection.

Please slope the conduit pipe down, and install a drain valve at the low end of the vertical pipe.

Please open the drain valve regularly.

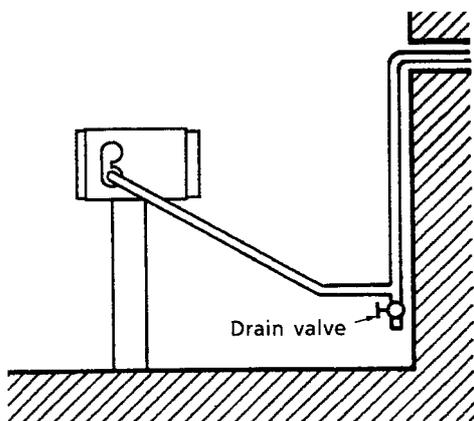


Figure 3.2.6 Conduit Wiring

**3.2.6 Connecting to External Instruments**

**CAUTION**

All the devices to be connected to current output and pulse output must be conformed to CSA1010, CSA950, or IEC950.

**(1)Analog Signal Output(4 to 20mADC)**

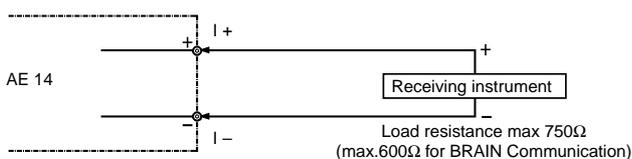


Figure 3.2.7 Connection for Analog Singal Output

**(2)Pulse Output**

**IMPORTANT**

Please give attention to voltage and polarity in wiring, because it is transistor contact (insulation type).

- In case of the filtering constant of Electric Counter is more than the pulse width, it makes signal decreases and can not be calculated correctly.

- In case of input impedance of electric counter is large inductive noise from power supply bring bad influence to measurement. To calculate correctly, it is recommended to use shield cable or to make input impedance small enough within the limits of pulse output of flowmeter.

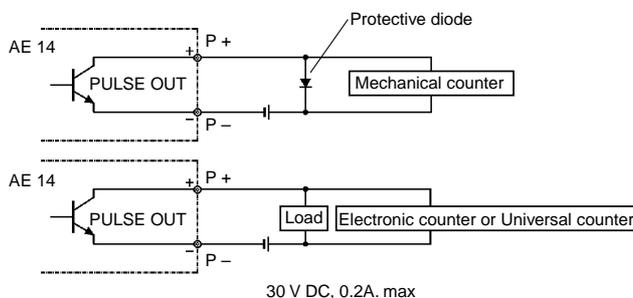


Figure 3.2.8 Pulse Output Connection

**(3)Alarm Output**

**IMPORTANT**

This is a transistor contact(insulated type) so attention must be paid to voltage and polarity when making connections.

This output can not switch an AC load. To do this, another relay (see the figure below) is required.

- \* The alarm output works from "close"(Normal) to "open"(Alarm).

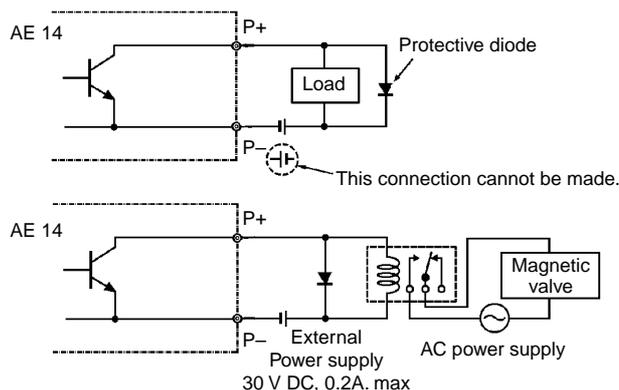


Figure 3.2.9 Contact Output Connection

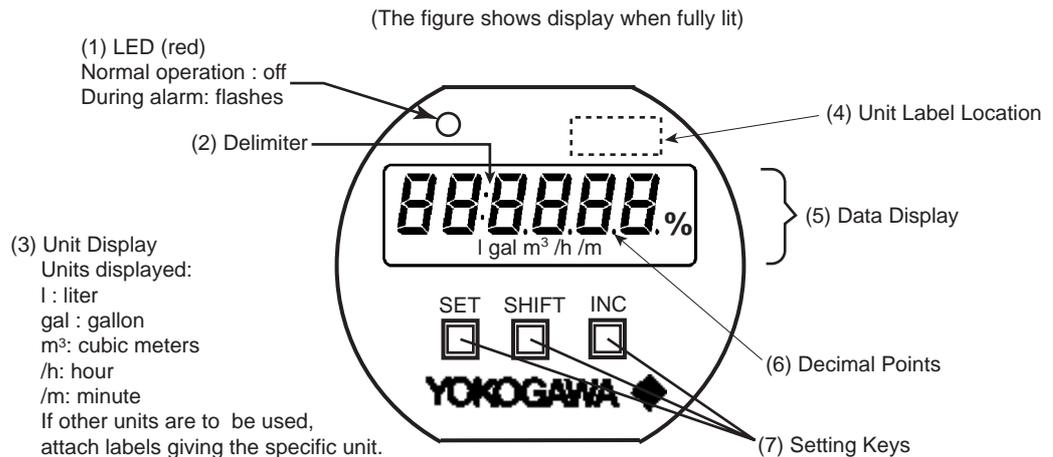
# 4. BASIC OPERATING PROCEDURES

All data settings can be performed with the three keys on the front panel (SET, SHIFT and INC) or using a handheld BRAIN (BT) terminal.

The following sections describe basic data configurations and how to use the three panel keys. (See chapter 6 for information on BT operations.)

## 4.1 Liquid Crystal Display

Figure 4.1 shows the configuration of the ADMAG AE display panel (if equipped).

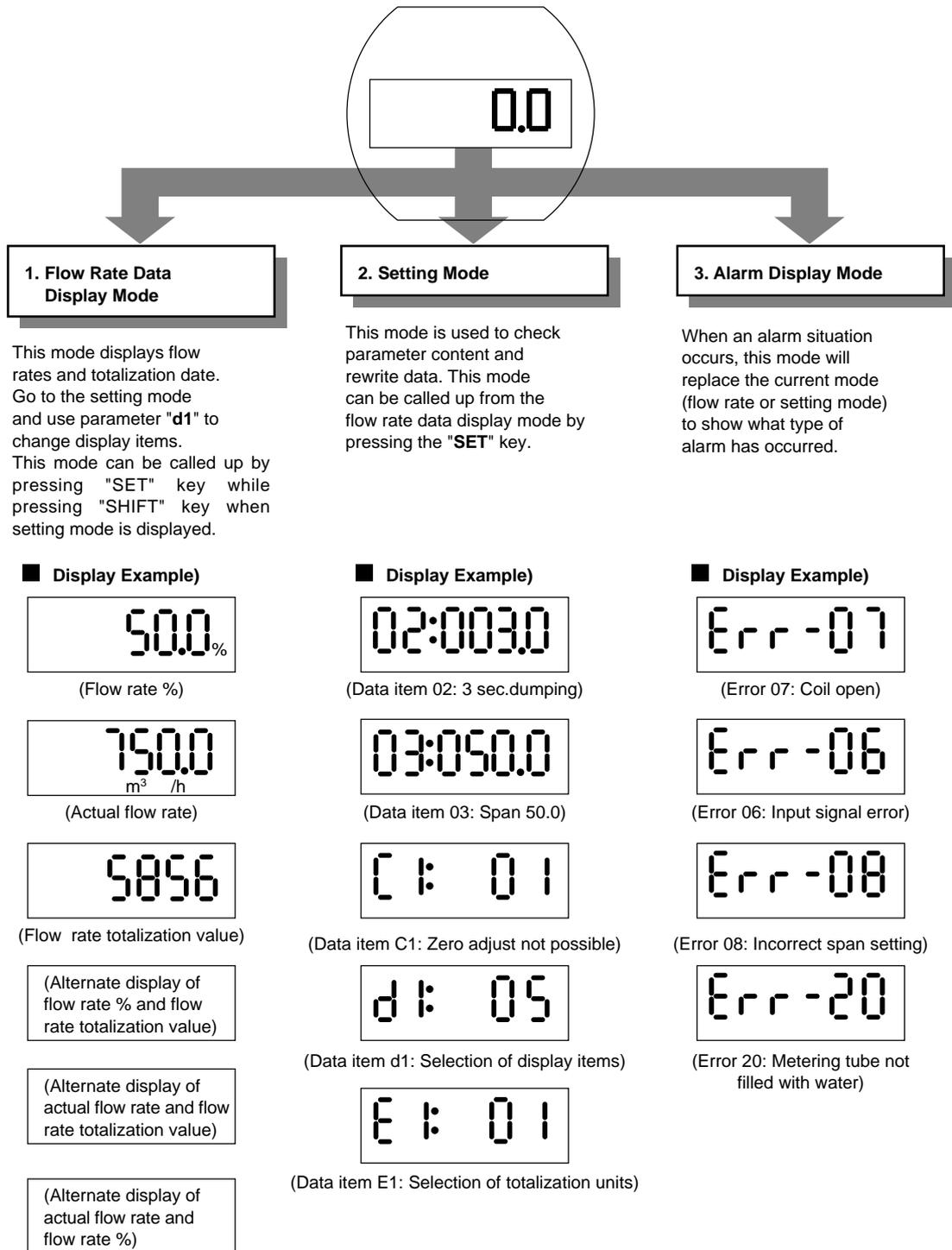


**Figure 4.1 Configuration of Display**

- |                         |  |
|-------------------------|--|
| (1) LED (red)           | : This LED is off during normal operation and flashes when an alarm condition has occurred.  |
| (2) Delimiter           | : The delimiter " : " (colon) indicates that the displayed data is in setting mode.  |
| (3) Unit Display        | : Displays flow rate units. In order to display other units, the required unit label should be selected from the provided data sheets and attached as shown. |
| (4) Unit Label Location | : To display units not on the LCD, select the required label from the provided data sheets and attach it here.   |
| (5) Data Display        | : Displays flow rate data, setting data and type of alarm generated.   |
| (6) Decimal Point       | : Displays decimal point in the data.  |
| (7) Setting Keys        | : These keys are used to change flow rate data displays and type of setting data.  |

## 4.2 Types of Display Data

Three major types of data are displayed.



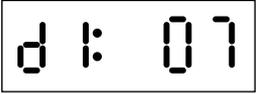
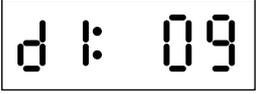
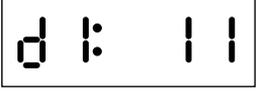
### 4.2.1 Flow Rate Data Display Mode

- The flow rate data display mode indicates instantaneous flow and totalized flow values.  
The ADMAG AE can display 12 types of flow rate data.
- This functions can be set in the parameter "d1" key of the flow converter.
- For changing from setting mode to flow rate data display mode, press "SET" key while pressing "SHIFT" key.
- When a BT is used, call up the "D01 DISP SELECT" parameter to select functions.

| Display item   | Content   | ADMAG AE Setting | BT Setting                      |
|--|---|------------------|---------------------------------|
| Forward Flow Rate %  | Instantaneous flow rate is displayed within a range of -8.0(-108.0) to 108 for the span.  |                  | D01 : DISP SELECT RATE(%)       |
| Actual forward Flow Rate   | The actual meter rate of instantaneous flow rate is displayed. (See note 1.)<br>The decimal place is the same as for the span setting. However, since a decimal point set at the most significant bit cannot be displayed. It is automatically shifted 1 digit to the right. (BT setting of 0.0001 is displayed as 0.000 on the ADMAG.) |                  | D01 : DISP SELECT RATE          |
| Forward flowrate totalization values                             | Display forward flow rate totalization value  |                  | D01 : DISP SELECT FOR.TOTAL     |
| Reverse flowrate totalization values                             | Display reverse flow rate totalization value  |                  | D01 : DISP SELECT REV.TOTAL     |
| Differential Between the forward and reverse totalization values | Differential totalization, between forward totalization and reverse totalization, is displayed.   |                  | D01 : DISP SELECT DIF. TOTAL    |
| Forward flowrate (%) and Forward totalization values             | Display alternately between display of "RATE(%)" and "FOR. TTL" every 4 second interval.  |                  | D01 : DISP SELECT RATE%/FOR.TTL |

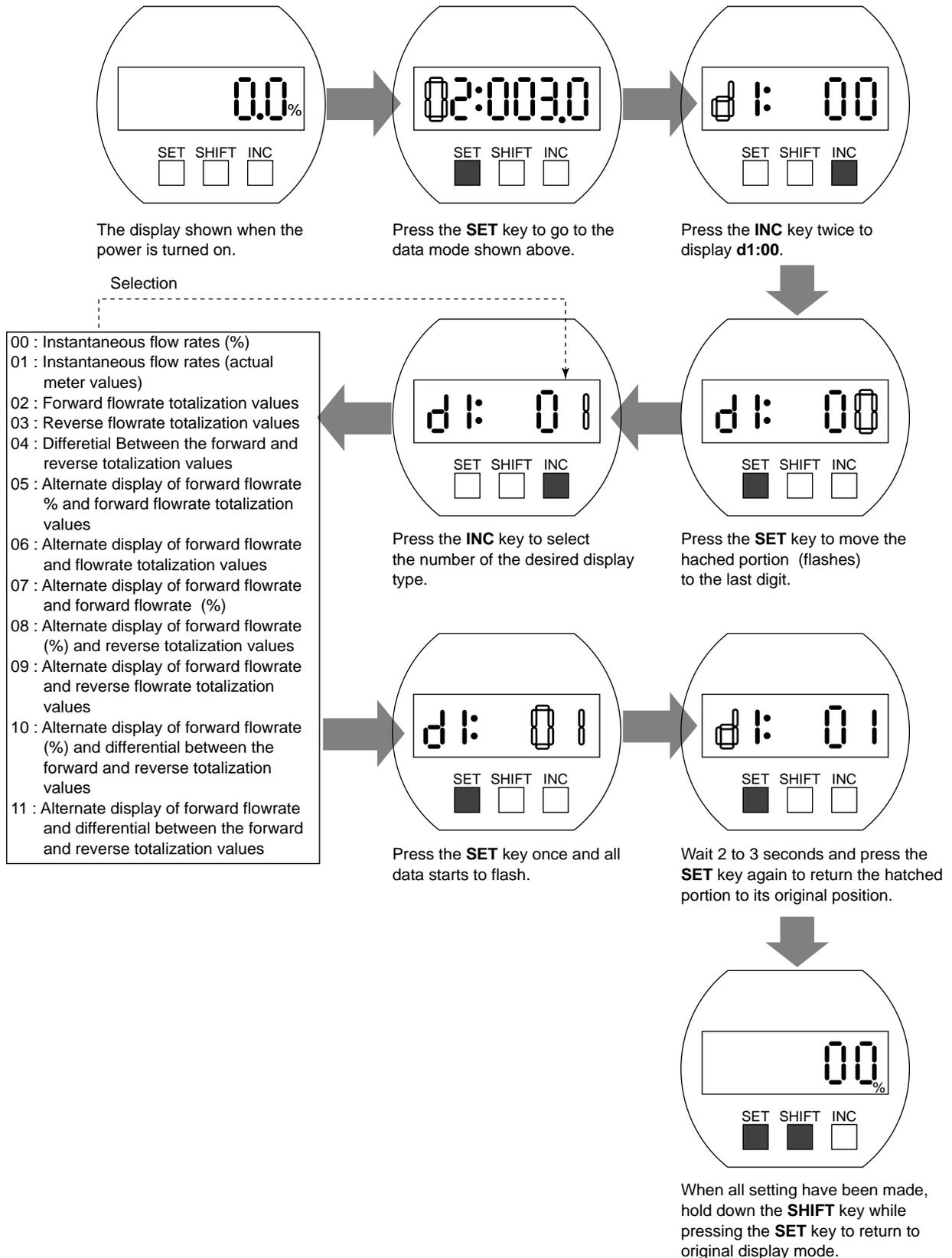
Note 1 : The LCD can display the following combination of units (by selecting a parameter)  
Units other than those shown below can be displayed by attaching the provided unit labels .  
l (liters) /h, l (liters) /m, m<sup>3</sup>/h, m<sup>3</sup>/m, gal/h, gal/m

4. BASIC OPERATING PROCEDURES

| Display item   | Content  | ADMAG AE Setting   | BT Setting                            |
|--|--|--|---------------------------------------|
| Alternate display of actual forward flowrate and flowrate totalization values                                  | Display alternately between display of "RATE" and "FOR. TTL" every 4 second interval.    |    | D01 : DISP SELECT<br>RATE/FOR.TTL     |
| Alternate display of actual forward flowrate and forward flowrate (%)  | Display alternately between display of "RATE" and "RATE(%)" every 4 second interval.     |    | D01 : DISP SELECT<br>RATE/RATE(%)     |
| Alternate display of forward flowrate (%) and reverse totalization values                                      | Display alternately between display of "RATE(%)" and "REV. TTL" every 4 second interval. |    | D01 : DISP SELECT<br>RATE(%) /REV.TTL |
| Alternate display of forward flowrate and reverse flowrate totalization values                                 | Display alternately between display of "RATE" and "REV. TTL" every 4 second interval.    |    | D01 : DISP SELECT<br>RATE/REV.TTL     |
| Alternate display of forward flowrate (%) and differential between the forward and reverse totalization values | Display alternately between display of "RATE(%)" and "DIF. TTL" every 4 second interval. |  | D01 : DISP SELECT<br>RATE(%) /DIF.TTL |
| Alternate display of forward flowrate and differential between the forward and reverse totalization values     | Display alternately between display of "RATE" and "DIF. TTL" every 4 second interval.    |  | D01 : DISP SELECT<br>RATE/DIF.TTL     |

(1) Changes in Flow Data Display Items

- Shows how the display changes when the flow converter switches are pressed.
- See chapter 6 for information on changes using the BT200.

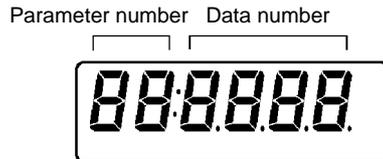


### 4.2.2 Setting Mode

- The setting mode is used for checking parameters and rewriting data.
- The following is an overview of the setting mode. See Section 5 "Function and Data Settings" for detailed information.

#### (1) Structure of Setting Mode Display

- The display consists of two areas ; two digits to the left of the colon and four digits to the right of it.
- Two types of data can be entered : direct entry of numerals and entry of desired data items using codes.  
Refer to "Parameter list" in chapter 11 for information on how to change settings.



#### (2) Procedures for Setting and Changing Data

Example of parameter change : Changing the span (number 03) from 1.000 to 1.200

| Item                               | Display                       | Content   |
|------------------------------------|-------------------------------|---|
| ① Switch to "Setting Mode"<br><br> |                               | Press the <b>SET</b> key to go from the flow rate data display to the setting mode. The delimiter ":" is displayed to indicate that the mode has been switched. |
|                                    | ② Parameter Selection<br><br> | <br>  |
| ③ Data Rewrite<br><br>             |                               | Use the <b>SET</b> key to move the flashing segment (the selected item) to the most significant location of the data area.                                      |
|                                    |                               | Use the <b>SHIFT</b> key to move the flashing segment (the selected item) within the data area.   |
|                                    |                               | Use the <b>INC</b> key to change the data area (numeric data) in the flashing segment (the selected item).  |

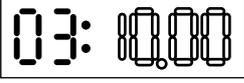
---Continued---

| Item                           | Display  | Content   |
|--------------------------------|--|---|
| ④ Data Input                   |  <p>SET SHIFT INC<br/>■ □ □</p> <p>First time</p>  <p>SET SHIFT INC<br/>■ □ □</p> <p>Second time</p> | Press the <b>SET</b> key twice to enter data.<br>(All data will start flashing when the key is pressed the first time. Then wait 2 to 3 seconds before pressing the key the second time.) |
| ⑤ Switching to Flow Data Entry |  <p>SET SHIFT INC<br/>■ ■ □</p>   | Hold down the <b>SHIFT</b> key and press the <b>SET</b> key to switch to the flow rate data display.  |

**(3) Procedures for Changing Decimal Place**

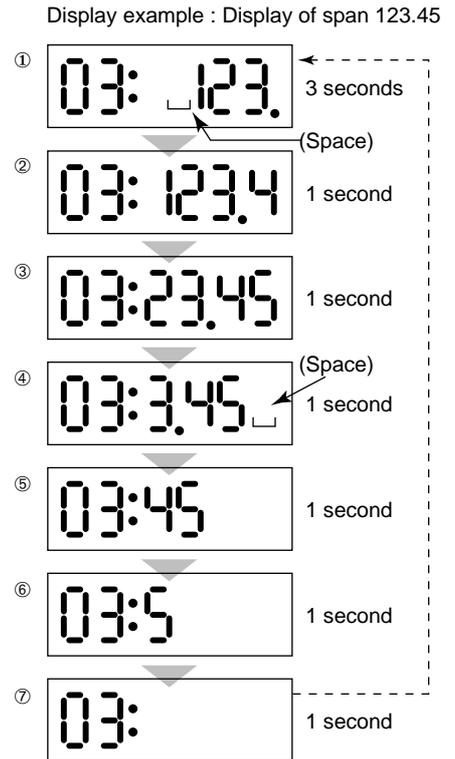
Before starting this procedure check in the data list if the position of the decimal point for the desired parameter decimal places can be changed.

Example of parameter change : Changing the span from 1.000 to 10.00

| Item                         | Display  | Content   |
|------------------------------|--|---|
| ① Selecting Decimal Position |  <p>SET SHIFT INC<br/>□ ■ □</p>   | Press the <b>SHIFT</b> key to move the flashing segment to the decimal point.   |
| ② Moving Decimal Portion     |  <p>SET SHIFT INC<br/>□ □ ■</p>   | Press the <b>INC</b> key to move the decimal point to the right.  |
| ③ Data Entry                 |  <p>SET SHIFT INC<br/>■ □ □</p> <p>First time</p>  <p>SET SHIFT INC<br/>■ □ □</p> <p>Second time</p> | Press the <b>SET</b> key twice to enter data.<br>(All data will start flashing when the key is pressed the first time. Then wait 2 to 3 seconds before pressing the key the second time.) |

**(4) Display of 5-digit Data**

- The data display area has four digits and can therefore not display span and other 5-digit data parameters. To display such data, the data is automatically shifted (scrolled) to the left one digit at a time . When a 5-digit parameter is selected, the delimiter " : " starts to flash.
- When the flashing segment is aligned with the last digit and the data includes a space, the data is displayed as shown ④ on the right.

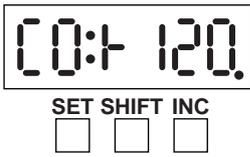
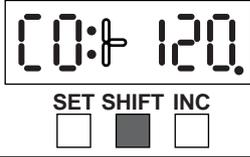
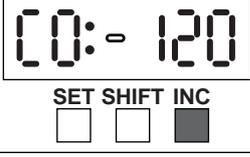


**(5) Display of 6-digit Data**

- The data display area has four digits and can therefore not display span and other 6-digit data parameters. (E05 TL SET VALUE is the only 6-digit parameter.) Like 5-digit data, 6-digit data is displayed by automatically shifting (scrolling) it to the left one digit at a time.

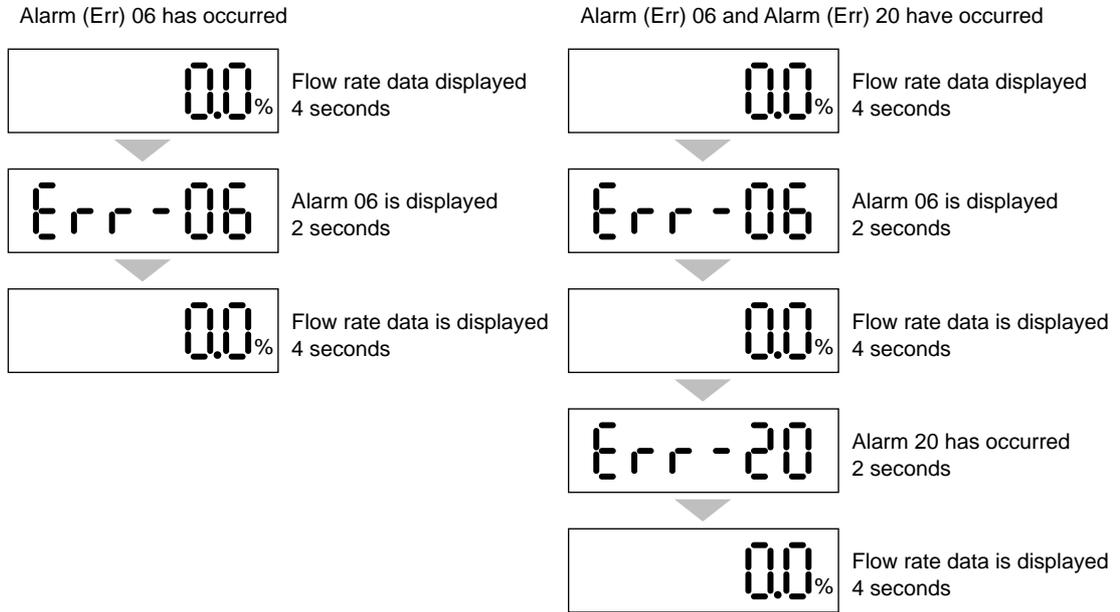
**(6) Display and Setting Coded Data**

- Example of change : Changing from +120 to -120

| Item   | Display   | Content   |
|--|---|---|
| 1. Selecting Coded Data<br> |  | The display on right indicates "+120".  |
| 2. Coded Data Flashes<br>   |  | Cause the "+" sign to flash.  |
| 3. Change of Coded Data  |  | Press the INC key to change the "+" sign to a "-" sign.<br>Press the SET key twice. |

### 4.2.3 Alarm Display Mode

- When an alarm occurs, an alarm number indicating is displayed in place of the normal display mode.  
However, this happens only when the current display mode is the flow rate data display mode or when parameter number are being changed in the setting mode.  
(Alarms are not displayed when data items are being changed.)



- See the section 7.2 "Self diagnostics function for information on alarm numbers.

# 5. FUNCTION AND DATA SETTINGS

A magnetic flowmeter calculates volume flow rate from minute voltage that corresponds to the flow velocity of a fluid and outputs a 4 to 20mA signal.



## NOTE

The three parameters must be set to obtain a correct signal. Nominal size, flow span and meter factor must be set.

This chapter explains how to set flow span and other functions.

Please set data correctly.



## NOTE

You cannot set the leftmost digit of display to numeric value greater than "4". If the leftmost digit of the span must be "4" or more, set the numeric value beginning from the digit second from the left on the display (the fourth digit). If the leftmost digit of the display is set to "3", the digits to its right can be set to "0" only, regardless of the decimal point position.

