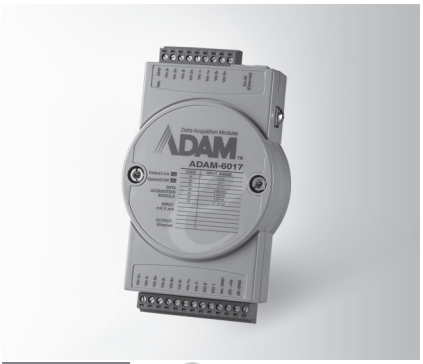
ADAM-6015
ADAM-6017
ADAM-6018+

7-ch Isolated RTD Input Modbus TCP Module
8-ch Isolated Analog Input Modbus TCP Module with 2-ch DO

8-ch Isolated Thermocouple Input Module

ADAM-6015



ADAM-6017

ADAM-6018+

Specifications

Analog Input

- **Channels** 7 (differential)
- **Input Impedance** > 10 MΩ
- **Input Connections** 2 or 3 wire
- **Input Type** Pt, Balco and Ni RTD
- **RTD Types and Temperature Ranges**

Pt 100	-50°C	~	150°C
	0°C	~	100°C
	0°C	~	200°C
	0°C	~	400°C
	-200°C	~	200°C
Pt 1000	-40°C	~	160°C

Supports both IEC 60751 ITS90 (0.0385 W/W/°C) and JIS C 1604 (0.0392 W/W/°C)

Balco 500	-30°C	~	120°C
Ni 518	-80°C	~	100°C
	0°C	~	100°C

- **Accuracy** ± 0.1 % or better
  High speed mode ±0.5% or better
- **Span Drift** ± 25 ppm/°C
- **Zero Drift** ± 6 μV/°C
- **Resolution** 16-bit
- **Sampling Rate**
  10 sample/ second (total)
  High speed mode:1K sample/second (total)
  CMR @ 50/60 HZ 90dB
  NMR @ 50/60 HZ 60dB
  *** high speed mode does not support CMR/NMR**
- **Wire Burnout Detection**

Ordering Information

- **ADAM-6015** 7-ch Isolated RTD Input Modbus TCP Module

Specifications

Analog Input

- **Channels** 8 (differential)
- **Input Impedance** > 10 MΩ (voltage)
  120 Ω (current)
- **Input Type** mV, V, mA
- **Input Range** ±150mV , ±500mV , ±1 V , ±5V , ±10V, 0 ~ 150mV, 0 ~ 500mV , 0 ~ 1V , 0 ~ 5V , 0 ~ 10V, 0 ~ 20mA , 4 ~ 20mA , ±20mA
- **Accuracy** ±0.1% (voltage)
  ±0.2% (current)
- **Span Drift** ±25 ppm/°C
- **Zero Drift** ±6 μV/°C
- **Resolution** 16-bit
- **Sampling Rate** 10 or 100 sample/ second (total)
  CMR @ 50/60 HZ 90dB
  NMR @ 50/60 HZ 67dB
- **Common-Mode Voltage** 350V_{DC}

Digital Output

- **Channels** 2, open collector to 30 V, 100 mA max. load
- **Power Dissipation** 300 mW for each module
- **Output Delay** On: 100μs
  Off: 150μs

Ordering Information

- **ADAM-6017** 8-ch Isolated AI with 2-ch DO Modbus TCP Module

Specifications

Analog Input

- **Channels** 8 (differential)
- **Input Type** Thermocouple
- **Thermocouple Type and Range:**

J	0 ~ 760°C	**R**	500 ~ 1,750°C
K	0 ~ 1,370°C	**S**	500 ~ 1,750°C
T	-100 ~ 400°C	**B**	500 ~ 1,800°C
E	0 ~ 1,000°C		

- **Accuracy@25°C** Type J,K,E,R,S: ±0.1% FSR Max
  Type B: ±0.15% FSR Max
  Type T: ±0.2% FSR Max
- **Span Drift** ±25 ppm/°C
- **Zero Drift** ±6 μV/°C
- **Resolution** 16-bit
- **Sampling Rate** 10 sample/ second (total)
- **Wire Burnout Detection**

Ordering Information

- **ADAM-6018+** 8-ch Isolated Thermocouple Input Module

Common Specifications

General

- **Certification** CE, FCC, UL
  *Class I, Division 2, Groups A, B, C and D Hazardous Locations for ADAM-6015 and ADAM-6017
- **LAN** 10/100Base-T(X)
- **Power Consumption** 2.5 W @ 24 V_{DC} (ADAM-6015)
  2.7 W @ 24 V_{DC} (ADAM-6017)
  1 W @ 24 V_{DC} (ADMA-6018+)
- **Connectors** 1 x RJ-45 (LAN), Plug-in screw terminal block (I/O and power)
- **Watchdog** System (1.6 second) and Communication (programmable)
- **Power Input** 10 ~ 30 V_{DC}
- **Supports Peer-to-Peer**
- **Supports GCL**
- **Supports Modbus/TCP, TCP/IP, UDP, RESTful**
- **Supports MQTT (D version), SNMP (D version) Protocols (ADAM-6017 and ADAM-6018+)**

Protection

- **Isolation Protection** 2,000 V_{DC}
- **Built-in TVS/ESD Protection**
- **Power Reversal Protection**

Environment

- **Operating Temperature** -10 ~ 70°C (14 ~ 158°F)
  -40 ~ 70°C (-40~158°F) (D version)
- **Storage Temperature** -20 ~ 80°C (-4 ~ 176°F)
  -40 ~ 85°C (-40~185°F) (D version)
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

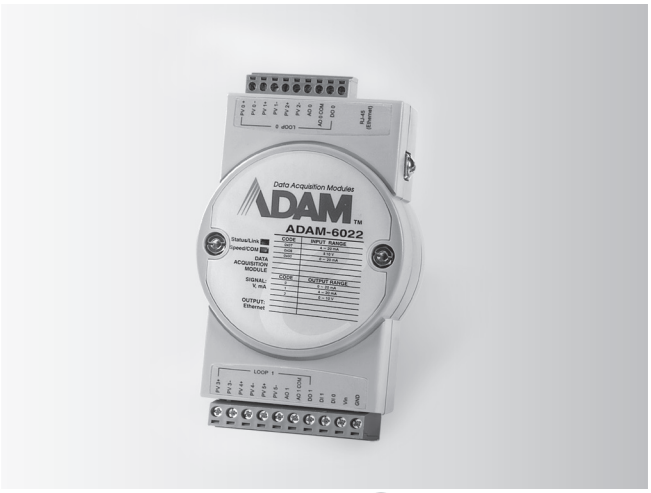
All product specifications are subject to change without notice.

