Mikoflow®
Universal Multivariable Flow Transmitter
Operation Manual
MMF-HART/RS485

Thanks for your selection for the flow transmitters. The manual will guide you to operate it.

Notes while installation and operation steps (Key points)

(1) Installation any one primary element (DP devices) and 3-way manifolds;

(2) Installation MMF on the top of 3 way manifolds, be sure no any divulge;

(3) Loosing the screw on house, selection suitable direction. Turing display board, selection suitable display position (+/-90°);

(4) Terminal connection:
- 4~20mA+HART: 24Vdc+,24Vdc-(/4~20mA+), Grand, 3 lines Pt100 (or without);
- 4~20mA+Modbus/RS485: addition 4 terminal, 4~20mA+/-, A,B(RS485);

(5) Check 4~20mA loop currents,
- Set a small 'Flow Range", let instrument into "Error 2" or other errors;
- Entering user menu to "Alarm Out Select [mA]", selection "Fixed Current out", and "Alarm_Value[mA]", setting within 4.0mA to 20.0mA, checking control room's 4~20mA input.
- If the error between two sides over +/-0.5mA, need to check the mA loop.
- If need let instrument to modify mA output, need entering special PIN (86123), to fine the 4mA code and 20mA code, which original codes can be seen at "Check Sheet of Factory". Press middle key, to large current; press the right key, to reduce. Need alternative change both codes, let 4/8/16/20mA up to all OK!
- If confusion, need to fill original code, to refine tuning.

(6) Set DP to zero after installation: Into the 2nd display DP interface, press 2nd&3rd keys together with 3", enter set DP to zero procedure, see P.2 - 2.2.2

(7) Entering user menu, to set others parameters as"Calculation Sheet", then "Save" all setting.

1. **Connection terminal** (either-or)
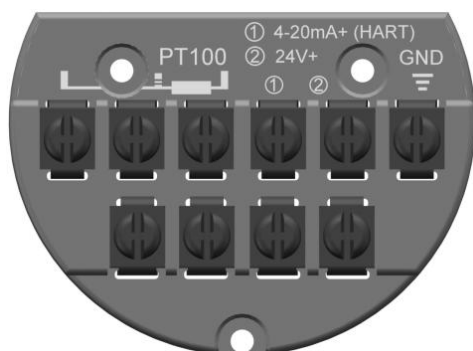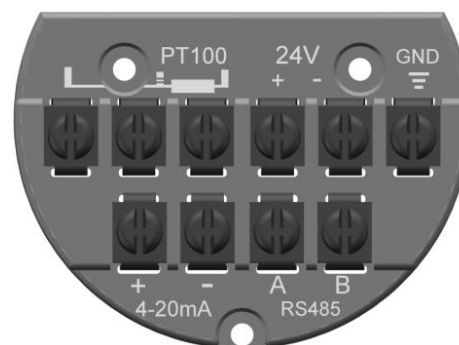
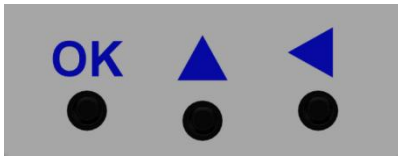4~20mA +HART   4 lines 4~20mA+Modbus (RS485)

- 2 lines 4~20mA +HART(only top line), which can be Ex ia & Ex id
  - (11~30)VDC+, 4~20mA+, GND
  - PT100 thermal resister 3 lines

- 4 lines 4~20mA+Modbus(RS485), which can be only Ex id
  - (11~30)VDC for power (top line)
  - PT100 thermal resister 3 lines(top line)
  - 4~20mA output (second line)
  - Modbus/RS485 A port and B port (second line)

2. Human machine interface

2.1 3 keys

There are 3 keys to operation

  a. confirm/selection key（OK）

  b. (0~9)circlel/selection up or down （▲）;

  c. Left /right shift mod bit（◄）

2.2 Display interfaces

More information can be seen on the 3 displays. Press"OK"will show next display. Or display next after waits 8 seconds . It will be return the 1ˢᵗ display if no operation up to 5 min.

2.2.1 1ˢᵗ display: current flow, flow unit, medium pressure(kpaA), temperature(℃) and 4~20mA output percent(%). P or T with underline is set by menu, not real measurement.

