

# RTD and TC Input Module

(Only used the NA-9112)

**ST-3714      ST-3734**  
**ST-3814      ST-3834**

**User Manual**



Version 1.03

**2013 CREVIS Co.,Ltd**

DOCUMENT CHANGE SUMMARY				
REV	PAGE	REMARKS	DATE	EDITOR
1.0	New Document		2012/2/10	JE KANG
1.01		Changed image	2012/2/13	JE KANG
		Add the certificate RoHS	2012/3/21	JE KANG
1.02		Changed Crevis TEL	2013/4/4	JE KANG
1.03		Environment Spec. 50°C→55°C (UL Temp)	2013/7/3	JE KANG

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## 1. Important Notes

Solid state equipment has operational characteristics differing from those of electromechanical equipment.

Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls describes some important differences between solid state equipment and hard-wired electromechanical devices.

Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will CREVIS be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, CREVIS cannot assume responsibility or liability for actual use based on the examples and diagrams.

### Warning!



- ✓ **If you don't follow the directions, it could cause a personal injury, damage to the equipment or explosion**
- Do not assemble the products and wire with power applied to the system. Else it may cause an electric arc, which can result into unexpected and potentially dangerous action by field devices. Arching is explosion risk in hazardous locations. Be sure that the area is non-hazardous or remove system power appropriately before assembling or wiring the modules.
- Do not touch any terminal blocks or IO modules when system is running. Else it may cause the unit to an electric shock or malfunction.
- Keep away from the strange metallic materials not related to the unit and wiring works should be controlled by the electric expert engineer. Else it may cause the unit to a fire, electric shock or malfunction.

### Caution!


- ✓ **If you disobey the instructions, there may be possibility of personal injury, damage to equipment or explosion. Please follow below Instructions.**
- Check the rated voltage and terminal array before wiring. Avoid the circumstances over 55°C of temperature. Avoid placing it directly in the sunlight.
- Avoid the place under circumstances over 85% of humidity.
- Do not place Modules near by the inflammable material. Else it may cause a fire.
- Do not permit any vibration approaching it directly.
- Go through module specification carefully, ensure inputs, output connections are made with the specifications. Use standard cables for wiring.
- Use Product under pollution degree 2 environment.

## 1.1. Safety Instruction

### 1.1.1. Symbols

<p><b>DANGER</b></p> 	<p>Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death property damage, or economic loss</p>
<p><b>IMPORTANT</b></p>	<p>Identifies information that is critical for successful application and understanding of the product</p>
<p><b>ATTENTION</b></p> 	<p>Identifies information about practices or circumstances that can lead to personal Injury, property damage, or economic loss.</p> <p>Attentions help you to identity a hazard, avoid a hazard, and recognize the consequences</p>

### 1.1.2. Safety Notes

<p><b>DANGER</b></p> 	<p>The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. FnBUS Pin.</p>
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### 1.1.3. Certification

c-UL-us UL Listed Industrial Control Equipment, certified for U.S. and Canada

See UL File E235505

FCC

CE Certificate

EN 61000-6-2; Industrial Immunity

EN 61000-6-4; Industrial Emissions

RoHS (EU, CHINA)

## 2. RTD and TC MODULE LIST

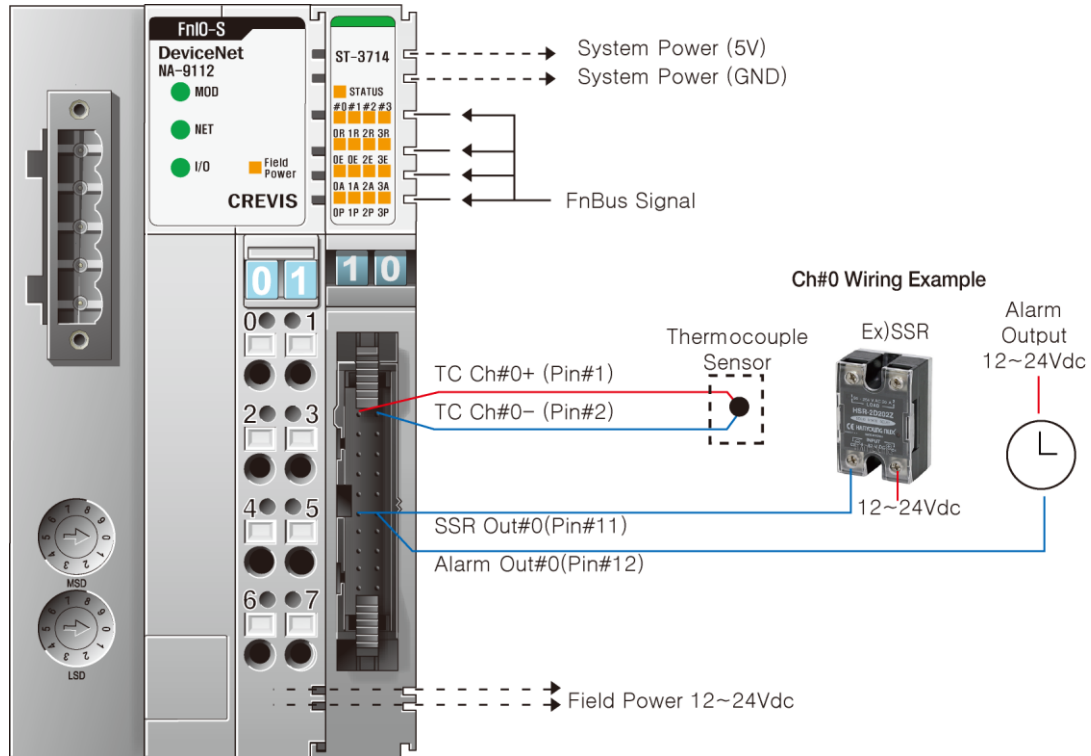
ST-Number	Description	ID(hex)	Production Status
ST-3714	4 Channels, TEMP. Controller, RTD Input, SSR Output		Active
ST-3734	4 Channels, TEMP. Controller, RTD Input, Current Output		Active
ST-3814	4 Channels, TEMP. Controller, TC Input, SSR Output		Active
ST-3834	4 Channels, TEMP. Controller, TC Input, Current Output		Active

