

## **FnIO M – Series :**

### **M3918, M3928, M3938, M3948**

**M3918 (8 Channels, Differential Current Input, 0~20mA / 4~20mA / -20~20mA, 12bits)**

**M3928 (8 Channels, Differential Voltage Input, 0~10V / 0~5V / -10~10V / -5~5V, 12bits)**

**M3938 (8 Channels, Differential Current Input, 0~20mA / 4~20mA / -20~20mA, 16bits)**

**M3948 (8 Channels, Differential Voltage Input, 0~10V / 0~5V / -10~10V / -5~5V, 16bits)**

## History

REV.	PAGES	REMARKS	DATE	Editor
-		Preliminary	2020/2/10	BS HA
1.01		Image, Torque, Hotswap Function	2020/04/21	CW SEO
1.02		Vibration specification, Product certification changed	2020/04/27	CW SEO
1.03	32-36	Added ATEX certificate	2020/05/07	CW SEO
1.04	31-35	Remove Description pages of Hot Swap Function, Use in Hazardous Environments and Caution(Before using the unit)	2020/12/09	SJ LIM

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## 1. Environment Specification

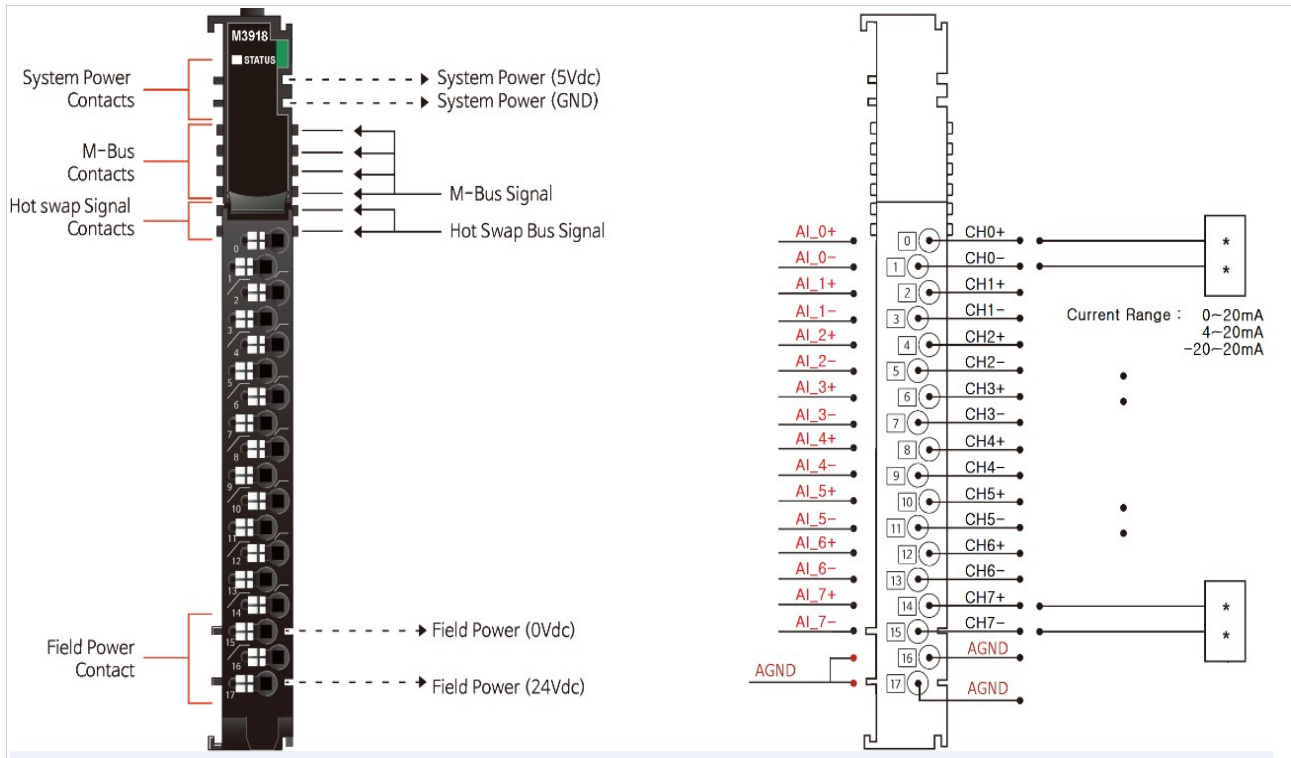
Environmental specification	
Operating Temperature	-25°C~60°C
UL Temperature	-20°C~60°C
Storage Temperature	-40°C~85°C
Relative Humidity	5% ~ 90% non-condensing
Mounting	DIN rail
General specification	
Shock Operating	IEC 60068-2-27
Vibration Resistance	Based on IEC 60068-2-6 DNVGL-CG-0039 : Vibration Class B, 4g
Industrial Emissions	EN 61000-6-4/A11 : 2011
Industrial Immunity	EN 61000-6-2 : 2005
Installation Position	Vertical and horizontal installation is available.
Product Certifications	CE, UL, FCC, ATEX

## 2. M3918 (8 Channels, Differential Current Input, 0~20mA / 4~20mA / -20~20mA, 12bits)

### 2.1. M3918 Specification

Items	Specification
<b>Input Specification</b>	
Inputs Per Module	8 Channels Differential, Non-isolated Between Channels
Indicators	1 Green M bus Status LED
Resolution in Ranges	12 bits : 4.88uA/bit(0~20mA) 12 bits : 3.91uA/bit(4~20mA) 12 bits : 9.77uA/bit(-20~20mA)
Input Range	0~20mA, 4~20mA, -20~20mA
Data Format	16bits Integer (2' compliment)
Module Error	±0.1% Full Scale @ 25°C ±0.3% Full Scale @ -25°C, 60°C
Input Impedance	100Ω
Conversion Time	2.4msec / All channel
Calibration	Not Required
Common Type	2 Common
<b>General Specification</b>	
Power Dissipation	Max. 200mA @ 5Vdc
Isolation	I/O to Logic : DC-DC Isolation Field power : Not Connected
Field Power	Not used Field power bypass to next expansion module
Single Wire	0.205mm <sup>2</sup> - 1.3mm <sup>2</sup> (24-16 AWG)
Torque	0.8Nm(7 lb-in)
Weight	72g
Module Size	12mm x 110mm x 75mm
Hot Swap	Possible
<b>Environment Condition</b>	<b>Refer to 'Environment Specification'</b>

