# TECHNICAL GUIDANCE

## Metal Tube Type Variable Area Flowmeter

# NMX Series

## OUTLINE

**NMX** Series flowmeter is the simple and compact product updated from current MX Series that is enjoying a good reputation. The unified 250mm face-to-face dimension makes piping design and work simpler which results in saving of the engineering cost and installation space. It covers liquids, gases and steammeasurement in various industrial fields.

## FEATURES

- ❑ The face-to-face dimensions are unified for all sizes from 15mm to 100mm, which allows well arranged piping design.
- ❑ Simple and rugged design allows many kinds of flow measurements of liquids, gases and steam for various applications.
- ❑ Highly anti-corrosive materials of 316LSS or equal are resistant to corrosive fluids.

## STANDARD SPECIFICATION

- ● Available size — Meter size : 15mm to 100mm
  Connection size : See the table for the availability of the connection size.
- ● Connection rating — Flange connection : JIS 10K, 20KRF
  ANSI Class 150, 300RF
  *: The JIS 10K flanges of the connection size 15mm to 40mm as marked " YES * " in the following table are made of JIS 20K.
  The JIS20K flanges are 2mm thicker than JIS10K flanges and other dimensions are the same.
- ● Fluid temperature — –20 to +300°C (local indication type)
  –20 to +200°C (transmitter type)
- ● Ambient temperature — –25 to +100°C (local indication type)
  –20 to +60°C (transmitter type)
- ● Fluid pressure — 4.1MPa at ambient temperature
  3.3MPa at 120°C
  Maximum allowable operating pressure differs with temperature, complying with JIS and ANSI flange standards.
- ● Materials — Wet parts : 316L SS or equal.
- ● Flow rate range — 0.04 to 100m³/h
  (Liquids equivalent to water, density 1.0g/cm³, viscosity 1.0mPa·s )
  1.2 to 600 m³/h (nor)
  (Gases equivalent to air at 0°C and 0 MPa, i.e. 1 atm.)
- ● Indication accuracy — ±1.5%F.S.
- ● Rangeability — 10 : 1
- ● Indicator construction — Enclosure IP 65 equivalent to NEMA 12/13
- ● Painting — Standard : Epoxy painting on indicator external surface only
  Color : RAL 5018 equivalent to Munsell 7.5 BG 5/4.5

● Connection size table

| Meter size mm | Connection Rating | Availability of connection size against meter size | | | |
|---|---|---|---|---|---|
| | | 1 rank smaller than meter | Same size as meter | 1 rank larger than meter | 2 rank larger than meter |
| 15 | 10K | NO | YES * | YES * | YES * |
| | 20K | NO | YES | YES | YES |
| | 150lb | NO | YES | YES | YES |
| | 300lb | NO | YES | YES | Consult us |
| 25 | 10K | NO | YES * | YES* | YES |
| | 20K | NO | YES | YES | YES |
| | 150lb | NO | YES | YES | YES |
| | 300lb | NO | YES | YES | Consult us |
| 40 | 10K | NO | YES * | YES | YES |
| | 20K | NO | YES | YES | YES |
| | 150lb | NO | YES | YES | YES |
| | 300lb | NO | YES | YES | Consult us |
| 50 | 10K | NO | YES | YES | YES |
| | 20K | NO | YES | YES | YES |
| | 150lb | NO | YES | YES | YES |
| | 300lb | NO | YES | YES | Consult us |
| 80 | 10K | NO | YES | YES | Consult us |
| | 20K | NO | YES | YES | Consult us |
| | 150lb | NO | YES | YES | Consult us |
| | 300lb | NO | YES | NO | NO |
| 100 | 10K | NO | YES | YES | Consult us |
| | 20K | NO | YES | YES | Consult us |
| | 150lb | NO | YES | YES | Consult us |
| | 300lb | NO | YES | NO | NO |

Consult TOKYO KEISO marked as "Consult us" and other standards not mentioned above table.

## ADDITIONAL FUNCTION

❑ ALARM OUTPUT FUNCTION

An alarm output function can be added to local indicator upon your request. Please specify it when ordering including whether high or low alarm with its motion of open or close at alarm activation, which are required for manufacturing.

