
User's Manual

Vortex Flowmeter VY Series ATEX Explosion Protection Type

IM 01F07A03-03EN



Vortex Flowmeter VY Series

ATEX Explosion Protection Type

IM 01F07A03-03EN 2nd Edition

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Revision Information

1. Introduction

This manual provides the basic guidelines for explosion protection type of Vortex Flowmeter VY Series. For the items which are not covered in this manual, read the applicable user's manuals and general specifications as listed in IM 01F07A21-01Z1 (Read Me First). To ensure correct use of the product, read these manuals thoroughly and fully understand how to operate the product before maintaining it. For method of checking the model and specifications, read the general specifications GS 01F07A00-01EN.

Website address: <http://www.yokogawa.com/fld/doc/>

These manuals can be downloaded from the website of YOKOGAWA or purchased from the YOKOGAWA representatives.

NOTE

When describing the model name like "VY####" in this manual, "####" means any of the following.

For VY####:

015, 025, 040, 050, 080, 100, 150, 200, 250, 300, 400

■ Precautions Related to the Protection, Safety, and Alteration of the Product

The following safety symbol marks are used in this manual and product.



WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.



CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or the entire product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the product or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

The following symbols are used in the product and the manual to indicate the accompanying safety precautions:



Functional grounding terminal



Direct current



Caution

This symbol indicates that the operator must read an explanation in the user's manual in order to avoid the risk of injury or death of personnel or damage to the product.

- For the protection and safe use of the product and the system in which this product is incorporated, be sure to follow the instructions and precautions on safety that is stated in user's manual as listed in IM 01F07A21-01Z1 (Read Me First) whenever you handle the product. Take special note that if you handle the product in a manner that violated these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of product.
- Do not modify this product.
- The product should be disposed of in accordance with local and national legislation/ regulations.

■ Regarding This User's Manual

- This manual should be provided to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without YOKOGAWA's written permission.
- YOKOGAWA makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, inform the nearest YOKOGAWA sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made products.
- Note that changes in the specifications, construction, or component parts of the product may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- This manual is intended for the following personnel;
Engineers responsible for installation and wiring of the product.
- To ensure correct use, read this manual and the applicable user's manuals as listed in IM 01F07A21-01Z1 (Read Me First) thoroughly before starting operation. Read the general specifications as listed in IM 01F07A21-01Z1 (Read Me First) for its specification.

■ Trademark

- All the brands or names of Yokogawa Electric's products used in this manual are either trademarks or registered trademarks of Yokogawa Electric Corporation.
- All other company and product names mentioned in this manual are trade names, trademarks or registered trademarks of their respective companies.
- In this manual, trademarks or registered trademarks are not marked with TM or [®].

■ For Safe Use of Product

For the protection and safe use of the product and the system in which this product is incorporated, be sure to follow the instructions and precautions on safety that is stated in user's manual as listed in IM 01F07A21-01Z1 (Read Me First) whenever you handle the product.

Take special note that if you handle the product in a manner that violated these instructions, the protection functionality of the product may be damaged or impaired. In such cases, YOKOGAWA shall not be liable for any indirect or consequential loss incurred by either using or not being able to use the product.

2. Explosion Protection Type



WARNING

VY### vortex flowmeter (Integral Flowmeter and Remote Sensor), and VY4A Remote Transmitter are products which have been certified as explosion protection type products if model code for explosion protection is specified. Strict limitations are applied to the structures, installation locations, external wiring work, maintenance and repairs, etc. of these products. Sufficient care must be taken, as any violation of the limitations may cause dangerous situations. Be sure to read this manual before handling the explosion protection type products.



WARNING

If the terminal box cover and display cover are locked by hexagon socket head cap screw, in the case of opening the cover, use the hexagonal wrench (nominal size 3). Read the Maintenance Manual, IM 01F07A01-02EN, for the procedure. Before opening the cover, be sure to check that the power of flowmeter has been turned off. Once the cover is closed, be sure to re-lock the product. Be sure to lock the cover with the screw by using the hexagonal wrench after tightening the cover.