## 2.2. M3918 Wiring Diagram



Pin No.	Signal Description
0	Input Channel 0(+)
1	Input Channel 0(-)
2	Input Channel 1(+)
3	Input Channel 1(-)
4	Input Channel 2(+)
5	Input Channel 2(-)
6	Input Channel 3(+)
7	Input Channel 3(-)
8	Input Channel 4(+)
9	Input Channel 4(-)
10	Input Channel 5(+)
11	Input Channel 5(-)
12	Input Channel 6(+)
13	Input Channel 6(-)
14	Input Channel 7(+)
15	Input Channel 7(-)
16	Input Channel Common(AGND)
17	Input Channel Common(AGND)

Series No	Through Air	Over Surface	CTI
RTB18C	1.5mm	1.5mm	175≤CTI≤400

Spacings : The following minimum spacing in inches(millimeters) shall be maintained between uninsulated live parts of opposite polarity; and between an uninsulated live part and a grounded Part including any mounting surface or exposed metal part.

## 2.3. M3918 LED Indicator

### 2.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
STATUS	M bus Status	Green

### 2.3.2. Channel Status LED

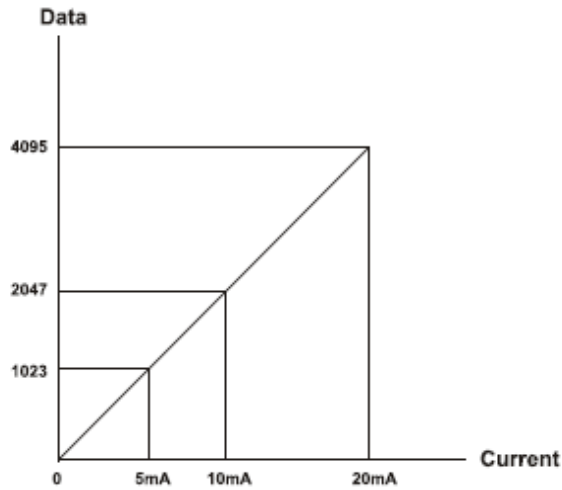
Status	LED	To indicate
M-bus Status	Off	Disconnection
	Green	Connection



## 2.4. Data Value / Current

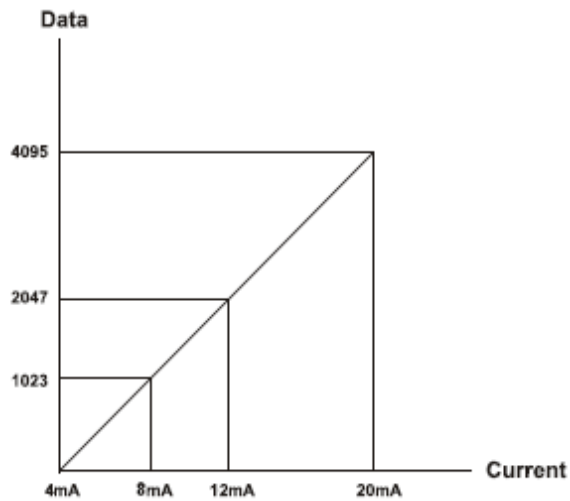
### Current Range : 0~20mA

Current	0.0mA	5.0mA	10.0mA	20.0mA
Data(Hex)	H0000	H03FF	H07FF	H0FFF



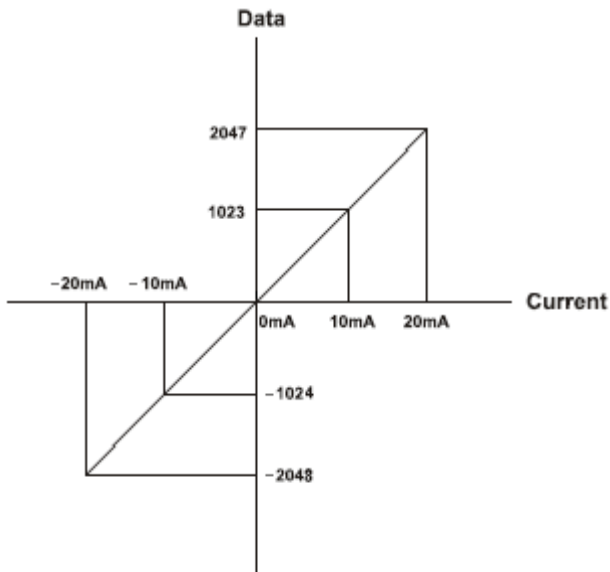
### Current Range : 4~20mA

Current	4.0mA	8.0mA	12.0mA	20.0mA
Data(Hex)	H0000	H03FF	H07FF	H0FFF



## Current Range : -20~20mA

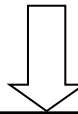
Current	-20.0mA	-10.0mA	0mA	+10.0mA	+20.mA
Data(Hex)	HF800	HFC00	H0000	H03FF	H07FF



## 2.5. Mapping Data into the Image Table

- **Input Module Data**

	Analog Input Ch0
	Analog Input Ch1
	Analog Input Ch2
	Analog Input Ch3
	Analog Input Ch4
	Analog Input Ch5
	Analog Input Ch6
	Analog Input Ch7



