IOT-DIN-IMX8PLUS I/O EXPANSION MODULES

Reference Guide

Compulab

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Table 1 Document Revision Notes

Date	Description
May 2024	• First release

Please check for a newer revision of this manual at the Compulab website https://www.compulab.com. Compare the revision notes of the updated manual from the website with those of the printed or electronic version you have.

1 INTRODUCTION

1.1 About This Document

This document is part of a set of documents providing information necessary to operate and program Compulab IOT-DIN-IMX8PLUS I/O Modules.

1.2 IOT-DIN-IMX8PLUS Part Number

To decode the IOT-DIN-IMX8PLUS I/O Modules part number please refer to the 'Ordering' section of the IOT-DIN-IMX8PLUS product page: https://www.compulab.com/products/iot-gateways/iot-din-imx8plus-industrial-iot-gateway/#ordering.

1.3 Related Documents

For additional information not covered in this manual, please refer to the documents listed in Table 2.

Table 2 Related Documents

Document	Location
IOT-DIN-IMX8PLUS resources	https://www.compulab.com/products/iot-gateways/iot-din-imx8plus-industrial-iot-gateway/#devres

2 IFM-DI8O8 DIGITAL I/O MODULE

2.1 Description

IFM-DI8O8 is a digital I/O expansion module with an isolated block of eight digital inputs and a block of eight digital outputs. The module is designed for 24V PLC applications, and contains ESD and transient protections. The user must provide isolated external power supplies for each block.

Digital input features:

- 8x low side (sink) inputs with common ground
- ESD protection according to IEC 61000-4-2
- Voltage surge protection according to IEC 61000-4-5
- Transient immunity according to IEC 61000-4-4
- Wide input DC voltage range
- Input current limiting

Digital output features:

- 8x high side (relay) outputs
- Conforms to IEC 61131-2
- ESD protection according to IEC 61000-4-2
- Output current limiting
- Under voltage shutdown
- Shorted load protection

NOTE: I/O expansion modules cannot be used stand-alone without a connection to the IOT-DIN-IMX8PLUS gateway.

2.2 Specifications

Table 3 IFM-DI8O8 Absolute Maximum Ratings

Parameter	Description	Minimum	Maximum	Unit
VDC_{IN}	External power supply voltage, inputs	-0.3	30	V
V_I	Input steady state voltage	-0.3	30	V
VDC_{OUT}	External power supply voltage, outputs	-0.3	41	V
I_R	Reverse output current (per channel)	-	-5	A

NOTE: Stresses beyond the maximum ratings may cause permanent damage to the device

Table 4 IFM-DI8O8 Electrical, Mechanical and Environmental Specifications

Mechanical Specifications	
Housing type	DIN rail housing (for DIN rail version EN 50022)
Housing material	ABS/PC high endurance
Dimensions	110 x 20 x 95 mm
Weight	110 gram
Terminal blocks connectors	0.2-1.5mm^2; 16-26 AWG;
Environmental and Reliability	
MTTF	> 200,000 hours
Operation temperature	-30° to 70° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation)
	05% to 95% (storage)
Compliance	
Regulatory	FCC, CE, UKCA
EMC	EN 55032/5, EN 61000-6-2, EN 61000-6-3
Safety	EN/UL/IEC 62368-1

Table 5 IFM-DI8O8 Digital Input Characteristics

Parameter	Description	Min	Typ.	Max	Unit
VDC	External power supply voltage	10	24	30	V
I_{LIM}	Input current limit	2.1	3	3.7	mA
V_{LOW}	Maximum off state voltage		1.5		V
V_{TH}	Activation threshold		3.4	5	V
V_{CL}	Clamping voltage	31	38		V

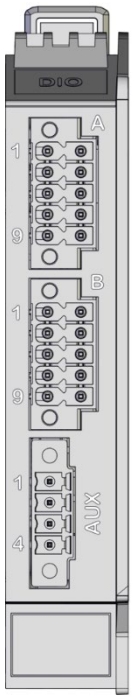
Table 6 IFM-DI8O8 Digital Output Characteristics