Last updated: 26-Apr-2024

ADAM-6022
ADAM-6024

Ethernet-based Dual-loop PID Controller

12-ch Isolated Universal Input/Output Modbus TCP Module



ADAM-6022

Specifications

General

- **Loop Number** 2 (3 AI, 1 AO, 1 DI, 1 DO for each control loop)

Analog Input

- **Channels** 6 (differential)
- **Input Range** ±10 V_{DC}, 0 ~ 20 mA, 4 ~ 20 mA

Analog Output

- **Channels** 2
- **Output Type** V, mA
- **Output Range** 0 ~ 10 V_{DC}, 4 ~ 20 mA, 0 ~ 20 mA

Digital Input

- **Channels** 2
- **Dry Contact** Logic level 0: close to GND
  Logic level 1: open
- **Wet Contact** Logic level 0: 0 ~ 3 V_{DC}
  Logic level 1: 10 ~ 30 V_{DC}

Digital Output

- **Channels** 2, open collector to 30 V, 100 mA max. load
- **Power Dissipation** 300 mW for each module

Ordering Information

- **ADAM-6022** Ethernet-based Dual-loop PID Controller

ADAM-6024

Specifications

Analog Input

- **Channels** 6 (differential)
- **Input Range** ±10 V_{DC}, 0 ~ 20 mA, 4 ~ 20 mA

Analog Output

- **Channels** 2
- **Output Type** V, mA
- **Output Range** 0 ~ 10 V_{DC}, 4 ~ 20 mA, 0 ~ 20 mA

Digital Input

- **Channels** 2
- **Dry Contact** Logic level 0: close to GND
  Logic level 1: open
- **Wet Contact** Logic level 0: 0 ~ 3 V_{DC}
  Logic level 1: 10 ~ 30 V_{DC}

Digital Output

- **Channels** 2, open collector to 30 V, 100 mA max. load
- **Power Dissipation** 300 mW for each module

Supports

- **Peer-to-Peer (Receiver only)**
- **GCL (Receiver only)**

Ordering Information

- **ADAM-6024** 12-ch Isolated Universal I/O Modbus TCP Module

Common Specifications

General

- **Certification** CE, FCC, UL
- **LAN** 10/100Base-T(X)
- **Power Consumption** 4 W @ 24 V_{DC}
- **Connectors** 1 x RJ-45 (LAN), Plug-in screw terminal block (I/O and power)
- **Watchdog** System (1.6 second) and Communication (programmable)
- **Power Input** 10 ~ 30 V_{DC}
- **Supports Modbus/TCP, TCP/IP, UDP, RESTful (D version), MQTT (D version), SNMP (D version)**

Analog Input

- **Input Impedance** 20 MΩ
- **Accuracy** ±0.1% of FSR
- **Resolution** 16-bit
- **Sampling Rate** 10 sample/second
- **CMR @ 50/60 Hz** 90 dB
- **NMR @ 50/60 Hz** 60 dB
- **Span Drift** ±25 ppm/° C
- **Zero Drift** ±6 μV/° C

Analog Output

- **Accuracy** ±0.1% of FSR
- **Resolution** 12-bit
- **Drift** ±50 ppm/° C
- **Current Load Resistor** Max. 500Ω
- **Voltage Load Resistor** Min. 1K Ω

Protection

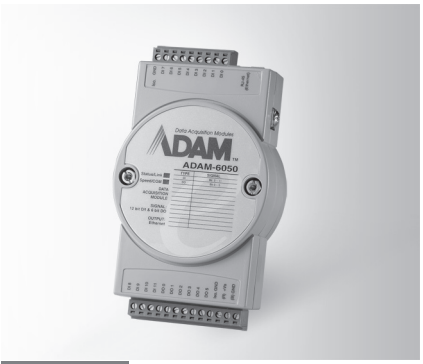
- **Isolation Protection** 2,000 V_{DC}
- **Built-in TVS/ESD Protection**
- **DI Over Voltage Protection** 35 V_{DC}
- **Power Reversal Protection**

Environment

- **Operating Temperature** -10 ~ 50° C (14 ~ 122° F)
  D version: -40 ~ 70° C (-40~158°F)
- **Storage Temperature** -20 ~ 80° C (-4 ~ 176° F)
  D version: -40 ~ 80° C (-40~176° F)
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

ADAM-6050
ADAM-6051
ADAM-6052

18-ch Isolated Digital I/O Modbus TCP Module
14-ch Isolated Digital I/O Modbus TCP Module with 2-ch Counter
16-ch Source-type Isolated Digital I/O Modbus TCP Module



ADAM-6050

Specifications

Digital Input

- **Channels** 12
- **Dry Contact** Logic level 0: Closed to GND
  Logic level 1: Open
- **Wet Contact** Logic level 0: 0 ~ 3 V_{DC}
  Logic level 1: 10 ~ 30 V_{DC} or floating
  Support DO type: Sink (NPN)
- **Supports 3 kHz Counter Input (32-bit + 1-bit overflow)**
- **Keep/Discard Counter Value when Power-off**
- **Supports 3 kHz Frequency Input**

Digital Output

- **Channels** 6 (sink type), open collector to 30 V, 100 mA maximum load
- **Supports 5 kHz Pulse Output**
- **Supports High-to-Low and Low-to-High Delay Output**

Ordering Information

- **ADAM-6050-D1** 18-ch Isolated DI/O Modbus TCP Module

ADAM-6051

Specifications

Digital Input

- **Channels** 12
- **Dry Contact** Logic level 0: Closed to GND
  Logic level 1: Open
- **Wet Contact** Logic level 0: 0 ~ 3 V_{DC}
  Logic level 1: 10 ~ 30 V_{DC} or floating
  Support DO type: Sink (NPN)
- **Supports 3 kHz Counter Input (32-bit + 1-bit overflow)**
- **Keep/Discard Counter Value when Power-off**
- **Supports 3 kHz Frequency Input**

Counter Input

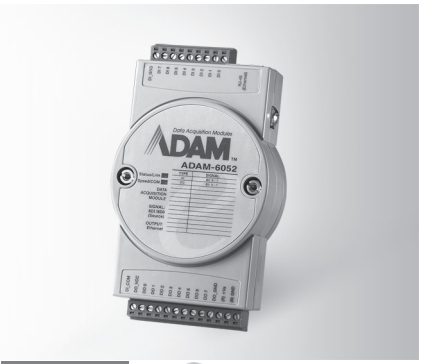
- **Channels** 2
- **Mode** Counter, Frequency
- **Keep/Discard Counter Value when Power-off**
- **Maximum Count** 4,294,967,295 (32-bit + 1-bit overflow)
- **Input Frequency** Frequency Mode: 0.2 ~ 4500 Hz
  Counter Mode: 0 ~ 4.5 kHz

Digital Output

- **Channels** 2 (sink type), open collector to 30 V, 100 mA maximum load
- **Supports 5 kHz Pulse Output**
- **Supports High-to-Low and Low-to-High Delay Output**

Ordering Information

- **ADAM-6051-D** 16-ch Isolated DI/O with Counter Modbus TCP Module



ADAM-6052

Specifications

Digital Input

- **Channels** 8
  Dry/Wet Contact decided by switch or jumper
- **Dry Contact** Logic level 0: Open
  Logic level 1: Closed to GND
- **Wet Contact** Logic level 0: 0 ~ 3 V_{DC} or floating
  Logic level 1: 10 ~ 30 V_{DC}
  Support DO type: Source (PNP)
- **Supports 3 kHz Counter Input (32-bit + 1-bit overflow)**
- **Keep/Discard Counter Value when Power-off**
- **Supports 3 kHz Frequency Input**

Digital Output

- **Channels** 8 (Source Type)
- **Voltage Range** 10 ~ 35 V_{DC}
- **Current** 1 A (per channel)
- **Supports 5 kHz Pulse Output**
- **Supports High-to-Low and Low-to-High Delay Output**
- **Supports Over Current Protection**

