Low Vapor source Material Control
Mass-Flo® Controller

Generic operation manual
MKS Type M330H,M330AH

(Rev. c, July.2004, logo changed Nov,2005)

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1. Safety Producers and Precautions

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT
Do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to MKS Calibration and Service Center for service and repair to ensure that all safety features are maintained.

SERVICE BY QUALIFIED PERSONNEL ONLY
Operating personnel must not attempt component replacement and internal adjustment. Any service must be qualified service personnel only.

USE CAUTION WHEN OPERATING WITH HAZERDOUS MATERIAL
If hazardous materials are sued, observe the proper safety precautions, completely purge the instrument when necessary, and ensure that the material used is compatible with the wetted materials in this products, including any sealing materials.

PURGE THE INSTRUMENT
After installing the unit, or before removing it from a system, purge the unit completely with a clean, dry gas to eliminate all traces of the previously used flow material.

USE PROPER PROCEDURES WHEN PURGING
This instrument must be purged under a ventilation hood, and gloves must be worn for protection.

DO NOT OPERATE IN AN EXPLOSIVE ENVIROMENT
To avoid explosion, do not operate this product in an explosive environment unless it has been specifically certified for such operation.

USE PROPER FITTINGS AND TIGHTENING PROCEDURES
All instrument fittings must be consistent with instrument specifications, and compatible with the intended use of the instrument. Assemble and tighten fittings according to the manufacturer's directions.

CHECK FOR LEAK-TIGHT FITTINGS
Carefully check all vacuum component connections to ensure leak-tight installation.

OPERATE AT SAFE INLET PRESSURE
Never operate at pressures higher than the rated maximum pressure (refer to the product specifications for the maximum allowable pressure).

INSTALL A SUITABLE BURST DISK
When operating from a pressurized gas source, install a suitable burst disk in the vacuum system to prevent system explosion should the system pressure rise.

KEEP THE UNIT FREE OF CONTAMINANTS
Do not allow contaminants to ensure the unit before or during use. Contamination such as dust, dirt, lint, glass chips, and metal chips may permanently damage the unit or contaminate the process.

ALLOW THE UNIT TO WORM UP
If the unit is used to control dangerous gases, they should not be applied before the unit has completely wormed up. Use a positive shutoff valve to ensure that no erroneous flow can occur during worm up.

2. General information

Design features
The Type M330AH,M330H Mass-Flo® controllers were designed for stable/ accurate flow rate control of low vapor source material at high temperature environments.

Sensor
Patented temperature balanced thermal flow sensor compensate ambient temperature effect automatically and works at wide temperature range with high sensitivity.
This optimized sensitivity allows low pressure drop measurement with patented cylindrical bypass which offers accurate flow split ratio through wide dynamic range.

Control valve
Patented motion dumped solenoid valve consist of no friction magnetic damper which damps and stabilize unexpected plunger motion at both of steady state and set point change. This patented feature allows us to have long stroke valve plunger, which helps wide pressure operating condition.

Control electronics
Control electronics designed for long-term sure operation. Linearity correction is made by patented non-linear curved fitting through all range. However the order of this compensation keeps at minimum level by the enough performance of sensor section.
This electronics provide also easy maintenance when re-calibration.

Flow pass
Inside volume is minimized for easy purge. Length of valve plunger is under half of conventional valve plunger and helps easy purge accompanied with its wide dynamic operation range. Low pressure drop design at sensor stage also help easy purge and evacuation. Fully polished surface finish is available by option.

Above advanced features offer reliable flow rate control at several tough operating conditions such as high temperature and low pressure drop application.
The M330AH flow units are available in a variety of types and configurations to suit specific needs.
The options that must be specified when you order the flow unit include:

- Actual operating temperature
- Actual inlet and outlet operating pressure
- Flow range
- Type of source material

3. Products Specifications

Model M330AH

This table shows general cover range of M330HA and please refer to deta sheet and specifications attached to individual ordering units