IMPORTANT

For multiple approval types:
For the installation, once a particular type of protection is selected, any other type of protection cannot be used. Apply a permanent mark in the check box of the selected approval type on the certification label to distinguish it from unused approval types as follows;
e.g.)
☒ Ex db ia IIC T6...T1 Gb
☐ Ex ia tb IIIC T80°C...T440°C Db
☐ Ex ia IIC T4...T1 Ga

2.1 Technical Data

Applicable Standard:

EN IEC 60079-0:2018
EN 60079-1:2014
EN 60079-11:2012
EN 60079-31:2014
EN 60529:1991 + A1:2000 + A2:2013

Certificate:

FM21ATEX0010X

Flameproof (Certification Code: KF2)

- **Type of Gas Atmosphere Protection**
(Integral Flowmeter)
II 2 G Ex db ia IIC T6...T1 Gb
(Remote Sensor)
II 1 G Ex ia IIC T6...T1 Ga
(Remote Transmitter)
II 2 (1) G Ex db ia [ia Ga] IIC T6 Gb
- **Type of Dust Atmosphere Protection**
(Integral Flowmeter)
II 2 D Ex ia tb IIIC T80°C...T440°C Db
(Remote Sensor)
II 2 D Ex ia IIIC T80°C...T440°C Db
(Remote Transmitter)
II 2 D Ex ia tb [ia Db] IIIC T70°C Db
- **Ambient Temperature: *1**
(Integral Flowmeter and Remote Transmitter)
-50°C ≤ Ta ≤ +60°C
(Remote Sensor)
T6, T80°C: -50°C ≤ Ta ≤ +40°C
T5, T95°C to T1, T440°C: -50°C ≤ Ta ≤ +60°C
- **Maximum Surface Temperature and Process Temperature: *1**
(Integral Flowmeter and Remote Sensor)
T6, T80°C: -196°C to +80°C / [+78°C]
T5, T95°C: -196°C to +95°C / [+93°C]
T4, T130°C: -196°C to +130°C / [+128°C]
T3, T195°C: -196°C to +195°C / [+193°C]
T2, T290°C: -196°C to +290°C / [+288°C]
T1, T440°C: -196°C to +440°C / [+438°C]
[]: Built-in temperature sensor
- **Atmospheric Pressure:** 80 kPa to 110kPa
- **Enclosure:**
IP66/IP67 in accordance with only EN 60529
IP66 in accordance with EN IEC 60079-0
(for transmitter assembly)
- **Pollution Degree:** 2
- **Overvoltage Category:** I

- **Power Supply:**
(Integral Flowmeter and Remote Transmitter)
10.5 to 42 V DC (Communication and I/O
Code: JA, JB or JJ)
- **Current I/O:**
(Integral Flowmeter and Remote Transmitter)
Output: 3.6 to 21.6 mA
Input: ≤ 21.6 mA
- **Pulse Output:**
(Integral Flowmeter and Remote Transmitter)
Output: ≤ 42 V DC, ≤ 120 mA
- **Dielectric Strength:**
(Remote Transmitter)
1500 V AC r.m.s., 1 min, 5 mA
Terminals: SUPPLY+, SUPPLY-, DOUT+,
DOUT-, AIN+ and AIN- to
BROWN, RED, ORANGE,
YELLOW, GREEN and BLUE
500 V AC r.m.s., 1 min, 5 mA
Terminals: BROWN, RED, ORANGE,
YELLOW, GREEN and BLUE to
Earth terminal
- **Control Drawing:** Read Section 2.3.

*1: The ambient temperature for the process temperature under -50°C is shown as Figure 1.

