

SAM

Speedy Accuracy Maintainability

Communication Specifications for DeviceNet™

**Digital Mass Flow Controller
1480FX/2480FX/1480G/2480G
DeviceNet™ Series**

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SAM Reserch**

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1. Preface

Thank you for purchasing one of our SAM Mass Flow Controllers: 1480FX/2480FX/1480G/2480G-D (also referred to as an "MFC"). In order to use the product correctly, please make sure the supplied product matches the specifications you wanted by referring to the nameplate on the product. Then read this instruction manual.

2. Precautions for use

- 1) Do not use the MFC in locations exposed to high temperature, high humidity or vibration.
The maximum storage temperature of the MFC is 65°C.
- 2) Make sure your gas type and flow rate match the specification of this MFC.
Use of a gas different from the gas specified for the MFC may cause large deviations in the flow rate. The MFC cannot control the flow rate of some gas types.
- 3) Make sure the installation direction (gas flow direction) is correct. Connecting the MFC backwards may cause it to malfunction.
- 4) There must not be any gas leaks in the plumbing, especially when using gases at very low concentrations.
- 5) Use of gas at excessively high pressures may cause faulty operation of the MFC. Observe the specified operating pressure range for the MFC.
If the MFC is placed under pressure at a level that exceeds its withstand pressure, it may be damaged.
- 6) Use of the MFC at operating temperatures outside the specified range may cause faulty MFC operation. Use the MFC only within the range of 5 to 50°C.
- 7) Do not use contaminated gas. The MFC may become clogged or malfunction.
- 8) If you need to use highly reactive gas, you must first thoroughly purge the plumbing and the MFC itself.
Any residual oxygen or moisture left inside due to insufficient purging can cause a chemical reaction, which can damage the MFC.
- 9) The MFC cannot completely stop the flow of gas itself. If you need to shut off the gas completely, use a separate shut off valve.
- 10) Note that our standard conditions for calibrated flow rates are 0°C and 1 ATM of pressure (SCCM, SLM).
- 11) Make sure the +24 VDC power supply is providing the correct voltage, polarity, and capacity.
Reversed polarity may damage the unit.
The power supply time from zero to full voltage must be 100 ms or less.
If you want to re-supply power after turning the unit off, wait at least 5 seconds.
This device is not designed to handle more than 100,000 on and off power cycles.
- 12) Make sure the MFC is sufficiently warmed up. The MFC needs at least 30 minutes to warm up and stabilize after turning on the power.

3. Connections

1) Connector type

Connector used: DeviceNet™ Male Micro Connector

(CM02-8DR5P-CF (D5) made by DDK or equivalent)

Pin No.	Signal name
1	Drain
2	V+
3	V-
4	CAN_H
5	CAN_L

2) DeviceNet™ communication specifications

Complies with the DeviceNet specification sheets "Volume Release 2.0 Errata 4" and "Volume Release 2.0 Errata 4", issued by ODVA.

4. DeviceNet Configuration

This paragraph describes the names, functions, and operation of each of the LEDs and rotary switches on the MFC.

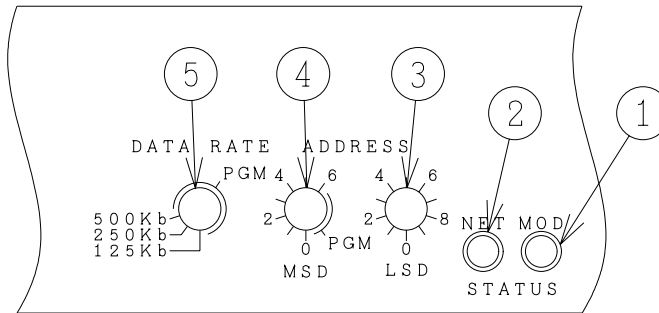


Fig. 1: LEDs and rotary switches on the top of the MFC

LED names

No.	Name
1	Module status
2	Network status

Rotary switch names

No.	Name
3	MacID (LSD)
4	MacID (MSD)
5	Baud rate

4-1. LED

The MFC is equipped with two, 2-color (green/red) LEDs to indicate the module status and network status.

The MFC controls these LEDs according to the module communication status.

The MFC follows the DeviceNet specifications in controlling the LEDs.

Display of the LEDs

Display type	LED	Status	Lighting condition
Module status	Off	No power	The power is off.
	Lit green	Operating normally	The power is on
	Flashes green	Needs adjustment	
	Flashes red	A problem that can be recovered from	- SIO communication error
	Lit red	A problem that cannot be recovered from	- RAM check error - Error during SIO self check
Network status	Off	Off line	
	Flashes green	On line/no connection	Dup_Mac_ID test was OK
	Lit green	On line/connected	A device is allocated to the master station
	Flashes red	Connection time out	I/O connection time out
	Lit red	Communication error	- Dup_Mac_ID test error - Buss OFF occurred
LED test	MOD, NET LEDs flash red/green.		LED test when turning on the power.