### Basic Key Operations

| Item  | Key Operation |
|---|---------------|
| How to change the display into the setting mode?                | SET           |
| How to move the cursor on the display during parameter setting? | SHIFT         |
| How to change the display into the data changing mode?          | SET           |
| How to move the cursor in the data changing mode?               | SHIFT         |
| How to change the data?   | INC           |
| How to input the set data?                                      | SET (Twice)   |

# 5.1 Setting Nominal Size

Data Example : flowtube size 50mm

| Switch Operation   | Display | Description  |
|--|---------|--|
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>              |         | Press the <b>SET</b> key during flow rate data display mode to display setting mode shown in the left figure.        |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p>              |         | Press the <b>SHIFT</b> key to cause the second digit from the left to flash.   |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p>              |         | Press the <b>INC</b> key to call up parameter number 06.   |
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>              |         | Press the <b>SET</b> key to move the flashing segment to the data area.  |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p>              |         | Press the <b>INC</b> key to select code "0" or "01" to display "mm" or "inch".                                       |
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>Twice</p> |         | Press the <b>SET</b> key twice.  |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p>              |         | Press the <b>INC</b> key to call up parameter number 07.   |
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>              |         | Press the <b>SET</b> key to move the flashing segment to the first digit in the data area.                           |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p>              |         | Set Flowtube size to number 07.  |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p>              |         |  |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p>              |         |  |
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> <p>Twice</p> |         | After completing the changes, press <b>SET</b> key twice ( wait slightly between presses), the setting is completed. |

| Code | Size Unit |
|------|-----------|
| 00   | mm        |
| 01   | inch      |

## 5.2 Setting Flow Span

### (1) Determining the Flow Rate Span Value

The flow rate span is the instantaneous flow rate value at which the output current is to be 20 mA.

Please determine the span under considering the followings.

- Please set the maximum flow rate at the most variable flow rate line. If the flow rate of the fluid exceeds the flow rate span value, the flow rate that exceeds this value (20mA or more) is not output and the meter will not display the correct flow rate (108% or more cannot be output).
- In a line where the flow rate is comparatively stable, set a value that is 1.5 to 2.0 times larger than the normal flow rate.
- Set a value that will correspond to a flow velocity of 0.3 to 10m/s.  
The flow velocity is checked using sizing data or parameter number "13". (Parameter number "13" displays the set span in flow velocity values.)
- The display of data is based on the input flow rate span value. It is recommended that the accuracy of the first digit is in a 0.05 to 0.1%. For example, 30 m<sup>3</sup>/h should be set as 30.00m<sup>3</sup>/h.
- The maximum numeric value that can be set is "30000" except any relation with decimal position.

(2) Span Setting using Display Keys (Example setting: 30.00 m<sup>3</sup>/h)

• Span Value Setting

| Switch Operation  | Display                    | Description  |
|---|----------------------------|--|
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> |                            | Press the <b>SET</b> key during flow rate data display mode to display setting mode shown in the left figure.  |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> |                            | Press the <b>SHIFT</b> key to cause the second digit from the left to flash.   |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |                            | Press the <b>INC</b> key to call up parameter number 03.<br><br>Default is set as 1.0000. Change this into 030.000   |
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> |                            | Press the <b>SET</b> key to move the flashing segment to the first digit in the data area.   |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |                            | Press the <b>INC</b> key to set the first digit to 0.  |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> |                            | Press the <b>SHIFT</b> key to move the decimal point.  |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |                            | Press the <b>INC</b> key to move the decimal point to "000.00".<br>*To set a "00000." as the data area is a four digit LCD, the three digits and the space will be displayed as "000".                 |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> |                            | Press the <b>SHIFT</b> key to move the flashing segment two digits to the right.   |
| <p>SET SHIFT INC</p> <p><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |                            | Press the <b>INC</b> key to enter "3".   |
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> |                            | Press the <b>SET</b> key once to cause all the data to flash.<br>*As the data display now will be scrolled, it may not appear as shown in the left figure.   |
| <p>SET SHIFT INC</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> |                            | Wait 2 to 3 seconds when the data starts flashing. Then press the <b>SET</b> key to return the flashing segment to the leftmost digit.<br>*This display will also be scrolled to display 5-digit data. |
|   | (Setting is now completed) |  |

Note : 5-digit span data can be displayed, but only 4 digits will be supplied at one time. As a result, when the last digit is changed, the last digit and the space will be displayed as the last three digits. (See 4.2.2 "Display of 5-digit data".)

• Setting Volume Measurement (m<sup>3</sup>) and Time Unit (/h)

| Switch Operation   | Display  | Description  |
|--|----------|--|
| (↓ Selecting m <sup>3</sup> )  |          |  |
| SET SHIFT INC<br><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> | 03:030.0 | Press the <b>SHIFT</b> key to cause the second digit from the left to flash.   |
| SET SHIFT INC<br><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> | 04: 12   | Press the <b>INC</b> key to call up parameter number 04.   |
| SET SHIFT INC<br><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 04: 12   | Press the <b>SET</b> key to move the flashing segment to the data area.  |
| SET SHIFT INC<br><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> | 04: 01   | Press the <b>INC</b> key to select "01" to display m <sup>3</sup> . (See the table on the right.)                                      |
| SET SHIFT INC<br><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 04: 01   | Press the <b>SET</b> key once to cause all the data to flash.  |
| SET SHIFT INC<br><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 04: 01   | Wait 2 to 3 seconds when the data starts flashing. Then press the <b>SET</b> key to return the flashing segment to the leftmost digit. |
| (↓ Selecting /h)   |          |  |
| SET SHIFT INC<br><input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> | 04: 01   | Press the <b>SHIFT</b> key to cause the second digit from the left to flash.   |
| SET SHIFT INC<br><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> | 05: 03   | Press the <b>INC</b> key to call up parameter number 05.   |
| SET SHIFT INC<br><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 05: 03   | Press the <b>SET</b> key to move the flashing segment to the data area.  |
| SET SHIFT INC<br><input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> | 05: 01   | Press the <b>INC</b> key to select the code "01" to display /h. (See the table on the right.)  |
| SET SHIFT INC<br><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 05: 01   | Press the <b>SET</b> key once to cause all the data to flash.  |
| SET SHIFT INC<br><input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | 05: 01   | Wait 2 to 3 seconds when the data starts flashing. Then press the <b>SET</b> key to return the flashing segment to the leftmost digit. |
| (Setting is now completed.)  |          |  |

| Code | Volume Unit  |
|------|--|
| 00   | km <sup>3</sup> (10 <sup>3</sup> ×m <sup>3</sup> ) |
| 01   | m <sup>3</sup>                                     |
| 02   | l(liter)   |
| 03   | cm <sup>3</sup> (10 <sup>-2</sup> ×m) <sup>3</sup> |
| 04   | Mgal   |
| 05   | kgal   |
| 06   | gal  |
| 07   | mgal   |
| 08   | kbbbl  |
| 09   | bbbl   |
| 10   | mbbl   |
| 11   | μbbbl  |
| 12   | m  |
| 13   | ft   |

| Code | Time Unit |
|------|-----------|
| 00   | /d        |
| 01   | /h        |
| 02   | /m        |
| 03   | /s        |

## 5.3 Setting Meter Factor

The meter factors are engraved on the data plate of the combined flow tube.

**Data Example :**    **Meter factor (L) : 1.1200**  
                           **Meter factor (H) : 1.2300**

| Switch Operation  | Display | Description  |
|---|---------|--|
| <p>SET SHIFT INC<br/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> |         | Press the <b>SET</b> key during flow rate data display mode to display the setting mode shown in the left figure.  |
| <p>SET SHIFT INC<br/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> |         | Press the <b>SHIFT</b> key to cause the second digit from the left to flash.                                       |
| <p>SET SHIFT INC<br/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |         | Press the <b>INC</b> key to call up parameter number 08.   |
| <p>SET SHIFT INC<br/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> |         | Press the <b>SET</b> key to move the flashing segment to the data area.  |
| <p>SET SHIFT INC<br/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> |         | Press the <b>SHIFT</b> key to move the flashing segment two digits to the right.                                   |
| <p>SET SHIFT INC<br/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |         | Press the <b>INC</b> key to enter "1".   |
| <p>SET SHIFT INC<br/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/></p> |         | Press the <b>SHIFT</b> key to move the flashing segment to the right.  |
| <p>SET SHIFT INC<br/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |         | Press the <b>INC</b> key to enter "2".   |
| <p>SET SHIFT INC<br/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p> |         | After completing the changes, press SET key twice (wait slightly between presses) , the data setting is completed. |
| <p>SET SHIFT INC<br/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/></p> |         | Set meter factor(H) to number 09. Set in the same way.   |

## 5.4 Power Frequency (For DC version only)



**IMPORTANT**

In case of DC power supply version, setting power frequency is required in areas where the frequency differs.

| Display  | Description  |
|--|--|
|  <p>Default:50.00Hz</p> | Set the value in area where the frequency differs in parameter number "12".<br>Setting Range : 47.00 to 53.00Hz. |

## 5.5 Other Functions and Settings

### 5.5.1 Pulse Output

#### (1) Pulse Output Overview

- By setting a pulse weight, a scaled pulse is transmitted to external counters and measuring instruments.

#### Pulse Output Overview

| Item                         | Content  |
|------------------------------|--|
| <b>Output specifications</b> | Transistor contact output(contact capacity is 30 V DC,200mA)   |
| <b>Connecting terminals</b>  | P+,P- When using these for pulse output, alarm output or status output are not available as the terminals are used commonly. |
| <b>Pulse width</b>           | Selection : DUTY50%, 0.5, 1, 20, 33, 50,100ms  |
| <b>Output rate</b>           | Min. 0.0001 P/s Max. 1000 P/s  |

\* See "3.2.7 Connecting external instruments" for information on how to connect external instruments.

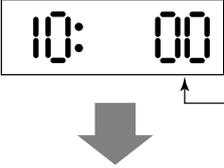


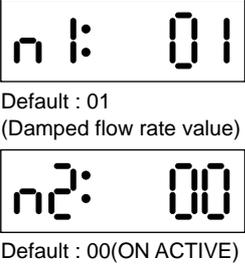
**NOTE**

P+, P- terminals are for common use with pulse, alarm and other status output functions. Therefore, in case this function is used, other functions are not available to use.

#### (2) Procedures for Setting Pulse Output

Example setting :10 liter output per pulse in a flow rate span of    m<sup>3</sup>/h

| Display   | Description   |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |
|---|---|------|----------|----|--------------|----|--------------|----|----------------------------------|----|-------------------------------|----|--------------------------------|----|---------------------|
|  | Select "Pulse output" in parameter number "10".<br><table border="1"> <thead> <tr> <th>Code</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Pulse output</td> </tr> <tr> <td>01</td> <td>Alarm output</td> </tr> <tr> <td>02</td> <td>Forward/reverse flow measurement</td> </tr> <tr> <td>03</td> <td>Automatic two range switching</td> </tr> <tr> <td>04</td> <td>Alarm output at low flow limit</td> </tr> <tr> <td>05</td> <td>Totalization switch</td> </tr> </tbody> </table> | Code | Contents | 00 | Pulse output | 01 | Alarm output | 02 | Forward/reverse flow measurement | 03 | Automatic two range switching | 04 | Alarm output at low flow limit | 05 | Totalization switch |
| Code  | Contents  |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |
| 00  | Pulse output  |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |
| 01  | Alarm output  |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |
| 02  | Forward/reverse flow measurement  |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |
| 03  | Automatic two range switching   |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |
| 04  | Alarm output at low flow limit  |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |
| 05  | Totalization switch   |      |          |    |              |    |              |    |                                  |    |                               |    |                                |    |                     |

| Display   | Description  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
|---|--|------|-------------|----|---|----|---|----|---|----|---|----|--|----|--|----|--|------|-------------|----|---------------------------------------|----|-------------------------------------|----|----------------------------------|----|----------------------------------|----|----------------------------------|----|----------------------------------|----|----------------------------------|
|  <p>Default : 3%</p> <p>Default : 50%DUTY</p>                                     | <p>Select the volume unit for pulse weight using parameter number "F1".</p> <table border="1" data-bbox="707 338 1299 600"> <thead> <tr> <th>Code</th> <th>Volume Unit</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Volume unit in that for the flow rate span <math>\times 10^{-9}</math></td> </tr> <tr> <td>01</td> <td>Volume unit in that for the flow rate span <math>\times 10^{-6}</math></td> </tr> <tr> <td>02</td> <td>Volume unit in that for the flow rate span <math>\times 10^{-3}</math></td> </tr> <tr> <td>03</td> <td>Volume unit in that for the flow rate span <math>\times 1</math></td> </tr> <tr> <td>04</td> <td>Volume unit in that for the flow rate span <math>\times 10^3</math></td> </tr> <tr> <td>05</td> <td>Volume unit in that for the flow rate span <math>\times 10^6</math></td> </tr> <tr> <td>06</td> <td>Number of pulses output per second at 100% of output</td> </tr> </tbody> </table> <p>Example : When pulses are to be output per same liter with the flowrate span of <math>\square\square \text{ m}^3/\text{h}</math>, select "02" since <math>\text{L}(\text{liter}) = 10^{-3} \times \text{m}^3</math></p> <p>Set pulse weight "10 (L)" in parameter number "E2".</p> <p>※ Since parameter number "F2" is a 5-digit data item, scrolling is necessary to display all the data. Mind the decimal point when setting are made. (The decimal point can be moved if required.)</p> <p>Set the low cut range percentage in parameter "F3".<br/>Range of setting : 0 to 100% (of span)</p> <p>Select the pulse width in parameter number "F4".</p> <table border="1" data-bbox="707 1193 1270 1451"> <thead> <tr> <th>Code</th> <th>Pulse Width</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>50%DUTY (Max. 1000P/s min. 0.0001P/s)</td> </tr> <tr> <td>01</td> <td>0.5ms (Max. 1000P/s min. 0.0001P/s)</td> </tr> <tr> <td>02</td> <td>1ms (Max. 500P/s min. 0.0001P/s)</td> </tr> <tr> <td>03</td> <td>20ms (Max. 25P/s min. 0.0001P/s)</td> </tr> <tr> <td>04</td> <td>33ms (Max. 15P/s min. 0.0001P/s)</td> </tr> <tr> <td>05</td> <td>50ms (Max. 10P/s min. 0.0001P/s)</td> </tr> <tr> <td>06</td> <td>100ms (Max. 5P/s min. 0.0001P/s)</td> </tr> </tbody> </table> | Code | Volume Unit | 00 | Volume unit in that for the flow rate span $\times 10^{-9}$ | 01 | Volume unit in that for the flow rate span $\times 10^{-6}$ | 02 | Volume unit in that for the flow rate span $\times 10^{-3}$ | 03 | Volume unit in that for the flow rate span $\times 1$ | 04 | Volume unit in that for the flow rate span $\times 10^3$ | 05 | Volume unit in that for the flow rate span $\times 10^6$ | 06 | Number of pulses output per second at 100% of output | Code | Pulse Width | 00 | 50%DUTY (Max. 1000P/s min. 0.0001P/s) | 01 | 0.5ms (Max. 1000P/s min. 0.0001P/s) | 02 | 1ms (Max. 500P/s min. 0.0001P/s) | 03 | 20ms (Max. 25P/s min. 0.0001P/s) | 04 | 33ms (Max. 15P/s min. 0.0001P/s) | 05 | 50ms (Max. 10P/s min. 0.0001P/s) | 06 | 100ms (Max. 5P/s min. 0.0001P/s) |
| Code  | Volume Unit  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 00  | Volume unit in that for the flow rate span $\times 10^{-9}$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 01  | Volume unit in that for the flow rate span $\times 10^{-6}$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 02  | Volume unit in that for the flow rate span $\times 10^{-3}$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 03  | Volume unit in that for the flow rate span $\times 1$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 04  | Volume unit in that for the flow rate span $\times 10^3$   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 05  | Volume unit in that for the flow rate span $\times 10^6$   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 06  | Number of pulses output per second at 100% of output   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| Code  | Pulse Width  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 00  | 50%DUTY (Max. 1000P/s min. 0.0001P/s)  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 01  | 0.5ms (Max. 1000P/s min. 0.0001P/s)  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 02  | 1ms (Max. 500P/s min. 0.0001P/s)   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 03  | 20ms (Max. 25P/s min. 0.0001P/s)   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 04  | 33ms (Max. 15P/s min. 0.0001P/s)   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 05  | 50ms (Max. 10P/s min. 0.0001P/s)   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| 06  | 100ms (Max. 5P/s min. 0.0001P/s)   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
| <p>Normally, these are all required settings. The following settings are made depending on the applications that are used.</p>                                      |  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |
|  <p>Default : 01<br/>(Damped flow rate value)</p> <p>Default : 00(ON ACTIVE)</p> | <p>Select instantaneous flow rate or flow rate after damping for the pulse output. (The damped value is the value set in "02".)</p> <p>Set parameter "n2" to "01" when the pulse output transistor is to be off active.</p>  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |      |             |    |                                       |    |                                     |    |                                  |    |                                  |    |                                  |    |                                  |    |                                  |

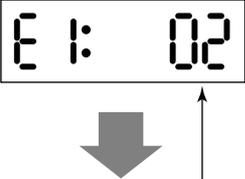
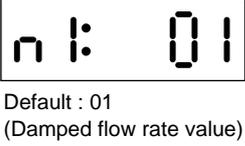
\*The "n" item can be opened by entering "55" in parameter number "L2".

### 5.5.2 Display of Internal Totalization Values

- The flow converter can display totalization values by setting the pulse weight.

#### (1) Setting Totalization Pulse Weight

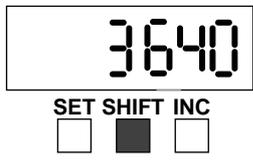
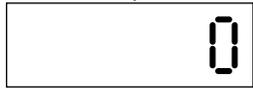
Example : Display 10 liter output per pulse in a flow rate span of  $\square\square\square\text{ m}^3/\text{h}$

| Display   | Description  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
|---|--|------|-------------|----|---|----|---|----|---|----|---|----|--|----|--|----|--|
|    | <p>Select the volume unit for pulse weight using parameter number "E1".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Volume Unit</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Volume unit in that for the flow rate span <math>\times 10^{-9}</math></td> </tr> <tr> <td>01</td> <td>Volume unit in that for the flow rate span <math>\times 10^{-6}</math></td> </tr> <tr> <td>02</td> <td>Volume unit in that for the flow rate span <math>\times 10^{-3}</math></td> </tr> <tr> <td>03</td> <td>Volume unit in that for the flow rate span <math>\times 1</math></td> </tr> <tr> <td>04</td> <td>Volume unit in that for the flow rate span <math>\times 10^3</math></td> </tr> <tr> <td>05</td> <td>Volume unit in that for the flow rate span <math>\times 10^6</math></td> </tr> <tr> <td>06</td> <td>Number of pulses output per second at 100% of output</td> </tr> </tbody> </table> <p>Example : When pulses are to be output per same liter with the flow rate span <math>\square\square\text{ m}^3/\text{h}</math>, select "02" since L(liter) = <math>10^{-3} \times \text{m}^3</math></p> | Code | Volume Unit | 00 | Volume unit in that for the flow rate span $\times 10^{-9}$ | 01 | Volume unit in that for the flow rate span $\times 10^{-6}$ | 02 | Volume unit in that for the flow rate span $\times 10^{-3}$ | 03 | Volume unit in that for the flow rate span $\times 1$ | 04 | Volume unit in that for the flow rate span $\times 10^3$ | 05 | Volume unit in that for the flow rate span $\times 10^6$ | 06 | Number of pulses output per second at 100% of output |
| Code  | Volume Unit  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
| 00  | Volume unit in that for the flow rate span $\times 10^{-9}$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
| 01  | Volume unit in that for the flow rate span $\times 10^{-6}$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
| 02  | Volume unit in that for the flow rate span $\times 10^{-3}$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
| 03  | Volume unit in that for the flow rate span $\times 1$  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
| 04  | Volume unit in that for the flow rate span $\times 10^3$   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
| 05  | Volume unit in that for the flow rate span $\times 10^6$   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
| 06  | Number of pulses output per second at 100% of output   |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
|   | <p>Set pulse weight "10 (L)" in parameter number "E2".</p> <p>※ Since parameter number "E2" is a 5-digit data item, scrolling is necessary to display all the data. Mind the decimal point when setting are made. (The decimal point can be moved if required.)</p>  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
|  | <p>Set the low cut range percentage in parameter "E3".<br/>Range of setting : 0 to 100% (of span)</p>  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |
|  | <p>Select pulse output calculation of instantaneous flow rate or flow rate after damping. (Use parameter "02" to set damping constant.)</p>  |      |             |    |   |    |   |    |   |    |   |    |  |    |  |    |  |

\*Item "n" can be opened by entering "55" in parameter number "L2".

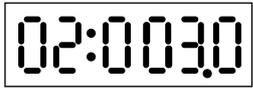
### 5.5.3 Resetting for Totalization Display

- This function is used to reset or preset totalization values of the display.
- Hold down the **SHIFT** key for more than 2 seconds while the totalization values of the flow rate are displayed to set the totalization value to the value set in parameter number "E5".

| Display   | Description   |      |             |    |                                 |    |                                 |
|---|---|------|-------------|----|---------------------------------|----|---------------------------------|
|  <p>Default : 00 (inhibit)</p> <p>↓</p>  <p>Default : 0</p> <p>↓</p>  <p>↓</p>  | <p>Select totalization enable in parameter number "E4"</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Totalization presetting inhibit</td> </tr> <tr> <td>01</td> <td>Totalization presetting enabled</td> </tr> </tbody> </table> <p>Set the totalization preset value in parameter number "E5". The initial value is 0, if it is no setting, the function is zero setting.</p> <p>Hold down the <b>SHIFT</b> key for more than 2 seconds while the totalization values of the flow rate reading are displayed to set the totalization value to the value set in parameter number "E5"</p> | Code | Description | 00 | Totalization presetting inhibit | 01 | Totalization presetting enabled |
| Code  | Description   |      |             |    |                                 |    |                                 |
| 00  | Totalization presetting inhibit   |      |             |    |                                 |    |                                 |
| 01  | Totalization presetting enabled   |      |             |    |                                 |    |                                 |

### 5.5.4 Damping Time Constant

- The time constant can be changed by setting the parameter number "02" to suppress a fluctuation or change a response time.
- The time constant influences to flow rate, pulse output and internal totalization. However, in case "00" is selected in parameter number "N1", the pulse output and internal totalization are not influenced by it.

| Display  | Description   |
|--|---|
|  <p>Default : 3 seconds</p> | <p>Set the value in parameter number "02".<br/>Range of possible settings : 0.1 to 200.0 seconds.</p> |

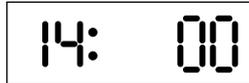
### 5.5.5 Current Output During Alarm Occurrence

- The current output and display values during alarming can be selected in advance.

| Display  | Description  |      |          |    |               |    |       |    |      |    |                |
|--|--|------|----------|----|---------------|----|-------|----|------|----|----------------|
|  <p>Default : 00<br/>(2.4 mA or less)</p> | <p>Set a value for current output to be used during alarms in parameter number "11"</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>2.4mA or less</td> </tr> <tr> <td>01</td> <td>4.0mA</td> </tr> <tr> <td>02</td> <td>Hold</td> </tr> <tr> <td>03</td> <td>21.6mA or more</td> </tr> </tbody> </table> | Code | Contents | 00 | 2.4mA or less | 01 | 4.0mA | 02 | Hold | 03 | 21.6mA or more |
| Code   | Contents   |      |          |    |               |    |       |    |      |    |                |
| 00   | 2.4mA or less  |      |          |    |               |    |       |    |      |    |                |
| 01   | 4.0mA  |      |          |    |               |    |       |    |      |    |                |
| 02   | Hold   |      |          |    |               |    |       |    |      |    |                |
| 03   | 21.6mA or more   |      |          |    |               |    |       |    |      |    |                |

### 5.5.6 Reversing Flow Direction

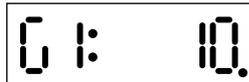
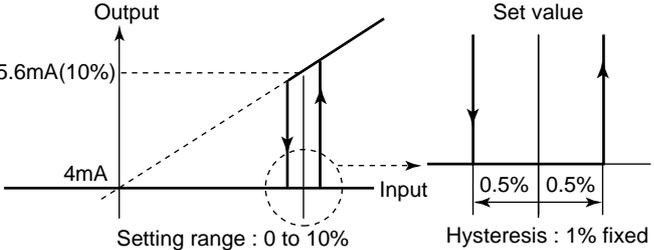
- The flow direction is set to "FORWARD" at the factory. This function enables to set flow direction from "FORWARD" to "REVERSE"

| Display   | Description   |      |          |    |                   |    |                                 |
|---|---|------|----------|----|-------------------|----|---------------------------------|
|  <p>Default : 00</p> | <p>Set the flow direction in parameter "14".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Contents</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Forward direction</td> </tr> <tr> <td>01</td> <td>Reverse direction to flow arrow</td> </tr> </tbody> </table> | Code | Contents | 00 | Forward direction | 01 | Reverse direction to flow arrow |
| Code  | Contents  |      |          |    |                   |    |                                 |
| 00  | Forward direction   |      |          |    |                   |    |                                 |
| 01  | Reverse direction to flow arrow   |      |          |    |                   |    |                                 |

### 5.5.7 Limiting Current Output

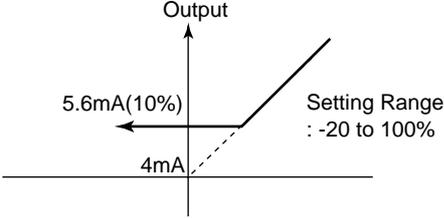
#### (1) 4 to 20 mA low cut output (Current Output near by 0% Range)

- This function makes it possible to reduce fluctuations in the 0% region to reduce it to 0%.

| Display   | Description   |
|---|---|
|  <p>Default : 0(%)</p> |  <p>Setting range : 0 to 10%      Hysteresis : 1% fixed</p> |

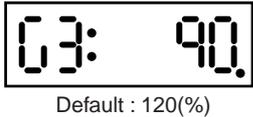
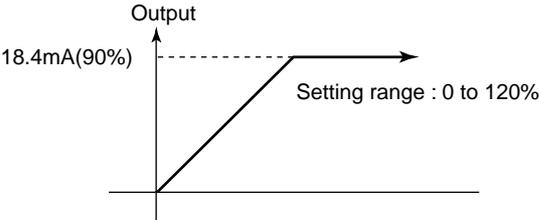
**(2) 4 to 20mA Low Limit**

- This function limits the low end of the analog output.
- The default value is -20%, and a -10% (2.4mA) as reverse flow limit. Please set in case other setting is required.
- 2.4mA or less output in alarming is also limited.

| Display   | Description  |
|---|--|
|  |  |

**(3) High Limit on Current Output**

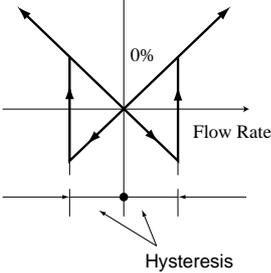
- This function limits the high end of analog output.
- The default value is 120% (23.2mA). Please set in case other setting is required.
- 21.6mA or more output in alarming is also limited.

| Display  | Description   |
|--|---|
|  |  |

### 5.5.8 Forward and Reverse Flow Measurement

- This function enables to measure forward and reverse flow rate without change the flow tube direction.
- By setting reverse range, in case fluids flow to reverse direction the flow tube measures it as reverse direction range automatically. In this time, a status signal that shows changing into the reverse direction is output.
- To set the internal totalizing function for forward direction can also show it for reverse direction by parameter settings.
- P+, P- terminals are used for output connection.

|   |  |
|---|--|
|  | <p><b>NOTE</b></p> <p>P+, P- terminals are for common use with pulse, alarm and other status output functions. Therefore, in case this function is used, other functions are not available to use.</p> |
|---|--|

| Display   | Description  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|---|--|------|---------|----|--------------|----|--------------|----|------------------------------------|----|-------------------------------|----|--------------------------------|----|---------------------|
|    | <p>F and R flow rate measurement can be selected as "02" in parameter No. "10".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Pulse output</td> </tr> <tr> <td>01</td> <td>Alarm output</td> </tr> <tr> <td>02</td> <td>Forward / reverse flow measurement</td> </tr> <tr> <td>03</td> <td>Automatic two range switching</td> </tr> <tr> <td>04</td> <td>Alarm output at low flow limit</td> </tr> <tr> <td>05</td> <td>Totalization switch</td> </tr> </tbody> </table>          | Code | Content | 00 | Pulse output | 01 | Alarm output | 02 | Forward / reverse flow measurement | 03 | Automatic two range switching | 04 | Alarm output at low flow limit | 05 | Totalization switch |
| Code  | Content  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 00  | Pulse output   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 01  | Alarm output   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 02  | Forward / reverse flow measurement   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 03  | Automatic two range switching  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 04  | Alarm output at low flow limit   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 05  | Totalization switch  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|  | <p>Reverse direction span can be set in parameter No. "30".<br/>Flow rate unit is the same as forward direction span.</p> <p>Further reverse range span should be set in the same number of places of decimals as forward range span.<br/>Example: forward flow rate : 1.000 then revers flow rate should be 4.000.</p>  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|  | <p>Hysteresis width at switching direction can be set in parameter No. "31".<br/>It is the rate (%) of the smaller span, either forward or reverse span.</p> <div style="text-align: center;">  </div> <p style="text-align: right;">Status output<br/>                     Forward flow measurement: OFF<br/>                     Reverse flow measurement: ON</p> <p>When using reversed status (ON/OFF) is required, it can be set in "n2 Output Mode".</p> |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |

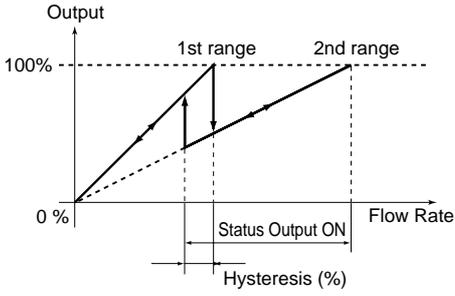
### 5.5.9 Automatic Two Range Switching

- When an input exceeds 100% of the first range, the range is automatically transferred to the second range and the status output changes state.
- P+, P- terminals are used for output connection.