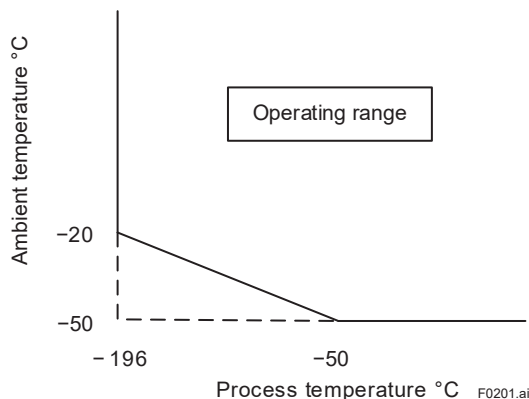


Figure 1 The ambient temperature for the process temperature under -50°C

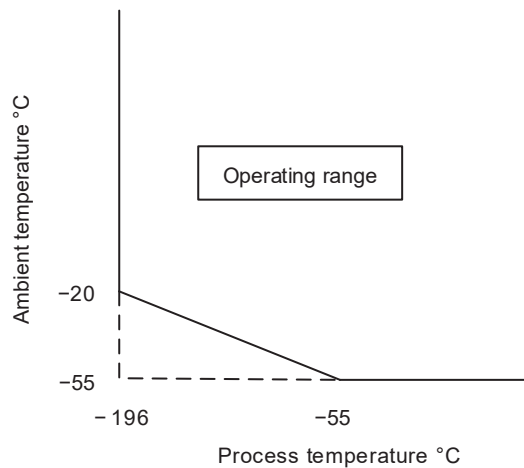
**Intrinsically safe (Certification Code: KS2,
Communication and I/O Code: JA, JB or JJ)**

- **Type of Gas Atmosphere Protection:**
(Integral Flowmeter)
II 1 G Ex ia IIC T4...T1 Ga
(Remote Sensor)
II 1 G Ex ia IIC T6...T1 Ga
(Remote Transmitter)
II 1 G Ex ia IIC T4 Ga
- **Ambient Temperature: *2**
(Integral Flowmeter)
 $-55^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$
(Remote Sensor)
T6, T80°C: $-55^{\circ}\text{C} \leq T_a \leq +40^{\circ}\text{C}$
T5, T95°C to T1, T440°C: $-55^{\circ}\text{C} \leq T_a \leq +60^{\circ}\text{C}$

(Remote Transmitter)
 $-55^{\circ}\text{C} \leq T_a \leq +80^{\circ}\text{C}$

- **Process Temperature: *2**
(Integral Flowmeter and Remote Sensor)
T6: -196°C to $+80^{\circ}\text{C}$ / $[+78^{\circ}\text{C}]$
T5: -196°C to $+95^{\circ}\text{C}$ / $[+93^{\circ}\text{C}]$
T4: -196°C to $+130^{\circ}\text{C}$ / $[+128^{\circ}\text{C}]$
T3: -196°C to $+195^{\circ}\text{C}$ / $[+193^{\circ}\text{C}]$
T2: -196°C to $+290^{\circ}\text{C}$ / $[+288^{\circ}\text{C}]$
T1: -196°C to $+440^{\circ}\text{C}$ / $[+438^{\circ}\text{C}]$
[] : Built-in temperature sensor
- **Atmospheric Pressure:** 80 kPa to 110 kPa
- **Enclosure:**
IP66/IP67 in accordance with only EN 60529
- **Pollution Degree:** 2
- **Overvoltage Category:** I
- **Power Supply:**
(Integral Flowmeter and Remote Transmitter)
10.5 to 30 V DC
- **Current I/O:**
(Integral Flowmeter and Remote Transmitter)
Output: 3.6 to 21.6 mA
Input: ≤ 21.6 mA
- **Pulse Output:**
(Integral Flowmeter and Remote Transmitter)
Output: ≤ 30 V DC, ≤ 80 mA
- **Dielectric Strength:**
(Integral Flowmeter)
500 V AC r.m.s., 1 min, 5 mA
Terminals: SUPPLY+, SUPPLY-, DOUT+,
DOUT-, AIN+ and AIN- to Earth
terminal
Terminals: SUPPLY+ and SUPPLY- to
DOUT+, DOUT-, AIN+ and AIN-
Terminals: DOUT+ and DOUT- to AIN+ and
AIN-
(Remote Transmitter)
500 V AC r.m.s., 1 min, 5 mA
Terminals: SUPPLY+, SUPPLY- to DOUT+,
DOUT-, AIN+ and AIN-
Terminals: DOUT+ and DOUT- to AIN+ and
AIN-
Terminals: SUPPLY+, SUPPLY-, DOUT+,
DOUT-, AIN+, AIN-, BROWN, RED,
ORANGE, YELLOW, GREEN and
BLUE to Earth terminal
Terminals: SUPPLY+, SUPPLY-, DOUT+,
DOUT-, AIN+ and AIN- to BROWN,
RED, ORANGE, YELLOW,
GREEN and BLUE
- **Control Drawing:** Read Section 2.3.

*2: The ambient temperature for the process temperature under -55°C is shown as Figure 2.