Table 1

Full scale	10 ～50,000 sccm (1)
Control range	1.5 ～100 % of F.S. (2)
Accuracy	＜±1% of F.S. with calibration gas
Repeatability	＜±0.2% of F.S.
Settling time	1 sec to ±2 % of set point (typical)
Operational differential pressure	7- 40 psig (2) ,15-40psig(2)(over 30,000sccm)
Maximum inlet pressure	150 psig
Maximum operating temperature	150 deg.c. (3) for M330AH 80 deg.c. (3) for M330H
Temperature coefficient	＜ 0.1 % F.S./ deg.c.
External leak	＜1×10^{-10}atm･cc/secHe
Valve type	Normally closed
Fitting	1/4 VCR ,3/8VCR(over 30,000sccm)
Wetted material	SUS-316L, PTFE, Corrosion-resistive magnetic alloy
Power requirements	±15VDC, 100mA

Note; (1) N2 equivalent at operating pressure 1500 torr inlet to atmospheric outlet.

(2) Consult factory for low vapor source material

(3) Requested to specify actual operating temperature when ordering.

(4) This specification shall be changed without notice for products update.

4. INSTALLATION

Mechanical dimensions

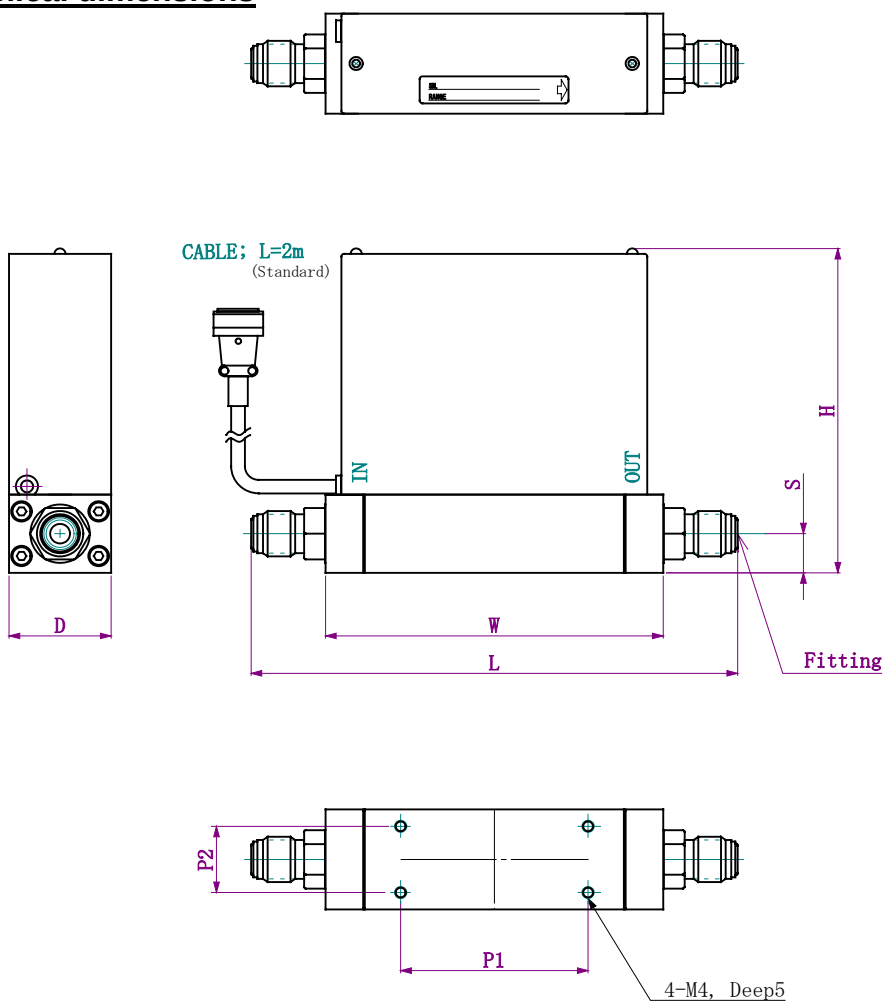


Fig. 1

Table 2 Seize table (mm)

Flow Range (1)	10 ～30,000 sccm	30,000～50,000 sccm
L	124	165
S	12.7	14.5
H	119	119
P1	38	68
P2	18.5	24.5
D	37	37
W	79	123
Fitting	4VCR	8VCR

Note (1) ;N2 equivalent at operating pressure 1500 torr to atmospheric.

