BMX ART 0414/0814 Analog Input Modules

6

Subject of this Chapter

This chapter presents the BMX ART 0414/0814 modules, their characteristics and explains how they are connected to the various sensors.

What Is in This Chapter?

This chapter contains the following topics:

Presentation

Function

The BMX ART 0414/0814 modules are multi-range acquisition devices with four inputs for the 0414 and eight inputs for the 0814. The inputs are isolated from each other. These modules offer the following ranges for each input, according to the selection made at configuration:

- RTD IEC Pt100/Pt1000, US/JIS Pt100/Pt1000, Cu10, Ni100/Ni1000 in 2, 3 or 4 wires
- thermocouple B, E, J, K, L, N, R, S, T, U
- voltage +/- 40 mV to 1.28 V.

Presentation

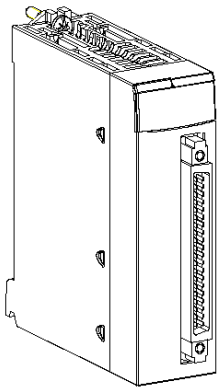
These modules offer the following ranges for each input, according to the selection made at configuration:

- Cu50 6651-94, Cu100 6651-94 in 2, 3 or 4 wires

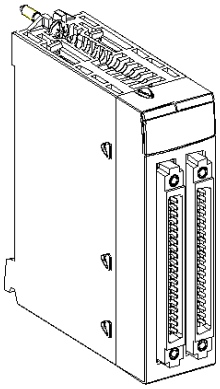
Illustration

The BMX ART 0414/0814 analog input modules looks like this:

BMX ART 0414



BMX ART 0814



Characteristics

General Characteristics

The general characteristics for the BMX ART 0414/BMX ART 0414H *(see page 45)* and BMX ART 0814/BMX ART 0814H *(see page 45)* modules are as follows:

Modules		**ART 0414**	**ART 0814**
Type of inputs		Isolated, RTD, thermocouple and voltage inputs	
Nature of inputs		+/- 40 mV; +/- 80 mV; +/- 160 mV; +/- 320 mV; +/- 640 mV; 1.28 V	
Number of channels		4	8
Acquisition cycle time		400 ms / 4 channels	400 ms / 8 channels
Conversion method		ΣΔ	
Resolution		15-bit + sign	
Isolation:			
• **Between channels** • **Between channels and bus** • **Between channels and ground**		750 Vdc 1400 Vdc 750 Vdc	
Maximum authorized over voltage for inputs		+/- 7.5 Vdc	
Cold junction compensation		• Internal compensation using the dedicated TELEFAST ABE-7CPA412 wiring accessory, including a sensor. • External compensation dedicating channel 0 to a 2/3-wires Pt100 for CJC. • External compensation using the CJC values of channels 4/7 for channels 0/3. In this case, only one sensor is needed.	
Input filter		Low pass filter (1st order numerical)	
Rejection in differential mode (50/60 Hz)		Typically 60 dB	
Common mode rejection (50/60 Hz)		Typically 120 dB	
Power consumption (3.3 V)	**Typical**	0.32 W	0.32 W
	Maximum	0.48 W	0.48 W
Power consumption (24 V)	**Typical**	0.47 W	1.00 W
	Maximum	1.20 W	1.65 W

Voltage Input Characteristics

The characteristics of the voltage inputs of the BMX ART 0414/BMX ART 0414H *(see page 45)* and BMX ART 0814/BMX ART 0814H *(see page 45)* modules are as follows:

Voltage range	+/- 40 mV; +/- 80 mV; +/- 160 mV; +/- 320 mV; +/- 640 mV; 1.28 V
Input impedance	Typically 10 MOhms
Maximum converted value	+/- 102.4%
Maximum resolution	2.4 µV in the range +/- 40 mV
Measurement error for standard module	
• **At 25° C (77° F)**	0.05% of FS (1)
• **Maximum in the temperature range 0...60° C (32...140° F)**	0.15% of FS (1)
Measurement error for Hardened module	
• **At 25° C (77° F)**	0.05% of FS (1)
• **Maximum in the temperature range -25° C..70° C (-13...140° F)**	0.20% of FS (1)
Temperature drift	30 ppm/° C
Legend: (1) FS: Full Scale	

RTD Input Characteristics

The characteristics of the RTD inputs of the BMX ART 0414/BMX ART 0414H *(see page 45)* and BMX ART 0814/BMX ART 0814H *(see page 45)* modules are as follows:

RTD	**Pt100**	**Pt1000**	**Cu10**	**Ni100**	**Ni1000**
Measurement range	In accordance with IEC: -175... +825° C (-347...+1517° F) In accordance with US/JIS: -87 +437° C (-125...+819° F)		-91... +251° C (-132 ...+484° F)	-54 +174° C (-65...+345° F)	
Resolution	0.1° C (0.2° F)				
Detection type	Open circuit (detection on each channel)				
Legend					
(1) Excluding errors caused by the wiring, +/- 1° C (0.2° F) on the range -100...+200° C (-148...+392° F) for Pt100					
(2) See detailed errors at the temperature point *(see page 332)*.					