Ordering Information

- **ADAM-6052-D** 16-ch Source-type Isolated DI/O Modbus TCP Module

Common Specifications

General

- **Certification** FCC, CE, UL
  *Class I, Division 2, Groups A, B, C and D Hazardous Locations
- **LAN** 1-port 10/100Base-T(X)
- **Power Consumption** 2 W @ 24 V_{DC}
- **Connectors** 1 x RJ-45 (LAN), Plug-in screw terminal block (I/O and power)
- **Watchdog** System (1.6 second) and Communication (programmable)
- **Power Input** 10 ~ 30 V_{DC}
- **Supports Peer-to-Peer, GCL**
- **Supports User Defined Modbus Address**
- **Supports Modbus/TCP, TCP/IP, UDP, RESTful, MQTT (D version), SNMP (D version) Protocol**

Protection

- **Power Reversal Protection**
- **Isolation Protection** 2,000 V_{DC}

Environment

- **Operating Temperature** -20 ~ 70°C (-4 ~ 158°F)
  D version
  -40 ~ 70°C (-40~158°F)
- **Storage Temperature** -30 ~ 80°C (-22 ~ 176°F)
  D version
  -40 ~ 85°C (-40~185°F)
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

ADAM-6060
ADAM-6066

6-ch Digital Input and 6-ch Relay Modbus TCP Module

6-ch Digital Input and 6-ch Power Relay Modbus TCP Module

FCC CE RoHS COMPLIANT 2002/95/EC c UL us LISTED E180881 I.T.E.

Specifications

General

- **LAN** 1-port 10/100Base-T(X)
- **Power Consumption** 2 W @ 24 VDC (ADAM-6060)
  2.5 W @ 24 VDC (ADAM-6066)
- **Connectors** 1 x RJ-45 (LAN), Plug-in screw terminal block (I/O and power)
- **Watchdog Timer** System (1.6 second) and Communication (programmable)
- **Power Input** 10 ~ 30 VDC
- **Supports Peer-to-Peer**
- **Supports GCL**
- **Supports Modbus/TCP, TCP/IP, UDP, DHCP,SNMP, RESTful and MQTT Protocol**

Digital Input

- **Channels** 6
- **Dry Contact** Logic level 0: Closed to GND
  Logic level 1: Open
- **Wet Contact** Logic level 0: 3 VDC
  Logic level 1: 10 ~ 30 VDC or floating
  Support DO type: Sink (NPN) only
- **Supports 3 kHz Counter Input (32-bit + 1-bit overflow)**
- **Keep/Discard Counter Value when Power-off**
- **Supports 3 kHz Frequency Input**
- **Supports Inverted DI Status**

Relay Output (Form A)

- **Channels** 6
- **Contact Rating (Resistive)** ADAM-6060: 120 VAC @ 0.5 A
  30 VDC @ 1 A
  ADAM-6066: 250 VAC @ 5 A
  30 VDC @ 3 A
- **Breakdown Voltage** 500 VAC (50/60 Hz)
- **Relay On Time** 7 ms
- **Relay Off Time** 3 ms
- **Total Switching Time** 10 ms
- **Insulation Resistance** 1 GΩ min. at 500 VDC
- **Maximum Switching Rate (at rated load)** 20 operations/minute
- **Supports Pulse Output**

Protection

- **Isolation Voltage** 2,000 VDC
- **Power Reversal Protection**

Environment

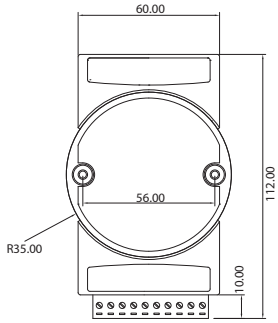
- **Operating Temperature** -40 ~ 70°C (-40~158°F)
- **Storage Temperature** -40 ~ 80°C (-40~176°F)
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

Ordering Information

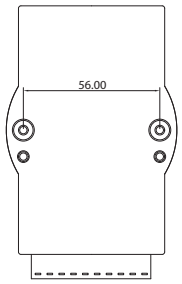
- **ADAM-6060-D1** 6-ch DI and 6-ch Relay Modbus TCP Module
- **ADAM-6066-D** 6-ch DI and 6-ch Power Relay Modbus TCP Module

ADAM-6000 Series Dimensions

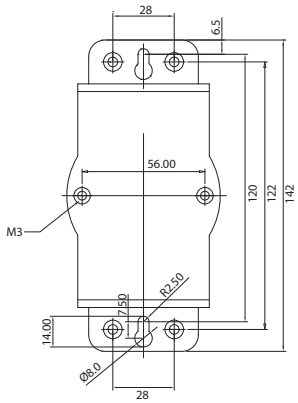
Unit: mm



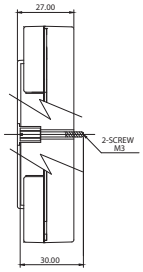
Front View



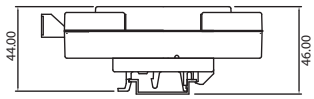
Rear View



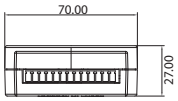
Wall Mounting View



Side View



DIN-Rail Mounting View



Top View

ADAM-6000 Series Common Specifications

General

- **Dimensions (W x H x D)** 70 x 120 x 30 mm
- **Enclosure** ABS+PC
- **Mounting** DIN 35 rail, stack, wall

ADAM-6217
ADAM-6224

8-ch Isolated Analog Input Modbus TCP Module

4-ch Isolated Analog Output Modbus TCP Module

ADAM-6217

ADAM-6224

Specifications

Analog Input

- **Channels** 8 (differential)
- **Input Impedance** > 10 MW (voltage)
  120 W (current)
- **Input Type** mV, V, mA
- **Input Range** ±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, 0 ~ 20 mA, 4 ~ 20 mA, ±20 mA
- **Span Drift** ± 30 ppm/°C
- **Zero Drift** ± 6 μV/°C
- **Resolution** 16-bit
- **Accuracy** ± 0.1% of FSR (Voltage) at 25°C
  ± 0.2% of FSR (Current) at 25°C
- **Sampling Rate** 10 sample/second (total)
- **CMR @ 50/60 Hz** 92 dB
- **NMR @ 50/60 Hz** 67 dB
- **Common Mode** 200 V_{DC}

Ordering Information

- **ADAM-6217** 8-ch Isolated Analog Input Modbus TCP Module

Specifications

Analog Output

- **Channels** 4
- **Output Impedance** 2.1 Ω
- **Output Settling Time** 20 μs
- **Driving Load** Voltage: 2kΩ
  Current: 500 Ω
- **Programmable Output Slope** 0.125 ~ 128 mA/sec
  0.0625 ~ 64 V/sec
- **Output Type** V, mA
- **Output Range** 0 ~ 5 V, 0 ~ 10 V, ± 5 V, ± 10 V, 0 ~ 20 mA, 4 ~ 20 mA
- **Accuracy** ± 0.3% of FSR (Voltage) at 25°C
  ± 0.5% of FSR (Current) at 25°C
- **Resolution** 12-bit
- **Current Load Resistor** 0 ~ 500 Ω
- **Drift** ± 50 ppm/°C