Gas line connections

1. Connect the gas line (Via tubing) from the gas supply to the flow controller's inlet, and from the flow controller's outlet, to the down stream tubing.

2. Fix high temperature MFC unit to rigid mount using tapped holes provided in the base of the unit. See mechanical dimensions of holes (hole taps are M4).
   Note: Check the mechanical interference between electrical cable. Continuous mechanical stress, i.e. moving, vibration cause cable problem.

3. Check external leak after mechanical installation by He leak detector.

4. Cyclic purge using high purity non-active dry gas is recommended before the run of process gas.
   Note; When purging is continued over than 30 min at every cycle, operation by flow set point signal is recommended rather than the use of valve fully open command.

5. Heat up MFC unit at specified temperature. Each MFC unit is shipped after calibrated at customer specified temperature. In order to get specified performance, MFC unit must be located at the environment of specified temperature.
   Note; Zero offset and Valve span to flow are different between the condition of room temperature and heat upped condition.

Electronics unit dimensions (single pair type)

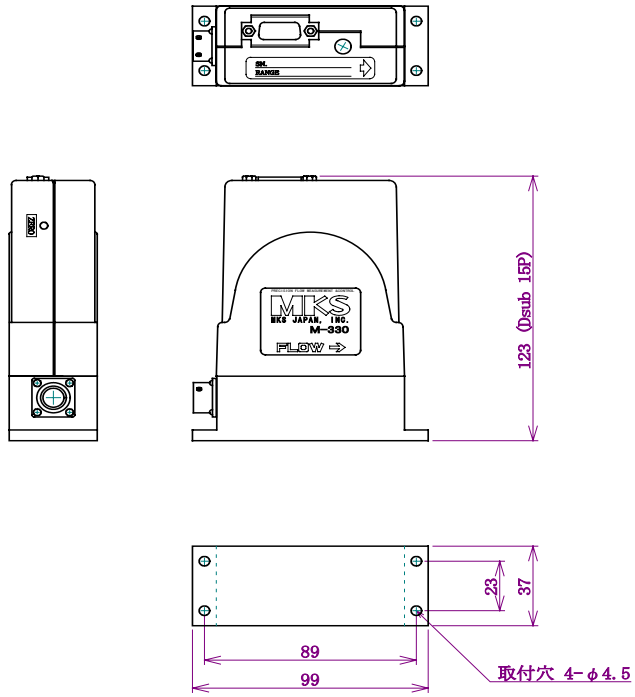


Fig. 2a

Electrical Interface

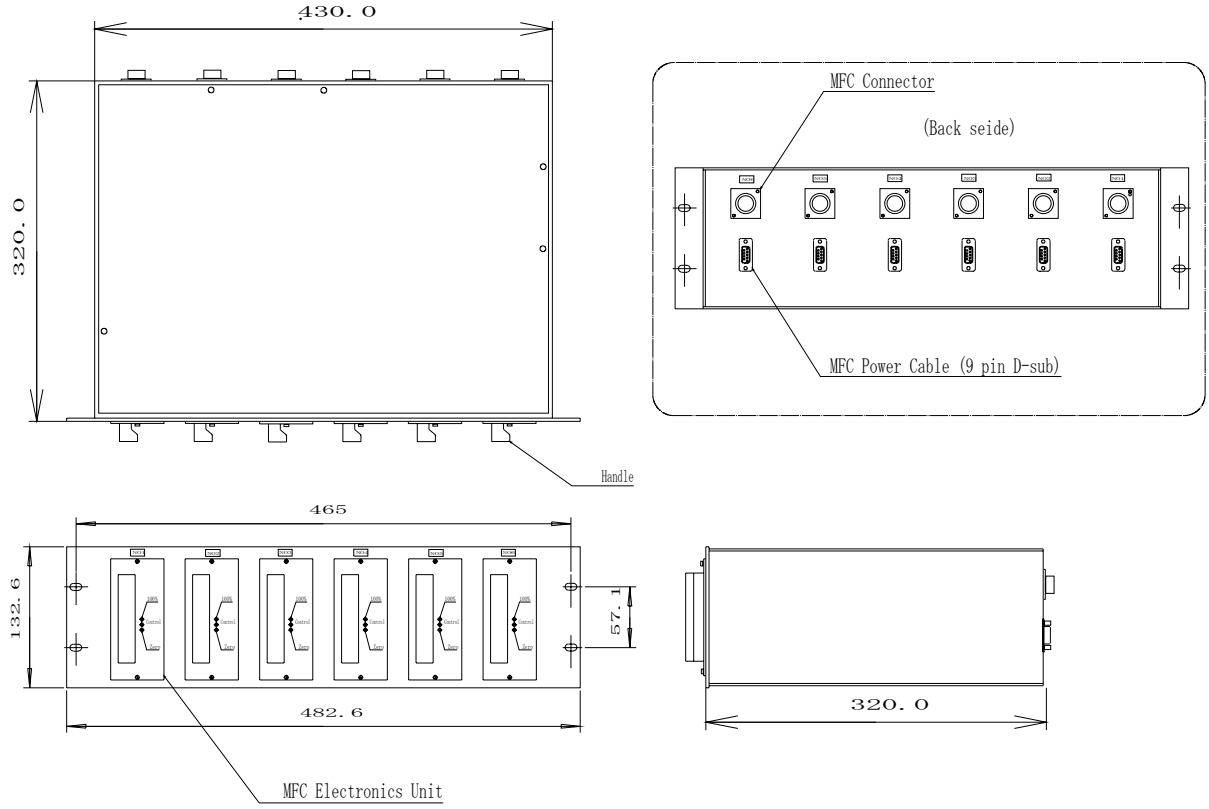
Signal output connector D-sub 9 Pin connector (female)

Pin assignment Pin No.	Signal
1	Valve open/close input (1)
2	Flow rate output signal (0～+5VDC)
3	Power supply +15VDC input(2)
4	Power common
5	Power supply -15VDC input(2)