RTD	Pt100	Pt1000	Cu10	Ni100	Ni1000
Error at 25° C (77° F) (1)	+/- 2.1 ° C (+/- 3.8° F)	+/- 2.1 ° C (+/- 3.8° F)	+/- 4 ° C (+/- 7.2° F)	+/- 2.1 ° C (+/- 3.8° F)	+/- 0.7 ° C (+/- 1.3° F)
Maximum error for standard modules in the temperature range 0...60° C (32...140° F) (2)	+/- 3 ° C (+/- 5.4° F)	+/- 3 ° C (+/- 5.4° F)	+/- 4 ° C (+/- 7.2° F)	+/- 3 ° C (+/- 5.4° F)	+/- 1.3 ° C (+/- 2.3° F)
Maximum error for Harened modules in the temperature range -25° C..70° C (-13...140° F) (2)	+/- 3.5 ° C (+/- 6.3° F)	+/- 3.5 ° C (+/- 6.3° F)	+/- 4.5 ° C (+/- 8.1° F)	+/- 3.5 ° C (+/- 6.3° F)	+/- 1.5 ° C (+/- 2.7° F)
Maximum wiring resistance					
• **4-wire**	50 Ohms	500 Ohms	50 Ohms	50 Ohms	500 Ohms
• **2/3-wire**	20 Ohms	200 Ohms	20 Ohms	20 Ohms	200 Ohms
Temperature drift	30 ppm/° C				
Legend (1) Excluding errors caused by the wiring, +/- 1° C (0.2° F) on the range -100...+200° C (-148...+392° F) for Pt100 (2) See detailed errors at the temperature point *(see page 332)*.					

RTD	CU50	CU100
Measurement range	-200...+200° C	
Resolution	0.1° C (0.2° F)	
Detection type	Open circuit (detection on each channel)	
Error at 25° C (77° F) (1)	+/- 2.1° C (+/- 3.8° F)	
Maximum error for standard modules in the temperature range 0...60° C (32...140° F) (2)	+/- 3° C (+/- 5.4° F)	
Maximum error for Hardened modules in the temperature range -25° C..70° C (-13...140° F) (2)	+/- 3.5° C (+/- 6.3° F)	
Maximum wiring resistance: • **4-wire** • **2/3-wire**	• 50 Ohms • 20 Ohms	
Temperature drift	30 ppm/° C	
Legend (1) Excluding errors caused by the wiring, +/- 1° C (0.2° F) on the range -100...+200° C (-148...+392° F) for Pt100 (2) See detailed errors at the temperature point *(see page 332)*.		

Thermocouple Input Characteristics

This table presents the general characteristics of the thermocouple inputs of the BMX ART 0414/BMX ART 0414H *(see page 45)* and BMX ART 0814/BMX ART 0814H *(see page 45)* modules.

Thermocouples	**B**	**E**	**J**	**K**	**L**
Measurement range	+171 +1,779° C (340...3234° F)	-240 +970° C (-400...1778° F)	-177 +737° C (-287...1359° F)	-231 +1,331° C (-384...2428° F)	-174 +874° C (-281...1605° F)
Thermocouples	**N**	**R**	**S**	**T**	**U**
Measurement range	-232 +1,262° C (-386...2304° F)	-9 +1,727° C (340...3234° F)	-9 +1,727° C (-15...3141° F)	-254 +384° C (-425...723° F)	-181 +581° C (-294...1078° F)
Resolution	0.1° C (0.2° F)				
Detection type	Open circuit (detection on each channel)				
Error at 25° C	+/- 3.2° C for J, L, R, S and U types (see *Characteristics of the BMX ART 0414/814 Thermocouple Ranges in Degrees Celsius, page 334* for detailed errors at temperature point for each type); +/- 3.7° C for B, E, K, N and T types				
Maximum error for standard modules in the temperature range - 25° C..70° C(-13...140° F)(2)	+/- 4.5° C (+/-8.1° F) for types: J, L, R, S and U; +/- 5° C (+/-9° F) for types: B, E, K, N and T (using the TELEFAST accessory with its internal cold junction compensation).				
Maximum error for Hardened modules in the temperature range - 25° C..70° C(-13...140° F)(2)	+/- 5.5° C (+/-9° F) for types: J, L, R, S and U; +/- 6° C (+/-10.8° F) for types: B, E, K, N and T (using the TELEFAST accessory with its internal cold junction compensation).				
Temperature drift	30 ppm/° C				

Resistive Input Characteristics

The characteristics of the resistive inputs of the BMX ART 0414/BMX ART 0414H *(see page 45)* and BMX ART 0814/BMX ART 0814H *(see page 45)* are as follows.

Range	400 Ω; 4000 Ω
Type measurement	2, 3, 4 wires
Maximum resolution	2.5 mΩ in the range 400 Ω 25 mΩ in the range 4000 Ω
Measurement error for standard module	
• **At 25° C (77° F)**	0.12% of FS (1)
• **Maximum in the temperature range 0...60° C (32...140° F)**	0.2% of FS (1)
Measurement error for ruggedized module	
• **At 25° C**	0.12% of FS (1)
• **Maximum in the temperature range -25° C..70° C (-13...140° F)**	0.3% of FS (1)
Temperature drift	25 ppm/° C
Legend: (1) FS: Full Scale	

Analog Input Values

Description

For RTD and TC sensors, the data is a multiple of 10 of the real temperature in °C or °F. The last digit represents 0.1°C or 0.1°F.

