Fermilab

Particle Physics Division
Mechanical Department Calibration
Standards/Procedures

Number: MD-CALPROC-010 **Date:** 6/26/2009

Manufacturer: Barton FCX

Model: FCX-C Series Transmitters

Reviewer(s): James E. Tweed

This Procedure is used for:

Calibration of Barton pressure transmitters.

A3 CALIBRATION

Preparation for calibration

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

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

Measurable range

Differential pressure range of FHK/FKK

Analog type	Smart type
Differential pressure range [kPa] {mmH_2O}	Differential pressure range [kPa] {mmH_2O}
0.6~6 {60~600}	0.375~6 {37.5~600}
3.2~32 {320~3200}	2~32 {200~3200}
13~130 {1300~13000}	8.125~130 {812.5~13000}
50~500 {5000~50000}	31.25~500 {3125~50000}
200~2000 {20000~200000}	125~2000 {12500~200000}

Differential pressure range of FHN

Analog type
Differential pressure range [kPa] {mmH_2O}
0.6~6 {60~600}
3.2~32 {320~3200}
13~130 {1300~13000}
50~500 {5000~50000}
200~2000 {20000~200000}

Pressure range of FHP/FKP

Analog type	Smart type
Pressure range [kPa] {bar}	Pressure range [kPa] {bar}
13~130 {0.13~1.3}	8.125~130 {0.08125~1.3}
50~500 {0.5~5}	31.25~500 {0.3125~5}
300~3000 {3~30}	187.5~3000 {1.875~30}
1000~10000 {10~100}	625~10000 {6.25~100}

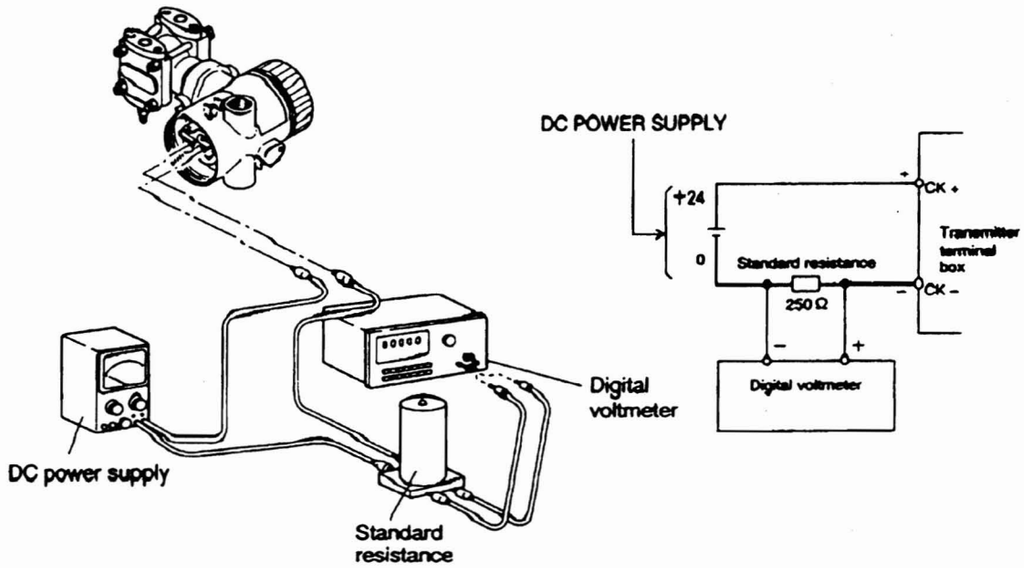
Pressure range of FHH/FKH

Analog type	Smart type
Pressure range [kPa abs] {bar abs}	Pressure range [kPa abs] {bar abs}
13~130 {0.13~1.3}	8.125~130 {0.08125~1.3}
50~500 {0.5~5}	31.25~500 {0.3125~5}
300~3000 {3~30}	187.5~3000 {1.875~30}

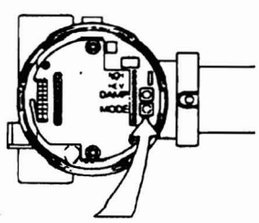
Calibration procedure (analog type)

(1) Make wiring according to the diagram below.

With DC power supply (power source) + digital voltmeter (measuring device):



(2) Calibration of converter (D/A) output



Setting mode 3 → Make sure output current is 4 mA.

Setting mode 4 → Make sure output current is 12 mA.

Setting mode 5 → Make sure output current is 20 mA.

When the outputs of setting modes 3 and 5 are not 4 and 20 mA, respectively, adjust them to 4 and 20 mA by the zero adjustment screw in each mode.

(3) Zero/span adjustment

a. Leave transmitter LP or HP sides open to atmosphere.	
b. Turn on power supply and wait for 10 minutes or longer. Then make sure the output current is 4 mA.	e. If the output current does not equal 4 mA:
c. In case of a transmitter under suppression or elevation, output at atmospheric pressure level is not 4 mA. Check for 4 mA with measurement start pressure applied.	f. Refer to "Zero adjustment" in 6.1 Range change.
d. Next, apply 100% pressure to the transmitter. Make sure the output current is 20 mA.	g. If the output current does not equal 20 mA:
	h. Refer to "Span adjustment" in 6.1 Range change.

(4) Conversion 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.

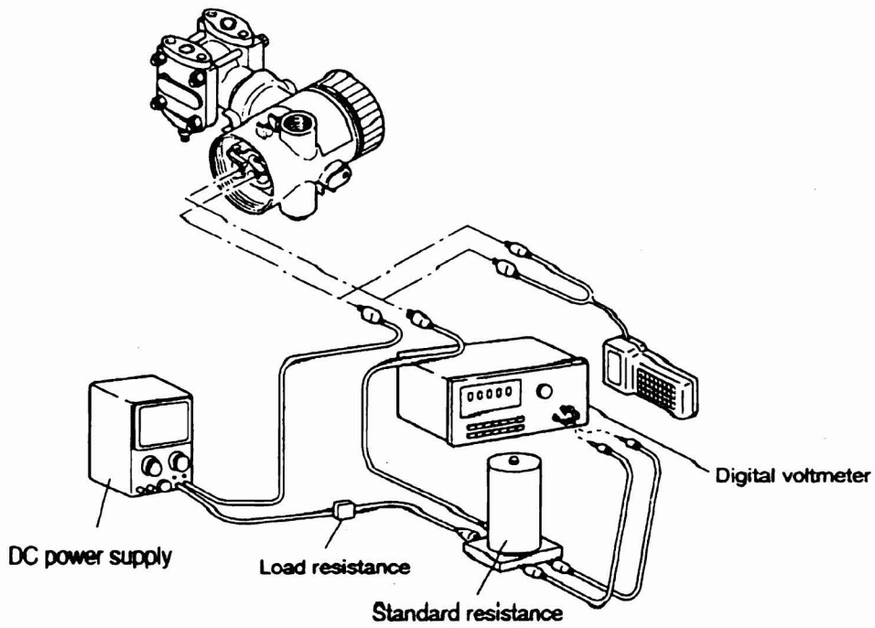
Make sure the difference between each output value and input pressure (%) is within the accuracy rating listed in the table below.

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

Calibration procedure (smart type)

(1) Make wiring according to the diagram below.
With DC power supply (power source), digital voltmeter (measuring device) and HHC (Hand Held Communicator):



Caution
Please Remember
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" (page 48) in "ADJUSTMENT OF SMART TYPE" in Section 7.

(3) Zero/span adjustment

Refer to "Zero/span adjustment" (page 47) in Section 7.

(4) Conversion 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 250 + digital voltmeter (measuring device).

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