6	Flow rate set point input (0～+5VDC)
7	Signal common
8	Signal common
9	Optional signal input(3)

Note: (1) Valve open :connect pin 1 to +15VDC
Valve close :connect pin 1 to -15VDC
(2) Connect to proper power source which is industry use and support at least 100mA/MFC channel with acceptable noise performance under EMC Directive 89/336/EEC
(3) Pressure signal input for closed loop pressure control for more information, please contact MKS application group.

Rack mount unit dimensions (module type)

Fig. 2b



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Connection to high temperature MFC unit(HT unit)

Connect corresponding connector of HT unit to the connector of Rack back side .

Note; After proper installation of all system, this connector should not be removed until next maintenance cycle.

Electronics module

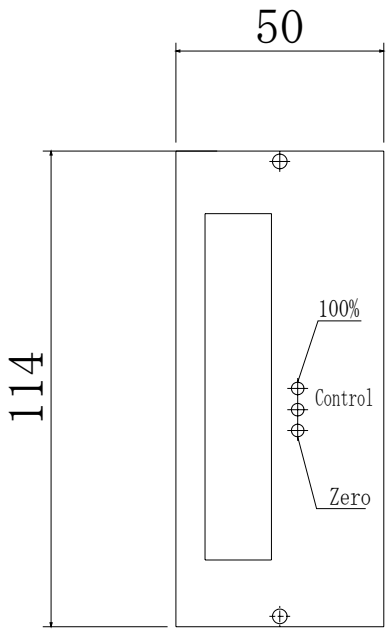

Fig. 3 Eelectronics Module

1. Electronics module is used as a pair of high temperature MFC unit. Each electronics module is calibrated with paired MFC unit and can not be swapped to other pairs without calibration.

2. Electronics modules are hold to Rack system with two screw at front panel and electrically connected to the Rack by card connector located at back side of Electronics module.
Electronics module can be removed by drawing out the handle after removing of front screw. Then power to the module be off.

3 Three adjusting pot are located at front panel of electronics module. These are zero adjustment pot, Full scale 100% adjustment pot and control gain.