Current Flow output 4~20mA percent %

- Current Flow and unit（Gas: Nm3/h, m3/h or kg/h；Liquid: m3/h or kg/h；Steam: kg/h), if setting flow output.
- If there are errors, all ERR codes will be display alternately.
- DP trans., show DP; P trans.,show P; Heat E trans.,show E

Medium Pressure, Temperature or menu setting (underline)

2.2.2 2ⁿᵈ display（current different pressure DP and unit)

Ambient temperature

Current DP and unit

The underline indicates is inside fixed. When the medium is saturated steam and the pressure compen, theoretical temper. is showed; if satur. & temper. compen, the theoretic pressure will be showed with underline. Press 2ⁿᵈ&3rd keys together over 3", enter set DP to ZERO, Press 3ʳᵈ key and press OK, DP will be zero at the fixed position. Confirm closed value

2.2.3 3ʳᵈ display (integrated flow, unit, density,......)

Accumulated Flow and unit (with 18 bits, two lines)

When the medium is saturated steam & temper compensation, the theoretical pressure is displayed

While liquid or steams, display operation density

３．**Mobile APP or computer calculation result- Meter Coefficient and Keps**

Website: **http://47.106.98.116/FlowCoef2** or www.mikoflow.cn

3.1 Input and calculation "meter coefficient"

Open APP on mobile or computer, input;

- Pipe information;
- Sensor and Primary element information
    - for T series, only input types (T10/T12/T26/T32/T40/T50);
    - for any others (UD), input discharge coeff. K or α or C, ε (max expansion coeff.)
    - β(d/D), which can be found in calculation sheet of primary element.
- Technical data: selection medium, input temperature /pressure. If user gives operation density, "other gas"or "other liquid" has to be selected, input directly working density.
- User's scale /max/normal/min flow. If the range is larger than the given max flow, need to change Dp senor measurement range. Then, press "Calculation" and press "Generate calculation paper", which can be printed out, if no any Err or alarms.
- Most data are concentrated into "Meter Coefficient". KEPS is key factor for ε cal on-time.
- "Scale Range" must be total same with MMF and DCS. Once mod., the 3 places all mod.

Sensor Selection

Two or ONE Sensor:	DP & P both measurement
Specification:	BD (Bellows Type, 6.0Kpa@2Mpa)
Material:	316L
Bellows Type:	2 lines: 4~20mA+HART
Additional PT100:	Not including

Pipe and Primary element

○ Round ○ Rectangular   WT: 5 mm
ID of Pipe: 200 mm
Pipe Material: Carbon (20#)
Expansion ratio ☐ 0.00001116 mm/mm°C
Primary element material: SS(304)
Expansion ratio ☐ 0.00001660 mm/mm°C
Primary element: Others: UD - Orifice-from 1/2ID
Primary element Safety: -
● K Coeff(K/α): 0.573747   ε (2/3): 0.98879
○ Disch. Coeff. (C): 0.535279
d/D ratio(β): 0.6
Diameter(d) at P&T:120.027mm 20°C ID(d):119.987mm

Technique Data

Medium:	air	
Pressure P&T:	200	KPa abs
Temp. P&T:	40	°C

S.Density : 1.2929 Kg/Nm³
(0°C、101.325KPa)
W.Density : 2.22601 Kg/m³

Viscosity : 0.01911 mPa.s
Isentropic index: 1.402

Correction Factor

Gain Coeff.: 1
Parallel DP: 0.0 kPa [Eduction]
Result of Eduation : ∞ [Acception]

Flow Data

Flow Range: 53.336~2921.318 Nm3/h

Scale Flow:	2000	Nm3/h
Max. Flow:	1000	Nm3/h
Nor. Flow:	100	Nm3/h
Min. Flow:	50	Nm3/h

	DP(kPa)	ε	Velocity_D(m/s)
	P. Loss(Pa)	ReD	Velocity_d(m/s)
Q_{design}	2.812	0.995982	10.266
	1490.7	239219	28.517
Q_{max}	0.703	0.998997	5.133
	372.7	119610	14.258
Q_{norm}	0.007	0.999990	0.513
	3.7	11961	1.426
Q_{min}	0.002	0.999997	0.257
	0.9	5980	0.713

[Calculate !]   [Generate Calculation Sheet]

MMF BD MA UD
Meter Coeff.:13.9092307   KEPS：0.28574105

Flow Gradient Table

Graduation	4~20mA	Flow (Nm3/h)	DP(kPa)	P. Loss(Pa)	ε	Velocity(m/s)	Re
100%	20.00	2000.000	2.8125	1490.677	0.995982	28.517	239219.5
98%	19.68	1960.000	2.7011	1431.646	0.996141	27.947	234435.1
95%	19.20	1900.000	2.5382	1345.336	0.996374	27.091	227258.5
90%	18.40	1800.000	2.2781	1207.448	0.996747	25.665	215297.5
85%	17.60	1700.000	2.0320	1077.014	0.997099	24.239	203336.6
80%	16.80	1600.000	1.8000	954.033	0.997430	22.814	191375.6
70%	15.20	1400.000	1.3781	730.432	0.998033	19.962	167453.6
60%	13.60	1200.000	1.0125	536.644	0.998555	17.110	143531.7