\*ST-3714, ST-3734, ST-3814, ST-3834 : Only used the DeviceNet network Adapter(NA-9112)

### 3. Specification

#### 3.1. The Interface and data

##### 3.1.1. ST-3714



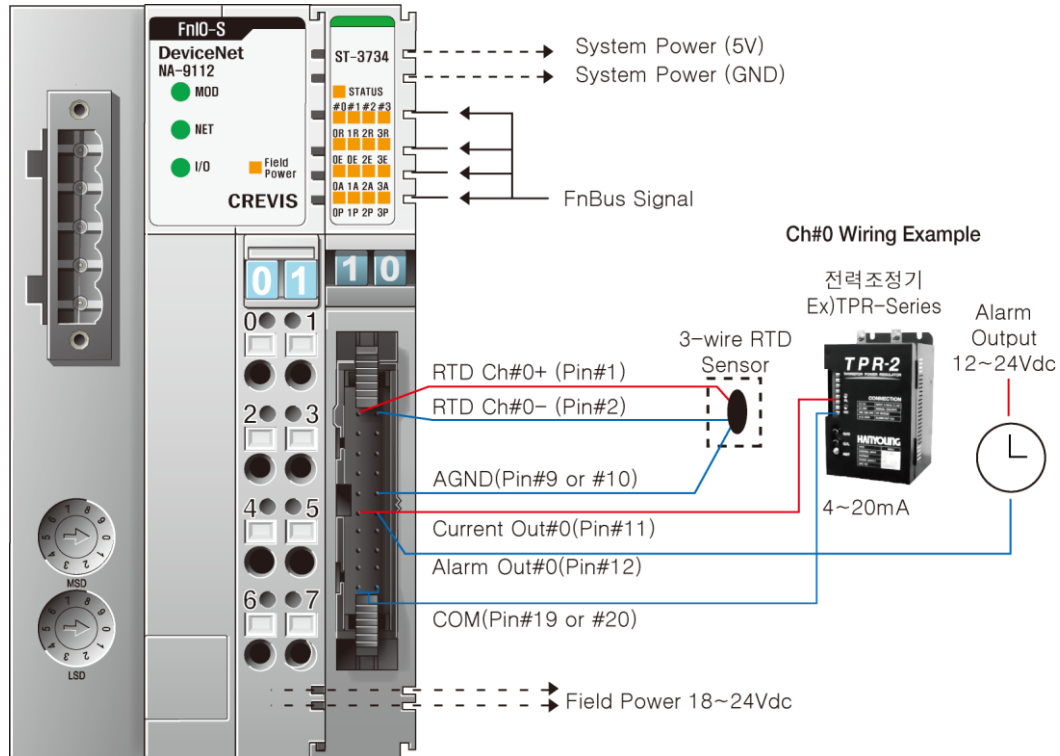
Pin No.	Description	Pin No.	Description
1	RTD Ch#0+	2	RTD Ch#0-
3	RTD Ch#1+	4	RTD Ch#1-
5	RTD Ch#2+	6	RTD Ch#2-
7	RTD Ch#3+	8	RTD Ch#3-
9	AGND	10	AGND
11	SSR Out Ch#0	2	Alarm Out Ch#0
13	SSR Out Ch#1	4	Alarm Out Ch#1
15	SSR Out Ch#2	6	Alarm Out Ch#2
17	SSR Out Ch#3	8	Alarm Out Ch#3
19	COM	20	COM

\* SSR Output and Alarm Output are Sink DC-Output (0.3A/1Output).