- **Input Image Value**

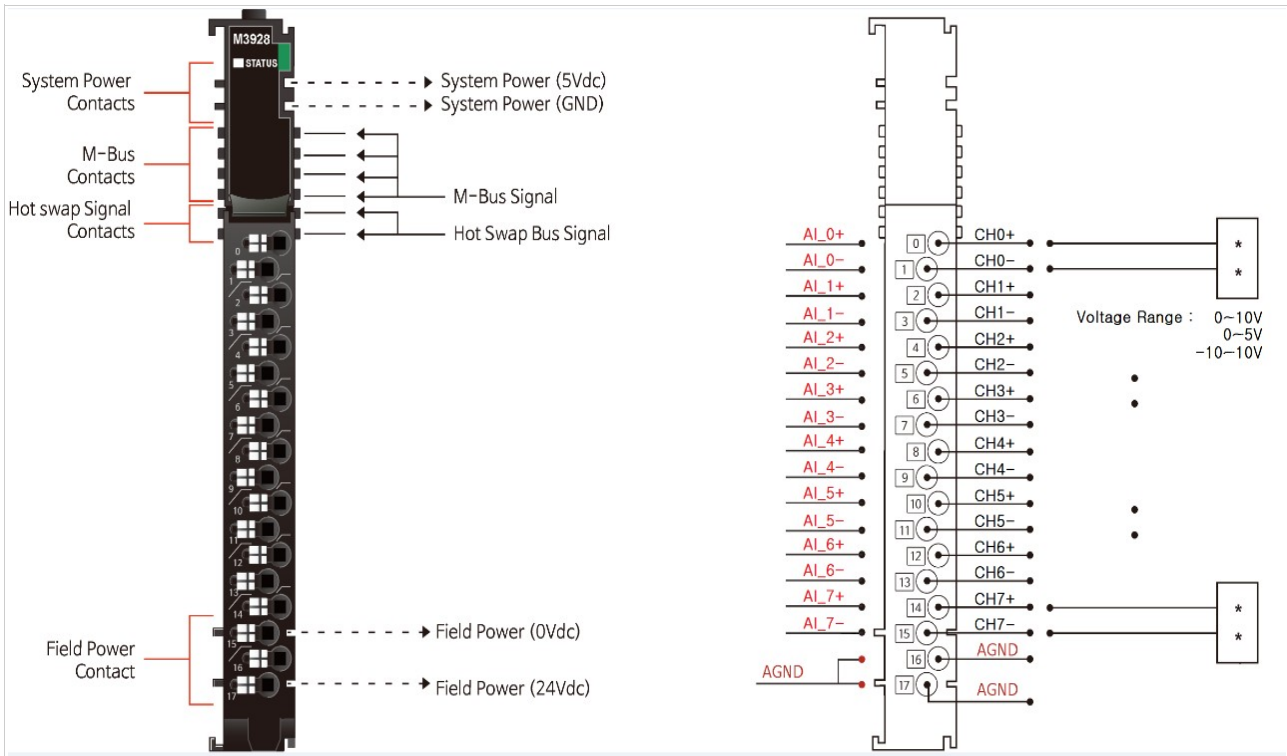
Bit No	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0				Analog Input Ch0 Low byte				
Byte 1				Analog Input Ch0 High byte				
Byte 2				Analog Input Ch1 Low byte				
Byte 3				Analog Input Ch1 High byte				
Byte 4				Analog Input Ch2 Low byte				
Byte 5				Analog Input Ch2 High byte				
Byte 6				Analog Input Ch3 Low byte				
Byte 7				Analog Input Ch3 High byte				
Byte 8				Analog Input Ch4 Low byte				
Byte 9				Analog Input Ch4 High byte				
Byte 10				Analog Input Ch5 Low byte				
Byte 11				Analog Input Ch5 High byte				
Byte 12				Analog Input Ch6 Low byte				
Byte 13				Analog Input Ch6 High byte				
Byte 14				Analog Input Ch7 Low byte				
Byte 15				Analog Input Ch7 High byte				

### 3. M3928 (8 Channels, Differential Voltage Input, 0~10V / 0~5V / -10~10V / -5~5V, 12bits)

#### 3.1. M3928 Specification

Items	Specification
<b>Input Specification</b>	
Inputs Per Module	8 Channels Differential, Non-isolated Between Channels
Indicators	1 Green M bus Status LED
Resolution in Ranges	12 bits : 2.44mV/Bit(0~10V) 12 bits : 1.22mV/Bit(0~5V) 12 bits : 4.88mV/Bit(-10~10V) 12 bits : 2.44mV/Bit(-5~5V)
Input Range	0~10Vdc, 0~5Vdc, -10~10Vdc, -5~5Vdc
Data Format	16bits Integer (2' compliment)
Module Error	±0.1% Full Scale @ 25°C ±0.3% Full Scale @ -25°C, 60°C
Input Impedance	667kΩ
Conversion Time	<2.2msec / All channel
Calibration	Not Required
Common Type	2 Common
<b>General Specification</b>	
Power Dissipation	Max. 200mA @ 5Vdc
Isolation	I/O to Logic : DC-DC Isolation Field power : Not Connected
Field Power	Not used Field power bypass to next expansion module
Single Wire	0.205mm <sup>2</sup> - 1.3mm <sup>2</sup> (24-16 AWG)
Torque	0.8Nm(7 lb-in)
Weight	72g
Module Size	12mm x 110mm x 75mm
Hot Swap	Possible
<b>Environment Condition</b>	<b>Refer to 'Environment Specification'</b>

### 3.2. M3928 Wiring Diagram



Pin No.	Signal Description
0	Input Channel 0(+)
1	Input Channel 0(-)
2	Input Channel 1(+)
3	Input Channel 1(-)
4	Input Channel 2(+)
5	Input Channel 2(-)
6	Input Channel 3(+)
7	Input Channel 3(-)
8	Input Channel 4(+)
9	Input Channel 4(-)
10	Input Channel 5(+)
11	Input Channel 5(-)
12	Input Channel 6(+)
13	Input Channel 6(-)
14	Input Channel 7(+)
15	Input Channel 7(-)
16	Input Channel Common(AGND)
17	Input Channel Common(AGND)

Series No	Through Air	Over Surface	CTI
RTB18C	1.5mm	1.5mm	175≤CTI≤400

Spacings : The following minimum spacing in inches (millimeters) shall be maintained between uninsulated live parts of opposite polarity; and between an uninsulated live part and a grounded part including any mounting surface or exposed metal part.

