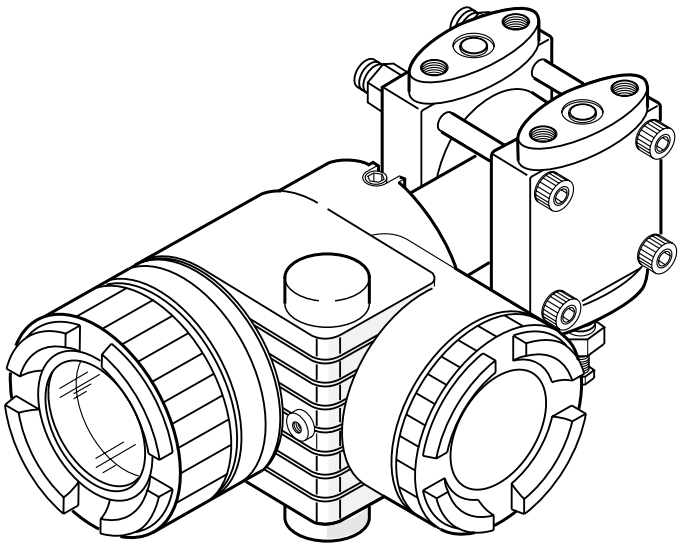
e-Front runners Fuji Electric France S.A.

Instruction Manual

FCX-AII SERIES TRANSMITTERS

TYPE: **FKA**
FKG
FKC
FKE
FKB, FKD, FKM



INTRODUCTION

Thank you very much for your purchase of the Fuji FCX-A2 Series Transmitter.
This instruction manual covers version 4 of the FCX series and contains information about the installation, piping, wiring, operation and maintenance of 9 types belonging to the FCX-A2 series.

- First read this instruction manual carefully until an adequate understanding is required, and then proceed to installation, operation and maintenance of the FCX-A2 Series transmitter.
- The specifications of the transmitter will be changed without prior notice for further product improvement.
- Modification of the transmitter without permission is strictly prohibited. Fuji will not bear any responsibility for a trouble caused by such a modification.
- This instruction manual should be kept by a person who is actually using the transmitter.
- After reading this manual, keep it at a place easier to access.
- This manual should be delivered to the end user without fail.
- For detail specifications and outline diagrams, refer to the specifications furnished separately.

The product conforms to the requirements of the Electromagnetic compatibility Directive 89/336/EEC as detailed within the technical construction file number TN513035. The applicable standards used to demonstrate compliance are :

EN 50081-2 : 1993	**Conducted and Radiated emissions**
EN 50082-2 : 1995	**Radiated immunity, ESD and FBT**

Manufacturer:	Fuji Electric Instruments Co., Ltd.
Type:	Described in nameplate on main frame (see Page iv)
Date of manufacture:	Described in nameplate on main frame
Product nationality:	Japan

Request

- Transcription of a part or the whole of this manual without permission is prohibited.
- The contents of this manual are subject to change without prior notice.

Issued in February, 2001

CAUTION ON SAFETY

First of all, read this “Caution on Safety” to ensure correct operation of the transmitter.

- The cautionary descriptions listed here contain important information about safety, so they should be observed without fail. Those safety precautions are classified into ranks "DANGER" and "CAUTION".

DANGER	Wrong handling may cause a dangerous situation, in which there is a risk of death or heavy injury.
CAUTION	Wrong handling may invite a dangerous situation, in which there is a possibility of medium-level trouble or slight injury or only physical damage is predictable.

On items listed under “**CAUTION**”, they may also lead to serious accidents depending on circumstances, and must be fully observed.

- The signs of prohibition and indication are explained in the following.

PROHIBITION	General items which pertain to prohibition (DO NOT)
INDICATION	General items which pertain to user’s action

Installation and Piping

DANGER

- Non-explosion-proof transmitter must not be used in a place with explosive gases to prevent serious accidents such as explosion, fire, etc.

CAUTION

- The transmitter is heavy. Be careful when handling it.
- The transmitter should be installed in a place that meets the operating conditions shown in DS sheet or this instruction manual.
- Install the transmitter according to the instruction manual. Improper installation may lead to the cause of fall, trouble or incorrect operation.
- When installing, make sure that the transmitter interior is free from cable chips and other foreign objects to prevent fire, trouble, or incorrect operation.
- When power is ON, do not change the position of the field indicator in an explosion-proof area.
- When power is ON, do not change the position of the transmission unit in an explosion-proof area.
- When power is ON, do not change the angle of the indicator.
- Main valve used for piping should be selected with the maximum pressure of the process taken into account (piping parts such as main valve, etc. should be furnished by user). If the main valve and other parts do not meet the rating, it may result in leakage of gas or liquid which could lead to hazard.
- Pressure pipes to be used must meet the temperature/pressure rating.

Wiring

DANGER

- On explosion-proof type transmitter, its wiring work must be performed according to the required laws and regulations. Incorrect wiring may cause explosion, fire or other serious accidents.

CAUTION

- Before making wiring work, be sure to turn OFF the main power to prevent electric shocks.
- Use wiring materials of correct rating to prevent fire accidents.
- Connect a power source of correct rating to prevent fire accidents.
- The transmitter should be grounded as specified to prevent electric shocks or incorrect operation.
- After installing the transmitter, firmly close the covers of the transmission unit and terminal box. If not, rain water enter the transmitter which may result in trouble or incorrect operation.

Adjustment

DANGER

- When using a flame-proof transmitter, do not connect HHC to the transmitter terminals and junction terminals.

Replacement of Maintenance Parts

DANGER

- When removing an explosion-proof transmitter, turn OFF the main power, then disconnect the piping and wiring. Do not remove it when the power is ON to prevent serious accident such as explosion, fire, etc.

CAUTIONS ON USE

Be sure to observe the following instructions

Storage for a long period

Store the transmitter in a dry room at normal temperature and humidity.
Keep protection caps in place at the conduit connection and process connection.

For installation, select an appropriate place

Site at location with minimal vibration, dust and corrosive gas

At a place allowing an adequate space for checkup

Site at location large enough to allow maintenance and checking.

Mounting angle

Mount to a pipe horizontally or vertically.

Attention to overload

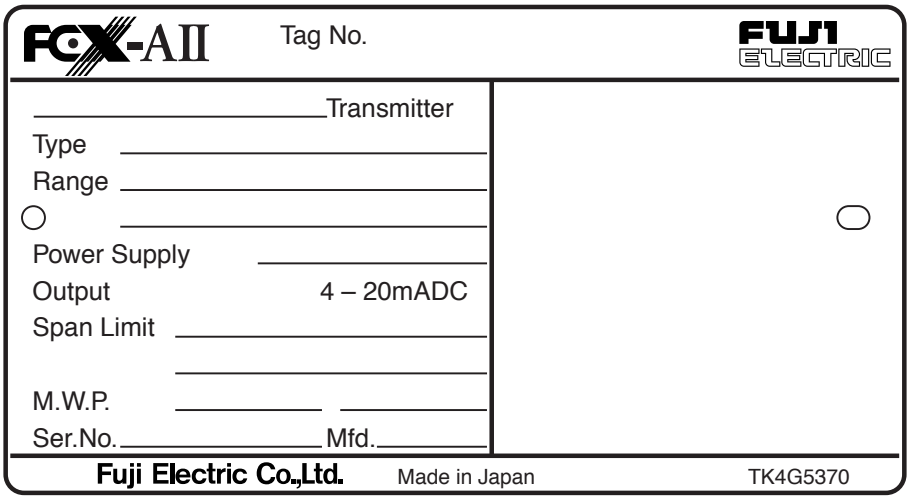
Do not apply a pressure outside the specified range.

Other

Besides the above, be sure to observe the cautions given in this manual.

CONFIRMATION OF YOUR SPECIFICATION

The instrument nameplate as shown below is attached at the transmission unit of this transmitter. Before use, make sure the contents of the nameplate agree exactly with your specifications.



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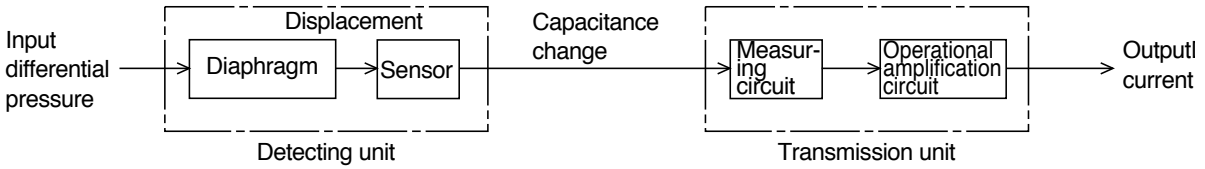
1. OUTLINE

The FCX-A2 series transmitter detects the differential pressure or pressure of various fluids, converts it into a current signal of 4 to 20mA DC and transmits it.
All the adjustment functions are incorporated in the transmission unit for making adjustments easily and exactly.
Transmitter settings (such as range and damping time constant, etc.) can be changed from an HHC (Hand Held Communicator).

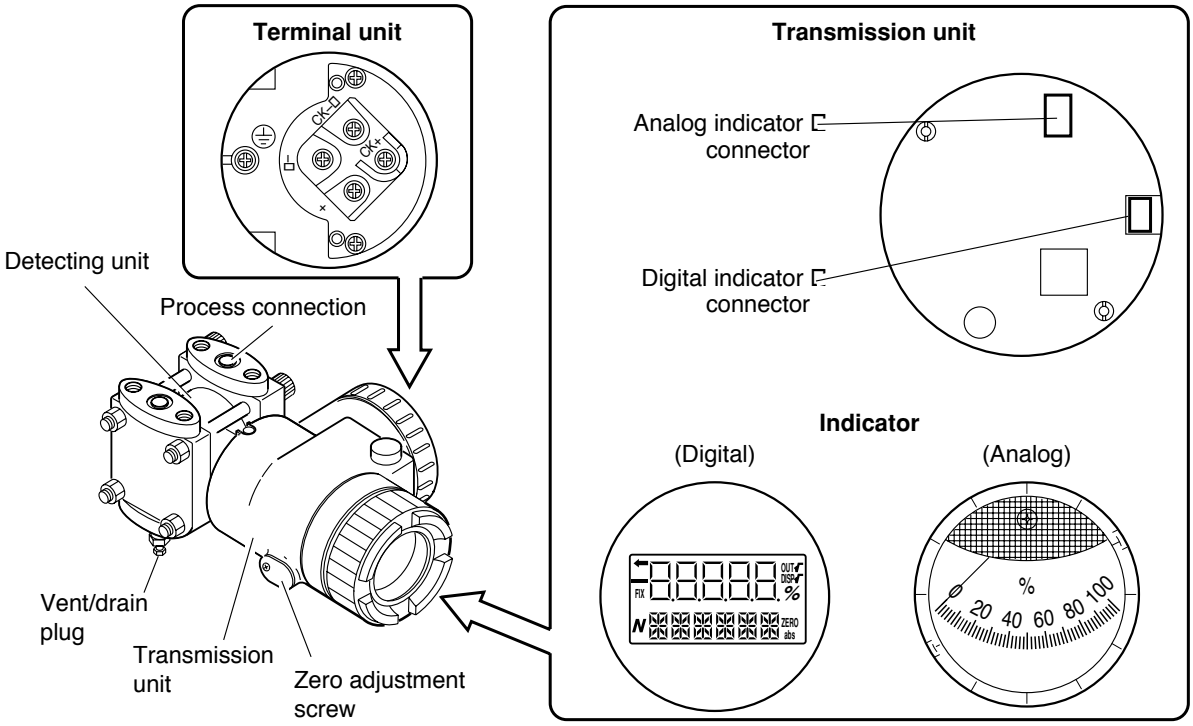
Principle

The operating principle of the FCX-A2 series transmitter is shown in the block diagram below.
The input pressure is changed into an electrostatic capacitance in the detecting unit. The change proportional to the pressure undergoes conditioning and amplification in the transmission unit, and is then output as a current of 4 to 20mA DC.



2. OPERATING PARTS AND THEIR FUNCTIONS

FCX-A2 Series transmitter



Description of FCX-A2 Series transmitter

Part name	Description
Detecting unit	Detects pressure, differential pressure or level of fluid.
Transmission unit	Converts the detected signal into an output signal.
Vent/drain plug	Used for gas discharge or draining. (Attention should be paid under a high pressure.)
Process connection	Connects impulse pipes from the process.
Conduit connection	Connects the output cable.
Zero adjustment screw	Adjusts zero (Refer to Section 7.)

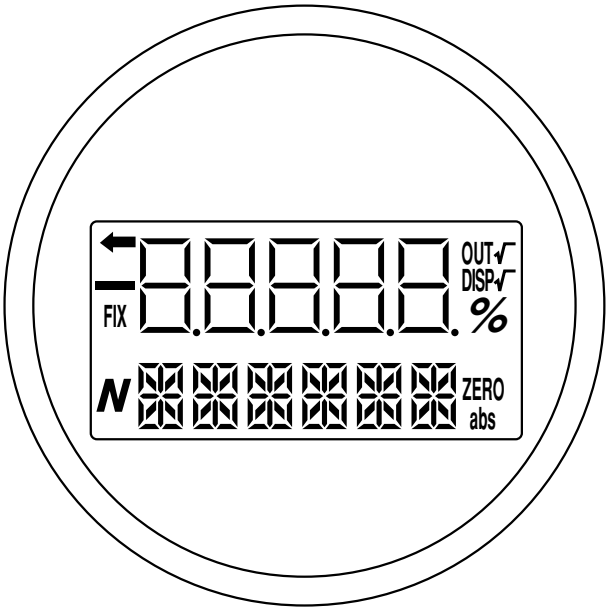
Transmission unit

Part name	Description
Analog indicator connector	Used for connecting an analog indicator.
Digital indicator connector	Used for connecting a digital indicator.
Indicator (option)	Analog or digital indicator, available.

Terminals

Symbol	Description
+, –	Connects the output cable.
CK+, CK–	Used for checking the output or connecting an indicator.
⏚	An external terminal used for grounding.

Mode indicating function of digital indicator



Mode indication

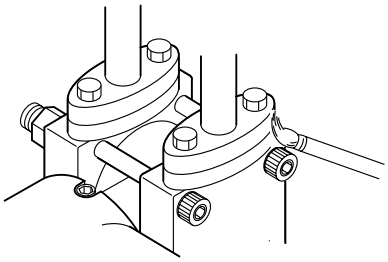
Mode	When indicated	When not indicated
%	% output	Actual scale
ZERO	External zero adjustment possible	External zero adjustment impossible
DISP √	Digital indicator √ display	Digital indicator proportional display
OUT √	√ output	Proportional output
FIX	Fixed current mode	Measurement mode
⬅	Sampling status (Flicker)	
abs	Absolute pressure	Gage pressure
–	Output value < Zero	Output value ≧ Zero
N	(a part of unit indicator)	

3. OPERATION AND SHUTDOWN

3.1 Preparation for operation

Before operating the transmitter, be sure to perform the following checks and procedures. On zero point check or zero adjustment in hazardous area, do not open terminal cover and do not use HHC. Use the transmitter indicator and the external adjustment screw.

Preparation procedure



(1) Check for liquid or gas leakage from the process connection, etc. by applying soapy water or the like.

(2) Check the signal wiring according to the "Terminal block connection diagram" shown in 7.1.

(3) Vent gas from the transmitter in the case of liquid measurement.

Important

When the plant requires chemical cleaning at the start of operation, be sure to close the valve of the transmitter to prevent entry of cleaning liquid into the pressure receiving unit.

(4) Perform zero point adjustment.

Zero point check

Turn on the power to the transmitter.
Check the output signal of the transmitter by connecting a DC ammeter across CK+ and CK– of the terminal block.
After ten minutes or longer, adjust the transmitter output current to 4 mA (zero adjustment). (See below.)

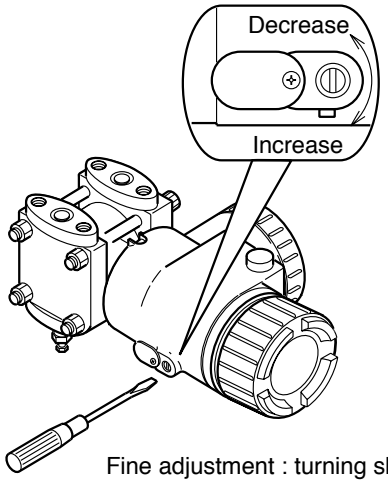
Zero adjustment

(1) Adjustment by zero adjustment screw
Adjust zero point of the transmitter to 4 mA by turning the zero adjustment screw.

Note 1) If the transmitter is locked (see section 4.1.3 Operating procedure, Lock of adjustment function.), this adjustment cannot be made with the external adjustment screw.

Note 2) When a digital indicator is attached to the transmitter, make sure that the LCD lamp "ZERO" is ON.

(2) Adjustment by HHC
Refer "zero adjustment" explained in section 4.1.



Fine adjustment : turning slowly
Rough adjustment turning quickly

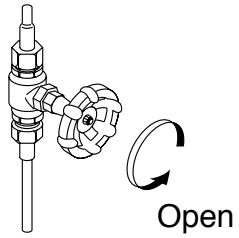
Important

1. After adjustment of the transmitter, it should be kept energized for about 10 seconds to write the adjustment results into memory.
2. Use a blade-edge screwdriver for adjusting the zero adjustment screw.

3.2 Operation

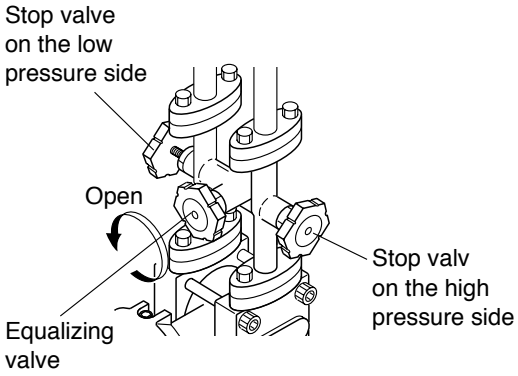
(1) Operation of pressure transmitter

Open the valve slowly to apply a pressure. When a pressure is applied, the transmitter is set in the operating status.

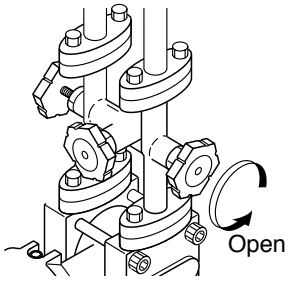


(2) Operation of differential pressure transmitter

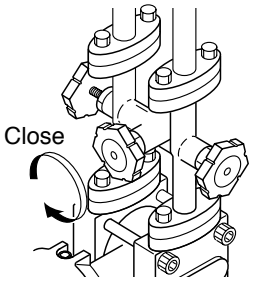
Set the operating status by manipulating the manifold valve.



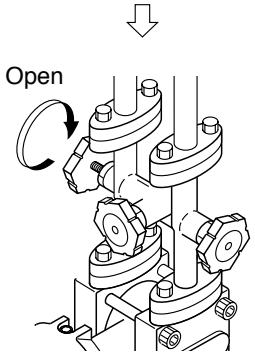
Make sure the equalizing valve is open.



Open the stop valve on the high pressure side slowly.



Close the equalizing valve.



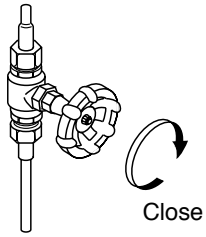
Finally, open the stop valve on the low pressure side slowly.

Check of operating status

Use a field indicator, receiving instrument or HHC to check the operating status.

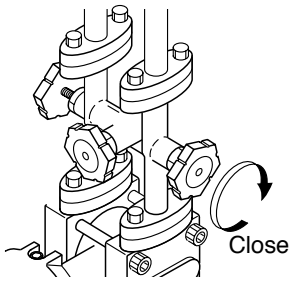
3.3 Shutdown

(1) Shutdown of pressure transmitter
Close the valve slowly to stop applying a pressure. The transmitter is set in the measurement stop status.



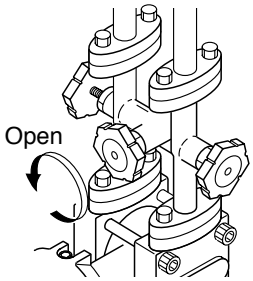
(2) Shutdown of differential pressure transmitter
Set the shutdown status by manipulating the manifold valve.
Turn off power supply.

⇩



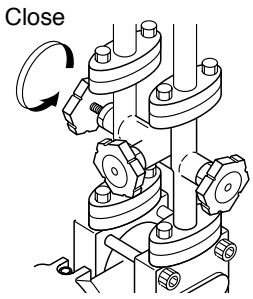
Close the stop valve on the high pressure side (H side) slowly.

⇩



Open the equalizing valve.

⇩



Close the stop valve on the low pressure side (L side) slowly.

Important

Before a long shutdown, discharge the process fluid and drain completely from the transmitter.
This is to protect the transmitter from freezing, corrosion, etc.

4. ADJUSTMENT

To operate the FCX-A2 series transmitter, the HHC is used for each adjustment.

4.1 Adjustment with HHC

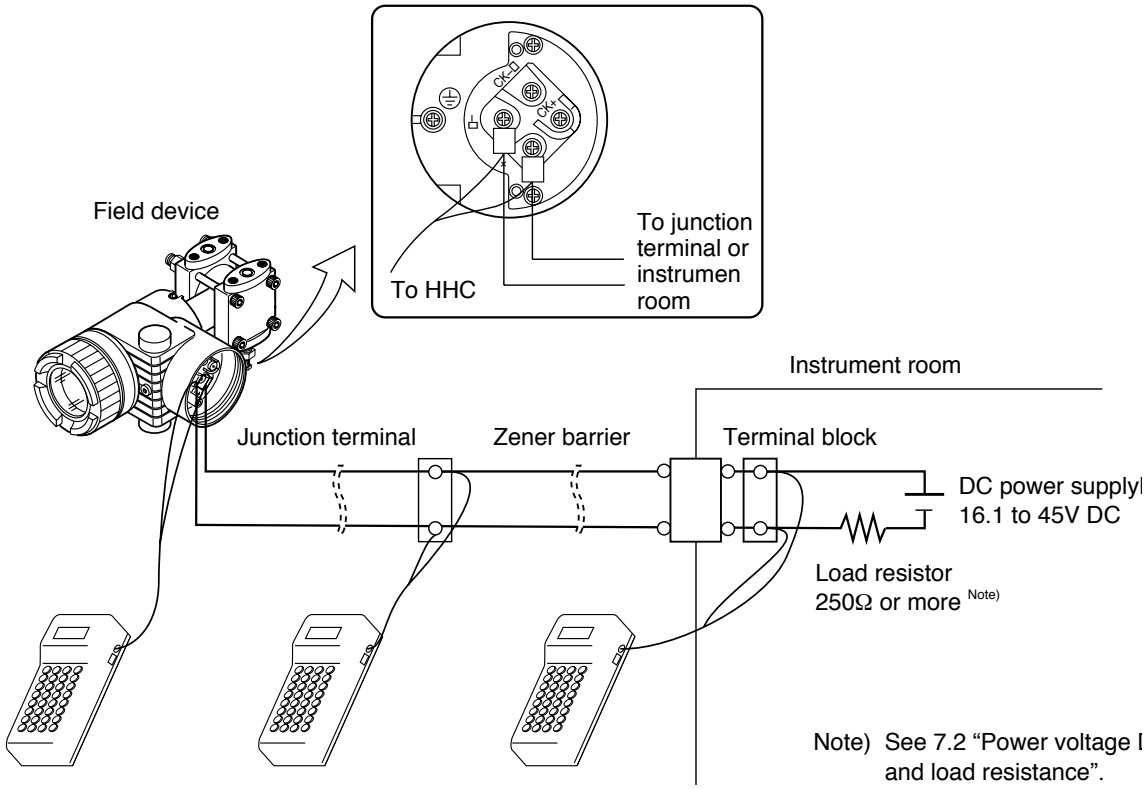
Startup and usage of the Hand Held Communicator (HHC) are detailed in the instruction manual for HHC. Please refer to this manual before commencing adjustment.

Important

After adjustment of the transmitter, it should be kept energized for about 10 seconds to write the adjustment results into memory.

4.1.1 Connection of HHC

The HHC can be connected to the transmitter, junction terminal or the terminals in the instrument room.



DANGER

In the case of a flameproof transmitter, never connect the HHC to the terminal block of the transmitter in hazardous area installations.

4.1.2 Outline of HHC operation

The following shows the flow of key operations, explained for FXW Version 6.0 (FXW□□□□1-□3).