**NOTE**

P+, P- terminals are for common use with pulse, alarm and other status output functions. Therefore, in case this function is used, other functions are not available to use.

| Display  | Description  |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|--|--|--------------|---------|----|--------------|----|--------------|----|------------------------------------|----|-------------------------------|----|--------------------------------|----|---------------------|
|  <p>Default : 00</p>    | <p>Automatic two range transfer can be selected "03" in parameter No. "10".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Pulse output</td> </tr> <tr> <td>01</td> <td>Alarm output</td> </tr> <tr> <td>02</td> <td>Forward / reverse flow measurement</td> </tr> <tr> <td>03</td> <td>Automatic two range switching</td> </tr> <tr> <td>04</td> <td>Alarm output at low flow limit</td> </tr> <tr> <td>05</td> <td>Totalization switch</td> </tr> </tbody> </table> <p>Forward second range can be set by calling up parameter No. "33".<br/>Setting restrictions: First range ≤ 2nd range.</p> <p>Further second range span should be set in the same number of places of decimals as first range span in parameter No. "03".<br/>Example: First range : 1.000 then second range should be 4.000</p> <p>Hysteresis width at switching range can be set in parameter No. "34".<br/>It is the rate (%) of first range span.</p>  <p style="text-align: center;">Status Output<br/>1st range: OFF<br/>2nd range: ON</p> <p>When using reversed status (ON/OFF) is required, it can be set in "n2 Output Mode".</p> | Code         | Content | 00 | Pulse output | 01 | Alarm output | 02 | Forward / reverse flow measurement | 03 | Automatic two range switching | 04 | Alarm output at low flow limit | 05 | Totalization switch |
| Code   |  | Content      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 00   |  | Pulse output |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 01   | Alarm output   |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 02   | Forward / reverse flow measurement   |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 03   | Automatic two range switching  |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 04   | Alarm output at low flow limit   |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 05   | Totalization switch  |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|                         |  |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|  <p>Default : 10%</p> |  |              |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |

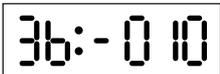
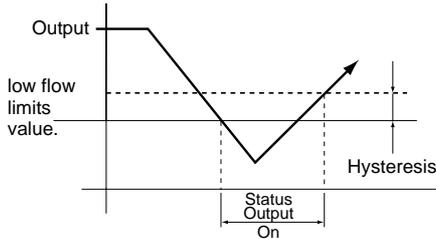
### 5.5.10 Alarm Output at Low Flow Limit (Flow Switch)

- In case flow rate decrease under set level, an status signal is output.



**NOTE**

P+, P- terminals are for common use with pulse, alarm and other status output functions. Therefore, in case this function is used, other functions are not available to use.

| Display   | Description  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|---|--|------|---------|----|--------------|----|--------------|----|------------------------------------|----|-------------------------------|----|--------------------------------|----|---------------------|
|  <p>Default : 00</p>     | <p>Alarm output at low flow limits can be selected "04" in parameter No. "10".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Pulse output</td> </tr> <tr> <td>01</td> <td>Alarm output</td> </tr> <tr> <td>02</td> <td>Forward / reverse flow measurement</td> </tr> <tr> <td>03</td> <td>Automatic two range switching</td> </tr> <tr> <td>04</td> <td>Alarm output at low flow limit</td> </tr> <tr> <td>05</td> <td>Totalization switch</td> </tr> </tbody> </table> | Code | Content | 00 | Pulse output | 01 | Alarm output | 02 | Forward / reverse flow measurement | 03 | Automatic two range switching | 04 | Alarm output at low flow limit | 05 | Totalization switch |
| Code  | Content  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 00  | Pulse output   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 01  | Alarm output   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 02  | Forward / reverse flow measurement   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 03  | Automatic two range switching  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 04  | Alarm output at low flow limit   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 05  | Totalization switch  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|  <p>(Default : -10%)</p> | <p>The Low Limit value can be set in parameter No. "36" as percentage for 4 to 20 mA.</p>  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|  <p>(Default : 5%)</p>  | <p>Hysteresis width is set in parameter No. "37".</p>   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|   | <p>When using reversed status (ON/OFF) is required, it can be set in "n2 Output Mode".</p>   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |

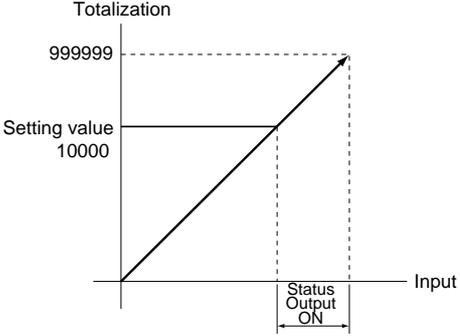
### 5.5.11 Totalization Switch Output

- In case the Internal Totalization Value increase over set level, an alarm signal is output.



**NOTE**

P+, P- terminals are for common use with pulse, alarm and other status output functions. Therefore, in case this function is used, other functions are not available to use.

| Display   | Description   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|---|---|------|---------|----|--------------|----|--------------|----|------------------------------------|----|-------------------------------|----|--------------------------------|----|---------------------|
|  <p>Default : 00</p> | <p>Totalization switch can be selected as "05" in parameter No. "10".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Pulse output</td> </tr> <tr> <td>01</td> <td>Alarm output</td> </tr> <tr> <td>02</td> <td>Forward / reverse flow measurement</td> </tr> <tr> <td>03</td> <td>Automatic two range switching</td> </tr> <tr> <td>04</td> <td>Alarm output at low flow limit</td> </tr> <tr> <td>05</td> <td>Totalization switch</td> </tr> </tbody> </table> | Code | Content | 00 | Pulse output | 01 | Alarm output | 02 | Forward / reverse flow measurement | 03 | Automatic two range switching | 04 | Alarm output at low flow limit | 05 | Totalization switch |
| Code  | Content   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 00  | Pulse output  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 01  | Alarm output  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 02  | Forward / reverse flow measurement  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 03  | Automatic two range switching   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 04  | Alarm output at low flow limit  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 05  | Totalization switch   |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|  <p>Default : 0</p>  | <p>Switch level can be selected by calling up parameter No. "06".</p>  <p>When using reversed status (ON/OFF) is required, it can be set in "n2 Output Mode".</p>  |      |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |

### 5.5.12 Alarm Output

- This function is for status output from P+, P- terminals, when an alarm occurs.

|   |  |
|---|--|
|  | <p><b>NOTE</b></p> <p>P+, P- terminals are for common use with pulse, alarm and other status output functions.<br/>Therefore, in case this function is used, other functions are not available to use.</p> |
|---|--|

- All of the alarms are able to output except empty pipe detection function that can be selected in parameter No. "n7" as out of selection.
- The status goes from close to open (OFF) during alarming.

| Display  | Description  |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|--|--|---------|---------|----|--------------|----|--------------|----|------------------------------------|----|-------------------------------|----|--------------------------------|----|---------------------|
|  <p>Default : 00</p>  | <p>The alarm output can be selected "01" in parameter No. "10" and P+, P- terminals are only for alarm output.</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Pulse output</td> </tr> <tr> <td>01</td> <td>Alarm output</td> </tr> <tr> <td>02</td> <td>Forward / reverse flow measurement</td> </tr> <tr> <td>03</td> <td>Automatic two range switching</td> </tr> <tr> <td>04</td> <td>Alarm output at low flow limit</td> </tr> <tr> <td>05</td> <td>Totalization switch</td> </tr> </tbody> </table> | Code    | Content | 00 | Pulse output | 01 | Alarm output | 02 | Forward / reverse flow measurement | 03 | Automatic two range switching | 04 | Alarm output at low flow limit | 05 | Totalization switch |
| Code   |  | Content |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 00   | Pulse output   |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 01   | Alarm output   |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 02   | Forward / reverse flow measurement   |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 03   | Automatic two range switching  |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 04   | Alarm output at low flow limit   |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 05   | Totalization switch  |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
|  <p>Default : 00</p> | <p>The empty pipe output selection can be set in parameter No. "n7".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>ALARM</td> </tr> <tr> <td>01</td> <td>NO ALARM</td> </tr> </tbody> </table>  | Code    | Content | 00 | ALARM        | 01 | NO ALARM     |    |                                    |    |                               |    |                                |    |                     |
| Code   | Content  |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 00   | ALARM  |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |
| 01   | NO ALARM   |         |         |    |              |    |              |    |                                    |    |                               |    |                                |    |                     |

\* Item "n" can be opened by entering "55" in parameter number "L2".

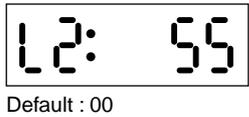
### 5.5.13 Data Setting Enable / Inhibit

- This function can inhibit to change all data except parameter No. "L1".  
However, auto zero adjustment function can work, if it has been set in parameter No. "C1".  
And the preset totalization value function also can work, if it has been set in parameter No. "E4".

| Display   | Description   |      |         |    |         |    |        |
|---|---|------|---------|----|---------|----|--------|
|  <p>Default : 01</p> | <p>The data setting inhibit item can be set "00" in parameter number "L1".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>INHIBIT</td> </tr> <tr> <td>01</td> <td>ENABLE</td> </tr> </tbody> </table> | Code | Content | 00 | INHIBIT | 01 | ENABLE |
| Code  | Content   |      |         |    |         |    |        |
| 00  | INHIBIT   |      |         |    |         |    |        |
| 01  | ENABLE  |      |         |    |         |    |        |

### 5.5.14 Procedure of Selecting Special Application Items

- Only the special application (“n” items) shipped being unpublished.  
In case the “n” items should be used, it can be set “55” in parameter No. “L2”.

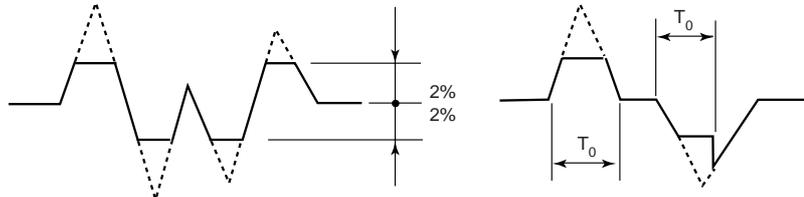
| Display   | Description   |      |         |    |                               |    |                               |
|---|---|------|---------|----|-------------------------------|----|-------------------------------|
|  | <p>It is possible to open up to item n when "55" is entered in parameter number "L2".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Accessible up to L parameters</td> </tr> <tr> <td>01</td> <td>Accessible up to n parameters</td> </tr> </tbody> </table> | Code | Content | 00 | Accessible up to L parameters | 01 | Accessible up to n parameters |
| Code  | Content   |      |         |    |                               |    |                               |
| 00  | Accessible up to L parameters   |      |         |    |                               |    |                               |
| 01  | Accessible up to n parameters   |      |         |    |                               |    |                               |

### 5.5.15 Rate Limit

- This function is used to remove noise that cannot be removed by increasing the damping time constant.
- In case unexpected noise from step signal or slurry is entered, a basis is set to recognize that signal is flow rate or noise.  
The recognition depends on rate limit value (upper and lower limit) and dead time (sampling time).
- Determination of rate limit value and dead time.

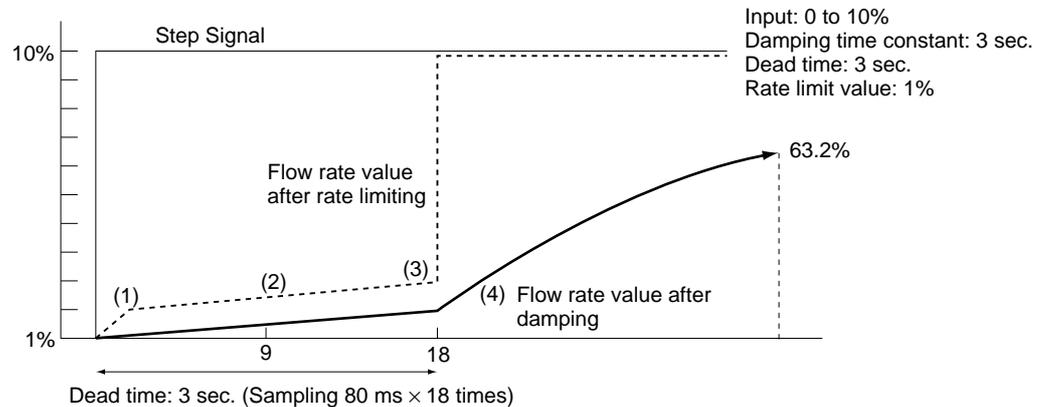
**Rate limit value:**  
Determine the level to reduce output fluctuation.  
For example, reducing 2% or more fluctuation by setting as 2% to reduce.

**Dead time  $T_0$ :**  
Please determine the dead time depending on output fluctuation width.  
In case of noise of which is longer than the dead time, please set the dead time longer.



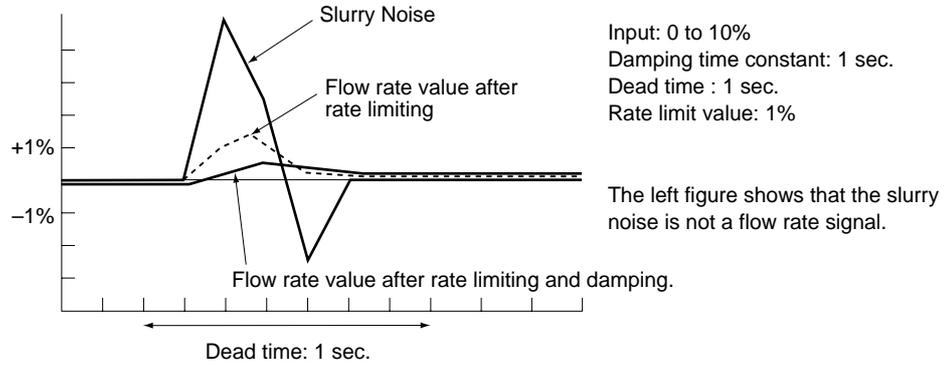
- **Signal processing procedures:**  
The function sets a certain upper and lower limit (rate limit value) for first order delay response values of flow rate data obtained in a previous sampling. If currently sampled flow rate data exceeds or goes below the limit is regarded as current flow rate value. Signals whose protruding portions show the same trends during a certain number of sampling times (dead time) are identified as flow rate signals.

#### Example 1: Step Input



- (1) Shows 1% response cause of excessive signal beyond the rate limit. However, actual output is under damping that described by a solid line.
- (2) Shows the flow rate signal (1%) of just after damping calculation (1) and rate limit value.
- (3) This signal is recognized as a flow rate signal since it does not return to within the rate limit value within the dead time.
- (4) The output signal follows the damping curve and tracks the step signal.

**Example 2: Slurry Noise**



| Display   | Description   |
|---|---|
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>n3: 05.</p> <p>Default : 5%</p> </div>   | Set a rate limit value in parameter number "n3".<br>Setting Range : 0 to 10%.   |
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>n4: 00.</p> <p>Default : 0sec</p> </div> | Set the dead time in parameter number "n4".<br>Setting Range : 0 to 15 seconds. |

\*Item "n" can be opened by entering "55" in parameter number "L2".

**5.5.16 Pulsating Flow**

- The pulsating flow produced by a plunger pump results in inaccurate average flow rate values. This function makes it possible to accurately track flow rate changes and control calculation.

| Display  | Description  |      |          |    |       |    |                              |
|--|--|------|----------|----|-------|----|------------------------------|
| <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>n6: 01</p> <p>Default : 00</p> </div> | <p>Select "01" (pulsating flow counteraction) in parameter number "n6".</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Code</th> <th style="text-align: center;">Contents</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">00</td> <td style="text-align: center;">Nomal</td> </tr> <tr> <td style="text-align: center;">01</td> <td style="text-align: center;">Counteracting pulsating flow</td> </tr> </tbody> </table> | Code | Contents | 00 | Nomal | 01 | Counteracting pulsating flow |
| Code   | Contents   |      |          |    |       |    |                              |
| 00   | Nomal  |      |          |    |       |    |                              |
| 01   | Counteracting pulsating flow   |      |          |    |       |    |                              |

\*Item "n" can be opened by entering "55" in parameter number "L2".

# 6. OPERATION VIA BRAIN TERMINAL

Products provided with / BR (BRAIN communication function) come equipped with a BRAIN communication function which allows them to communicate with dedicated BRAIN terminals (BT) or CENTUM systems. In the BRAIN series communications system, a  $\pm 2$  mA, 2.4 kHz modulated signal is superimposed onto the 4 to 20 mA DC analog signal for data transmission. Since the modulated wave is an AC signal, superimposed on the analog signal will cause no error in the DC component of the analog signal. Thus, monitoring can be performed via communications while the ADMAG AE is online.

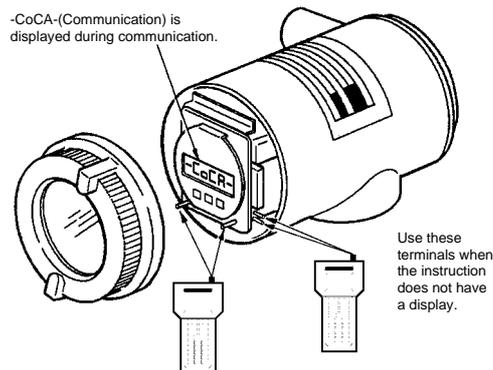
A BRAIN Terminal can be connected to the terminals shown in Figure 6.1 on products that are not provided with a / BR (BRAIN communication function).

## 6.1 Operation Via the BT200

This section describes the operation procedures using a BRAIN terminal. For details on the functions of the ADMAG AE, see Chapter 5, "Function and Data Settings." And also, see the "BT200 Instruction Manual" (IM 1COA11-01E) for more detailed information.

### 6.1.1 BT200 Connections

#### (1) Connecting BT200 to Converter

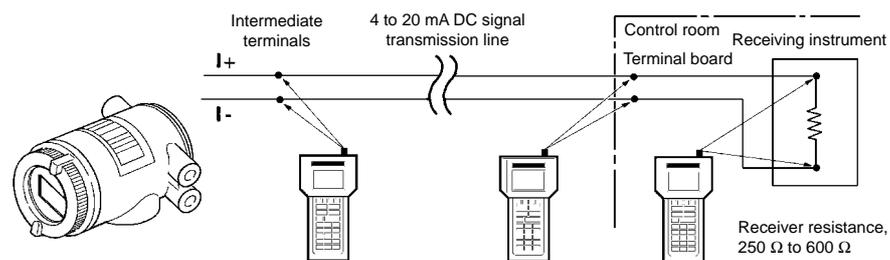


**Figure 6.1 Connection of BT200 to Flow Converter**

For products not provided with the / BR (BRAIN communication function), the terminals for BRAIN communication are provided on the circuit board. Please connect BT200 to the terminals on the circuit board directly.

#### (2) Connecting the BT200 to a 4 to 20 mA DC Transfer Line

The communication signal of the ADMAG AE with the / BR function (optional specification) is superimposed onto the 4 to 20 mA DC analog signal to be transferred.



**Figure 6.2 Communicating via a 4 to 20 mA DC Signal Line**

### 6.1.2 BT200 Keypad Layout

Figure 6.3 shows the key pad lay out of the BT200.

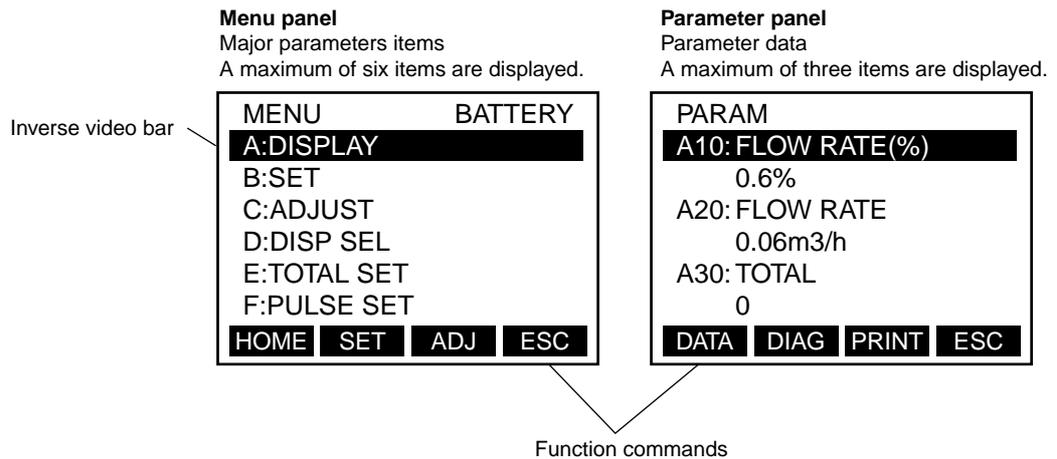
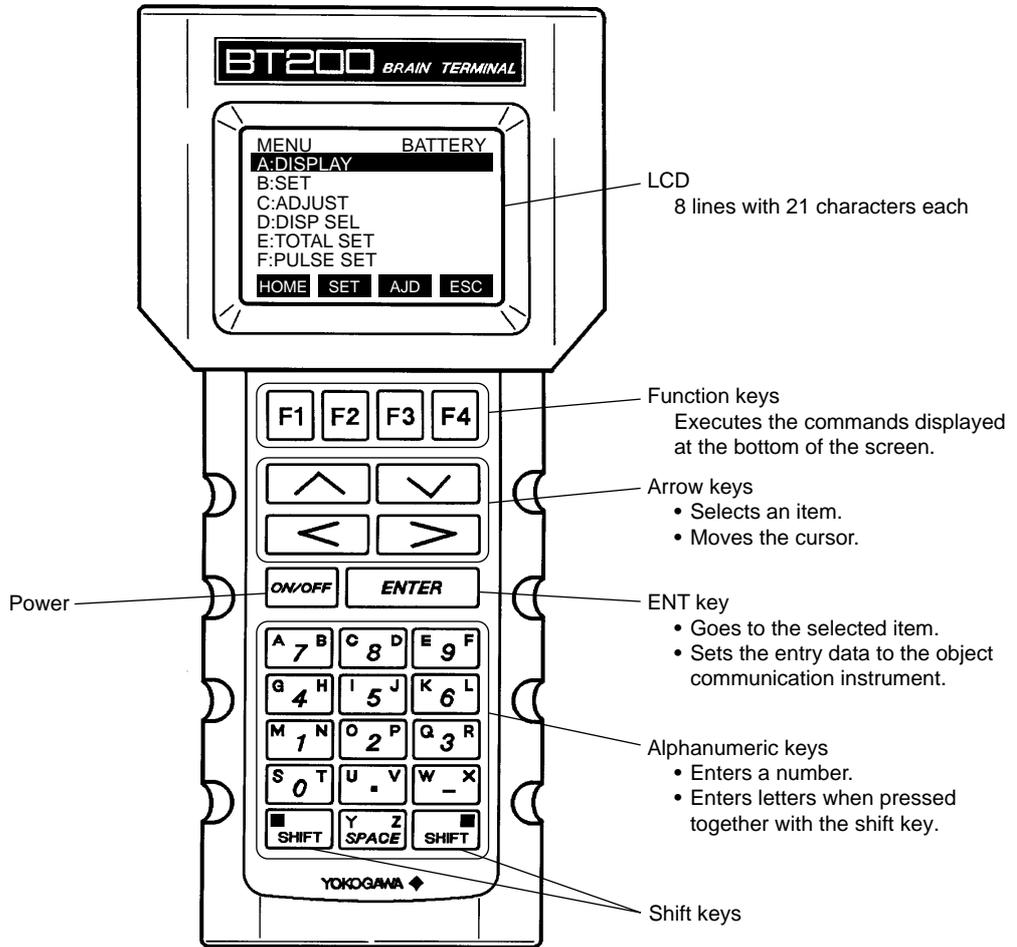


Figure 6.3 Key Layout and Functions

### 6.1.3 Major BT200 Key Functions

#### (1) Entry of Alphanumeric Characters

Numbers, codes and letters can be entered in combinations of the alphanumeric keys and the SHIFT key.