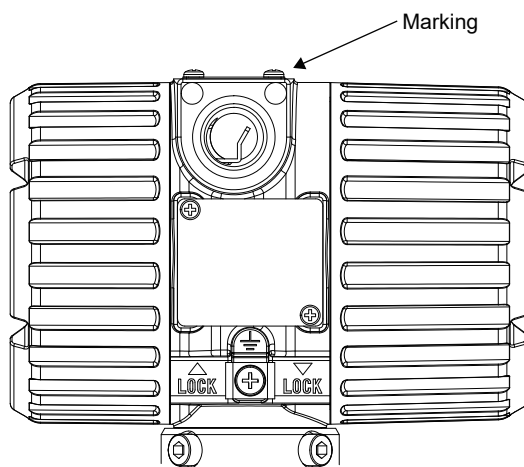
F0202.ai

Figure 2 The ambient temperature for the process temperature under -55°C

2.2 Cable Entry

Cable entry devices suitable for the thread form and the size of the cable entries must be used, according to the following marking on the equipment.

Marking	Screw form / Size
M	ISO M20 x 1.5 Female
N	ASME 1/2 NPT Female



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2.3 Installation

Read the Installation Manual, IM 01F07A01-01EN (for VY### and VY4A), for basic installation procedure.

- The equipment shall be installed in accordance with EN 60079-14 and relevant local codes and requirements.
- See the control drawing: DIE0023-A071.

Integral Flowmeter

- The surge absorber may be added to or removed from the equipment.

Flameproof (Certification Code: KF2)

- Take care the following warning marking.
"WHEN THE PROCESS TEMP. IS $\geq 290^{\circ}\text{C}$,
USE THE HEAT-RESISTING CABLE AND
CABLE GLAND $\geq 75^{\circ}\text{C}$."

Remote Transmitter

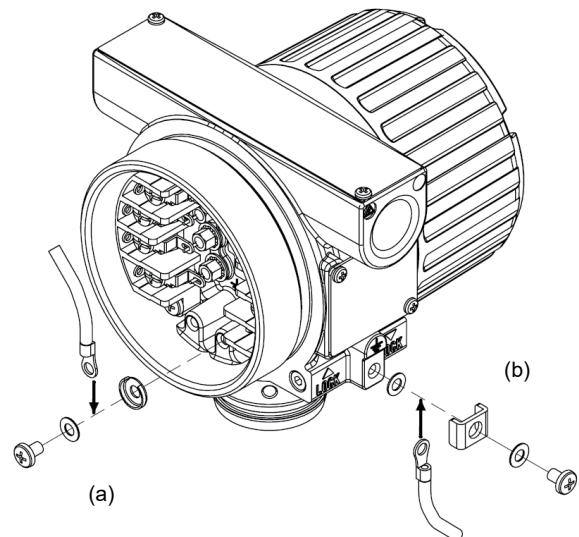
- The surge absorber may be added to or removed from the equipment.

The grounding terminals are located on the inside and outside of the terminal area.

Connect the cable to the grounding terminal in accordance with wiring procedure (a) or (b).

(a) Internal grounding terminal

(b) External grounding terminal (Certification Code: KF2)



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Read the Control Drawing.

All wiring shall comply with local installation requirements.

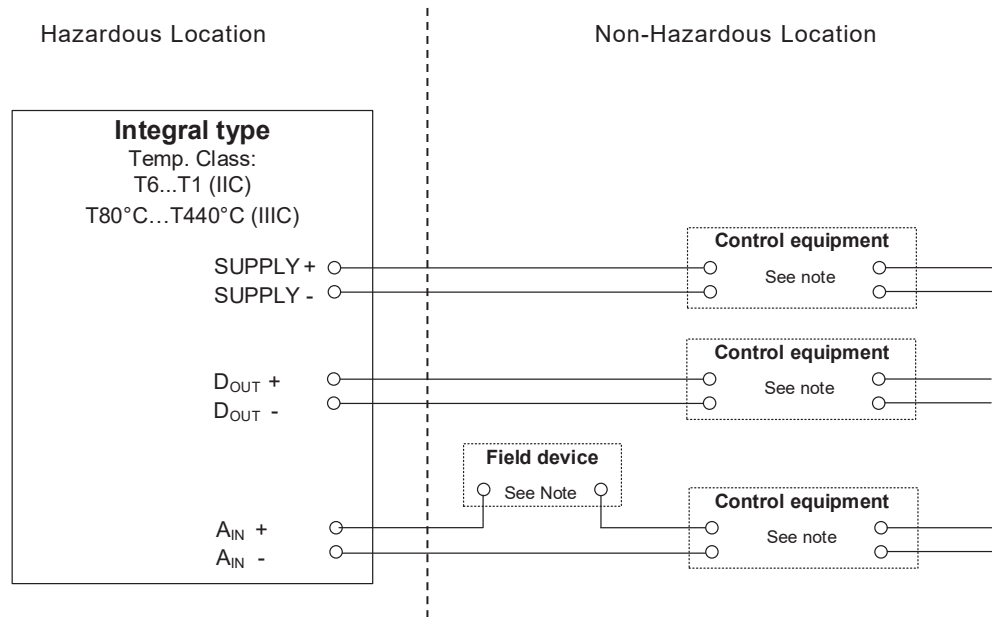
- **Integral Flowmeter**
- **Flameproof (Certification Code: KF2)**