For millivoltmeter, the data ranges from 40 mV, 320 mV to 1280 mV and is also a multiple of 10 of the real measurement. The last digit represents 10 nV.

For millivoltmeter, the data range of 640 mV is a multiple of 100 of the real measurement. The last digit represents 100 nV.

RTD Ranges

The table below presents the ranges for the RTD sensors (values in brackets are in 1/10°F).

Range	Under flow	Lower scale	Upper scale	Over flow
Pt100 IEC 751-1995, JIS C1604-1997 (2/4 wires)	-1990 (-3260)	-1750 (-2830)	8250 (15170)	8490 (15600)
Pt1000 IEC 751-1995, JIS C1604-1997 (2/4 wires)	-1990 (-3260)	-1750 (-2830)	8250 (15170)	8490 (15600)
Ni100 DIN43760-1987 (2/4 wires)	-590 (-750)	-540 (-660)	1740 (3460)	1790 (3550)
Ni1000 DIN43760-1987 (2/4 wires)	-590 (-750)	-540 (-660)	1740 (3460)	1790 (3550)
Pt100 IEC 751-1995, JIS C1604-1997 (3 wires)	-1990 (-3260)	-1750 (-2830)	8250 (15170)	8490 (15600)
Pt1000 IEC 751-1995, JIS C1604-1997 (3 wires)	-1990 (-3260)	-1750 (-2830)	8250 (15170)	8490 (15600)
Ni100 DIN43760-1987 (3 wires)	-590 (-750)	-540 (-660)	1740 (3460)	1790 (3550)
Ni1000 DIN43760-1987 (3 wires)	-590 (-750)	-540 (-660)	1740 (3460)	1790 (3550)
JPt100 JIS C1604-1981, JIS C1606-1989 (2/4 wires)	-990 (-1460)	-870 (-1240)	4370 (8180)	4490 (8400)
JPt1000 JIS C1604-1981, JIS C1606-1989 (2/4 wires)	-990 (-1460)	-870 (-1240)	4370 (8180)	4490 (8400)
JPt100 JIS C1604-1981, JIS C1606-1989 (3 wires)	-990 (-1460)	-870 (-1240)	4370 (8180)	4490 (8400)

Range	Under flow	Lower scale	Upper scale	Over flow
JPt1000 JIS C1604-1981, JIS C1606-1989 (3 wires)	-990 (-1460)	-870 (-1240)	4370 (8180)	4490 (8400)
Cu10 (2/4 wires)	-990 (-1460)	-910 (-1320)	2510 (4840)	2590 (4980)
Cu10 (3 wires)	-990 (-1460)	-910 (-1320)	2510 (4840)	2590 (4980)

TC Ranges

The table below presents the ranges for the TC sensors (values in brackets are in (1/10° F).

Range	Under flow	Lower scale	Upper scale	Over flow
Type J	-1980 (-3260)	-1770 (-2870)	7370 (13590)	7580 (13980)
Type K	-2680 (-4500)	-2310 (-3830)	13310 (24270)	13680 (24940)
Type E	-2690 (-4510)	-2400 (-3990)	9700 (17770)	9990 (18290)
Type T	-2690 (-4520)	-2540 (-4250)	3840 (7230)	3990 (7500)
Type S	-500 (-540)	-90 (160)	17270 (29550)	17680 (30250)
Type R	-500 (-540)	-90 (160)	17270 (29550)	17680 (30250)
Type B	1320 (2700)	1710 (3390)	17790 (32000)	18170 (32000)
Type N	-2670 (-4500)	-2320 (-3860)	12620 (23040)	12970 (23680)
Type U	-1990 (-3250)	-1810 (-2930)	5810 (10770)	5990 (11090)
Type L	-1990 (-3250)	-1740 (-2800)	8740 (16040)	8990 (16490)

Voltage Ranges

The table below presents the voltage ranges.

Range	Under flow	Lower scale	Upper scale	Over flow
+/- 40 mV	-4192	-4000	4000	4192
+/- 80 mV	-8384	-8000	8000	8384
+/- 160 mV	-16768	-16000	16000	16768
+/- 320 mV	-32000	-32000	32000	32000
+/- 640 mV	-6707	-6400	6400	6707
+/- 1280 mV	-13414	-12800	12800	13414

Resistance Ranges

The table below presents the resistance ranges.

Range	Under flow	Lower scale	Upper scale	Over flow
0-400 Ohms 2/4 wires	0	0	4000	4096
0-4000 Ohms 2/4 wires	0	0	4000	4096
0-400 Ohms 3 wires	0	0	4000	4096
0-4000 Ohms 3 wires	0	0	4000	4096

Functional Description

Function

The BMX ART 0414/814 modules are multi-range acquisition devices with four inputs for the BMX ART 0414 and eight inputs for the BMX ART 0814.