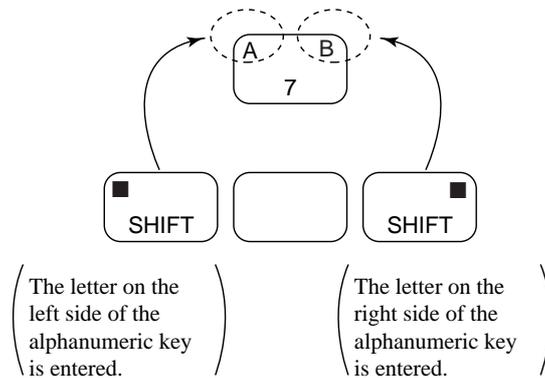
- **Entry of numbers, codes and a space (0 to 9, ., -, \_)**

Entering of them is possible by using the alphanumeric keys.

| Example of entry | Key Operation |
|------------------|---------------|
| -4.3             |               |
| 1_ -0.3          |               |

- **Entry of letters**

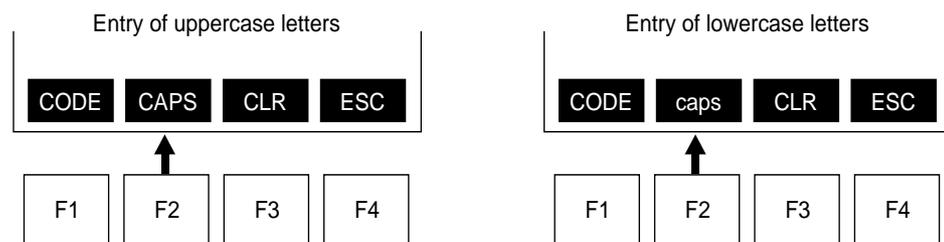
Press an alphanumeric key while one of the SHIFT keys is pressed and the letter on the same side of the key as the shift key that is pressed can be entered. Press the SHIFT key each time when entering a letter.



| Example of entry | Key operation |
|------------------|---------------|
| WIC              |               |
| J.B              |               |

- **Selection of uppercase / lowercase of letters**

Uppercase and lowercase letters can be selected alternately by pressing the function key [F2] (CAPS).

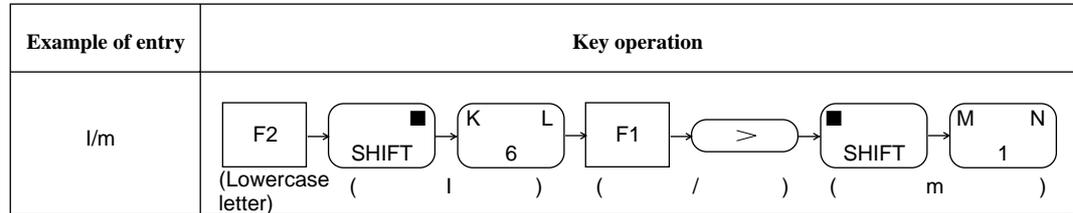


• **Entry of codes**

Codes can be entered by pressing the function key [F1] (CODE). Every time [F1] CODE is pressed, the codes are displayed at the cursor position in the order shown below.

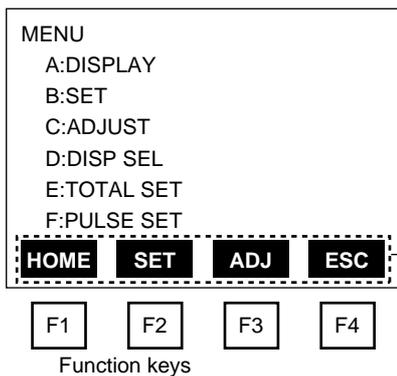
/ . - , + \* ) ( ' & % \$ # " !

To enter characters after the codes above, move the cursor using the [>] key before entry.



**(2) Function Keys**

The functions of the function keys vary with the commands being displayed on the display panel.

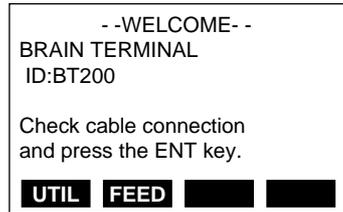


| Command   | Description   |
|-----------|---|
| ADJ       | Calls up the zero-adjustment menu.                                |
| CAPS/caps | Changes the uppercase / lowercase mode.                           |
| C LR      | Clears entered data /deletes all data.                            |
| CODE      | See the above “Entry of codes”                                    |
| COPY*     | Prints parameters on the screen.                                  |
| DATA      | Updates parameter data.   |
| DEL       | Deletes one character.  |
| DIAG      | Calls up the self-check screen.                                   |
| ESC       | Returns to the preceding screen.                                  |
| FEED*     | Paper feed.   |
| HOME      | Calls up the home menu (A : DISPLAY).                             |
| LIST*     | Prints all parameters of the menus.                               |
| NO        | Setting stop / re-setting. Returns to the previous screen         |
| OK        | Goes to the next screen.  |
| PARM      | Parameter number setting mode.                                    |
| PON/POFF* | Printer output of data whose setting was changed<br>Mode on / off |
| PRNT*     | Changes to the prints mode.                                       |
| SET       | Calls up the setting menu. (B : SETTING)                          |
| SLOT      | Returns to the slot selection screen.                             |
| GO*       | Starts print out.   |
| STOP*     | Stops printing.   |
| UTIL      | Transfers to the utility screen.                                  |

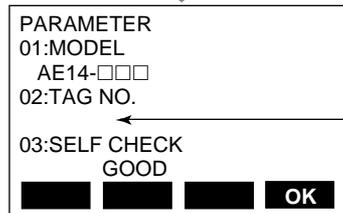
\*The command is available only for BT200-P00.

### 6.1.4 Displaying Flow Rate Data

Flow rate data can be displayed on the BT200 screen according to the following procedure.

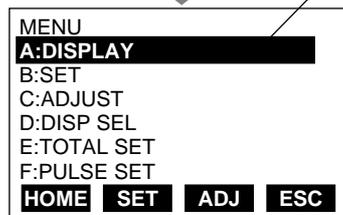


Turn the power on and the screen on the left appears after "please wait..." is displayed for a few seconds.



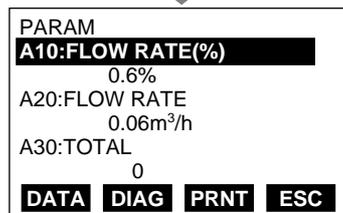
Pressing the ENTER key causes the initial data screen on the left to be displayed.

The tag number specified upon ordering is entered.

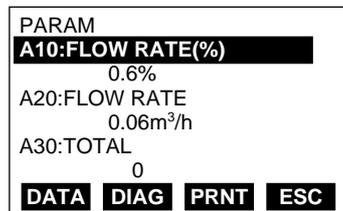


Inverse video bar

Pressing the F4 key or the ENTER key causes the menu screen on the left to be displayed.



- With "A : DISPLAY" displayed on the menu panel in the inverse video bar, press the ENTER key and the flow data screen appears.
- A maximum of three data items can be displayed on one screen.
- Data are communicated at an interval of 5 seconds. Thus, the data are updated every 5 seconds.
- The arrow keys, [^], [v] or [<], [>], are used for page feeds or item selection.



#### Execution of the function keys



- F1:** Updates the current data. Pressing this key causes forcible communication with the connected instruments and the data of the instruments are loaded to be read.
- F2:** Displays the self-check screen.
- F3:** Displays the parameter print screen.
- F4:** Returns to the previous panel (menu panel).

## 6.2 Setting Parameters

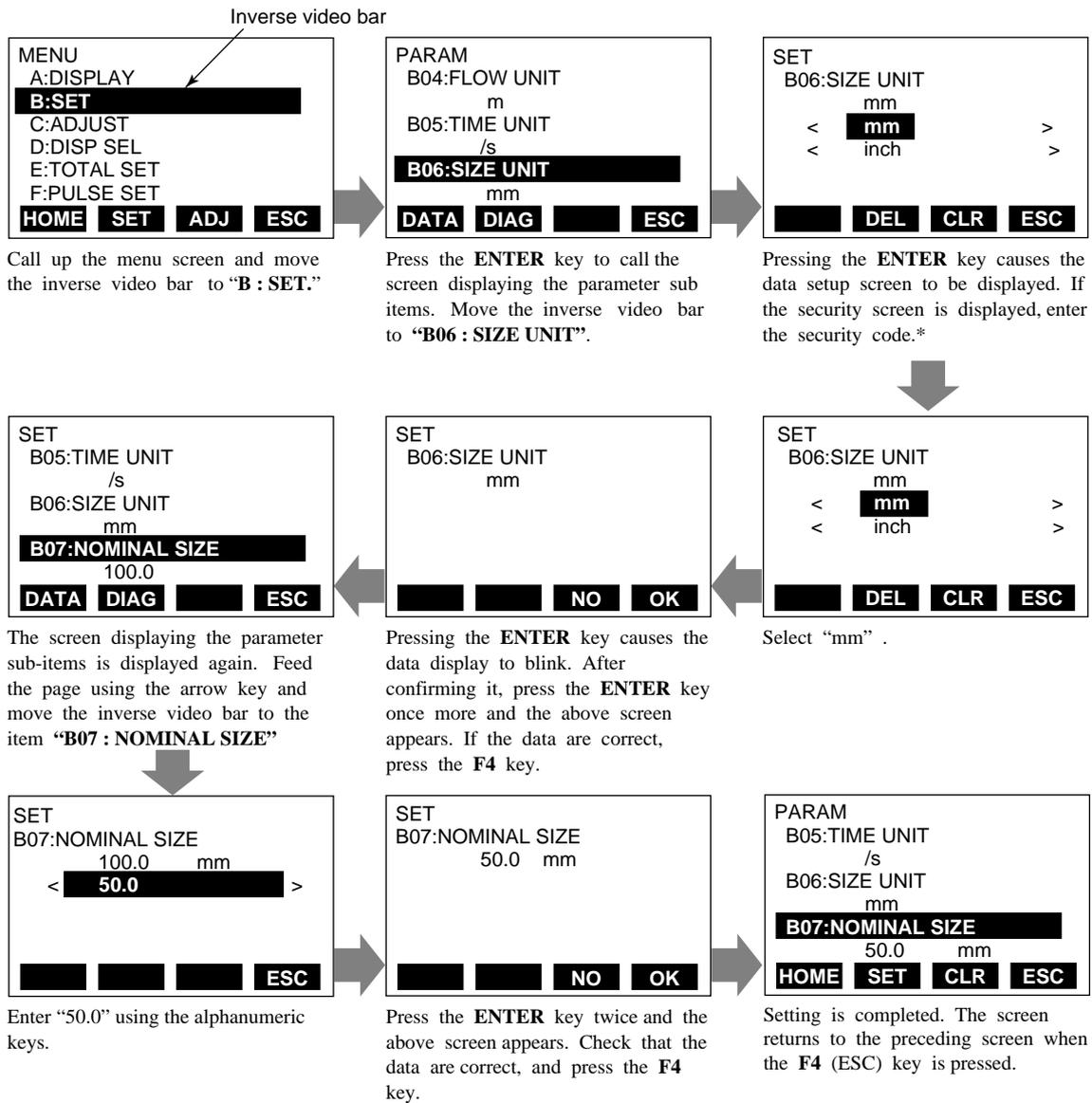


### NOTE

The three parameters must be set to obtain a connect signal. Nominal size, flow span and meter factor must be set.

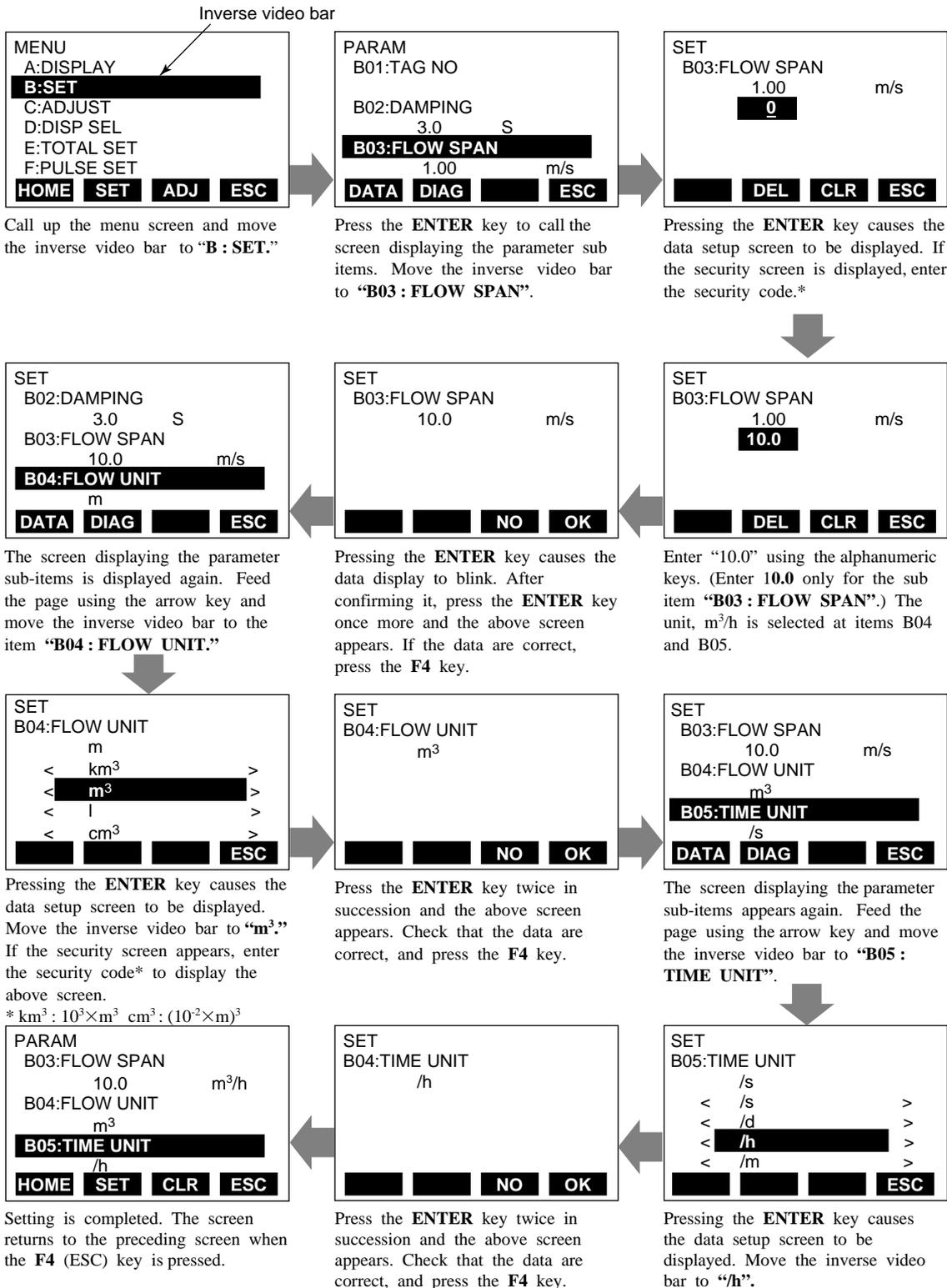
### 6.2.1 Setting Nominal Size

Example: flow tube size 50mm



### 6.2.2 Setting Flow Span Via the BT200

Example: Flow span 10.00 m<sup>3</sup>/h

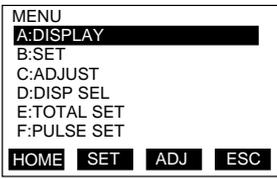
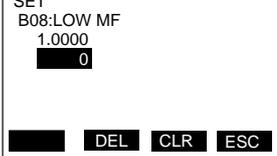
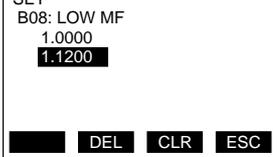
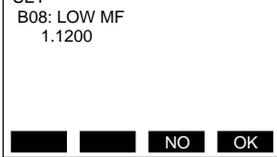


\*For entry of the security code, see IM 1C0A11-01E.

### 6.2.3 Setting Meter Factor

The meter factors are engraved on the data plate of the combined flow tube.

**Example: set " 1.1200" as meter factor(L).**

| Display  | Description   |
|--|---|
|  <p>MENU<br/>A:DISPLAY<br/>B:SET<br/>C:ADJUST<br/>D:DISP SEL<br/>E:TOTAL SET<br/>F:PULSE SET<br/>HOME SET ADJ ESC</p>     | <p>Call up the menu screen</p> <p>Use the arrow key to select "B:SET" with the arrow key and press the ENTER key.</p>   |
|  <p>PARAM<br/>B01:TAG NO<br/>B02:DAMPING<br/>3.0 s<br/>B03:FLOW SPAN<br/>1.00 m/s<br/>DATA DIAG ESC</p>                   | <p>Then, the parameter panel is displayed.</p>  |
|  <p>PARAM<br/>B06:SIZE UNIT<br/>mm<br/>B07:NOMINAL SIZE<br/>50.0mm<br/>B08:LOW MF<br/>1.0000<br/>DATA DIAG ESC</p>       | <p>Select "B08:LOW MF" by feeding the page with the arrow key and press ENTER key to call up the following data setup panel.</p>  |
|  <p>SET<br/>B08:LOW MF<br/>1.0000<br/>0<br/>DEL CLR ESC</p>   | <p>Press ENTER key on the parameter panel to display the data setup panel as shown on the left.<br/>(If the security panel appears, enter the security code.*)</p>                                      |
|  <p>SET<br/>B08:LOW MF<br/>1.0000<br/>1.1200<br/>DEL CLR ESC</p>  | <p>Set "1.1200" using the alphanumeric keys. Default:1.0000</p>   |
|  <p>SET<br/>B08:LOW MF<br/>1.1200<br/>NO OK</p>   | <p>Press ENTER key twice at an interval of a few seconds.<br/>The display as shown on the left appears.</p>   |
|  <p>PARAM<br/>B06:SIZE UNIT<br/>inch<br/>B07:NOMINAL SIZE<br/>2.00 inch<br/>B08:LOW MF<br/>1.1200<br/>DATA DIAG ESC</p> | <p>If the data is correct, press F4 key [OK].</p> <p>The parameter panel is displayed again.<br/>The setting is completed.</p> <p>Set meter factor(H) to parameter No B09.<br/>Set in the same way.</p> |

\* For entry of the security code, see IM1C0A11-01E.

### 6.2.4 Power Frequency


IMPORTANT
In case of DC power supply version, setting power frequency is required.

| Display  | Description   |
|--|---|
| <div style="border: 1px solid black; padding: 5px;">                     PARAM<br/> <b>B10:OUTPUT FUNC</b><br/>                     PULSE OUT<br/>                     B11:4-20ALM OUT<br/>                     2.4mA OR LESS<br/>                     B12:POWER FREQ<br/>                     50.03Hz<br/>                     DATA DIAG ESC                 </div> | Set value in areas where the frequency differs in "B12 : POWER FREQ".<br>Default:50.00Hz.<br>Setting Range : 47.00 to 53.00Hz |

### 6.2.5 Pulse Output (Refer to 5.5.1)

Example setting : 10 L output per pulse in a flow rate span of  $\square\square\square\text{ m}^3/\text{h}$

| Display  | Description   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
|--|---|------|-------------|-----------|----------------------------------|-----------|----------------------------------|--------------|------------------------------------|---------------|--------------------------------|-----------|---------------------------------|--------------|--------------------------------|-------|-------------------------------|----------|--|----------|--|----------|--|--------|---|----------|--|----------|--|----------|--|
| <div style="border: 1px solid black; padding: 5px;">                     PARAM<br/> <b>B10:OUTPUT FUNC</b><br/>                     PULSE OUT<br/>                     B11:4-20ALM OUT<br/>                     2.4mA OR LESS<br/>                     B12:POWER FREQ<br/>                     50.03Hz<br/>                     DATA DIAG ESC                 </div>         | The pulse output terminals (P+, P-) are also used for alarms. Select "Pulse output" in parameter number "B10". <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr><td>PULSE OUT</td><td>Pulse output</td></tr> <tr><td>ALARM OUT</td><td>Alarm output</td></tr> <tr><td>BI DIRECTION</td><td>Forward / reverse flow measurement</td></tr> <tr><td>AUTO 2 RANGES</td><td>Automatic two range switching</td></tr> <tr><td>LOW ALARM</td><td>Alarm output at low flow limits</td></tr> <tr><td>TOTAL SWTICH</td><td>Totalization switch</td></tr> </tbody> </table> Select the volume unit for the pulse weight in parameter number "B04". <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Volume unit</th> </tr> </thead> <tbody> <tr><td>n UNIT/P</td><td>Volume unit in that for the flow rate span <math>\times 10^9</math></td></tr> <tr><td>m UNIT/P</td><td>Volume unit in that for the flow rate span <math>\times 10^6</math></td></tr> <tr><td>M UNIT/P</td><td>Volume unit in that for the flow rate span <math>\times 10^3</math></td></tr> <tr><td>UNIT/P</td><td>Volume unit in that for the flow rate span <math>\times 1</math></td></tr> <tr><td>k UNIT/P</td><td>Volume unit in that for the flow rate span <math>\times 10^1</math></td></tr> <tr><td>M UNIT/P</td><td>Volume unit in that for the flow rate span <math>\times 10^2</math></td></tr> <tr><td>P ULSE/s</td><td>Number of pulses output per second at 100% of output</td></tr> </tbody> </table> Example) When pulses are to be output per same liter with the flow rate span of $\square\square\text{ m}^3/\text{h}$ , select "m UNIT/P" since a L(liter) = $10^{-3} \times \text{m}^3$ | Code | Content     | PULSE OUT | Pulse output                     | ALARM OUT | Alarm output                     | BI DIRECTION | Forward / reverse flow measurement | AUTO 2 RANGES | Automatic two range switching  | LOW ALARM | Alarm output at low flow limits | TOTAL SWTICH | Totalization switch            | Code  | Volume unit                   | n UNIT/P | Volume unit in that for the flow rate span $\times 10^9$ | m UNIT/P | Volume unit in that for the flow rate span $\times 10^6$ | M UNIT/P | Volume unit in that for the flow rate span $\times 10^3$ | UNIT/P | Volume unit in that for the flow rate span $\times 1$ | k UNIT/P | Volume unit in that for the flow rate span $\times 10^1$ | M UNIT/P | Volume unit in that for the flow rate span $\times 10^2$ | P ULSE/s | Number of pulses output per second at 100% of output |
| Code   | Content   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| PULSE OUT  | Pulse output  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| ALARM OUT  | Alarm output  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| BI DIRECTION   | Forward / reverse flow measurement  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| AUTO 2 RANGES  | Automatic two range switching   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| LOW ALARM  | Alarm output at low flow limits   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| TOTAL SWTICH   | Totalization switch   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| Code   | Volume unit   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| n UNIT/P   | Volume unit in that for the flow rate span $\times 10^9$  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| m UNIT/P   | Volume unit in that for the flow rate span $\times 10^6$  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| M UNIT/P   | Volume unit in that for the flow rate span $\times 10^3$  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| UNIT/P   | Volume unit in that for the flow rate span $\times 1$   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| k UNIT/P   | Volume unit in that for the flow rate span $\times 10^1$  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| M UNIT/P   | Volume unit in that for the flow rate span $\times 10^2$  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| P ULSE/s   | Number of pulses output per second at 100% of output  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| <div style="border: 1px solid black; padding: 5px;">                     PARAM<br/>                     F01:PULSE UNIT<br/>                     m UNIT/P<br/>                     F02:PULSE SCALE<br/>                     10 m UNIT/P<br/>                     F03:PULSE LOWCUT<br/>                     3. %<br/>                     DATA DIAG ESC                 </div> | Set the pulse weight "10 ( L )" in parameter number "F02". <p>*Since parameter number "F02" is a 5-digit data item, scrolling is necessary to display all the data. Mind the decimal point when setting are made. (The decimal point can be moved if required.)</p> Set the low cut range percentage in parameter "F03".<br>Range of setting : (0 to 100% of span)  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| <div style="border: 1px solid black; padding: 5px;">                     PALAM<br/>                     F02:PULSE UNIT<br/>                     10 m UNIT/P<br/>                     F03:PULSE LOWCUT<br/>                     3. %<br/>                     F04:PULSE WIDTH<br/>                     50% DUTY<br/>                     DATA DIAG ESC                 </div> | Select the pulse width in parameter number "F04" <table border="1" style="width: 100%; margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Pulse width</th> </tr> </thead> <tbody> <tr><td>50% DUTY</td><td>(Max. of 1000P/s Min. 0.0001P/s)</td></tr> <tr><td>0.5ms</td><td>(Max. of 1000P/s Min. 0.0001P/s)</td></tr> <tr><td>1ms</td><td>(Max. of 500P/s Min. 0.0001P/s)</td></tr> <tr><td>20ms</td><td>(Max. of 25P/s Min. 0.0001P/s)</td></tr> <tr><td>33ms</td><td>(Max. of 15P/s Min. 0.0001P/s)</td></tr> <tr><td>50ms</td><td>(Max. of 10P/s Min. 0.0001P/s)</td></tr> <tr><td>100ms</td><td>(Max. of 5P/s Min. 0.0001P/s)</td></tr> </tbody> </table>  | Code | Pulse width | 50% DUTY  | (Max. of 1000P/s Min. 0.0001P/s) | 0.5ms     | (Max. of 1000P/s Min. 0.0001P/s) | 1ms          | (Max. of 500P/s Min. 0.0001P/s)    | 20ms          | (Max. of 25P/s Min. 0.0001P/s) | 33ms      | (Max. of 15P/s Min. 0.0001P/s)  | 50ms         | (Max. of 10P/s Min. 0.0001P/s) | 100ms | (Max. of 5P/s Min. 0.0001P/s) |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| Code   | Pulse width   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| 50% DUTY   | (Max. of 1000P/s Min. 0.0001P/s)  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| 0.5ms  | (Max. of 1000P/s Min. 0.0001P/s)  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| 1ms  | (Max. of 500P/s Min. 0.0001P/s)   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| 20ms   | (Max. of 25P/s Min. 0.0001P/s)  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| 33ms   | (Max. of 15P/s Min. 0.0001P/s)  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| 50ms   | (Max. of 10P/s Min. 0.0001P/s)  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| 100ms  | (Max. of 5P/s Min. 0.0001P/s)   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| Normally, these are all required settings.<br>The following settings are made depending on the application that is used.   |   |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |
| <div style="border: 1px solid black; padding: 5px;">                     PARAM<br/>                     N01:TOTAL/PULSE<br/>                     DAMP<br/>                     N02:OUTPUT MODE<br/>                     ON<br/>                     N03:RATE LIMIT<br/>                     5. %<br/>                     DATA DIAG ESC                 </div>               | Select instantaneous flow rate or flow rate after damping data for the pulse output.<br>(The damping time value is the value set in "B02")<br>Default : DAMP <p>Set parameter "N02" to "OFF" when the pulse output transistor is to be off active.</p>  |      |             |           |                                  |           |                                  |              |                                    |               |                                |           |                                 |              |                                |       |                               |          |  |          |  |          |  |        |   |          |  |          |  |          |  |

\* The "N" item can be opened by entering "55" in parameter number "L02".