Digital Input

- **Channels** 4 (Dry Contact only)
- **Dry Contact** Logic 0: Open
  Logic 1: Closed to DGND
- **Support DI Filter**
- **Support Inverted DI Status**
- **Support Trigger to Startup or Safety Value**

Ordering Information

- **ADAM-6224** 4-ch Isolated Analog Output Modbus TCP Module

Common Specifications

General

- **Ethernet** 2-port 10/100 Base-TX (for Daisy Chain)
- **Protocol** Modbus TCP, TCP/IP, UDP, HTTP, DHCP,RESTful, SNMP (B version), MQTT (B version)
- **Connector** Plug-in 5P/15P screw terminal blocks
- **Power Input** 10 - 30 V_{DC} (24 V_{DC} standard)
- **Watchdog Timer** System (1.6 seconds)
  Communication (Programmable)
- **Dimensions** 70 x 122 x 27 mm
- **Protection** Built-in TVS/ESD protection
  Power Reversal protection
  Isolation protection: 2500 V_{DC}
- **Power Consumption** ADAM-6217: 3.5W @ 24 V_{DC}
  ADAM-6224: 6W @ 24 V_{DC}

Features

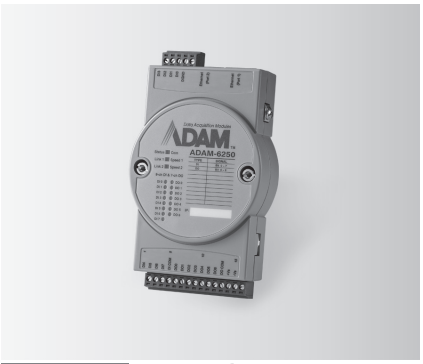
- Daisy chain connection with auto-bypass protection
- Remote monitoring and control with smart phone/pad
- Group configuration capability for multiple module setup
- Flexible user-defined Modbus address
- Intelligent control ability by Peer-to-Peer and GCL function
- Multiple protocol support: Modbus TCP, TCP/IP, UDP, HTTP, DHCP, RESTful SNMP (B version), MQTT (B version)
- Web language support: XML, HTML 5, Java Script
- System configuration backup
- User Access Control

Environment

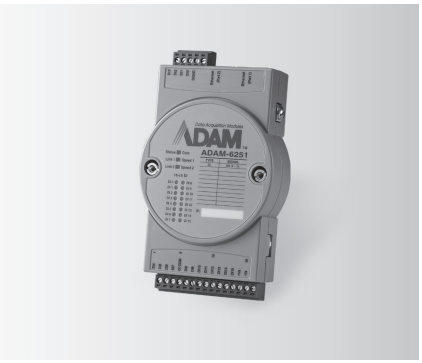
- **Operating Temperature** -10 ~ 70°C (14 ~ 158°F)
  -40 ~ 70°C (-40~158°F) (B version)
- **Storage Temperature** -20 ~ 80°C (-4 ~ 176°F)
  -40 ~ 85°C (-40~185°F) (B version)
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

ADAM-6250
ADAM-6251
ADAM-6256

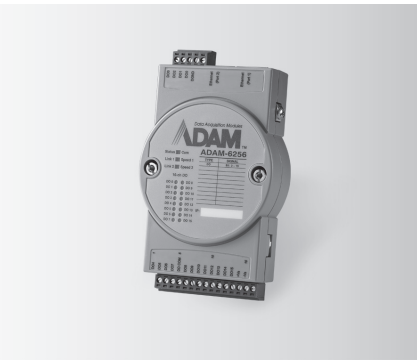
15-ch Isolated Digital I/O Modbus TCP Module
16-ch Isolated Digital Input Modbus TCP Module
16-ch Isolated Digital Output Modbus TCP Module



ADAM-6250



ADAM-6251



ADAM-6256

Specifications

Digital Input

- **Channels** ADAM-6250: 8
ADAM-6251: 16
- **Dry Contact** Logic 0: Open
Logic 1: Closed to DGND
- **Wet Contact** Logic 0: 0 ~ 3 V_{DC} or 0 ~ -3 V_{DC}
Logic 1: 10 ~ 30 V_{DC} or -10 ~ -30 V_{DC}
(Dry/Wet Contact decided by Switch)
- **Input Impedance** 5.2 kΩ (Wet Contact)
- **Transition Time** 0.2 ms
- **Frequency Input Range** 0.1 ~ 3kHz
- **Counter Input** 3kHz (32 bit + 1 bit overflow)
- **Keep/Discard Counter Value when power off**
- **Supports Inverted DI Status**

Digital Output

- **Channels** ADAM-6250: 7 (Sink Type)
ADAM-6256: 16 (Sink Type)
- **Output Voltage Range** 10 ~ 30 V_{DC}
- **Normal Output Current** 100 mA (per channel)
- **Pulse Output** Up to 5kHz
- **Delay Output** High-to-Low and Low-to-High

Ordering Information

- **ADAM-6250** 15-ch Isolated Digital I/O Modbus TCP Module
- **ADAM-6251** 16-ch Isolated Digital Input Modbus TCP Module
- **ADAM-6256** 16-ch Isolated Digital Output Modbus TCP Module

Common Specifications

General

- **Cerification** CE,FCC,UL
- **Ethernet** 2-port 10/100 Base-TX (for Daisy Chain)
- **LED Indication** ADAM-6250: 8 DI + 7 DO
ADAM-6251: 16 DI
ADAM-6256: 16 DO
- **Protocol** Modbus/TCP, TCP/IP, UDP, HTTP, DHCP, MQTT, SNMP
- **Connector** Plug-in 5P/15P screw terminal blocks
- **Power Input** 10 - 30 V_{DC} (24 V_{DC} standard)
- **Watchdog Timer** System (1.6 seconds)
Communication (Programmable)
- **Dimensions** 70 x 122 x 27 mm
- **Protection** Built-in TVS/ESD protection
Power Reversal protection
Over Voltage protection: +/- 35V_{DC}
Isolation protection: 2500 V_{DC}
- **Power Consumption** ADAM-6250: 3 W @ 24 V_{DC}
ADAM-6251: 2.7 W @ 24 V_{DC}
ADAM-6256: 3.2 W @ 24 V_{DC}

Features

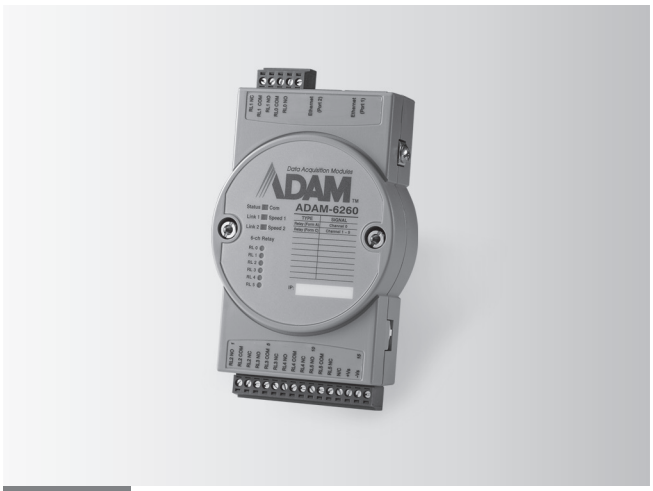
- Daisy chain connection with auto-bypass protection
- Remote monitoring and control with smart phone/pad
- Group configuration capability for multiple module setup
- DI/O LED Indication
- Flexible user-defined Modbus address.
- Intelligent control ability by Peer-to-Peer and GCL function
- Multiple protocol support: Modbus/TCP, TCP/IP, UDP, HTTP, DHCP, MQTT, SNMP
- Web language support: XML, HTML 5, Java Script
- System configuration backup
- User Access Control