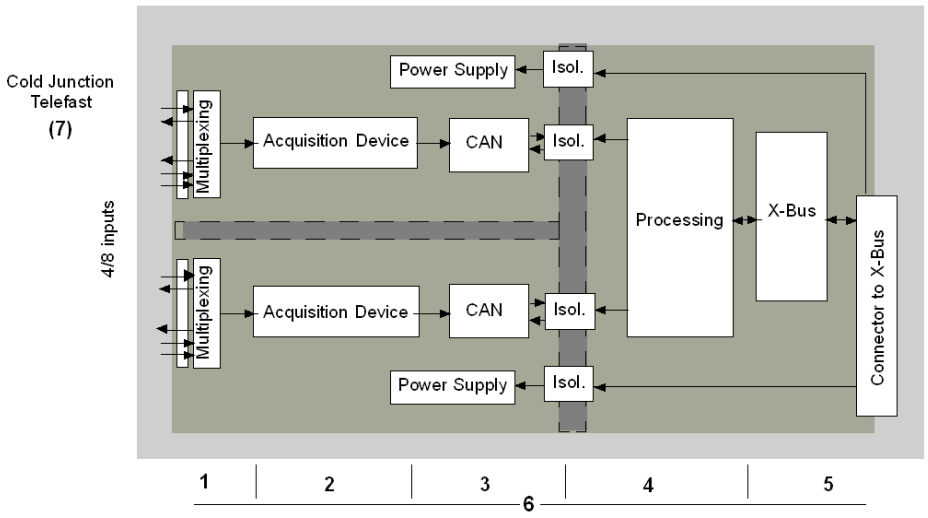
Both Modules offer the following ranges for each input, according to the selection made during configuration:

- RTD: IEC Pt100, IEC Pt1000, US/JIS Pt100, US/JIS Pt1000, Copper CU10, Ni100 or Ni1000
- thermocouple: B, E, J, K, L, N, R, S, T or U,
- voltage: +/- 80 mV, +/- 80 mV, +/- 160 mV, +/- 320 mV, +/- 640 mV, +/- 1.28 V,
- ohms: 0..400 Ω, 0..4000 Ω

NOTE: The TELEFAST2 accessory referenced **ABE-7CPA412** facilitates connection and provides a cold junction compensation device.

Illustration

The BMX ART 0414/0814 input modules perform the following functions.



Details of the functions are as follows.

Address	Element	Function
1	Adapting the Inputs	Adaptation consists in a common mode and ifferential mode filter. Protection resistors on the inputs allowt to withstand voltage spikes of up to +/- 7.5 V. A layer of multiplexing allows self-calibration of the acquisition device offset, as close as possible to the input terminal, as well as selecting the cold junction compensation sensor included in the TELEFAST housing.
2	Amplifying Input Signals	Built around a weak-offset amplifier internal to the A/N converter. A current generator ensures the RTD resistance measurement.
3	Conversion	The converter receives the signal issued from an input channel or from the cold junction compensation. Conversion is based on a $\Sigma\Delta$ 16 -bit converter. There is a converter for each input.
4	Transforming incoming values into workable measurements for the user	• recalibration and alignment coefficients to be applied to measurements, as well as the module's self-calibration coefficients • (numeric) filtering of measurements, based on configuration parameters • scaling of measurements, based on configuration parameters
5	Communicating with the Application	• manages exchanges with CPU. • topological addressing • receiving configuration parameters from module and channels • sending measured values, as well as module status, to the application
6	Module monitoring and sending error notification back to application	• conversion string test • range under/overflow on channels and cold junction compensation process test • watchdog test
7	Cold Junction Compensation	• internal compensation using the TELEFAST ABE-7CPA412 • external compensation by Pt100 • external compensation using the CJC values of channels 4/7 for channels 0/3. In this case, only one sensor is needed

Display of Electrical Range Measurements

Measurements may be displayed using standardized display (in %, to two decimal places).

Type of Range	Display
Bipolar range	from -10,000 to +10,000 (-100.00 % to +100.00 %)

It is also possible to define the range of values within which measurements are expressed, by selecting:

- the lower threshold corresponding to the minimum value for the range -100.00 %
- the upper threshold corresponding to the maximum value for the range +100.00 %

These lower and upper thresholds are integers between -32,768 and 32,768.

Display of Temperature Range Measurements

Measurements provided to the application are directly usable. It is possible to choose either "In Temperature" Display or Standardized Display:

- for "In Temperature" display mode, values are provided in tenths of a degree (Celsius or Fahrenheit, depending on the unit you have selected).
- for the user-specified display, you may choose a Standardized Display 0...10,000 (meaning from 0 to 100.00 %), by specifying the minimum and maximum temperatures as expressed in the 0 to 10,000 range.

Measurement Filtering

The type of filtering performed by the system is called "first order filtering". The filtering coefficient can be modified from a programming console or via the program.

The mathematical formula used is as follows:

$$Mesf(n) = \alpha \times Mesf(n-1) + (1-\alpha) \times Valb(n)$$

where:

α = efficiency of the filter

Mesf(n) = measurement filtered at moment n

Mesf(n-1) = measurement filtered at moment n-1

Valg(n) = gross value at moment n

You may configure the filtering value from 7 possibilities (from 0 to 6). **This value may be changed even when the application is in RUN mode**.

NOTE: Filtering may be accessed in Normal or Fast Cycle.

The filtering values are as follows. They depend on the sensor type. T is a cycle time of 200 ms for TC and mV. T is also a cycle time of 400 ms for RTD and Ohms.