\* COM is Field Power (0V) for SSR Output and Alarm Output.



## 3.1.2. ST-3734

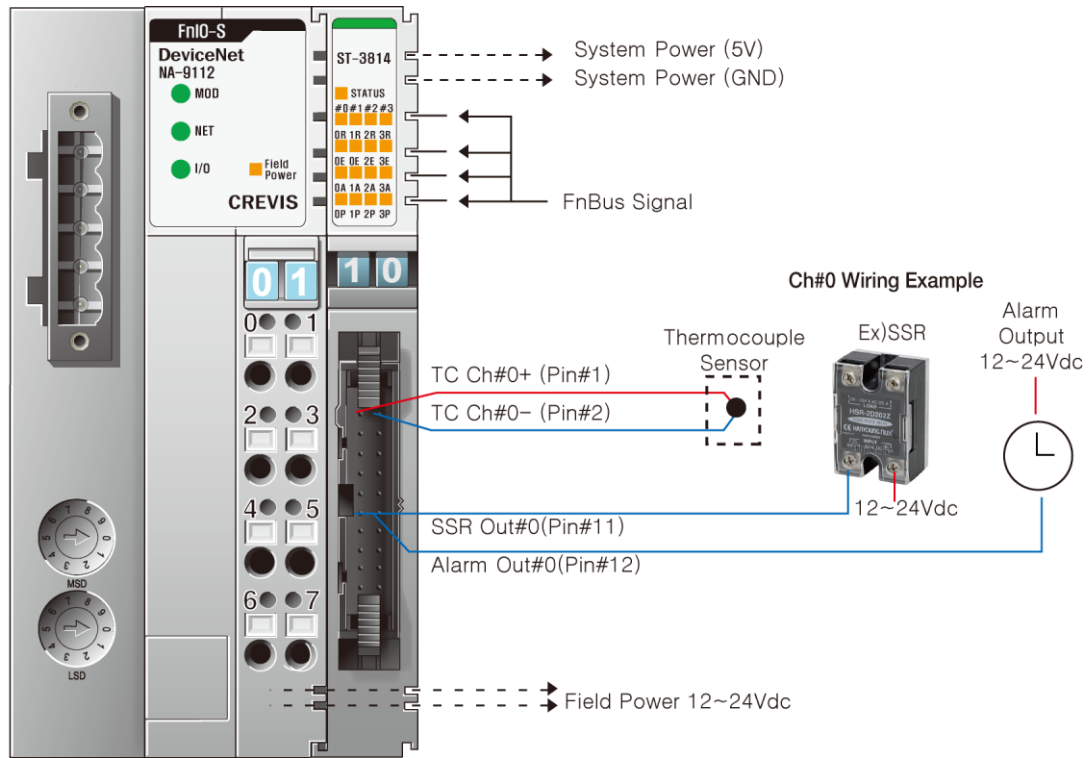


Pin No.	Description	Pin No.	Description
1	RTD Ch#0+	2	RTD Ch#0-
3	RTD Ch#1+	4	RTD Ch#1-
5	RTD Ch#2+	6	RTD Ch#2-
7	RTD Ch#3+	8	RTD Ch#3-
9	AGND	10	AGND
11	Current Out Ch#0	2	Alarm Out Ch#0
13	Current Out Ch#1	4	Alarm Out Ch#1
15	Current Out Ch#2	6	Alarm Out Ch#2
17	Current Out Ch#3	8	Alarm Out Ch#3
19	COM	20	COM

\* Alarm Output is Sink DC-Output (0.3A/1Output).

\* COM is Field Power (0V) for Current Output and Alarm Output.