Parameter	Description	Min	Typ.	Max	Unit
VDC	External power supply voltage	10.5	24	36	V
$V_{OUT(OFF)}$	OFF state output voltage			1	V
$t_{d(OFF)}$	Turn OFF delay		12		µs
$t_{d(ON)}$	Turn ON delay		6		µs
I_{OUT}	Output current per channel			1	A
I_{LIM}	DC short-circuit current	1.1		2.6	A

2.3 Connectors

Table 7 IFM-DI8O8 connectors

Connector	Description
A	Digital input block
B	Digital output block
AUX	Power input



Connector	Connector Type
A, B	10-pin dual-raw plug with push-in spring connections Locking: screw flange Pitch: 3.5 mm Wire cross-section: AWG 16 – AWG 26
AUX	4-pin plug with screw terminal connections Locking: screw flange Pitch: 3.5 mm Wire cross-section: AWG 16 – AWG 26

Table 8 IFM-DI8O8 connector A pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	IN_0	Digital Input 0	IN
2	IN_1	Digital Input 1	IN
3	IN_2	Digital Input 2	IN
4	IN_3	Digital Input 3	IN
5	COM_IN	Digital inputs reference (0V)	IN
6	COM_IN	Digital inputs reference (0V)	IN
7	IN_4	Digital Input 4	IN
8	IN_5	Digital Input 5	IN
9	IN_6	Digital Input 6	IN
10	IN_7	Digital Input 7	IN

Table 9 IFM-DI8O8 connector B pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	OUT_0	Digital Output 0	OUT
2	OUT_1	Digital Output 1	OUT
3	OUT_2	Digital Output 2	OUT
4	OUT_3	Digital Output 3	OUT
5	COM_OUT	Digital outputs reference (0V)	OUT
6	COM_OUT	Digital outputs reference (0V)	OUT
7	OUT_4	Digital Output 4	OUT
8	OUT_5	Digital Output 5	OUT
9	OUT_6	Digital Output 6	OUT
10	OUT_7	Digital Output 7	OUT

Table 10 IFM-DI8O8 AUX connector pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	COM_IN	Digital inputs reference (0V)	IN
2	VDC_IN	Input block voltage supply	IN
3	COM_OUT	Digital outputs reference (0V)	OUT
4	VDC_OUT	Output block voltage supply	OUT