Yokogawa Electric Corporation			Model		VY Series		
Title	Control drawing (IECEEx, ATEX)						
No.	DIE0023-A071		Page	5	Revision	0	

Integral type

Certification: SF2, SU2, KF2, KU2, WF2, WU2, SV2, KV2, WV2

Communication and I/O: Dx, Jx, xD or xJ



*1: Field device can be connected to A_{IN} + line or A_{IN} - line.

*2: A_{IN} terminals are not always provided.

Electrical parameters (SUPPLY / D_{OUT} / A_{IN})

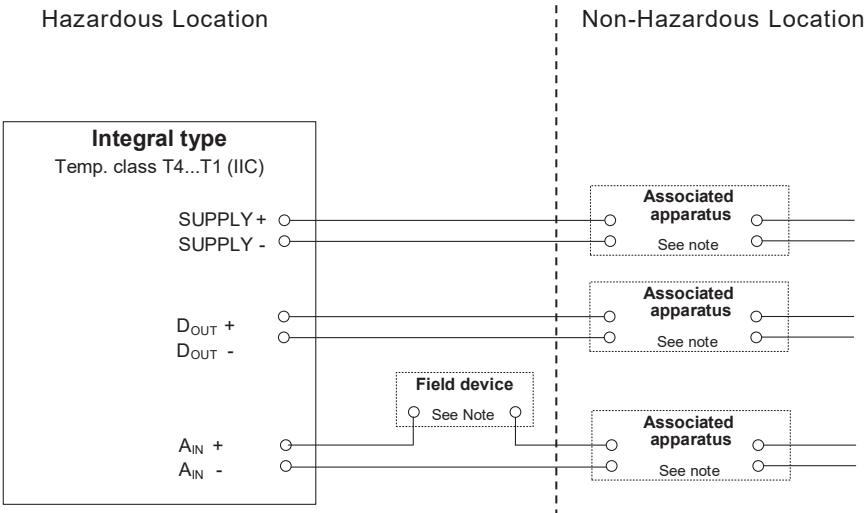
Model Code: VY###-###-#####-#####@#	
@: 0 to 9	@: A to Y
Um = 60 V DC	Um = 250 V

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• Intrinsically Safe (Certification Code: KS2, Communication and I/O Code: JA, JB or JJ)

Yokogawa Electric Corporation			Model		VY Series			
Title	Control drawing (IECEX, ATEX)							
No.	DIE0023-A071		Page	1	Revision	0	Date	2021-01-15
Revised pages		-						

Integral type
Certification: SS2, SU2, KS2, KU2, WS2, WU2, ST2, SV2, KT2, KV2, WT2, WV2
Communication and I/O: Dx, Jx, xD or xJ



*1: Field device can be connected to A_{IN} + line or A_{IN} – line.
*2: A_{IN} terminals are not always provided.