### 3.1.3. ST-3814

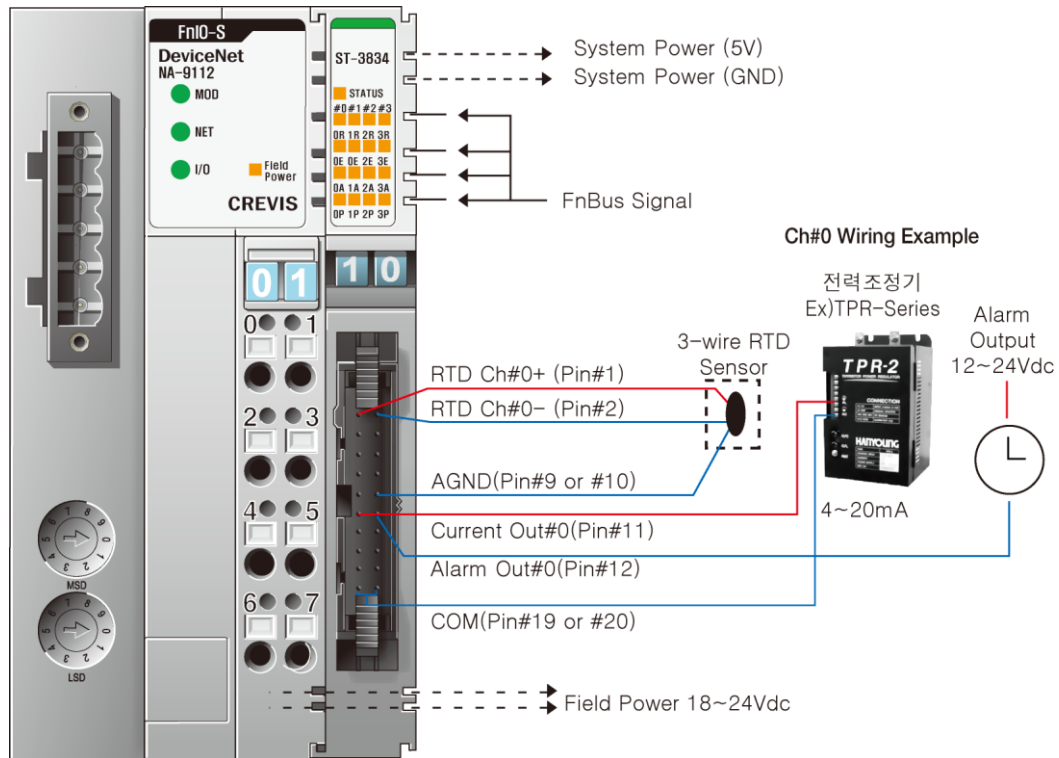


Pin No.	Description	Pin No.	Description
1	TC Ch#0+	2	TC Ch#0-
3	TC Ch#1+	4	TC Ch#1-
5	TC Ch#2+	6	TC Ch#2-
7	TC Ch#3+	8	TC Ch#3-
9	Cold Junction Sensor	10	Cold Junction Sensor
11	SSR Out Ch#0	2	Alarm Out Ch#0
13	SSR Out Ch#1	4	Alarm Out Ch#1
15	SSR Out Ch#2	6	Alarm Out Ch#2
17	SSR Out Ch#3	8	Alarm Out Ch#3
19	COM	20	COM

\* SSR Output and Alarm Output are Sink DC-Output (0.3A/1 Output).

\* COM is Field Power (0V) for SSR Output and Alarm Output.

### 3.1.4. ST-3834



Pin No.	Description	Pin No.	Description
1	TC Ch#0+	2	TC Ch#0-
3	TC Ch#1+	4	TC Ch#1-
5	TC Ch#2+	6	TC Ch#2-
7	TC Ch#3+	8	TC Ch#3-
9	Cold Junction Sensor	10	Cold Junction Sensor
11	Current Out Ch#0	2	Alarm Out Ch#0
13	Current Out Ch#1	4	Alarm Out Ch#1
15	Current Out Ch#2	6	Alarm Out Ch#2
17	Current Out Ch#3	8	Alarm Out Ch#3
19	COM	20	COM

\* Alarm Output is Sink DC-Output (0.3A/1Output).

\* COM is Field Power (0V) for Current Output and Alarm Output.

### 3.2. Environment Specification

Environmental Specifications	
Operating Temperature	-20 to 55 °C (Discrete I/O) 0 to 55 °C (Analog I/O)
Non-Operating Temperature	-40 °C to 85 °C
Relative Humidity	5%~90% non-condensing
Operating Altitude	2000m
Mounting	DIN rail
General Specifications	
Shock Operating	10g
Shock Non-Operating	30g
Vibration/Shock resistance	Displacement : 0.012Inch p-p from 10~57Hz Acceleration : 2G's from 57~500Hz Sweep Rate : 1 octave Per Minute Axes to test : x, y, z Frequency Sweeps Per Axis : 10
EMC resistance burst/ESD	Confirms to EN-61000-6-2
EMI	Confirms to EN-61000-6-4
Installation Pos. /Protect. Class	Variable / IP20
Product Certification	UL / cUL, CE, FCC
Isolation	DC Module (Included Analog Module) : Terminal Block to F.G 500Vac/1min AC Module : Terminal Block to F.G 1500Vac/1min Relay Module : Terminal Block to F.G 2500Vac/1min