2.4 Application Information

Figure 1: Digital Inputs

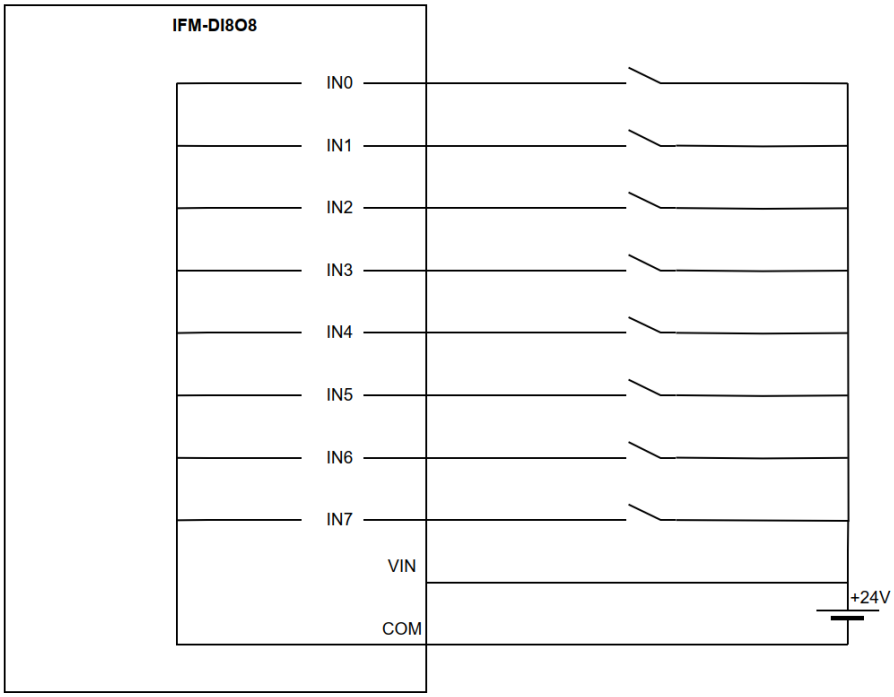
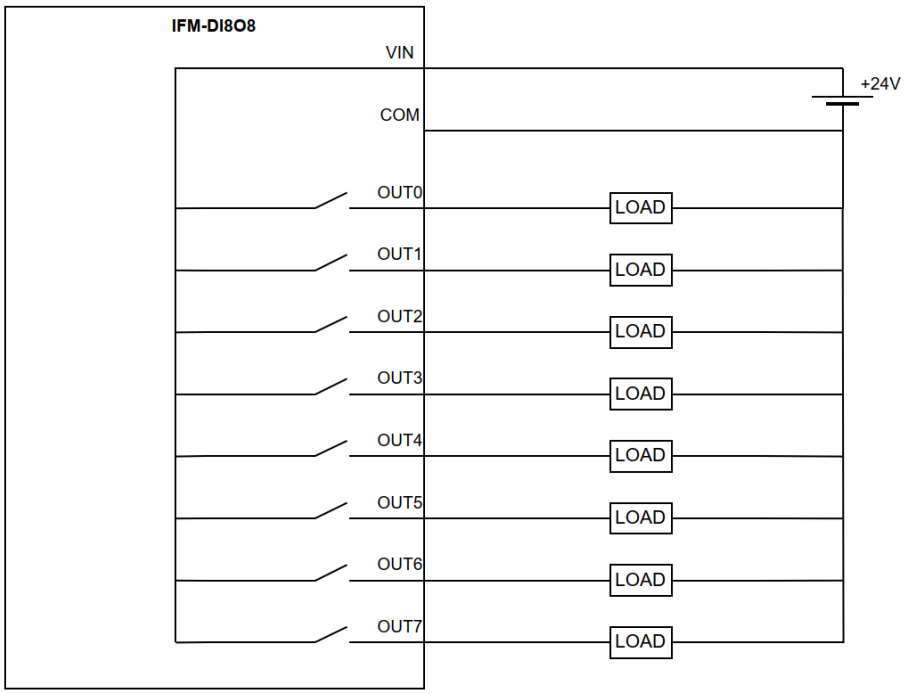


Figure 2: Digital Outputs



3 IFM-RS232 4-PORT RS232 MODULE

3.1 Description

IFM-RS232 is an asynchronous communication I/O expansion module that contains four 2-wire RS-232 ports implemented with MAX3221 RS-232 line driver/receivers. The ports are separated into blocks; each block is isolated from the other and from the main system. Each port inlcudes a receive / transmit pair and a reference GND.

IFM-RS232 receives power from the main gateway and does not require external power.

Key features:

- ESD protection +/-15kV
- Meets TIA/EIA-232-F standards
- Programmable baud rates up 250kbps

NOTE: I/O expansion modules cannot be used stand-alone without a connection to the IOT-DIN-IMX8PLUS gateway

3.2 Specifications

Table 11 IFM-RS232 Absolute Maximum Ratings

Parameter	Description	Minimum	Maximum	Unit
$V_{I(RECEIVER)}$	Input voltage on receiver	-25	25	V
$V_{O(DRIVER)}$	Output voltage from driver	-13.2	13.2	V

NOTE: Stresses beyond the maximum ratings may lead to permanent damage to the device.