### Model code

NMX1□□□— ··· / 1A or 1B or 1C or 1D

**1. Alarm output specification**

- Contact system : Reed switch 1point, variable with pointer
- Electric rating : Max.voltage 125 V AC or 100 V DC
  Operating current capacity 10 μA to 0.5 A
  Max. switching capacity 10 VA or 10 W

Note) The above-mentioned rating shows the case of resistance load. When using other loads, welding of a contact may be caused by an inrush current. Use it not to exceed rating at the maximum inrush current.

| Kind of load | Inrush current |
|---|---|
| Lamp load | 5 to10 times of ordinary use |
| Motor load | 10 to 15 times of ordinary use |
| Inductive load | 4 to 5 times of ordinary use |

- Suitable wiring : 0.2 to 2.5 mm² / 24 to 12 AWG (Single wire or stranded wire)
- Insulation resistance : 100 MΩ or more (500 V DC)
- Withstand voltage : 1500 V AC (Holding time 1min.)
- Setting accuracy: ±2% F.S.
- Reset span : Less than 15% F.S. (Less than 20% F.S. for flow range with " ✻ " mark as shown in the Flow rate table.)

**2. Intrinsically safe specification**

Intrinsically safe version is available for alarm output type. This instrument has the ATEX certification for alarm type even without transmitting functions.

### Model code

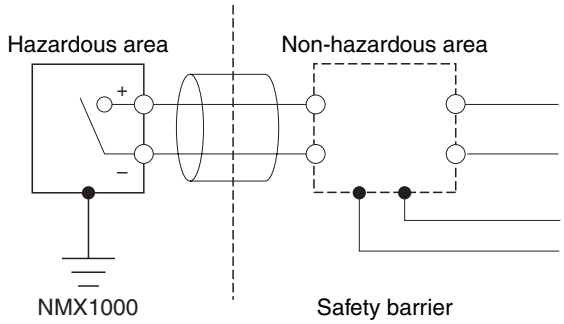
NMX1□□□— ··· / 1A or 1B or 1C or 1D/JI : TIIS certification
Protection class: Ex ia IIC T6
Recommended intrinsically safe relay EB3C
(Ex ia IIC manufactured by IDEC)

NMX1□□□— ··· / 1A or 1B or 1C or 1D/EI :ATEX certification
Protection class: II 2G Ex ia IIC T3…T4 (No. KEMA 07ATEX0157)

### Rating of intrinsically safe circuit

- Maximum input voltage : 30 V
- Maximum input current : 500 mA

The specified safety barrier is to be properly installed in non-hazardous area to establish the intrinsically safe system. See the following diagram.




### Maximum process temperature

Applied for ATEX only

| Maximum process temperature | Temperature class | |
|---|---|---|
| Rating | T3 | T4 |
| ATEX | 200°C | 135°C |

❑ CURRENT OUTPUT FUNCTION

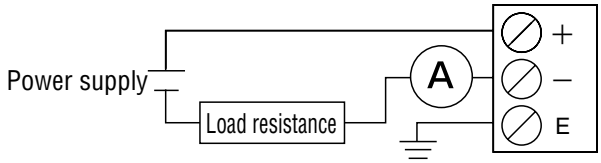
The current output function can be added to local indicator upon your request.
If needed, please specify it when ordering.

### Model code

NMX1□□□— ··· / E1 : Non-intrinsically safe circuit transmitter
NMX1□□□— ··· / E2 : Intrinsically safe circuit transmitter
4 to 20 mA is output corresponding 0 to 100% instantaneous flow rate.

**1. Current output specification**

- Power supply : 11 to 35 V DC (Voltage between transmitter terminals)
- Current output : 4 to 20 mA DC
- Output accuracy : ±1.0% F.S. (against scale plate)
- Allowable load resistance : 0 to 600 Ω (at 24 V DC)
- Power supply variation influence : 0.2% F.S. or less
- Load resistance influence : 0.2% F.S. or less
- Insulation resistance : 100 MΩ or more (500 V DC)
- Withstand voltage : 500 V AC (Holding time: 1min.)
- Terminal schematics




**2. Intrinsically safe specification**

Intrinsically safe version is available for current output type. This instrument has the ATEX certification for the type without transmitting functions.