4-2. Rotary switch

The MFC is equipped with a switch for setting the communication speed (baud rate) and a switch for setting the MacID.

The MFC reads the settings of the rotary switches when the power is turned on and sets the MacID internally.

Baud rate switch

Rotary switch	Baud rate
0	125 KBaud
1	250 KBaud
2	500 KBaud

If the switch is set to a number greater than "2", the previous baud rate will be reused.

MacID switch

Rotary switch (MSD)	Rotary switch (LSD)
Upper digit (x 10)	Lower digit (x 1)

MacID = Upper digit x 10 + Lower digit

However, the MacID must be between 00 and 63 (decimal). If the switch is set to a number outside this range, the previous value will be reused.

5. Connection example

Fig. 2 below shows some connection examples for establishing DeviceNet communication with the MFC.

For details, see the DeviceNet specification sheets.

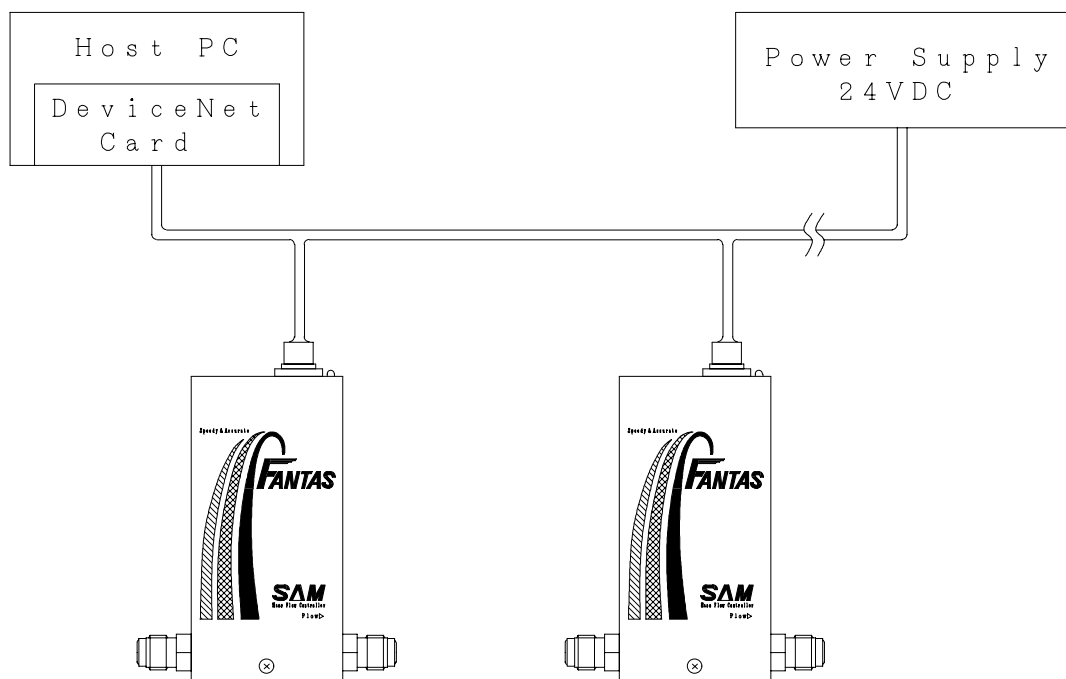
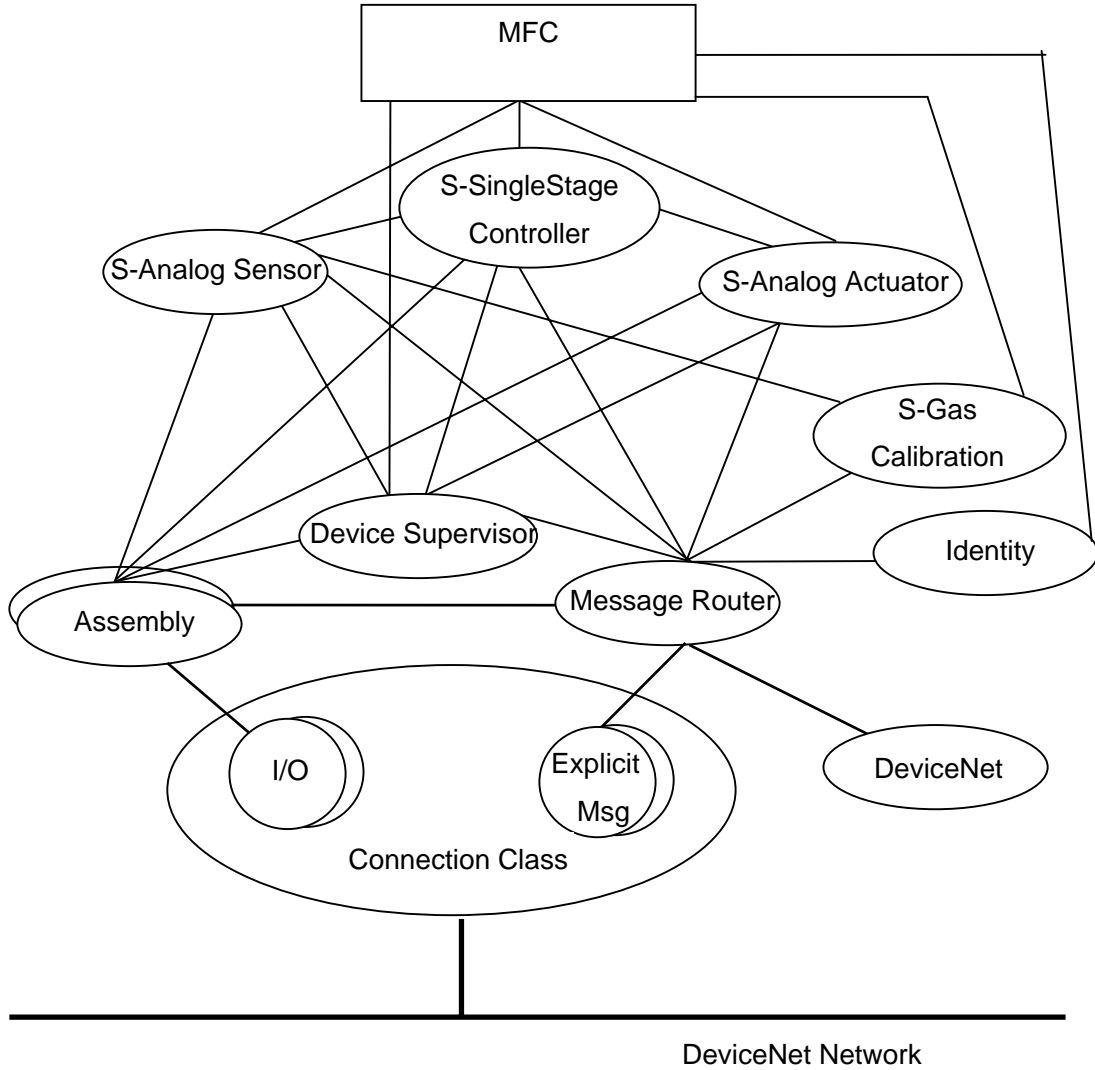