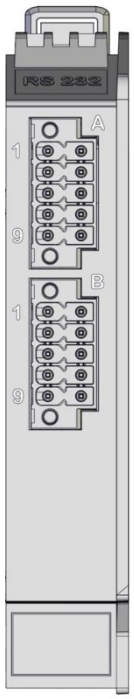
Table 12 IFM-RS232 Electrical, Mechanical and Environmental Specifications

Mechanical Specifications	
Housing type	DIN rail housing (for DIN rail version EN 50022)
Housing material	ABS/PC high endurance
Dimensions	110 x 20 x 95 mm
Weight	110 gram
Terminal blocks connectors	0.2-1.5mm^2; 16-26 AWG;
Environmental and Reliability	
MTTF	> 200,000 hours
Operation temperature	-30° to 70° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation)
	05% to 95% (storage)
Compliance	
Regulatory	FCC, CE, UKCA
EMC	EN 55032/5, EN 61000-6-2, EN 61000-6-3
Safety	EN/UL/IEC 62368-1

3.3 Connectors

Table 13 IFM-RS232 connectors

Connector	Description
A	RS232 Ports 0 and 1
B	RS232 Ports 2 and 3



Connector	Connector Type
A, B	10-pin dual-raw plug with push-in spring connections Locking: screw flange Pitch: 3.5 mm Wire cross-section: AWG 16 – AWG 26

Table 14 IFM-RS232 connector A pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	PORT0_RX	RS232 Port 0 Rx input	A
2	PORT0_TX	RS232 Port 0 Tx output	A
3	COM_A	Ports 0 and 1 reference (0V)	A
4	COM_A	Ports 0 and 1 reference (0V)	A
5	N.C.	Not connected	A
6	N.C.	Not connected	A
7	COM_A	Ports 0 and 1 reference (0V)	A
8	COM_A	Ports 0 and 1 reference (0V)	A
9	PORT1_RX	RS232 Port 1 Rx input	A
10	PORT1_TX	RS232 Port 1 Tx output	A

Table 15 IFM-RS232 connector B pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	PORT2_RX	RS232 Port 2 Rx input	B
2	PORT2_TX	RS232 Port 2 Tx output	B
3	COM_B	Ports 2 and 3 reference (0V)	B
4	COM_B	Ports 2 and 3 reference (0V)	B
5	N.C.	Not connected	B
6	N.C.	Not connected	B
7	COM_B	Ports 2 and 3 reference (0V)	B
8	COM_B	Ports 2 and 3 reference (0V)	B
9	PORT3_RX	RS232 Port 3 Rx input	B
10	PORT3_TX	RS232 Port 3 Tx output	B

4 IFM-RS485 4-PORT RS485 MODULE

4.1 Description

The IFM-RS485 is a I/O expansion module that contains four half-duplex RS485 compatible ports implemented with MAX13488E transceivers. The ports are separated into blocks; each block is isolated from the other and from the main system. Each port contains a positive / negative pair, a reference GND and optional 120Ω termination selectable via jumper. Please refer to Application Information for details.

IFM-RS485 receives power from the main gateway and does not require external power.

Key features:

- ESD protection +/-15kV
- Meets TIA/EIA-485 standards
- Programmable data rates up to 4Mbps

NOTE: I/O expansion modules cannot be used stand-alone without a connection to the IOT-DIN-IMX8PLUS gateway

4.2 Specifications

Table 16 IFM-RS485 Absolute Maximum Ratings

Parameter	Description	Minimum	Maximum	Unit
V_{SIG}	D+/D- Voltage	-8	13	V

NOTE: Stresses beyond the maximum ratings may lead to permanent damage to the device

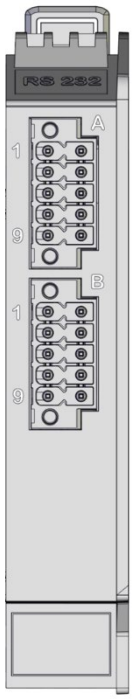
Table 17 IFM-RS485 Electrical, Mechanical and Environmental Specifications