Desired Efficiency	Required Value	Corresponding α	Filter Response Time at 63%	Cut-off Frequency (in Hz)
No filtering	0	0	0	0
Low filtering	1 2	0.750 0.875	4 x T 8 x T	0.040 / T 0.020 / T
Medium filtering	3 4	0.937 0.969	16 x T 32 x T	0.010 / T 0.005 / T
High filtering	5 6	0.984 0.992	64 x T 128 x T	0.025 / T 0.012 / T

The values may be displayed using standardized display (in %, to two decimal places).

Type of Range	Display
Unipolar range	from 0 to 10,000 (0 % at +100.00 %)
Bipolar range	from -10,000 to 10,000 (-100.00 % to +100.00 %)

The user may also define the range of values within which measurements are expressed, by selecting:

- the lower threshold corresponding to the minimum value for the range -100.00 %
- the upper threshold corresponding to the maximum value for the range +100.00 %.

These lower and upper thresholds are integers between -32,768 and +32,767.

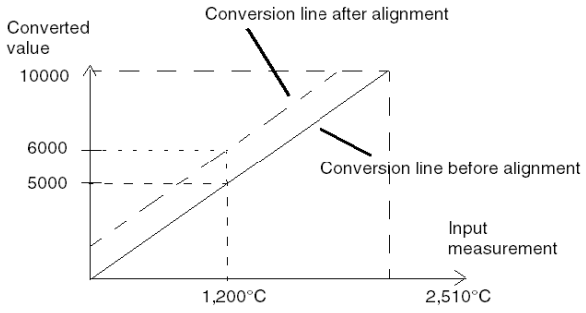
Main frequency 50/60 Hz Rejection

Depending on the country, the user can configure the frequency rejection of main power harmonics by adapting the speed of sigma delta converter.

Sensor Alignment

The process of "alignment" consists in eliminating a systematic offset observed with a given sensor, around a specific operating point. This operation compensates for an error linked to the process. Therefore, replacing a module does not require a new alignment. However, replacing the sensor or changing the sensor's operating point does require a new alignment.

Conversion lines are as follows:



The alignment value is editable from a programming console, even if the program is in RUN Mode. For each input channel, you can:

- view and modify the desired measurement value.
- save the alignment value.
- determine whether the channel already has an alignment.

The alignment offset may also be modified through programming.

Channel alignment is performed on the channel in standard operating mode, without any effect on the channel's operating modes.

The maximum offset between measured value and desired (aligned) value may not exceed +/-1,500.

NOTE: To align several analog channels on the BMX ART/AMO/AMI/AMM modules, we recommand proceeding channel by channel. Test each channel after alignment before moving to the next channel in order to apply the parameters correctly.

Wiring Precautions

Introduction

In order to protect the signal from outside interference induced in series mode and interference in common mode, we recommend that you take the following precautions.

Cable Shielding

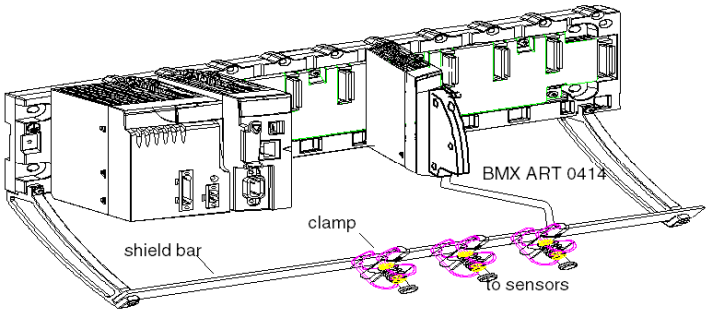
- Connection at the FCN connectors:
  Given that there are a large number of channels, a cable of at least 10 twisted pairs is used, with general shielding (outside diameter 10 mm maximum), fitted with one or two male 40-pin FCN connectors for direct connection to the module. Connect the cable shielding to the grounding bar. Clamp the shielding to the grounding bar on the module side. Use the BMX XSP 0400/0600/0800/1200 electromagnetic protection kit *(see Modicon M340 Using Unity Pro, Processors, Racks, and Power Supply Modules, Setup Manual)* to connect the shielding.

⚠ DANGER

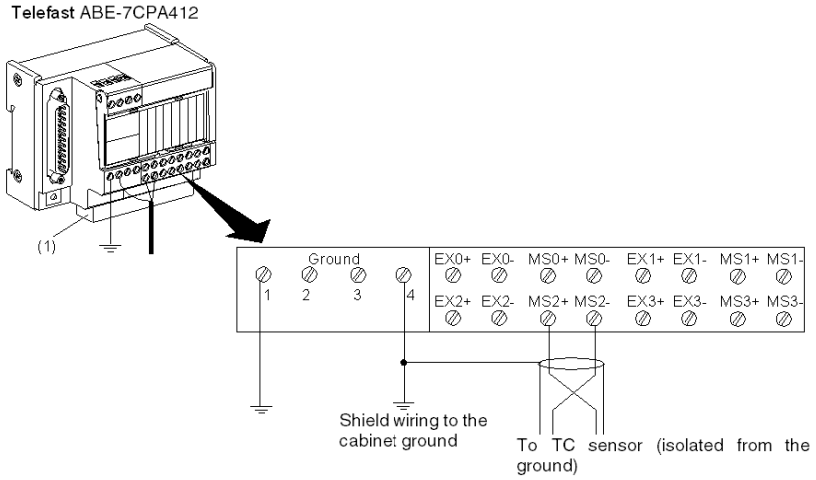
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

While mounting / removing the modules:
- make sure that each terminal block is still connected to the shield bar and
- disconnect voltage supplying sensors and pre-actuators.