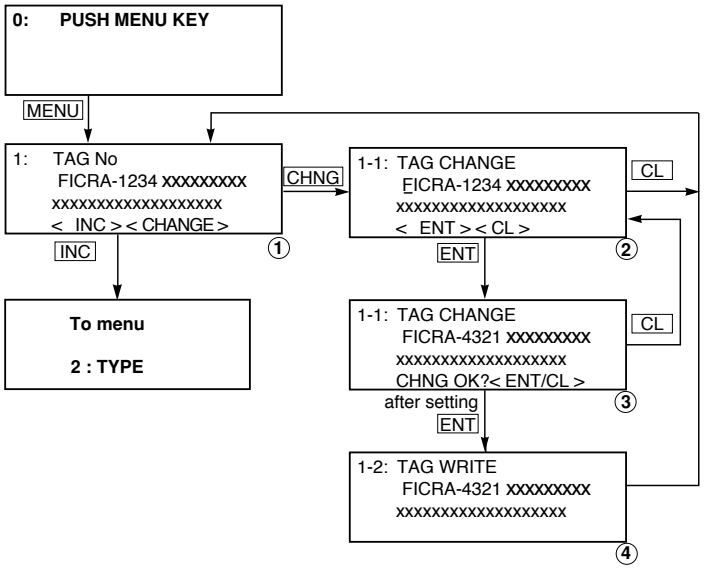
FXW prior to Version 6.0 (FXW □□□□1-□ 3) are not available of operation of FCX-A2 sereis transmitter.

In this case, the user is requested to contract our office for ROM Version Up.

Classification			Display symbol	Key symbol	Referential page
1	TAG No.	INC	1: TAG N	MENU	10
2	Type	INC	2: TYPE	MENU ⇨ INC	11
3	Display of serial No.	INC	3: SERIAL No.	MENU ⇨ INC ⇨ INC	11
4	Industrial value unit	INC	4: UNIT	UNIT	12
5	Range limit	INC	5: RANGE LIMIT	UNIT ⇨ INC	13
6	Range change (LRV, URV)	INC	6: RANGE	RANG	13
7□	Damping adjustment	INC	7: DAMPING	DAMP	14
8	Output mode	INC	8: OUTPUT MODE	LIN / √	15
9	Burnout direction	INC	9: BURNOUT	LIN / √ ⇨ INC	16
A	Zero/span adjustment	INC	A: CALIBRATE	CALB	17
B	Calibration of output circuit	INC	B: OUTPUT ADJ	OUT	18
C	Indication of measured data	INC	C: DATA	DATA	19
D	Self-diagnosis	INC	D: SELF CHECK	DATA ⇨ INC	19
E	Printer function	INC	E: PRINT	DATA ⇨ INC ⇨ INC	20
F	Lock of adjustment functions	INC	F: XMTR EXT.SW	DATA ⇨ INC ⇨ INC ⇨ INC	21
G	Indication of digital indicator	INC	G: XMTR DISPLAY	DATA ⇨ INC ⇨ INC ⇨ INC ⇨ INC	22
H	Programmable Linearization function	INC	H: LINEARIZE	DATA ⇨ INC ⇨ INC ⇨ INC ⇨ INC ⇨ INC	25
I	Rerange (Set LRV/URV calibration)	INC	I: RERANGE	DATA ⇨ INC ⇨ INC ⇨ INC ⇨ INC ⇨ INC ⇨ INC	2

4.1.3 Operating procedure

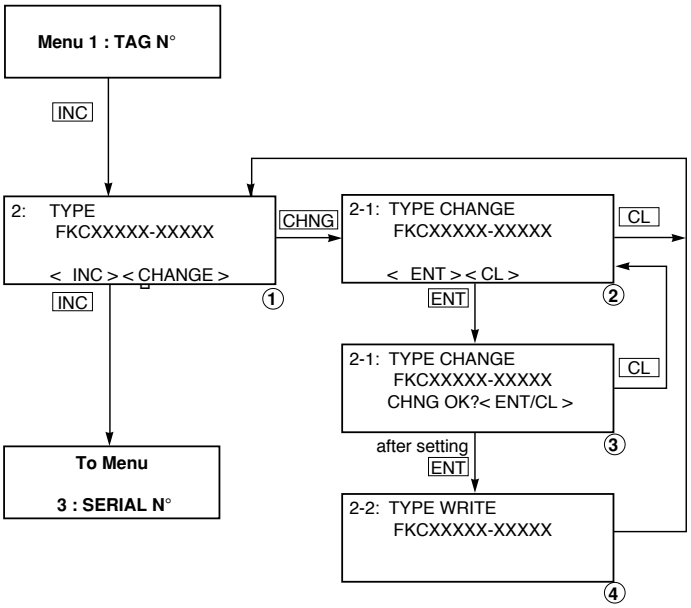
In case of a flameproof transmitter, never connect the HHC to the terminal block of transmitter in hazardous area installations.



TAG N°.

To set the TAG N°. of each field device, use the procedures shown in the following diagram. TAG N°. can be inputted up to 26 characters of alphanumeric codes.

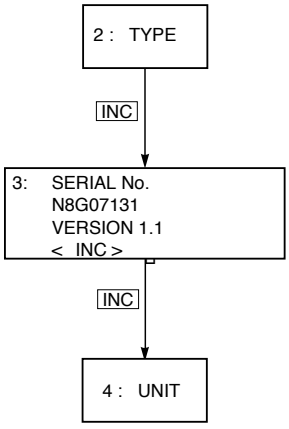
- After PUSH MENU KEY is displayed, press the <MENU> key to display TAG N°.
- To make changes press the <CHNG> key and the cursor will be displayed under display ①.
- Set the alphanumeric keys as necessary under display ②. To set the alphabet, press the <CHNG ALHA> key first. Using < ◁ >< ▷ > keys, cursor position can be moved.
- At the completion of setting, press the <ENT> key and a prompt is displayed check entry under display ②.
- If the entry is correct, press the <ENT> key to input it to the field device under display ③ and ④ and the initial image ① is displayed.
- To display TYPE display, press the <INC> key under display ①.



TYPE

Type of field device is displayed and changed (ex. of differential pressure transmitter).

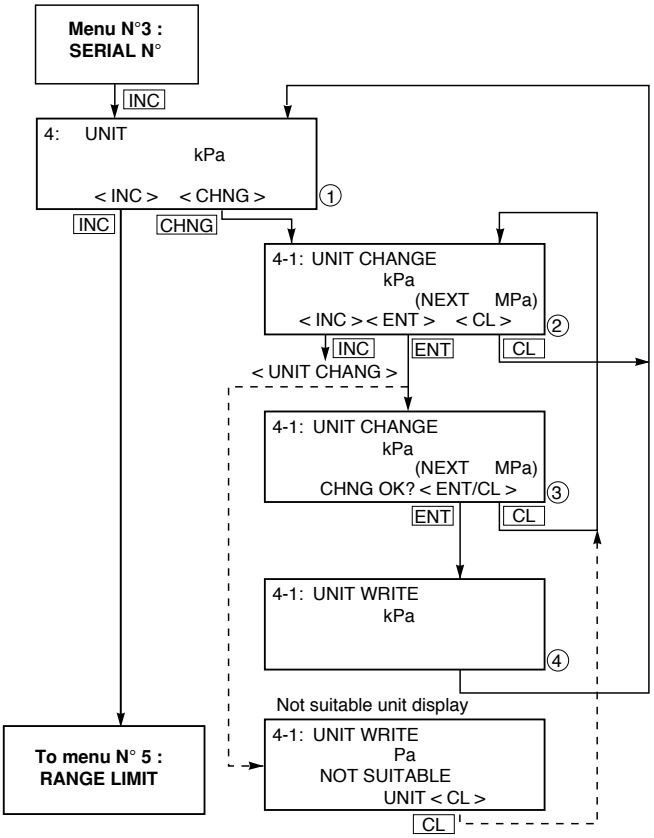
- After TAG N°. is displayed, press the <INC> key to display TYPE image.
- To make changes press the <CHNG> key under display ① and the cursor will be displayed under display ②.
- Set the alphanumeric keys as necessary under display ②. To set the alphabet, press the <CHNG ALHA> key first. Using < >< > keys, cursor position can be moved.
- At the completion of setting, press the <ENT> key and a prompt is displayed check entry under display ②.
- If the entry is correct, press the <ENT> key to input it to the field device under display ③ and ④ and the initial image ① is displayed.
- To display SERIAL NO., press the <INC> key under display ①.



Display of SERIAL N°.

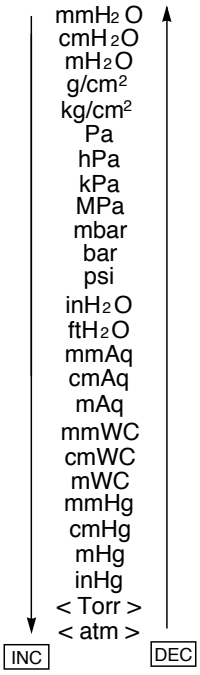
SERIAL N°. and transmitters software version are displayed.

- After setting TYPE, press the <INC> key to display SERIAL NO. and software version of transmitter.
- By pressing the <INC> key, UNIT setting image is displayed.



Industrial value unit

Available unit for FCX-A2



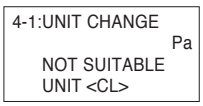
Note: The mark < > is settable for absolute pressure transmitter only.

- When pressing <CHNG> under display ①, the display for changing the unit of industrial value ② appears.
- The desired unit of industrial value is selectable by using <INC> or <DEC> under display ②.
- Display ③ is provided for confirming your change.
- Display ④ is for registering the unit of industrial value.

Important

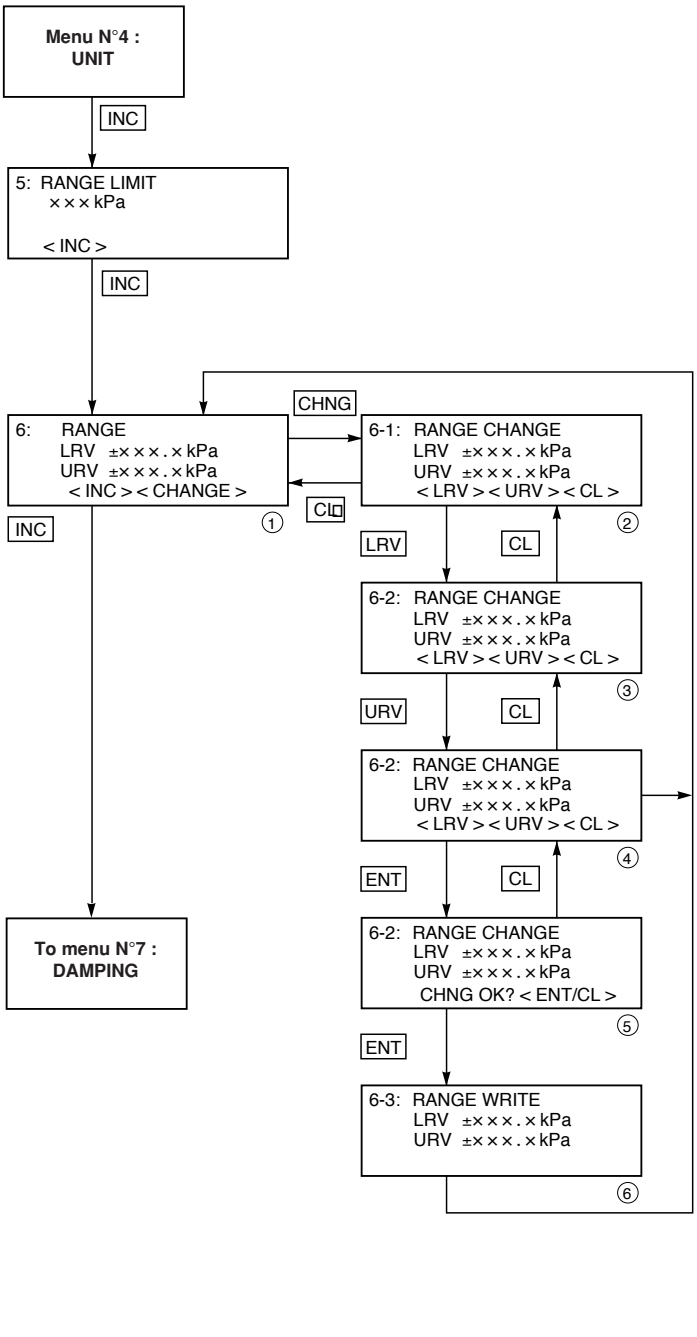
The unit of industrial value is set according to the range as ordered, but the display resolution lowers depending on the unit being set.

When



is displayed upon changing the unit of industrial value, output cannot be displayed in the engineering unit selected.

In this case, press the CL key and change the engineering unit to a different one.



Range limit

Indicates the maximum measuring range of this transmitter.

Range change (LRV, URV)

LRV: Lower range value (0% point)
URV: Upper range value (100% point)

- When pressing <CHNG> under display (1), display changes to the LRV and URV selection screen.

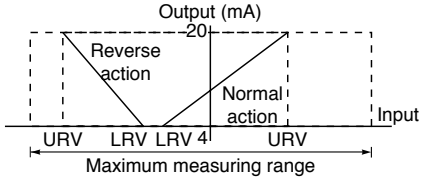
  Press <LRV> for presenting the display for setting the zero point range (display (3)), or <URV> for presenting the display for setting the span range (display (4)).

- Under displays (3) and (4), input zero point and span values.

  * Press <ENT> after setting LRV and URV.

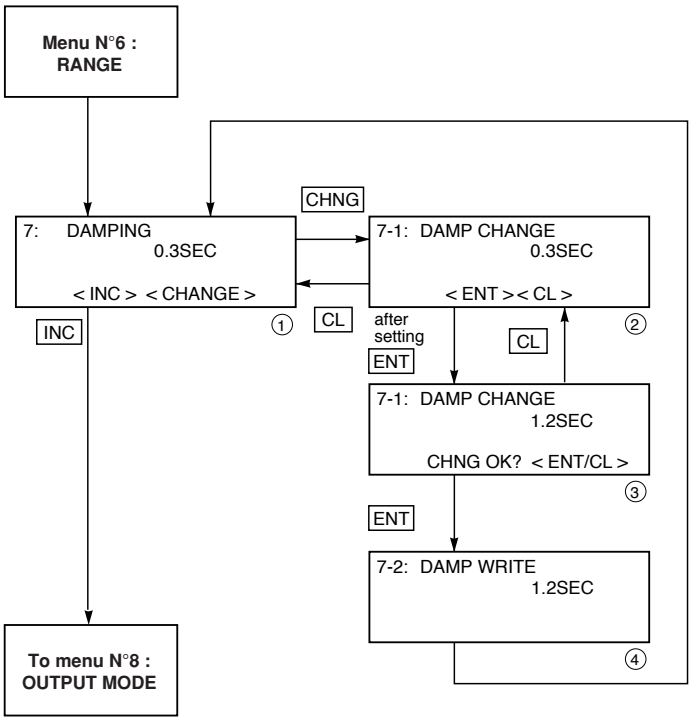
- When pressing <+/–> under display (3), (4), negative value is available.

Selectable setting range



Important

In case of the actual scale specification with a digital indicator provided, if the range is changed, indicator display does not match. So, setting is required again in response to the display in the digital indicator (G: XMTR DISPLAY). In case of the actual scale specification with an analog indicator provided, if the range is changed, indicator display does not match. So, replacement of the analog indicator is required.



Damping adjustment

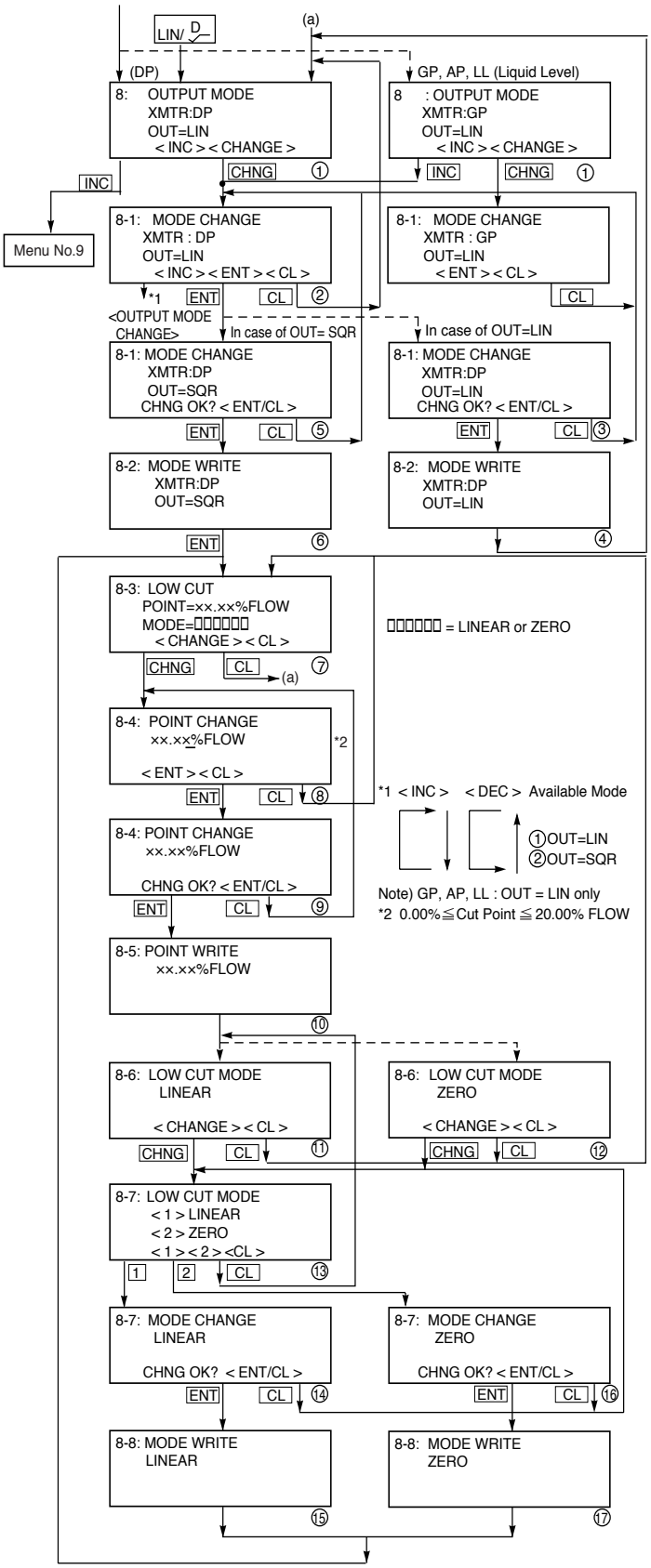
When process input changes excessively, an appropriate damping time constant should be set.

Input time constant value under display ②, time constant can be changed.

Selectable time constant value
No damping (= measuring period) to 32 sec

Note)

The above damping constants are used only for the electronics unit. The detecting unit has its own constants independent of the electronics unit (for details, refer to the data sheet).

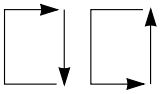


Output mode

The output mode is used to select the proportional mode (proportional to input differential pressure) or square root extraction mode (proportinal to flow rate) for output signal (4 to 20 mA). In case of square root extraction mode, the cut point and the mode below the cut point can be set. Under display (2), press <INC> or <DEC> for selection of the square root extraction mode or proportional mode.

Change of output mode

<INC> <DEC>



a OUT=LIN

b OUT=SQR

Since display (7) is presented when the square root extraction mode is selected, the low flow cut point should be set.

Cut point is adjustable within the range of 0.00 to 20.00%. The cut point is used for stabilizing output near 0% when the square root extraction mode is selected for output signal. There are two modes; in one mode, proportional output is selected for output below a cut point (Fig. A) and in the other mode, output is forcibly reduced to 0% for output below a cut point (Fig. B).

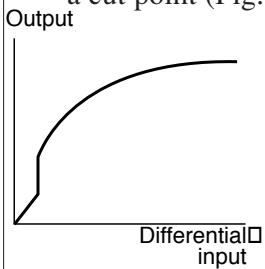


Fig. A: With linear output selected in low cut mode

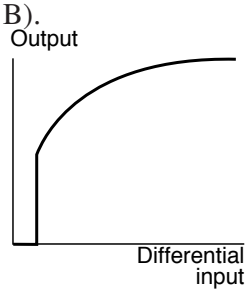
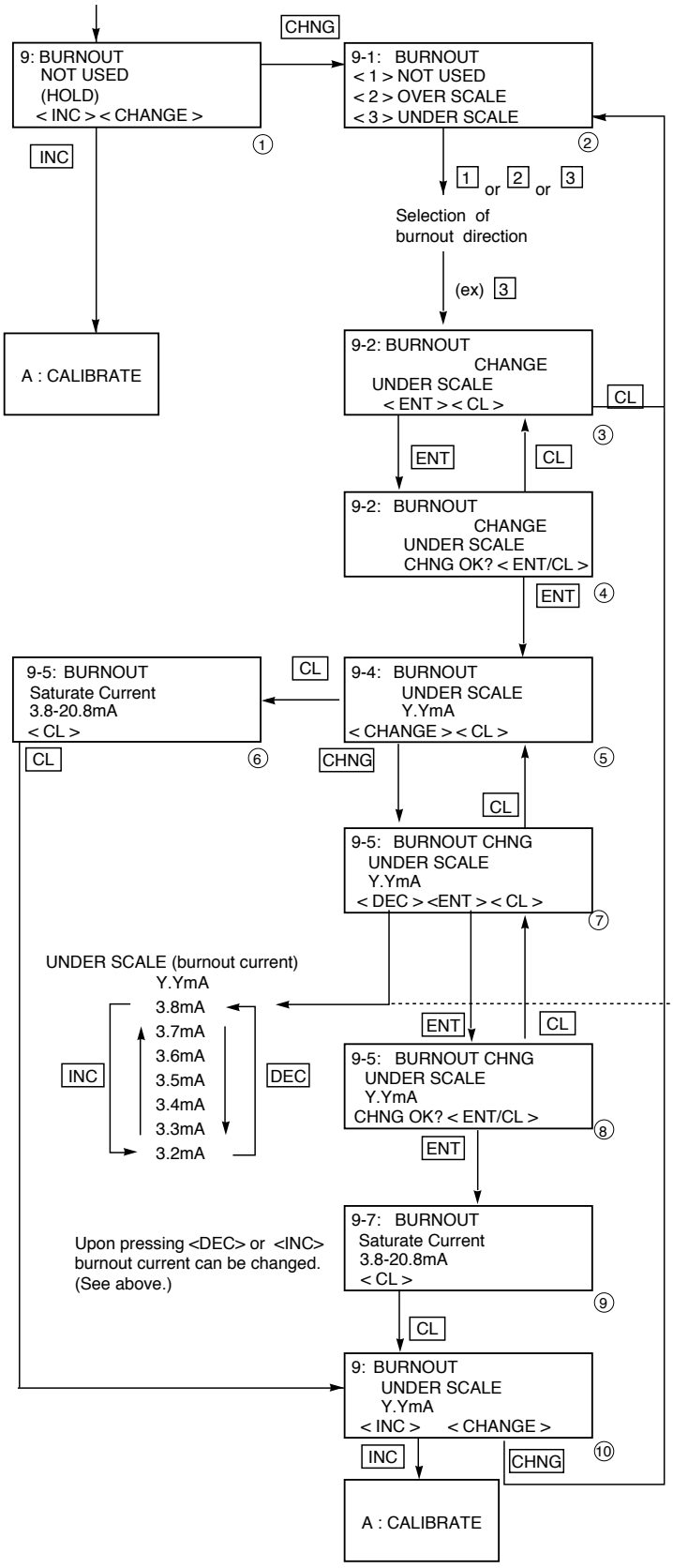


Fig. B: With zero output selected in low cut mode

Under display (13), linear or zero output is selectable for output below the cut point.



Burnout direction

Used for selecting output at occurrence of a fault in the detecting unit. Burnout direction is selectable under display (2)

- For selection of NOT USED, press <1>.
- For selection of OVER SCALE, press <2>.
- For selection of UNDER SCALE, press <3>.

The meaning of each condition above is as follows.

- NOT USED → Not used (Output hold)
  Saturation current = 3.8, 20.8mA

Note) Output value just before the occurrence of trouble is given in the output hold mode.