### 3.3. Specification

#### 3.3.1. ST-3714

Items	Specification
<b>Input Specification</b>	
Number of Inputs	4 Channels
Indicators	1 Green/Red FnBus state 4 Green LEDs/ch - Ready (R) - Sensor Error (E) - Alarm Output (A) - Process Output for SSR (P)
Sensor Types	RTD Input/ch - PT 100, PT50 - JPT100 - NI100, NI120 - CU20 - TBD
Control Method	P, PI, PD, PID with Auto tuning (Limit Cycle Method), On/Off (PB=0)
Control Output	1 DC-Sink PWM Output for SSR control (11~28.8Vdc) 1 DC-Sink Alarm Output (11~28.8Vdc)
Excitation Current for RTD	1mA
Parameter Setting	NA-9112 (DeviceNet), NA-9715 (DeviceNet, Serial), NA-9785 (Ethernet, Serial), TBD
Proportional Band (PB)	0.0~1000.0℃
Integral Time (Ti)	0~3600sec
Derivative Time (Td)	0~3600sec
Control Cycle (Tc)	1~60sec
Sample Time (Ts)	0.5sec fixed
Module Accuracy	±0.1% FS@25℃ or 1℃, TBD
Etc Functions	ARW, MR, Temp. Offset, Hysteresis (On/Off) TBD
<b>General Specification</b>	
Power Dissipation	Max. 200mA @5.0Vdc, TBD
Isolation	I/O to Logic : Photocoupler Isolation DC Module (Included Analog Module) : Terminal Block to F.G 500Vac/1min
Field power	Supply Voltage : 24Vdc Nominal Voltage Range : 11~28.8Vdc
Wiring	I/O Cable up to AWG22 Unit Connector : HIF3BA-20PA-2.54DSA Mate Connector : HIF3C-20D-2.54C, HIF3BA-20D-2.54C Mate Crimp Pin : HIF3C-2226SCA
Weight	100g, TBD
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 12)

### 3.3.2. ST-3734

Items	Specification
<b>Input Specification</b>	
Number of Inputs	4 Channels
Indicators	1 Green/Red FnBus state 4 Green LEDs/ch - Ready (R) - Sensor Error (E) - Alarm Output (A) - Process Output (P)
Sensor Types	RTD Input/ch - PT 100, PT50 - JPT100 - NI100, NI120 - CU20 - TBD
Control Method	P, PI, PD, PID with Auto tuning (Limit Cycle Method), On/Off (PB=0)
Control Output	1 Current Output (4~20mA, 12bit Resolution) 1 DC-Sink Alarm Output (18~28.8Vdc)
Excitation Current for RTD	1mA
Parameter Setting	NA-9112 (DeviceNet), NA-9715 (DeviceNet, Serial), NA-9785 (Ethernet, Serial), TBD
Proportional Band (PB)	0.0~1000.0℃
Integral Time (Ti)	0~3600sec
Derivative Time (Td)	0~3600sec
Control Cycle (Tc)	0.5sec fixed
Sample Time (Ts)	0.5sec fixed
Module Accuracy	±0.1% FS@25℃ or 1℃, TBD
Etc Functions	ARW, MR, Temp. Offset, Hysteresis (On/Off) TBD
<b>General Specification</b>	
Power Dissipation	Max. 200mA @5.0Vdc, TBD
Isolation	I/O to Logic : Photocoupler Isolation DC Module (Included Analog Module) : Terminal Block to F.G 500Vac/1min
Field power	Supply Voltage : 24Vdc Nominal Voltage Range : 18~28.8Vdc
Wiring	I/O Cable up to AWG22 Unit Connector : HIF3BA-20PA-2.54DSA Mate Connector : HIF3C-20D-2.54C, HIF3BA-20D-2.54C Mate Crimp Pin : HIF3C-2226SCA
Weight	100g, TBD
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 12)

### 3.3.3. ST-3814

Items	Specification
<b>Input Specification</b>	
Number of Inputs	4 Channels
Indicators	1 Green/Red FnBus state 4 Green LEDs/ch - Ready (R) - Sensor Error (E) - Alarm Output (A) - Process Output for SSR (P)
Sensor Types	Thermocouple Input / ch - Type K/J/T/B/R/S/E/N/L/U/C/D TBD
Control Method	P, PI, PD, PID with Auto tuning (Limit Cycle Method), On/Off (PB=0)
Control Output	1 DC-Sink PWM Output for SSR control (11~28.8Vdc) 1 DC-Sink Alarm Output (11~28.8Vdc)
Cold Junction Compensation	External PT100
Cold Junction Range	-20~100℃
Parameter Setting	NA-9112 (DeviceNet), NA-9715 (DeviceNet, Serial), NA-9785 (Ethernet, Serial), TBD
Proportional Band (PB)	0.0~1000.0℃
Integral Time (Ti)	0~3600sec
Derivative Time (Td)	0~3600sec
Control Cycle (Tc)	1~60sec
Sample Time (Ts)	0.5sec fixed
Module Accuracy	±0.3% FS@25℃ or 5℃, TBD
Etc Functions	ARW, MR, Temp. Offset, Hysteresis (On/Off) TBD
<b>General Specification</b>	
Power Dissipation	Max. 200mA @5.0Vdc, TBD
Isolation	I/O to Logic : Photocoupler Isolation DC Module (Included Analog Module) : Terminal Block to F.G 500Vac/1min
Field power	Supply Voltage : 24Vdc Nominal Voltage Range : 11~28.8Vdc
Wiring	I/O Cable up to AWG22 Unit Connector : HIF3BA-20PA-2.54DSA Mate Connector : HIF3C-20D-2.54C, HIF3BA-20D-2.54C Mate Crimp Pin : HIF3C-2226SCA
Weight	100g, TBD
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 12)