3.2 Calculation Results

systec® Universal Mass Flow Calculation Results

systec Controls Mess- und Regeltechnik GmbH
Lindberghstraße 4,82178 Puchheim,Germany
www.systec-controls.de
Phone : ++49-(0)89-80906-0
eMail: info@systec-controls.de

NO:MFB2023042100923

Ver: 1.00

Order Company		Contacter/Tel	/*****
Contract Number		Data resources	
Project Name		End User	
Tag		Applications	
S/N		Number	1
Noted:			

Type of Transmitters and its Introduce

Type	MMF BD UD

MMF measures process DP, P and T for gas, liquid or steam. Process density is compensated by P, T and normal density. Flow/DP/Pressure/Heat Energy can be selected as 4~20mA output. 2-lines 12~30Vdc is power+output+HART. 4-lines 4~20mA+RS485(option).

Digital shower can display Flow, DP, P, T, Density, Integrated flow (18 bits), Units, Error info, and so on.

There are 10 points non-linear calibration for Q(i)-A(i), the flow precision will be higher from 1%FS to 0.5%R.

Sensor: see label.Element:UD,User Define, such as nozzle, orifice, or bar.

Process Data

Pipe type	Round	Pipe material	CS (#20)
Inside Dia.	100.0 mm	Well thickness	5.0 mm
Equi. ID	100.00 mm, under temper	Fluid name	O2
Pressure	100.0 KPa, A	Normal Density	1.42895 Kg/Nm³, (0°C,101.325KPa)
Temperature	20.0 °C	Operation Density	1.31405 Kg/m³

Calculation Results:(under flow scale)

Min~Max Flow Range	26~1410 Nm3/h	ImprovelT-factor	1.00000 -
Viscosity	0.02036 Cp	Isentropic index	1.39770 -
K-Factor or α	0.57375 -	Probe safety	-

	unit	Q	Q_max	Q_norm	Q_min
flow	Nm3/h	1000.0	1000.0	1000.0	1000.0
DP	kPa	3.0196	3.0196	3.0196	3.0196
DP loss	Pa	1600.48	1600.48	1600.48	1600.48
ε	—	0.9666	0.9666	0.9666	0.9666
ReD	—	248235	248235	248235	248235
v	m/s	38.46	38.46	38.46	38.46

Transmitter KEY Parameters Setting

Fluid Name	Gas	
Meter Coefficient	13.9751700	Keps 1.10445006
Full range of Flow	1000	unit Nm3/h (not need input)
Filter constant	1~999 second (based on the fluid stability.)	
Note	Please select correction temperature resource--inside or Pt100 from terminal	

Last part is information which will be inputted into MMF
- Fluid name: only 5 kinds, Gas/ water/Sat_steam/Suph_steam/ Liquid, for selection;
- "Meter Coefficient": Each bit never mistake!!!
- "Keps" is modification factor of ε, for ε calculation on MMF on-time;
- Scale flow range must be same with design sheet and DCS's setting;
- Flow unit does not need input, only tell customer.

3.3 Entering user menu: keep Press "OK" hold 5" on any display, press "OK", it will enter " user menu".

3 . 4 Return back display:

    3.4.1 normal mode: last menu "Save", selection "yes", then save all setting and quit .

    3.4.2 Long press "OK" 5 second at any menu, it will not save to quit .

    3.4.3 It will be returned if no any operation after 5 min. Note, no any save at the situation.

Note: after power off, 3.5.2 and 3.5.3 case, the changed data cannot be saved.

4. User menu

---------Flow---------
PIN: 00000
PIN: 00000

4.1 PIN

    Show "PSW"：000000，press directly "OK", it will enter user menu.

【**NOTICE: For DP/μDP tran., below menu with * cannot be seen. Only one menu more for 4~20mA output under linear output or square**】

-----Flow------
Gas/ water/ Sat_Steam /Suph_steam/ liquid
Select

4.2* Process medium selection (march with Calculation sheet)

    Cycle switch shows Gas/Water/Saturated steam/Superheated steam /Liquid，based on "Calculation sheet".

    Liquid density (m3/h) must be asked to enter if selecting "Liquid", others density will be automatic calculated in MMF.

Please note: Once changing medium, the compute mode and formula will be changed, all accumulated flow will be reset to zero. Some alarms will be showed on screen!!

--(Flow/DP/P/HE) select--
Flow/DP/P/Heat E
mA out define
-----Flow/DP/P/HE----
00010000. 00
Flow Range Nm3/h

4.3. Full range setting (Flow/ DP /P /Heat Energy range, depend setting)

    MMF 4~20mA output declination, based on special setting (PIN:86123), there are 4 kinds of 4~20mA output define: Flow/ DP /P /Heat Energy".