## 3.3. M3928 LED Indicator

### 3.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
STATUS	M bus Status	Green

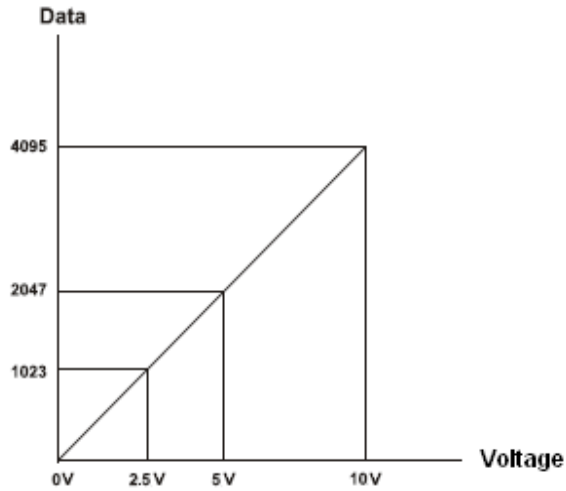
### 3.3.2. Channel Status LED

Status	LED	To indicate
M-bus Status	Off	Disconnection
	Green	Connection

## 3.4. Data Value / Voltage

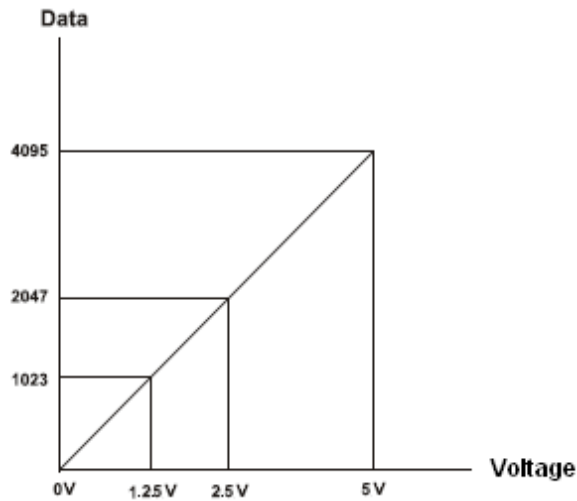
### Voltage Range : 0~10V

Voltage	0V	2.5V	5.0V	10.0V
Data(Hex)	H0000	H03FF	H07FF	H0FFF



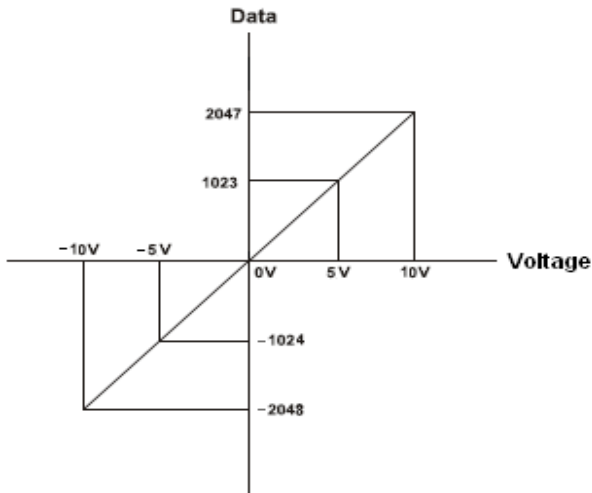
### Voltage Range : 0~5V

Current	0V	1.25V	2.5V	5.0V
Data(Hex)	H0000	H03FF	H07FF	H0FFF



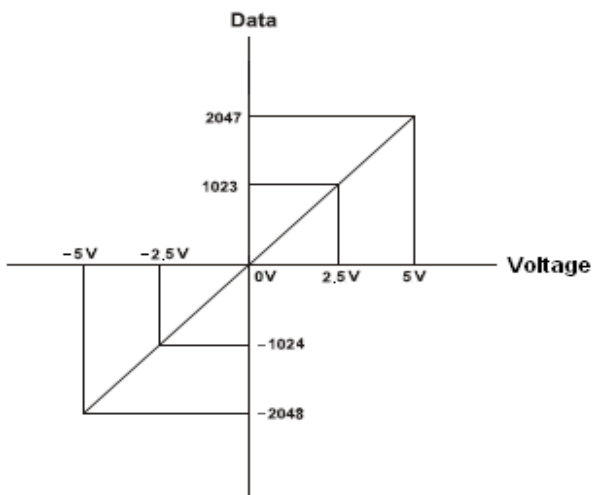
### Voltage Range : -10~10V

Current	-10V	-5V	0V	5.0V	10.0V
Data(Hex)	HF800	HFC00	H0000	H03FF	H07FF



### Voltage Range : -5~5V

Current	-5V	-2.5V	0V	2.5V	5.0V
Data(Hex)	HF800	HFC00	H0000	H03FF	H07FF

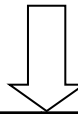




## 3.5. Mapping Data into the Image Table

- **Input Module Data**

	Analog Input Ch0
	Analog Input Ch1
	Analog Input Ch2
	Analog Input Ch3
	Analog Input Ch4
	Analog Input Ch5
	Analog Input Ch6
	Analog Input Ch7