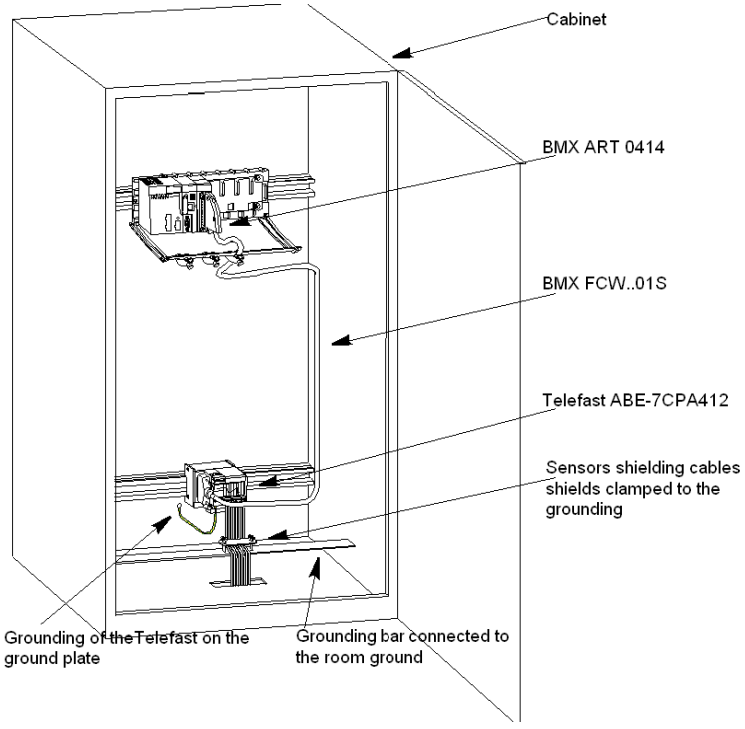
Failure to follow these instructions will result in death or serious injury.



- TELEFAST connection:
  Connect the sensor cable shielding to the terminals provided and the whole assembly to the cabinet ground.



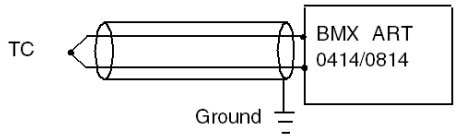
(1) The grounding of cables is facilited using the ABE-7BV10 accessory.



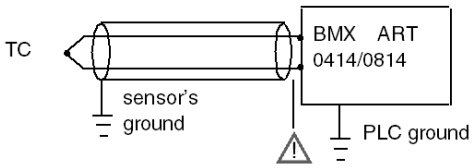
Sensors shielding

In order for the acquisition system to operate correctly, we recommend you take the following precautions:

- if sensors are isolated from ground, all the shields of the sensor cables must be referenced to the Telefast/PLC ground.

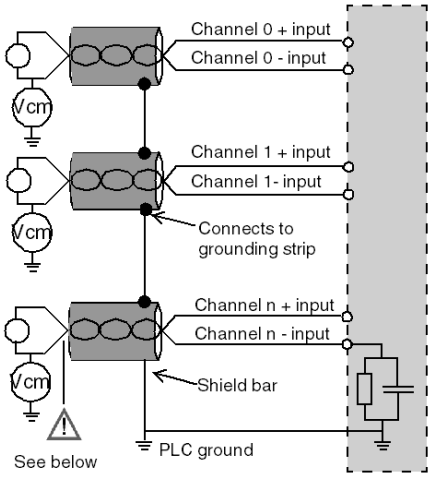


- if sensors are referenced to the sensor ground which is far from PLC ground, all the shields of the sensor cables must be referenced to the sensors ground to eliminate the ground loop path.



Using the Sensors Isolated from the Ground

The sensors are connected according to the following diagram:



If the sensors are referenced in relation to the ground, this may in some cases return a remote ground potential to the terminals or the FCN connector. It is therefore essential to follow the following rules:

- the potential must be less than the permitted low voltage: for example, 30 Vrms or 42.4 VDC.
- setting a sensor point to a reference potential generates a leakage current. You must therefore check that all leakage currents generated do not disturb the system.

Sensors and other peripherals may be connected to a grounding point some distance from the module. Such remote ground references may carry considerable potential differences with respect to local ground. Induced currents do not affect the measurement or integrity of the system.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK

Ensure that sensors and others peripherals are not exposed through grounding points to voltage potential greater than acceptable limits.

Failure to follow these instructions will result in death or serious injury.

Electromagnetic Hazard Instructions

⚠ CAUTION

UNEXPECTED BEHAVIOR OF APPLICATION

Follow those instructions to reduce electromagnetic perturbations:

- use the BMX XSP 0400/0600/0800/1200 electromagnetic protection kit *(see Modicon M340 Using Unity Pro, Processors, Racks, and Power Supply Modules, Setup Manual)* to connect the shielding.

Electromagnetic perturbations may lead to an unexpected behavior of the application.

Failure to follow these instructions can result in injury or equipment damage.

Wiring Diagram

Introduction

The BMX ART 0414 input module consists of a 40-pin FCN connector.