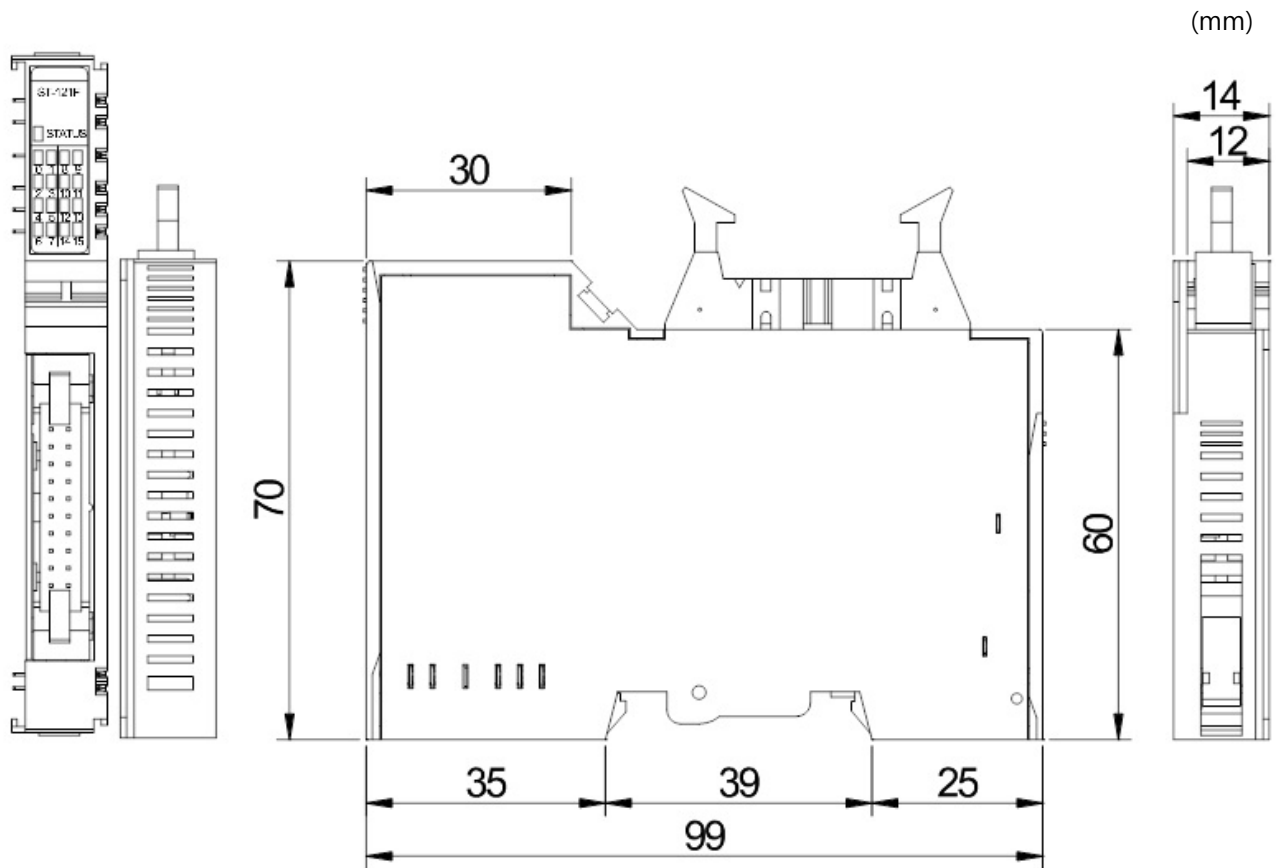
### 3.3.4. ST-3834

Items	Specification
<b>Input Specification</b>	
Number of Inputs	4 Channels
Indicators	1 Green/Red FnBus state 4 Green LEDs/ch - Ready (R) - Sensor Error (E) - Alarm Output (A) - Process Output (P)
Sensor Types	Thermocouple Input / ch - Type K/J/T/B/R/S/E/N/L/U/C/D TBD
Control Method	P, PI, PD, PID with Auto tuning (Limit Cycle Method), On/Off (PB=0)
Control Output	1 Current Output (4~20mA, 12bit Resolution) 1 DC-Sink Alarm Output (18~28.8Vdc)
Cold Junction Compensation	External PT100
Cold Junction Range	-20~100℃
Parameter Setting	NA-9112 (DeviceNet), NA-9715 (DeviceNet, Serial), NA-9785 (Ethernet, Serial), TBD
Proportional Band (PB)	0.0~1000.0℃
Integral Time (Ti)	0~3600sec
Derivative Time (Td)	0~3600sec
Control Cycle (Tc)	0.5sec fixed
Sample Time (Ts)	0.5sec fixed
Thermocouple Accuracy	±0.3% FS @ Operating Temperature
Current Output Accuracy	±1.0% FS @ Operating Temperature
Cold Junction Accuracy	±0.40ohm @ 25℃ ±1.50ohm @ 0℃ or 50℃
Etc Functions	ARW, MR, Temp. Offset, Hysteresis (On/Off) TBD
<b>General Specification</b>	
Power Dissipation	Max. 200mA @5.0Vdc, TBD
Isolation	I/O to Logic : Photocoupler Isolation DC Module (Included Analog Module) : Terminal Block to F.G 500Vac/1min
Field power	Supply Voltage : 24Vdc Nominal Voltage Range : 18~28.8Vdc
Wiring	I/O Cable up to AWG22 Unit Connector : HIF3BA-20PA-2.54DSA Mate Connector : HIF3C-20D-2.54C, HIF3BA-20D-2.54C Mate Crimp Pin : HIF3C-2226SCA
Weight	100g, TBD
Module Size	12mm x 99mm x 70mm
Environment Condition	Refer to " Environment Specification"(page : 12)



## 4. Dimension

### 4.1. ST-3714, ST-3734, ST-3814, ST-3834



## 5. Mapping Data into the image Table

### 5.1. ST-3714, ST-3734, ST-3814, ST-3834

#### IO Input Image Data – 12byte

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	Ch#0 Auto Tuning	Ch#0 Process Out(P)	Ch#0 Alarm (A)	Ch#0 Sensor Err (E)	Ch#0 Ready (R)
1	0	0	0	Ch#1 Auto Tuning	Ch#1 Process Out(P)	Ch#1 Alarm (A)	Ch#1 Sensor Err (E)	Ch#1 Ready (R)