### 6.2.6 Display of Internal Totalization Values (Refer to 5.5.2)

Example : 10 L output per pulse in a flow rate span of  $\square\square\square\text{ m}^3/\text{h}$

| Display  | Description  |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
|--|--|------|-------------|----------|--|--------------|--|----------|--|--------|--|----------|---|----------|---|---------|---|
| <pre> PARAM E01:TOTAL UNIT       m UNIT/P ← E02:TOTAL SCALE       10 m UNIT/P ← E03:TOTAL LOWCUT       3. % ← [DATA] [DIAG] [ ] [ESC]           </pre> | <p>Select the volume unit for the pulse weight in parameter number "E01."</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Volume unit</th> </tr> </thead> <tbody> <tr> <td>n UNIT/P</td> <td>Volume unit used in that for the flow rate span <math>\times 10^{-9}</math></td> </tr> <tr> <td><math>\mu</math> UNIT/P</td> <td>Volume unit used in that for the flow rate span <math>\times 10^{-6}</math></td> </tr> <tr> <td>m UNIT/P</td> <td>Volume unit used in that for the flow rate span <math>\times 10^{-3}</math></td> </tr> <tr> <td>UNIT/P</td> <td>Volume unit used in that for the flow rate span <math>\times 1</math></td> </tr> <tr> <td>k UNIT/P</td> <td>Volume unit used in that for the flow rate span <math>\times 10^3</math></td> </tr> <tr> <td>M UNIT/P</td> <td>Volume unit used in that for the flow rate span <math>\times 10^6</math></td> </tr> <tr> <td>PULSE/s</td> <td>Number of pulse output per second at 100% of output</td> </tr> </tbody> </table> <p>Example) When pulses are to be output per same liter with the flow rate span of <math>\square\square\text{m}^3/\text{h}</math>, select "m UNIT/P" since a L(liter) = <math>10^{-3}\times\text{m}^3</math></p> | Code | Volume unit | n UNIT/P | Volume unit used in that for the flow rate span $\times 10^{-9}$ | $\mu$ UNIT/P | Volume unit used in that for the flow rate span $\times 10^{-6}$ | m UNIT/P | Volume unit used in that for the flow rate span $\times 10^{-3}$ | UNIT/P | Volume unit used in that for the flow rate span $\times 1$ | k UNIT/P | Volume unit used in that for the flow rate span $\times 10^3$ | M UNIT/P | Volume unit used in that for the flow rate span $\times 10^6$ | PULSE/s | Number of pulse output per second at 100% of output |
| Code   | Volume unit  |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| n UNIT/P   | Volume unit used in that for the flow rate span $\times 10^{-9}$   |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| $\mu$ UNIT/P   | Volume unit used in that for the flow rate span $\times 10^{-6}$   |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| m UNIT/P   | Volume unit used in that for the flow rate span $\times 10^{-3}$   |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| UNIT/P   | Volume unit used in that for the flow rate span $\times 1$   |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| k UNIT/P   | Volume unit used in that for the flow rate span $\times 10^3$  |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| M UNIT/P   | Volume unit used in that for the flow rate span $\times 10^6$  |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| PULSE/s  | Number of pulse output per second at 100% of output  |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| <pre> PARAM NO1:TOTAL/PULSE       DAMP ← NO2:OUTPUT MODE       ON NO3:RATE LIMIT       5. % [DATA] [DIAG] [ ] [ESC]           </pre>                   | <p>Set the pulse weight "10(L)" in parameter number "E02."</p> <p>Set the low cut range percentage in parameter "E03."<br/>Range of setting : (0 to 100% of span)</p>  |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |
| <pre> PARAM NO1:TOTAL/PULSE       DAMP ← NO2:OUTPUT MODE       ON NO3:RATE LIMIT       5. % [DATA] [DIAG] [ ] [ESC]           </pre>                   | <p>Select instantaneous flow rate or flow rate after damping for the pulse output.<br/>(The damping time value is the value set in "B02."<br/>Default : DAMP (damped flow rate data)</p>   |      |             |          |  |              |  |          |  |        |  |          |   |          |   |         |   |

\* The "N" item can be opened by entering "55" in parameter number "L02".

### 6.2.7 Resetting for Totalization Display (Refer to 5.5.3)

| Display  | Description  |      |             |        |                                 |         |                                 |
|--|--|------|-------------|--------|---------------------------------|---------|---------------------------------|
| <pre> PARAM E04:TOTAL SET       ENABLE ← E05:TL SET VALUE       0 ← E10:TOTAL SWITCH       0 [DATA] [DIAG] [ ] [ESC]           </pre>  | <p>Select totalization enable in parameter number "E04."</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>ENABLE</td> <td>Totalization presetting enabled</td> </tr> <tr> <td>INHIBIT</td> <td>Totalization presetting inhibit</td> </tr> </tbody> </table>                          | Code | Description | ENABLE | Totalization presetting enabled | INHIBIT | Totalization presetting inhibit |
| Code   | Description  |      |             |        |                                 |         |                                 |
| ENABLE   | Totalization presetting enabled  |      |             |        |                                 |         |                                 |
| INHIBIT  | Totalization presetting inhibit  |      |             |        |                                 |         |                                 |
| <pre> PARAM A10:FLOW RATE(%)       50.0 % A20:FLOW RATE       50.0 m³/h A30:TOTAL       12345 [DATA] [DIAG] [PRNT] [ESC]           </pre> <p style="text-align: center;">↓</p> <pre> SETTING A30:TOTAL       0 [ ] [ ] [CLR] [ESC]           </pre> <p style="text-align: center;">ENTER</p> | <p>Set the totalization preset value in parameter number "E05."<br/>The default is 0 and if the setting is omitted, the parameter functions reset to 0.</p> <p>If the ENT key is pressed twice while "A30:TOTAL" is displayed on the setting screen, the totalization value (A30:TOTAL) will be replaced with the values set in "E05."</p> |      |             |        |                                 |         |                                 |

### 6.2.8 Damping Time Constant (Refer to 5.5.4)

| Display  | Description   |
|--|---|
| <pre> PARAM B01:TAG NO B02:DAMPING   3.0      s B03:FLOW SPAN   1.00    m/s DATA  DIAG  ESC                     </pre> | <p>Set the value in parameter number "B02."<br/>Setting Range : 0.1 to 200.0 seconds.</p> |

### 6.2.9 Current Output during Alarm Occurrence (Refer to 5.5.5)

| Display  | Description  |      |         |               |                |       |        |      |  |                |                 |
|--|--|------|---------|---------------|----------------|-------|--------|------|--|----------------|-----------------|
| <pre> PARAM B10:OUTPUT FUNC PULSE OUT B11:4-20 ALM OUT   2.4mA OR LESS B12:POWER FREQ   50.03Hz DATA  DIAG  ESC                     </pre> | <p>Set the value for current output to be used during alarms in parameter "B11."<br/>(Default : 2.4 mA or less)</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>2.4mA OR LESS</td> <td>2.4 mA or less</td> </tr> <tr> <td>4.0mA</td> <td>4.0 mA</td> </tr> <tr> <td>HOLD</td> <td>Fixed to output when alarm is generated.</td> </tr> <tr> <td>21.6mA OR MORE</td> <td>21.6 mA or more</td> </tr> </tbody> </table> | Code | Content | 2.4mA OR LESS | 2.4 mA or less | 4.0mA | 4.0 mA | HOLD | Fixed to output when alarm is generated. | 21.6mA OR MORE | 21.6 mA or more |
| Code   | Content  |      |         |               |                |       |        |      |  |                |                 |
| 2.4mA OR LESS  | 2.4 mA or less   |      |         |               |                |       |        |      |  |                |                 |
| 4.0mA  | 4.0 mA   |      |         |               |                |       |        |      |  |                |                 |
| HOLD   | Fixed to output when alarm is generated.   |      |         |               |                |       |        |      |  |                |                 |
| 21.6mA OR MORE   | 21.6 mA or more  |      |         |               |                |       |        |      |  |                |                 |

### 6.2.10 Reversing Flow Direction(Refer to 5.5.6)

| Display  | Description  |      |             |         |                   |         |                                 |
|--|--|------|-------------|---------|-------------------|---------|---------------------------------|
| <pre> PARAM B13:VELOCITY CHK   5 m/s B14:FLOW DIR   REVERSE B60:SELF CHECK   GOOD m/s DATA  DIAG  ESC                     </pre> | <p>The flow direction can be set in parameter number "B14"</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>FORWARD</td> <td>Forward direction</td> </tr> <tr> <td>REVERSE</td> <td>Reverse direction to flow arrow</td> </tr> </tbody> </table> | Code | Description | FORWARD | Forward direction | REVERSE | Reverse direction to flow arrow |
| Code   | Description  |      |             |         |                   |         |                                 |
| FORWARD  | Forward direction  |      |             |         |                   |         |                                 |
| REVERSE  | Reverse direction to flow arrow  |      |             |         |                   |         |                                 |

### 6.2.11 Limiting Current Output (Refer to 5.5.7)

#### (1) 4 to 20 mA low cut output (Current Output near by 0% Range)

| Display  | Description  |
|--|--|
| <pre> PARAM G01:4-20 LOW CUT   10 % G02:4-20 LOW LMT   -20 % G03:4-20 H LMT   120 % DATA  DIAG  ESC                     </pre> | <p>Setting range : 0 to 10% Default:0% Hysteresis:1% fixed</p> |

(2) 4 to 20 mA Low Limit

| Display  | Description   |
|--|---|
| <pre> PARAM G01:4-20 LOW CUT   0 % <b>G02:4-20 LOW LMT</b>   10 % ← G03:4-20 H LMT   110 % <b>DATA</b> <b>DIAG</b> <b>ESC</b>                     </pre> | <p>Setting Range : -20 to 100%<br/>Default : -20%</p> |

(3) 4 to 20 mA High Limit

| Display   | Description   |
|---|---|
| <pre> PARAM G01:4-20 LOW CUT   0 % G02:4-20 LOW LMT  -20 % <b>G03:4-20 H LMT</b>   90 % ← <b>DATA</b> <b>DIAG</b> <b>ESC</b>                     </pre> | <p>Setting range : 0 to 120%<br/>Default : 120%</p> |

6.2.12 Forward and Reverse Flow Measurement (Refer to 5.5.8)

| Display   | Description   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
|---|---|------|---------|-----------|--------------|-----------|--------------|--------------|------------------------------------|---------------|-------------------------------|-----------|---------------------------------|--------------|---------------------|
| <pre> PARAM B09:HIGH MF   1.0000 <b>B10:OUTPUT FUNC</b>   BI DIRECTION ← B11:4-20 ALM OUT   2.4mA OR LESS <b>DATA</b> <b>DIAG</b> <b>ESC</b>                     </pre> | <p>Select "BI DIRECTION" (Direct / reverse flow measuring mode) in parameter number "B10".</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>PULSE OUT</td> <td>Pulse output</td> </tr> <tr> <td>ALARM OUT</td> <td>Alarm output</td> </tr> <tr> <td>BI DIRECTION</td> <td>Forward / reverse flow measurement</td> </tr> <tr> <td>AUTO 2 RANGES</td> <td>Automatic two range switching</td> </tr> <tr> <td>LOW ALARM</td> <td>Alarm output at low flow limits</td> </tr> <tr> <td>TOTAL SWTICH</td> <td>Totalization switch</td> </tr> </tbody> </table> | Code | Content | PULSE OUT | Pulse output | ALARM OUT | Alarm output | BI DIRECTION | Forward / reverse flow measurement | AUTO 2 RANGES | Automatic two range switching | LOW ALARM | Alarm output at low flow limits | TOTAL SWTICH | Totalization switch |
| Code  | Content   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| PULSE OUT   | Pulse output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| ALARM OUT   | Alarm output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| BI DIRECTION  | Forward / reverse flow measurement  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| AUTO 2 RANGES   | Automatic two range switching   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| LOW ALARM   | Alarm output at low flow limits   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| TOTAL SWTICH  | Totalization switch   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| <pre> PARAM B30 :REV. SPAN   □□□   ← B31 :BI. DIREC HYS   □□   ← B33 :FOR. SPAN2   □□□ <b>DATA</b> <b>DIAG</b> <b>ESC</b>                     </pre>                    | <p>Reverse direction span can be set in parameter No."B30".<br/>Flow rate unit is the same as forward direction span.</p> <p>Further reverse range span should be set in the same number of places of decimals as forward range span.<br/>Example: forward flow rate : 1.000 then reverse flow rate should be 4.000.</p> <p>Hysteresis width at switching direction can be set in parameter No."B31".<br/>It is the rate(%) of the smaller span, either forward or reverse span.</p>  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |

### 6.2.13 Automatic Two Range Switching (Refer to 5.5.9)

| Display  | Description   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
|--|---|------|---------|-----------|--------------|-----------|--------------|--------------|------------------------------------|---------------|-------------------------------|-----------|---------------------------------|--------------|---------------------|
| <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">                     PARAM<br/>                     B09:HIGH MF<br/>                     1.0000<br/> <b>B10:OUTPUT FUNC</b><br/>                     AUTO 2 RANGES ←<br/>                     B11:4-20 ALM OUT<br/>                     2.4mA OR LESS<br/> <b>DATA</b> <b>DIAG</b> <b>ESC</b> </div> <div style="border: 1px solid black; padding: 5px;">                     PARAM<br/>                     B31:BI DIREC HYS<br/>                     □□<br/>                     B33:FOR. SPAN2<br/>                     □□□ ←<br/>                     B34:AUTO RNG HYS<br/>                     □□ ←<br/> <b>DATA</b> <b>DIAG</b> <b>ESC</b> </div> | <p>Select "AUTO 2 RANGES" (Automatic two range transfer) in parameter number "B10".</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>PULSE OUT</td> <td>Pulse output</td> </tr> <tr> <td>ALARM OUT</td> <td>Alarm output</td> </tr> <tr> <td>BI DIRECTION</td> <td>Forward / reverse flow measurement</td> </tr> <tr> <td>AUTO 2 RANGES</td> <td>Automatic two range switching</td> </tr> <tr> <td>LOW ALARM</td> <td>Alarm output at low flow limits</td> </tr> <tr> <td>TOTAL SWTICH</td> <td>Totalization switch</td> </tr> </tbody> </table> <p>Forward second range can be set by calling up parameter No. "B33".<br/>Setting restrictions: First range ≤ 2nd range.</p> <p>Further second range span should be set in the same number of places of decimals as first range span in parameter No. "B03".<br/>Example: First range : 1.000 then second range should be 4.000</p> <p>Hysteresis width at switching range can be set in parameter No. "B34".<br/>It is the rate (%) of first range span.</p> | Code | Content | PULSE OUT | Pulse output | ALARM OUT | Alarm output | BI DIRECTION | Forward / reverse flow measurement | AUTO 2 RANGES | Automatic two range switching | LOW ALARM | Alarm output at low flow limits | TOTAL SWTICH | Totalization switch |
| Code   | Content   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| PULSE OUT  | Pulse output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| ALARM OUT  | Alarm output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| BI DIRECTION   | Forward / reverse flow measurement  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| AUTO 2 RANGES  | Automatic two range switching   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| LOW ALARM  | Alarm output at low flow limits   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| TOTAL SWTICH   | Totalization switch   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |

### 6.2.14 Alarm Output at Low Flow Limits (Flow Switch) (Refer to 5.5.10)

| Display  | Description   |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |
|--|---|------|---------|-----------|--------------|-----------|--------------|--------------|-----------------------------------|---------------|------------------------------|-----------|---------------------------------|--------------|---------------------|
| <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">                     PARAM<br/>                     B09:HIGH MF<br/>                     1.0000<br/> <b>B10:OUTPUT FUNC</b><br/>                     LOW ALARM ←<br/>                     B11:4-20 ALM OUT<br/>                     2.4mA OR LESS<br/> <b>DATA</b> <b>DIAG</b> <b>ESC</b> </div> <div style="border: 1px solid black; padding: 5px;">                     PARAM<br/>                     B34:AUTO RNG HYS<br/>                     □□<br/>                     B36:LOW ALARM<br/>                     □□ ←<br/>                     B37:L. ALARM HYS<br/>                     □□ ←<br/> <b>DATA</b> <b>DIAG</b> <b>ESC</b> </div> | <p>Select "LOW ALARM" (Alarm output at low flow limits) in parameter number "B10".</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>PULSE OUT</td> <td>Pulse output</td> </tr> <tr> <td>ALARM OUT</td> <td>Alarm output</td> </tr> <tr> <td>BI DIRECTION</td> <td>Direct / reverse flow measurement</td> </tr> <tr> <td>AUTO 2 RANGES</td> <td>Automatic two range transfer</td> </tr> <tr> <td>LOW ALARM</td> <td>Alarm output at low flow limits</td> </tr> <tr> <td>TOTAL SWTICH</td> <td>Totalization switch</td> </tr> </tbody> </table> <p>Set the comparison level in parameter number "B36".</p> <p>Set the hysteresis in parameter "B37".</p> | Code | Content | PULSE OUT | Pulse output | ALARM OUT | Alarm output | BI DIRECTION | Direct / reverse flow measurement | AUTO 2 RANGES | Automatic two range transfer | LOW ALARM | Alarm output at low flow limits | TOTAL SWTICH | Totalization switch |
| Code   | Content   |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |
| PULSE OUT  | Pulse output  |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |
| ALARM OUT  | Alarm output  |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |
| BI DIRECTION   | Direct / reverse flow measurement   |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |
| AUTO 2 RANGES  | Automatic two range transfer  |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |
| LOW ALARM  | Alarm output at low flow limits   |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |
| TOTAL SWTICH   | Totalization switch   |      |         |           |              |           |              |              |                                   |               |                              |           |                                 |              |                     |

### 6.2.15 Totalization Switch Output (Refer to 5.5.11)

| Display   | Description   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
|---|---|------|---------|-----------|--------------|-----------|--------------|--------------|------------------------------------|---------------|-------------------------------|-----------|---------------------------------|--------------|---------------------|
| <pre> PARAM B09:HIGH MF 1.0000 <b>B10:OUTPUT FUNC</b> TOTAL SWITCH ← B11:4-20 ALM OUT 2.4mA OR LESS <b>DATA</b> <b>DIAG</b> <b>ESC</b>                 </pre> | <p>Select "TOTAL SWITCH" (Totalization Switch) in parameter number "B10"</p> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width:30%; text-align: center;">Code</th> <th style="text-align: center;">Content</th> </tr> </thead> <tbody> <tr><td>PULSE OUT</td><td>Pulse output</td></tr> <tr><td>ALARM OUT</td><td>Alarm output</td></tr> <tr><td>BI DIRECTION</td><td>Forward / reverse flow measurement</td></tr> <tr><td>AUTO 2 RANGES</td><td>Automatic two range switching</td></tr> <tr><td>LOW ALARM</td><td>Alarm output at low flow limits</td></tr> <tr><td>TOTAL SWTICH</td><td>Totalization switch</td></tr> </tbody> </table> | Code | Content | PULSE OUT | Pulse output | ALARM OUT | Alarm output | BI DIRECTION | Forward / reverse flow measurement | AUTO 2 RANGES | Automatic two range switching | LOW ALARM | Alarm output at low flow limits | TOTAL SWTICH | Totalization switch |
| Code  | Content   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| PULSE OUT   | Pulse output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| ALARM OUT   | Alarm output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| BI DIRECTION  | Forward / reverse flow measurement  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| AUTO 2 RANGES   | Automatic two range switching   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| LOW ALARM   | Alarm output at low flow limits   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| TOTAL SWTICH  | Totalization switch   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| <pre> PARAM E05 :TL SET VALUE □□□ E06 :TOTAL SWITCH □□□□ ← E10 :TL USER UNIT □□ <b>DATA</b> <b>DIAG</b> <b>ESC</b>                 </pre>                     | <p>Set the switch level in parameter number "E6".</p>   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |

### 6.2.16 Alarm Output (Refer to 5.5.12)

| Display  | Description   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
|--|---|------|---------|-----------|--------------|-----------|--------------|--------------|------------------------------------|---------------|-------------------------------|-----------|---------------------------------|--------------|---------------------|
| <pre> PARAM <b>B10:OUTPUT FUNC</b> ALARM OUT ← B11:4-20 ALM OUT 2.4mA OR LESS B12:POWER FREQ 50.03Hz <b>DATA</b> <b>DIAG</b> <b>ESC</b>                 </pre> | <p>Set "ALARM" in parameter number "B10" to use the P+ and P- terminals for alarm output only.</p> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width:30%; text-align: center;">Code</th> <th style="text-align: center;">Content</th> </tr> </thead> <tbody> <tr><td>PULSE OUT</td><td>Pulse output</td></tr> <tr><td>ALARM OUT</td><td>Alarm output</td></tr> <tr><td>BI DIRECTION</td><td>Forward / reverse flow measurement</td></tr> <tr><td>AUTO 2 RANGES</td><td>Automatic two range switching</td></tr> <tr><td>LOW ALARM</td><td>Alarm output at low flow limits</td></tr> <tr><td>TOTAL SWTICH</td><td>Totalization switch</td></tr> </tbody> </table> | Code | Content | PULSE OUT | Pulse output | ALARM OUT | Alarm output | BI DIRECTION | Forward / reverse flow measurement | AUTO 2 RANGES | Automatic two range switching | LOW ALARM | Alarm output at low flow limits | TOTAL SWTICH | Totalization switch |
| Code   | Content   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| PULSE OUT  | Pulse output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| ALARM OUT  | Alarm output  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| BI DIRECTION   | Forward / reverse flow measurement  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| AUTO 2 RANGES  | Automatic two range switching   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| LOW ALARM  | Alarm output at low flow limits   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| TOTAL SWTICH   | Totalization switch   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| <pre> PARAM N06 :PULSING FLOW NO <b>N07 :EMPTY PIPE</b> ALARM ← N60 :SELF CHECK GOOD <b>DATA</b> <b>DIAG</b> <b>ESC</b>                 </pre>                 | <p>Select whether an empty pipe alarm is to be performed or not in parameter number "N07."</p> <table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="width:30%; text-align: center;">Code</th> <th style="text-align: center;">Content</th> </tr> </thead> <tbody> <tr><td>ALARM</td><td>ALARM</td></tr> <tr><td>NO ALARM</td><td>NO ALARM</td></tr> </tbody> </table>  | Code | Content | ALARM     | ALARM        | NO ALARM  | NO ALARM     |              |                                    |               |                               |           |                                 |              |                     |
| Code   | Content   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| ALARM  | ALARM   |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |
| NO ALARM   | NO ALARM  |      |         |           |              |           |              |              |                                    |               |                               |           |                                 |              |                     |

\* The "N" item can be opened by entering "55" in parameter number "L02".

### 6.2.17 Data Setting Enable / Inhibit (Refer to 5.5.13)

- This function makes it possible to inhibit all data changes (except L1). However, automatic zero adjustment can be made if the automatic zero-adjustment function is enabled (set in C1). Also, totalization presetting can be done if the totalization presetting function is enabled (set in E4).

| Display  | Description   |      |         |        |                       |         |                       |
|--|---|------|---------|--------|-----------------------|---------|-----------------------|
| <pre> PARAM L01:TUNING   INHIBIT ← L02:KEY   00 L60:SELF CHECK   GOOD DATA  DIAG  ESC                     </pre> | <p>Selecting "INHIBIT" in parameter number "L01" disables data setting.</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>ENABLE</td> <td>Data setting enabled.</td> </tr> <tr> <td>INHIBIT</td> <td>Data setting inhibit.</td> </tr> </tbody> </table> <p>← Default</p> | Code | Content | ENABLE | Data setting enabled. | INHIBIT | Data setting inhibit. |
| Code   | Content   |      |         |        |                       |         |                       |
| ENABLE   | Data setting enabled.   |      |         |        |                       |         |                       |
| INHIBIT  | Data setting inhibit.   |      |         |        |                       |         |                       |

### 6.2.18 Procedure of Selecting Special Application Items (Refer to 5.5.14)

| Display  | Description   |      |         |    |                               |    |                               |
|--|---|------|---------|----|-------------------------------|----|-------------------------------|
| <pre> PARAM L01:TUNING   INHIBIT L02:KEY   55 ← L60:SELF CHECK   GOOD DATA  DIAG  ESC                     </pre> | <p>It is possible to open up to item N when "55" is entered in parameter number "L02."</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Accessible up to L parameters</td> </tr> <tr> <td>55</td> <td>Accessible up to n parameters</td> </tr> </tbody> </table> <p>← Default</p> | Code | Content | 00 | Accessible up to L parameters | 55 | Accessible up to n parameters |
| Code   | Content   |      |         |    |                               |    |                               |
| 00   | Accessible up to L parameters   |      |         |    |                               |    |                               |
| 55   | Accessible up to n parameters   |      |         |    |                               |    |                               |

### 6.2.19 Rate Limit (Refer to 5.5.15)

| Display   | Description   |
|---|---|
| <pre> PARAM N03:RATE LIMIT   5 % ← N04:DEAD TIME   0 s ← N05:POWER SYNCH   YES DATA  DIAG  ESC                     </pre> | <p>Set the rate limit value in parameter number "N03." Range of possible settings : 0 to 10%.</p> <p>Set the dead time in parameter number "N04." Range of possible settings : 0 to 15 seconds. Default : 0 (Rate limit function off)</p> |

### 6.2.20 Pulsating Flow (Refer to 5.5.16)

| Display   | Description   |      |         |    |        |     |                              |
|---|---|------|---------|----|--------|-----|------------------------------|
| <pre> PARAM N04:DEAD TIME   0 N05:POWER SYNCH   YES N06:PULSING FLOW   YES ← DATA  DIAG  ESC                     </pre> | <p>Select "YES" (pulsating flow counteraction) in parameter number "N06". (Default : NO)</p> <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>NO</td> <td>Normal</td> </tr> <tr> <td>YES</td> <td>Counteracting pulsating flow</td> </tr> </tbody> </table> | Code | Content | NO | Normal | YES | Counteracting pulsating flow |
| Code  | Content   |      |         |    |        |     |                              |
| NO  | Normal  |      |         |    |        |     |                              |
| YES   | Counteracting pulsating flow  |      |         |    |        |     |                              |

### 6.2.21 User-Defined Units Via the BT200

This function displays the instantaneous flow rate indicated in "A20 FLOW RATE" in units other than those selectable with B04. If the specific gravity of the fluid is known, the instantaneous flow rate can be displayed in weight units.