Mechanical Specifications	
Housing type	DIN rail housing (for DIN rail version EN 50022)
Housing material	ABS/PC high endurance
Dimensions	110 x 20 x 95 mm
Weight	110 gram
Terminal blocks connectors	0.2-1.5mm^2; 16-26 AWG;
Environmental and Reliability	
MTTF	> 200,000 hours
Operation temperature	-30° to 70° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation)
	05% to 95% (storage)
Compliance	
Regulatory	FCC, CE, UKCA
EMC	EN 55032/5, EN 61000-6-2, EN 61000-6-3
Safety	EN/UL/IEC 62368-1

4.3 Connectors

Table 18 IFM-RS485 connectors

Connector	Description
A	RS485 Ports 0 and 1
B	RS485 Ports 2 and 3



Connector	Connector Type
A, B	10-pin dual-raw plug with push-in spring connections Locking: screw flange Pitch: 3.5 mm Wire cross-section: AWG 16 – AWG 26

Table 19 IFM-RS485 connector A pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	PORT0_NEG	RS485 Port 0 signal D-	A
2	PORT0_POS	RS485 Port 0 signal D+	A
3	PORT0_TRM_A	Port 0 termination A (connect to B for 120Ω termination)	A
4	PORT0_TRM_B	Port 0 termination B (connect to A for 120Ω termination)	A
5	COM_A	Ports 0 and 1 reference (0V)	A
6	COM_A	Ports 0 and 1 reference (0V)	A
7	PORT1_TRM_A	Port 1 termination A (connect to B for 120Ω termination)	A
8	PORT1_TRM_B	Port 1 termination B (connect to A for 120Ω termination)	A
9	PORT1_NEG	RS485 Port 1 signal D-	A
10	PORT1_POS	RS485 Port 1 signal D+	A

Table 20 IFM-RS485 connector B pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	PORT2_NEG	RS485 Port 2 signal D-	B
2	PORT2_POS	RS485 Port 2 signal D+	B
3	PORT2_TRM_A	Port 2 termination A (connect to B for 120Ω termination)	B
4	PORT2_TRM_B	Port 2 termination B (connect to A for 120Ω termination)	B
5	COM_B	Ports 2 and 3 reference (0V)	B
6	COM_B	Ports 2 and 3 reference (0V)	B
7	PORT3_TRM_A	Port 3 termination A (connect to B for 120Ω termination)	B
8	PORT3_TRM_B	Port 3 termination B (connect to A for 120Ω termination)	B
9	PORT3_NEG	RS485 Port 3 signal D-	B
10	PORT3_POS	RS485 Port 3 signal D+	B

4.4 Application Information

Each RS485 ports in the IFM-RS485 module comes with an optional 120Ω line termination. To enable the termination, place a wire between TRM_A and TRM_B pins for the respective port. Leave these pins unconnected for operation without termination.

For example, when using channel RS485 PORT0, place a jumper between PORT0_TRM_A (Pin 3) and PORT0_TRM_B (Pin 4).