Environment

- **Operating Temperature** -10 ~ 70°C (14 ~ 158°F)
-40 ~ 70°C (-40~158°F) (B version)
- **Storage Temperature** -20 ~ 80°C (-4 ~ 176°F)
-40 ~ 80°C (-40~176°F) (B version)
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

ADAM-6260
ADAM-6266

6-ch Relay Output Modbus TCP Module
4-ch Relay Output Modbus TCP Module with 4-ch DI



ADAM-6260

ADAM-6266

Specifications

Relay Output

- **Channels** ADAM-6260: 5 Form C and 1 Form A
ADAM-6266: 4 Form C
- **Contact Rating (Resistive)** 250 V_{AC} @ 5A
30 V_{DC} @ 5A
- **Max. Switching Voltage** 400 V_{AC}
300 V_{DC}
- **Breakdown Voltage** 500 V_{AC} (50/60Hz)
- **Max. Breakdown Capacity** 1250 VA
- **Frequency of Operation** 360 operations/hour with load
72,000 operations/hour without load
- **Set/Reset Time** 8 ms/8 ms
- **Mechanical Endurance** > 15 x 10^6 operations
- **Isolation between Contact** 1000 V_{rms}
- **Insulation Resistance** > 10 GΩ @ 500 V_{DC}

Digital Input

- **Channels** ADAM-6266: 4
- **Dry Contact** Logic 0: Open
Logic 1: Closed to DI COM
- **Wet Contact** Logic 0: 0 ~ 3 V_{DC} or 0 ~ -3 V_{DC}
Logic 1: 10 ~ 30 V_{DC} or -10 ~ -30 V_{DC}
(Dry/Wet Contact decided by Switch)
- **Input Impedance** 5.2 kΩ (Wet Contact)
- **Transition Time** 0.2 ms
- **Frequency Input Range** 0.1 ~ 3kHz
- **Counter Input** 3kHz (32 bit + 1 bit overflow)
- **Keep/Discard Counter Value when power off**
- **Supports Inverted DI Status**

Ordering Information

- **ADAM-6260** 6-ch Relay Output Modbus TCP Module
- **ADAM-6266** 4-ch Relay Output Modbus TCP Module with 4-ch DI

Common Specifications

General

- **Ethernet** 2-port 10/100 Base-TX (for Daisy Chain)
- **LED Indication** ADAM-6260: 6 RL
ADAM-6266: 4 RL + 4 DI
- **Protocol** Modbus/TCP, TCP/IP, UDP, HTTP, DHCP, SNMP, MQTT
- **Connector** Plug-in 5P/15P screw terminal blocks
- **Power Input** 10 - 30 V_{DC} (24 V_{DC} standard)
- **Watchdog Timer** System (1.6 seconds)
Communication (Programmable)
- **Dimensions** 70 x 122 x 27 mm
- **Protection** Built-in TVS/ESD protection
Power Reversal protection
Over Voltage protection: +/- 35V_{DC}
Isolation protection: 2500 V_{DC}
- **Power Consumption** ADAM-6260: 4.5 W @ 24 V_{DC}
ADAM-6266: 4.2 W @ 24 V_{DC}

Features

- Daisy chain connection with auto-bypass protection
- Remote monitoring and control with smart phone/pad
- Group configuration capability for multiple module setup
- DI/O LED Indication
- Flexible user-defined Modbus address.
- Intelligent control ability by Peer-to-Peer and GCL function
- Multiple protocol support: Modbus/TCP, TCP/IP, UDP, HTTP, DHCP, SNMP, MQTT
- Web language support: XML, HTML 5, Java Script
- System configuration backup
- User Access Control

Environment

- **Operating Temperature** -10 ~ 70°C (14 ~ 158°F)
-40 ~ 70°C (-40~158°F) (B version)
- **Storage Temperature** -20 ~ 80°C (-4 ~ 176°F)
-40 ~ 80°C (-40~176°F) (B version)
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

ADAM-6315

IoT OPC UA Ethernet I/O - RTD Module

ADAM-6317

IoT OPC UA Ethernet I/O - AI Module

ADAM-6315

ADAM-6317

Specifications

Analog Input

- **Channels** 8 (differential)
- **Input Impedance** > 10 MΩ
- **Input Connections** 2 or 3 wire
- **Input Type** Pt, Balco and Ni RTD
- **RTD Types and Temperature Ranges**

Pt 100	-50°C - 150°C 0°C - 100°C 0°C - 200°C 0°C - 400°C -100°C - 100°C -200°C - 200°C

*Supports both IEC 60751 ITS90 (0.00385Ω/Ω/°C) and JIS C 1604 (0.00392Ω/Ω/°C)

Pt 1000	-40°C - 160°C
Balco 500	-30°C - 120°C
Ni 508	0°C - 100°C
Ni 518	-80°C - 100°C

- **Accuracy** ± 0.1 % or better
High speed mode ±0.5% or better
- **Span Drift** ± 25 ppm/°C
- **Zero Drift** ± 6 μV/°C
- **Resolution** 16-bit
- **Sampling Rate** Normal speed mode:10 sample/ second (total)
High speed mode:1024 sample/second (total)
CMR: 90 dB @ 50/60 HZ
NMR: 60 dB @ 50/60 HZ

* High speed mode does not support CMR/NMR

- **Wire Burnout Detection**

Digital Input

- **Channels** 6
- **Dry contact** logic 0: Open; logic 1: Closed to ground
- **Wet contact** logic 0: 0 ~ 3 V_{DC} or floating; logic 1: 10 ~ 30 V_{DC}
Support DO type: Sink (NPN) and Source (PNP)
- **DI0~DI5 support 3 kHz counter input**
- **DI0~DI5 support 3 kHz frequency input**

Digital Output

- **Channels** 8
- **Output type** Sink type, 30 V_{DC}, 0.1A max. per channel
- **DO2~DO7 support 3 kHz pulse output**

Ordering Information

- **ADAM-6315-A1** OPC UA and Security Remote I/O - RTD Module

Specifications

Analog Input

- **Channels** 8 (differential)
- **Sampling Rate** 10 or 100 samples/ second (total)
- **Resolution** 16 bits
- **Input Range** 0 ~ 150mV, 0 ~ 500mV,
0 ~ 1V, 0 ~ 5V, 0 ~ 10V,
±150 mV, ±500 mV, ±1V,
±5 V, ±10 V, ±20 mA,
0 ~ 20 mA, 4 ~ 20mA

Digital Input

- **Channels** 11
- **Dry contact** logic 0: Open
logic 1: Closed to ground
- **Wet contact** logic 0: 0 ~ 3 V_{DC} or floating
logic 1: 10 ~ 30 V_{DC}
Support DO type:
Sink (NPN) and Source (PNP)
- **DI5~DI10 support 3 kHz counter input**
- **DI5~DI10 support 3 kHz frequency input**