- **Input Image Value**

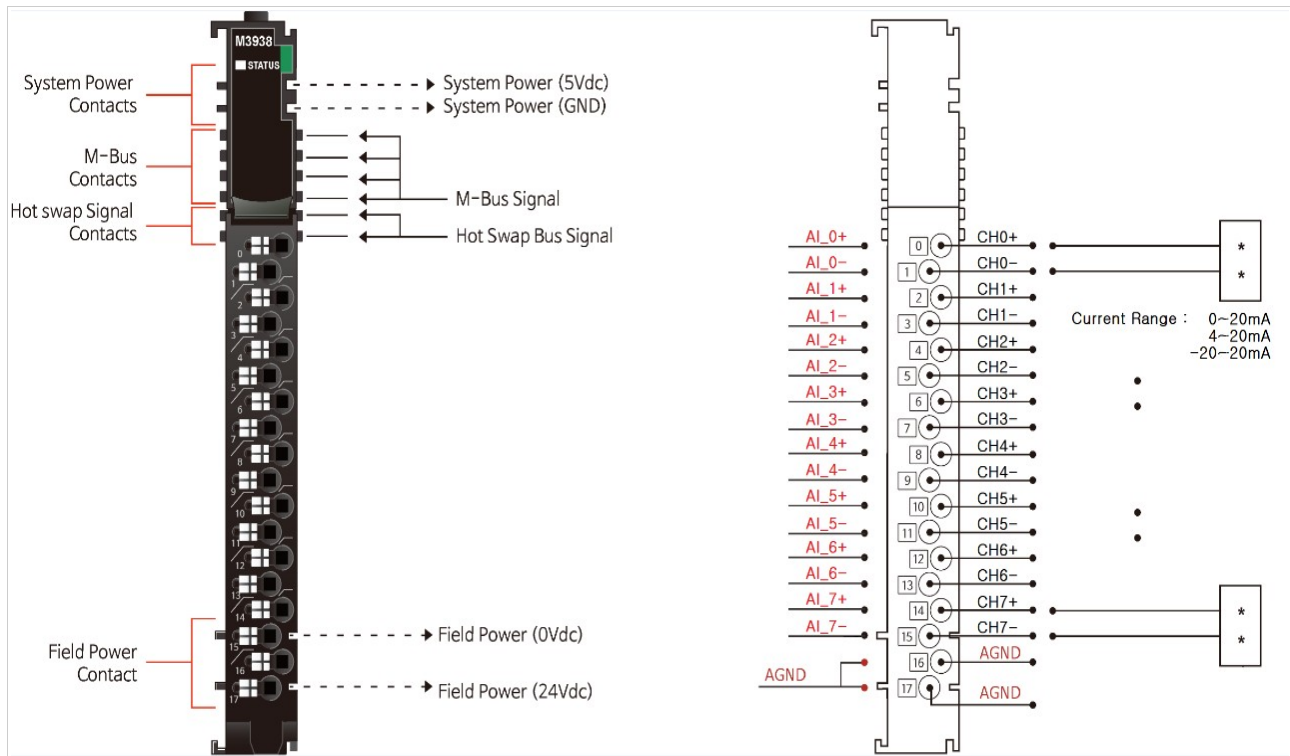
Bit No	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0				Analog Input Ch0 Low byte				
Byte 1				Analog Input Ch0 High byte				
Byte 2				Analog Input Ch1 Low byte				
Byte 3				Analog Input Ch1 High byte				
Byte 4				Analog Input Ch2 Low byte				
Byte 5				Analog Input Ch2 High byte				
Byte 6				Analog Input Ch3 Low byte				
Byte 7				Analog Input Ch3 High byte				
Byte 8				Analog Input Ch4 Low byte				
Byte 9				Analog Input Ch4 High byte				
Byte 10				Analog Input Ch5 Low byte				
Byte 11				Analog Input Ch5 High byte				
Byte 12				Analog Input Ch6 Low byte				
Byte 13				Analog Input Ch6 High byte				
Byte 14				Analog Input Ch7 Low byte				
Byte 15				Analog Input Ch7 High byte				

## 4. M3938 (8 Channels, Differential Current Input, 0~20mA / 4~20mA / -20~20mA, 16bits)

### 4.1. M3938 Specification

Items	Specification
<b>Input Specification</b>	
Inputs Per Module	8 Channels Differential, Non-isolated Between Channels
Indicators	1 Green M bus Status LED
Resolution in Ranges	16bit(Include Sign) 15 bits : 0.61uA/Bit(0~20mA) 15 bits : 0.49uA/Bit(4~20mA) 15bit(Include Sign) 15 bits : 1.22uA/Bit(-20~20mA)
Input Range	0~20mA, 4~20mA, -20~20mA
Data Format	16bits Integer (2' compliment)
Module Error	±0.1% Full Scale @ 25°C ±0.3% Full Scale @ -25°C, 60°C
Input Impedance	100Ω
Conversion Time	<2.4msec / All channel
Calibration	Not Required
Common Type	1 Common
<b>General Specification</b>	
Power Dissipation	Max. 200mA @ 5Vdc
Isolation	I/O to Logic : DC-DC Isolation Field power : Not Connected
Field Power	Not used Field power bypass to next expansion module
Single Wire	0.205mm <sup>2</sup> - 1.3mm <sup>2</sup> (24-16 AWG)
Torque	0.8Nm(7 lb-in)
Weight	72g
Module Size	12mm x 110mm x 75mm
Hot Swap	Possible
<b>Environment Condition</b>	<b>Refer to 'Environment Specification'</b>

## 4.2. M3938 Wiring Diagram



Pin No.	Signal Description
0	Input Channel 0(+)
1	Input Channel 0(-)
2	Input Channel 1(+)
3	Input Channel 1(-)
4	Input Channel 2(+)
5	Input Channel 2(-)
6	Input Channel 3(+)
7	Input Channel 3(-)
8	Input Channel 4(+)
9	Input Channel 4(-)
10	Input Channel 5(+)
11	Input Channel 5(-)
12	Input Channel 6(+)
13	Input Channel 6(-)
14	Input Channel 7(+)
15	Input Channel 7(-)
16	Input Channel Common(AGND)
17	Input Channel Common(AGND)

Series No	Through Air	Over Surface	CTI
RTB18C	1.5mm	1.5mm	175≤CTI≤400

Spacings : The following minimum spacing in inches(millimeters) shall be maintained between uninsulated live parts of opposite polarity; and between an uninsulated live part and a grounded Part including any mounting surface or exposed metal part.