Electrical parameters (SUPPLY / D_{OUT} / A_{IN})

U _i = 30 V
I _i = 200 mA
P _i = 1.0 W
C _i = 14.4 nF
L _i = 1.9 μH

F0206.ai

- Remote Transmitter and Remote Sensor
- Flameproof (Certification Code: KF2)

Yokogawa Electric Corporation			Model		VY Series		
Title	Control drawing (IECEX, ATEX)						
No.	DIE0023-A071	Page	6	Revision	0		

Remote transmitter

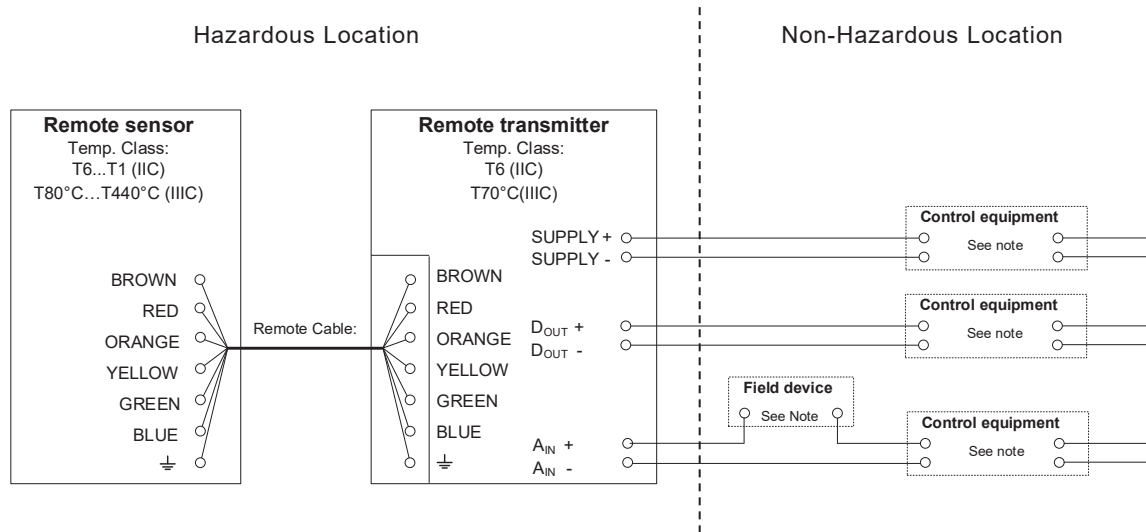
Certification: SF2, SU2, KF2, KU2, WF2, WU2, SV2, KV2, WV2

Communication and I/O: Dx, Jx, xD or xJ

Remote sensor

Certification: SF2, SU2, KF2, KU2, WF2, WU2, SV2, KV2, WV2

Communication and I/O: NN



*1: Field device can be connected to $A_{IN} +$ line or $A_{IN} -$ line.

*2: A_{IN} terminals are not always provided.

Electrical parameters (SUPPLY / D_{OUT} / A_{IN})

Model Code: VY4A-###-#####@#	
@: 0 to 9	@: A to Y
$U_m = 60 \text{ V DC}$	$U_m = 250 \text{ V}$

Electrical parameters (Remote Cable)

$C_c \leq 10000 \text{ pF}$, $L_c \leq 100 \text{ } \mu\text{H}$

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• **Intrinsically Safe (Certification Code: KS2, Communication and I/O Code: JA, JB or JJ)**

Yokogawa Electric Corporation			Model		VY Series		
Title	Control drawing (IECEX, ATEX)						
No.	DIE0023-A071		Page	2	Revision	0	

Remote transmitter

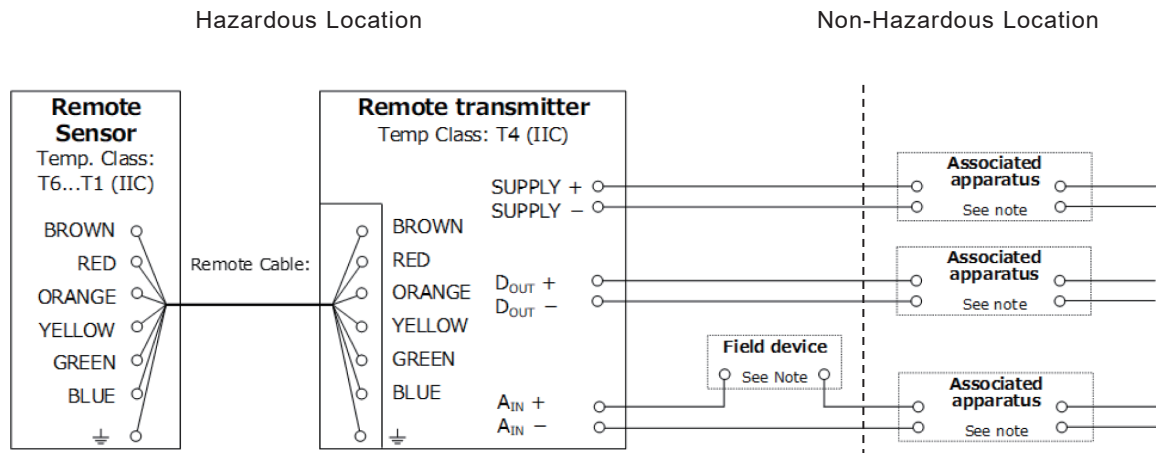
Certification: SS2, SU2, KS2, KU2, WS2, WU2, ST2, SV2, KT2, KV2, WT2, WV2