#### (1) User-Defined Units for Instantaneous Flow Rate

Example : Displaying the flow rate of a fluid (its specific gravity is 2) in weight (kg) in a flow rate span of 10m<sup>3</sup>/h. When the flow rate is 100%, 20,000kg is displayed.

| Display   | Description  |
|---|--|
| <pre>PARAM D02:FL USER SEL   PROVIDED ← D03:FL USER SPAN   20000.0 ← D10:FL USER UNIT   kg/h ← DATA  DIAG  [ ]  ESC</pre> | <p>Select "PROVIDED" in "D02."</p> <p>For item "D03," set the value to be displayed in "A20 FLOW RATE" when the flow rate is 100% in the span set in "B03FLOW SPAN." Set the unit in "D10".</p> <p>Set the user-defined unit in "D10."</p> |
|    |  |
| <pre>PARAM A10:FLOW RATE(%)   100.0% A20:FLOW RATE   20000.0   kg/h ← A30:TOTAL   12345 DATA  DIAG  [ ]  ESC</pre>        | <p>The instantaneous flow rate in user-defined unit can be displayed in "A20 : FLOWRATE."</p>  |

#### (2) User-Defined Units for Totalization Values

User-defined unit can be added to the totalization display in "A30 TOTAL".

| Display   | Description  |
|---|--|
| <pre>PARAM E04:TOTAL SET   INHIBIT E05:TL SET VALUE   0 E10:TL USER UNIT   hhh ← DATA  DIAG  [ ]  ESC</pre>             | <p>Set the user-defined unit in the item "E10."</p>                                  |
|                                      |  |
| <pre>PARAM A10:FLOW RATE(%)   100.0% A20:FLOW RATE   40000.0   kg/h A30:TOTAL   12345   hhh ← DATA  [ ]  CLR  ESC</pre> | <p>The totalization value in user-defined unit can be displayed in "A30 TOTAL" .</p> |

## 6.2.22 Other Important Points to Note

- (1) The automatic power-off function turns the terminal off automatically if no key is pressed for about 5 minutes or more. However, this function does not operate when the terminal is displaying the variables in (2) below.
- (2) When A10 FLOW RATE (%) or A20 FLOW RATE is displayed, data are updated every 5 seconds.
- (3) UPLD is used when the parameters of one ADMAG AE are copied to the BT and DNLD is used when the parameters copied to the BT are copied to another ADMAG AE. (For details, see the "BT200 Instruction Manual " (IM 1C0A11-01E). Parameters that can be copied include span and pulse factor parameters such as the following:

B02 DAMPING, B03 FLOW SPAN, B04 FLOW UNIT, B05 TIME UNIT  
B06 SIZE UNIT, B07 NOMINAL SIZE, B10 OUTPUT FUNC, B11 4-20 ALM OUT  
D01 DISP SELECT, D02 FL USER SEL, D03 FL USER SPAN, D10 FL  
USERUNIT, E01 TOTAL UNIT, E02 TOTAL SCALE, E03 TOTAL LOWCUT,  
E04 TOTAL SET, E05 TL SET VALUE, E10 TL USER UNIT, F01 PULSE  
SELECT, F02 PULSE SCALE, F03 PULSE LOW CUT, F04 PULSE WIDTH,  
G01 4-20 LOW CUT, G02 4-20 LOW LMT, G03 4-20 H LMT.

# 7. ACTUAL OPERATION

After you have installed the flowtube into the process piping, wired the input / output terminals, set up the required parameters, and performed the pre-operation zero adjustment, the magnetic flowmeter should output an accurate flow signal from its terminals as soon as the measured liquid begins to flow.

This section describes procedures of zero adjustment and alarms countermeasure.

## 7.1 Pre-Operation Zero Adjustment

In the magnetic flowmeter, zero adjustment is required before beginning operation in order to obtain a 4 to 20mA signal that is accurately proportional to the flow.

This section describes two procedures for performing zero adjust : one using the switches on the converter panel and the other using the BT200. Use either method.

Zero adjustment is made to set the instrument to 0% (4mA) when the flow rate is 0.

The flow tube must be filled with fluid and let it stand until all motion has ceased.



### IMPORTANT

- Zero adjustment should be done only when the fluid is filled in the flow tube and the fluid velocity is completely zero by closing the valve.
- Zero adjustment should be done prior to the other operation. For 30 seconds during the zero adjustment, any setting cannot be accepted.

### 7.1.1 Zero Adjustment Using Data Setting Keys

The following two procedures can be used to perform zero adjustment with the data setting keys.

(1) Hold Down the INC Key for Two Seconds in Flow Rate Data Display Mode.

| Display | Description  |      |         |    |         |    |        |
|---------|--|------|---------|----|---------|----|--------|
|         | Call up the setting mode and set "01" in "C1". (zero adjustment enable / inhibit) <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>INHIBIT</td> </tr> <tr> <td>01</td> <td>ENABLE</td> </tr> </tbody> </table> | Code | Content | 00 | INHIBIT | 01 | ENABLE |
| Code    | Content  |      |         |    |         |    |        |
| 00      | INHIBIT  |      |         |    |         |    |        |
| 01      | ENABLE   |      |         |    |         |    |        |
|         | Hold down the INC key for two seconds in flow rate data display mode.  |      |         |    |         |    |        |
|         | The display panel shows "-ZERO-". After about 30 seconds, the zero correction is displayed. Then the meter returns to data display mode.   |      |         |    |         |    |        |

(2) Display "C2" and Press the SET key Twice

| Display | Description  |      |         |    |         |    |        |
|---------|--|------|---------|----|---------|----|--------|
|         | Call up the setting mode and set "01" in "C1" (zero adjustment enable/inhibit). <table border="1"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>INHIBIT</td> </tr> <tr> <td>01</td> <td>ENABLE</td> </tr> </tbody> </table> | Code | Content | 00 | INHIBIT | 01 | ENABLE |
| Code    | Content  |      |         |    |         |    |        |
| 00      | INHIBIT  |      |         |    |         |    |        |
| 01      | ENABLE   |      |         |    |         |    |        |
|         | Call up "C2" and press the SET key twice (as for data entry).  |      |         |    |         |    |        |
|         | The display panel shows "-ZERO-". After about 32 seconds, the zero correction is displayed. Then the meter returns to data display mode.   |      |         |    |         |    |        |
|         |  |      |         |    |         |    |        |

## 7.1.2 Zero Adjustment Via the BT200

| Display  | Description   |
|--|---|
| <pre> MENU A:DISPLAY B:SET <b>C:ADJUST</b> D:DISP SEL E:TOTAL SET F:PULSE SET HOME SET ADJ ESC </pre>    | <p>Call up the menu screen and select "<b>C:ADJUST</b>"</p>   |
| <pre> PARAM C01:ZERO TUNING ENABLE <b>C02:MAGFLOW ZERO</b> 0.05 C60:SELF CHECK GOOD DATA DIAG ESC </pre> | <p>Press the <b>ENTER</b> key to call the screen displaying the parameter sub items. Select <b>C02:MAGFLOW ZERO</b></p>   |
| <pre> SET C02:MAGFLOW ZERO 0.05 + 00.05 DIAG ESC </pre>  | <p>Pressing the <b>ENTER</b> key causes the data setup screen to be displayed. If the security screen is displayed, enter the security code.*</p>   |
| <pre> SET C02:MAGFLOW ZERO AUTOZERO FEED NO OK </pre>  | <p>While "<b>C02:MAGFLOW ZERO</b>" is displayed, press the <b>ENTER</b> key once, then wait a few seconds and press again. "<b>AUTO ZERO</b>" is now displayed</p>                              |
| <pre> PARAM C01:ZERO TUNING ENABLE <b>C02:MAGFLOW ZERO</b> 0.02 C60:SELF CHECK GOOD DATA ESC </pre>      | <p>After about 30 seconds, press the "<b>F4</b>" of the Function key causes the Menu screen to be displayed. The zero correction is displayed. Then the meter returns to data display mode.</p> |

\*For entry of the security code, see IM 1C0A11-01E

## 7.2 Self-diagnostics Functions

- The self-diagnostics function displays instrument internal errors, input/output signal abnormalities, setting errors, and other problems.
- When an alarm occurs, an alarm number announcing that an error has occurred is superimposed on the normal data display. However, alarms are only displayed during normal flow rate data display mode and when parameter numbers are changed in the setting mode. (Alarms are not displayed when data items are being changed.)
- When the BT200 is used, alarms are displayed in the A60 to N60 SELF CHECK parameter.

### 7.2.1 Display and Output Status during Alarm Occurrence

- If an error occurs, the panel display LED flashes and an alarm number is superimposed on the normal display. During this time the current output is fixed to 2.4mA or less, 4mA, HOLD or 21.6mA or more, as selected in 4-20 ALM OUT (out-put current during alarm).
- An alarm (status contact output) is output for any of the errors indicated in the table at right.

| Display |                   | LED           | Contact output | Current output          | Totalization pulse |
|---------|-------------------|---------------|----------------|-------------------------|--------------------|
| AE      | Display on BT     |               |                |                         |                    |
| 00      | GOOD              | OFF           | ON             | Normally                | Normally           |
| 01      | ERROR             | Flash-<br>ing | OFF            | Fixed<br>(See<br>note.) | Stop               |
| 02      | μ P FAULT         |               |                |                         |                    |
| 03      | EEPROM FAULT      |               |                |                         |                    |
| 04      | A/D(H) FAULT      |               |                |                         |                    |
| 05      | A/D(L) FAULT      |               |                |                         |                    |
| 06      | SIGNAL OVERFLOW   |               |                |                         |                    |
| 07      | COIL OPEN         |               |                |                         |                    |
| 08      | VEL. SAPN>10m/s   |               |                |                         |                    |
| 09      | VEL. SPAN<0.3m/s  |               |                |                         |                    |
| 10      | P.SPAN>1000p/s    |               |                |                         |                    |
| 11      | P.SPAN>500p/s     |               |                |                         |                    |
| 12      | P.SPAN>25p/s      |               |                |                         |                    |
| 13      | P.SPAN>15p/s      |               |                |                         |                    |
| 14      | P.SPAN>10p/s      |               |                |                         |                    |
| 15      | P.SPAN>5p/s       |               |                |                         |                    |
| 16      | P.SPAN<0.0001p/s  |               |                |                         |                    |
| 17      | T.SPAN>1000p/s    |               |                |                         |                    |
| 18      | T.SPAN<0.0001p/s  |               |                |                         |                    |
| 19      | 4-20 LMT ERROR    |               |                |                         |                    |
| 20      | EMPTY PIPE        |               |                |                         |                    |
| 21      | MULTI RANGE ERROR |               |                |                         |                    |

Note : As selected in 4-20 ALM OUT (output current during alarm)

### 7.2.2 Error Description and Countermeasures

| AE | Display on BT     | Error Contents  | Countermeasures  |
|----|-------------------|---|--|
| 02 | μ P FAULT         | Microprocessor error  | Contact the nearest Yokogawa office, or service center |
| 03 | EEPROM FAULT      | EEPROM error  |  |
| 04 | A/D(H) FAULT      | A/D converter (high frequency side) error   |  |
| 05 | A/D(L) FAULT      | A/D converter (low frequency side) error  |  |
| 06 | SIGNAL OVERFLOW   | Excessive input signal  |  |
| 07 | COIL OPEN         | Flow Tube coil open-circuit   | Contact the nearest Yokogawa office, or service center |
| 08 | VEL. SAPN>10m/s   | Setting for span flow velocity exceeds 11 m/s   | Change setting   |
| 09 | VEL. SAPN<0.3m/s  | Setting for span flow velocity is 0.2m/s or below   |  |
| 10 | P.SPAN>1000p/s    | Pulse output rate exceeds 1100 p/s, at 50% DUTY Pulse output rate exceeds 1000 p/s, at 0.5 ms pulse width |  |
| 11 | P.SPAN>500p/s     | Pulse output rate exceeds 500 p/s at 1 ms pulse width   |  |
| 12 | P.SPAN>25p/s      | Pulse output rate exceeds 25 p/s at 20 ms pulse width   |  |
| 13 | P.SPAN>15p/s      | Pulse output rate exceeds 15 p/s at 33 ms pulse width   |  |
| 14 | P.SPAN>10p/s      | Pulse output rate exceeds 10 p/s at 50 ms pulse width   |  |
| 15 | P.SPAN>5p/s       | Pulse output rate exceeds 5 p/s at 100 ms pulse width   |  |
| 16 | P.SPAN<0.0001p/s  | Pulse output rate is 0.00005 p/s or below   |  |
| 17 | T.SPAN>1000p/s    | Totalization rate exceeds 1100 p/s  |  |
| 18 | T.SPAN<0.0001p/s  | Totalization rate is 0.00005 p/s or less  |  |
| 19 | 4-20 LMT ERROR    | Analog low limit > Analog high limit  |  |
| 20 | EMPTY PIPE        | Pipe is not filled with fluid or insulating material attached to electrode.                               |  |
| 21 | MULTI RANGE ERROR | In Auto 2 range, 1st range>2nd range  | Change setting   |

# 8. MAINTENANCE

## 8.1 Loop Test (Test Output)

This function enables you to set up any desired value, and to output it from the converter. Since this function corresponds to flow rate totalization display and pulse output, this makes it possible to check operation of individual functions.

The test functions of status output are also provided.



### IMPORTANT

- Test outputs take priority of the flow signal. Do not forget to return to the normal operation mode after the loop test.
- In case "BI DIRECTION" is set at OUTPUT FUNCTION (Parameter No. b10), the setting range is available -108 to +108. Please set the loop test value in +/- percentage based on the larger flow span within forward and reverse flow span.
- In case "AUTO 2 RANGES" is set at OUTPUT FUNCTION (Parameter No. b10), the loop test setting value should be set in percentage based on the second range.

### 8.1.1 Settings for Test Output Using Data Setting Keys

(1) Current Output (Corresponding to Flow Rate, Pulse and Totalization Display)

| Display                                     | Description  |      |         |    |                  |    |             |
|---|--|------|---------|----|------------------|----|-------------|
|   | Call up the setting mode and display "H1" (test mode) and set "01". <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Normal operation</td> </tr> <tr> <td>01</td> <td>Test output</td> </tr> </tbody> </table> | Code | Content | 00 | Normal operation | 01 | Test output |
| Code  | Content  |      |         |    |                  |    |             |
| 00  | Normal operation   |      |         |    |                  |    |             |
| 01  | Test output  |      |         |    |                  |    |             |
| <p>Setting range<br/>: -8(-108) to 108%</p> | Display "H2" and set the value in % of maximum span.<br>(The figure shows a 100% setting.)   |      |         |    |                  |    |             |

\*These functions must be returned to their original status during flow rate measurements.

(2) Status Output

| Display | Description   |      |         |    |                  |    |                         |    |                          |
|---------|---|------|---------|----|------------------|----|-------------------------|----|--------------------------|
|         | Call up the setting mode and display "H1" (test mode) and set "01". <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Normal operation</td> </tr> <tr> <td>01</td> <td>Test output</td> </tr> </tbody> </table>  | Code | Content | 00 | Normal operation | 01 | Test output             |    |                          |
| Code    | Content   |      |         |    |                  |    |                         |    |                          |
| 00      | Normal operation  |      |         |    |                  |    |                         |    |                          |
| 01      | Test output   |      |         |    |                  |    |                         |    |                          |
|         | Select the mode of status to be output in "H3". <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>00</td> <td>Normal operation</td> </tr> <tr> <td>01</td> <td>Transistor contact (ON)</td> </tr> <tr> <td>02</td> <td>Transistor contact (OFF)</td> </tr> </tbody> </table> | Code | Content | 00 | Normal operation | 01 | Transistor contact (ON) | 02 | Transistor contact (OFF) |
| Code    | Content   |      |         |    |                  |    |                         |    |                          |
| 00      | Normal operation  |      |         |    |                  |    |                         |    |                          |
| 01      | Transistor contact (ON)   |      |         |    |                  |    |                         |    |                          |
| 02      | Transistor contact (OFF)  |      |         |    |                  |    |                         |    |                          |

\*These functions must be returned to their original status during flow rate measurements.

### 8.1.2 Setting for Test Output Via the BT200

(1) Current Output (Corresponding to Flow Rate, Pulse and Totalization Display)

| Display | Description   |      |             |        |                  |      |             |
|---------|---|------|-------------|--------|------------------|------|-------------|
|         | Select Test mode in parameter number "H01". <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>NORMAL</td> <td>Normal operation</td> </tr> <tr> <td>TEST</td> <td>Test output</td> </tr> </tbody> </table> Display "H02:OUTPUT VALUE" and set the value in % of maximum span.<br>(The figure shows a 100% setting.) | Code | Description | NORMAL | Normal operation | TEST | Test output |
| Code    | Description   |      |             |        |                  |      |             |
| NORMAL  | Normal operation  |      |             |        |                  |      |             |
| TEST    | Test output   |      |             |        |                  |      |             |

\*These functions must be returned to their original status during flow rate measurements.

(2) Status Output

| Display    | Description  |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |
|------------|--|------|---------|--------|------------------|------|-------------|------|---------|--------|------------------|------------|-------------------------|-----------|--------------------------|
|            | Call up the setting mode and display "H1" (test mode) and set "01". <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>NORMAL</td> <td>Normal operation</td> </tr> <tr> <td>TEST</td> <td>Test output</td> </tr> </tbody> </table> Select the mode of status to be output in "H03". <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Code</th> <th>Content</th> </tr> </thead> <tbody> <tr> <td>NORMAL</td> <td>Normal operation</td> </tr> <tr> <td>CLOSED(ON)</td> <td>Transistor contact (ON)</td> </tr> <tr> <td>OPEN(OFF)</td> <td>Transistor contact (OFF)</td> </tr> </tbody> </table> | Code | Content | NORMAL | Normal operation | TEST | Test output | Code | Content | NORMAL | Normal operation | CLOSED(ON) | Transistor contact (ON) | OPEN(OFF) | Transistor contact (OFF) |
| Code       | Content  |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |
| NORMAL     | Normal operation   |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |
| TEST       | Test output  |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |
| Code       | Content  |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |
| NORMAL     | Normal operation   |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |
| CLOSED(ON) | Transistor contact (ON)  |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |
| OPEN(OFF)  | Transistor contact (OFF)   |      |         |        |                  |      |             |      |         |        |                  |            |                         |           |                          |

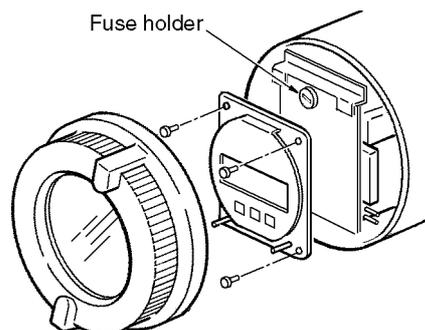
\*These functions must be returned to their original status during flow rate measurements.

## 8.2 Fuse Replacement

### WARNING

This instrument must be installed by expert engineer or skilled personnel. Fuse replacement is not permitted for operators.

The fuse holder is located under the display which has to be removed to allow fuse replacement. A spare fuse is taped to the cover of the converter.



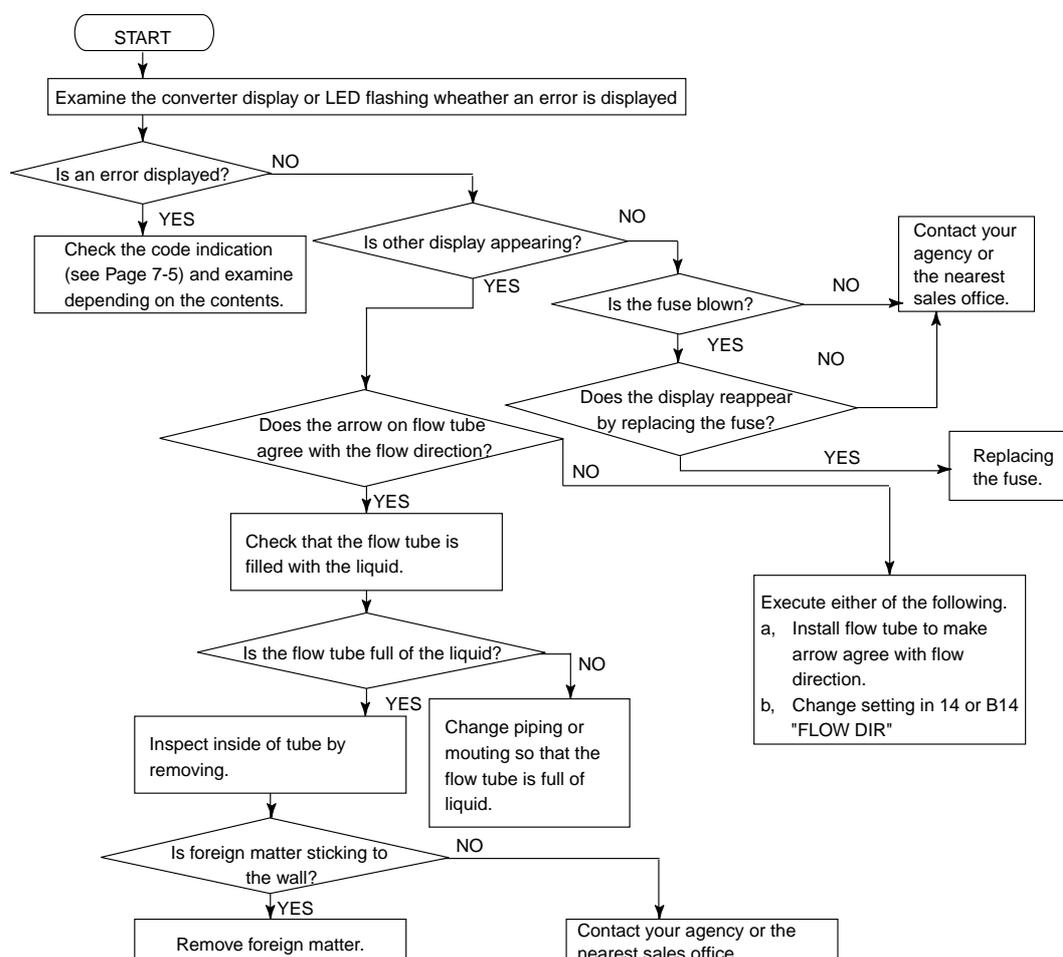
### CAUTION

Before replacing the fuse, make sure to turn OFF the power supply and disconnect the power source. Use only specified fuses which should be obtained from your nearest Sales & Service Office. The use of other fuses might cause fire. After replacing the fuse, confirm that the connector of the display board has not loosened.

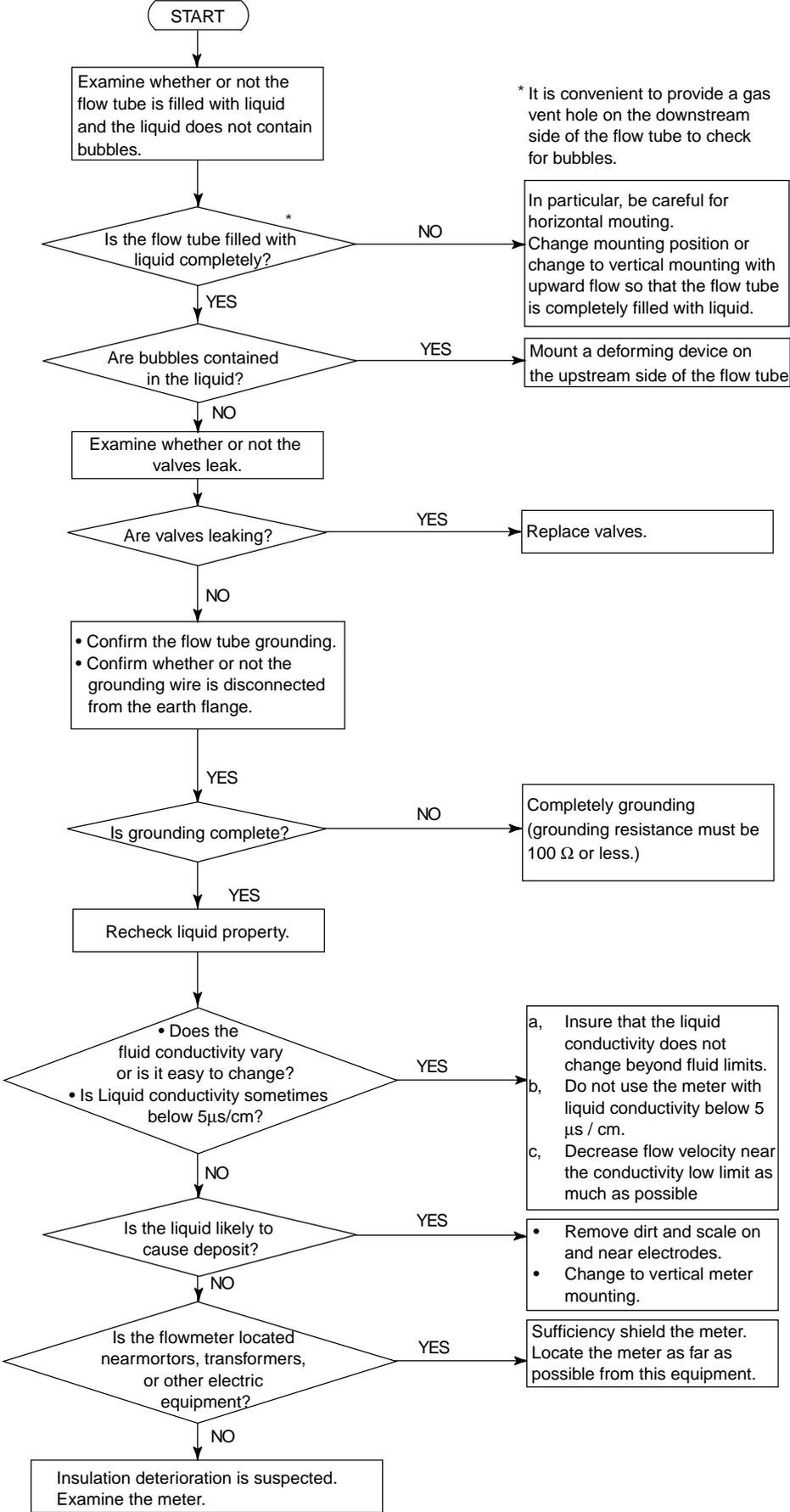
## 8.3 Trouble Shooting

Although magnetic flowmeters rarely require maintenance, failures occur when the instrument is not operating correctly. Since a failure is located by troubleshooting the receiving instrument information. This information will be described below.