    After define of 4~20mA output, the menu can be different showed:
"Flow range": as "Calculation sheet", flow unit does not need to input.

    "DP/P range": must be smaller than max DP(Pa)/P(kPa), which setting at selection model, such as 6kPa@2MPa. Max DP is 6kPa, Max P is 2000kPa.

    "Heat Range" is free setting, unit is GJ(10^9 Joule). Then need to enter "(heat) Water Range" as "Calculation sheet" and input cool temperature(10℃ or more).

    For "DP/P/Heat E", 1st display will be "DP: xxxxPa" /P:xxxxPa /E xxxxGJ/h, show the same output.

-------Flow------
012.1650005
Meter Coef

4.4* Meter Coefficient （Must march with Calculation sheet）

    Please note: never take any mistake while entering each bits, because each bit has more information. It must be march with Calculation sheet.

-------Flow-------
0.2390283
Keps

4.5* Keps

    It is one modifying factor for on time calculation "ε, coefficient of expansion". Check the "Calculation sheet". Default value is 0, its range is 0~5.0000.
While medium is water or liquid, it always is 1, no the menu. It need to input for any gas /steam.

———Flow———
1.000000
Linear Gain

4.6* Linear Gain   (current flow fine tuning, UP or Down linear for all range)
   It will let current flow linear fine tuning at full range.
LG>1: let flow linear larger;   LG<1, let flow linear smaller.
  Default value: 1.00000, modify range is 1.2~0.8.

———Flow———
003
Damp [s]

4.7 Damping [s]
   Setting range :1~999 second, default value: 3 sec.
   Please let it larger if the DP is unstable.

——Flow———
Alarm_H/Alarm_L /Fixed/Current Value
Alarm Out Select

4.8* Alarm Out Selection
While instrument meets major errors, 4~20mA will be stop, which output depend on the menu selection. There are 4 kinds output for selection.
Alarm_H: output 21.6mA; Alarm_L: 3.8mA; "Current Value" output or Fixed one fixed value within 3.8~21.6mA for next menu.

———Flow———
003
Min. DP(0-999)Pa

4.9 Min. DP (0~999)Pa

  Minimal DP can be selected by user based on system.

4.10 DP ZERO (The menu had been removed to 2nd display)

———Flow———
30.4   Pa
DP ZERO

  While installation the transmitter before running, need to set DP into zero. The max zero is about +/-390Pa if DP two poles are under vertical, which is not good installation position, special for small flow range(0~1kPa range). Under the DP display, press 2nd &3rd key over 3", into clear DP procedure: press move key

move cursor to "YES", press "OK", "CLR ZERO", after one second, DP will be clear, show 0.0 Pa. Setting DP zero will be finished. Please NO any flow on the pipe while these operation.

   After then, the zero bias value has been saved instantly, not need save up to last menu.

———Flow———
FIXED   YES NO
▲
Inside Set Temp

4.11*Temperature Resource selection (from Pt100 or inside menu digital setting)
   Medium temperature come from: Pt100 from terminal 1,2,3(outside),or inside menu digital setting.
If selecting YES(inside setting), next menu will need input one fixed temperature (20 or 100℃). If medium is steam, it will show "Set limit" if it is smaller than 100℃. After then, the value will be showed with underline at 1st and 2nd display.
  If selecting "No", temperature resource will be from terminal 1,2,3. It will be show "Error 6" if terminal is empty, or cables blocked. 4~20mA output will be defined as 4.8.

   The inside or outside temperature will be showed in lower right corner of 1st /2nd display. Inside or outside temperature can be used for off-line or on-line estimation by temperature, pressure and DP.

   When the medium is "Saturated Steam", the menu will be two options: "Temperature or Pressure Compensation". If "Pressure Compensation" is selected, temperature and density are calculated based on pressure. When temperature compensation is selected, the pressure and density

will be calculated based on temperature, and showed on 2nd and 3rd display. At this time, temperature or pressure will be with under line.(2500kpaA or 250°C).

It is MMF, there are more selection. Selection pressure compensation without PT100.

If order MMF-Exx, saturated steam application can only be temperature compensation, by inside or outside temperature resource, not need pressure measurement.

```
———Flow———
FIXED   YES NO
            ▲
Inside  Set  Press
```

4.12* Pressure resource selection

Outside source(NO): measure high pressure side (+) of primary element, its type is absolute pressure (such as 200kPaA)

Inside source(YES): menu setting one fixed pressure, for temp-pressure density compensation, or digital estimation. Setting pressure unit is kPaA. After then, 1st and 2nd display's pressure will be underline, its mean is inside setting, not outside measured.