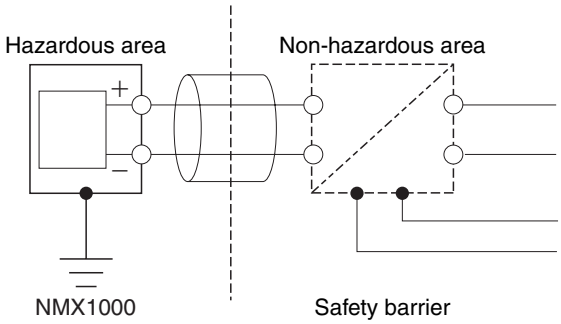
### Model code

NMX1□□□— ··· / E2 / JI : TIIS certification
Protection class : Ex ia IIC T4(No.TC17866)
NMX1□□□— ··· / E2 / CI : NEPSI certification
Protection class : Ex ia IIC T4(No.GYJ06240)
NMX1□□□— ··· / E2 / EI : ATEX certification
Protection class : II 2G Ex ia IIC T3…T4 (No. KEMA 07ATEX0157)

## Rating of intrinsically safe circuit

- Maximum input voltage : 28 V
- Maximum input current : 93 mA
- Maximum input power : 650 mW
- Maximum internal capacitance : 0.01302 µF
- Maximum internal inductance : 0.3697 mH

The specified safety barrier is to be properly installed in non-hazardous area to establish the intrinsically safe system. See the following diagram.




## Maximum process temperature

| Maximum process temperature | Temperature class | |
|---|---|---|
| Rating | T3 | T4 |
| ATEX | 200°C | 135°C |
| NEPSI | N.A. | 130°C |
| TIIS | N.A. | No limitation |

### 3. HART Communication

Hart communication version is available for current output type.

## Model code

NMX1□□□— ··· / E1 / HC
NMX1□□□— ··· / E2 / HC
Intrinsically safe version is also applicable.

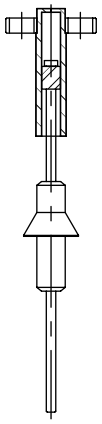
❑ CABLE ENTRY SIZE

Select from MODEL CODE table.

❑ DAMPER DEVICE

These units of all sizes for gas measurement type are equipped with dampers as a standard. The damper device can be added at the liquid measurement with pulsation.

The damper should be avoided for such services as chlorine gas that tends to form chemical compounds and fluids that contain rusts, debris and oil. They might hinder the damping effect.



❑ Flow rate table

| Meter size mm | Water | | Air | |
|---|---|---|---|---|
| | Flow rate m³/h | Max.press.loss kPa | Flow rate m³/h (nor) | Max.press.loss kPa |
| 15 | 0.04 to 1.85 | 11 | 1.2 to 45 | 17 |
| 25 | 1.5 to 5.4 | 16 | 45 to 135 | 30 |
| | 5.4 to 6* | 19 | | |
| 40 | 5 to 10.5 | 8 | 130 to 230 | 10 |
| 50 | 9 to 16.8 | 10 | 220 to 300 | 8 |
| | 16.8 to 21.5* | 16 | 300 to 400* | 10 |
| 80 | 20 to 40 | 22 | 390 to 600* | 13 |
| | 40 to 50* | 32 | | |
| 100 | 50 to 100* | 26 | – | – |

Flow rate range marked as * has the alarm reset span of 20% of F.S. The above flow rate shows the value converted into water (Density 1.0 g/cm³,Viscosity 1.0mPa·s) and air (0°C, 0 MPa, i.e. 1 atm ).The numeric value as indicated shows the flow range in the maximum graduation.

❑ FLOW CONVERSION METHOD

### 1. Liquid application

Flow rates on the Flow rate table are for liquid application equivalent to water (Density 1.0g/cm³ and Viscosity 1.0 mPa·s). If actual fluid condition has different values, a conversion calculation is required per following formula:

$Qw = Q \times 2.59 / \sqrt{((7.7/\rho) - 1)}$

Qw : Water converted flow rate (m³/h)
Q : Flow rate of actual fluid (m³/h)
$\rho$ : Density of actual fluid (g/cm³)

Consult us about high viscosity specification.