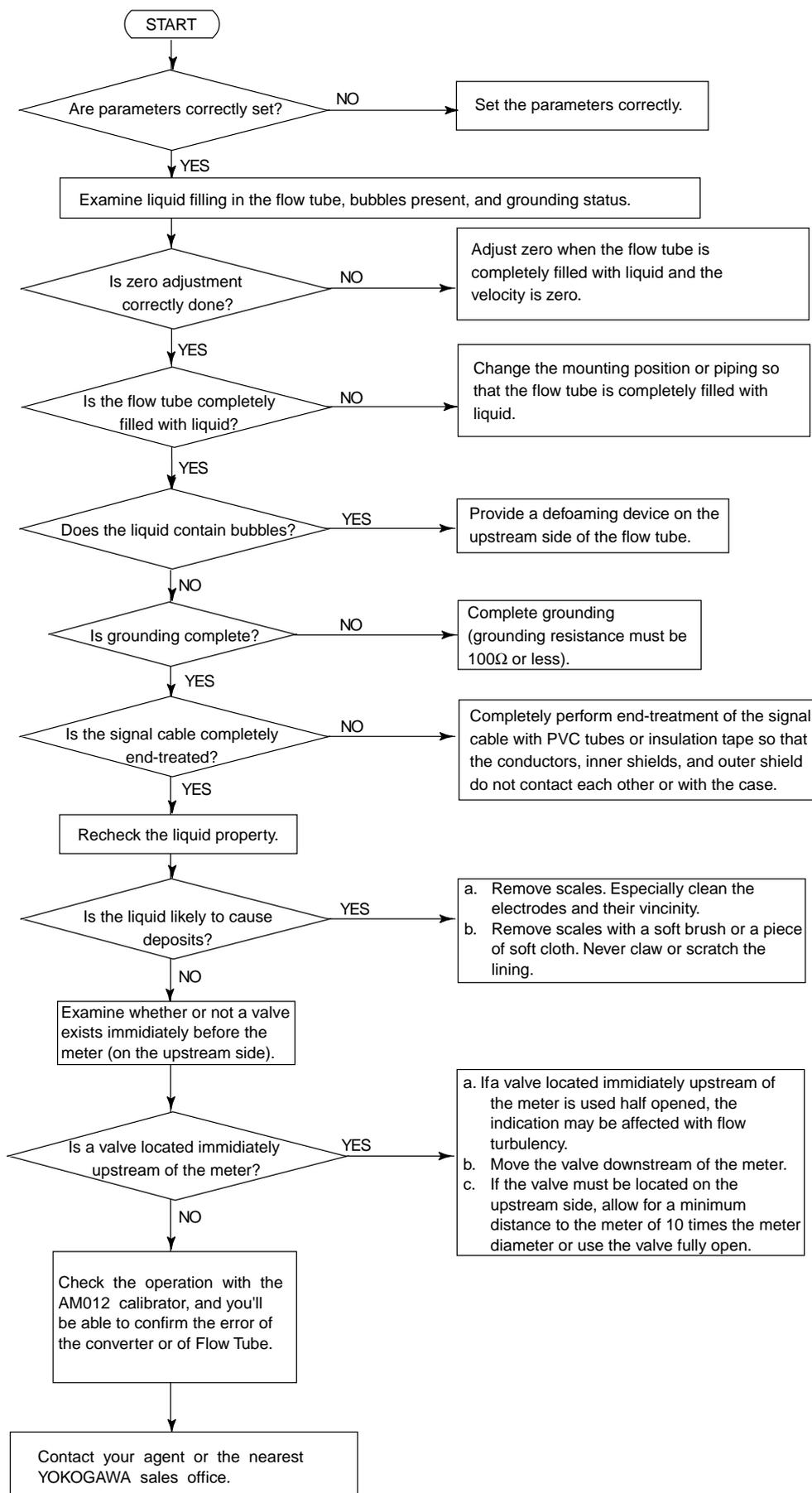
### (1) No Indication



(2) Unstable Zero



## (3) Disagreement of Indication with Actual Flow Result



# 9. OUTLINE

## ■ STANDARD SPECIFICATIONS

Note 1: For models with no indicator, a hand-held terminal is necessary to set parameters.

Note 2: Pulse output, status output and alarm output use common terminals, therefore, these functions are not available at the same time.

Note 3: Please refer to GS 01E07F01-00E for Fieldbus communication type(/FB).

**Excitation method:** Dual frequency excitation

**Output Signal(Note 3):**

Current Output: 4 to 20 mA DC (Load resistance 750Ω maximum).

Transistor Contact Output(Open-collector):

Pulse, alarm or status output selected by parameter setting. Contact rating: 30 V DC (OFF), 200 mA (ON).

**Communication (option)(Note 3):**

BRAIN or HART (Superimposed on the 4 to 20 mA DC signal)

Load Resistance: (including cable resistance)

BRAIN: 250 to 600Ω

HART: 230 to 600Ω, depending on q'ty of field devices connected to the loop (multidrop mode)

Load Capacitance: 0.22 μF maximum

Load Inductance: 3.3 mH maximum

Distance from Power Line:

15 cm(0.6 ft) or more (Parallel wiring should be avoided.)

Input Impedance of Receiver Connected to the Receiving Resistance: 10kΩ or larger (at 2.4 kHz)

Maximum Cable Length:

2 km (6500 ft) (when polyethylene-insulated PVC-sheathed control cables (CEV cables) are used)

**Note:** HART is a registered trademark of the HART Communication Foundation.

**Instantaneous Flow Rate Display Function:**

Flow rate can be displayed either in engineering units or in percent of span. (for models with indicator)

**Totalizer Display Function:**

Totalized volume in any engineering unit can be displayed by setting a totalizing factor. (for models with indicator)

**Damping Time Constant(Note1):**

Settable from 0.1 second to 200 seconds (63% response time).

**Span Setting Function(Note1):**

Volumetric flow setting is available by setting volume unit, time unit, flow rate value and flow tube size.

Volume Unit: gallon(US), m<sup>3</sup>, l (litre), cm<sup>3</sup>, barrel(=158.987L)

Velocity Unit: ft, m

Time Unit: sec., min., hour, day

Flow Tube Size: inch, mm

**Pulse Output Function(Note2), (Note3):**

Scaled pulse can be output by setting a pulse factor.

Pulse Width: Duty 50% or fixed pulse width (0.5, 1, 20, 33, 50, or 100 ms) - user selectable.

Output Rate: 0.0001 to 1000pps (when pulse output function is selected.)

**Status Output Function(Note2), (Note3):**

One of the following is selected by parameter setting.

• **Auto 2 Ranges Status Output:**

Indicates the selected range for automatic dual range function.

• **Forward and Reverse Status Output:**

Indicates the flow direction for forward and reverse flow measurement mode.

• **Totalization Status Output:**

Indicates that the internal totalized value exceeds the set value.

• **Low Limit Alarm:**

Indicates that flow rate is under the low limit set value.

**Alarm Output Function(Note2), (Note3):**

Indicates that an alarm occurs (Normal Close Fixed).

**Self Diagnostics Function(Note1):**

Converter failure, flow tube failure, erroneous setting, etc. can be diagnosed and displayed.

**Data Security During Power Failure:**

Data storage by EEPROM - no back-up battery required.

**Electrical Connection:**

ANSI 1/2NPT female, DIN Pg13.5 female, ISO M20×1.5 female, JIS G1/2 female.

**Terminal Connection:** M4 size screw terminal.

**Case Material:** Aluminum alloy.

**Coating:** Polyurethane corrosion-resistant coating.

Cover; Deep sea moss green (Munsell 0.6GY3.1/2.0)

Case; Frosty white (Munsell 2.5Y8.4/1.2)

**Degrees of Protection:** IP67, NEMA 4X, JIS C0920 water tight protection

**Mounting :** 2-inch pipe mounting

## ■ STANDARD PERFORMANCE

**AE\*\*\*DG/DN/DH+AE14 (up to 30 m cable)**

**Accuracy:**

**PFA and Ceramic Lining (except /FB)**

| Size in mm (inch)      | Span in m/s (ft/s) | Accuracy  |
|------------------------|--------------------|---|
| 2.5 to 15 (0.1 to 0.5) | 0.3 to 1 (1 to 3)  | 0.5% of span  |
|                        | 1 to 10 (3 to 33)  | 0.25% of span (at indications below 50% of span)<br>0.5% of rate (at indications 50% of span or more) |
| 25 or larger (1)       | 0.3 to 1 (1 to 3)  | 0.25% of span (at indications below 50% of span)<br>0.5% of rate (at indications 50% of span or more) |
|                        | 1 to 10 (3 to 33)  | 0.1% of span (at indications below 20% of span)<br>0.5% of rate (at indications 20% of span or more)  |

**Polyurethane Lining (except /FB)**

| Size in mm (inch) | Span in m/s (ft/s) | Accuracy  |
|-------------------|--------------------|---|
| 25 or larger (1)  | 0.3 to 1 (1 to 3)  | 0.5% of span                                      |
|                   | 1 to 10 (3 to 33)  | 0.25% of span (at indications below 50% of span)  |
|                   |                    | 0.5% of rate (at indications 50% of span or more) |

**PFA and Ceramic Lining (/FB)**

| Size in mm (inch)      | Set Value in m/s (ft/s) | Accuracy      |
|------------------------|-------------------------|---------------|
| 2.5 to 15 (0.1 to 0.5) | less than 0.3(1)        | 1.5mm/s       |
|                        | 0.3(1) or more          | ±0.5% of rate |
| 25 or larger (1)       | less than 0.15(0.5)     | 0.75mm/s      |
|                        | 0.15(0.5) or more       | ±0.5% of rate |

**Polyurethane Lining (/FB)**

| Size in mm (inch) | Set Value in m/s (ft/s) | Accuracy      |
|-------------------|-------------------------|---------------|
| 25 or larger (1)  | less than 0.3(1)        | 1.5mm/s       |
|                   | 0.3(1) or more          | ±0.5% of rate |

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**Repeatability:** 0.1% of flowrate (minimum 1 mm/s)

**Maximum Power Consumption:** 12.5W

**Insulation Resistance :**

- 100MΩ between power terminals and ground terminal at 500 V DC.
- 100MΩ between power terminals and each output terminal at 500 V DC.
- 20MΩ between each output terminal and ground terminal at 100V DC.

**Withstand Voltage :**

1500 V AC between power terminals and ground terminal for 1 minute.

**CAUTION**

When performing the Voltage Breakdown Test, Insulation Resistance Test or any unpowered electrical test, wait 10 seconds after the power supply is turned off before removing the housing cover. Be sure to remove the Short Bar at terminal "G". After testing, return the Short Bar to its correct position. Screw tightening torque should be 1.18N-m(0.88ft-lb) or more, because the G-terminal is thought as a protective grounding and should conform to the Safety Requirements.

**Safety Requirement Standards:**

IEC1010, EN61010

**EMC Conformity Standards:**

EN61326  
EN61000-3-2, EN61000-3-3  
AS/NZS 2064

**Grounding:** 100Ω or less

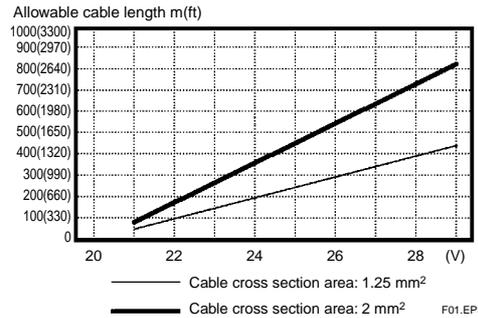
**NORMAL OPERATING CONDITIONS**

**Ambient Temperature:** -20 to 60°C (-4 to 140°F)

**Ambient Humidity:** 5 to 95%RH (no condensation)

**Power Supply Voltage:** -A1; Range 80 to 264 V AC, 47 to 63Hz/100 to 130 VDC,  
-D1; Range 20.4 to 28.8 V DC(except /FB)

**Supplied Power and Max. Cable Length for 24 V DC version:**



**Altitude at installation side:** Max.2000m above sea level  
**Installation category based on IEC1010:** II(See Note)  
**Pollution level based on IEC1010:** 2(See Note)

- Note** • The "Installation category" implies the regulation for impulse withstand voltage. It is also called the "Overvoltage category". "II" applies to electrical equipment.  
• "Pollution level" describes the degree to which a solid, liquid or gas which deteriorates dielectric strength is adhering. "2" applies to normal indoor atmosphere.

**Fuse:** 2A, 250V(Time - Lag type)

**Measurable Flow Rate Range:**

**SI Units (Size: mm, Flowrate: m³/h)**

| Size | Min. Range @0.3m/s | Max. Range @10m/s |
|------|--------------------|-------------------|
| 2.5  | 0.0054             | 0.1767            |
| 5    | 0.0213             | 0.7068            |
| 10   | 0.0849             | 2.8274            |
| 15   | 0.1909             | 6.361             |
| 25   | 0.5302             | 17.671            |
| 40   | 1.3572             | 45.23             |
| 50   | 2.1206             | 70.68             |
| 65   | 3.584              | 119.45            |
| 80   | 5.429              | 180.95            |
| 100  | 8.483              | 282.74            |
| 125  | 13.254             | 441.7             |
| 150  | 19.086             | 636.1             |
| 200  | 33.93              | 1,131             |
| 250  | 53.02              | 1,767.1           |
| 300  | 76.35              | 2,544.6           |
| 350  | 103.91             | 3,463             |
| 400  | 135.72             | 4,523             |

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**English Units (Size: inch, Flowrate: GPM)**

| Size | Min. Range @1.0ft/s | Max. Range @33ft/s |
|------|---------------------|--------------------|
| 0.1  | 0.0241              | 0.8031             |
| 0.2  | 0.0964              | 3.212              |
| 0.4  | 0.3856              | 12.850             |
| 0.5  | 0.6024              | 20.078             |
| 1    | 2.4095              | 80.31              |
| 1.5  | 5.422               | 180.70             |
| 2    | 9.638               | 321.2              |
| 2.5  | 15.06               | 501.9              |
| 3    | 21.685              | 722.8              |
| 4    | 38.56               | 1,285.0            |
| 5    | 60.24               | 2,007.8            |
| 6    | 86.74               | 2,891.3            |
| 8    | 154.21              | 5,140              |
| 10   | 240.95              | 8,031              |
| 12   | 347.0               | 11,565             |
| 14   | 472.3               | 15,741             |
| 16   | 616.9               | 20,560             |

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**ACCESSORIES**

**Remote type converter :**

- Fuse(2A) 1
- Data sheet 1
- Mounting bracket 1
- Hexagonal wrench (in case of Ex-proof) 1

■ TERMINAL CONNECTION

| Terminal Symbols | Description                   |
|------------------|-------------------------------|
| SA               | A shield                      |
| A                |                               |
| B                |                               |
| SB               |                               |
| C                | Flow signal input             |
| EX1              |                               |
| EX2              | B shield                      |
| P+               |                               |
| P-               | Common                        |
| I+               |                               |
| I-               | Excitation current output     |
| L+               |                               |
| N/-              | Pulse, alarm or status output |
| ⊕                |                               |
|                  | Current output 4 to 20mA DC   |
|                  |                               |
|                  | Power supply                  |
|                  |                               |
|                  | Protective grounding          |

For Fieldbus Communication Type

| Terminal Symbols | Description                   |
|------------------|-------------------------------|
| SA               | A shield                      |
| A                |                               |
| B                |                               |
| SB               |                               |
| C                | Flow signal input             |
| EX1              |                               |
| EX2              | B shield                      |
| P+               |                               |
| P-               | Common                        |
| I+               |                               |
| I-               | Excitation current output     |
| L+               |                               |
| N/-              | Not used                      |
| ⊕                |                               |
|                  | Fieldbus communication signal |
|                  |                               |
|                  | Power supply                  |
|                  |                               |
|                  | Protective grounding          |

■ MODEL AND SUFFIX CODE

Remote Type Converter:

| Model                        | Suffix Code                         | Description                |
|------------------------------|-------------------------------------|----------------------------|
| <b>AE14</b>                  | .....                               | Magnetic flow converter    |
| Indicator                    | <b>-D</b> .....                     | 7 seg. LCD                 |
|                              | <b>-N</b> .....                     | None                       |
| Power supply                 | <b>A1</b> .....                     | 80 to 264VAC/100 to 130VDC |
|                              | <b>D1</b> .....                     | 20.4 to 28.8VDC            |
| Electrical connection (Note) | <b>J</b> .....                      | JIS G1/2 female            |
|                              | <b>A</b> .....                      | ANSI1/2 NPT female         |
|                              | <b>D</b> .....                      | DIN Pg 13.5 female         |
|                              | <b>M</b> .....                      | ISO M20×1.5 female         |
| Optional Code                | Refer to "Optional Specifications." |                            |

Note: For CENELEC ATEX ex-proof type, select ANSI 1/2NPT or ISO M20×1.5 electrical connection.

Dedicated Signal Cable:

| Model                  | Suffix Code         | Description                            |
|------------------------|---------------------|--|
| <b>AM011</b>           | .....               | Dedicated cable for magnetic flowmeter |
| End treatment          | <b>-0</b> .....     | Non termination                        |
|                        | <b>-4</b> .....     | Terminated                             |
| Cable length           | <b>-L</b> □ □ ..... | Enter the length in m (Max 30m)        |
| Style code             | <b>*A</b> .....     | Style A                                |
| Optional specification | <b>/C</b> □ ..      | Number of end treatment parts          |

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Optional Specification

○: Available    -: Not available

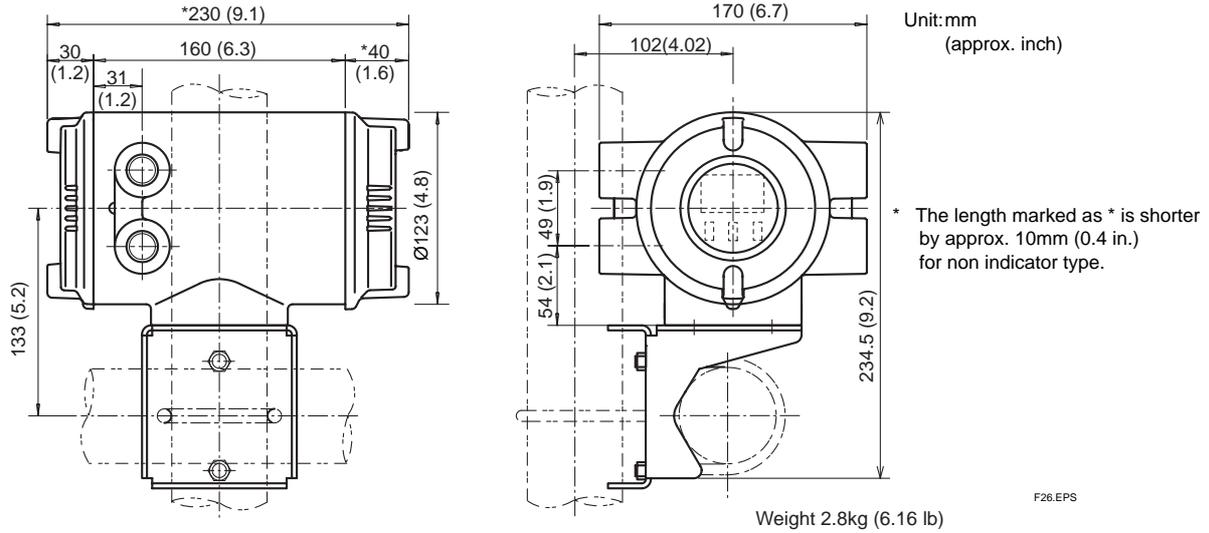
| Item   | Specification  | Application Model |               | Code     |
|--|--|-------------------|---------------|----------|
|  |  | General           | Ex-proof      |          |
|  |  | AE14              | AE14          |          |
| Waterproof Gland                                 | Waterproof glands are attached to all wiring ports. For JIS G1/2 only.                 | ○                 | -             | /ECG     |
| Waterproof Gland with Union Joint                | Waterproof glands (union joint) are attached to all wiring ports. For JIS G1/2 only.   | ○                 | -             | /ECU     |
| DC Noise Suppression                             | Eliminating DC Noise Size 15mm(0.5in.) or larger; Conductivity 50μS/cm or higher.      | ○                 | ○             | /ELC     |
| Lightning Protector                              | Built-in Lightning Protector(Only for 24VDC version)                                   | ○                 | ○             | /A       |
| BRAIN Communication(Note 1)                      | Digital Communication with BRAIN protocol  | ○                 | ○             | /BR      |
| HART Communication(Note 1)                       | Digital Communication with HART protocol   | ○                 | ○             | /HART    |
| FOUNDATION Fieldbus Communication(Note 1)        | Digital Communication with FOUNDATION Fieldbus protocol(Except 24 VDC version)         | ○                 | (Note 3)<br>○ | /FB      |
| PID/LM function for FOUNDATION Fieldbus (Note 2) | PID control function and Link Master function  | ○                 | (Note 3)<br>○ | /LC1     |
| Epoxy Coating                                    | Coating is changed to epoxy coating.   | ○                 | ○             | /EPF     |
| High Anti-corrosion Coating                      | Coating is changed to three-layer coating(Urethane coating on two-layer Epoxy coating) | ○                 | ○             | /X2      |
| FM Explosion Proof Type                          | FM Explosion proof/FM Nonincendive   | -                 | ○             | /FF1/FN1 |
| CENELEC ATEX Explosion Proof Type (KEMA)         | CENELEC ATEX Explosion proof EExdIICT6 Group IIG Category 2                            | -                 | ○             | /KF2     |
| CSA Explosion Proof Type                         | CSA Explosion proof/CSA Nonincendive   | (Note 3)<br>-     | ○             | /CF1/CN1 |
| SAA Explosion Proof Type                         | SAA Explosion proof  | (Note 3)<br>-     | ○             | /SF1     |
| GOST Certificate                                 | Calibration Certificate for GOST (only for products produced at YMF)                   | ○                 | ○             | /GOS     |
| Calibration Certificate                          | Level 2:Declaration and Calibration Equipment List                                     | ○                 | ○             | /L2      |
|  | Level 3:Declaration and Primary Standard List  | ○                 | ○             | /L3      |
|  | Level 4:Declaration and YOKOGAWA Measuring   | ○                 | ○             | /L4      |

Note 1: Either BRAIN, HART or FOUNDATION Fieldbus communication can be selected.

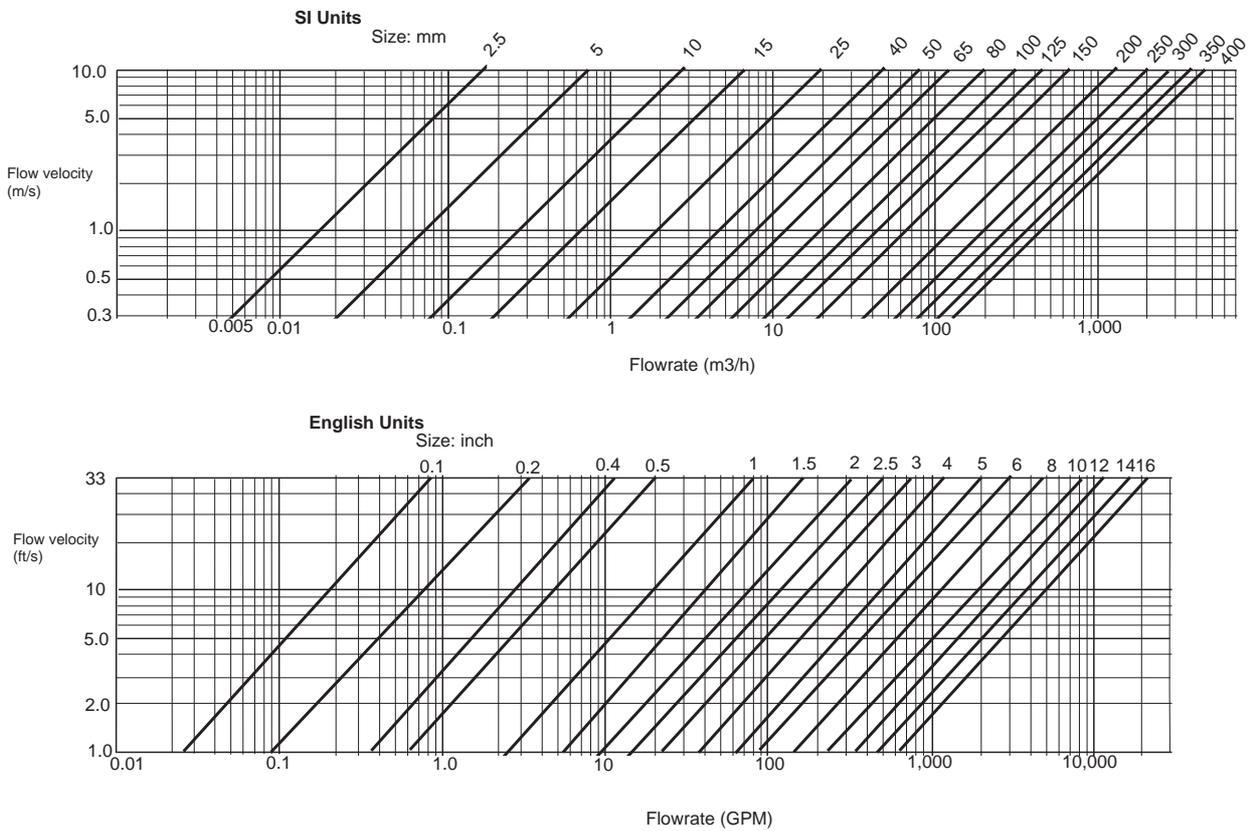
Note 2: Optional code /LC1 is a function for Fieldbus communication. Optional code /FB must be selected together with /LC1.

Note 3: Ex-proof Fieldbus communication is available for CENELEC ATEX and FM ex-proof version.

EXTERNAL DIMENSIONS



SIZING DATA



\* Measurable flow velocity is from 0 m/s.

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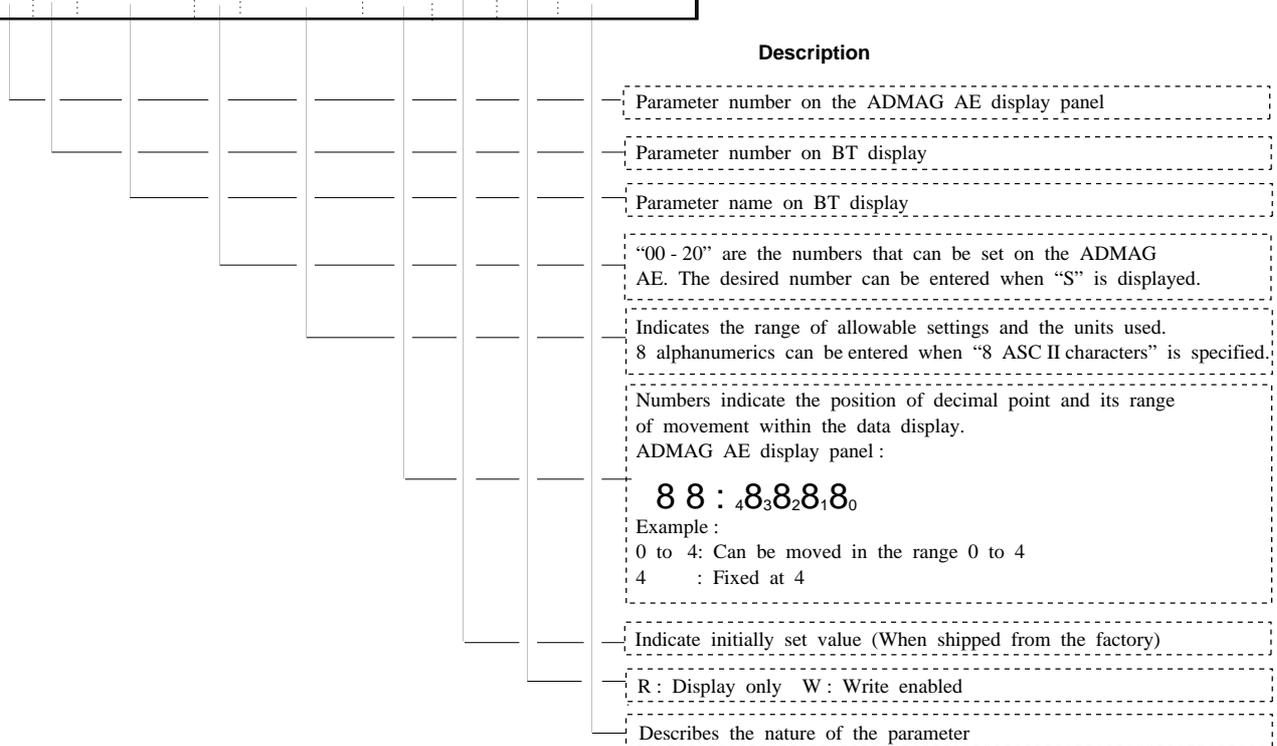
# 10. PARAMETER SUMMARY

This appendix describes all parameters used by ADMAG AE.