Figure 3: RS485 PORT0 with Terminating Resistor

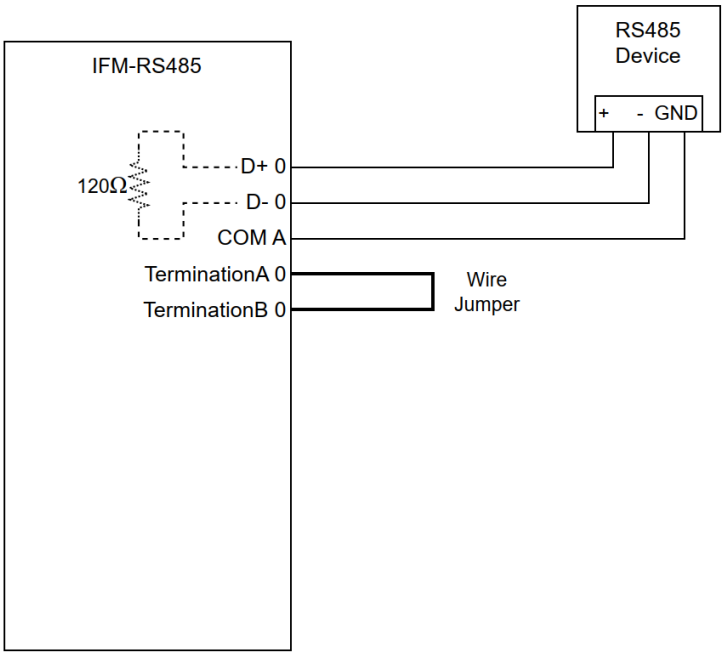
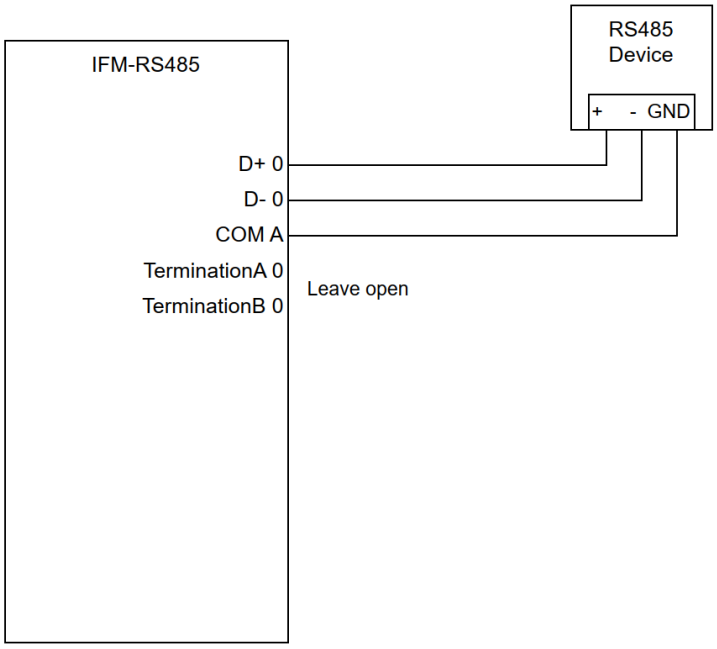


Figure 4: RS485 PORT0 without Terminating Resistor



5 IFM-ADC8 ANALOG INPUT MODULE

5.1 Description

IFM-ADC8 is an I/O expansion module with eight single-ended analog input channels with shared reference COM, divided into two blocks of 4. Inputs operate between 0-10V or 4-20mA ranges for use with industiral sensors. Each block can be set into current or voltage input mode via jumper. For details please refer to Application Information.

Key features:

- 8x single-ended analog inputs separated into two blocks of 4 channels
- Selectable operating modes 0-10V or 4-20mA
- Galvanic isolation from main unit
- Programmable sample rate 128SPS to 3.3kSPS
- 11-bit (2048 units) low noise resolution
- Programmable comparator and dedicated interrupt for critical signals

NOTE: I/O expansion modules cannot be used stand-alone without a connection to the IOT-DIN-IMX8PLUS gateway

5.2 Specifications

Table 21 IFM-ADC8 Absolute Maximum Ratings

Parameter	Description	Minimum	Maximum	Unit
V_{IN}	Voltage on input channels	-0.3	18	V
I_{IN}	Current on input channels	0	30	mA

NOTE: Stresses beyond the maximum ratings may lead to permanent damage to the device