Zero adjusting pot ; Adjusting for zero offset.
Full scale adjusting pot; Adjusting for Full scale 100% flow output.
Control gain ; Adjusting for stable control of flow output

5. OPERATION

1. Power on and warm-up at least 30 min after mechanical and electrical installation.
   Note; 1) Ambient temperature should be actual operating temperature specified by each products. Model M-330AH is not assured at other temperatures than specified one.
   2) After installing the unit, or before removing it from a system,
   purge the unit completely with a non-active clean, dry gas to eliminate all traces of the previously used flow material.

2. Adjust zero with no gas flow condition.
   Adjusting pot is located at front panel of Electronics module or Electronics unit. See Fig. 2a or Fig.3.
   Note; During this adjustment, Flow set point signal should be Zero Volt.
3. Introduce gas source to MFC.
   Note; When introduce gas, Flow set point signal should be zero volt and Valve open/close signal to be -15V or non connection.

4. Change Flow set point signal to control point after making free the Valve open/close signal.

5. When gas flow stops, Flow set point signal should be zero.
   Note; Gas flow cannot be zero by just closing of MFC valve. There is small leak through MFC valve and positive shut-off valve should be additionally applied wherever necessary according to the application.

6 MAINTENANCE

Troubleshooting Chart

Symptoms	Possible cause	Remedy
Zero shift (after warm-up).	Improper operating temperature of high temperature unit	Verify operating temperature of unit.
	Improper combination with electronics module	Verify paired module
	Unit inside contamination	Run cyclic purge
	Electronics malfunctioning	Return to service
Output over-range at zero	Valve override full open function applied	Disconnect valve overide.
	Electronics malfunctioning	Return to service.
No gas flow	No source pressure	Verify inlet and outlet pressure of the unit.
	Valve override full close function applied	Disconnect valve overide.
Unit does not achieve full flow	Inlet source pressure is low	Verify inlet pressure and/or temperature of source material of liquid source.
	Use of other gases than specified gas type.	Verify gas type.
	Excessive valve preload	Needs valve preload adjustment, return for service.
Irregular output fluctuation	Generation of mist and/or re-liquefaction of source material.	Verify temperature profile of source material and the and piping connection to the unit.
Excessive valve closed conductance	Improper operating condition	Verify differential pressure of the unit and operating temperature of the unit.
	Inadequate valve preload	Needs valve preload adjustment, return for service.

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Output oscillation	Use of other gases than specified gas type Too high a control gain setting Unstable inlet pressure	Verify gas type. Reduce (turn adjusting pot to counter-clockwise) control gain. Check pressure condition.
Output over shoot	Setpoint signal is applied before gas supply Too high a control gain setting	Zero the setpoint signal before gas supply. Reduce (turn adjusting pot to counter-clockwise) control gain.

REPAIR

If it is necessary to return the instrument to MKS for repair, please contact any of the MKS international service/calibration centers for an ERA (Equipment Return Authorization) number to expedite handling and ensure proper servicing of your instrument.

7 WARRANTY

1. MKS Japan (MKS) warrants the mass flow controller and rack mount system free of charge from defects in material and/or workmanship for one year from the date of shipment.
   Warranty period for repaired or replaced parts shall be either of 90 days after repair or replacement or the warranty period described in item 1 whichever is longer.
   MKS , at its option, will repair any units returned intact to the service center, transportation charges prepaid, which MKS, upon inspection, shall determine to be defective in material and/or workmanship, without charge to the customer.

2. Scope of warranty
   The warranty shall over the mass flow controller and rack mount system only. In no event shall MKS be liable for any direct, incidental or consequential damages of any nature, or losses or expenses resulting from any defective product or the use of any product.

3. Exceptions
   MKS makes no warranties, either express or implied, expect as provided herein-before .
   The warranty shall be invalidated by those as follows, including without limitation thereof;

   1) Inevitable accidents including natural disaster
   2) Abuse, misuse, misapplication or improper installation of the products.
   3) Application or keeping of the product in improper environment or conditions.
   4) Application of the product in excess of rated specifications, or any remodeling or modifications.
   5) Other cases judged to be out of the MKS's responsibility.

   Note: In case applicability of warranty is not clear, MKS will disassembly and inspect the returned product for judgment.

   MKS Japan, makes no warranties, either express or implied, except as provided herein, including without limitation thereof, warranties as to marketability, merchantability, for a particular purpose or use, or against infringement of any patent.