Fig. 2: Connection examples of the MFC that confirm to the DeviceNet communication.

6. Communication function

6-1. Object module

1) MFC device object module



2) Supported messages

Group	Message ID	Type
1	FH	Slave's I/O Poll Response Messages
2	3H	Slave's Explicit Response Messages
	4H	Master's Explicit Request Messages
	5H	Master's I/O Poll Command Messages
	6H	Unconnected Explicit Request Messages
	7H	Duplicate MAC ID Check Message

6-2. Function of each object

1) Identity Object (ClassID: 01hex)

a. Instance: 1

b. Attribute

ID	Need in implementation	Access Rule	Name	Data type	Value
1	Required	Get	Vender ID	UINT	186
2	Required	Get	Device Type	UINT	1Ahex (MFC)
3	Required	Get	Product Code	UINT	01
4	Required	Get	Revision	STRUCT	4.1
			Major Revision	USINT	4
			Minor Revision	USINT	1
5	Required	Get	Status	WORD	DeviceNet specifications
6	Required	Get	Serial Number	UINT	DeviceNet specifications Serial Number
7	Required	Get	Product Name	SHORT-STRING	"SFC1480FX" "SFC2480FX", etc.

c. Service

Service code (Hex)	Need in implementation	Service name
05	Required	Reset
0E	Required	Get_Attribute_Single

2) Message Router Object (Class ID: 02hex)

a. Instance: No

b. Attribute: No

c. Service: No

3) DeviceNet Object (Class ID: 03hex)

a. Instance: 0

b. Attribute

ID	Access Rule	Name	Data type	Value
1	Get	Revision	UINT	02

c. Service

Service code (Hex)	Service name
0E	Get_Attribute_Single

d. Instance: 1

e. Attribute

ID	Access Rule	Name	Data type	Value
1	Get/Set	MAC ID	USINT	0 to 63 (by rotary switch)
2	Get/Set	Baud Rate	USINT	0 to 2 (by rotary switch)
3	Get/Set	BOI	BOOL	DeviceNet specifications
4	Get/Set	Bus-Off Counter	USINT	0 to 255
5	Get	Allocation Information	STRUCT of	DeviceNet specifications
		Allocation Choice byte	BYTE	
		Master's MAC ID	USINT	
6	Get	MAC ID Switch Changed	BOOL	DeviceNet specifications
7	Get	Baud Rate Switch Changed	BOOL	DeviceNet specifications
8	Get	MAC ID Switch Value	USINT	DeviceNet specifications
9	Get	Baud Rate Switch Value	USINT	DeviceNet specifications

f. Service

Service code (Hex)	Service name
0E	Get_Attribute_Single
10	Set_Attribute_Single
4B	Allocate_Master/Slave Connection_Set
4C	Release_Group_2_Identifier_Set