Table 22 Analog Input Characteristics

Parameter	Description	Min	Typ.	Max	Unit
V_{IN}	Analog input (voltage)	0	-	10	V
I_{IN}	Analog input (current)	4	-	20	mA
$R_{IN(I)}$	Input impedance (current mode)		500		Ω
$R_{IN(V)}$	Input impedance (voltage mode)		5k		Ω

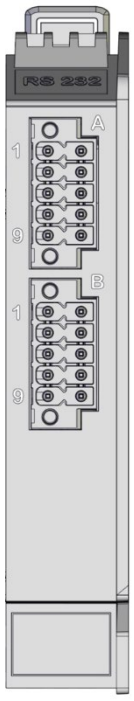
Table 23 IFM-ADC8 Electrical, Mechanical and Environmental

Mechanical Specifications	
Housing type	DIN rail housing (for DIN rail version EN 50022)
Housing material	ABS/PC high endurance
Dimensions	110 x 20 x 95 mm
Weight	110 gram
Terminal blocks connectors	0.2-1.5mm^2; 16-26 AWG;
Environmental and Reliability	
MTTF	> 200,000 hours
Operation temperature	-30° to 70° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation)
	05% to 95% (storage)
Compliance	
Regulatory	FCC, CE, UKCA
EMC	EN 55032/5, EN 61000-6-2, EN 61000-6-3
Safety	EN/UL/IEC 62368-1

5.3 Connectors

Table 24 IFM-ADC8 connectors

Connector	Description
A	Analog Inputs 0 - 3
B	Analog Inputs 4 - 7



Connector	Connector Type
A, B	10-pin dual-raw plug with push-in spring connections Locking: screw flange Pitch: 3.5 mm Wire cross-section: AWG 16 – AWG 26

Table 25 IFM-RS485 connector A pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	COM	Signal Reference (0V)	ANALOG
2	AIN_0	Analog input channel 0	ANALOG
3	COM	Signal Reference (0V)	ANALOG
4	AIN_1	Analog input channel 1	ANALOG
5	COM	Signal Reference (0V)	ANALOG
6	AIN_2	Analog input channel 2	ANALOG
7	COM	Signal Reference (0V)	ANALOG
8	AIN_3	Analog input channel 3	ANALOG
9	COM	Signal Reference (0V)	ANALOG
10	MODE_A	Channel 0 – 3 mode select (connect to COM for 4 – 20mA operation; Leave open for 0 – 10V)	ANALOG

Table 26 IFM-RS485 connector B pin-out

Pin	Signal Name	Description	Isolation Power Domain
1	COM	Signal Reference (0V)	ANALOG
2	AIN_4	Analog input channel 4	ANALOG
3	COM	Signal Reference (0V)	ANALOG
4	AIN_5	Analog input channel 5	ANALOG
5	COM	Signal Reference (0V)	ANALOG
6	AIN_6	Analog input channel 6	ANALOG
7	COM	Signal Reference (0V)	ANALOG
8	AIN_7	Analog input channel 7	ANALOG
9	COM	Signal Reference (0V)	ANALOG
10	MODE_B	Channel 4 – 7 mode select (connect to COM for 4 – 20mA operation; Leave open for 0 – 10V)	ANALOG

5.4 Application Information

Each block of four channels can be used in 0 – 10V (Voltage Mode) or 4 – 20mA (Current Mode). In each terminal block, to set Current Mode, place a plain wire between COM (pin 9) and MODE (pin 10). For Voltage Mode, leave MODE pin unconnected.

For example, to set AIN_0 – AIN_3 to Current Mode, loop a plain wire between COM (Pin 9) and MODE_A (Pin 10).