- OVER SCALE → Over scale (Output 20.8 to 21.6mA)
  Saturation current = 3.8, 20.8mA
- UNDER SCALE → Under scale (Output 3.2 to 3.8 mA)
  Saturation current = 3.8, 20.8mA

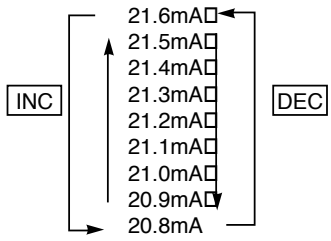
Burnout Current of FCX-CII series transmitter

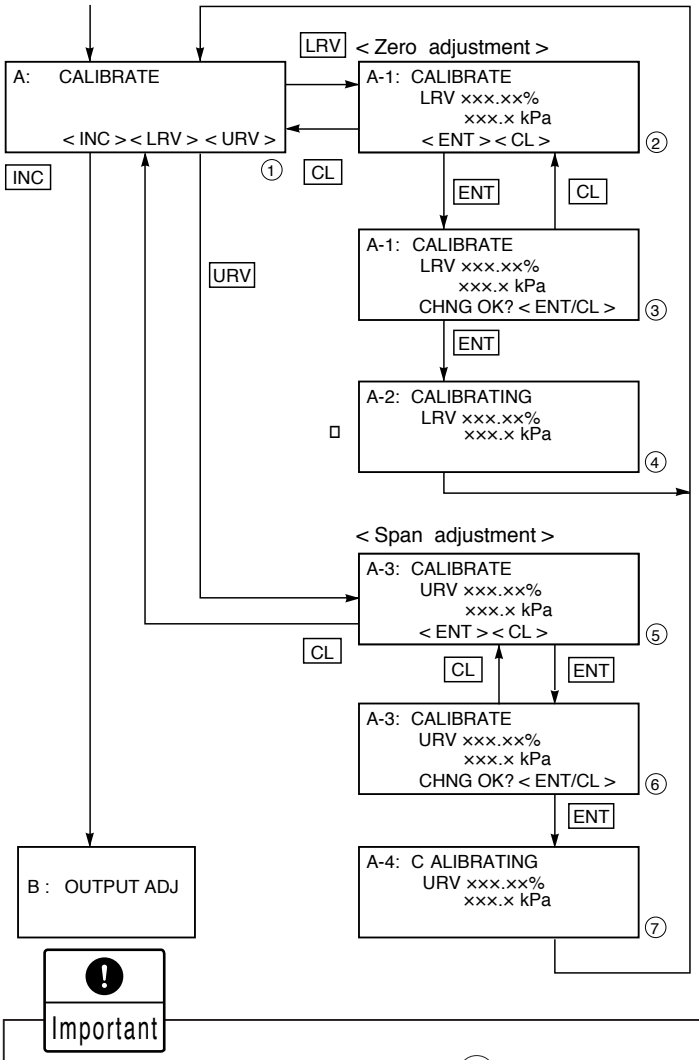
Over scale burnout current = 20.8 to 21.6mA

Under scale burnout current=3.2 to 3.8mA

Saturation current=3.8, 20.8mA

Change of Over scale current





Zero/span adjustment

Zero and span are adjustable by applying an actual pressure.
When pressing <LRV> under display (1) the screen for zero adjustment (2) appears, and that for span adjustment (5) appears when pressing <URV>.
Under display (2), after applying actual pressure equal to zero point, press <ENT> two times. Zero adjustment will be over.
When adjustment is made at any point other than zero, input the pressure value at that point at the display of (2), then press the <ENT> key at the display of (3) while applying a corresponding pressure to the transmitter.
Under display (5), after applying actual pressure equal to desired span, press <ENT> two times. Span adjustment will be over.
When adjustment is made at any point other than span, input the pressure value at that point at the display of (5), then press the <ENT> key at the display of (6) while applying a corresponding pressure to the transmitter.

Important

Press LRV or URV at display of (1).
When the following is displayed, it means that calibration can not be made because Menu No. H: LINEARIZE is effective. In this case, set INVALID on the panel of No. H: LINEARIZE.

```
A-1:CALIBRATE
Can't proceed.
Set Linearize
invalid          <CL>
```

1. Span adjustment should be performed after zero adjustment is completed.
2. When the actual input exceeds the adjustable range, [NOT CALB <CL>] is displayed.
   In this case, adjustment is required again.

Adjustable range

Zero adjustment: Within ±40% of maximum span
Span adjustment: Within ±20% of calibrated span

3. When the adjustment point does not meet the following condition,
   [SETTING ERR<CL>] is displayed. In this case, adjustment is required again.

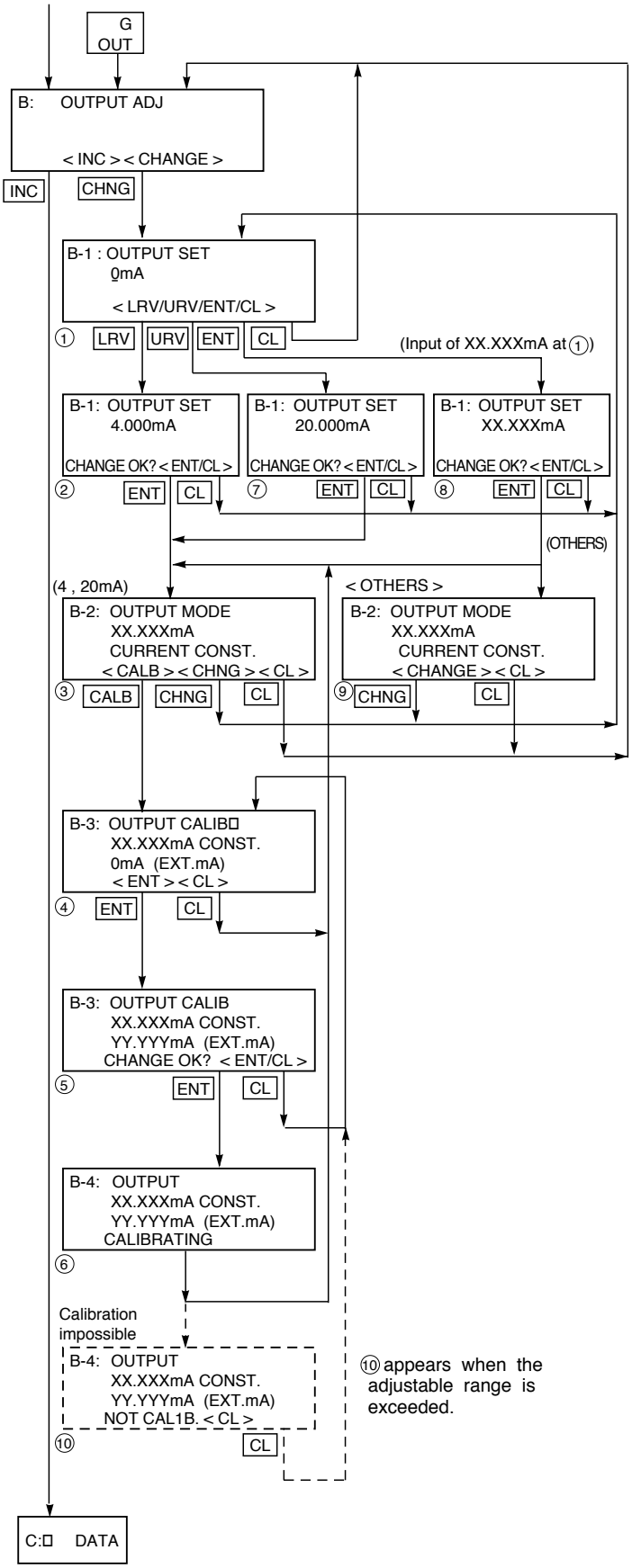
Adjustment point setting condition

$-1.000\%CS^{(*)} \leqq PL \leqq 100.000\%CS^{(*)}$ $\quad 0.000\%CS^{(*)} \leqq PH \leqq 110.000\%CS^{(*)}$

$$PL = \frac{\text{(Lower adjustment point)} - LRV}{URV - LRV} \times 100$$

$$PH = \frac{\text{(Higher adjustment point)} - LRV}{URV - LRV} \times 100$$

(*) : CS (Calibrated Span) is equal to measuring range.



Calibration of output circuit (D/A)

The output circuit (D/A) should be calibrated by the following procedure when necessary.

Make calibration wiring transmitter according to "Calibration" in Appendix A2, and calibrate the output circuit with the HHC using the following procedure.

When the <LRV> key is pressed at the display of ①, the display ② for 4mA current output and its calibration will appear on the screen. When the <URV> key is pressed, the display ⑦ for 20mA current output and its calibration will appear on the screen.

Under display ①, input a desired value within a range of 3.8 to 20.8mA and then press <ENT> two times.
At this input value, a regulated current output is available.

Under display ④, input digital values measured by digital voltmeter.

Under display ④, the output circuit is calibrated when pressing <ENT>.

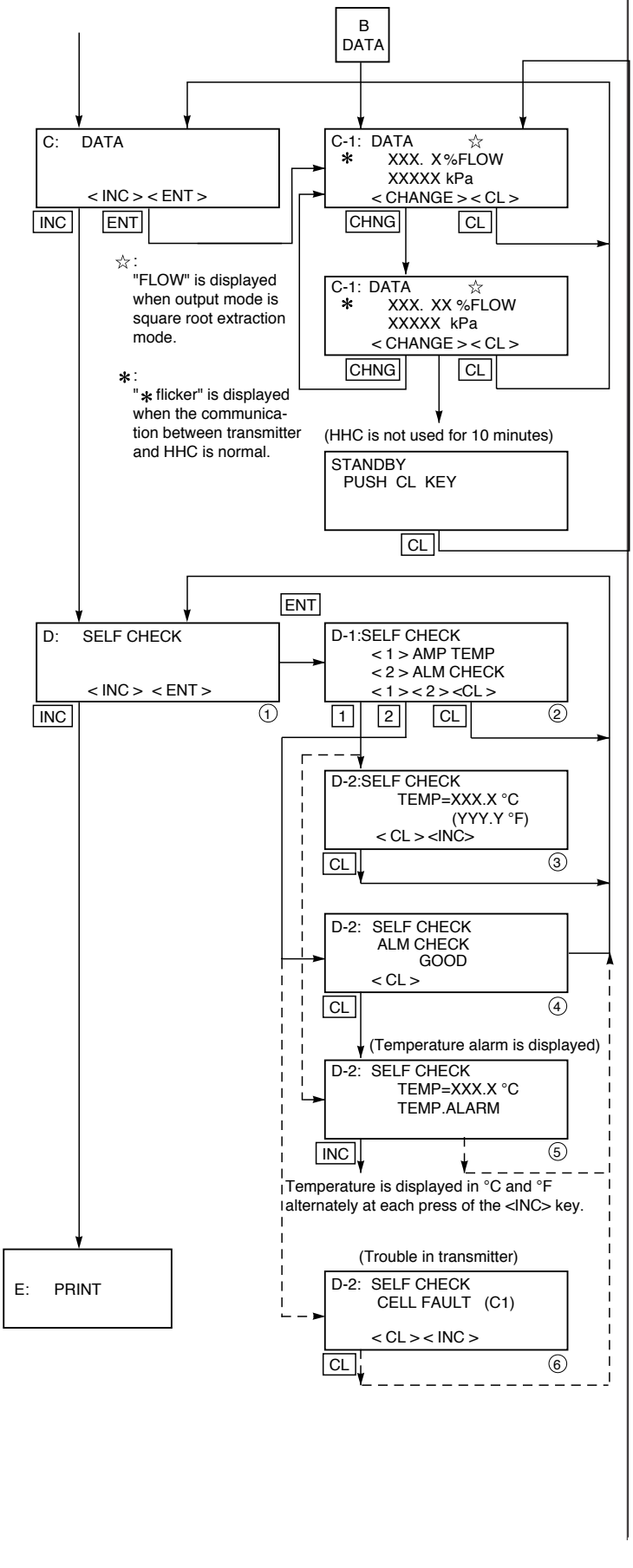
Important

After setting and calibrating the constant current output, be sure to reset the HHC display to the initial display.

B:□ OUTPUT ADJ
<INC> <CHANGE>

In this way, the transmitter output is reset to the measurement output. It should be noted that if HHC is removed from the transmitter loop or the HHC power is turned OFF when the constant current output has been set, the transmitter output is retained at the constant current output.

Indication of measured data



The measured value can be indicated. For more information about operating procedure, refer to the instruction manual of HHC.

Self-diagnosis

Use for displaying the measured temperature in the transmitter and the alarm information.
When pressing <1> on display (2) , the temperature in the amplifier (AMP TEMP) is displayed. When pressing <2>, result of self-diagnosis about transmitter (ALM CHECK) is displayed.

Result of diagnosis

When the temperature in the amplifier is normal:

```
D-2: SELF CHECK
        TEMP= ×××.×˚C

     <CL>
```

When temperature alarm is detected:

```
D-2: SELF CHECK
        TEMP= ×××.×˚C
        TEMP. ALARM
     <CL>
```

When no error has occurred:

```
D-2: SELFCHECK
     ALM CHECK
        GOOD
     <CL>
```

When an error has occurred:

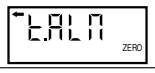
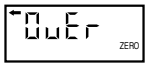
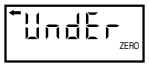
```
D-2: SELF CHECK
     CELL FAULT (C1)

     <CL> <INC>
```

For contents of error, refer to "Contents of message" on the next page.

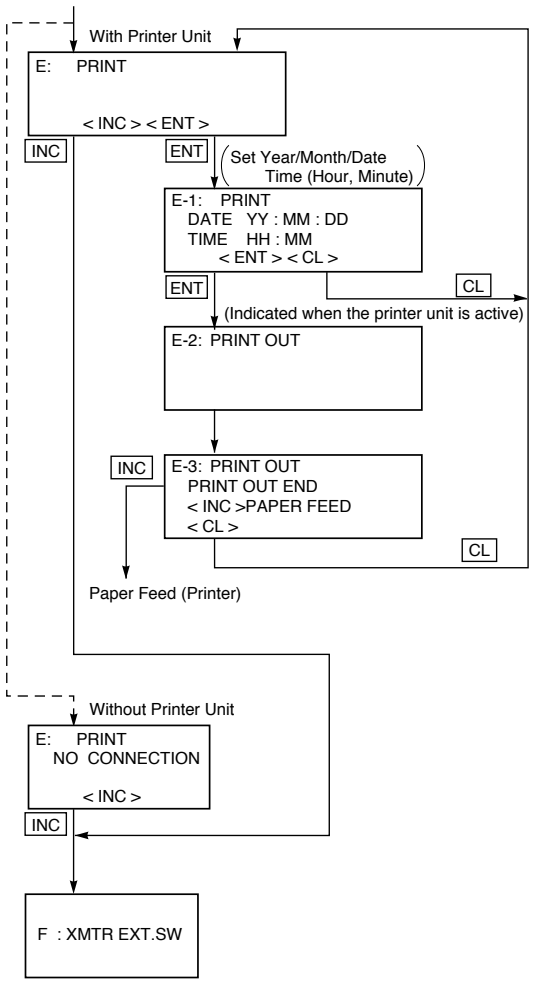
[Contents of message]

As a result of self-diagnosis, the message below is appeared on the LCD display of HHC, when there are trouble in the transmitter. For each error, its cause and remedy are suggested.

Message	Indication on digital indicator	Cause	Remedy
CELL FAULT (C1) ⟨ CELL FAULT (C9)(*1)	FL-1	Error of detecting unit	Replacement of detecting unit
EEPROM (AMP) FLT	FL-2	EEPROM error on amplifier side	Replacement of amplifier
EEPROM (CELL) FLT	FL-3	EEPROM error on cell side	Replacement of detecting unit
TEMP. ALARM	T.ALM  (*2)	Transmitter temperature is not within the allowable range (–45 to 90°C).	Transmitter temperature is normalized.
XMTR FAULT	FL-1	Amplifier error	Replacement of amplifier
	OVER  (*2)	Input pressure is 105% or higher of setting range.	Properly controlled.
	Under  (*2)	Input pressure is –1.25% or lower of setting range.	Properly controlled.

(*1) CELL FALUT (C5) to (C9) are appeared in case of "9" in 6th digit code of FKC.

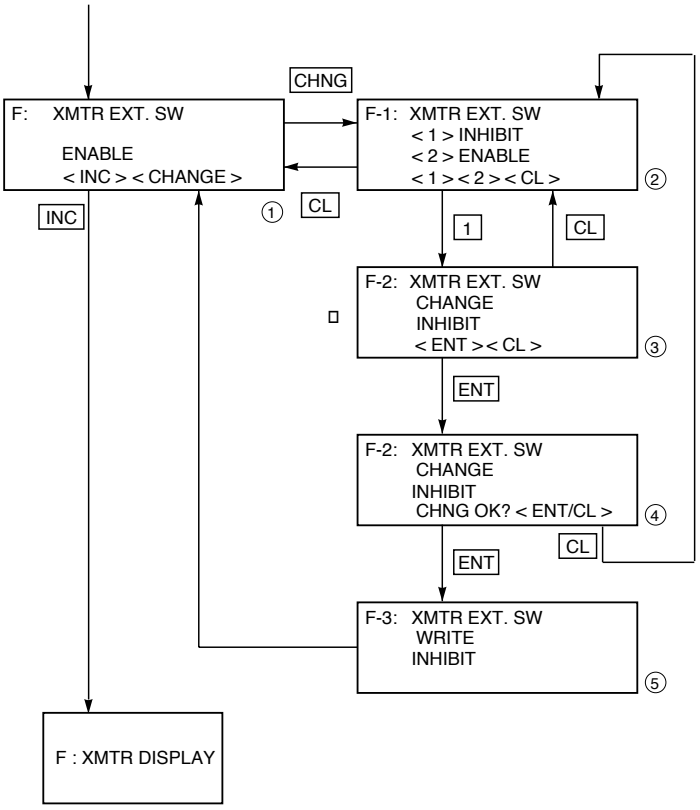
(*2) Real indication



Printer function

Usable only when a printer is connected.

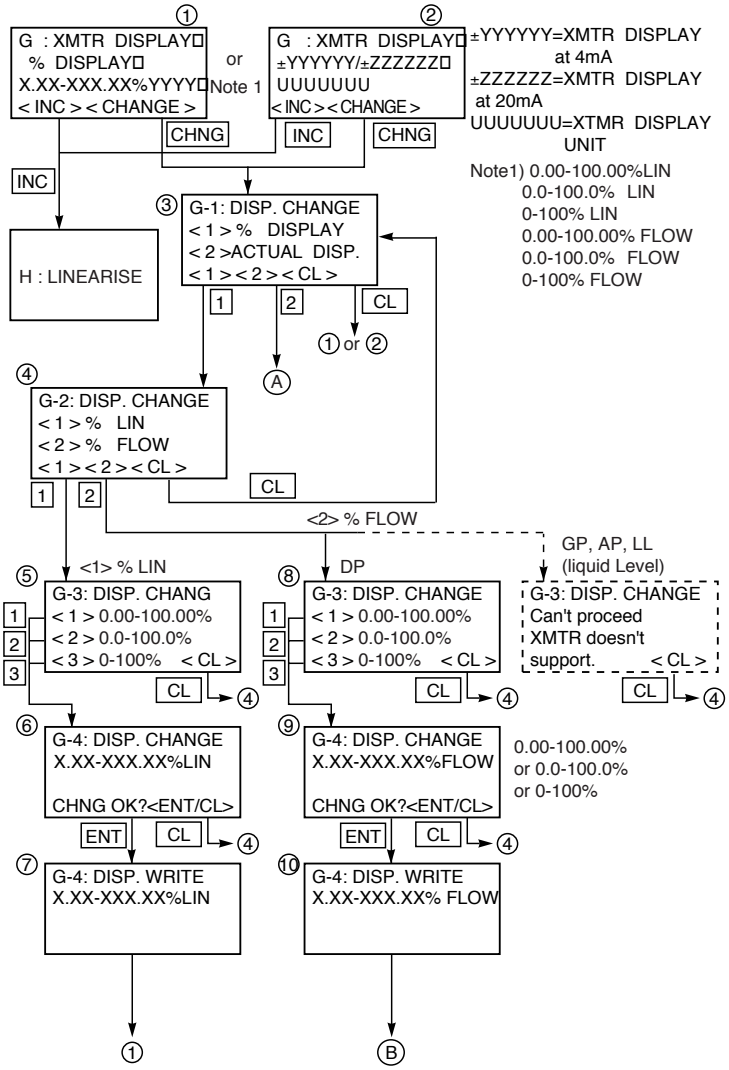
Refer to the instruction manual of HHC.



Lock of adjustment function

The zero adjustment function can be locked by the transmitter adjust screw.

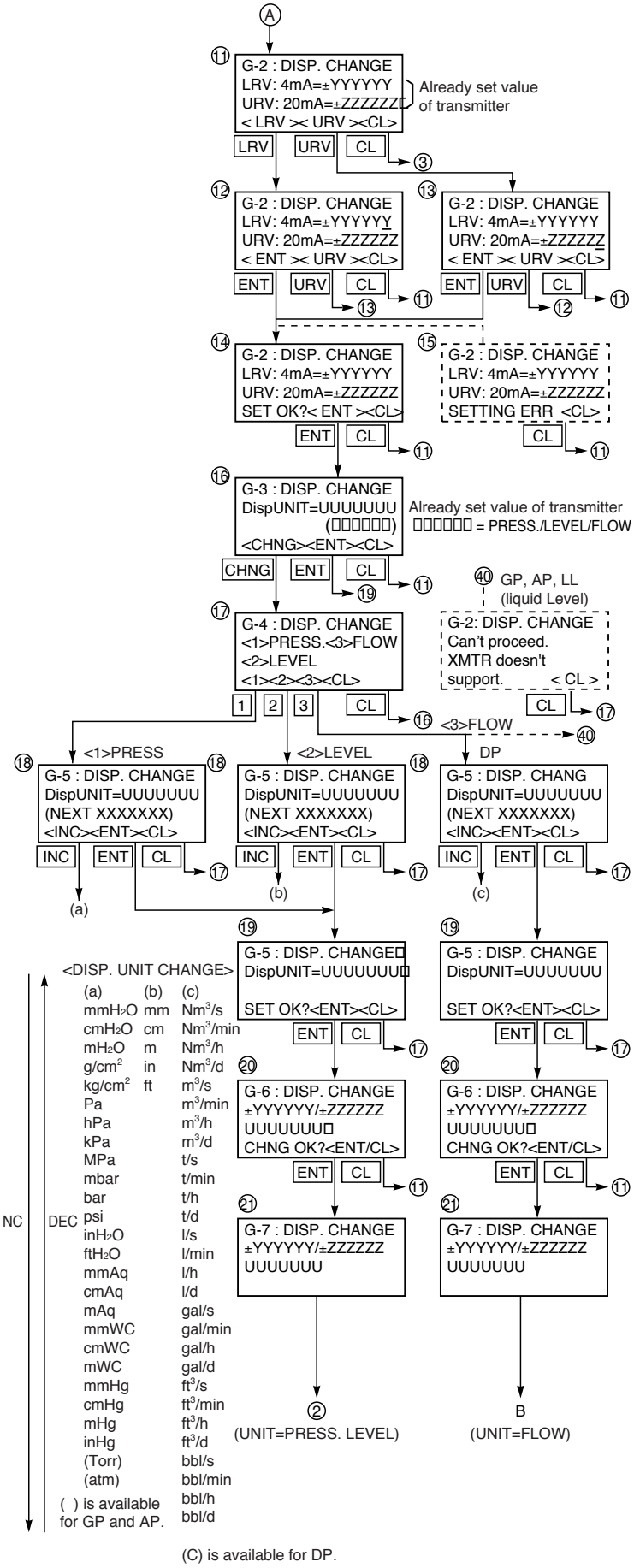
When pressing <1> (INHIBIT) under display ② , the external switch lock function is activated, and it is released when pressing <2> (ENABLE).



Indication of digital indicator

For digital indicator, either % display or actual-scale display is selectable. In display on the actual scale, display values corresponding to 0% (4mA) and 100% (20mA) are settable.

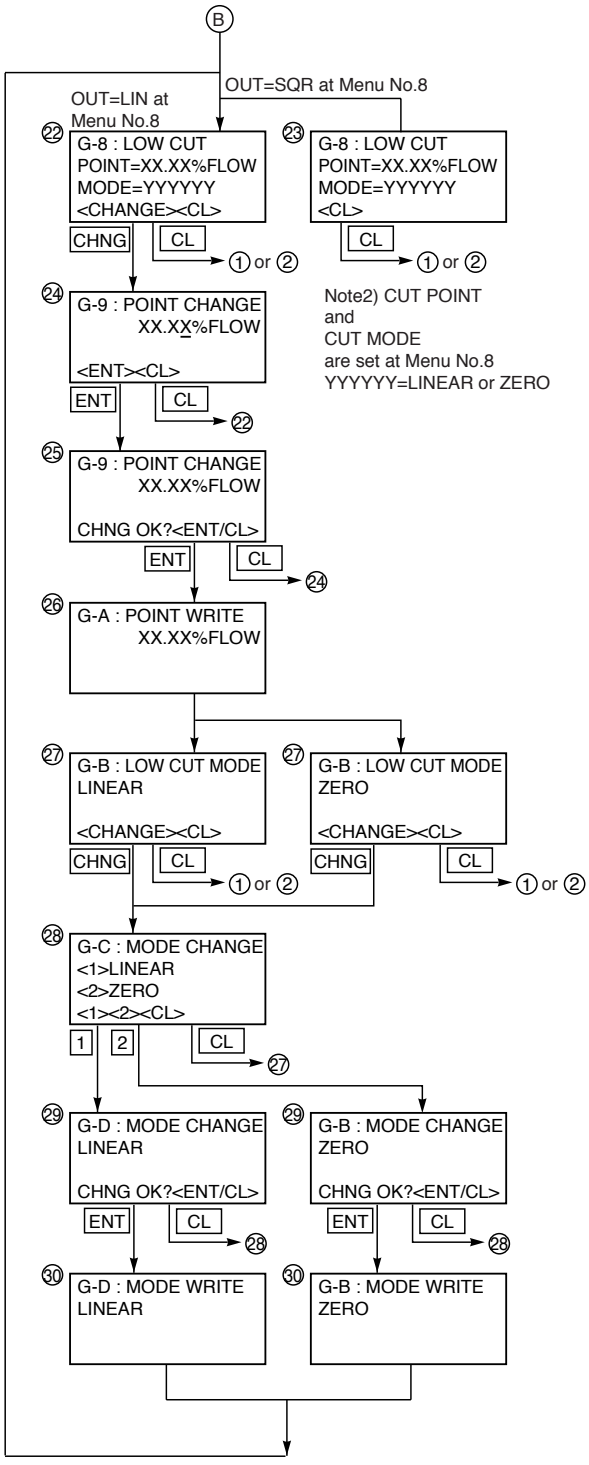
In setting % display, proportional mode and square root extraction mode is selectable as shown in (4).
In (4),
<1> %LIN is displayed in % in the proportional mode
<2> %FLOW is set by % in the square root extraction mode (proportional to flow)
In case of pressure transmitter, absolute pressure transmitter and level transmitter, <2> % FLOW cannot be set in (4).