Digital Output

- **Channels** 10
- **Output type** Sink type, 30 V_{DC},
0.1A max. per channel
- **DO4~DO9 support 3 kHz pulse output**

Ordering Information

- **ADAM-6317-A1** OPC UA and Security Remote I/O - AI Module

Common Specifications

General

- **Power input** 10 ~ 30 V_{DC}
- **Power Consumption** 2.9 W @ 24 V_{DC} (ADAM-6317)
2.8 W @ 24 V_{DC} (ADAM-6350)
- **LAN port** 2-port 10/100 Base-T(X) (for Daisy Chain)
- **Connectors** 2 x RJ-45 (LAN), Plug-in screw terminal block (I/O and power)
- **Watchdog** System and Communication
- **Protocol** OPC UA, Modbus

Protection

- **Isolation** 2,500 V_{DC}
- **Power Reversal Protection**

OPC UA

- **Max Monitored Items** 600 (A maximum of 32 ScaledValueHistory items can be included in all sessions)
- **Max Sessions** 4 (including security or non-security session)
- **Max Subscriptions per Session** 1
- **Support security/certificate management**

Modbus/TCP

- **Modbus/TCP connection** 4

Environment

- **Operating Temperature** -25° C ~ 70° C
- **Storage Temperature** -25° C ~ 85° C
- **Operating Humidity** 20 ~ 95% RH (non-condensing)
- **Storage Humidity** 0 ~ 95% RH (non-condensing)

ADAM-6350
ADAM-6360D
ADAM-6366

IoT OPC UA Ethernet I/O - DI/O Module
IoT OPC UA Ethernet I/O - SSR Relay Output Module
IoT OPC UA Ethernet I/O - SSR Relay Output Module

ADAM-6350

Specifications

Digital Input

- **Channels** 18
- **Dry contact** logic 0: Open
  logic 1: Closed to ground
- **Wet contact** logic 0: 0 ~ 3 V_{DC} or floating
  logic 1: 10 ~ 30 V_{DC}
  Support DO type:
  Sink (NPN) and Source (PNP)
- **DI12~DI17 support 3 kHz counter input**
- **DI12~DI17 support 3 kHz frequency input**

Digital Output

- **Channels** 18
- **Output type** Sink type, 30 V_{DC},
  0.1A max. per channel
- **DO12~DO17 support 3 kHz pulse output**

ADAM-6360D

Specifications

Relay Output (PhotoMOS SPST)

- **Channels** 8 (Form A)
- **Contact rating (Resistive and Inductive load)** 1 A @25°C @30 V_{DC}
  0.7A @70°C @30 V_{DC}
- **Relay-on time** 1.3 ms
- **Relay-off time** 0.8 ms
- **Isolation (Relay output to power)** 1500Vrms
- **Peak Load Current** 4A (100ms (1 pulse))
- **Total Power Dissipation** 400mW / channel
- **On-state resistance** 0.5Ω

Digital Input

- **Channels** 14
- **Dry contact** logic 0: Open
  logic 1: Closed to ground
- **Wet contact** logic 0: 0 ~ 3 V_{DC} or floating
  logic 1: 10 ~ 30 V_{DC}
  Support DO type:
  Sink (NPN) and Source (PNP)
- **DI8~DI13 support 3 kHz counter input**
- **DI8~DI13 support 3 kHz frequency input**

Digital Output

- **Channels** 6
- **Output type** Sink type, 30 V_{DC},
  0.1A max. per channel
- **DO0~DO5 support 3 kHz pulse output**

ADAM-6366

Specifications

Relay Output

- **Channels** 6 (Form A)
- **Contact rating** 0.25A@250V_{AC}
  2A@30V_{DC}
- **Relay-on time** 3 ms
- **Relay-off time** 5 ms
- **Electrical endurance at contact application** Resistive, 0.25A@250V_{AC}:
  $1x10^5$ operations/min.
  Resistive, 2A@30V_{DC}:
  $1x10^5$ operations/min.
- **Insulation Resistance** 1 GΩ

Digital Input

- **Channels** 18
- **Dry contact** logic 0: Open
  logic 1: Closed to ground
- **Wet contact** logic 0: 0 ~ 3 V_{DC} or floating
  logic 1: 10 ~ 30 V_{DC}
  Support DO type:
  Sink (NPN) and Source (PNP)
- **DI12~DI17 support 3 kHz counter input**
- **DI12~DI17 support 3 kHz frequency input**

Digital Output

- **Channels** 6
- **Output type** Sink type, 30 V_{DC},
  0.1A max. per channel
- **DO0~DO5 support 3 kHz pulse output**

Common Specifications

General

- **Power input** 10 ~ 30 V_{DC}
- **Power Consumption** 2.8 W @ 24 V_{DC}
  (ADAM-6350)
  2.8 W @ 24 V_{DC}
  (ADAM-6360D)
  4.5 W @ 24 V_{DC}
  (ADAM-6366)
- **LAN port** 2-port 10/100 Base-T(X)
  (for Daisy Chain)
- **Connectors** 2 x RJ-45 (LAN), Plug-in
  screw terminal block
  (I/O and power)
- **Watchdog** System and Communication
- **Protocol** OPC UA, Modbus

Protection

- **Isolation** 2,500 V_{DC}
- **Power Reversal Protection**

OPC UA

- **Max Monitored Items** 600
  (including all sessions)
- **Max Sessions** 4 (including security or
  non-security session)
- **Max Subscriptions per Session** 1
- **Support security/certificate management**

Modbus/TCP

- **Modbus/TCP connection** 4

Environment

- **Operating Temperature** -25° C ~ 70° C
- **Storage Temperature** -25° C ~ 85° C
- **Operating Humidity** 20 ~ 95% RH
  (non-condensing)
- **Storage Humidity** 0 ~ 95% RH
  (non-condensing)

Ordering Information

- **ADAM-6350-A1** OPC UA and Security Remote I/O - DI/O Module
- **ADAM-6360D-A1** OPC UA and Security Remote I/O - SSR Relay Output Module
- **ADAM-6366-A1** OPC UA and Security Remote I/O - SSR Relay Output Module

Ethernet I/O Modules: ADAM-6000/6200/6300

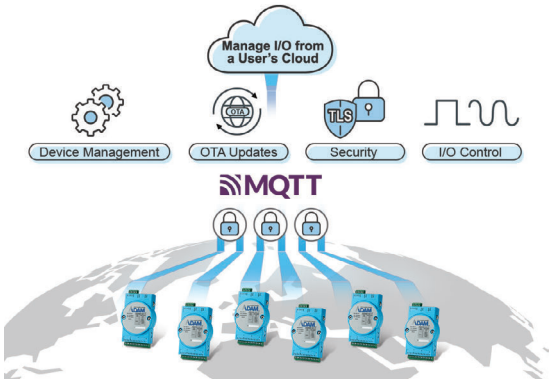
Introduction

Advantech's ADAM-6000/6200/6300 Ethernet I/O modules are easily integrated so they can remotely monitor and control devices more flexibly.