### 2. Gas application

Flow rates on the Flow rate table are measurable flow rates for air 20°C, 0MPa (1atm). If actual fluid condition has different from values, a conversion calculation is performed by the following formula:

$QA = Q \times 0.01635 \times \sqrt{(\rho \times (273+t) / (0.1013+P))}$

QA : Converted flow rate in air 0°C, 0MPa [m³/h(nor)]
Q : Flow rate of gas to be measured [m³/h(nor)]
$\rho$ : Density of gas to be measured [kg/m³ (nor)]
P : Operating pressure (MPa)
t : Operating temperature (°C)

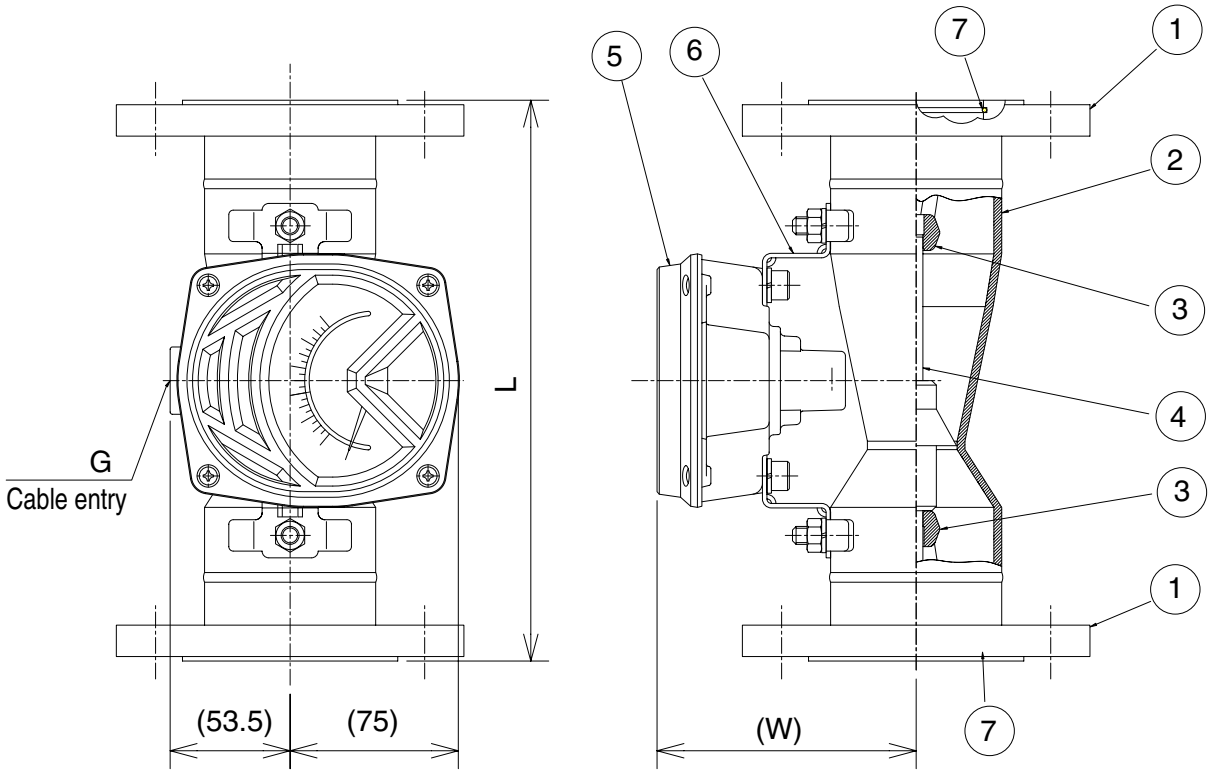
### 3. Steam application

Steam flow rate is to be converted into Air (0°C, 0MPa) flow rate by the following formula.