When setting the actual-scale display, first select <2> ACTUAL DISP in ③. Next, after setting the actual-scale display value (⑪ to ⑭), perform the actual-scale display unit setting (⑯ to ⑲).

In case of pressure transmitter, absolute pressure transmitter and level transmitter, the flow units cannot be set as shown in ⑰.

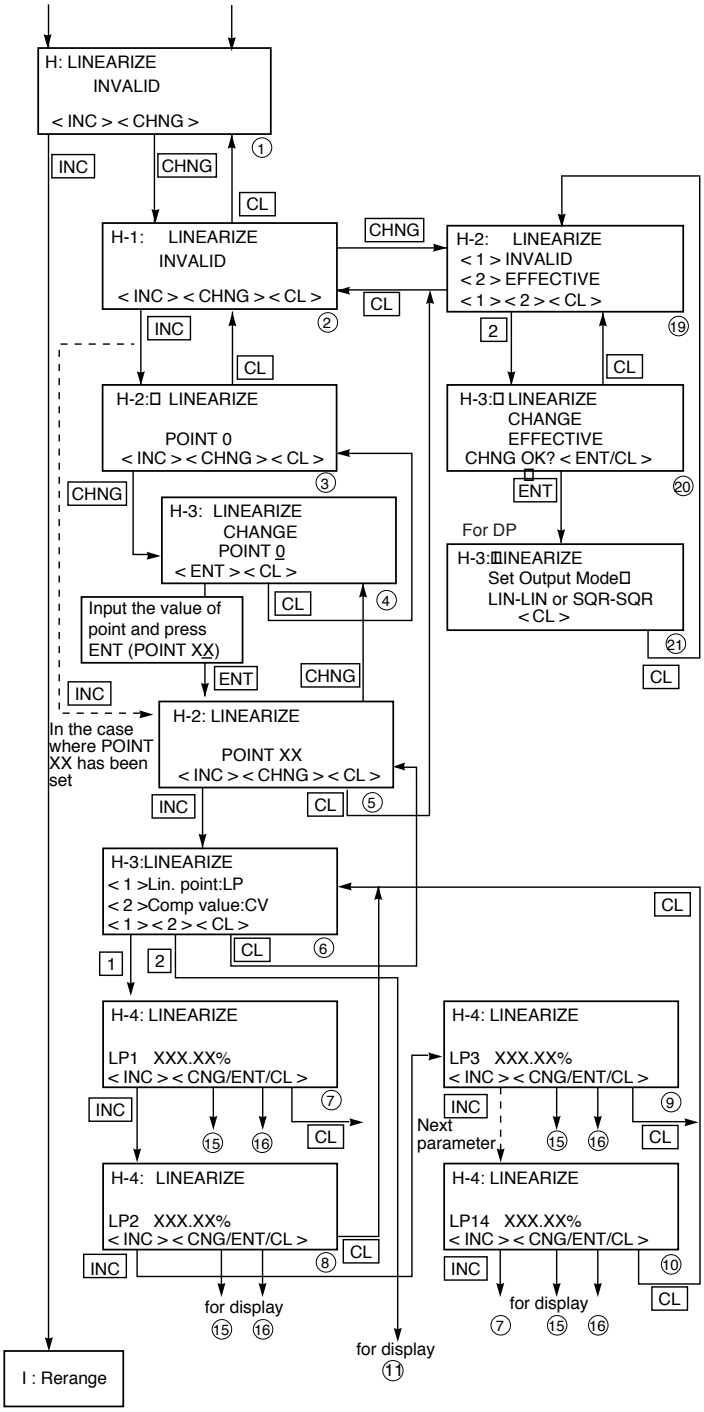
After making sure of the setting of the actual scale display ⑳, enter the [ENT] and then data is written in the transmitter.



When setting of % Flow in %display or Flow unit in actual scale display, low flow cut point and low flow cut mode are displayed (㉒ or ㉓).

When, in the OUTPUT MODE (Menu No. 8), OUT = SQR is set, already set low flow cut point and low flow cut mode are displayed (㉓).

With OUT = LIN set, the present low flow cut point and low flow cut mode are displayed (㉒). Then, enter <CHANGE>, and the setting can be renewed.



Important

Note) In the key stroke for Linearization, please set each parameter in the below sequence.

1. Set the number of compensation points in the range of 2 to 14.
2. Set each linearization option point (LP*) correctly, and write them.
3. Set each compensation value (CV*) correctly, and write them.
4. Set linearization option into EFFECTIVE and write.

Programmable linearization function

User can set output compensation against the input using 14 compensation points, (X_1, Y_1), (X_2, Y_2)...(X_{14}, Y_{14}). Each compensation value between (Xn, Yn) and (Xn+1, Yn+1) is connected by first order approximate formula.

This linearization function is useful to compensate the tank figure in level measurement application and the flow rate of steam or gas in flow measurement application .

Functions for LINEARIZE are available for FXW Version 6.0 and upward.

By pressing INC at display of (2), the display is shifted to the setting of LINEARIZE POINT (3). Press CHNG at display of (3) and input POINT XX to be compensated. Then press ENT and the display will be shifted to (5).

Press INC at display of (5) and the display will be shifted to y for selection of <1> Lin. point: LP and <2> Comp. value : CV.

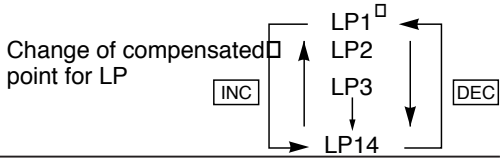
Select <1> Lin. point: LP at display of (6) and input XXX.XX% to each point (LP1-LP□).

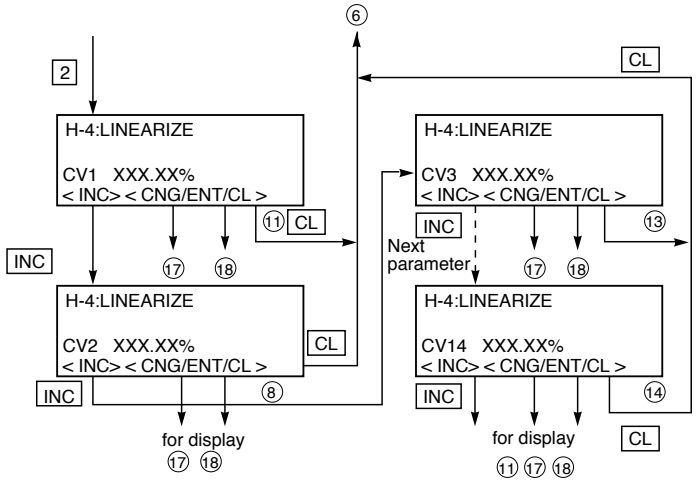
At the completion of input to all the compensated points, press ENT twice and the write of LP will be finished.

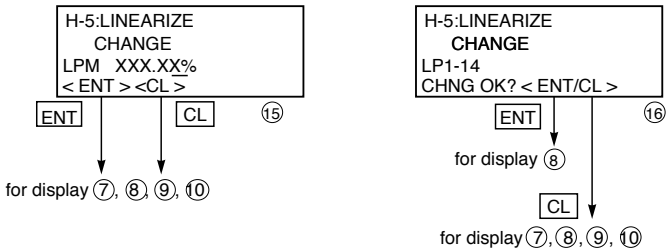
At this time, the display is shifted to (6).

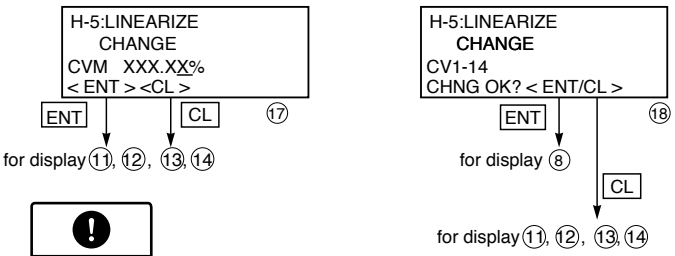
Select <2> Comp. point: CV at display of (6) and input XXX. XX% to each point (CV1-CV□) in the same manner as noted in <1> LP. At the completion of input to all the compensated points, press ENT twice and the write of CV will be finished.

At the completion of write of compensated program for LP/CV, press CL twice at the display of (6) for shifting to (2). Then, press CHNG for selection of <1> INVALID and <2> EFFECTIVE of (19). At display of (19), press <2> and the display will be changed to EFFECTIVE.









Important

When ENT is pressed at display of @0, the following is displayed,

```
H-3: LINEARIZE
Set LINEARIZE
Point, LP and CV
correctly.    <CL>
```

Requirement of setting

1. LP≦LP2≦LP3…LP8≦LP9…LP13≦LP14 (In the case that LP1-LP14=All Zero, it is inhibited to be set enable)
2. If CVa≠CVb, then it must be LPa < LPb. (Note 1)
3. If LPa =LPb, then it must be CVa= CVb. (Note 1)

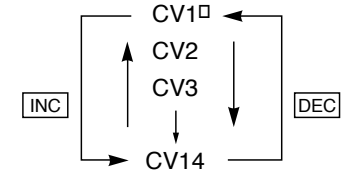
Note 1) a, b show next numeral such as a=1 b=2 or a=2 b=3 or ……a=13 b=14.

or

the following is displayed.

```
H-3: LINEARIZE
Set OUTPUT MODE
LIN-LIN or
SQR-SQR   <CL>
```

Change of compensated point for CV



Important

When INC is pressed at display of ③, the following is displayed,

```
H-2: LINEARIZE
      POINT  0
SETTING ERR <CL>
```

or

When ENT is pressed at display of ④, the following is displayed,

```
H-3: LINEARIZE
      POINT  15
      POINT  SET
SETTING ERR <CL>
```

POINT=2≦(number of correction)≦14 setting err=00 or 01 or≧15

When ENT is pressed at display of ⑮, the following is displayed,

```
H-5: LINEARIZE
      CHANGE
LPM        150.01%
SETTING ERR <CL>
```

Requirement of setting
-1.25%≦LP1 < LP2… < LP14≦+110%

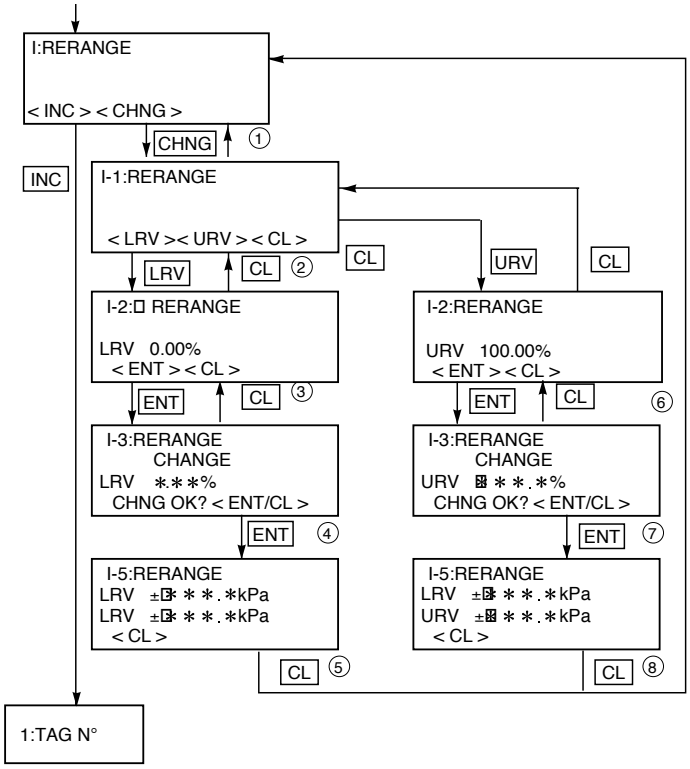
When ENT is pressed at display of ⑰, the following is displayed,

```
H-5: LINEARIZE
      CHANGE
CVM        100.01%
SETTING ERR <CL>
```

Requirement of setting
-100%≦CV1 < CV2… < CV14≦+100%

Before performing the LINEARIZE setting, set either of the following equations in the OUTPUT mode (Menu No. 8) and XMTR DISPLAY (Menu No. G):
OUT = LIN SMTR DISP = LIN or
OUT =SQR XMTR DISP = FLOW (Note 1)

Note 1) XMTR DISP = FLOW means the settings of % FLOW in %display or of FLOW units in actual-scale display.



Rerange (Set LRV/URV calibration)

(application to level measurement) at change of level (LRV/URV)
Functions of RERANGE can be made with FXW Version 6.0 or upward.

When the lower range value (LRV) and uppeer range value (URV) need to be adjusted again during measurement of tank level, the measurement levels can be changed at the same time by setting the LRV or URV to be adjusted from FXW.

Apply an input pressure required for rerange of LRV at display of ③ and press ENT twice.

In this way, the rerange of LRV is completed, then the new measurement range LRV and URV, which conforms to the actual input pressure, is displayed.
When rerange is made at a point other than 0%, input the set value (PV%) of that point at display of ③, and press ENT at display of ④ while applying a corresponding pressure. In this way, the measurement range can be changed to the input corresponding to that pressure.

Apply an input pressure required for rerange of URV at display of ⑥ and press ENT twice. The rerange of URV is completed, then the new measurement range LRV and URV corresponding to the actual input pressure is displayed. When rerange is made at a point other than 100%, input the set value (PV%) of that point at display of ⑥ and press ENT at display of ⑦ while applying a corresponding pressure. In this way, the measurement range can be changed to the input corresponding to that pressure.

Note)The unit of LRV/URV at ⑤ and ⑧ are displayed in theunit selected by Menu No. 4:UNIT.

Important

Adjustment point setting condition
-1.00%≦LRV 100.00% 0.00%≦URV 110.00%
In the case that point is out of setting limit.

(Ex)

```
1-2: RERANGE

LRV      100.01%
SETTING ERR <CL>
```

In case of the actual scale specification with a digital indicator provided, if the range is changed, indicator display might not match. So, setting is required again in response to the display in the digital indicator (G:XMTR DISPLAY).
In case of the actual scale specification with an analog indicator provided, if the range is changed, the scale for indicator might not ensure exact reading.

When CHNG is pressed at display of q, the following is displayed.

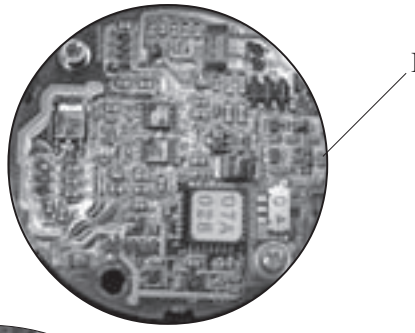
```
1-1: RERANGE
Can't proceed.
Set Linearize
invalid.     <CL>
```

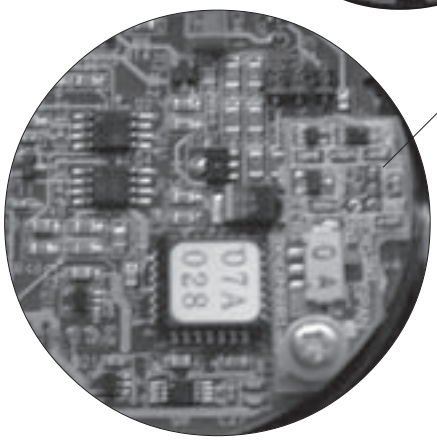
This means that RERANGE cannot be made because MENU No. H: LINEARIZE is set in EFFECTIVE. In this case, press the CL key and set in INVALID on the panel of No. H: LINEARIZE.

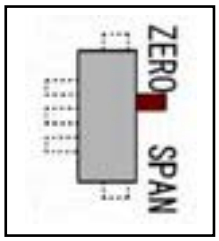
4.2 Zero adjustment by the screw

Zero point of the transmitter is adjustable by the outside screw with the mode setting switch in the housing set at zero position. The figure shown below is an example of “Mode setting switch” is attached.

(1) Set the mode setting switch to zero position.

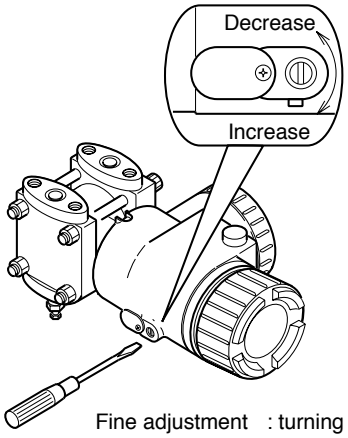






(2) Apply standard input pressure corresponding to new Lower Range Value

(3) Adjust output to 4mA by turning the outside screw



For zero suppression or elevation, apply the specified input pressure in advance and adjust the output to 4mA using the outside screw.

Note 1) If the transmitter is locked, it cannot be adjusted by the external adjustment screw.

Note 2) When a digital indicator is attached to the transmitter, make sure that the LCD lamp “ZERO” is ON.

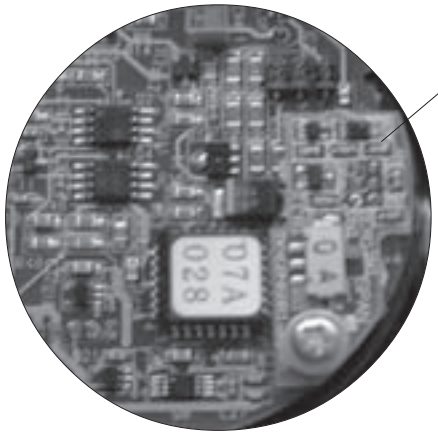
Important

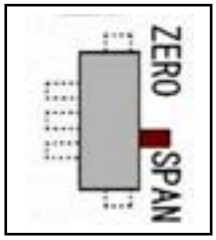
After adjustment, the transmitter should be kept energized at about 10 seconds to write the adjustment results into memory.

4.3 Span adjustment by the screw

The measuring range for each transmitter is determinated according to its type.
Span is changed by the outside screw with the mode setting switch in the housing set at span position. The figure shown below is an example of “Mode setting switch” is attached.

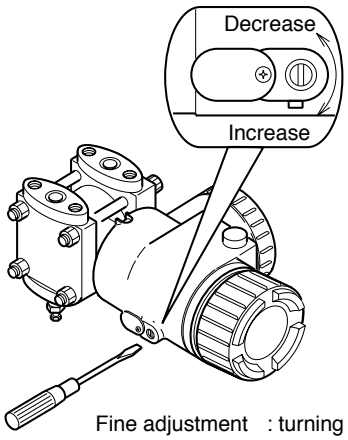
(1) Set the mode setting switch to span position.





(2) Apply standard input pressure corresponding to new Upper Range Value.

(3) Adjust output to 20mA by turning the outside screw



Fine adjustment : turning slowly
Rough adjustment : turning quickly

(4) Then return to applying input pressure of zero again and make sure output is 4mA.

Note 1) If the transmitter is locked, it cannot be adjusted by the external adjustment screw.

Note 2) When a digital indicator is attached to the transmitter, make sure that the LCD lamp “ZERO” is ON.

Important

After adjustment, the transmitter should be kept energized at about 10 seconds to write the adjustment results into memory.

4.4 Local adjustment unit with LCD display

1. Outline

When local adjustment unit with LCD display (Parts number is *ZZPFCX4-A055) is installed in the FCX-AII transmitter, some functions are available without HHC (Hand Held Communicator).
Name of each part in local adjustment unit with LCD display and their functions are indicated below.

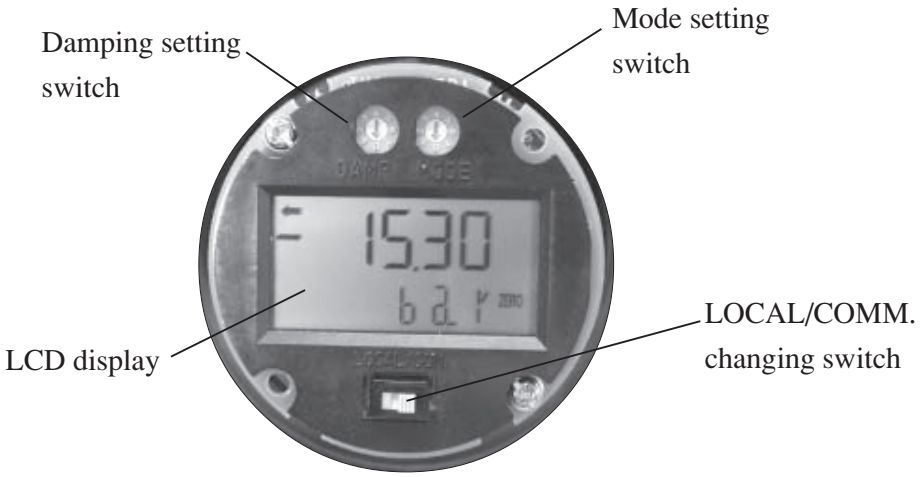


Table 1.Functions of Mode setting switch

Positions of switch	Functions of external adjustment screw	Output	
		Difference pressure & Flow transmitter (Model:FKC)	Pressure and Absolute pressure transmitter (Model:FKG,FKA)
0	Zero adjustment	Proportional to differential pressure	Proportional to pressure
1	Span adjustment	Proportional to differential pressure	Proportional to pressure
2	Locking of function	Proportional to differential pressure	Proportional to pressure
3	Adj. fixed current	4mA fixed current	4mA fixed current
4	Adj. fixed current	12mA fixed current	12mA fixed current
5	Adj. fixed current	20mA fixed current	20mA fixed current
6	Span adjustment	Proportional to flow	Proportional to pressure
7	Locking of function	Proportional to flow	Proportional to pressure

Table 2.Functions of Damping setting switch

Positions of switch	Time constant (sec.)
0	0
1	0,3
2	0,6
3	1,2
4	2,4
5	4,8
6	9,6
7	19,2

Table 3. LOCAL/COMM. Changing switch

Positions of switch	Adjustment methods
LOCAL	Adjustments of transmitter are carried out by Mode setting switch and Damping setting switch.
COMM.	Adjustments of transmitter are carried out by HHC.

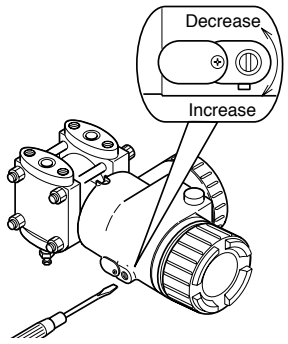
2.Selection of transmitter adjustment method

LOCAL/COMM. Changing switch decides the method of FCX-AII transmitter adjustment. If switch is set to “COMM.” side, adjustment of transmitter is carried out by HHC. This method is explained in instruction manual.
If switch is set to “LOCAL” side, adjustment of transmitter is carried out by Mode setting switch and Damping setting switch.
This method is explain below.

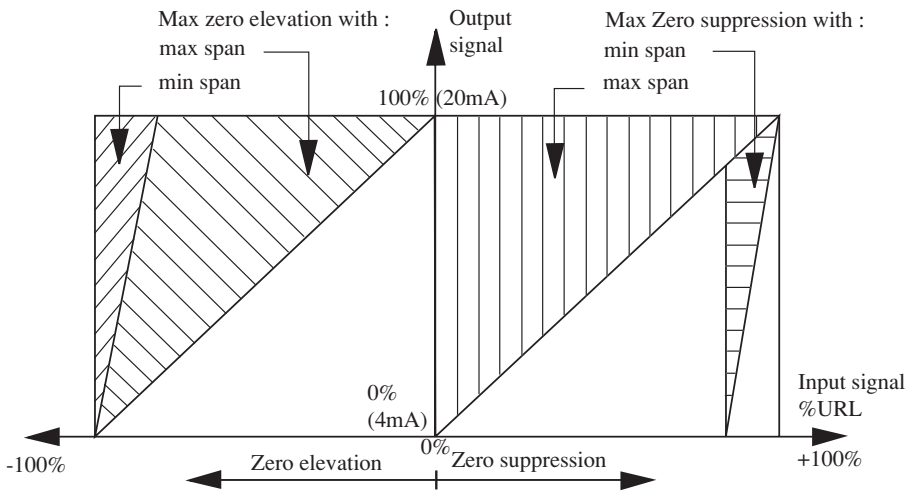
3.Range change procedure
For changing the measuring range, carry out zero adjustment first, and span adjustment next. (If zero adjustment is performed after span adjustment, the 100% point may not be adjusted correctly.). There is no interference between zero adjustment and span adjustment.

3.1 Zero adjustment (Change Lower Range Value)
Zero point of the transmitter is adjustable by the external adj. screw with the mode setting switch set at “0” position.