Feature Highlights

Secured Cloud I/O

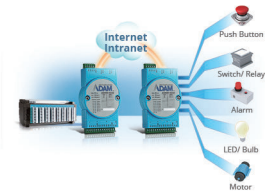
Innovative ADAM-6000/6200 Secured Cloud I/O offers device management, OTA updates, security and device monitoring functions in IoT era and help user easily manage widespread assets across diverse applications



- **Device Management:** UUID, networking setting, I/O channel configuration
- **OTA Updates:** firmware, certificate and configuration mass deployment
- **Security:** TLS, X.509 certificate, cipher suites, IP whitelisting, protocol disabled
- **I/O Control:** digital I/O on/off, analog I/O read/write, I/O value periodically updated, alarm notificatio

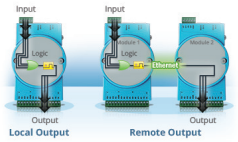
Simple and Intuitive Logic Control

ADAM-6000/6200 Peer-to-Peer (P2P) and Graphic Condition Logic (GCL) modules can perform as standalone products for measurement, control, and automation.



Peer-to-Peer(P2P) connection

- Easy channel mapping from different I/O modules without extra programming effort or additional controllers.
- Utilizes Peer-to-Peer modules, just configure settings through ADAM.NET utility.



Graphic condition logic (GCL)

- GCL function is built-in ADAM-6000 and ADAM-6200 modules for users to easily set up logic rules in any application.
- User defined logic rules through graphical configuration environment in ADAM.NET utility.
- No additional controllers or programming is needed.

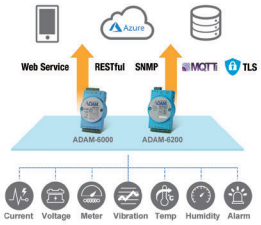
Easy Deployment and Robust Communication

Flexible deployment with daisy chain networking and auto-bypass protection

ADAM-6200/6300 series supports daisy chain connectivity that offers flexible cabling and space saving capabilities. With Ethernet auto-bypass function supported to prevent accidental power failures if one of the modules unexpectedly shuts down.

Rich IoT Protocols

The ADAM-6000/6200 series supports multiple protocols for IoT applications: MQTT, SNMP, Restful APIs, and Modbus, which are very flexible and can be easily integrated with Microsoft Azure, Database, Network and SCADA systems.



Cloud

- Supports Azure IoT Hub

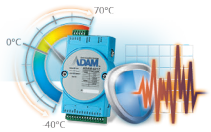
MQTT

- Actively publish MQTT messages with user defined intervals.
- Shortens downtime with alarm event notification.
- Privacy assured with the TLS (Transport Layer Security).
- User defined topic to integrate existing systems.

SNMP

- Simple way to monitor I/O data on NMS (Network Management System).
- SNMP trap to notify alarm events.
- Reduces implementation cost with ADAM MIB (Management Information Base) file.

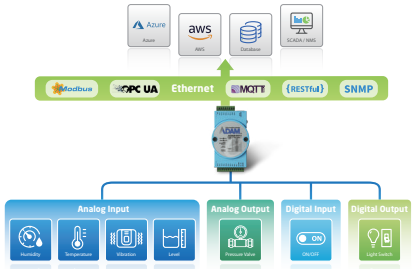
Industrial Grade with Isolation & Wide-operating Temperature



ADAM-6000/6200/6300 series has a rugged design.

- Supports isolation protection to avoid system damage from high-energy noise.
- Supports operating temperatures of between -40 ~70°C and can perform in most harsh environments.

Application Structure



ADAM-6000/6200/6300 Series Comparison

Series Name		ADAM-6000 Series	ADAM-6200 Series	ADAM-6300 Series
Daisy-chain Connectivity		–	✓	✓
Protocol	MQTT	✓	✓	–
	SNMP	✓	✓	–
	Modbus	✓	✓	✓
	RESTful	✓	✓	–
	OPC UA	–	–	✓
	Cloud I/O	✓	✓	(By request)

Ethernet I/O Modules: ADAM-6000

Model		ADAM-6015	ADAM-6017	ADAM-6018+	ADAM-6022	ADAM-6024
Interface		1x RJ-45 LAN port, 10/100 Mbps Ethernet				
Peer-to-Peer[1]			✓		–	Receiver Only[2]
GCL[1]			✓		–	Receiver Only[2]
Resolution			16-bit		16-bit for analog inputs 12-bit for analog outputs	16-bit for analog inputs 12-bit for analog outputs
Analog Input	Channels	7	8	8	6	6
	Sampling Rate	10 Hz	10/100 Hz	10 Hz	10 Hz	10 Hz
	Voltage Input	–	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V, 0~150 mV, 0~500 mV, 0~1 V, 0~5 V, 0~10 V	–	±10 V	±10 V
	Current Input	–	0~20 mA, 4~20 mA, ±20 mA	–	0~20 mA, 4~20 mA	0~20 mA, 4~20 mA
	Direct Sensor Input	Pt, Balco, and Ni RTD	–	J, K, T, E, R, S, B thermocouple	–	–
	Burn-out Detection	✓	✓ (4 ~ 20mA only)	✓	–	–
	Math. Functions	Max. Min. Avg.	Max. Min. Avg.	Max. Min. Avg.	–	–
Analog Output	Channels	–	–	–	2	2
	Current Output	–	–	–	0~20, 4~20 mA @ 15 V_{DC}	0~20, 4~20 mA @ 15 V_{DC}
	Voltage Output	–	–	–	0~10 V_{DC} @ 30 mA	0~10 V_{DC} @ 30 mA
Digital I/O	Input Channels	–	–	–	2	2
	Output Channels	-	2 (sink)	8 (sink)	2 (sink)	2 (sink)
	High/Low Alarm Settings	✓	✓	✓	–	–
Isolation Protection			2,000 V_{DC}		2,000 V_{DC}	2,000 V_{DC}
Remark		–	–	–	Built-in dual loop PID control algorithm	–
Protocol		D version: Modbus TCP, RESTful, MQTT, SNMP, ASCII			Modbus TCP	D version: Modbus TCP, RESTful, MQTT, SNMP, ASCII
Certification		CID2, UL, CE, FCC	CID2, UL, CE, FCC	UL, CE, FCC	CE, FCC	UL, CE, FCC

Model		ADAM-6050	ADAM-6051	ADAM-6052	ADAM-6060	ADAM-6066
Interface		1x RJ-45 LAN port, 10/100 Mbps Ethernet				
Peer-to-Peer[1]		✓	✓	✓	✓	✓
GCL[1]		✓	✓	✓	✓	✓
Digital I/O	Input Channels	12	12	8	6	6
	Output Channels	6 (sink)	2 (sink)	8 (source)	6-ch relay	6-ch power relay
	Extra Counter Channels	–	2	–	–	–
	Counter Input	3 kHz	4.5 kHz	3 kHz	3 kHz	3 kHz
	Frequency Input	3 kHz	4.5 kHz	3 kHz	3 kHz	3 kHz
	Pulse Output	✓	✓	✓	✓	✓
	High/Low Alarm Settings	–	–	–	–	–
Isolation Protection		2,000 V_{DC}				
Protocol		D version: Modbus TCP, RESTful, MQTT, SNMP, ASCII				
Certification		CID2, UL, CE, FCC	UL, CE, FCC	CID2, UL, CE, FCC	UL, CE, FCC	UL, CE, FCC