$QA = 0.8488 \times Q_{S1} / \sqrt{\rho s}$
$QA = 0.8488 \times Q_{S2} \times \sqrt{\rho s}$

QA : Air (0°C, 0MPa) converted flow rate [Unit: m³/h (nor)]
$Q_{S1}$ : Flow rate (Mass) (Unit: kg/h)
$Q_{S2}$ : Flow rate (Volume) (Unit: m³/h)
$\rho s$ : Density of steam (kg/m³)

## DIMENSIONS




### SIZE AND WEIGHT

| Meter size (mm) | Connection size JIS A size (inch) | Dimensions (mm) | | Approx. mass *1 (kg) |
|---|---|---|---|---|
| | | L | W | |
| 15 | 15 (1/2) | 250 | 115.5 | 2.5 |
| 25 | 25 (1) | 250 | 115.5 | 4.0 |
| 40 | 40 (1 1/2) | 250 | 115.5 | 4.5 |
| 50 | 50 (2) | 250 | 115.5 | 7.0 |
| 80 | 80 (3) | 250 | 115.5 | 13.0 |
| 100 | 100 (4) | 250 | 135.5 | 18.0 |

*1 Approx. mass shows the case of ANSI Class 150.

### MATERIALS

| No. | Description | Material |
|---|---|---|
| 1 | Flange | 316L SS |
| 2 | Tapered tube | 316L SS |
| 3 | Float guide | 316L SS |
| 4 | Float | 316L SS |
| 5 | Indicator | ADC 12 |
| 6 | Fittings | 316 SS |
| 7 | Stop ring | 316L SS |

Note)
- The upper float guide is replaced with the damper (cylinder) for gas, steam services and other services where a damper required.
- The lower float guides being fixed to the flanges of 15mm and 100mm meter size can not be removed.

## MODEL CODE

| NMX | ✻ | ✻ | ✻ | ✻ | – ✻✻ | ✻ | ✻ | –✻ | ✻ | ✻ | ✻ | /✻✻ | Specification | Restriction of selection: Liquid service | Restriction of selection: Gas service |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Indicator type | 1 | | | | | | | | | | | | Non-flameproof type indicator | Selection is not necessary. | |
| Main body | | 1 | | | | | | | | | | | Standard | | |
| Material in contact with liquid | | | 1 | | | | | | | | | | 316L SS | | |
| Float material | | | | 1 | | | | | | | | | 316L SS | | |
| Rating | | | | | –J1 | | | | | | | | JIS10K | The connection size is 50mm or more. | |
| | | | | | –J4 | | | | | | | | JIS20K | No restriction | |
| | | | | | –A2 | | | | | | | | ANSI 150Lb | | |
| | | | | | –A5 | | | | | | | | ANSI 300Lb | Refer to the Connection size. | |
| Connection | | | | | | RF | | | | | | | RF flange | Selection is not necessary. | |
| Connection size | | | | | | | 1 | | | | | | 15A (1/2") | As the standard, connection size is the same as meter size or 1 or 2 rank larger than meter size. For details refer to the connection size. | |
| | | | | | | | 2 | | | | | | 20A (3/4") | | |
| | | | | | | | 3 | | | | | | 25A (1") | | |
| | | | | | | | 4 | | | | | | 40A (1 1/2") | | |
| | | | | | | | 5 | | | | | | 50A (2") | | |
| | | | | | | | 6 | | | | | | 65A (2 1/2") | | |
| | | | | | | | 7 | | | | | | 80A (3") | | |
| | | | | | | | 8 | | | | | | 100A (4") | | |
| | | | | | | | 9 | | | | | | 125A (5") | | |
| | | | | | | | A | | | | | | 150A (6") | | |
| Meter size | | | | | | | | –1 | | | | | 15mm | Qw ($m^3$/h) 20°C, Water: 0.04 to 1.85 | QA ($m^3$/h) 0°C, 0MPa, Air: 1.2 to 45 |
| | | | | | | | | –3 | | | | | 25mm | 1.5 to 6 | 45 to 135 |
| | | | | | | | | –4 | | | | | 40mm | 5 to 10.5 | 130 to 230 |
| | | | | | | | | –5 | | | | | 50mm | 9 to 21.5 | 220 to 400 |
| | | | | | | | | –7 | | | | | 80mm | 20 to 50 | 390 to 600 |
| | | | | | | | | –8 | | | | | 100mm | 50 to 100 | |
| Tapered tube | | | | | | | | | ✻ | | | | Tapered tube number | Selection is not necessary. Manufacture's code | |
| Float | | | | | | | | | | ✻ | | | Float number | | |
| Float damper | | | | | | | | | | | 1 | | Not provided | Standard | N.A. |
| | | | | | | | | | | | 2 | | Provided | Selectable | Standard |
| Additional function: Alarm output (1 point) | | | | | | | | | | | | /1A | 1 point alarm (High Close) | Duplicated selection has no effect. | |
| | | | | | | | | | | | | /1B | 1 point alarm (High Open) | | |
| | | | | | | | | | | | | /1C | 1 point alarm (Low Close) | | |
| | | | | | | | | | | | | /1D | 1 point alarm (Low Open) | | |
| Current output (2-wire, 4 to 20mA DC output) | | | | | | | | | | | | /E1 | TYPE 1 (Non intrinsic safe circuit) | | |
| | | | | | | | | | | | | /E2 | TYPE 2 (Intrinsically safe circuit) | | |
| | | | | | | | | | | | | /HC | HART communication | Available for /E1 or E2 | |
| Intrinsic safety | | | | | | | | | | | | /JI | TIIS certification | Available for TYPE 2 (/E2) and alarm output | |
| | | | | | | | | | | | | /EI | ATEX certification | Not available for TYPE 1 (/E1) available for others | |
| | | | | | | | | | | | | /CI | NEPSI certification | Available for TYPE 2 (/E2) | |
| Cable entry | | | | | | | | | | | | /M1 | M16×1.5 (F) | Duplicated selection has no effect. | |
| | | | | | | | | | | | | /M2 | M20×1.5 (F) | | |
| | | | | | | | | | | | | /GH | G 1/2 (F) | | |
| | | | | | | | | | | | | /NP | NPT 1/2 (F) | | |
| Special: Cleaning | | | | | | | | | | | | /OL | Degrease treatment | No restriction | |
| | | | | | | | | | | | | /WL | Non-water treatment | | |
| | | | | | | | | | | | | /AP | Acid pickling | | |
| Painting | | | | | | | | | | | | /PS | Special painting | No restriction | |
| Inspection | | | | | | | | | | | | /LT | Gas leakage test | No restriction | |
| Accessories | | | | | | | | | | | | /AC | Provided | IR series, Amplifier for alarm etc. | |
| Special specification | | | | | | | | | | | | /Z | Others | Consult us for details. | |