(1) Check if “ZERO” is lit on the LCD indicator.
If not lit, set the mode setting switch to “0” position.
(2) Apply standard input pressure corresponding to new Lower Range Value
(3) Adjust output signal to 4.00mA by turning the external adj. screw



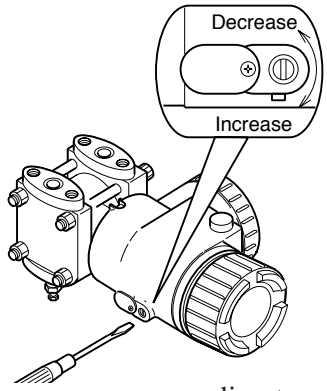
For zero suppression or elevation ranges, apply the specified LRV pressure in advance and adjust the output signal to 4.00mA using the external adj. screw.



3.2 Span adjustment (Change Upper Range Value)

The measuring range for each transmitter is determined according to its type.
The span is changed by the external adj. screw when the mode setting switch is set at “1” or ”6" position.

(1) Set the mode setting switch to “1” or ”6” position.
(2) Apply standard input pressure corresponding to new Upper Range Value.
(3) Adjust output to 20.00mA by turning the external adj. screw.



(4) Then, apply input pressure corresponding to new Lower Range Value again and make sure output is 4mA.
(5) After span adjustment according to above procedure from 3.2-(1) to (4), please set mode setting switch to appropriate position

Important

After adjustment, the transmitter should be kept energized at about 10 seconds to write the adjustment parameter into memory.

4. Damping adjustment

If a pulsation of the output current is caused due to flow noise etc., it can be attenuated by performing damping adjustment.
Damping is adjustable in 8 steps. The damping constant becomes lager in the order of 0,1,2,3and 4. These damping constant correspond to time constant 0, 0.3, 0.6, 1.2, 2.4, 4.8, 9.6, 19.2 seconds for the transmission unit regardless of span.
The relationship between position of switch and time constant are indicated in table 2.

Note)
The damping constant above is a time constant applied to the transmission unit only. The detecting unit has additional time constant
(Please see data sheet about details)

Important

When the transmitter respose speed is changed, the time constant of the control system is also changed. Be sure to check the controllability again.

5. Fixed current output and its adjustment

Output of fixed current regardless of input is available.
Output of fixed current is convenient for loop check.
When the output(4 or 20mA)is in error, it can be adjusted by the external adjustment screw.

5. MAINTENANCE

5.1 Periodic inspection

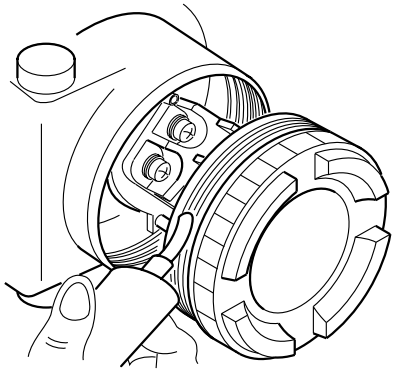
In order to ensure the measurement accuracy and long life of the transmitter, it is essential to inspect the transmitter periodically according to the operating conditions.

Visual inspection

Visually inspect each part of the transmitter for damage, corrosion, etc.
If you detect any material which may cause corrosion, it should be cleaned off.

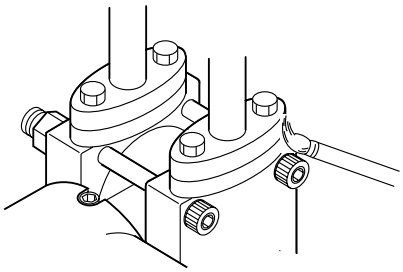
Check of cover and O-ring

The transmitter has a water and dust-proof construction.
Make sure the O-ring of the case cover is not damaged or deteriorated.
Carefully prevent foreign materials from sticking to threads.



Piping leakage check

Using soapy water or the like, check the all process connections for leakage of process fluid. If necessary, drain the moisture which has accumulated in the transmitter and process pipe.



5.2 Troubleshooting

If an abnormality occurred in the process or transmitter, action should be taken with reference to the table below.

Symptom	Cause	Remedy
Output current overshoots scale (exceeds 20mA).	(1) The manifold valve does not open/close normally.	Repair the valve so that it opens/closes normally.
	(2) Pressure leak is occurring.	Repair a leak.
	(3) Process piping is improper.	Make correct piping.
	(4) Process pipe is clogged.	Eliminate the cause of clogging.
	(5) Power supply voltage and/or load resistance is improper.	Make arrangement to obtain proper values. For power supply voltage and load resistance, refer to 7.2. (For intrinsically safe installations, the power supply voltage should be 16.1 to 26V DC.)
	(6) Voltage between the external connection terminals of transmission unit is wrong.	Check for faulty cable, insulation, etc. and repair as needed. For power supply voltage and load resistance, refer to "7.2". (For intrinsically safe installations, the power supply voltage should be 16.1 to 26V DC.)
	(7) Zero and span are not adjusted.	Readjust according to chapter 4.
	(8) Electronics unit is faulty.	Replace the electronics unit according to 5.3.
No output current (less than 3.8 mA).	(1) Same as (1) to (4) above	
	(2) Power supply polarity is wrong.	Correct wiring according to 7.1.
	(3) Power supply voltage and/or load resistance is improper.	Make arrangement to obtain proper values. (For power supply voltage and load resistance, refer to 7.2.) (For intrinsically safe installations, the power supply voltage should be 16.1 to 26V DC.)
	(4) Voltage between the external connection terminals is wrong.	Check for faulty cable, insulation, etc. and repair as needed. (For power supply voltage and load resistance, refer to 7.2.) (For intrinsically safe installations, the power supply voltage should be 16.1 to 26V DC.)
	(5) Electronics unit is faulty.	Replace the electronics unit according to 5.3.
Output current error	(1) Process piping is improper.	Correct the piping.
	(2) Gas or solution is mixed in.	Vent or drain the transmitter.
	(3) Liquid density changes.	Perform density compensation.
	(4) Ambient temperature changes widely.	Minimize the temperature change.
	(5) Zero or span has deviated.	Readjust zero or span.
	(6) Electronics unit is faulty.	Replace the electronics unit according to 5.3.

If remedy is impossible, contact Fuji Electric's service department.

5.3 Replacement of parts

If the transmitter requires a replacement part, drain process fluid from the transmitter, disconnect it from the process and carry out replacement in an instrument room.

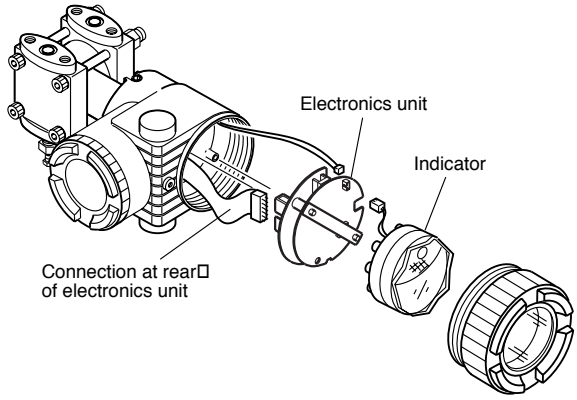
DANGER

When removing an explosion-proof transmitter, turn OFF the main power, then disconnect the piping and wiring. Do not remove it when the power is ON to prevent serious accident such as explosion, fire, etc.

To identify faulty part

Replace the transmission unit with a spare one in order to determine whether it is the detecting unit or transmission unit which is faulty.
When the faulty unit is identified, it should be replaced with a new one.

Replacement of electronics unit



—— Replacing procedure ——

(1) Turn off the power supply.

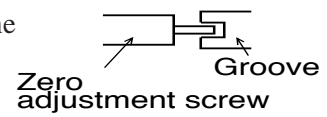
(2) Remove the indicator.

(3) Remove the electronics unit.
Unplug each connector.

(4) Replace the electronics unit with a new one and assemble it by reversing the above procedure from (3) to (1).

Important

When installing the electronics unit, make sure that the zero adjust screw end is in front of the groove in the amplifier unit.

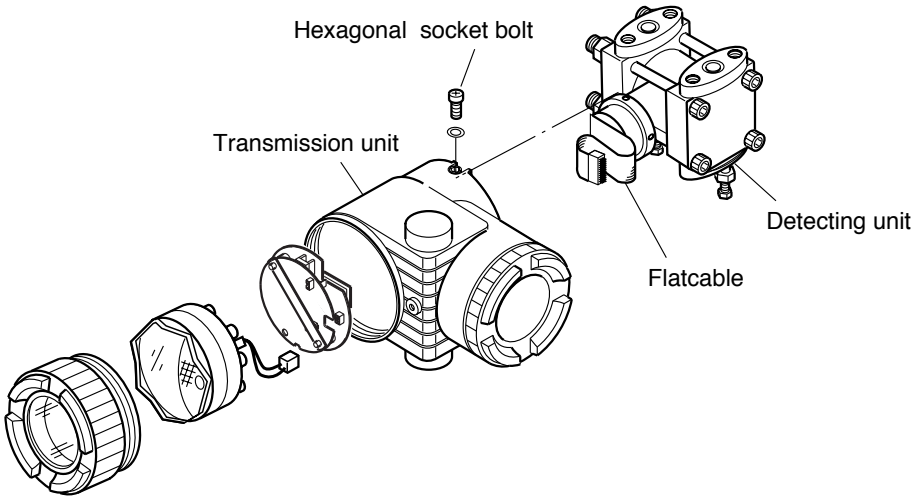


(5) After completion of replacement, perform zero and span adjustments.

Important

The electronics unit should be removed carefully so as not to damage the internal wiring.

Replacement of detecting unit



—— Replacing procedure——

(1) Remove the electronics unit according to "Replacement of electronics unit."

(2) Remove the hex. socket bolts from the electronic housing.
Pull the electronics housing straight forward and away from the detecting unit.

(3) Replace the detecting unit with a new one of the same type.

(4) Fit the transmission unit to the detecting unit and tighten it.

(5) Connect each connector of the electronics unit and attach it to the transmission unit.

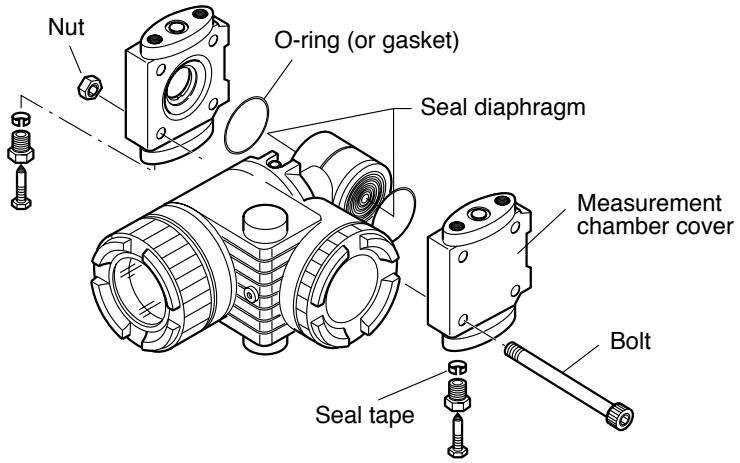
(6) After reassembly, carry out zero and span adjustments.

Important

- Ensure that replacement detector unit is the same specification as the original by comparing dataplates.
- When removing the transmitter case, pay attention not to damage the flatcable.

Replacement of the internal parts of detecting unit

In case of differential and flow transmitter (code symbol: FKC)



—— Replacing procedure ———

(1) Remove four hexagon socket head bolts with a torque wrench, etc..

(2) Disassembly gives access to the casing covers, O-rings (or gasket), hexagon socket head bolts and nuts.

(3) After disassembly, replace the faulty part with a new one.

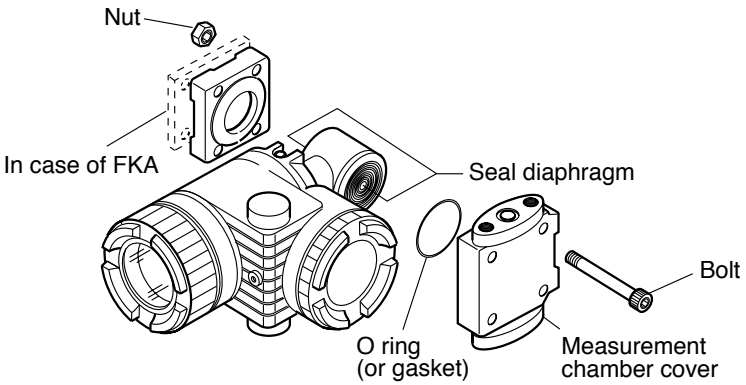
(4) Before reassembly, clean the O-ring face of casing cover with the soft cloth immersed in water, alcohol, or similar detergent.

(5) Reassemble the detecting unit by reversing the disassembling procedure. The casing covers should be assembled so as to be symmetrical with each other in the left-right direction and carefully so as not to damage the seal diaphragm. Tightening torque should follow the table below.

Bolt size	Bolt material	Tightening torque [N·m] (kgf·m) <ft-lb>	Maximum working pressure [MPa] {bar} <psi>	Application
M10	Cr-Mo steel	50 (5) <36>	42 {420} <6000>	Working pressure 42 MPa {420 bar} <6000 psi> or less
M10	SUS304 ASTMB7M ASTML7M	30 (3) <22>	10 {100} <1400>	Working pressure 10MPa {100 bar} <1400 psi> or less
M10	SUS630	50 (5) <36>	42 {420} <6000>	Working pressure 42 MPa {420 bar} <6000 psi> or less

(6) After assembly, carry out a pressure test. Apply a pressure equal to 150% of the maximum working pressure to both high pressure (H) and low pressure (L) measurement chambers of the transmitter simultaneously for 15 minutes, and make sure there is no leakage.

In case of absolute pressure and gauge pressure transmitter (code symbol: FKA and FKG)



(1) Remove four bolts with a torque wrench, etc..

(2) Disassembly gives access to casing covers, O-rings (or gasket), bolts and nuts.

(3) After disassembly, replace the faulty part with a new one.

(4) Before reassembly, clean the O-ring face of casing cover with the soft cloth immersed in water, alcohol, or similar detergent.

(5) Reassemble the detecting unit by reversing the disassembling procedure. The casing covers should be assembled so as to be symmetrical with each other in the left-right direction and carefully so as not to damage the seal diaphragm. Tightening torque should follow the table below.

In case of absolute pressure transmitter (FKA)

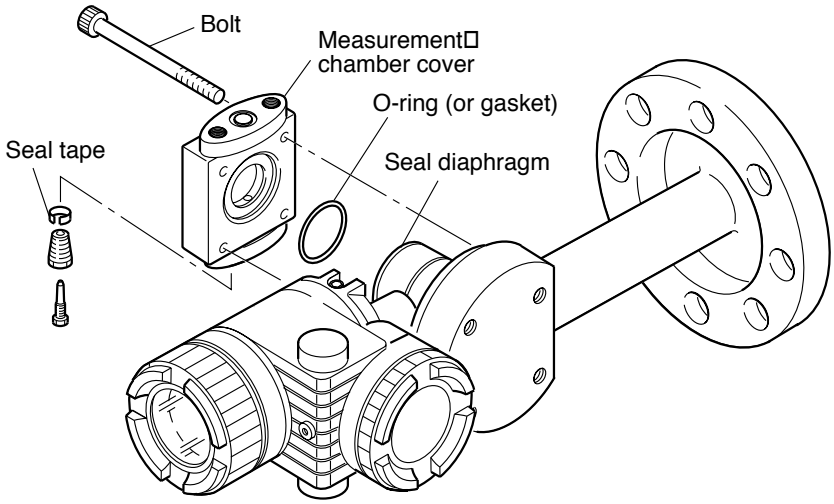
Bolt size	Bolt material	Tightening torque [N·m] (kgf·m) <ft-lb>	Maximum working pressure [kPa] {bar abs} <psi>	Application
M10	Cr-Mo steel	50 (5) <36>	3000 {30} <430>	Common over entire range
M10	SUS304 ASTMB7M ASTML7M	30 (3) <22>	3000 {30} <430>	

In case of gauge pressure transmitter (FKG)

Bolt size	Bolt material	Tightening torque [N·m] (kgf·m) <ft-lb>	Maximum working pressure [kPa] {bar} <psi>	Application
M10	Cr-Mo steel	50 (5) <36>	50000 {500} <7100>	Common over entire range
M10	SUS304 ASTMB7M ASTML7M	30 (3) <22>	10000 {100} <1400>	Range 10000 [kPa] <1400 psi> or less
M10	SUS630	50 (5) <36>	50000 {500} <7100>	Exclusive for range 50000 [kPa]

- After assembly, carry out a pressure test.
  Apply a pressure equal to 150% of the maximum working pressure to the high pressure measurement chamber of the transmitter for 15 minutes, and make sure there is no leakage.

In case of level transmitter (code symbol: FKE)



(1) Remove four hexagon socket head bolts with a torque wrench, etc..

(2) Disassembly gives access to the casing cover, O-ring (or gasket) and hexagon socket head bolts.

(3) After disassembly, replace the faulty part with a new one.

(4) Before reassembly, clean the O-ring face of casing cover with the soft cloth immersed in water, alcohol, or similar.

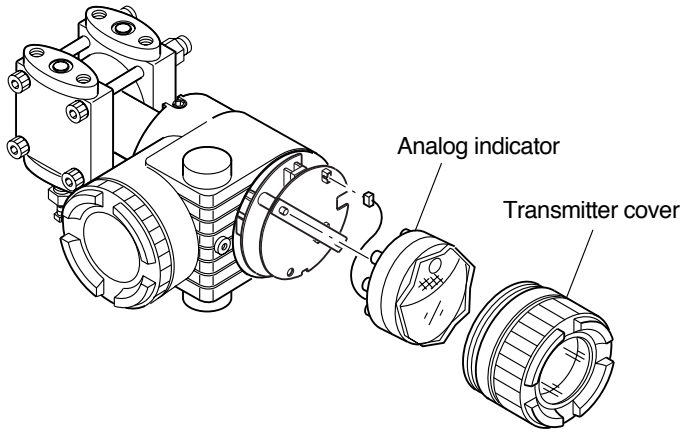
(5) Reassemble the detecting unit by reversing the disassembling procedure. The casing cover should be assembled carefully so as not to damage the seal diaphragm. Tightening torque should follow the table below.

Bolt size	Bolt material	Tightening torque [N·m] (kgf·m) <ft-lb>	Maximum working pressure
M10	Cr-Mo steel	50 (5) <36>	Up to rated flange oressure
M10	SUS304 ASTMB7M ASTML7M	30 (3) <22>	Up to rated flange pressure

(6) After assembly, carry out a pressure test. Apply a pressure equal to 150% of the maximum working pressure to both flange side (high pressure side) and low pressure (L) measurement chamber of the transmitter simultaneously for 15 minutes, and make sure there is no leakage.

Replacement of field indicator

1. Replacement of analog indicator



—— Replacing procedure ——

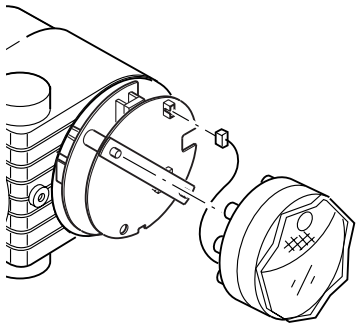
(1) Detach the transmitter cover.

(2) Remove the analog indicator.

(3) Pull out the connector extending from the analog indicator.

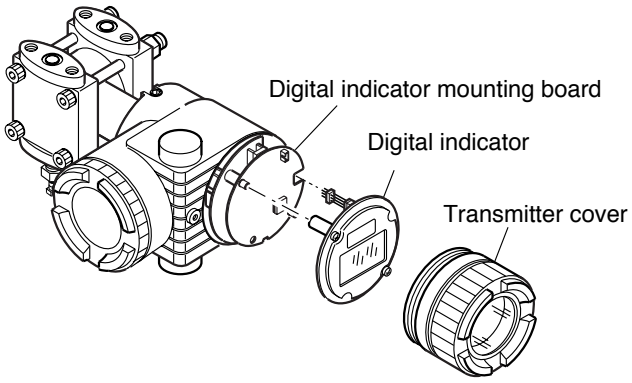
(4) Connect the connector of a new analog indicator to the electronics section. (See the figure below.)

(5) Then, mount the analog indicator at the electronics section.



6) Attach the transmitter cover.

2. Replacement of digital indicator



—— Replacing procedure——

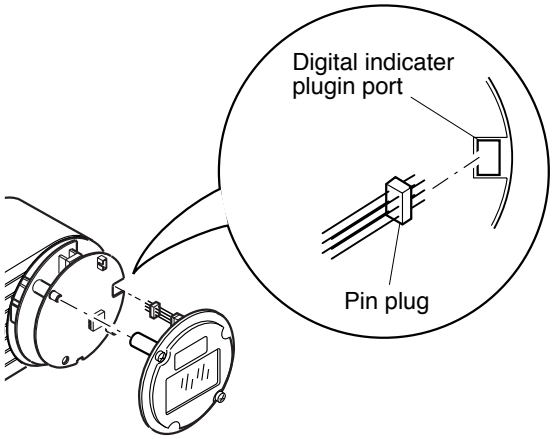
(1) Detach the transmitter cover.

(2) Remove two fixing screws which fasten the digital indicator and separate the indicator.

(3) Pull out the leading end of the flatcable extending from the digital indicator after raising the slider (white knob) in the electronics section. (See the figure below.)

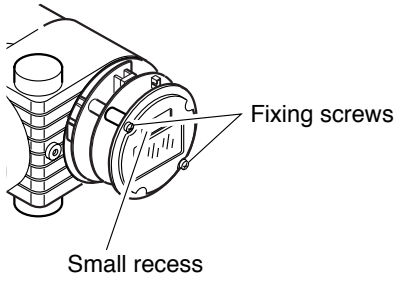
(4) Insert the leading end of the flatcable of a new digital indicator into the connector plug-in port of the electronics section and fix it by pushing in the slider. Before inserting the flexible PC board, confirm its correct orientation.

(5) Fasten the digital indicator to the electronics section by tightening two fixing screws.



Before tightening, make sure a small recess on the surface is positioned at the top as shown below.

When twisting the flexible PC board for mounting, adequate attention should be paid not to damage the board.



(6) Attach the transmitter cover.

5.4 Adjustment after replacement of unit

Adjustment

After completion of the assembly work mentioned above, use the following procedures for adjustment and setting. Adjustment should be performed using the HHC.

(1) After replacement of electronics unit (including replacement of internal parts)

Step	Adjustment item	Relevant page
1	Constant current output (output circuit)	P18
2	TAG. No.	P10
3	Type	P11
4	Industrial value unit	P12
5	Range (zero/span)	P13
6	Zero/span adjustment	P17
7	Damping	P14
8	Output mode (LIN/ $\sqrt{\ }$ selection)	P15
9	Burnout direction	P16
10	Lock of adjustment function	P21

(2) After replacement of detecting unit (including replacement of internal parts)

Step	Adjustment item	Relevant page
1	Range (zero/span)	P13

6. INSTALLATION AND PIPING

6.1 Installation

After unpacking, check the delivered items.
This transmitter can be mounted on a pipe or on a wall.
(However, level transmitters (types: FKE) require flange mounting).
Note that the bolts (M8) for wall mounting should be supplied by the customer.

⚠ CAUTION

- The transmitter is heavy. Be careful when handling it.
- The transmitter should be installed in a place that meets the operating conditions shown in DS sheet or instruction manual.
- Install the transmitter according to the instruction manual. Improper installation may lead to the cause of fall, trouble or incorrect operation.
- When installing, make sure that the transmitter interior is free from cable chips and other foreign objects to prevent fire, trouble or incorrect operation.

⚠ DANGER

- Non-explosion-proof transmitter must not be used in a place with explosive gas to prevent serious accidents such as explosion, fire, etc.

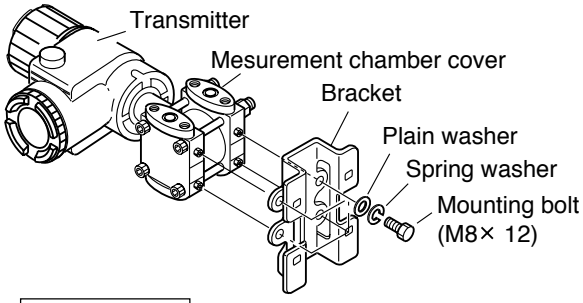
Important

If the transmitter is not used soon after delivery, then leave it packed and store it in a room at the normal temperature and humidity (25°C <77°F>, 60%RH).

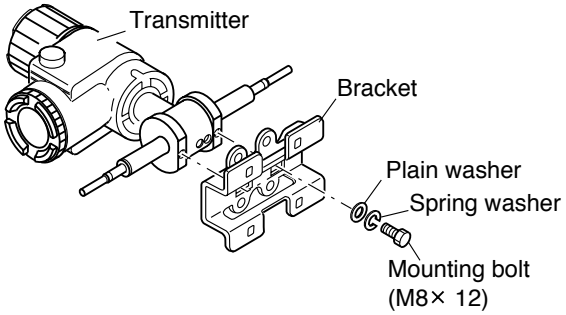
Bracket mounting

Mount the bracket to the transmitter.
The bracket should be mounted to the process cover as shown below.