2	0	0	0	Ch#2 Auto Tuning	Ch#2 Process Out(P)	Ch#2 Alarm (A)	Ch#2 Sensor Err (E)	Ch#2 Ready (R)
3	0	0	0	Ch#3 Auto Tuning	Ch#3 Process Out(P)	Ch#3 Alarm (A)	Ch#3 Sensor Err (E)	Ch#3 Ready (R)
4	Ch#0 Temperature(PV/SV), 16bit signed, Little Endian, Unit=0.1C							
5								
6	Ch#1 Temperature(PV/SV), 16bit signed, Little Endian, Unit=0.1C							
7								
8	Ch#2 Temperature(PV/SV), 16bit signed, Little Endian, Unit=0.1C							
9								
10	Ch#3 Temperature(PV/SV), 16bit signed, Little Endian, Unit=0.1C							
11								

- If Temperature(PV) value is 245, Real Temperature is 24.5 °C

#### IO Output Image Data – 12byte

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Ch#0 Command							
1	Ch#1 Command							
2	Ch#2 Command							
3	Ch#3 Command							
4	Ch#0 Value for update							
5								
6	Ch#1 Value for update							
7								
8	Ch#2 Value for update							
9								
10	Ch#3 Value for update							
11								

**Ch#0, 1, 2, 3 Command Format**

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	=00 : Write Release =01 : Read =10 : Write			=0_0001 : SV (Read/Write) =others : PV (Read Only)				

Example) Update Ch#0's SV = 150 °C, then Ch#0's SV=250 °C

IO Output Data = 00 00 00 00 00 00 00 00 00 00 00 00

IO Output Data = 81 00 00 00 DC 05 00 00 00 00 00 00 //Ch#0's SV=150 °C, 0x05DC=1500d

IO Output Data = 00 00 00 00 C4 09 00 00 00 00 00 00 //Write Command Release

IO Output Data = 81 00 00 00 C4 09 00 00 00 00 00 00 //Ch#0's SV=250 °C, 0x09C4=2500d

**Configuration Parameter – 8byte (Reserved for future)**

- Reserved, TBD

## 5.2. Temp. Channel Object

Class Code: 81<sub>HEX</sub> (129<sub>DEC</sub>)

### Common Services

Service Code	Implemented for		Service Name
	Class	Instance	
0x0E	Yes	Yes	Get_Attribute_Single
0x10	No	Yes	Set_Attribute_Single

### Class Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
0	0	Get	Object Revision	UINT array	
	1	Get/Set	SV, Set Value	INT array	0.1C

\* Class Attribute Get/Set is for all channels.