❑ STANDARD GRADUATION DIVISION

Following table shows 17 kinds of standard graduation pattern.

| Scale range | Subdivision of graduation | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 - 10 | 1 | 2 | 4 | 6 | 8 | 10 | |
| 1.2 - 12 | 1.2 | 2 | 4 | 6 | 8 | 10 | 12 |
| 1.5 - 15 | 1.5 | 2.5 | 5 | 7.5 | 10 | 12.5 | 15 |
| 1.6 - 16 | 1.6 | 5 | 10 | 15 | 16 | | |
| 1.8 - 18 | 1.8 | 5 | 10 | 15 | 18 | | |
| 2 - 20 | 2 | 5 | 10 | 15 | 20 | | |
| 2.5 - 25 | 2.5 | 5 | 10 | 15 | 20 | 25 | |
| 3 - 30 | 3 | 5 | 10 | 15 | 20 | 25 | 30 |
| 3.5 - 35 | 3.5 | 10 | 20 | 30 | 35 | | |
| 4 - 40 | 4 | 10 | 20 | 30 | 40 | | |
| 4.5 - 45 | 4.5 | 10 | 20 | 30 | 40 | 45 | |
| 5 - 50 | 5 | 10 | 20 | 30 | 40 | 50 | |
| 6 - 60 | 6 | 10 | 20 | 30 | 40 | 50 | 60 |
| 7 - 70 | 7 | 20 | 40 | 60 | 70 | | |
| 7.5 - 75 | 7.5 | 20 | 40 | 60 | 75 | | |
| 8 - 80 | 8 | 20 | 40 | 60 | 80 | | |
| 9 - 90 | 9 | 20 | 40 | 60 | 80 | 90 | |

## CAUTIONS

- This flowmeter in its principle transmits the displacement caused by the magnet coupling. The surrounding magnet field might affect the performance of the instrument.
- Avoid the installation in the magnet field and do not bring the magnet material close less than 20 cm including insulation cover which may affect the performance.
- When installing two or more flowmeters, install them in more than 30cm distance to avoid the mutual interferences.

* Specification is subject to change without notice.

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