(Differential pressure/flow transmitters, pressure transmitters, and absolute pressure transmitters, types: FKC, FKG, FKA)



(Remote seal type transmitters, types: FKD, FKB, FKM)



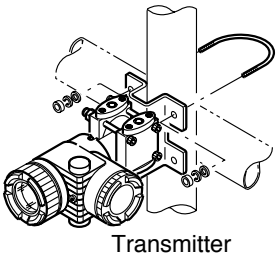
Mounting

Pipe mounting

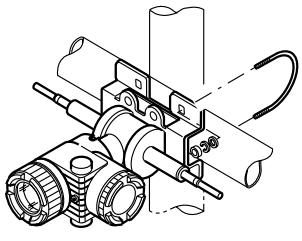
(1) Fasten the transmitter to a vertical or horizontal pipe using the supplied U-bolt (Tightening torque approximately 15 N·m (1.5 kgf·m)<11ft-lb>).

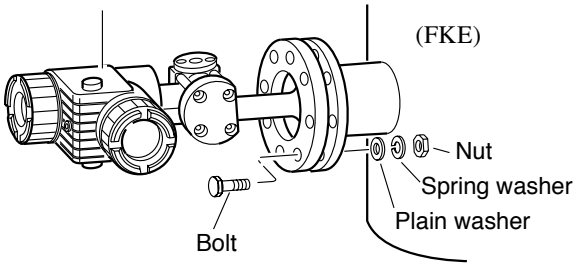
(2) Use a pipe of outside diameter ø60.5<2.38">mm.

(FKC, FKG, FKA)



(FKD, FKB, FKM)





Wall mounting

(1) Fasten to wall face by M8 bolt utilizing the U-bolt holes.

Flange mounting

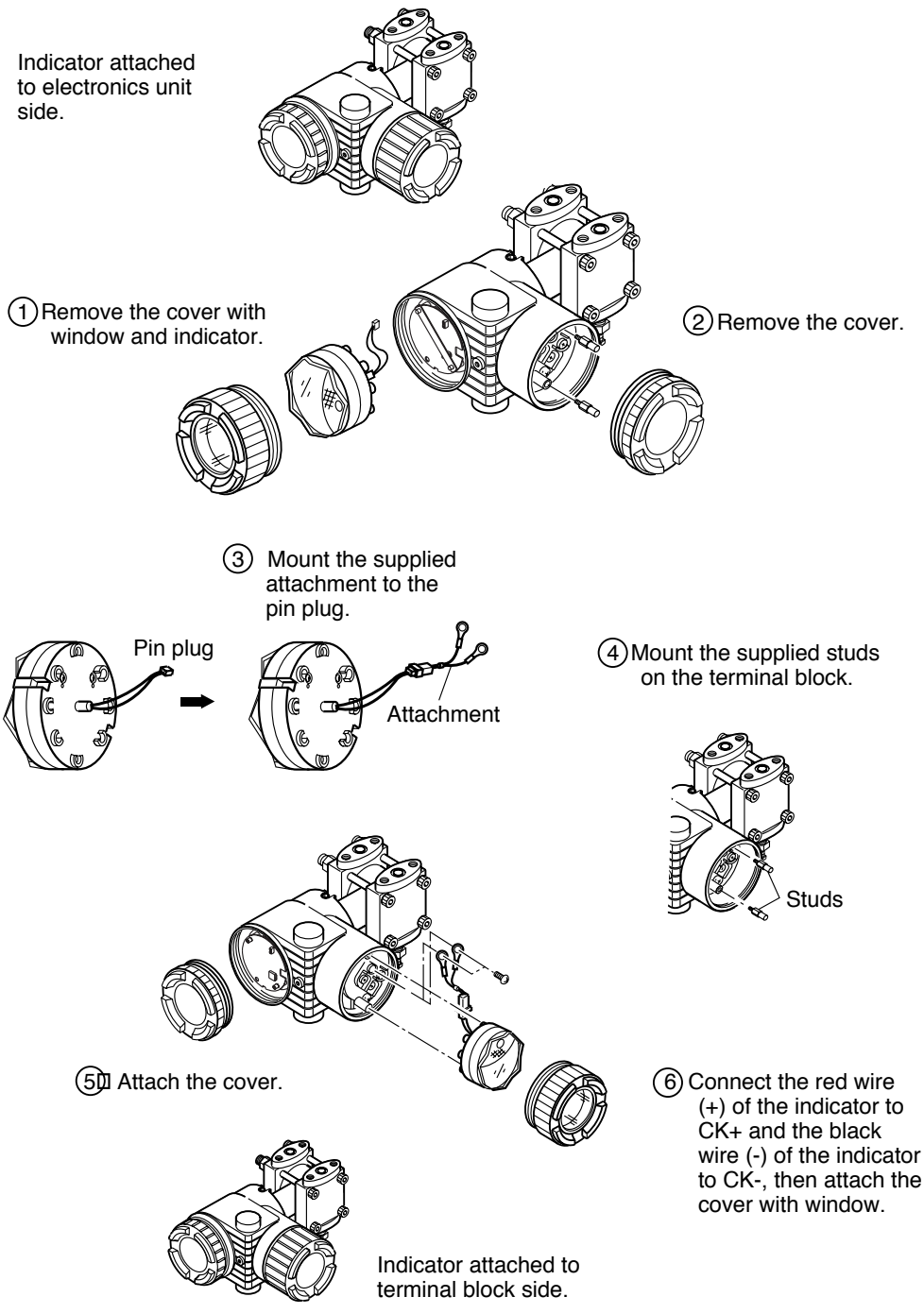
Bolt to tank flange.

Change of field indicator position

CAUTION Avoid the following procedure in an explosionproof area.

It is sometimes preferable to mount the indicator on the terminal block side due to installation location.
In such a case, the following mounting procedure should be followed for analog indicator.

Digital indicator cannot be mounted on the terminal block side.

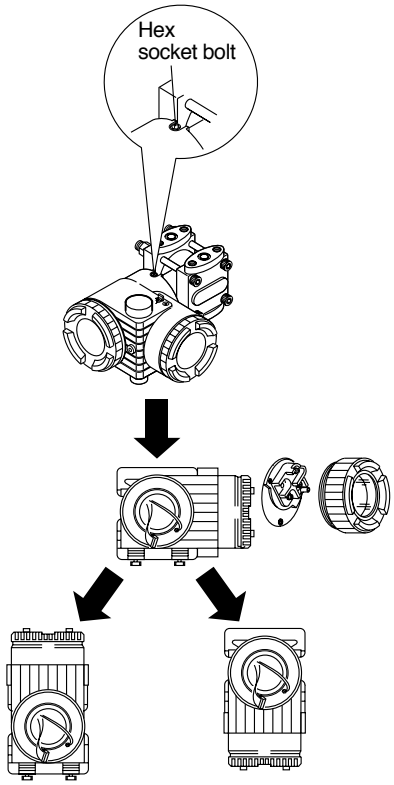


Change of transmission unit position

CAUTION Avoid the following procedure in an explosionproof area.

Wiring is sometimes difficult depending on the installation location. In such a case, it is convenient to carry out the following.
Before turning the transmission unit, remove the electronics unit.
The transmission unit is secured by 2 hex socket bolts.
Loosen the bolts, turn the transmission unit at 90˚ or 180˚ in the clockwise or counterclockwise direction and fix it by the screws. Then, carry out wiring.

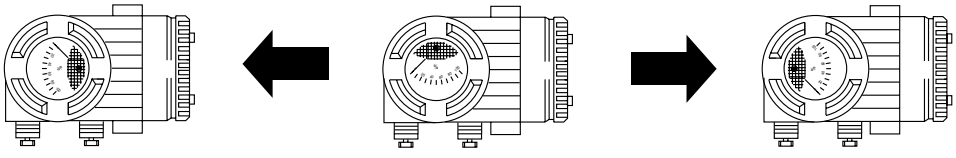
Important If the transmission unit has been turned excessively without removing the electronics unit, straighten the flatcable which connects the electronics unit in the transmission unit and the detecting unit, and set the transmission unit again.



Change of indicator angle

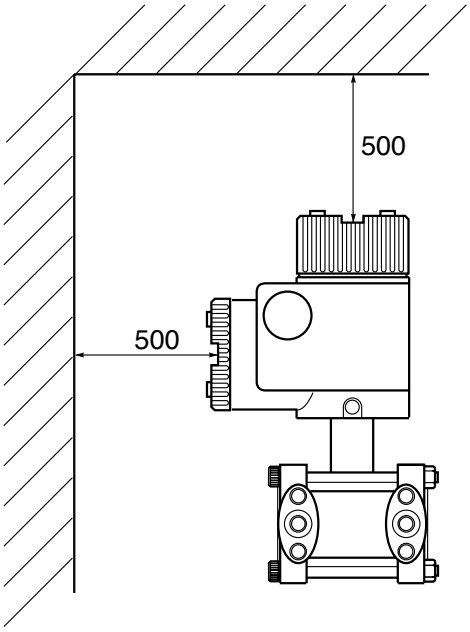
CAUTION Avoid the following procedure in an explosionproof area.

The analog or digital indicator can be turned ±180˚ in 90˚ increments because it is connected with a pin plug.



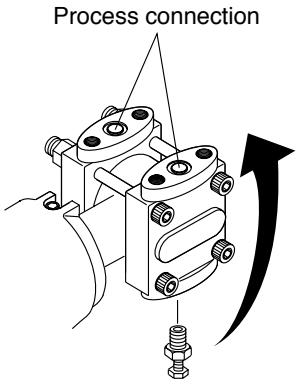
Check space

Ensure a space of about 500mm against the cover in order to facilitate check, adjustment, etc.



Change of vent/drain plug position

Grasp the hexagon part of vent/drain plug and rotate it to remove.
Bind vent/drain plug's thread with new seal tape and mount vent/drain plugs to new process connections.
Tightening torque : 25N·m (2.5kgf·m) <18ft·lb>



6.2 Piping

It is generally recognized that there are appropriate positioning relationship between the transmitter and main process piping for accurate measurement to avoid harmful gas or liquid accumulation.
General recognizations are;

① Mount transmitter below main process piping for liquid or steam measurement.
② Mount transmitter above main process piping for gas measurement.

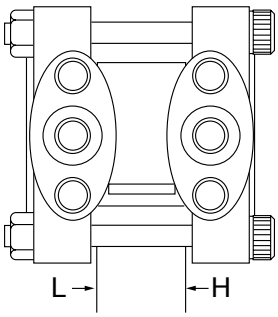
The standard style of FCX-A2 series transmitter correspond to the piping procedure① mentioned above. Change the vent/drain plug to correspond to the piping procedure②.

⚠ CAUTION	Main valve used for piping should be selected with the maximum pressure of the process taken into account (piping parts such as main valve, etc. should be furnished by user). If the main valve and other parts do not meet the rating, it may result in leakage of gas or liquid which could lead to a hazard.

6.2.1 Piping of differential pressure and flow transmitters (type: FKC.)

Check of high/low pressure sides of transmitter

The detecting unit of the differential pressure transmitter bears symbols H and L which represent high and low pressure sides, respectively.
Also, vent/drain plugs are provided at the lower process connection, while impulse pipes are connected at the upper process connections.



Removal of protective cap

The process connection ports of the transmitter and manifold (equalizer) valve are fitted with protective caps. Before piping, be sure to remove the caps. When removing the caps, carefully protect the threaded portion and sealing face from damage.

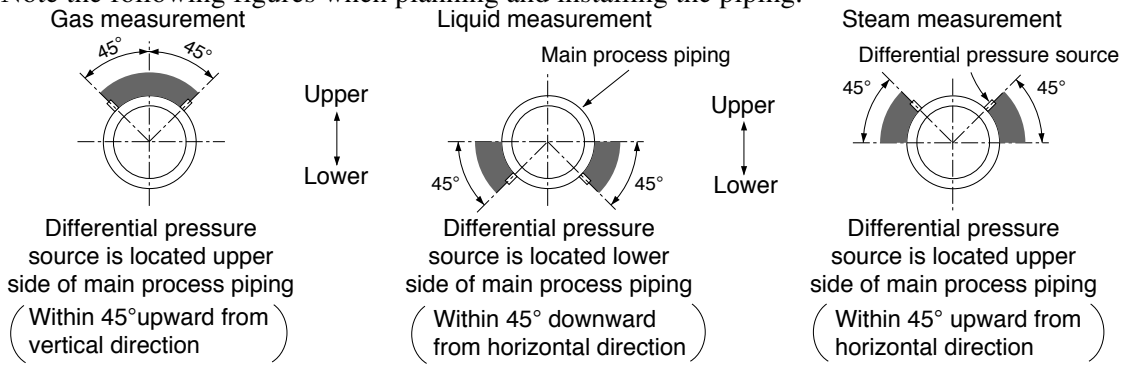
Connection of transmitter and impulse pipes

(1) When using the manifold valve, it should be fixed to the transmitter by tightening four oval flange setbolts (7/16-20UNF), and then the impulse pipe should be connected to the manifold valve. Tightening torque of 7/16-20UNF mounting bolt should be 30 to 40 N·m (3 to 4 kgf·m).

(2) If a manifold valve is not used, the impulse pipes can directly be screwed into the transmitter. If thread size does not match between the transmitter and impulse pipes, an oval flange should be used. Tightening torque of 7/16-20UNF mounting bolt in an oval flange should be 30 to 40 N·m (3 to 4 kgf·m).

Position of process taps (Horizontal main process piping)

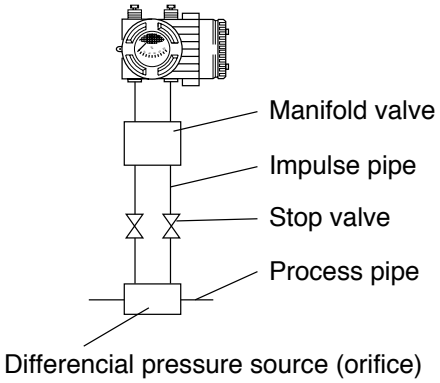
The position of the process tap is determined by the relationship between the condition, characteristics and measuring point of the process fluid.
Note the following figures when planning and installing the piping.



Typical examples of piping

1 Flow measurement (in case of gas)

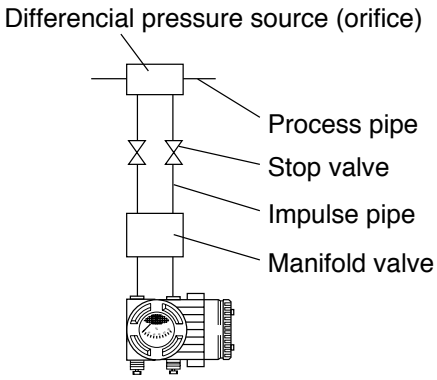
Place the transmitter above the differential pressure source.



2 Flow measurement (in case of liquid)

Place the transmitter below the differential pressure source.

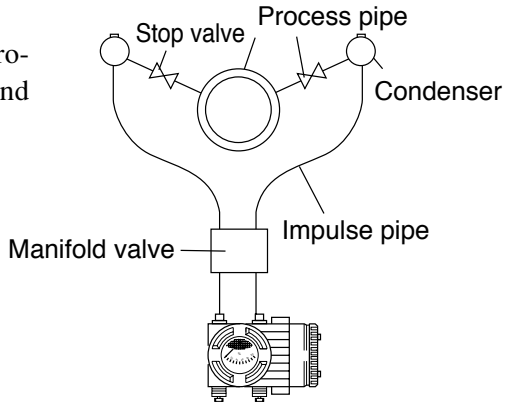
Make piping so that gas in the impulse pipe is not delivered to the transmitter, and incorporate gas reservoirs as required.



3 Flow measurement (in case of steam)

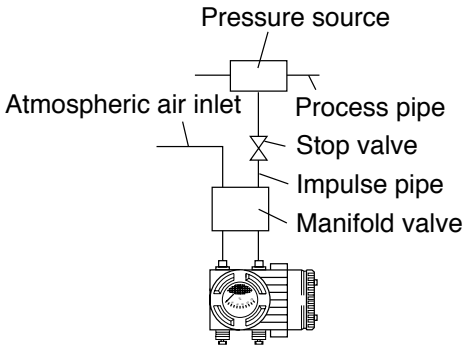
Set two condensers at the same height near the process tap. Fill the line between the condensers and transmitter with condensed water.

Install a drain port as required.



4 Pressure measurement (in case of liquid)

Zero point can be checked with a manifold valve installed.



Important

(1) Protection is required to prevent dust from entering through the atmospheric air inlet after installation of the manifold valve.

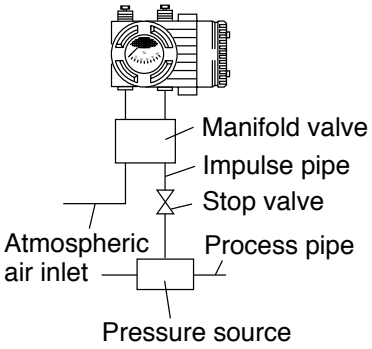
(2) If process pressure range is narrow (below 10kPa (1000mmH_2O)), the following should be considered.

- Pressure variation due to wind around atmospheric air inlet
- Temperature variation near process taps
- Difference in atmospheric pressure between process tap and transmitter location

To overcome this, provide atmospheric pressure-side pipe with a proper orifice and consider accommodating the transmitter and atmospheric air inlet in a box.

5 Pressure measurement (in case of gas)

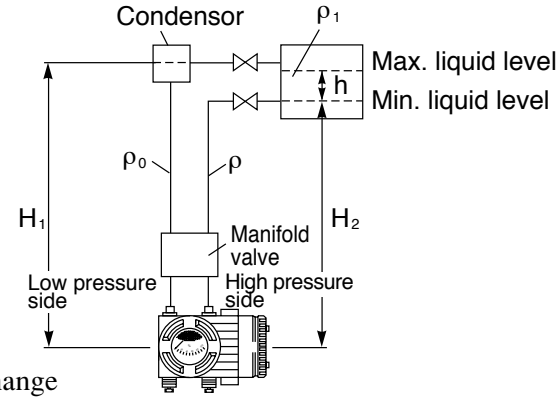
Mount the transmitter above the process pipes to preventing moisture from entering the inside of transmitter.



6 Level measurement

(1) In case of wet leg:

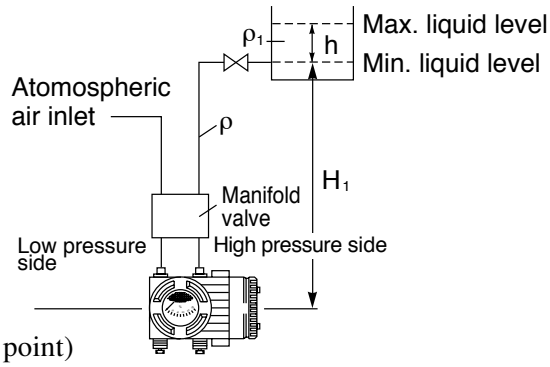
For measurement, connect the highest liquid level tapping of tank with the low pressure side of transmitter, and the lowest liquid level tapping of tank with the high pressure side of transmitter.



Level calculation formula
LRV : $\rho H_2 - \rho_0 H_1$
URV : $\rho H_2 + \rho_1 h - \rho_0 H_1$
Span (ΔP): $\rho_1 h$
LRV : Low limit of measurement (0% point)
URV : High limit of measurement (100% point)
ρ_0, ρ, ρ_1: Density
H_1, H_2: Liquid level, h: Liquid level change

(2) In case of dry leg:

For an open tank, leave the low pressure side of transmitter open to atmosphere.



Level calculation formula
LRV: ρH_1
URV: $\rho H_1 + \rho_1 h$
Span (DP): $\rho_1 h$
LRV: Low limit of measurement (0% point)
URV: High limit of measurement (100% point)
ρ, ρ_1: Density
H_1: Liquid level, h: Liquid level change

Cautions on impulse piping

- For liquid, the impulse pipes should have an upward slope of 1/10 or more between the process connection and the transmitter to prevent accumulation of gas, etc. in the detecting unit.
- For gas, the impulse pipes should have a downward slope of 1/10 or more between the process connection and transmitter to prevent accumulation of moisture, etc. in the detecting unit.
- Avoid any sharp bends in impulse pipe which may cause gas or moisture to accumulate in the impulse pipe.
- In order to prevent vibration of the transmitter body and capillary from interfering with output, the transmitter body should be installed at a vibration-free place and the capillary should be fixed to a stable support.
- Take care not to apply an excessive force to the transmitter during its connection.
- The impulse pipes used should be suitable for the working temperature, pressure, etc.
- When the measuring fluid is likely to freeze in the cover of the measurement chamber, the cover needs to be warmed up with steam or a heater.

6.2.2 Piping of pressure and absolute pressure transmitters (types: FKG, FKA)

Removal of protective cap

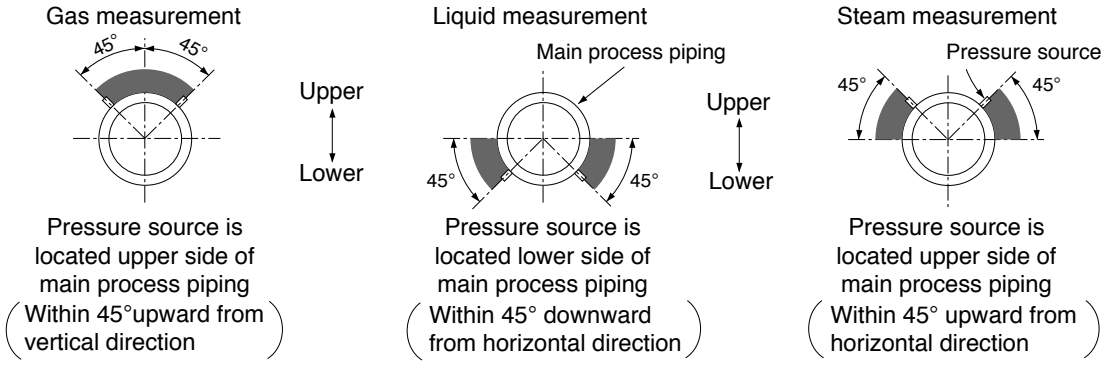
The process connection port of the transmitter is fitted with a protective cap. Before piping, remove the cap carefully. When removing the cap, carefully protect the threaded portion and sealing face from damage.

Connection of transmitter and impulse pipe

- Impulse pipe should be connected with an oval flange. Also, the pipe can directly be screwed into the transmitter. Tightening torque of 7/16-20UNF mounting bolt in an oval flange should be 30 to 40 N·m (3 to 4 kgf·m).
- After connection, close the stop valve of transmitter in order to prevent foreign materials from entering the inside.

Position of process taps (Horizontal main process piping)

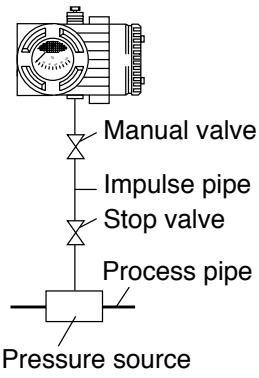
The position of the process tap is determined by the relationship between condition, characteristics and measurement point of process fluid. Note the following figures when planning and installing the piping.



Typical examples of piping

1 Gas measurement

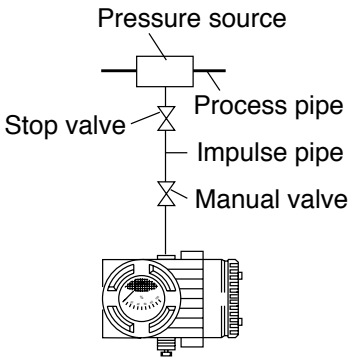
Place the transmitter above the pressure source.



2 Liquid measurement

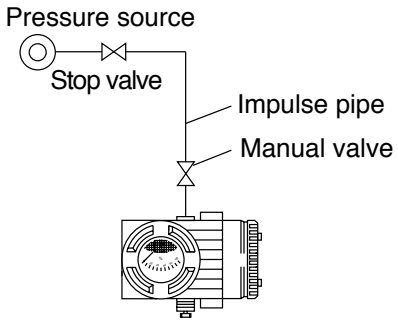
Place the transmitter below the pressure source.

Make piping so that gas in the process pipe is not delivered to the transmitter, and incorporate gas reservoirs as required.



3 Steam measurement

Place the transmitter below the pressure source.



Cautions on impulse piping

- For liquid, the impulse pipe should have an upward slope of 1/10 or more between the process connection and transmitter to prevent accumulation of gas, etc. in the detecting unit.
- For gas, the impulse pipe should have a downward slope of 1/10 or more between process connection and transmitter to prevent accumulation of moisture, etc. in the detecting unit.
- Avoid any sharp bends in impulse pipe which may cause gas or moisture to accumulate in the impulse pipe.
- In order to prevent vibration of the transmitter body and capillary from interfering with output, the transmitter body should be installed at a vibration-free place and the capillary should be fixed to a stable support.
- Take care not to apply an excessive force to the transmitter during its connection.

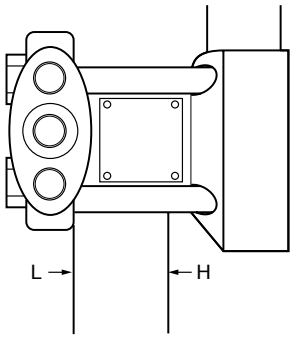
⚠ CAUTION	The impulse pipe used should be suitable for the working temperature, pressure, etc.