## 4.3. M3938 LED Indicator

### 4.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
STATUS	Status LED	Green

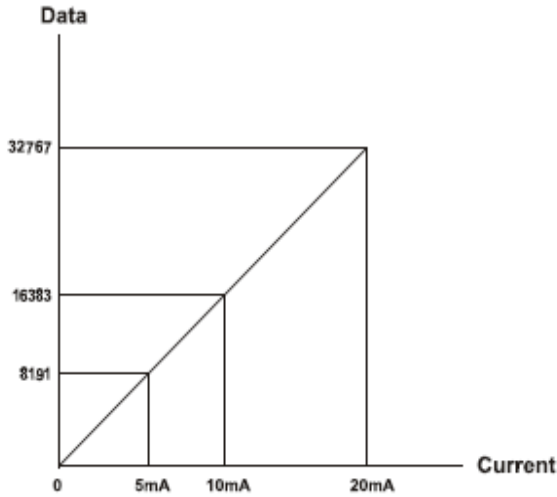
### 4.3.2. Channel Status LED

Status	LED	To indicate
M-bus Status	Off	Disconnection
	Green	Connection

#### 4.4. Data Value / Current

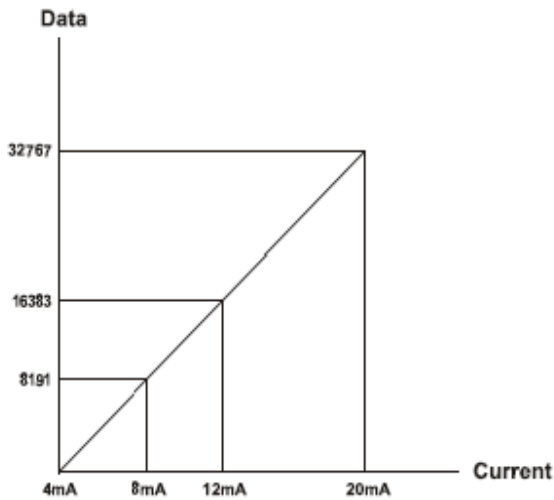
##### Current Range : 0~20mA

Current	0.0mA	5.0mA	10.0mA	20.0mA
Data(Hex)	H0000	H1FFF	H3FFF	H7FFF



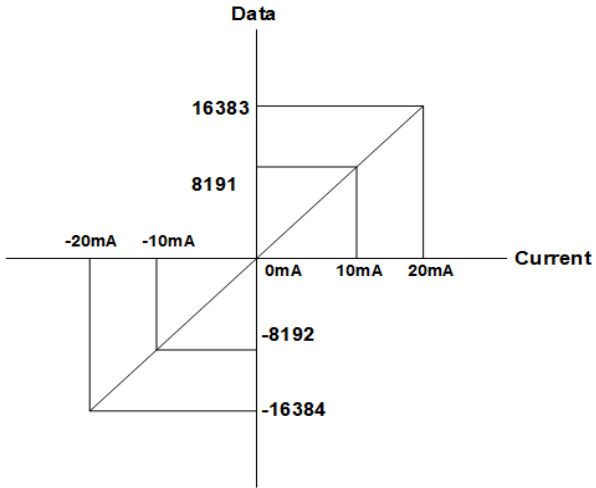
##### Current Range : 4~20mA

Current	4.0mA	8.0mA	12.0mA	20.0mA
Data(Hex)	H0000	H1FFF	H3FFF	H7FFF



## Current Range : -20~20mA

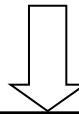
Current	-20.0mA	-10.0mA	0mA	+10.0mA	+20.mA
Data(Hex)	HC000	HE000	H0000	H1FFF	H3FFF



## 4.5. Mapping Data into the Image Table

- **Input Module Data**

	Analog Input Ch0
	Analog Input Ch1
	Analog Input Ch2
	Analog Input Ch3
	Analog Input Ch4
	Analog Input Ch5
	Analog Input Ch6
	Analog Input Ch7



- **Input Image Value**

Bit No	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0				Analog Input Ch0 Low byte				
Byte 1				Analog Input Ch0 High byte				
Byte 2				Analog Input Ch1 Low byte				
Byte 3				Analog Input Ch1 High byte				
Byte 4				Analog Input Ch2 Low byte				
Byte 5				Analog Input Ch2 High byte				
Byte 6				Analog Input Ch3 Low byte				
Byte 7				Analog Input Ch3 High byte				
Byte 8				Analog Input Ch4 Low byte				
Byte 9				Analog Input Ch4 High byte				
Byte 10				Analog Input Ch5 Low byte				
Byte 11				Analog Input Ch5 High byte				
Byte 12				Analog Input Ch6 Low byte				
Byte 13				Analog Input Ch6 High byte				
Byte 14				Analog Input Ch7 Low byte				
Byte 15				Analog Input Ch7 High byte				