4) Assembly Object (Class ID: 04hex)

The assembly instance of the I/O data can be selected by changing the procedure for Instance 2 of the connected object, or by the consumed connection path when all of the below are satisfied:

- After establishing Exp Msg data,
- Before establishing I/O Msg data.
- The MFC device status is idle

a. Instance

1 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
1						

2 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						

3 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3	Valve Position	S-Analog Actuator	32hex	1	Value	06hex
4						

4 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3	Setpoint	S-Single Stage Controller	33hex	1	Setpoint	06hex
4						

5 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3	Setpoint	S-Single Stage Controller	33hex	1	Setpoint	06hex
4						
5	Valve Position	S-Analog Actuator	32hex	1	Value	06hex
6						

6 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3	Setpoint	S-Single Stage Controller	33hex	1	Setpoint	06hex
4						
5	Valve Override	S-Analog Actuator	32hex	1	Override	05hex
6	Valve Position	S-Analog Actuator	32hex	1	Value	06hex
7						

7 (Type = Output)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Setpoint	S-Single Stage Controller	33hex	1	Setpoint	06hex
1						

8 (Type = Output)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Valve Override	S-Analog Actuator	32hex	1	Override	05hex
1	Setpoint	S-Single Stage Controller	33hex	1	Setpoint	06hex
2						

9 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex

10 (Type=Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Exception Detail Alarm0	Device Supervisor	30hex	1	Exception Detail Alarm	0Dhex
2	Exception Detail Alarm1					
3	Exception Detail Alarm2					
4	Exception Detail Alarm3					
5	Exception Detail Alarm4					
6	Exception Detail Alarm5					
7	Exception Detail Alarm6					

11 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Exception Detail Warning0	Device Supervisor	30hex	1	Exception Detail Warning	0Ehex
2	Exception Detail Warning 1					
3	Exception Detail Warning 2					
4	Exception Detail Warning 3					
5	Exception Detail Warning 4					
6	Exception Detail Warning 5					
7	Exception Detail Warning 6					

12 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Exception Detail Alarm0	Device Supervisor	30hex	1	Exception Detail Alarm	0Dhex
2	Exception Detail Alarm1					
3	Exception Detail Alarm2					
4	Exception Detail Alarm3					
5	Exception Detail Alarm4					
6	Exception Detail Alarm5					
7	Exception Detail Alarm6					
8	Exception Detail Warning0	Device Supervisor	30hex	1	Exception Detail Warning	0Ehex
9	Exception Detail Warning 1					
10	Exception Detail Warning 2					
11	Exception Detail Warning 3					
12	Exception Detail Warning 4					
13	Exception Detail Warning 5					
14	Exception Detail Warning 6					

13(Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
1						
2						
3						

14 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3						
4						

15 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3						
4						
5	Valve Position	S-Analog Actuator	32hex	1	Value	06hex
6						
7						
8						

16 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3						
4						
5	Setpoint	S-SingleStag Controller	33hex	1	Setpoint	06hex
6						
7						
8						

17 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3						
4						
5	Setpoint	S-SingleStag Controller	33hex	1	Setpoint	06hex
6						
7						
8						
9	Valve Position	S-Analog Actuator	32hex	1	Value	06hex
10						
11						
12						

18 (Type = Input)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3						
4						
5	Setpoint	S-SingleStag Controller	33hex	1	Setpoint	06hex
6						
7						
8						
9	Valve Override	S-Analog Actuator	32 hex	1	Override	05hex
10	Valve Position	S-Analog Actuator	32 hex	1	Value	06hex
11						
12						
13						

19 (Type = Output)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Setpoint	S-SingleStage Controller	33 hex	1	Setpoint	06hex
1						
2						
3						

20 (Type = Output)

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Valve Override	S-Analog Actuator	32hex	1	Override	05hex
1	Setpoint	S-SingleStage Controller	33hex	1	Setpoint	06hex
2						
3						
4						

21 (Type = Input) Note: Limited to models with an integrated pressure sensor

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3	Pressure	S-Analog Sensor	31hex	2	Setpoint	06hex
4						
5	Temperature	S-Analog Sensor	31 hex	3	Value	06hex
6						