✓: supported, – : not supported, △ : optional

Ethernet I/O Modules: ADAM-6200

Model		ADAM-6217	ADAM-6224	ADAM-6250	ADAM-6251	ADAM-6256	ADAM-6260	ADAM-6266
Interface		2x RJ-45 LAN port (Daisy-chain), 10/100 Mbps Ethernet						
Peer-to-Peer[1]		✓	Receiver Only[2]	✓	✓	✓	✓	✓
GCL[1]		✓	✓	✓	✓	✓	✓	✓
Analog Input	Channels	8	–	–	–	–	–	–
	Input Impedance	>10MΩ (voltage) 120Ω (current)	–	–	–	–	–	–
	Voltage Input	±150 mV, ±500 mV, ±1 V, ±5 V, ±10 V	–	–	–	–	–	–
	Current Input	0~20 mA, 4~20 mA ±20 mA	–	–	–	–	–	–
	Sampling Rate	10 Hz	–	–	–	–	–	–
	Burn-out Detection	✓ (4~20 mA)	–	–	–	–	–	–
	Resolution	16-bit	–	–	–	–	–	–
	Accuracy	±0.1% of FSR (voltage) @ 25°C ±0.2% of FSR (current) @ 25°C	–	–	–	–	–	–
Analog Output	Channels	–	4	–	–	–	–	–
	Voltage Output	–	0~5 V, 0~10 V, ±5 V, ±10 V	–	–	–	–	–
	Current Output	–	0~20 mA, 4~20 mA	–	–	–	–	–
	Resolution	–	12-bit	–	–	–	–	–
Digital I/O	Input Channels	–	4 (dry contact only)	8	16	–	–	4
	Output Channels	–	–	7 (sink)	–	16 (sink)	–	–
	Relay Output	–	–	–	–	–	1 x Form A, 5 x Form C	4 x Form C
	Contact Rating	–	–	–	–	–	250 V_{AC} @ 5A 30 V_{DC} @ 5A	
	Counter Input	–	–	3 kHz	3 kHz	–	–	3 kHz
	Frequency Input	–	–	3 kHz	3 kHz	–	–	3 kHz
	Pulse Output	–	–	5 kHz	–	5 kHz	5 kHz	5 kHz
	LED Indicators	–	–	8 digital outputs, 7 digital inputs	16 digital inputs	16 digital outputs	6 relay	4 digital inputs, 4 relay
Power Consumption		3.5 W	6 W	3 W	2.7 W	3.2 W	4.5 W	4.2 W
Isolation Voltage		2,500 V_{DC}						
Watchdog Timer		System (1.6 s), Communication (programmable)						
Communication Protocol		Modbus TCP, RESTful, MQTT, SNMP, ASCII						
Power Requirements		10~30 V_{DC} (24 V_{DC} standard)						
Operating Temperature		-40~70 °C (-40~158 °F)						
Storage Temperature		-40~85 °C (-40~185 °F)						
Operating Humidity		20~95% RH (non-condensing)						
Storage Humidity		0~95% RH (non-condensing)						
Certification		UL, CE, FCC	UL, CE, FCC	UL, CE, FCC	UL, CE, FCC	UL, CE, FCC	UL, CE, FCC	UL, CE, FCC

Note 1: Peer-to-peer and GCL cannot be run simultaneously; only one feature can be enabled at a time.
Note 2: The ADAM-6224 can only act as a receiver and generate analog output when peer-to-peer or GCL mode is used.
✓: supported, – : not supported, △ : optional

OPC UA Ethernet I/O Modules: ADAM-6300

Model		ADAM-6315	ADAM-6317	ADAM-6318	ADAM-6324	ADAM-6350	ADAM-6360D	ADAM-6366
Description		IoT OPC UA Ethernet I/O - RTD Input Module	IoT OPC UA Ethernet I/O - Analog Input Module	IoT OPC UA Ethernet I/O - T/C Input Module	IoT OPC UA Ethernet I/O - Analog Output Module	IoT OPC UA Ethernet I/O - Digital I/O Module	IoT OPC UA Ethernet I/O - SSR Relay Output Module	IoT OPC UA Ethernet I/O - Relay Output Module
General	Power Input	10~30 V_{DC}						
	LAN Port	2 x RJ-45 10/100 Mbps						
	Connectors	2 x RJ-45 (LAN), Plug-in screw terminal block (I/O and power)						
	Watchdog	System and Communication						
	Protocol	OPC UA, Modbus TCP						
Protection	Isolation	2500 V_{DC}						
	Power Reversal Protection	Yes						
OPC UA	Max Monitored Items	600 (including all sessions)						
	Max Sessions	4 (including security or non-security session)						
	Max Subscriptions per Session	1						
	Support Security/ Certificate Management	Yes						
Modbus TCP Connections		4						
Environment	Operating Temperature	-25° C~70° C (-13~158 °F)						
LED Indicator		Status, Error, Link, Active						
Analog Input	Channels	8	8	7	–	–	–	–
	Voltage Input	RTD: Pt 100, Pt 1000, Balco 500, Ni 518	0~150mV, 0~500mV, 0~1V, 0~5V, 0~10V, ±150 mV, ±500 mV, ±1V, ±5 V, ±10 V	Thermocouple: J, K, T, E, R, S, B	–	–	–	–
	Current Input	–	0 ~ 20 mA, 4 ~ 20 mA, ± 20 mA	–	–	–	–	–
	Sampling Rate	10 Hz (total)	10/100 Hz (total)	10 Hz (total)	–	–	–	–
	Burn-out Detection	Yes	Yes (4~20 mA)	Yes	–	–	–	–
	Resolution	16-bit	16-bit	16-bit	–	–	–	–
Digital Input	Digital Input Channels	10	11	10	11	18	14	18
	Counter Input	3 kHz (DI4~DI9)	3 kHz (DI5~DI10)	3 kHz (DI4~DI9)	3 kHz (DI5~DI10)	3 kHz (DI12~DI17)	3 kHz (DI8~DI13)	3 kHz (DI12~DI17)
	Frequency Input	3 kHz (DI4~DI9)	3 kHz (DI5~DI10)	3 kHz (DI4~DI9)	3 kHz (DI5~DI10)	3 kHz (DI12~DI17)	3 kHz (DI8~DI13)	3 kHz (DI12~DI17)
Digital Output	Digital Output Channels	10	10	13	12	18	6	6
	Relay Output Channels	–	–	–	–	–	8 x Form A (SSR)	6 x Form A
	Contact Rating	–	–	–	–	–	1 A @25°C @ 30 V_{DC} 0.7A @70°C @30 V_{DC}	250 V_{AC} @ 0.25 A, 30 V_{DC} @ 2 A
	Pulse Output	3 kHz (DO4~DO9)	3 kHz (DO4~DO9)	3 kHz (DO7~DO12)	3 kHz (DO6~DO11)	3 kHz (DO12~DO17)	3 kHz (DO0~DO5)	3 kHz (DO0~DO5)
Analog Output	Channels	–	–	–	4	–	–	–
	Type	–	–	–	0~5 V, 0~10 V, ± 5 V, ± 10 V, 0~20 mA, 4~20 mA	–	–	–
Certification		CE, FCC	CE, FCC	CE, FCC	CE, FCC	CE, FCC	CE, FCC	CE, FCC

✓: supported, – : not supported, △ : optional