After setting, its density will be calculated, if over water/steam density range, instrument will be show"ERRxx";

If order MMF-Exx, no real-time measure medium pressure, only inside setting, no the menu, directly enter setting inside pressure. So it is call fixed pressure temperature density compensation.

4.13* Dp-Flow estimation (need order)

```
———Flow———
FIXED    YES NO
            ▲
Dp-Flow  Est
```

Only order the on-line/ off-line estimation and 10 points calibration function, the follow menus can be seen. Other wise it will be jump to 4.17

If selection "NO", the program will jump to 4.17; selection "YES", it will enter estimation proceduret.

```
——Flow—— 25.8%
Qm:   1278.2
Dp: 2991829.2   1275
923  kPa  |   135℃
```

4.14 Off-line and on-line estimation (need order)

Entering the menu, the current pressure(kPa) , current temperature, can be seen below line or not, which setting before menu. The middle area are estimation area, (DP:) can set Dp value with 7 digital, 1 decimal. Current flow will be calculated by Dp, P, T, Meter Coef., ε(eps), S heat compensation, etc. It (Qm') will be showed next Dp. If you select 10 points non-linear calibration, Qm is new current flow after 10 points(segments) modified, with 1 decimal, a litter different with before calibration. If no 10 segment calibration, two flow are the same, only Qm has one decimal more.

4~20mA's percent (25.8%) will be display at top right corner, which is march with real output. It is only digital estimation, no real 4~20mA output. It does not have any relationship with current mA output. It is only for estimation mA output

If pressure and temperature both are real measuring from DP chip or back terminal, it will be real time estimation.

If the pressure and temperature are setting by menu, it is total off-time digital estimation, but its parameters are total as user offered.

Customer can calculate Qm' and Qm based on their "calculation paper" which is total theoretic values. Then to input Dp(i), copy down Qm(i)' and A(i)(=Qreal(i)/Qm(i)').

Qreal(i): maybe is theoretic value, or real running Qreal(i) under real Dp(i) /P(i)/T(i)

Setting one excel table (red color er lines)

i	1	2	3	4	5	6	7	8	9	10
QM'	100	200	250	320	500	1000	2000	93000	–	–
Qreal	108	203	260	310	480	998	2015	3010	4008	6003
A(gain)	1.0800	1.0150	1.0400	0.9688	0.9600	0.9980	1.0075	–	–	–

Taking (100,1.08000),(200,1.0150),.....input next menu.

Had better drawing a curve grape, find out each knee point. Kick to linear parts. Selection the key points as segments.

```
---------Flow---------

000000100    Q(1)

1.080000     A(1)

Fine Tuning A1
```

4.15   Fine tuning for 10 segments non-linear (need order)

Each menu can input one segment (knee point). One by one modification, if some bit input mistake, it can re-back from 1st bit again. Q(i) has 9-bit integer, A(i) has 6 bit decimal. Any flow will be linear interpolation based on top-down Qm(i) and Ai. There are some rules, as follow:

- Q(0)=0, A0=1;
- Q(i+1)>Q(i); otherwise, program will be alarm, asking re-input.
- $0.8 \leqq A(i) \leqq 1.2$，over range will be alarm.
- If want to close 10 segment calibration, let the Q(1)>120%Qfs(120% scale range), it will just to finish(menu 4.13）.
- If only wish set 7 segments, as above example, let Qm'(8)>120%Qfs, it will jump to 4.13.
- If want to jump out the segment, let its A(i)=1, the segment 's gain will be 1.0 without any fine modification.

```
---------Flow---------

Back     Yes  NO

           ▲

Check again
```

4.16 Check again (need order)

After input each segment, or jump some segments, to the menu. Asking if need to go back 1st segment to check again. If need back to check, press "YES", wish go next menu, selection "NO".

```
-------Flow-------

Normal /rolloing

Display_Style
```

4.17   1st, 2nd and 3rd display working mode selection

"Rolling": each display will automatic show 8 second , after next.

"Normal", each display will be controlled by "OK" key. Press once, next

```
---------Flow---------

English/ German
    /Chinese

Language
```

4.18 Language Selection

It has English /German /Chinese for selection. The selection can be saved at last menu. No save, no successful to change language.

```
---------Flow---------

SAVE     YES  NO

           ▲

END SET
```

4.19 Setting Save and Exit or Not

Select: "YES", save all new setting and quit

Select: "NO", not save and not exit, return to first menu again.

If selection "NO", and medium had been changed, middle quit, no save. Program will work as new medium, but cannot clear integrated flow. Only power off, the all new setting will be forgot. New language can not work until save at the menu.