22 (Type = Input) Note: Limited to models with an integrated pressure sensor

Byte	Data Component Name	Class		Instance No	Attribute	
		Name	No		Name	No
0	Exception Status	Device Supervisor	30hex	1	Exception Status	0Chex
1	Indicated Flow	S-Analog Sensor	31hex	1	Value	06hex
2						
3	Valve position	S-Analog Actuator	32hex	1	Value	06hex
4						
5	Pressure	S-Analog Sensor	31hex	2	Setpoint	06hex
6						
7	Temperature	S-Analog Sensor	31 hex	3	Value	06hex
8						

b. Attribute

ID	Access Rule	Name	Data type	Value
3	Get	Data	ARRAY	Refer to DeviceNet specifications I/O Assembly Data Attribute Map

c. Service

Service code (Hex)	Service name
0E	Get_Attribute_Single

5) Connection Object (ClassID: 05hex)

a. Instance: 1

b. Attribute

ID	Access Rule	Name	Data type	Value
1	Get	State	USINT	DeviceNet specifications
2	Get	Instance type	USINT	00 (Explicit Msg)
3	Get	Transport Class Trigger	BYTE	83h (server, class 3)
4	Get	Produced_Connection_Id	UINT	DeviceNet specifications
5	Get	Consumed_Connection_Id	UINT	DeviceNet specifications
6	Get	Initial_Comm_Characteristics	BYTE	21hex
7	Get	Produced_Connection_Size	UINT	FFFFhex
8	Get	Consumed_Connection_Size	UINT	FFFFhex
9	Get/Set	Expected_Packet_rate	UINT	2500msec
12	Get/Set	Watchdog_Timeout_Action	USINT	1(AutoDelete)
13	Get	Produced_Connection_Path_Length	UINT	0
14	Get	Produced_Connection_Path	ARRAY of USINT	NULL
15	Get	Consumed_Connection_Path_Length	UINT	0
16	Get	Consumed_Connection_Path	ARRAY of USINT	NULL
17	Get	Production_Inhibit_Time	UINT	0

c. Instance: 2

d. Attribute

ID	Access Rule	Name	Data type	Value
1	Get	State	USINT	DeviceNet specifications
2	Get	Instance_type	USINT	01 (I/O Msg)
3	Get	TransportClassTrigger	BYTE	82hex (Server, Class 2)
4	Get	Produced_Connection_Id	UINT	DeviceNet specifications
5	Get	Consumed_Connection_Id	UINT	DeviceNet specifications
6	Get	Initial_Comm_Characteristics	BYTE	01hex
7	Get	Produced_Connection_Size	UINT	1,3,4,5,7,8,9,13,14,15 byte
8	Get	Consumed_Connection_Size	UINT	2,3,4,5 byte
9	Get/Set	Expected_Packet_rate	UINT	0msec
12	Get/Set	Watchdog_Timeout_Action	USINT	0 (TimeOut)
13	Get	Produced_Connection_Path_Length	UINT	6
14	Get/Set	Produced_Connection_Path	ARRAY of USINT	20 04 24 01 30 03 20 04 24 02 30 03 (Default) 20 04 24 03 30 03 20 04 24 04 30 03 20 04 24 05 30 03 20 04 24 06 30 03 20 04 24 09 30 03 20 04 24 0A 30 03 20 04 24 0B 30 03 20 04 24 0C 30 03 20 04 24 0D 30 03 20 04 24 0E 30 03 20 04 24 0F 30 03 20 04 24 10 30 03 20 04 24 11 30 03 20 04 24 12 30 03 20 04 24 15 30 03(Note) 20 04 24 16 30 03(Note)
15	Get	Consumed_Connection_Path_Length	UINT	6
16	Get/Set	Consumed_Connection_Path	ARRAY of USINT	20 04 24 07 30 03 (Default) 20 04 24 08 30 03 20 04 24 13 30 03 20 04 24 14 30 03
17	Get	Production_Inhibit_Time	UINT	0

Note: Limited to models with an integrated pressure sensor.

e. Service

Service code (Hex)	Service name
0E	Get_Attribute_Single
10	Set_Attribute_Single
05	Reset

6) Device Super Visor Object (ClassID: 30hex)

a. Instance:1

b. Attribute

ID	Need in implementation	Access Rule	Name	Data type	Value
3	Required	Get	Manufacturers Device Type	SHORT STRING	DeviceNet specifications
4	Required	Get	SEMI Standard Revision Level	SHORT STRING	"E54-0997"
5	Required	Get	Manufacturers Name	SHORT STRING	"Hitachi Metals, Ltd."
6	Required	Get	Manufacturers Model Number	SHORT STRING	MFC's Model
7	Required	Get	Software Revision Level	SHORT STRING	3.1
8	Required	Get	Hardware Revision Level	SHORT STRING	3.1
9	Optional	Get	Manufacture's Serial Number	SHORT STRING	Serial Number of MFC
11	Required	Get	Device Status	USINT	DeviceNet specifications
12	Required	Get	Exception Status	BYTE	DeviceNet specifications
13	Conditional	Get	Exception Detail Alarm	STRUCT of	DeviceNet specifications
14	Conditional	Get	Exception Detail Warning	STRUCT of	DeviceNet specifications
15	Required	Get/Set	Alarm Enable	BOOL	1: Enable [default] 0: Disable
16	Required	Get/Set	Warning Enable	BOOL	1: Enable [default] 0: Disable