- When the measuring fluid is likely to freeze in the cover of the measurement chamber, the cover needs to be warmed up with steam or a heater.

6.2.3 Piping of level transmitter (type: FKE)

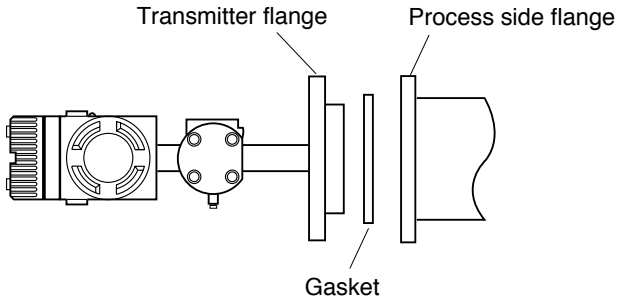
Check of high/low pressure sides of transmitter

The detecting unit of the level transmitter bears symbols H and L which represent high and low pressure sides, respectively.



Seal on mounting flange face

When mounting the flange on the high pressure side, a gasket should be inserted as follows.



Minimum internal diameter of non-projection type gasket

Flange size	Minimum internal diameter of gasket
DN80/3”	SS : 49mm
DN100/4”	SS : 100mm

Important

It should be noted that leakage of fluid from the wetted parts would affect the performance due to the progress of corrosion.

Connecting method of the mounting flange

Tighten bolts of mounting flange and process flange in a diagonal order and about three cycles.

Removal of protective cap from process connection port

The process connection port on the low pressure side is fitted with a protective cap. Before piping, remove the cap carefully. When removing the cap, carefully protect the threaded portion and sealing face from damage.

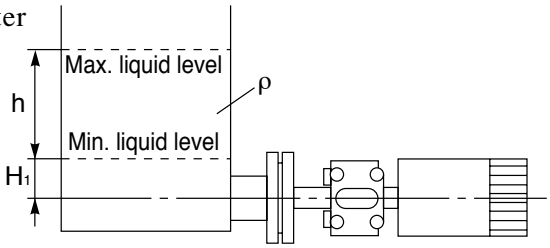
Connection of transmitter and impulse pipe

- The pipe on the low pressure side can be connected with an oval flange. Also, the impulse pipe can directly be screwed into the transmitter. Tightening torque of 7/16-20UNF mounting bolt in an oval flange should be 30 to 40 N·m (3 to 4 kgf·m).
- After connection, close the stop valve of transmitter in order to prevent foreign materials from entering the inside.

Typical examples of piping

1 Level measurement of open tank

Leave the low pressure side of transmitter open to atmosphere.

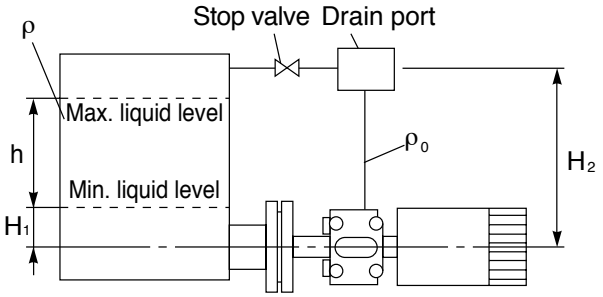


Level calculation formula
LRV: ρH_1
URV: $\rho (H_1 + h)$
Span (ΔP): ρh
LRV: Low limit of measurement (0%)
URV: High limit of measurement (100%)
ρ: Measuring liquid density
H_1: Liquid level (Refer to "Cautions on installation")
h: Liquid level change

2 Level measurement of enclosed tank

(1) In case of wet leg:

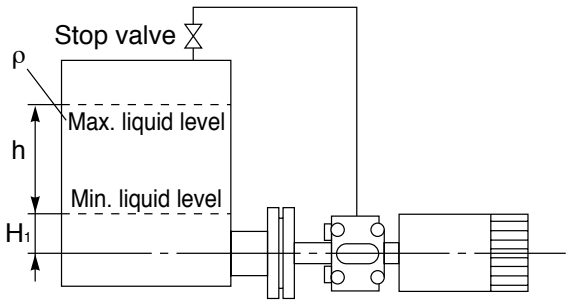
Connect the highest liquid level tapping of tank to the low pressure side of transmitter, and the lowest liquid level tapping of tank to the high pressure side (flange side) of transmitter.



Level calculation formula
LRV: $\rho H_1 - \rho_0 H_2$
URV: $\rho (H_1 + h) - \rho_0 H_2$
Span (ΔP): ρh
LRV: Low limit of measurement (0%)
URV: High limit of measurement (100%)
ρ: Measuring liquid density
ρ_0: Seal liquid density
H_1: Liquid level (Refer to "Cautions on installation")
h: Liquid level change
H_2: Seal liquid level

(2) In case of dry leg:

Connect the highest liquid level tapping of tank to the low pressure side of transmitter, and the lowest liquid level tapping of tank to the high pressure side (flange side) of transmitter.



Level calculation formula
LRV: ρH_1
URV: $\rho (H_1 + h)$
Span (ΔP): ρh
LRV: Low limit of measurement (0%)
URV: High limit of measurement (100%)
ρ: Measuring liquid density
H_1: Liquid level (Refer to "Cautions on installation")
h: Liquid level change

Cautions on installation

- Restriction on H_1

  Liquid level is not proportional to the transmitter output at some points inside the seal diaphragm.
  Therefore, H_1 should be set higher than the value shown in the table below.

- In order to prevent vibration of the transmitter body and capillary from interfering with output, the transmitter body should be installed at a vibration-free place and the capillary should be fixed to a stable support.
- Do not shock the seal diaphragm by hitting hard object against it, for example.
- Take care not to apply an excessive force to the flange during connection.
- When the measuring fluid is likely to freeze in the cover of the low pressure measurement chamber, the cover needs to be warmed up with steam or a heater.

Minimum value of H_1

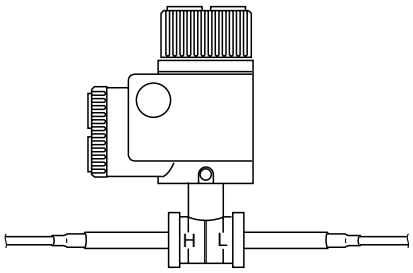
Flange size	Non-projection type	Projection type
40A ($1^1/_2$B)	30mm	——
50A (2B)	30mm	30mm
80A (3B)	55mm	40mm
100A (4B)	55mm	55mm

6.2.4 Piping of remote seal type transmitter (types: FKB, FKD, FKM)

(1) Piping of remote seal type differential pressure transmitter (type : FKD)

Check of high/low pressure sides of transmitter

The detecting unit of the remote seal type differential pressure transmitter bears symbols H and L which represent high and low pressure sides, respectively. Both high and low pressure sides employ flange connection.



Seal on mounting flange face

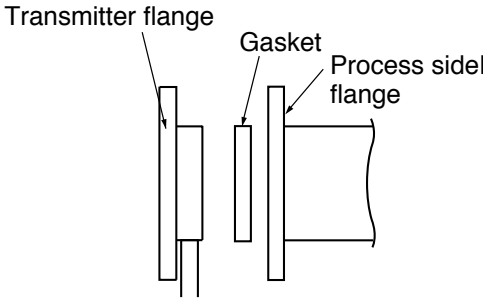
When mounting the flange, a gasket should be inserted as follows.

Important

On the non-projection type, be sure to use a gasket with an internal diameter larger than shown in the table below, to prevent the gasket from touching the seal diaphragm.
On the 80A (3B) type particularly, it should be noted that the 80A (3B) gasket available from the market is such that its inside diameter is smaller than the size shown below. If it is used, it touches the seal diaphragm and cause errors in measurements.

Minimum internal diameter of non-projection type gasket

Flange size	Minimum internal diameter of gasket
40A ($1^1/_2$B), 50A (2B)	49mm
80A (3B), 100A (4B)	100mm



Important

When measuring a highly corrosive process fluid, care should be taken as corrosion may occur if the fluid leaks past wetted parts.

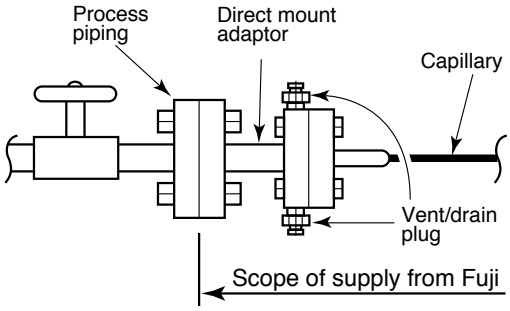
Connecting method of the mounting flange

Tighten the bolts of mounting flange and process flange in a diagonal order and about three cycles.

Piping for small flange transmitter with direct mount adaptor

When connecting the direct mount adaptor to the process piping, make sure that the 2 vent/drain plugs fitted to the adaptor are positioned up and down, respectively.

Gaskets, bolt and nuts used for connecting the process piping are not supplied from Fuji, and should be prepared by user.

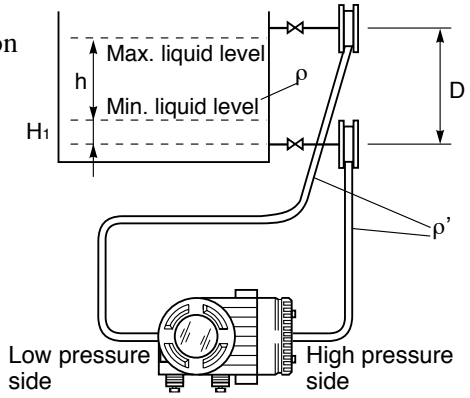


Typical examples of piping

Level measurement

(1) Open tank

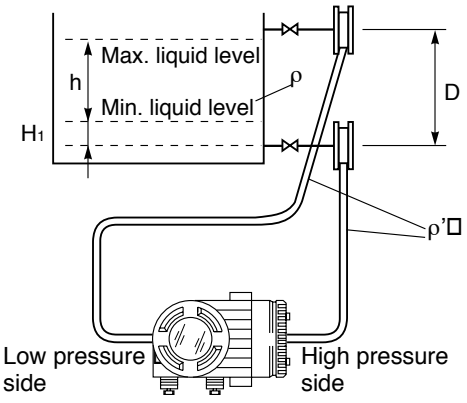
An open tank should be piped so that the flange on the low pressure side is open to atmosphere.



Level calculation formula
LRV: $\rho H_1 - \rho' D$
URV: $\rho (H_1 + h) - \rho' D$
Span (ΔP): ρh
LRV: Low limit of measurement (0%)
URV: High limit of measurement (100%)
ρ: Measuring liquid density
ρ': Seal liquid density
H_1: Liquid level (Refer to "Cautions on installation")
h: Level change

(2) Enclosed tank

Connect the low pressure side flange to the highest liquid level tapping of tank, and the high pressure side flange to the lowest liquid level tapping of tank.



Level calculation formula
LRV: $\rho H_1 - \rho' D$
URV: $\rho (H_1 + h) - \rho' D$
Span (ΔP): ρh
LRV: Low limit of measurement (0%)
URV: High limit of measurement (100%)
ρ: Measuring liquid density
ρ': Seal liquid density
H_1: Liquid level (Refer to "Cautions on installation")
h: Level change

* The seal liquid density ρ' is a value at 25°C.

13th digit of type code	Density	Description
Y, G	0.95	For general measurement (silicone oil)
W, A, D	1.9	For oxygen and chlorine measurement (fluorine-group oil)
H, S, K	1.07	For high temperature, high temperature and vacuum, and high temperature and high vacuum (silicone oil)
J, T	1.09	

Important

The transmitter body should be installed below any pressure receiving unit. This is mandatory where process pressure may become vacuum due to application.

Cautions on installation

- Restriction on H_1

  Liquid level is not proportional to the transmitter output at some pints inside the seal diaphragm. Therefore, H_1 should be set higher than the value shown in the table below.

  Minimum value of H_1

Flange size	Non-projection type	Projection type
40A ($1^1/_2$B)	30mm	——
50A (2B)	30mm	30mm
80A (3B)	55mm	40mm
100A (4B)	55mm	55mm

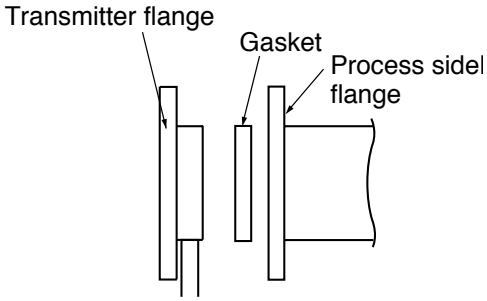
- In order to prevent vibration of the transmitter body and capillary from interfering with output, the transmitter body should be installed at a vibration-free place and the capillary should be fixed to a stable support.
- For minimizing the influence by a difference in the ambient temperature, the capillaries on the high and low pressure sides should be laid together.
- Do not shock the seal diaphragm by hitting a hard object against it, for example.
- Water head pressure due to difference in the height of flange

  When there is a difference (D) in flange mounting position between the high-pressure side and the low-pressure side, a water pressure head "–ρ'D" is applied to the transmitter, so a zero point shift for the water head pressure (–ρ'D) due to difference in height of flange is required at range setting as shown in the example of typical piping.
  On the FCX-A2 series transmitter, it is made by setting LRV, URV and –ρ'D with HHC (for details, refer to Item 4 "Adjustment", 4.1 Adjustment with HHC and operation procedure, range change).

(2) Piping of remote seal type pressure transmitter (type: FKB, FKM)

Seal on mounting flange face

When mounting the flange, a gasket should be inserted as follows.



Important

When measuring a highly corrosive process fluid, care should be taken as corrosion may be aggravated if the fluid leaks out of wetted parts.

Minimum internal diameter of non-projection type gasket

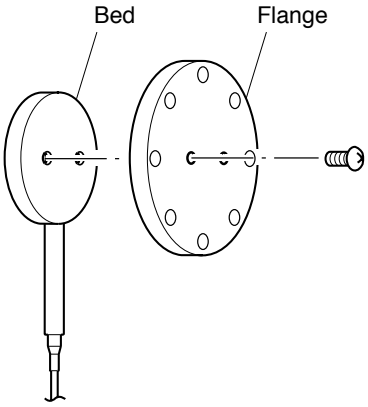
Flange size	Minimum internal diameter of gasket
DN80/3”	SS : 73mm
DN100/3”	SS : 100mm

Connecting method of the mounting flange

Tighten the bolts of mounting flange and process pipe flange in a diagonal order and about three cycles.

Mounting of flange and bed

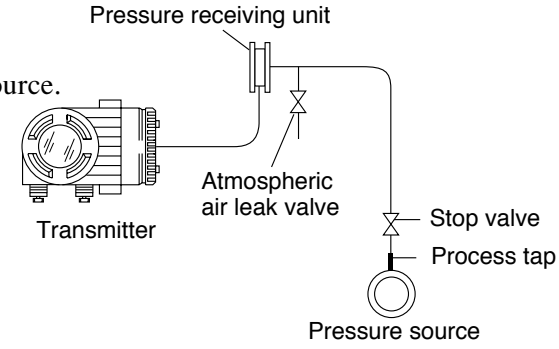
The bed has two screw holes on the back face. It is therefore recommended to mount the bed to the flange in advance by tightening screws (M6). The flange should be supplied by the customer.



Typical examples of piping

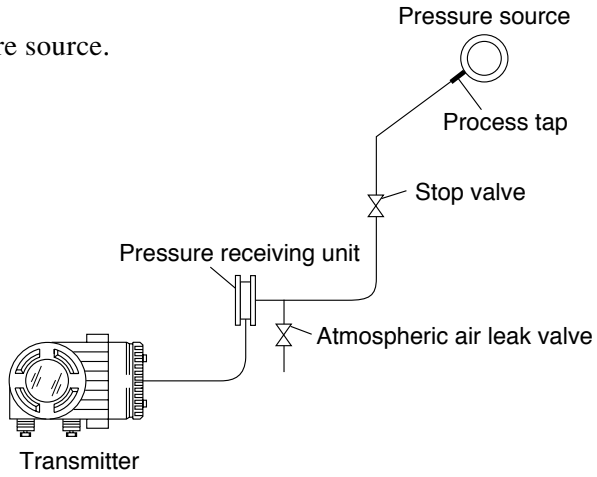
1 Gas measurement

Locate the process tap above the pressure source.



2 Liquid measurement

Locate the process tap below the pressure source.



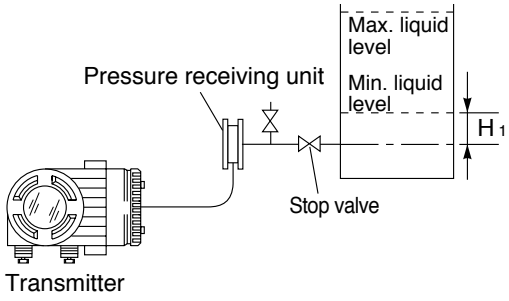
3 Level measurement

Open tank

An open tank should be connected on the lowest liquid level tapping point.

- Restriction on H_1

  Liquid level is not proportional to the transmitter output at some pints inside the seal diaphragm. Therefore, H_1 should be set higher than the value shown in the table below.



Minimum value of H_1

Flange size	Non-projection type	Projection type
40A ($1^1/_2$B)	30mm	——
50A (2B)	30mm	30mm
80A (3B)	55mm	40mm
100A (4B)	55mm	55mm

Important

The transmitter body should be installed below any pressure receiving unit. This is mandatory where process pressure becomes vacuum due to application.

Cautions on process piping

- In order to prevent vibration of the transmitter body and capillary from interfering with output, the transmitter body should be installed at a vibration-free place and the capillary should be fixed to a stable support.
- Do not shock the seal diaphragm by hitting hard object against it, for example.

7. WIRING

Cautions on wiring

(1) Application of a voltage exceeding 60 V DC or 40 V AC (exceeding 33 V DC or 23 V AC when arrester equipped) between "+" and "–" terminals may result in damage to the transmitter.

(2) Use a shielded cable for the transmission line where possible.

(3) Avoid installation of signal cable and power cable in same conduit or cable tray in order to prevent increased noise. Also, do not bring the signal cable close to large electrical equipment.

DANGER

In case of an explosionproof arrangement, wiring shall be made in accordance with the relevant regulations to ensure the explosionproofing.

7.1 Wiring procedure

CAUTION

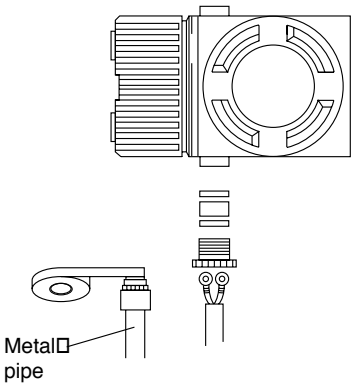
- Before making wiring work, be sure to turn OFF the main power to prevent electric shocks.
- Use wiring materials of correct rating to prevent fire accidents.
- After installing the transmitter, firmly close the covers of the transmission unit and terminal box. If not, rain water enter the transmitter which may result in trouble or incorrect operation.

Sealing of conduit connection

Use sealing tape, if using metal pipe screw coupling or rubber gasket and fastening gland in the case of cable (outside diameter ø11) <0.43"> to ensure airtightness of the connection box.

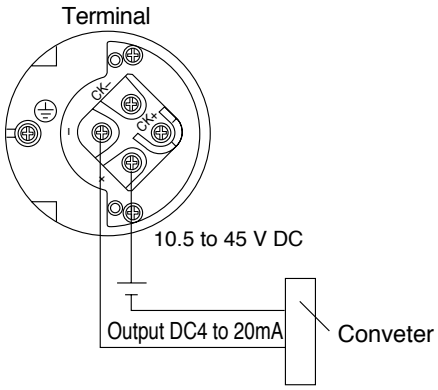
Important

1. If the connection box is located above the transmitter when using a protective tube for the wiring, then moisture may enter the protective tube and have an adverse effect on the transmitter. So maintaining airtightness of the connection box is an important practice.
2. The thread of conduit tube should meet the selected size and a seal fixture should be used.



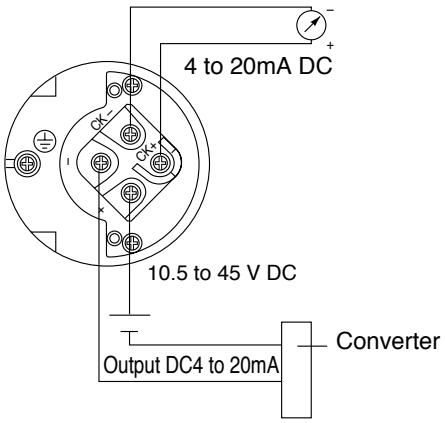
Terminal block connection diagram

Tighten the terminal screws (M4 × 10) to a torque of approximately 1.5 N·m (15 kgf·cm) <11ft-lb> so that the wires will not loosen.
After connection, fasten the cover until it does not turn.



When using an external field indicator

For direct connection to an external field indicator, connect the "+" and "–" sides of the field indicator to CK+ and CK– of the transmitter as shown below.
Use an external field indicator with internal resistance of 12Ω or less.



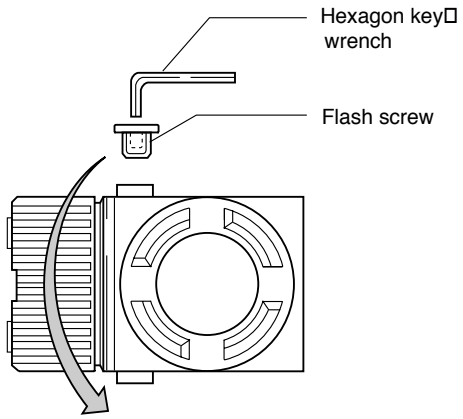
Things convenient to know beforehand

When using conduit connection at the top
(In the case of 4th digit of type code "S, T, V, W, X")
For wiring from the top conduit connection, use the following procedure.

(1) Remove the screw plug of the top conduit connection.

(2) Screw the removed screw plug into the bottom conduit connection.

(3) Insert the cable from the top and connect it.



Important

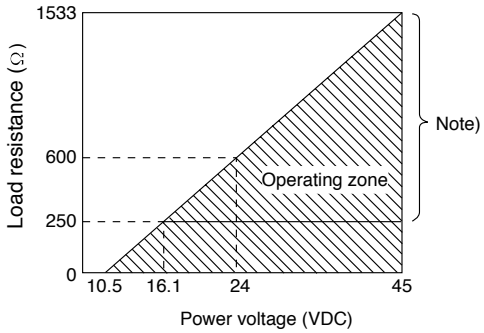
- The unused conduit connection is of great importance to flameproofing and moisture prevention. So be sure to tighten the flush screw and packing into the connection.
- When performing an insulation check after wiring, use a Megger (insulation resistance meter) of 250 V DC or less and avoid applying a high voltage. If an arrester is equipped, avoid the insulation resistance test and the dielectric strength measurement.

7.2 Power voltage and load resistance

Make sure the load resistance of the wiring connected to the loop is within the range shown below.

CAUTION

Connect power source of correct rating. Use of power source in excess of the rating may cause a fire.



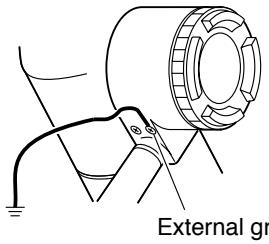
Note) For communication with HHC, minimum load resistance of 250 Ω required.

7.3 Grounding

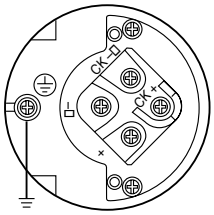
⚠ CAUTION	The transmitter must be grounded. Otherwise, it may cause electric shocks or incorrect operation.

Grounding terminals are provided at two places (at the inside of terminal box and on the side of conduit connection).
By any of the methods given below, ground the transmitter in compliance with the relevant stipulation in the standard on explosionproof installation (for example, grounding resistance 100 Ω or less by one of the methods given below). In case of intrinsically safe and flameproof installation, be sure to use the ground terminal for grounding.