For advanced engineer password PIN 86123, only enter once. If selection NO save, enter normal "user menu", not before menu, in order to safety.

So, wish to save and then quit, it will store all new setting parameters .

─────Flow─────
TF CLR   YES NO
▲
CLR MF

4.17　Accumulated Flow reset to zero

Under 3rd display, press "◄"and "▲" together keep 5 second, entering sets zero procedure for accumulated flow. The first selection "YES", then need enter password (97531)；AFTER check, press "▲"(middle key) again, Accumulated Flow will be cleared.

5. Errors Code definition

When happening one of "Error 1" or "Error 2"or "Error3" or "Error4" or "Error5" or"Error6" or"Error10"(see below table), the instrument will stop to compute current flow, asking user to find out questions. Meanwhile, 4~20mA output as setting "Current mA/3.8mA/21.6mA/free setting within 3.8~21.6mA. See 4.8.

If there are more than one error, they will be showed one after one on the 1st display.

Error Codes table(show at 1st display)

Error Code	Fault content	Cases and solutions
Error 1	IIC bus error, DP/P reading error	Check connection cable, if not obvious bloke, need send back factory
Error2	Current Flow is larger than 110% Flow Range	Flow output over flow range 110%.　　Normal: meter Coef /Flow Range enter mistake, Pt100 entering mistakes, linear gain is too large, flow range is too small.....
Error3	Density of saturated steam error	The measured pressure or temperature does not meet the saturated steam conditions, please check whether the process pressure or temperature are correct
Error4	Density of superheated steam error	The measured pressure or temperature does not meet the superheated steam condition, please check whether the process pressure or temperature are correct
Error5	Density of water error	The measured pressure or temperature does not meet the water conditions, please check whether the process pressure or temperature are correct
Error6	Pt100 thermal resistance error	Terminal is empty, check that the Pt100 thermal resistance wiring is correct or disconnected
Error7	ambient temperature >70℃	Take thermal isolation or strengthen heat dissipation to ensure that the transmitter ambient temperature is less than 50℃, it is recommended to change to split installation
Error8	medium temperature>600℃	Check the external Pt100 resistance wiring or resistance fault, or set T is over range
Error9	DP measurement lower alarm	DP zero point: not calibration; High/low pressure installation disordered, **high** pressure side of primary element is blocking. Need to clear guide-pressure pipe,....
Error10	DP measurement higher alarm	DP zero point: not calibration; High/low pressure installation disordered, **low** pressure side of primary element is blocking. Need to clear guide-pressure pipe, DP range is too small.
Error11	Pressure (A）lower alarm	Transmitter is under big vacuum condition or under negative condition.
Error12	Pressure (A）higher alarm	max pressure ordered is smaller then now meet. Need to selec more high level.

6. Special PIN for engineers (86123)

There are 5 menus more then user menu, which need careful set or selection. Most are the same with user menu. After "pressure inside/outside" menu, these menus will be found. The PIN only be effective once. If no "SAVE" and no quit, enter the first menu of normal user menu. If you want enter again, need input PIN again, it is for safety.

――――Flow――――
Flow /DP/ P/ Heat E
mA out define

6.1 mA out define

Customer can free select 4~20mA out as Flow or DP or P or Heat Energy. Please reference 2.2.1 (1st display) and menu 4.3.

- If select "Flow", as normal, no more change. If select others, flow calculation will still be operated, only 4~20mA is other variables.

- If select "DP", 1st display will show "DP" , current dp value and unit. In the 4.3, need input DP scale range, which must smaller then max DP of the instrument. Such as 0~6kPa, any less than 6kPa can be inputted, otherwise will be alarmed. The top right corner of 1st will be DP's percent (0~100%). 4~20mA output has "linear" or "square" selection in menu.

- If select "P", 1st display will show "P" , current pressure value and unit kPa(A), total same with below pressure. In the 4.3, need input Pressure scale range, which must smaller then max Pressure of the instrument. Such as 0~2MPa, any less than 2MPa can be inputted, otherwise will be alarmed. The top right corner of 1st will be Pressure's percent (0~100%).

- If select " Heat E", 1st display will show "E" , current heat energy and unit GJ/h. The integrated flow will be show at 3rd display. In the 4.3, medium must be "Water", cannot be changed. After then, need to set scale Heat Energy, cool temperature and scale flow of water as "calculation paper". The 20mA must match with DCS's scale Heat Energy. The top right corner of 1st will be Heat E 's percent (0~100%).

――――Flow――――
MOD   YES NO
4.0/20mA Out Test

――――Flow――――
01245
4.0/20mA MOD

6.2 4.0mA out test

Please reference beginning of installation. If need to modification 4~20mA, it can support to larger or smaller 4mA.