The BMX ART 0814 input module consists of two 40-pin FCN connectors.

⚠ WARNING

UNEXPECTED EQUIPMENT OPERATION

Take every precaution at the installation to prevent any subsequent mistake in the connectors. Plugging the wrong connector would cause an unexpected behavior of the application.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

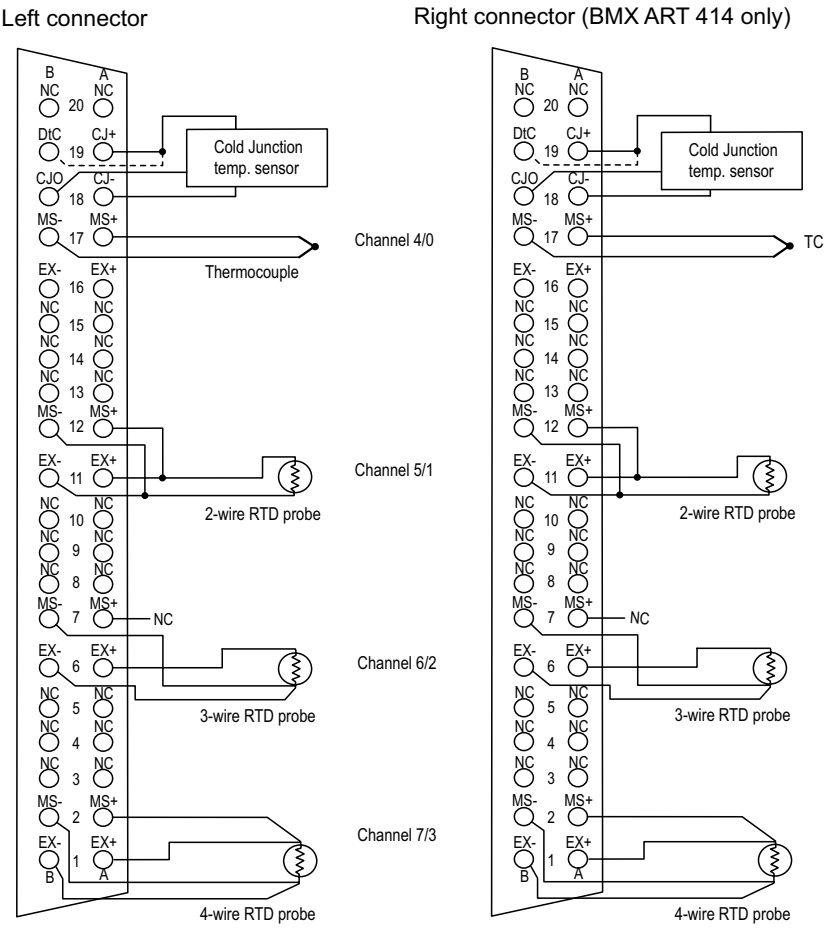
Connector Pin Assignment and Sensors Wiring

This example uses a probe configuration with:

- Channel 0/4: Thermocouple
- Channel 1/5: 2-wires RTD
- Channel 2/6: 3-wires RTD
- Channel 3/7: 4-wires RTD

The pin assignment for the 40-pin FCN connector and the sensors wiring is shown below:

Module Front View - cabling view



MS+: RTD Measure + input / Thermocouple + input
MS-: RTD Measure - input / Thermocouple - input
EX+: RTD probe current generator + output
EX-: RTD probe current generator - output
NC: Not connected
DtC: The CJC sensor detection input is connected to CJ+ if the sensor type is DS600. It is not connected (NC) if the sensor type is LM31.

NOTE: The CJC sensor is needed for TC only.

Cold Junction Compensation

For each block of 4 channels (channels 0 to 3 and channels 4 to 7), the external compensation of the module is performed in the TELEFAST ABE-7CPA412 accessory. This device provides a voltage in mV corresponding to:

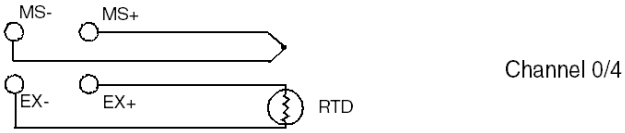
Voltage = (6.45 mV * T) + 509 mV (where T = temperature in °C).

The overall margin of error when using this device is reduced to 1.2° C in the -5° C to +60° C temperature range.

It is possible to increase the precision of the compensation by using a 2/3-wires Pt100 probe directly connected to channels 0 and 4 (only for the BMX ART0814) on the module or connected to the TELEFAST terminal blocks. Channel 0 is thus dedicated to the cold junction compensation of channels 1, 2 and 3. channel 4 is thus dedicated to channels 4 to 7.

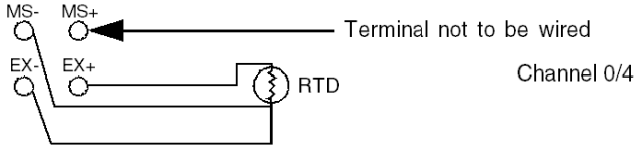
It is also possible, by using a 2-wire Pt100 probe, provided the initial length of the probe is limited, to maintain channel 0 as a thermocouple input.

The wiring would then look like this:



The wiring is only valid if the channel 0 is used. If the channel 0 is not used, select a cold junction with external Pt100. The range of the channel 0 is changed to a 3-wires Pt100 probe.