Communication and I/O: Dx, Jx, xD or xJ

Remote sensor

Certification: SS2, SU2, KS2, KU2, WS2, WU2, ST2, SV2, KT2, KV2, WT2, WV2

Communication and I/O: NN



*1: Field device can be connected to $A_{IN} +$ line or $A_{IN} -$ line.

*2: A_{IN} terminals are not always provided.

Electrical parameters (SUPPLY / D_{OUT} / A_{IN})

$U_i = 30 \text{ V}$
 $I_i = 200 \text{ mA}$
 $P_i = 1.0 \text{ W}$
 $C_i = 14.4 \text{ nF}$
 $L_i = 1.9 \text{ } \mu\text{H}$

Electrical parameters (Remote Cable)

$C_c \leq 10000 \text{ pF}$, $L_c \leq 100 \text{ } \mu\text{H}$

F0208.ai

- **Flameproof and Intrinsically Safe (All Certification Codes)**

Yokogawa Electric Corporation			Model		VY Series		
Title	Control drawing (IECEX, ATEX)						
No.	DIE0023-A071		Page	9	Revision	0	

Notes:

1. Except for FISCO power supply, the Associated Apparatus must be a linear power source.
2. The remote transmitter and the remote sensor must be installed in the same earthing system.
3. When more than one intrinsically safe apparatus are connected in an intrinsically safe circuit, total Ci and Li of the connected apparatus must be considered.
4. FISCO installation must be in accordance with IEC (EN) 60079-25.

F0209.ai

2.4 Operation

When installation of explosion protection type product, read installation manual, IM 01F07A01-01EN (for VY### and VY4A).

- Take care the following warning marking.
“POTENTIAL ELECTROSTATIC CHARGING HAZARD.”
In hazardous areas, avoid any actions which generate electrostatic charges, such as rubbing the equipment with a dry cloth.

Integral Flowmeter

Flameproof (Certification Code: KF2)

- Take care the following warning marking.
“AFTER DE-ENERGIZING, DELAY 3 MINUTES BEFORE OPENING.”

Intrinsically Safe (Certification Code: KS2, Communication and I/O Code: JA, JB or JJ)

- The push-button switches on the display must be operated only when an explosive atmosphere is not present.

Remote Transmitter

Flameproof (Certification Code: KF2)

- Take care the following warning marking.
“AFTER DE-ENERGIZING, DELAY 3 MINUTES BEFORE OPENING.”

Intrinsically Safe (Certification Code: KS2, Communication and I/O Code: JA, JB or JJ)

- The push-button switches on the display must be operated only when an explosive atmosphere is not present.

2.5 Maintenance and Repair

For maintenance of explosion protection type product, read maintenance manual, IM 01F07A01-02EN (for VY### and VY4A).

- A modification of the equipment would no longer comply with the construction described in the certificate documentation.
- Only personnel authorized by Yokogawa Electric Corporation can repair the equipment.

2.6 Name Plate

Example for name plates in case of "Flameproof,
Integral Flowmeter"

VORTEX FLOWMETER				F9463AA
MODEL: SUFFIX:	STYLE:	K-FACTOR: RANGE:	PS: TS:	 READ IM 01F07A21-01Z1 LISEZ IM 01F07A21-01Z1
SUPPLY:	V DC	NO.:	MPa at 38°C °C	
OUTPUT:				
TAG NO.:				
YOKOGAWA  Made in <u> 2 </u> Yokogawa Electric Corporation TOKYO 180-8750 JAPAN *1)				

F9463DA	
No.: FM21ATEX0010X	CE 0344
	☐ Ex db ia IIC T6...T1 Gb
	☐ Ex ia tb IIIC T80°C...T440°C Db
CONTROL DRAWING: DIE0023-A071	
IP66/IP67, Um: 60V DC	
 WARNING AFTER DE-ENERGIZING, DELAY 3 MINUTES BEFORE OPENING. POTENTIAL ELECTROSTATIC CHARGING HAZARD. WHEN THE PROCESS TEMP. IS ≥ 290°C, USE THE HEAT-RESISTING CABLE AND CABLE GLAND ≥ 75°C. READ USER'S MANUAL.	