Figure 5 Analog Input used in Voltage Mode

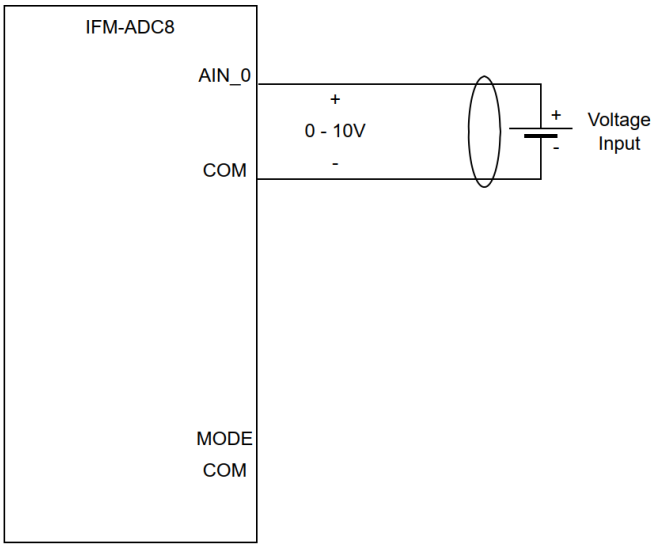
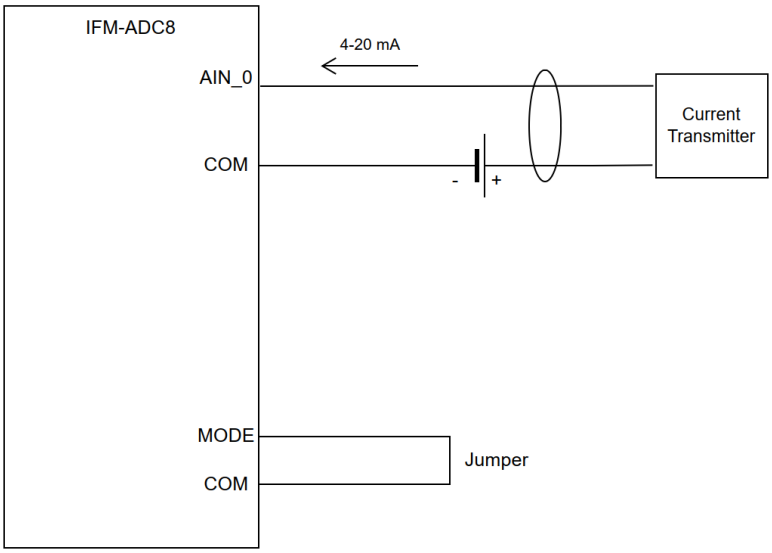


Figure 6 Analog Input used in Current Mode



6 IFM-WB WIFI / BLUETOOTH MODULE

6.1 Description

IFM-WB is an expansion module that adds Wi-Fi and Bluetooth capabilities to the system. Implemented using Intel Wi-Fi 6E AX210 connectivity module. IFM-WB features two RP-SMA connectors for external antennas.

Key features:

- Supports Wi-Fi 6E including new 6GHz band
- Bluetooth® 5.3

NOTE: I/O expansion modules cannot be used stand-alone without a connection to the IOT-DIN-IMX8PLUS gateway

6.2 Specifications

For wireless specifications please refer to the Intel Wi-Fi 6E AX210 datasheet.

Table 27 Electrical, Mechanical and Environmental

Mechanical Specifications	
Housing type	DIN rail housing (for DIN rail version EN 50022)
Housing material	ABS/PC high endurance
Dimensions	110 x 20 x 95 mm
Weight	110 gram
Environmental and Reliability	
MTTF	> 200,000 hours
Operation temperature	-30° to 70° C
Storage temperature	-40° to 85° C
Relative humidity	10% to 90% (operation)
	05% to 95% (storage)
Compliance	
Regulatory	FCC, CE, UKCA
EMC	EN 55032/5, EN 61000-6-2, EN 61000-6-3
Safety	EN/UL/IEC 62368-1

6.3 Connectors

Table 28 IFM-ADC8 connectors

Connector	Description	
A	Wi-Fi (Chain A) + Bluetooth	
B	Wi-Fi (Chain B)	

Connector	Connector Type
A, B	RP-SMA