Selection "YES", the D/A output code will be showed. Press middle key, the code will be larger,the 4mA value will be higher one unit. Press right key, the code will be down/reduce, 4mAvalue will be smaller one unit. Press "OK", new code will be stored. Original codes are written on "Check sheet of factory".

6.3 20mA out test

The steps and function are total the same with 6.2. BE careful:

- no only change one side (4mA or 20mA), they are affection each other.
- All operation must be in series with 4 1/2 current meter.

End word

Please contact with us, if meet trouble while operating the instrument.

Or visit "www.mikoflow.cn/index_en.html?chlang=&langid=2" which English version. You can get more information and many material can be download. During the instrument will add more functions, so menu will still have some changes, please understand.

Appendix1: Mobile phone wireless HART monitor

Connection: Install the relevant APP on Android phone or IPAD to communicate with the HART modem within 40 meters, while the 2-lines of HART modem are connected with the 2-lins of MMF-HART, which can be completed. It is very easy and fast.

Functions:

1. About 10 process variables on MMF can be monitored remotely in real time, e. g mass flow, differential pressure, pressure, temperature, cumulative flow, medium name, medium density, inside temperature of MMF, output current, flow percentage%, MMF model, serial number, software and hard version, DP/ pressure measurement range, etc.;

2. More than 10 variables on the MMF can be modified remotely in real time on the mobile phone, such as : Medium (5 kinds, air/water/steams), full range of main variable, two most important parameters (meter-coefficient and Keps), linear gain (full range correction coefficient), filter constant, alarm mode, internal and external setting pressure / temperature, DP (/ flow) small resection;

Superiority:

1. It can remotely monitor MMF, without operating locally (climbing high and low);2.
Through the query mode, (1~15) units MMF can be monitored in turn;

3. Power supply inside / outside, can be single / multi-machine monitoring;

4. not expensive, easy to operate, greatly reduces the labor intensity for instrument workers

5. Its interface can be automatic changed into your mobile phone's language

Appendix2: Automatic online purging controller MMF-DPC

Summary:

For online reverse purging of DP-type primary element or pipe, suitable for each any primary element, its function is to cut off the normal DP channel, the reverse timing interval connection all clean air source, to achieve the online purge effect. The system is suitable for flow measurement with dirty media measure, such as steel plant all kinds of gas (blast furnace gas, coal oven gas or converter gas), power plants and all kinds of the primary wind, the secondary wind.

Characteristic:

1. The whole purge design is completed by the user himself, and the purge interval is designed on the touch screen (24 / 20 / 12 / 8 / 4 / 2 / 1 hour and 1 minute for test) , specific for each purge process, users can complete the design by filling in the schedule;

2. During the purge period, the output current of the MMF remains unchanged (hold) until the purge ends;

3. It can be scanned locally or remotely at any time through the button or touch screen;

4. The purge process or purge interval waiting time, and the number of times can be completed in touch real-time monitoring on the screen

5. Its interface can be changed into English or German.

Appendix 3: Small DCS with one or more MMF

It supports one or more parallel MMF-485, connected to one TFT touch screen, through the system built-in engineering software, complete:

1. Remote display of various process variables: mass flow, DP, Pressure, Temperature, working density, cumulative flow, output current, flow percentage%, velocity, medium name, current time

【**Usually a DP transmitter can only get DP value, here becomes an underlying database**】

2．Remote modification of nearly 10 important instrument parameters, such as media (5 kinds), two key parements, full flow range, damping, gain, small DP excision, int. & ext. source of temperature / pressure selection and settings; After these setting, user can simulation real flow by online / offline, DP, P and T can setting based on project data. All parameters setting protected by password;

【Remote operation, instrument workers do not need to climb up and down, convenient and fast】

3. Display real-time DP and mass flow as value and curve mode, intuitive and clear;
4. User can view the [flow, pressure, temperature and DP] values in each historical period Line;

【**with small DCS function to save and trace various pipeline information several hours ago**】

5. MMF-HART obtains RS485 signals by the converter, but the number of variables displayed is only 4~5. It can gets 4 - 4 ~ 20 mA (flow, DP, pressure and temperature / accumulate flow);
6. It can make customized design and multi-language interface according to the needs of users;
7. Connection and display (1-64) MMFs data for different sites through "Comm. Settings".