F0210.ai

- MODEL: Specified model code
- SUFFIX: Suffix codes of the model code
- STYLE: Specified style code
- SUPPLY: Power supply voltage of apparatus
- OUTPUT: Output signal of apparatus
- TAG NO.: Specified TAG No.
- K-FACTOR: Device-specific factor
- RANGE: Specified range
- PS: Fluid pressure of apparatus
- TS.: Fluid temperature of apparatus
- NO.: Manufacturing serial number
- YOKOGAWA  : Name of manufacturer
- Tokyo 180-8750 JAPAN: address of manufacturer *1)
- No.: FM21ATEX0010X: Certificate number
- Ex db ia IIC T6...T1 Gb: Protection type and maximum surface temperature for gas
- Ex ia tb IIIC T80°C...T440°C Db: Protection type and maximum surface temperature for dust
- Control drawing: Specified Control drawing No.
- IP66/67: Enclosure protection code
- Um 60 V DC: Maximum r.m.s. a.c. or d.c. voltage
-  **WARNING**: Warning to apparatus
 - *1) "180-8750" is a zip code which represents the following address: 2-9-32 Nakacho, Musashino-shi, Tokyo Japan
 - *2) The product - producing country
 - *3) Production year/month

2.7 Specific Condition of Use

- Electrostatic charges on the non-metallic parts (excluding glass parts) or coated parts of the equipment shall be avoided.
- Read Section 2.1 for details of temperature ratings.

Integral Flowmeter

Flameproof (Certification Code: KF2)

- Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.
- If the equipment is used as $U_m = 60$ V DC, it must be installed in a SELV (safety extra-low voltage) or PELV (protective extra-low voltage) system, or it must be directly connected to apparatus complying with EN 61010-1 or a technically equivalent standard.
- The equipment shall be installed as overvoltage category I.

Intrinsically Safe (Certification Code: KS2, Communication and I/O Code: JA, JB or JJ)

- When the equipment is mounted in an area where the use of Category 1 G equipment is required, it shall be installed in such a way that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.
- The dielectric strength of 500 V r.m.s. between the intrinsically safe circuit and the enclosure of the equipment is limited, only by the removable surge absorber.

Remote sensor

- When the equipment is mounted in an area where the use of Category 1 G equipment is required, it shall be installed in such a way that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.
- From the safety point of view, the intrinsically safe circuit of the remote sensor shall be assumed to be connected to earth.

Remote transmitter

Flameproof (Certification Code: KF2)

- Flameproof joints are not intended to be repaired. Contact Yokogawa representative or Yokogawa office.
- If the equipment is used as $U_m = 60$ V DC, it must be installed in a SELV (safety extra-low voltage) or PELV (protective extra-low voltage) system, or it must be directly connected to apparatus complying with EN 61010-1 or a technically equivalent standard.
- The equipment shall be installed as overvoltage category I.

Intrinsically Safe (Certification Code: KS2, Communication and I/O Code: JA, JB or JJ)

- When the equipment is mounted in an area where the use of Category 1 G equipment is required, it shall be installed in such a way that, even in the event of rare incidents, an ignition source due to impact and/or friction sparks is excluded.
- The dielectric strength of 500 V r.m.s. between the intrinsically safe circuit of the remote transmitter without the option code /BWC and the enclosure of the equipment is limited, only by the removable surge absorber.

Revision Information

- Title : User's manual
Flowmeter VY Series ATEX Explosion Protection Type
- Manual No. : IM 01F07A03-03EN

Edition	Date	Page	Revised Item
1st	Feb. 2022	—	New Publication
2nd	Aug. 2022	4, 7, 9, 11, 13 12	Added Option code for Dual-Sensor (Welded) Revised Name Plate.