Grounding of transmitter casing

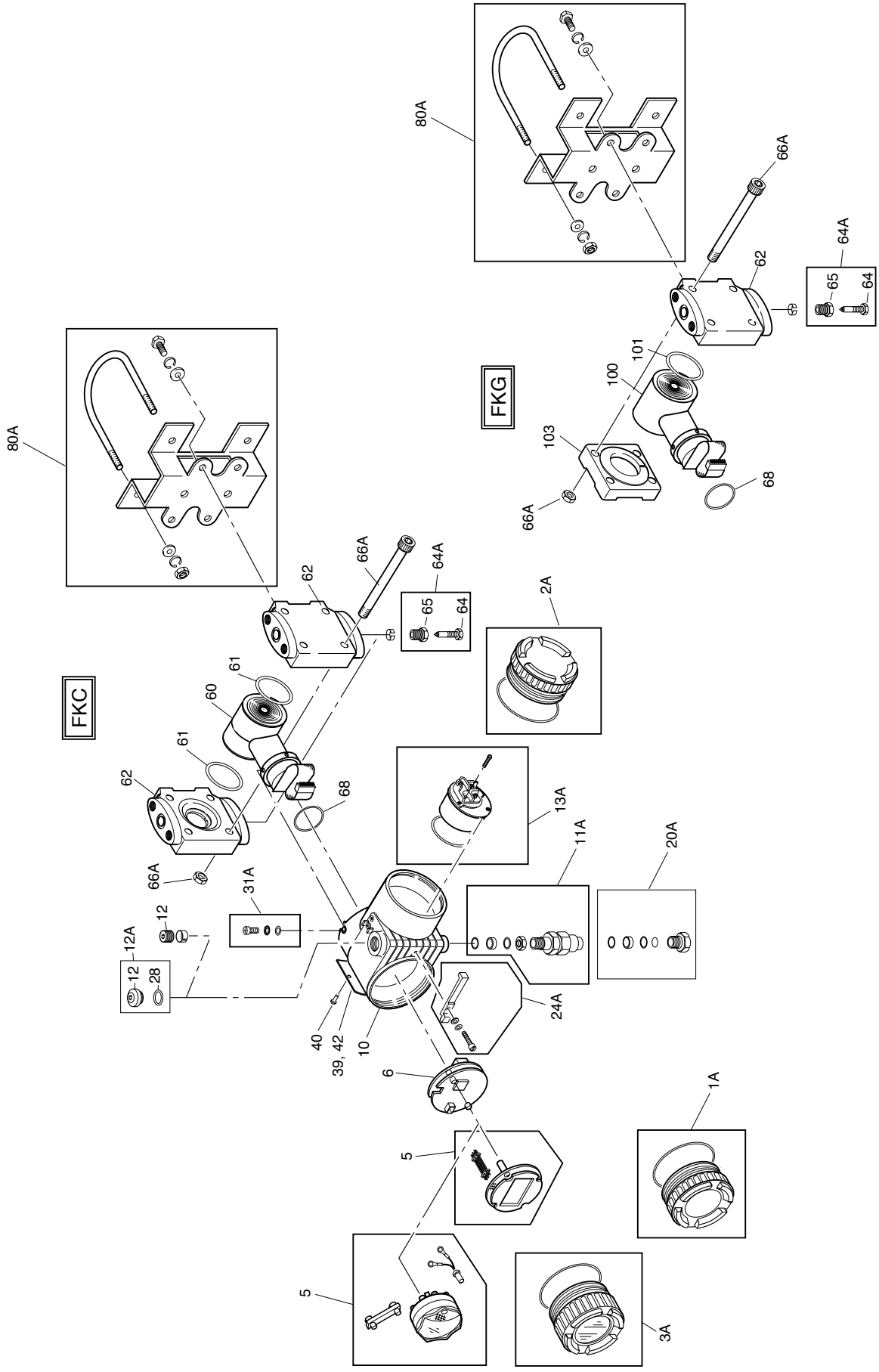


Grounding from ground terminal



8. SPARE PARTS

This diagram shows main parts of the differential pressure (flow) transmitter (FKC) and pressure transmitter (FKG). For details, contact our office.



No.	Parts No.	Part Name	Q'ty	Material	Remarks
1A	*ZZPFCX4-A010	Cover	1	ADC12	Blind cover for electronics compartment.
2A	*ZZPFCX4-A021	Cover	1	ADC12	Blind cover for terminal box cover.
3A	*ZZPFCX4-A030	Cover ass'y	1	Aluminum alloy ADC12	Window cover for indicator option.
5	*ZZPFCX4-A050	Incicator kit	1		Analog, 0- 100% linear.
	*ZZPFCX4-A051	Indicator kit	1		Analog, 0- 100% square - root.
	*ZZPFCX4-A052	Incicator kit	1		Analog, dual scale.
	*ZZPFCX4-A053	Indicator kit	1		Analog, actual scale.
	*ZZPFCX4-A054	Indicator kit	1		LCD Meter.
6	*ZZPFCX4-A060	Amplifier Unit	1		Common for any FCX-A2 models.
10	*ZZPFCX4-A101	Electronics housing	1	ADC12	With G1/2 connection. Conduit connection 1 location.
	*ZZPFCX4-A102	Electronics housing	1	ADC12	With Pg13.5 connection. Conduit connection 1 location.
	*ZZPFCX4-A103	Electronics housing	1	ADC12	With 1/2 - 14NPT connection. Conduit connection 1 location.
	*ZZPFCX4-A104	Electronics housing	1	ADC12	With M20 × 1.5 connection. Conduit connection 1 location.
	*ZZPFCX4-A109	Electronics housing	1	ADC12	With G1/2 connection. Conduit connection 2 locations.
	*ZZPFCX4-A10A	Electronics housing	1	ADC12	With Pg13.5 connection. Conduit connection 2 locations.
	*ZZPFCX4-A10B	Electronics housing	1	ADC12	With 1/2 - 14NPT connection. Conduit connection 2 locations.
	*ZZPFCX4-A10C	Electronics housing	1	ADC12	With M20 × 1.5 connection. Conduit connection 2 locations.
11A	*ZZPFCX1-A110A	Cable gland kit	1		Requires only for JIS flameproof. G1/2 connection.
12A	*ZZPFCX4-A120A	Plug kit	1		Plug for G1/2 connection.
	*ZZPFCX4-A121A	Plug kit	1		Plug for Pg13.5 connection.
	*ZZPFCX4-A123A	Plug kit	1		Plug for M20 × 1.5 connection.
12	*ZZPFCX1-A122	Plug	1	Stainless steel	Plug for NPT1/2 connection.
13A	*ZZPFCX4-A132	Terminal block unit	1		Round washer type.
	*ZZPFCX4-A133	Terminal block unit	1		Wire retaining washer type.
	*ZZPFCX4-A134	Terminal block unit	1		Round washer type with arrester.
	*ZZPFCX4-A135	Terminal block unit	1		Wire retaining washer type with arrester.
20A	*ZZPFCX1-A200A	Cable gland kit	1		Required only for transmitter with Pg13.5 connections. Minimum order q'ty 10 pcs.
24A	Note) *ZZPFCX2-A241A	Fastener kit	1		Required only for BASEEFA or JIS flameproof (Exd) transmitters. Minimum order q'ty 10 pcs.
31A	*ZZPFCX1-A310A	Hex. socket screw kit	2		Minimum order q'ty 10 pcs.

4th digit of type code
S
V
W
T

No.	Parts No.	Part Name	Q'ty	Material	Remarks
39	*ZZPFCX2-A391	Blank name plate	1	Stainless steel	Standard. Minimum order q'ty 5 pcs.
	Note) *ZZPFCX4-A392	Blank name plate	1	Stainless steel	FM Explosionproof. Minimum order q'ty 5 pcs.
	Note) *ZZPFHX4-A393	Blank name plate	1	Stainless steel	CSA Explosionproof. Minimum order q'ty 5 pcs.
	Note) *ZZPFCX4-A394	Blank name plate	1	Stainless steel	BASEEFA Explosionproof. Minimum order q'ty 5 pcs.
	Note) *ZZPFCX4-A395	Blank name plate	1	Stainless steel	FM Intrinsic safety. Minimum order q'ty 5 pcs.
	Note) *ZZPFCX4-A396	Blank name plate	1	Stainless steel	CSA Intrinsic safety. Minimum order q'ty 5 pcs.
	Note) *ZZPFCX4-A397	Blank name plate	1	Stainless steel	BASEEFAS intrinsic safety. Minimum order q'ty 5 pcs.
	Note) *ZZPFCX4-A398	Blank name plate	1	Stainless steel	BASEEFA type N intrinsic safety. Minimum order q'ty 5 pcs.
40	*ZZPFCX1-A400	Rivet	2	Stainless steel	Minimum order q'ty 50 pcs.
42	Note) *ZZPFCX1-A420 ~ *ZZPFCX1-A42R	Ex. plate	1	Alminum	JIS Explosionproof and Intrinsic safety Minimum order q'ty 5 pcs. Need inquiry.
60	————	Detecting unit	1		Contact our office for inquiry.
61	*ZZPFCX4-B080	O - Ring	2	Viton	} Minimum order q'ty 10 pcs.
	*ZZPFCX4-B081	Gasket	2	Teflon	
62	*ZZPFCX4-B091	Cover	2	SCS14	
	*ZZPFCX4-B093	Cover	2	SCS14	
	*ZZPFCX4-B095	Cover	2	SCS14	
	*ZZPFCX4-B097	Cover	2	SCS14	
64A	*ZZPFHC1-B121	Vent / drain kit	2	Stainless steel	Rc 1/4
	*ZZPFHC1-B122	Vent / drain kit	2	Stainless steel	NPT 1/4
66A	*ZZPFHC1-B143	Bolt / Nut kit	4	C.S.	Hexagon socket head cap screw
	*ZZPFHC1-B144	Bolt / Nut kit	4	Stainless steel	
	*ZZPFHC1-B145	Bolt / Nut kit	4	Stainless steel	
68	*ZZPFHC1-B160	O - Ring	1	Chloroprene	Minimum order q'ty 10 pcs.
80A	*ZZPFHC1-B171	Mounting braket kit	1	Stainless steel	

4th digit of type code	5th digit of type code
A,S	
B,E,T,X	
V,W	1,2,3
V,W	4

15th digit of type code
E,S
F,T

Note) Approval pending

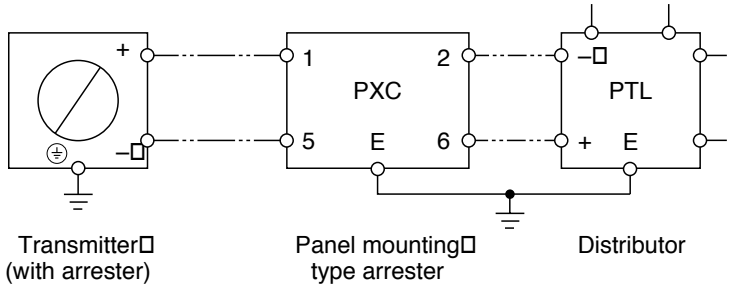
A1 BUILT-IN ARRESTER

General

An arrester is used to protect a transmitter or receiver from an abnormal voltage such as lightning surges induced into signal lines. A built-in type arrester is mounted behind the terminal unit. A nameplate marked "with arrester" is attached to the terminal unit of transmitter with a built-in arrester.

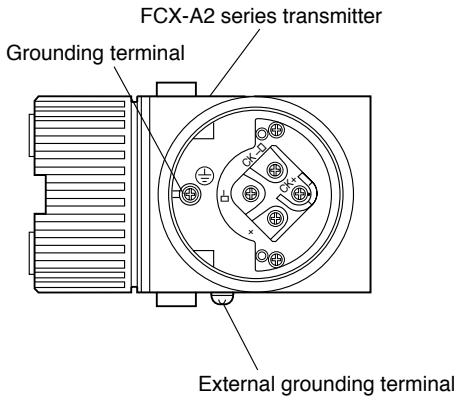
Installation

The built-in arrester should be used in combination with panel mounting type arrester (type PXC) for distributor protection.



Grounding

Since transmitter and arrester groundings are internally connected together, user have only to connect the external grounding terminals to ground.
Grounding terminal must be used, in case of the explosionproof or intrinsic safety type transmitter.



Important

1. Grounding resistance should be 100Ω or less.
2. Avoid common grounding with a lightning rod.

Maintenance

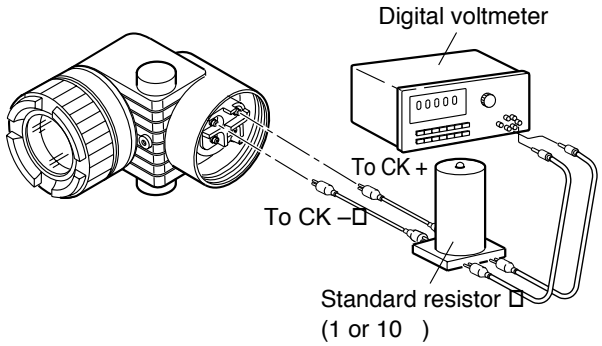
Check of arrester

- Measure output current from the transmitter check terminals and output current to flow into transmitter (see figure below).
  When current is measured with an ammeter connected to CK+ and CK– terminals, the internal resistance of the ammeter should be 12Ω or less.
- If the measured two output current are the same, the arrester is normal.
- In case the measured values have a difference of 0.1% (0.016mA) or more, the arrester is not functioning.
- In the above case, the arrester unit (terminal unit) should be replaced with a new one.

Limitation of insulation resistance and dielectric strength test

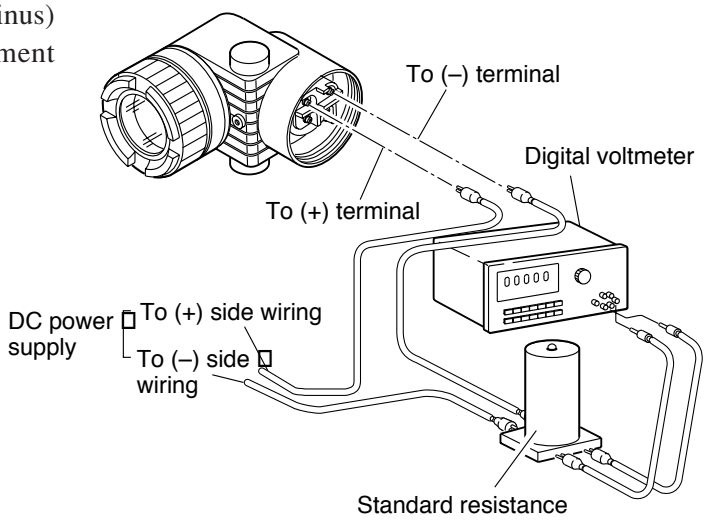
An insulation resistance and dielectric strength test should be avoided as a rule, since it may damage the arrester.

Output measurement at check terminals



Output measurement outside transmitter

* Disconnect the wire from the – (minus) terminal and connect the measurement device a shown below.



A2 CALIBRATION

Preparation for calibration

The transmitter should be calibrated in a calibration room. For calibration of each transmitter, the following devices are required.

- Pressure source and pressure measuring equipment (should have as high an accuracy as possible)
  * Measurable ranges are listed in the table below.
- Power supply: DC power supply (24 V DC) or Fuji Electric FC series power supply unit (type PXJ)
- Load resistor: Standard resistor 250 W (within ±0.0125 W)
- Measuring device: Digital voltmeter (capable of measuring transmitter output with an accuracy better than 0.1%)
  * Use meter having a 5-digit display.
- Hand Held Communicator (HHC) type FXW

Measurable range

Differential pressure range of FKC

Differential pressure range [kPa] {mbar} <inH$_2$O>
0.1 to 1 {1 to 10} <0.4 to 4>
0.1 to 6 {1 to 60} <0.4 to 24>
0.32 to 32 {3.2 to 320} <1.25 to 12.5>
1.3 to 130 {13 to 1300} <5.2 to 520>
5 to 500 {50 to 5000} <0.7 to 70psi>
30 to 3000 {300 to 30000} <4.3 to 430psi>

Pressure range of FKG

Pressure range [kPa] {bar} <psi>
1.3 to 130 {0.013 to 1.3} <0.2 to 20>
5 to 500 {0.05 to 5} <0.7 to 70>
30 to 3000 {0.3 to 30} <4.3 to 430>
100 to 10000 {1 to 100} <15 to 1500>
500 to 50000 {5 to 500} <70 to 7000>

Pressure range of FKA

Pressure range [kPa abs] {bar•abs} <inHg abs>
1.6 to 16 {0.016 to 0.16} <0.46 to 4.6>
1.6 to 130 {0.16 to 1.3} <0.46 to 38>
5 to 500 {0.05 to 5} <0.7 to 70psi abs>
30 to 3000 {0.3 to 30} <4.3 to 430psi abs>

Differential pressure range of FKD

Differential pressure range [kPa] {bar} <inH$_2$O>
0.32 to 32 {0.0032 to 0.32} <1.25 to 125> 1.3 to 130 {0.013 to 1.3} <5.2 to 520> 5 to 500 {0.05 to 5} <0.7 to 70psi>

Pressure range of FKB

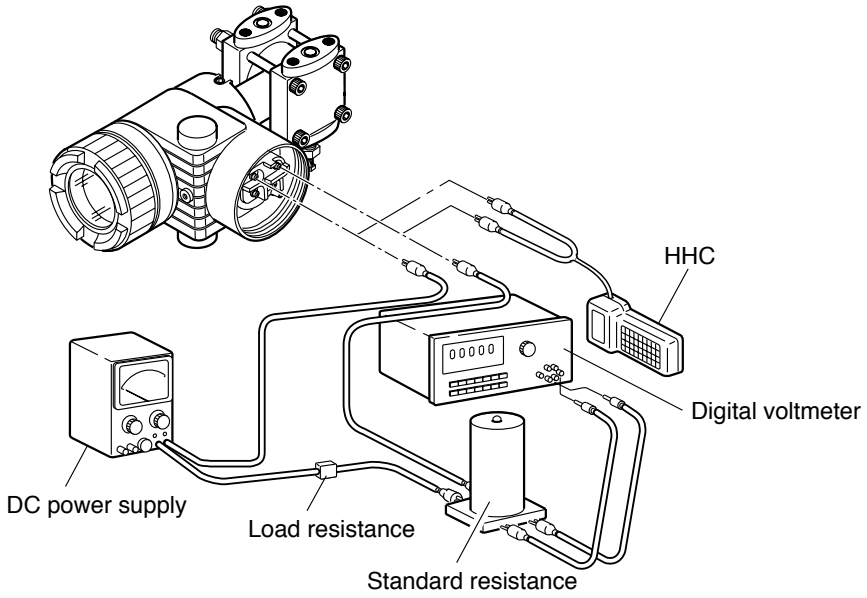
Pressure range [kPa] {bar} <psi>
1.3 to 130 {0.013 to 1.3} <0.2 to 20> 5 to 500 {0.05 to 5} <0.7 to 70> 30 to 3000 {0.3 to 30} <4.3 to 430> 100 to 10000 {1 to 100} <15 to 1500> 500 to 50000 {5 to 500} <70 to 7000>

Differential pressure range of FKE

Differential pressure range [kPa] {mbar} <inH$_2$O>
0.32 to 32 {3.2 to 320} <1.25 to 125> 1.3 to 130 {13 to 1300} <5.2 to 520> 5 to 500 {50 to 5000} <0.7 to 70psi>

Calibration procedure

(1) Make wiring according to the diagram below.
Connect DC power supply (power source), digital voltmeter (measuring device), standard resistance and HHC (Hand Held Communicator):
When current is measured with an ammeter connected to CK+ and CK – terminals, the internal resistance of the ammeter should be 12Ω or less.



Important For communication with the HHC, a load resistor of 250Ω is necessary.

(2) Calibration of output circuit (D/A)
Calibrate the output circuit with reference to "Calibration of output circuit" in "ADJUSTMENT" in Chapter 4.

(3) Zero/span adjustment
Refer to "Zero/span adjustment" in Chapter 4.

(4) Accuracy test
Apply input pressures in the order of 0%, 25%, 50%, 75%, 100%, 75%, 50%, 25% and 0%, and read output at each input pressure.
Make sure the difference between each output value and input pressure (%) is within the accuracy rating listed in the table below.
The voltage values in the table are dependent on use of "DC power supply + standard resistor 250Ω + digital voltmeter (measuring device).

Measurement category	Reference value	Accuracy (example)	
		Accuracy:0.1%	Accuracy:0.2%
Percent display (%)	0, 25, 50, 75, 100	±0.1	±0.2
Current measurement (mA)	4, 8, 12, 16, 20	±0.016	±0.032
Voltage measurement (V)	1, 2, 3, 4, 5	±0.004	±0.008

A3 PARAMETER SETTING PRIOR TO DELIVERY

The damping value (time constant), function of zero/span adjust screw, output current mode, indicator scale, cut point, mode below cut point and burnout, have been set prior to delivery as shown in the following. Each parameter is changed by using HHC.

No.	Item	Contents of parameter
1	Damping value□ (time constant)	No damping□ (= measuring period)
2	Zero adjust□ screw function	Zero point adjustment possible□ (Note 1)
3	Current output mode	To be set by designation□ when ordering (Note 2)
	Digital indicator scale□ (9th digit of code □ symbols)	To be set by designating type□ when ordering
4	Cut point□ (square-root extraction mode setting)	□ 7.07%
5	Mode below cut point□ (square-root setting)	Linear
6	Burnout	To be set by designation□ when ordering (Note 3)
7	Linearization function	Invalid

Note 1) For span adjustment, HHC should be used. HHC can also be used for zero adjustment.

Note 2) In both the differential pressure transmitter (Type: FKC) and remote seal type (Type: FKD), the output current mode is set in linear unless it is designated.

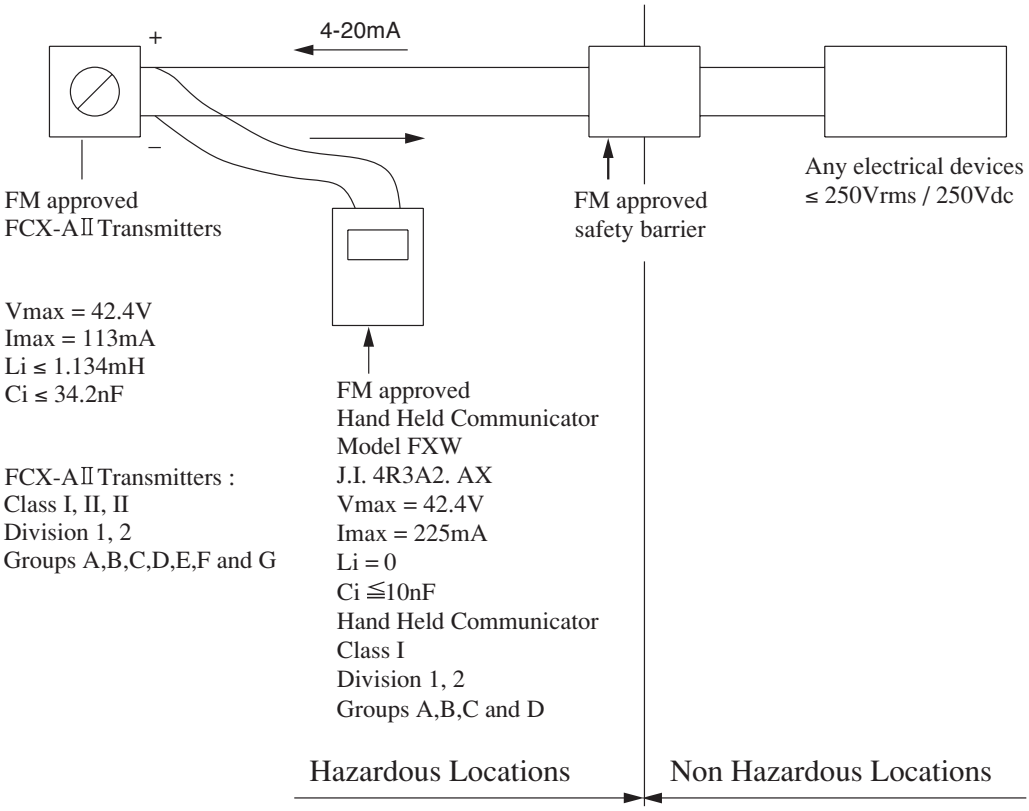
Note 3) Burnout direction is selectable from HHC, Hold, Over scale (20.8 to 21.6mA), under scale (3.2 to 3.8mA).

A4 HAZARDOUS LOCATION INSTALLATION INFORMATION

This appendix contains documents that present installation instruction for the FCX-AII Series Transmitter in a hazardous location. refer to these figures when installing or servicing a transmitter mounted in a hazardous location.

When installed, the apparatus must be provided with a voltage limited device which prevent the rated voltage of 45V being exceeded.

INSTALLATION INSTRUCTIONS



Notes :

1) The Intrinsic Safety Entity concept allows the interconnection of FM Approved Intrinsically safe devices with entity parameters not specifically examinated in combination as a system when : Uo orVoc or Vt ≤ Vmax, Io or Isc or It ≤ Imax, Ca or Co ≥ Ci+Ccable, La or Lo ≥ Li + Lcable, Po ≤ Pi.
2) The Hand Held Communicator, Model FXW may be connected at any point between the transmitter and the safety barrier, Provided the hand held communicator is a FM Approved model.
3) Dust-tight conduit seal must be used when installed in Class II and Class III environments.
4) Control equipment connected to the Associated Apparatus must not use or generate more than 250Vrms or Vdc.
5) Installation should be in accordance with ANSI/ISA RP12.6 “Installation of Intrinsically Safe systems for Hazardous (Classified) Locations” and the National Electrical Code® (ANSI/NFPA70) sections 504 and 505.
6) The configuration of associated Apparatus must be Factory Mutual Research Approved under Entity Concept.
7) Hand Held Communicator and Associated Apparatus manufacturer’s installation drawing must be followed when installing this equipment.
8) AEx ib is suitable only for Class I, Zone 1, Hazardous (Classified) Locations and is not suitable for Class I, Zone 0, or Class I, Division 1 Hazardous (Classified) Locations.
9) No revision to drawing without prior Factory Mutual Research Approval.
10) Simple Apparatus is defined as a device that neither generates nor stores more than 1.2V, 0.1A 20uJ or 25mW.

Contents on this page are based on TC520807

Figure 1. FCX-AII Series transmitter, Intrinsically Safe Installation or FM

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