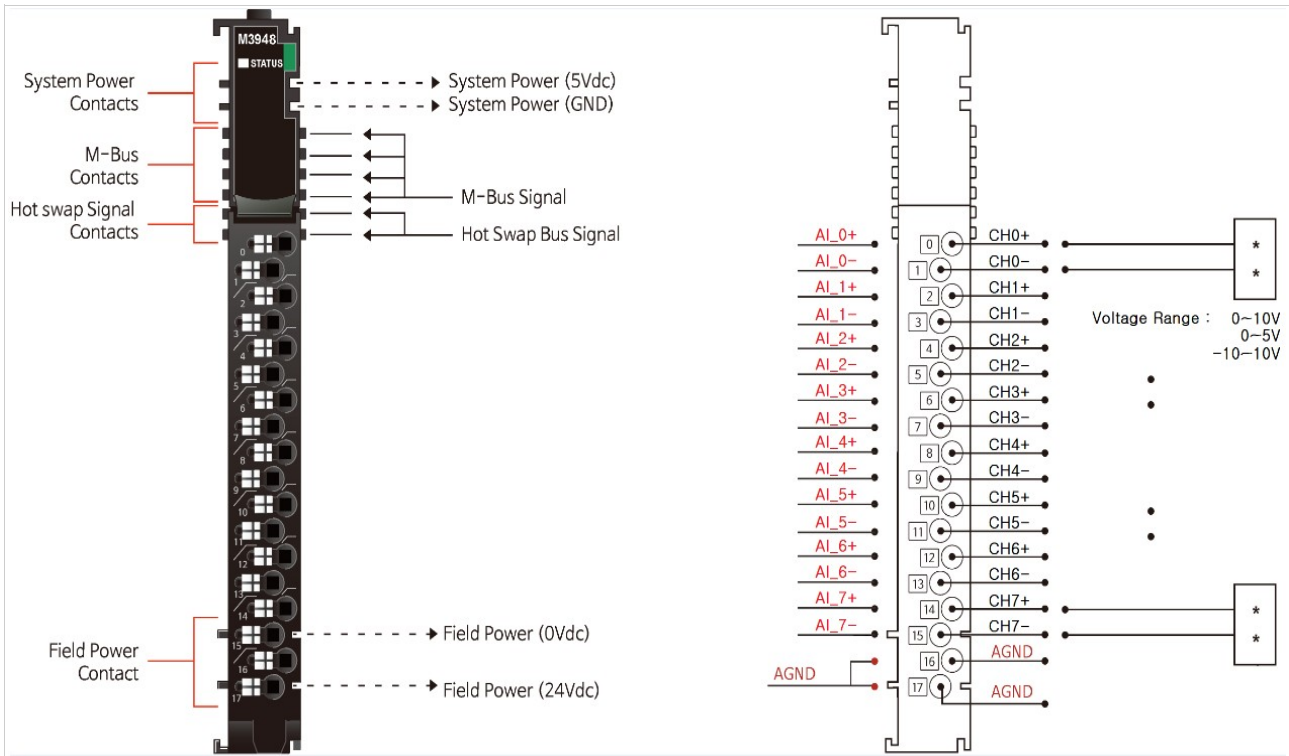
## 5. M3948 (8 Channels, Differential Voltage Input, 0~10V / 0~5V / -10~10V / -5~5V, 16bits)

### 5.1. M3948 Specification

Items	Specification
<b>Input Specification</b>	
Inputs Per Module	8 Channels Differential, Non-isolated Between Channels
Indicators	1 Green M bus Status LED
Resolution in Ranges	16bit(Include Sign) 15 bits : 0.31mV/Bit(0~10V) 15 bits : 0.15mV/Bit(0~5V) 15bit(Include Sign) 15 bits : 0.61mV/Bit(-10~10V) 15 bits : 0.31mV/Bit(-5~5V)
Input Range	0~10Vdc, 0~5Vdc, -10~10Vdc, -5~5Vdc
Data Format	16bits Integer (2' compliment)
Module Error	±0.1% Full Scale @ 25°C ±0.3% Full Scale @ -25°C, 60°C
Input Impedance	667kΩ
Conversion Time	<2.5msec / All channel
Calibration	Not Required
Common Type	2 Common
<b>General Specification</b>	
Power Dissipation	Max. 200mA @ 5Vdc
Isolation	I/O to Logic : DC-DC Isolation Field power : Not Connected
Field Power	Not used Field power bypass to next expansion module
Single Wire	0.205mm <sup>2</sup> - 1.3mm <sup>2</sup> (24-16 AWG)
Torque	0.8Nm(7 lb-in)
Weight	72g
Module Size	12mm x 110mm x 75mm
Hot Swap	Possible
<b>Environment Condition</b>	<b>Refer to 'Environment Specification'</b>



## 5.2. M3948 Wiring Diagram



Pin No.	Signal Description
0	Input Channel 0(+)
1	Input Channel 0(-)
2	Input Channel 1(+)
3	Input Channel 1(-)
4	Input Channel 2(+)
5	Input Channel 2(-)
6	Input Channel 3(+)
7	Input Channel 3(-)
8	Input Channel 4(+)
9	Input Channel 4(-)
10	Input Channel 5(+)
11	Input Channel 5(-)
12	Input Channel 6(+)
13	Input Channel 6(-)
14	Input Channel 7(+)
15	Input Channel 7(-)
16	Input Channel Common(AGND)
17	Input Channel Common(AGND)

Series No	Through Air	Over Surface	CTI
RTB18C	1.5mm	1.5mm	175≤CTI≤400

Spacings : The following minimum spacing in inches (millimeters) shall be maintained between uninsulated live parts of opposite polarity; and between an uninsulated live part and a grounded part including any mounting surface or exposed metal part.