### Instance Attributes

Instance ID	Attribute ID	Access Rule	Name	Data Type	Value
1~32	0x00 (0)	Get	Object Revision	UINT	=0x02, 0x02
	0x01 (1)	Get/Set	SV, Set Value	INT	0.1C
	0x02 (2)	Get/Set	PB, Proportional Band	INT	0.1C
	0x03 (3)	Get/Set	Ti, Integral Time	UINT	
	0x04 (4)	Get/Set	Td, Derivative Time	UINT	
	0x05 (5)	Get/Set	Tc, Control Cycle Time	UINT	
	0x06 (6)	Get/Set	ARW, Anti Reset Windup	INT	0.1%
	0x07 (7)	Get/Set	MR, Manual Reset	INT	0.1%
	0x08 (8)	Get/Set	HYST, Hysteresis	UINT	0.1C, for only On/Off control
	0x09 (9)	Get/Set	Alarm Low	INT	0.1C
	0x0A (10)	Get/Set	Alarm High	INT	0.1C
	0x0B (11)	Get/Set	Alarm Deviation	UINT	0.1C
	0x0C (12)	Get/Set	Alarm Function	USINT	
	0x0D (13)	Get/Set	Alarm Option	USINT	
	0x0E (14)	Get/Set	Using Low, Reserved	INT	
	0x0F (15)	Get/Set	Using High, Reserved	INT	
	0x10 (16)	Get/Set	All Parameter	INT*10	SV, PB, Ti, Td, Tc, ARW, MR, HYST, UsingLow, UsingHigh
	0x11 (17)	Get/Set	All Alarm		Alarm Low, Alarm High, Alarm Dev, Alarm Function, Alarm Option
	0x18 (24)	Get/Set	Using Low, Using High	INT*2	
	0x19 (25)	Get/Set	Ti, Td Error Value	INT*2	
	0x1A (26)	Get/Set	PB Band	INT*2	0.1C
	0x1B (27)	Get/Set	Using Rate	INT	
	0x20 (32)	Get/Set	Status	USINT	Same as Channel's status 1 byte
	0x21 (33)	Get	PV, Present Value	INT	0.1C
	0x22 (34)	Get	CV, Control Value	INT	0.1%
	0x23 (35)	Get	Status & PV	INT*2	Status, PV
	0x24 (36)	Get/Set	Alarm	USINT	
	0x26 (38)	Get/Set	PID Running Value		
	0x27 (39)	Get	PV, CV	INT*2	PV, CV

0x28 (40)	Get	Cold Junction	INT*2	Cold Junction(0.1C), Ohm/mV
0x29 (41)	Get/Set	Temp. Offset	INT	0.1C
0x2A (42)	Get	100mOhm/10uV	INT	
0x2B (43)	Get/Set	PV Min, Max	INT*4	
0x2C (44)	Get	Conversion Counter	USINT	
0x30 (48)	Get	All Status	INT*4	Status, PV, CV, 0x0000
0x31 (49)	Get	SV, PV, CV, Status	INT*4	
0x40 (64)	Get/Set	Auto Tuning	BOOL	1:Run Auto Tuning
0x41 (65)	Get/Set	Select Auto Tuning Point	USINT	
0x42 (66)	Get/Set	Select Auto Tuning PID	USINT	
0x44 (68)	Get/Set	Sensor Type	USINT	
0x45 (69)	Get/Set	Temp. Type	USINT	
0xF4(244)	Get	SlotNo, Instance, SlotId	USINT*4	
0xF8(248)	Get/Set	Lock/Unlock Parameter	BOOL	

\* Instance #1~32 is channel #0~31

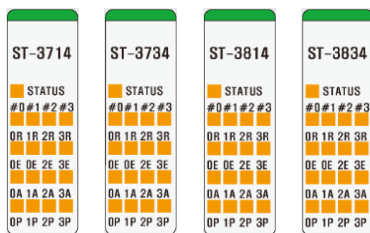
## 6. Trouble Shooting

### ATTENTION



In this manual, it couldn't be described all variety case with Network Adapter of several protocols.  
So if you couldn't find any fault after investigating all below cases, refer to NA user manual.

### 6.1. ST-3714, ST-3734, ST-3814, ST-3834



LED Status		Cause	Action
EXPANSION MODULE STATUS LED			
Off		Not Power No Initialized	Not powered Not Initialized yet.
Green		Module Connection	Normal Operation, IO Exchange
Flashing Green		Module Ready	Module ready
Flashing Red		Module Fault	Module failed in Communication
Red		Module Fault	Module fault
Ready (R)	Green	Module Ready.	Normal Operation
	Off	Not connection	Checking the connection
Error (E)	Green	Module Error.	Sensor open or error occurred.
	Off	Normal status.	Normal Operation
Alarm Output (A)	Green	Output status when alarm is set	Normal Operation (when the alarm is set)
	Off	Not setting the alarm	Make sure the alarm setting
Process Output (P)	Green	Current output state	Normal Operation (when the current output is set)
	Off	Not setting the current output	Make sure the current output state