- Description of Items

| No. |    | Name | Data Range, Units |    | Deci-<br>mal<br>Point | Initial<br>Setting | R/W | Description |
|-----|----|------|-------------------|----|-----------------------|--------------------|-----|-------------|
| AE  | BT |      | AE                | BT |                       |                    |     |             |
|     |    |      |                   |    |                       |                    |     |             |

**Description**



Parameter number on the ADMAG AE display panel

Parameter number on BT display

Parameter name on BT display

“00 - 20” are the numbers that can be set on the ADMAG AE. The desired number can be entered when “S” is displayed.

Indicates the range of allowable settings and the units used. 8 alphanumerics can be entered when “8 ASC II characters” is specified.

Numbers indicate the position of decimal point and its range of movement within the data display.  
ADMAG AE display panel :

**8 8 : 4 8<sub>3</sub> 8<sub>2</sub> 8<sub>1</sub> 8<sub>0</sub>**

Example :  
0 to 4: Can be moved in the range 0 to 4  
4 : Fixed at 4

Indicate initially set value (When shipped from the factory)

R : Display only W : Write enabled

Describes the nature of the parameter

10. PARAMETER SUMMARY

| No. |     | Name         | Data Range, Units |  | Deci-<br>mal<br>Point | Initial<br>Setting | R/W | Description  |
|-----|-----|--------------|-------------------|--|-----------------------|--------------------|-----|--|
| AE  | BT  |              | AE                | BT   |                       |                    |     |  |
| —   | A00 | DISPLAY      |                   |  |                       |                    | R   | Major display items  |
| —   | A10 | FLOW RATE(%) | —                 | - 8.0(-108.0) to 108.0%  | 1                     |                    | R   | Displays instantaneous flow in %                           |
| —   | A20 | FLOW RATE    | —                 | ±300.0m/s  | 0 to 4                |                    | R   | Displays instantaneous flow in actual units                |
| —   | A30 | TOTAL        | —                 | 0 to 999999  | 0                     |                    | W   | Displays forward direction totalization values             |
|     | A60 | SELF CHECK   | —                 | GOOD<br>ERROR<br>µP FAULT<br>EEPROM FAULT<br>A/D (L) FAULT<br>A/D (H) FAULT<br>SIGNAL<br>OVERFLOW<br>COIL OPEN<br>SPAN VEL.>10m/s<br>SPAN VEL.<0.3m/s<br>P. SPAN>1000p/s<br>P. SPAN>500p/s<br>P. SPAN>25p/s<br>P. SPAN>15p/s<br>P. SPAN>10p/s<br>P. SPAN>5p/s<br>P. SPAN<0.0001p/s<br>T. SPAN>1000p/s<br>T. SPAN<0.0001p/s<br>4 · 20 LMT ERROR<br>EMPTY PIPE<br>MULTI RANGE<br>EROOR |                       |                    | R   | Self check<br>Indicates nature of alarm when alarm occurs. |

10. PARAMETER SUMMARY

| No. |     | Name           | Data Range, Units  |   | Decimal Point | Initial Setting | R/W | Description  |
|-----|-----|----------------|--|---|---------------|-----------------|-----|--|
| AE  | BT  |                | AE   | BT  |               |                 |     |  |
| —   | B00 | SET            | —  |   |               |                 | R   | Major parameter setting items  |
| —   | B01 | TAG NO.        | —  | 8 ASCII characters  |               | (Space)         | W   | Specifies tag number using up to 8 characters.   |
| 02  | B02 | DAMPING        | S  | 0.1 to 200.0  | 1             | 3.0             | W   | Sets output time constants.  |
| 03  | B03 | FLOW SPAN      | S  | 1 to 30000  | 0 to 4        | 1.0000          | W   | Flow rate span<br>A combination of B04 and B05 units are used.   |
| 04  | B04 | FLOW UNIT      | 00<br>01<br>02<br>03<br>04<br>05<br>06<br>07<br>08<br>09<br>10<br>11<br>12<br>13 | km <sup>3</sup> (10 <sup>3</sup> ×m <sup>3</sup> )<br>m <sup>3</sup><br>l(liter)<br>cm <sup>3</sup> (10 <sup>-2</sup> ×m) <sup>3</sup><br>Mgal<br>kgal<br>gal<br>mgal<br>kbbbl<br>bbbl<br>mbbl<br>ubbl<br>m<br>ft |               | m               | W   | Select volume units of flow rate span.   |
| 05  | B05 | TIME UNIT      | 00<br>01<br>02<br>03   | /d<br>/h<br>/m<br>/s  |               | /s              | W   | Select time constants of flow rate span.   |
| 06  | B06 | SIZE UNIT      | 00<br>01   | mm<br>inch  |               | mm              | W   | Sets unit of meter tube size   |
| 07  | B07 | NOMINAL SIZE   | S  | 1 to 3000.0   | 1             | (Set)           | W   | Sets meter tube size using B06 units.  |
| 08  | B08 | LOW MF         |  | 0.2500 to 3.0000  | 4             | (Set)           | W   | Select low frequency measurement meter factor.   |
| 09  | B09 | HIGH MF        |  | 0.2500 to 3.0000  | 4             | (Set)           | W   | Select high frequency measurement meter factor.  |
| 10  | B10 | OUTPUT FUNC    | 00<br>01<br>02<br>03<br>04<br>05   | PULSE OUT<br>ALARM OUT<br>BI DIRECTION<br>AUTO 2 RANGES<br>LOW ALARM<br>TOTAL SWITCH  |               | PULSE OUT       | W   | Select pulse output / alarm output or status output functions.   |
| 11  | B11 | 4 - 20 ALM OUT | 00<br>01<br>02<br>03   | 2.4mA OR LESS<br>4.0mA<br>HOLD<br>21.6mA OR MORE  |               | 2.4mA OR LESS   | W   | Select current to be output during alarm. However, a hardware failure that causes a burn-out will result in 0 mA output. |

10. PARAMETER SUMMARY

| No. |     | Name          | Data Range, Units |                                   | Decimal Point | Initial Setting | R/W    | Description  |
|-----|-----|---------------|-------------------|-----------------------------------|---------------|-----------------|--------|--|
| AE  | BT  |               | AE                | BT                                |               |                 |        |  |
| 12  | B12 | POWER FREQ    | S                 | 47.00 to 63.00                    | 2             | 50.00           | W<br>R | DC power supply :<br>Power frequency setting<br>AC power supply :<br>Power frequency display |
| 13  | B13 | VELOCITY CHK  | S                 | 0 to 20.000                       | 3             |                 | R      | Range span displayed in m/s  |
| 14  | B14 | FLOW DIR      | 00<br>01          | FORWARD<br>REVERSE                |               | FOR<br>WARD     | W      | Select flow direction  |
| 30  | B30 | REV. SPAN     | S                 | 1 to 30000                        | 0 to 4        | 1.0000          | W      | Span for reverse direction flow measuring  |
| 31  | B31 | BI. DIREC HYS | S                 | 0 to 10                           | 0             | 2               | W      | Direct / reverse flow measuring hysteresis   |
| 33  | B33 | FOR. SPAN 2   | S                 | 1 to 30000                        | 0 to 4        | 1.0000          | W      | Second span for forward direction multi - range  |
| 34  | B34 | AUTO RNG HYS  | S                 | 0 to 15                           | 0             | 10              | W      | Two range transfer hysteresis  |
| 36  | B36 | LOW ALARM     | S                 | -10 to 110                        | 0             | -10             | W      | Comparison level for alarm output at low flow limits   |
| 37  | B37 | L. ALARM HYS  | S                 | 0 to 10                           | 0             | 5               | W      | Hysteresis for alarm output at low flow limits   |
| —   | B60 | SELF CHECK    | 00<br>↓<br>21     | GOOD<br>↓<br>MULTI RANGE<br>ERROR |               |                 | R      | Self check<br>Indicates nature of alarm when alarm occurs.                                   |
| —   | C00 | ADJUST        | —                 |                                   |               |                 | R      | Parameter for setting auto zero adjust   |
| C1  | C01 | ZERO TUNING   | 00<br>01          | INHIBIT<br>ENABLE                 |               | ENABLE          | W      | Parameter for setting auto zero adjust   |
| C2  | C02 | MAGFLOW ZERO  | S                 | 0 to ±99.99                       | 2             | 0.00            | W      | Displays zero correction   |
| —   | C60 | SELF CHECK    | 00<br>↓<br>21     | GOOD<br>↓<br>MULTI RANGE<br>ERROR |               |                 | R      | Self check<br>Indicates nature of alarm when alarm occurs.                                   |

10. PARAMETER SUMMARY

| No. |     | Name         | Data Range, Units  |  | Deci-<br>mal<br>Point | Initial<br>Setting | R/W | Description   |   |
|-----|-----|--------------|--|--|-----------------------|--------------------|-----|---|---|
| AE  | BT  |              | AE   | BT   |                       |                    |     |   |   |
| —   | D00 | DISP SEL     | —  |  |                       |                    | R   | Display selection items   |   |
| d1  | D01 | DISP SELECT  | 00<br>01<br>02<br>03<br>04<br>05<br>06<br>07<br>08<br>09<br>10<br>11 | RATE (%)<br>RATE<br>FOR. TOTAL<br>REV. TOTAL<br>DIF. TOTAL<br>RATE(%) /<br>FOR. TTL<br>RATE / FOR. TTL<br>RATE / RATE(%)<br>RATE(%) /<br>REV. TTL<br>RATE / REV. TTL<br>RATE(%) /<br>DIF. TTL<br>RATE / DIF. TTL |                       | RATE(%)            | W   | Display panel selections  |   |
| d2  | D02 | FL USER SEL  | 00<br>01   | NOT PROVIDED<br>PROVIDED   |                       | NOT                | W   | Selects whether special units are to be used for instantaneous flow rates |   |
| d3  | D03 | FL USER SPAN | S  | 0 to 30000   | 0 to 4                | 100                | W   | Sets the value to be displayed in the special unit at 100% output         |   |
| —   | D10 | FL USER UNIT | —  | 8 ASCII characters   |                       | Space              | W   | Sets the special instantaneous flow rate unit                             |   |
| —   | D60 | SELF CHECK   | 00<br>↓<br>21  | GOOD<br>↓<br>MULTI RANGE<br>ERROR  |                       |                    | R   | Self check<br>Indicates nature of alarm when alarm occurs                 |   |
| —   | E00 | TOTAL SET    | —  |  |                       |                    | R   | Totalization display items  |   |
| E1  | E01 | TOTAL UNIT   | 00<br>01<br>02<br>03<br>04<br>05<br>06                               | n UNIT / P<br>μ UNIT / P<br>m UNIT / P<br>UNIT / P<br>k UNIT / P<br>M UNIT / P<br>PULSE / S  |                       | PULSE/S            | W   | Sets flow rate unit per pulse for totalization display                    |   |
| E2  | E02 | TOTAL SCALE  | S  | 0 to 30000   | 0 to 4                | 0                  | W   | Sets flow rate per pulse for totalization display                         |   |
| E3  | E03 | TOTAL LOWCUT | S  | 0 to 100   |                       | 0                  | 3   | W   | Sets the range in vicinity of 0% within which totalization will be halted |
| E4  | E04 | TOTAL SET    | 00<br>01   | INHIBIT<br>ENABLE  |                       | INHIBIT            | W   | Totalization preset(reset) enabled / inhibited                            |   |
| E5  | E05 | TL SET VALUE | S  | 0 to 999999  | 0                     | 0                  | 0   | W   | Sets preset (reset) value   |

10. PARAMETER SUMMARY

| No. |     | Name         | Data Range, Units                      |   | Deci-<br>mal<br>Point | Initial<br>Setting | R/W | Description   |
|-----|-----|--------------|--|---|-----------------------|--------------------|-----|---|
| AE  | BT  |              | AE                                     | BT  |                       |                    |     |   |
| E6  | E06 | TOTAL SWITCH | S                                      | 0 to 999999   | 0                     | 0                  | W   | Set the totalization switch level   |
| —   | E10 | TL USER UNIT | S                                      | 8 ASCII characters  |                       | Space              | W   | Sets special totalization units   |
| —   | E11 | REV. TOTAL   | —                                      | 0 to 999999   | 0                     | 0                  | R   | Display differential totalization values  |
| —   | E12 | DIF. TOTAL   | —                                      | 0 to 999999   | 0                     | 0                  | R   | Display differential totalization values  |
|     | E60 | SELF CHECK   | 00<br>↓<br>21                          | GOOD<br>↓<br>MULTI RANGE<br>ERROR   |                       |                    | R   | Self check<br>Indicates ature of alarm when<br>alarm occurs.                    |
| —   | F00 | PULSE SET    | —                                      |   |                       |                    | R   | Pulse output items  |
| F1  | F01 | PULSE SELECT | 00<br>01<br>02<br>03<br>04<br>05<br>06 | n UNIT / P<br>μ UNIT / P<br>m UNIT / P<br>UNIT / P<br>k UNIT / P<br>M UNIT / P<br>PULSE / S |                       | PULSE/S            | W   | Selects pulse rate units  |
| F2  | F02 | PULSE SCALE  | S                                      | 0 to 30000  | 0 to 4                | 0                  | W   | Sets pulse rate   |
| F3  | F03 | PULSE LOWCUT | S                                      | 0 to 100  | 0                     | 3                  | W   | Sets the range in vicinity of 0%<br>within which pulse output will<br>be halted |
| F4  | F04 | PULSE WIDTH  | 00<br>01<br>02<br>03<br>04<br>05<br>06 | 50% DUTY<br>0.5 msec<br>1 msec<br>20 msec<br>33 msec<br>50 msec<br>100 msec                 |                       | 50%<br>DUTY        | W   | Sets width of pulse output  |
| —   | F60 | SELF CHECK   | 00<br>↓<br>21                          | GOOD<br>↓<br>MULTI RANGE<br>ERROR   |                       |                    | R   | Self check<br>Indicates nature of alarm when<br>alarm occurs                    |

10. PARAMETER SUMMARY

| No. |     | Name           | Data Range, Units |                                   | Deci-<br>mal<br>Point | Initial<br>Setting | R/W | Description  |
|-----|-----|----------------|-------------------|-----------------------------------|-----------------------|--------------------|-----|--|
| AE  | BT  |                | AE                | BT                                |                       |                    |     |  |
| —   | G00 | 4 - 20 SEL     | —                 |                                   |                       |                    | R   | Current output (4 to 20) settings                                  |
| G1  | G01 | 4 - 20 LOW CUT | S                 | 0 to 10                           | 0                     | 0                  | W   | Sets low cut range for 4 to 20 mA output                           |
| G2  | G02 | 4 - 20 LOW LMT | S                 | -20 to 100                        | 0                     | -20                | W   | Sets low limit for 4 to 20 mA output                               |
| G3  | G03 | 4 - 20 H LMT   | S                 | 0 to 120                          | 0                     | 120                | W   | Sets high limit for 4 to 20 mA output                              |
| —   | G60 | SELF CHECK     | 00<br>↓<br>21     | GOOD<br>↓<br>MULTI RANGE<br>ERROR |                       |                    | R   | Self check<br>Indicates nature of alarm when alarm occurs          |
| —   | H00 | TEST           | —                 |                                   |                       |                    | R   | Test mode items  |
| H1  | H01 | TEST MODE      | 00<br>01          | NORMAL<br>TEST                    |                       | NORMAL             | W   | Sets normal mode/test mode   |
| H2  | H02 | OUTPUT VALUE   | S                 | -10 to 110                        | 0                     | 0                  | W   | Sets test output values  |
| H3  | H03 | ALARM OUT      | 00<br>01<br>02    | NORMAL<br>CLOSED(ON)<br>OPEN(OFF) |                       | NORMAL             | W   | Sets state of alarm output   |
| —   | H60 | SELF CHECK     | 00<br>↓<br>21     | GOOD<br>↓<br>MULTI RANGE<br>ERROR |                       |                    | R   | Self check<br>Indicates nature of alarm when alarm occurs          |
| —   | L00 | OTHER          |                   |                                   |                       |                    | R   | Data change inhibit/enable and display restrictions                |
| L1  | L01 | TUNING         | 00<br>01          | INHIBIT<br>ENABLE                 |                       | ENABLE             | W   | Select whether data changes should be inhibit or enabled           |
| L2  | L02 | KEY            | 00<br>55          | 00(TO"L")<br>55(TO"N")            |                       | 0                  | W   | Display restrictions<br>Set 55 and items up to N will be displayed |
| —   | L60 | SELF CHECK     | 00<br>↓<br>21     | GOOD<br>↓<br>MULTI RANGE<br>ERROR |                       |                    | R   | Self check<br>Indicates nature of alarm when alarm occurs          |

10. PARAMETER SUMMARY

| No. |     | Name         | Data Range, Units |                                   | Deci-<br>mal<br>Point | Initial<br>Setting | R/W | Description   |
|-----|-----|--------------|-------------------|-----------------------------------|-----------------------|--------------------|-----|---|
| AE  | BT  |              | AE                | BT                                |                       |                    |     |   |
| —   | N00 | APPL SET     | —                 |                                   |                       |                    | R   |   |
| n1  | N01 | TOTAL/PULSE  | 00<br>01          | NO DAMP<br>DAMP                   |                       | DAMP               | W   | Selects whether instantaneous flow rate values or damping derived flow rate values are to be used in totalization/pulse |
| n2  | N02 | PLSE MODE    | 00<br>01          | ON<br>OFF                         |                       | ON                 | W   | Selects whether the pulse output transistor is to be set to ON ACTIVE or OFF ACTIVE                                     |
| n3  | N03 | RATE LIMIT   | S                 | 0 to 10                           | 0                     | 5                  | W   | Sets the level to reduce output fluctuation.  |
| n4  | N04 | DEAD TIME    | S                 | 0 to 15                           | 0                     | 0                  | W   | Sets the dead time to reduce output fluctuation. When "0" is set, "Rate limit" is not available.                        |
| n5  | N05 | POWER SYNCH  | 00<br>01          | YES<br>NO                         |                       | YES                | W   | Selects whether the internal frequency is to be synchronized with the power supply or not.                              |
| n6  | N06 | PULSING FLOW | 00<br>01          | YES<br>NO                         |                       | NO                 | W   | Counteraction of pulsing flow   |
| n7  | N07 | EMPTY PIPE   |                   | ALARM<br>NO ALARM                 |                       | ALARM              | W   | Selects whether the detecting empty pipe function is to be used as an alarm or not.                                     |
| —   | N60 | SELF CHECK   | 00<br>↓<br>21     | GOOD<br>↓<br>MULTI RANGE<br>ERROR |                       |                    | R   | Self check<br>Indicates nature of alarm when alarm occurs   |

# 11. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described. For explosion proof type instrument, the description in this chapter is prior to other description in this User's Manual.



## NOTE

The terminal box cover and display cover is locked by special screw. In case of opening the cover, please use the Hexagonal Wrench attached.



## CAUTION

Be sure to lock the cover with the special screw using the Hexagonal Wrench attached after tightening the cover.

## 11.1 ATEX Directive



## WARNING

Only trained persons use this instrument in industrial locations.

### (1) Technical Data

No. KEMA 02ATEX2022

Group, category: II2G

EEx d IIC T6

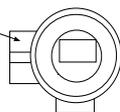
Amb. Temp: +60°C Max.

Enclosure : IP67

### (2) Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following codes.

| Screw Size         | Marking |
|--------------------|---------|
| ISO M20x1.5 female | △ M     |
| ANSI 1/2NPT female | △ A     |



### (3) Installation



## WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- In hazardous locations, the cable entry devices shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is flameproof certified.)

### (4) Operation



## WARNING

- OPEN CIRCUIT BEFORE REMOVING COVER. INSTALL IN ACCORDANCE WITH USER'S MANUAL IM1E7C1-E.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

### (5) Maintenance and Repair



## WARNING

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

### (6) Data Plate

|  |                |
|--|----------------|
| <b>WARNING</b>   |                |
| AFTER DE-ENERGIZING,<br>DELAY 10 MINUTES BEFORE OPENING.               |                |
| <br><b>ADMAE</b><br>MAGNETIC FLOW CONVERTER                            |                |
| MODEL  |                |
| SUFFIX   |                |
|  |                |
| STYLE  |                |
| SUPPLY   | VDC ≒ 12.5     |
| VAC ~ 47-63 Hz 36 VA 12.5  |                |
| CURRENT  | 4-20mA         |
| OUTPUT   | (0-750Ω)       |
| PULSE  |                |
| OUTPUT   | 30VDC 0.2Amax. |
| Tamb.  | -20 TO 60 °C   |
| No.  |                |
| 0344   |                |
| No. : KEMA 02ATEX2022<br>EEx d IIC T6<br>ENCLOSURE : IP67              |                |
| <b>YOKOGAWA</b> TOKYO 180-8750<br>Made in Japan                  JAPAN |                |

MODEL : Specified model code  
 SUFFIX : Suffix codes of the model code  
 STYLE : Specified style code  
 SUPPLY : Power supply voltage of apparatus  
 CURRENT OUTPUT : Output signal of apparatus  
 PULSE OUTPUT : Output signal of apparatus  
 Tamb : Ambient temperature  
 No. : Manufacturing serial number  
 CE : CE marking  
 ExII 2G : Group II Category 2 Gas atmosphere  
 KEMA No. : KEMA 02ATEX2022 : Certificate number  
 EExd IICT6 : Protection type and temp. class  
 ENCLOSURE : Enclosure protection number

**!** **WARNING:** Warning to apparatus

YOKOGAWA ♦ TOKYO 180-8750 JAPAN :  
 Name and address of manufacturer

\*1) The third figure from the last shows the last one figure of the year of production. For example, the year of production of the product engraved as follows is year 1998.

No. F261GA091 813

↑  
 Produced in 1998

\*2) The identification number of the notified body:0344

\*3) The product-producing country

## 11.2 FM

### (1) Technical Data

- Explosionproof for Class I Division 1 Groups A, B, C & D. Dust-ignitionproof for Class II/III Division 1 Groups E, F & G.  
 Temp. Code. T6  
 Enclosure : NEMA 4X
- Nonincendive for Class I, Division 2, Groups A, B, C & D ; Suitable for Class II, Division 2, Groups F & G ; Class III, Division 1 and 2  
 Temp. Code : T5  
 Enclosure : NEMA 4X

### (2) Installation



#### WARNING

- All wiring shall comply with national electrical code ANSI/NFPA 70 and local electrical code.
- In hazardous locations, wiring to be in conduit as shown in Figure 11.2.1.

### (3) Operation



#### WARNING

- Open circuit before opening the covers and seal all conduits within 18 inches in hazardous locations.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

## (4) Maintenance and Repair



#### WARNING

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of Factory Mutual Research Corporation.

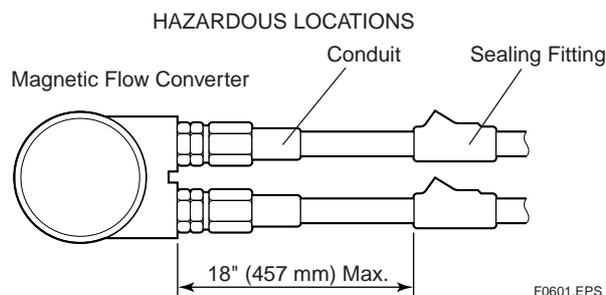


Figure 11.2.1 Conduit Wiring

## 11.3 CSA

### (1) Technical Data

- Explosionproof for Class I, Division 1, Groups B, C & D ; Dust-ignitionproof Class II/III, Division 1 Groups E, F & G.  
 Temp. Code T6  
 Enclosure: Type 4
- Nonincendive for Class I, Division 2, Groups A, B, C & D ; Suitable for Class II, Division 2, Groups E, F and G ; Class III, Division 1  
 Temp. Code T5  
 Enclosure: Type 4

### (2) Installation



#### WARNING

All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes. In hazardous location, wiring shall be in conduit as shown in Figure 11.3.1.

**CAUTION :** SEAL ALL CONDUITS WITHIN 50cm OF THE ENCLOSURE' UN SCELLEMENT DOIT ÊTRE INSTALLÉ À MOINS DE 50cm DU BOÎTIER.

**(3) Operation**

**! WARNING**

**CAUTION : OPEN CIRCUIT BEFORE REMOVING COVER.**

OUVRIRE LE CIRCUIT AVANT D'ENLEVER LE COUVERCLE.

Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

**(4) Maintenance and Repair**

**! WARNING**

The instrument modification or parts replacement by other than authorized representative of YOKOGAWA Electric Corporation or YOKOGAWA Corporation of AMERICA is prohibited and will void Canadian Standards Explosionproof Certification.

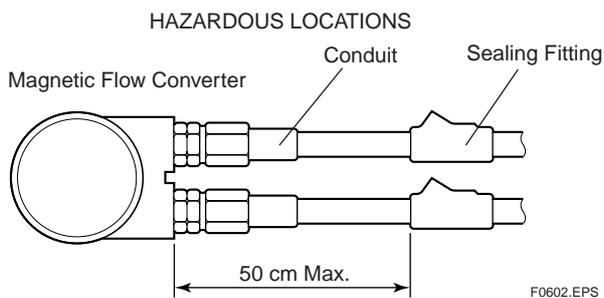


Figure 11.3.1 Conduit Wiring

**(2) Installation**

**! WARNING**

- All wiring shall comply with local installation requirements and local electrical code.
- In hazardous locations, the cable entry devices shall be of a certified flameproof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements. (The plug attached is flameproof certified.)

**(3) Operation**

**! WARNING**

- Open circuit before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

**(4) Maintenance and Repair**

**! WARNING**

The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

**11.4 SAA**

**! WARNING**

Only trained persons use this instrument in industrial locations .

**(1) Technical Data**

|                    |                   |
|--------------------|-------------------|
| SA Certificate No. | AUS Ex 3210X      |
| Type of Protection | Ex d II C T6 IP67 |