## 5.3. M3948 LED Indicator

### 5.3.1. LED Indicator



LED No.	LED Function / Description	LED Color
STATUS	Status LED	Green

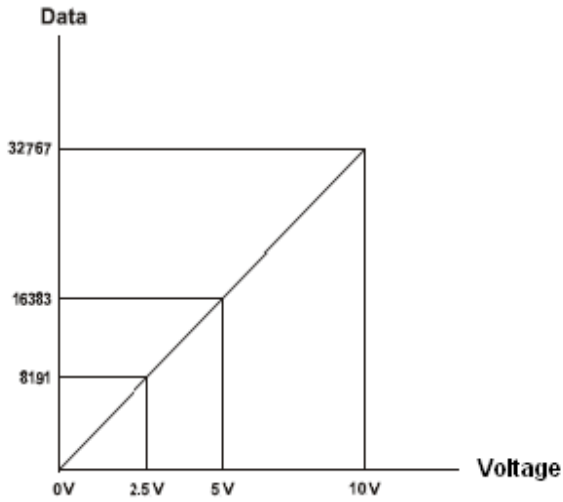
### 5.3.2. Channel Status LED

Status	LED	To indicate
M-bus Status	Off	Disconnection
	Green	Connection

### 5.4. Data Value / Voltage

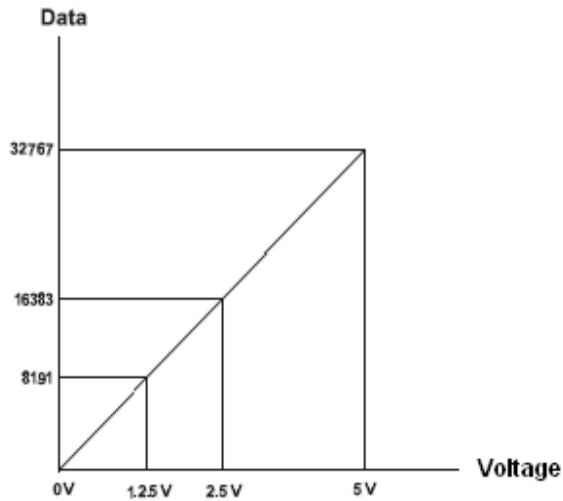
#### Voltage Range : 0~10V

Voltage	0V	2.5V	5.0V	10.0V
Data(Hex)	H0000	H1FFF	H3FFF	H7FFF



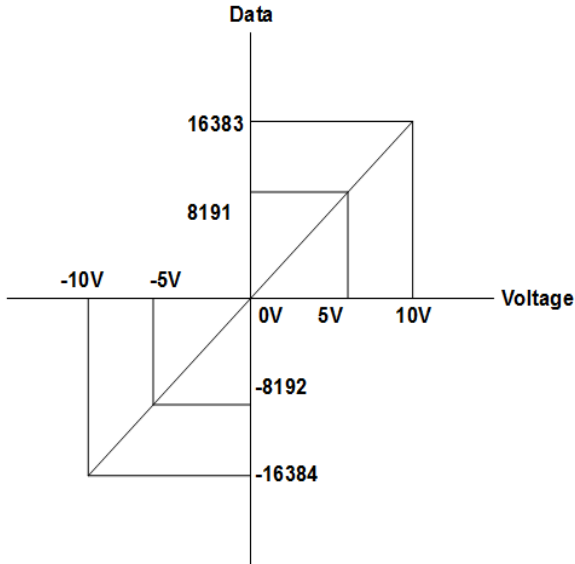
#### Voltage Range : 0~5V

Current	0V	1.25V	2.5V	5.0V
Data(Hex)	H0000	H1FFF	H3FFF	H7FFF



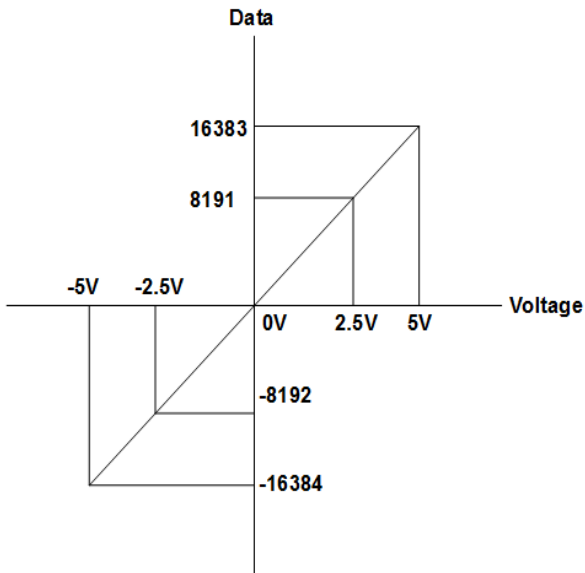
### Voltage Range : -10~10V

Current	-10V	-5V	0V	5.0V	10.0V
Data(Hex)	HC000	HE000	H0000	H1FFF	H3FFF



### Voltage Range : -5~5V

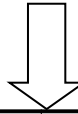
Current	-5V	-2.5V	0V	2.5V	5.0V
Data(Hex)	HC000	HE000	H0000	H1FFF	H3FFF



## 5.5. Mapping Data into the Image Table

- **Input Module Data**

	Analog Input Ch0
	Analog Input Ch1
	Analog Input Ch2
	Analog Input Ch3
	Analog Input Ch4
	Analog Input Ch5
	Analog Input Ch6
	Analog Input Ch7



- **Input Image Value**

Bit No	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Byte 0				Analog Input Ch0 Low byte				
Byte 1				Analog Input Ch0 High byte				
Byte 2				Analog Input Ch1 Low byte				
Byte 3				Analog Input Ch1 High byte				
Byte 4				Analog Input Ch2 Low byte				
Byte 5				Analog Input Ch2 High byte				
Byte 6				Analog Input Ch3 Low byte				
Byte 7				Analog Input Ch3 High byte				
Byte 8				Analog Input Ch4 Low byte				
Byte 9				Analog Input Ch4 High byte				
Byte 10				Analog Input Ch5 Low byte				
Byte 11				Analog Input Ch5 High byte				
Byte 12				Analog Input Ch6 Low byte				
Byte 13				Analog Input Ch6 High byte				
Byte 14				Analog Input Ch7 Low byte				
Byte 15				Analog Input Ch7 High byte				

## 6. Input Range Setting & Conversion Time Setting

### 6.1. M3918, M3938

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Ch#0 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
1	Ch#1 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
2	Ch#2 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
3	Ch#3 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
4	Ch#4 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
5	Ch#5 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
6	Ch#6 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
7	Ch#7 Command(H00 : 0~20mA, H01 : 4~20mA, H02 : -20~20mA)							
8	Filter Time(H00 : Default Filter(20), H01 : Fastest ~ H3E : Slowest)							
9	Reserve							

\* ID\_PARAMETER (10Byte)

### 6.2. M3928, M3948

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Ch#0 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
1	Ch#1 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
2	Ch#2 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
3	Ch#3 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
4	Ch#4 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
5	Ch#5 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
6	Ch#6 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
7	Ch#7 Command(H00 : 0~10V, H01 : 0~5V, H02 : -10~10V, H03 : -5~5V)							
8	Filter Time(H00 : Default Filter(20), H01 : Fastest ~ H3E : Slowest)							
9	Reserve							

\* ID\_PARAMETER (10Byte)