Exception Status format

Data configuration element	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Exception Status	1 (Supports expansion)	Manufacturer Warning	Device Warning	Common Warning	Reserved	Manufacturer Alarm	Device Alarm	Common Alarm

Exception Detail Alarm/ Exception Detail Warning format

Data configuration element	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Common Exception Detail Size	0	0	0	0	0	0	1	0
Common Exception Detail [0]	Reserved	Except internal real time	Reserved	Except RAM	Except EEPROM	Except EPROM	Except micro processor	Except internal diagnosis
Common Exception Detail [1]	Reserved	Except on reset	Notice to vendor	Scheduled maintenance	Power input voltage	Power input voltage	Spare power supply	Current overload
MFC Device Exception Detail Size	0	0	0	0	0	0	1	0
MFC Device Exception Detail [0]	Reserved	Reserved	Value High	Value Low	Flow Control	Flow Height	Flow Low	Reading Valid *
MFC Device Exception Detail [1]	Reserved	Reserved	Reserved	Reserved	Gas Temp High	Gas Temp Low	Pressure High	Pressure Low
Manufacturer Exception Detail Size	0	0	0	0	0	0	0	1
Manufacturer Exception Detail	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Flow rate sensor current error	Flow rate sensor zero point correction error

c. Service

Service code (Hex)	Service name
0E	Get_Attribute_Single
10	Set_Attribute_Single
05	Reset
06	Start
07	Stop
4B	Abort
4C	Recover
4E	Perform_Diagnostics

7) S-ANALOG SENSOR OBJECT (ClassID: 31hex)

a. Instance: 1 (Flow Sensor)

b. Attribute

ID	Need in implementation	Access Rule	Name	Data type	Value	
3	Optional	Get/Set *1	Data Type	USINT	0xC3 = INT [default] 0xCA = REAL	
4	Optional	Get/Set *1	Data Units	UINT	1001hex = Count [default] 1007hex = % 1400hex = SCCM 1401hex = SLM	
5	Required	Get	Reading Valid	BOOL	0 = Invalid 1 = valid	
6	Required	Get	Value	Based on Attribute 3	DeviceNet specifications	
7	Required	Get	Status	BYTE	Bit Details	
					0	High Alarm Exception 0 = Cleared / 1 = Set
					1	Low Alarm Exception 0 = Cleared / 1 = Set
					2	High Warning Exception 0 = Cleared / 1 = Set
3	Low Warning Exception 0 = Cleared / 1 = Set					
8	Optional	Get/Set	Alarm Enable	BOOL	0: Disabled [default] 1: Enabled	
9	Optional	Get/Set	Warning Enable	BOOL	0: Disabled [default] 1: Enabled	
10	Optional	Get	Full Scale	Based on Attribute 3	6000hex Count = [default] (This setting can be changed before the delivery.	
17	Optional	Get/Set	Alarm Trip Point High	Based on Attribute 3	6000hex Count	
18	Optional	Get/Set	Alarm Trip Point Low	Based on Attribute 3	07AEhex Count	
20	Optional	Get/Set	Alarm Settling Time	UINT	5000ms	
21	Optional	Get/Set	Warning Trip Point High	Based on Attribute 3	3000hex Count	
22	Optional	Get/Set	Warning Trip Point Low	Based on Attribute 3	0999hex Count	
24	Optional	Get/Set	Warning Settling Time	UINT	1000ms	
27	Optional	Get/Set	Autozero Enable	BOOL	0: Disabled [default] 1: Enabled	
28	Optional	Get	Autozero Status	BOOL	0: inactive [default] 1: active	
35	Conditional	Get/Set	Gas Calibration Object Instance	UINT	Gas Calibration Instance Number *2	

*1) When the device is idle, and before an I/O connection is established, it supports the Set service. For other conditions, it only supports the Get service.

*2) By selecting the Gas Calibration Instance, the device can change to a gas for which there is an instance of the data Required.