The wiring would then look like this:



NOTE: For the BMX ART 0814 Module, the CJC values of channels 4 to 7 can also be used for channels 0 to 3. Therefore, only one external CJC *(see page 135)* sensor is wired on channel 4.

Use of the TELEFAST ABE-7CPA412 Accessory

At a Glance

The TELEFAST ABE-7CPA412 accessory is a base unit used to connect 4-channel analog modules to screw terminal blocks.

NOTE: When the cabinet where the TELEFAST ABE-7CPA412 accessory is located and powered up, wait at least 45mn to achieve full precision of the CJC compensation. It is not necessary to wait 45 mn if the compensation is performed by an external Pt100 probe.

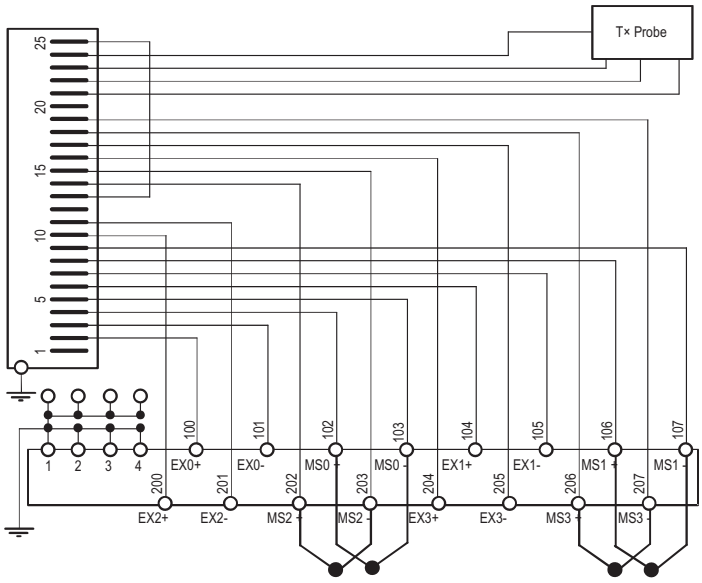
When using the TELEFAST ABE-7CPA412's cold junction compensation, in order to make sure you achieve the indicated level of precision, the movement of air around the TELEFAST ABE-7CPA412 must not exceed 0.1 m/s. Temperature variations must not exceed 10° C/hour and the TELEFAST ABE-7CPA412 must be placed at least 100mm away from all heat sources.

The TELEFAST ABE-7CPA412 can be operated from -40° C to +80° C external temperature.

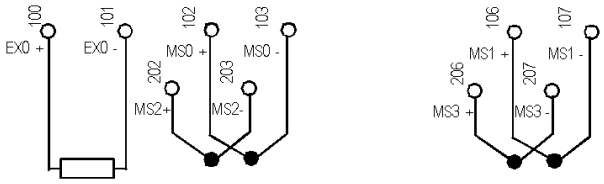
Connecting Sensors

Sensors may be connected to the TELEFAST ABE-7CPA412 accessory as shown in this illustration *(see page 128)*.

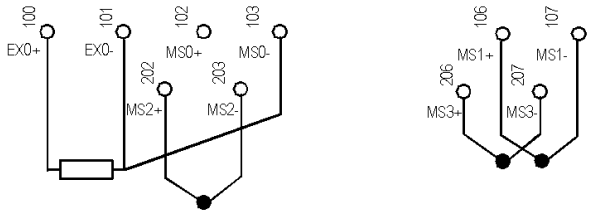
Wirings



Legend: Operating in TC mode with Telefast internal cold junction compensation.



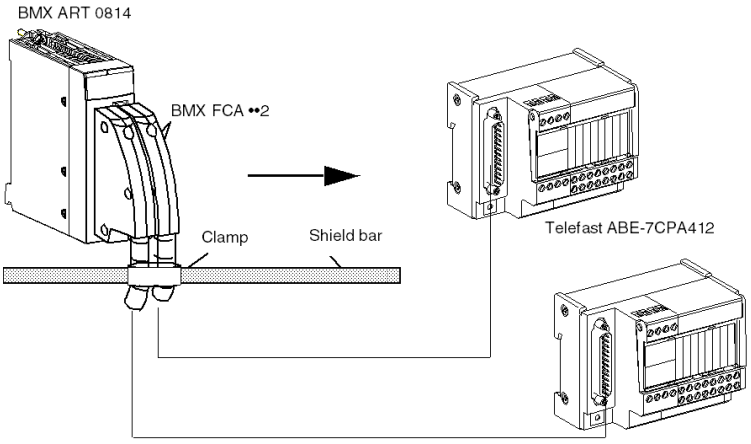
Legend: Operating in TC mode with cold junction compensation using a 2-wire PT100 probe.



Legend: Operating in TC mode with cold junction compensation using a 3-wire PT100 probe.

Connecting Modules

Modules can be connected to a TELEFAST ABE-7CPA412 as shown in the illustration below:



The BMX ART 0414/0814 analog modules may be connected to the TELEFAST ABE-7CPA412 accessory using one of the following cables:

- BMX FCA 152: length 1.5 m
- BMX FCA 302: length 3 m
- BMX FCA 502: length 5 m