Appendix 8: Close to actual flow demonstration system to simulate different media

1. Including DN40 metal pipe-T12 bar primary element, 3 manifolds, built-in PT 100 and stable support; 【**As actual pipe, actual throttling device**】

2. MMF-500Pa-485, measurement: 0~500Pa DP, 0~2MPa pressure, 0~100℃ T;

3. One 7 " TFT touch screen, engineering program with Chinese or English interface, industrial machine Box, built-in power supply and industrial plug connector; refer to appendix 7 for specific display;

4. DN40 adjustable fan, which can produce (0.1~170) Pa, and (0.5~38) Nm3/h;

5. Adjust the fan to produce changeable DP, and the real-time display: Mass flow, DP, Pressure, Temperature, density, cumulative flow rate, output current, flow percentage%, velocity, medium name, Current time, etc.;

[become a small DCS system and become a underlying database]

6. With the help of the fan, generating DP, built-in fixed pressures or from local atmosphere; fixed T or from Pt100, it can be estimation for any gases, water, liquid, superheated steam or saturated steam. The question is only the DP with one small range about (0~170Pa).

【**need to plug the fan mouth, it can able to appear about 0.1Pa**】

7. Handheld shock-proof industrial chassis, protect all parts safely, quickly install, and quickly receive

hidden 　　【**visit customers, live demonstrations, exhibition exhibits, best choice**】

Appendix 5: Including full factors online compensation conforming to national standards, high precision calculation of natural gas / steam flow

Main features

(1) Hardware and software with multivariable acquisition and transmission, connected with any primary element ;

(2) Online calculation of all variables complying with GB/T2624-2006;

(3) All variables in the probe-style flowmeter according to ISO3966-2020;

(4) Compliance with AGA 3 natural gas flow calculation algorithm;

(5) Full variable range:T(-20~80)℃, P(100~1200)kPa,DP(0.05~100)kPa for hyper-compression factor online calculation, full factor online compensation, algorithm error is less than$\pm10^{-5}$, the overall flow error reaches$\pm0.10\%$, meet the requirements of international standards for natural gas trade settlement;

(6) Support saturated/ superheat steam trade settlement, support their automatically switch between each other, and calculate the water and water steam density according to IF97;

(7) Support the online real-time calculation of the complex gas hyper-compression factor, and greatly improve the measurement accuracy;

(8) MMF-485 supports a MMF to get over 10 variables, supports the underlying database, realizes intelligent flow measurement. Normal one DP-tran. only get one variable.

Calculation software and error analysis:

工艺参数

甲烷 CH₄ 93.9202%	氮气 N₂ 1.0219%	二氧化碳 CO₂ 0.3600%	乙烷 C₂H₆ 4.0613%	丙烷 C₃H₈ 0.4354%	水份 H₂O	硫化氢 H₂S
氢气 H₂	一氧化碳 CO	氧气 O₂	异丁烷 i-C₄H₁₀ 0.0708%	正丁烷 n-C₄H₁₀ 0.0996%	异戊烷 i-C₅H₁₂ 0.0145%	正戊烷 n-C₅H₁₂ 0.0093%
正己烷 n-C₆H₁₄	正庚烷 n-C₇H₁₆	正辛烷 n-C₈H₁₈	正壬烷 n-C₉H₂₀	正癸烷 n-C₁₀H₂₂	氦气 He	氩气 Ar
-	-	-	-	-	-	-

管道类型	圆管	管道材质	碳钢 —— 线胀系数 0.00001116 mm/mm℃		
管道内径	157.0 mm	等效内径	157.00 mm, 热态	管道壁厚	4.0 mm
节流件	T26	节流件材质	316L —— 线胀系数 0.00001210 mm/mm℃		
流量系数	0.64038 -	开孔比	1.00000	探杆安全	安全
工况压力	109.0 KPa，绝对压力	工况温度	20.0 ℃	标况状态	20℃、101.325KPa
介质名称	天然气	标况密度	0.70991 Kg/Nm³	工况密度	0.76381 Kg/m³
等熵指数	1.29613 -	动力粘度	0.01089 mPa·S	压缩系数	0.99777
量程范围	110~2452 Nm3/h	修正系数	1.00000 -		

Time	T(℃)	P(kPa)	DP(kPa)	Cal. F(Nm3/H)	RealF(NM3/h)	Error %
16:24:22	11	102	10000	5011.43894	5011.515	0.001510715
16:24:41	-4	280	50	623.650401	623.6735	0.003707576
16:25:28	-19.5	122.5	500	1338.59629	1338.732	0.010151209
16:26:12	79.35	11987.5	66683.34	137349.848	137365.7	0.011566685
16:26:33	19.25	180	66683.34	15423.2303	15425.38	0.013937029
16:27:14	31	12000	90005	182208.192	182210.1	0.001069567
16:27:29	2.5	6000	90005	132503.159	132504.7	0.00113002
16:27:46	5	10810	60020	155472.275	155475.3	0.001933688
16:40:54	-20	100	3000	2940.58962	2940.589	-9.00E-06
16:36:00	-20	200	3000	4186.1152	4186.124	0.000210717