This can even be set while executing a measurement.

c. Instance: 2 (Press Sensor) Note: Limited to devices with an integrated pressure sensor.

d. Attribute

ID	Need in implementation	Access Rule	Name	Data type	Value	
3	Optional	Get/Set *1	Data Type	USINT	0xC3 = INT [default] 0xCA = REAL	
4	Optional	Get/Set *1	Data Units	UINT	1001hex = Count [default] 1300hex = psia 130Ahex = kPa	
6	Required	Get	Value	Based on Attribute 3	DeviceNet specifications	
7	Required	Get	Status	BYTE	Bit Details	
					0	High Alarm Exception 0 = Cleared / 1 = Set
					1	Low Alarm Exception 0 = Cleared / 1 = Set
					2	High Warning Exception 0 = Cleared / 1 = Set
3	Low Warning Exception 0 = Cleared / 1 = Set					
8	Optional	Get/Set	Alarm Enable	BOOL	0: Disabled [default] 1:Enabled	
9	Optional	Get/Set	Warning Enable	BOOL	0: Disabled [default] 1:Enabled	
10	Optional	Get	Full Scale	Based on Attribute 3	6000hex Count = [default] (This setting can be changed before the delivery.)	
17	Optional	Get/Set	Alarm Trip Point High	Based on Attribute 3	6000hex Count	
18	Optional	Get/Set	Alarm Trip Point Low	Based on Attribute 3	07AEhex Count	
20	Optional	Get/Set	Alarm Settling Time	UINT	5000ms	
21	Optional	Get/Set	Warning Trip Point High	Based on Attribute 3	3000hex Count	
22	Optional	Get/Set	Warning Trip Point Low	Based on Attribute 3	0999hex Count	
24	Optional	Get/Set	Warning Settling Time	UINT	1000ms	
28	Optional	Get	Zero Adjust Status	BOOL	0: inactive 1: active	

*1) When the device is idle, and before an I/O connection is established, it supports the Set service. For other conditions, it only supports the Get service.

e. Instance:3 (Temperature Sensor)

f. Attribute

ID	Need in implementation	Access Rule	Name	Data type	Value	
3	Optional	Get/Set *1	Data Type	USINT	0xC3 = INT [default] 0xCA = REAL	
4	Optional	Get/Set *1	Data Units	UINT	1001hex = Count [default] 1200hex = °C 1201hex = °F 1202hex = K	
6	Required	Get	Value	Based on Attribute 3	DeviceNet specifications	
7	Required	Get	Status	BYTE	Bit	Details
					0	High Alarm Exception 0 = Cleared / 1 = Set
					1	Low Alarm Exception 0 = Cleared / 1 = Set
					2	High Warning Exception 0 = Cleared / 1 = Set
3	Low Warning Exception 0 = Cleared / 1 = Set					
8	Optional	Get/Set	Alarm Enable	BOOL	0: Disabled [default] 1: Enabled	
9	Optional	Get/Set	Warning Enable	BOOL	0: Disabled [default] 1: Enabled	
10	Optional	Get	Full Scale	Based on Attribute 3	6000hex Count = [default] (This setting can be changed before the delivery.)	
17	Optional	Get/Set	Alarm Trip Point High	Based on Attribute 3	553Ehex Count	
18	Optional	Get/Set	Alarm Trip Point Low	Based on Attribute 3	4353hex Count	
20	Optional	Get/Set	Alarm Settling Time	UINT	5000ms	
21	Optional	Get/Set	Warning Trip Point High	Based on Attribute 3	52AFhex Count	
22	Optional	Get/Set	Warning Trip Point Low	Based on Attribute 3	449Bhex Count	
24	Optional	Get/Set	Warning Settling Time	UINT	1000ms	

*1) When the device is idle, and before an I/O connection is established, it supports the Set service. For other conditions, it only supports the Get service.

g. Service

ID (Hex)	Need in implementation	Name
0E	Required	Get_Attribute_Single
10	Required	Set_Attribute_Single
4B	Optional	Zero_Adjust

8) S-ANALOG ACTUATOR OBJECT (ClassID: 32hex)

a. Instance: 1

b. Attribute

ID	Need in implementation	Access Rule	Name	Data type	Value	
3	Optional	Get/Set *1	Data Type	USINT	0xC3 = INT [default] 0xCA = REAL	
4	Optional	Get/Set *1	Data Units	UINT	1001hex = Count [default] 1007hex = %	
5	Required	Set	Override	USINT	0 (normal) 1 (off / closed) 2 (on / open) 3 (Hold) 4 (Safe State) See Attribute ID: 21 128 (Parge)	
6	Required	Get	Value	Based on Attribute 3	DeviceNet specifications	
7	Required	Get	Status	BYTE	Bit	Definition
					0	High Alarm Exception 0 = Cleared / 1 = Set
					1	Low Alarm Exception 0 = Cleared / 1 = Set
					2	High Warning Exception 0 = Cleared / 1 = Set
3	Low Warning Exception 0 = Cleared / 1 = Set					
8	Optional	Get/Set	Alarm Enable	BOOL	0: Disabled [default] 1: Enabled	
9	Optional	Get/Set	Warning Enable	BOOL	0: Disabled [default] 1: Enabled	
15	Optional	Get/Set	Alarm Trip Point High	Based on Attribute 3	6000hex Count	
16	Optional	Get/Set	Alarm Trip Point Low	Based on Attribute 3	0000hex Count	
18	Optional	Get/Set	Warning Trip Point High	Based on Attribute 3	6000hex Count	
19	Optional	Get/Set	Warning Trip Point Low	Based on Attribute 3	0000hex Count	
21	Optional	Get/Set *1	Safe State	USINT	0 (off / closed) [default] 1 (on / open)) 2 (Hold Last Value) 3 (Use Safe Value)	
22	Optional	Get/Set	Safe Value	Based on Attribute 3	0000hex Count	
95	Optional	Get	Calibration Pressure	REAL	10132dec(101.32kPa)	

*1) When the device is idle, and before an I/O connection is established, it supports the Set service. For other conditions, it only supports the Get service.

c. Service

ID (Hex)	Need in implementation	Name
0E	Required	Get_Attribute_Single
10	Required	Set_Attribute_Single

9) S-SINGLE STAGE CONTROLLER OBJECT (ClassID: 33hex)

a. Instance: 1

b. Attribute

ID	Need in implementation	Access Rule	Name	Data type	Value	
3	Optional	Get/Set *1	Data Type	USINT	0xC3 = INT [default] 0xCA = REAL	
4	Optional	Get/Set *1	Data Units	UINT	1001hex = Count [default] 1007hex = % 1400hex = SCCM 1401hex = SLM	
6	Required	Get/Set *1	Setpoint	Based on Attribute 3	DeviceNet specifications	
7	Conditional	Get	Process Variable	Based on Attribute 3	DeviceNet specifications	
10	Required	Get	Status *3	BYTE	Bit	Definition
					0	Alarm Exception 0 = Cleared / 1 = Set
					1	Warning Exception 0 = Cleared / 1 = Set
11	Optional	Get/Set	Alarm Enable	BOOL	0: Disabled [default] 1: Enabled	
12	Optional	Get/Set	Warning Enable	BOOL	0: Disabled [default] 1: Enabled	
13	Optional	Get/Set	Alarm Settling Time	UINT	10000ms	
14	Optional	Get/Set	Alarm Error Band	Based on Attribute 3	0999hex Count	
15	Optional	Get/Set	Warning Settling Time	UINT	5000ms	
16	Optional	Get/Set	Warning Error Band	Based on Attribute 3	4CCChex Count	
19	Optional	Get/Set	Ramp Rate	UDINT	DeviceNet specifications Time [msec]	

*1) When the device is idle, and before an I/O connection is established, it supports the Set service. For other conditions, it only supports the Get service.

c. Service

ID (Hex)	Need in implementation	Name
0E	Required	Get_Attribute_Single
10	Required	Set_Attribute_Single

10) S-GAS CALIBRATION OBJECT (ClassID: 34hex)

a. Instance: 1

b. Attribute

ID	Need for mounting	Access Rule	Name	Data type	Value
3	Required	Get	Gas Standard Number *1	UINT	DeviceNet specifications
4	Required	Get	Valid Sensor Instance	UINT	0 = Invalid 1 = valid
5	Optional	Get /Set	Gas Symbol	SHORT STRING	DeviceNet specifications
6	Optional	Get	Full Scale *2	REAL	Amount (Full scale value)
				UINT	Units (gas units)
8	Optional	Get	Calibration Date	DATE	Number of days after January 1, 1972.
9	Optional	Get	Calibration gas Number *1	UINT	DeviceNet specifications
95	Optional	Get	Calibration pressure	REAL	Gas pressure (KiloPascals)

*1) It must be a SEMI E52-100 code.

*2) The amount means the full-scale value shown by the Instance ID.

The unit is the value of the gas unit shown by the Instance ID.

c. Service

ID (Hex)	Need in implementation	Name
0E	Required	Get_Attribute_Single
10	Required	Set_All_Instances
4B	Required	Get_All_Instances

Get_All_Instances Success Response Service Data Field Parameter

Parameter	Request	Name	Data type	Value
Size of List	Required	Size of List	UINT	Number of gas types supported
List of Gas Calibration	Required If size > 0	Supported List	Array of	The List of Calibrations
		Supported Gas Type	STRUCT of	
		S-Gas Calibration Object Instance ID	UINT	
		Gas Standard Number	UINT	
		Valid Sensor Instance	UINT	

7. RAS function

7-1. Self check

- 1) System RAM: Executes a RAM check (writing and reading)
- 2) Watchdog timer: Monitors program malfunction using a WDT (Watchdog Timer)
The WDT time-out period is 129-msec.

7-2. Response when an error occurs

When a network error (Buss OFF) occurs.

When the DeviceNet enters the Buss OFF status, the MFC red LED will light and stop the network communication process.

(When the DeviceNetObject BOI attribute is 0)

8. Maintenance ability

LED display: The LEDs are displayed according to the DeviceNet standard