

#### FEATURES

- Eight Quad Isolated Digital Input Channels
- Input Range  $\pm(12 \text{ to } 36)$  VOLTS
- 250Vrms Signal Overrange Protection
- User settable Debounce Time
- 3000 Vrms Isolation Input, Power and Network
- 2000 Vrms Channel-to-Channel Isolation
- Wide Range 9-36 VDC or 7-28 VAC Supply
- -40 to 85 °C Operating Temperature Range
- Synchronized Sampling & Hold of all channels throughout the Network
- Complies with the requirements of IEC61000-6-5 and IEC61326-1

#### PRODUCT OVERVIEW

This Modbus RTU version 24V Digital Input Module features 8 Isolated independent channels and an isolated RS-485 interface.

The channels are fully isolated with 3000 Vrms between Input, Power, RS-485 link and 2000 Vrms Channel-to-Channel. All channels feature 250Vrms Overrange Protection.

Eight green LEDs provide Input Status Indication while the debounce time is user settable.

All 8 channels are sampled synchronously. A global Modbus command will result in synchronized sampling and hold of all Input Channels in the network. These samples are then stored in a second set of registers in each module for eventual readout.

Plug-in Terminal blocks with Ejection lever enable easy installation and replacement.



## SPECIFICATIONS

#### Maximum Ratings

Power Supply Voltage	39 VDC or 29 VAC
Signal Input	250 Vrms continuous
Storage Temperature	-55 to 125 Deg C
Input Common Mode	3 KVRms (1 min)
Channel to Channel Voltage	2 KVRms (1 min)
RS-485 Common Mode	2.5 KVRms (1 min)

#### Emissions & Immunity

Complies with the requirements of IEC61000-6-5 and IEC61326-1

In particular :

IEC61000-3-2	Class B emissions
IEC61000-4-2	8 KV electrostatic discharge
IEC61000-4-4	4 KV burst, 5/50 ns, 5 Khz
IEC61000-4-5	4 KV surge 1.2/50 us, line to ground, 2 KV line to line
IEC61000-4-6	Conducted RF

#### Signal Inputs

Voltage Range	$\pm(12 \text{ to } 36)$ V
Input Threshold	$\pm 7$ V
Input Resistance	12 Kohm

#### Common Mode

Leakage Current	2 $\mu$ A rms at 1000 Vrms and 50/60 Hz, per channel
Capacitance	4 pF max per channel

#### Power Requirements

Supply Voltage	9 to 36 VDC or 7 to 28 VAC
Max Power	1.4 W, Non Polarized

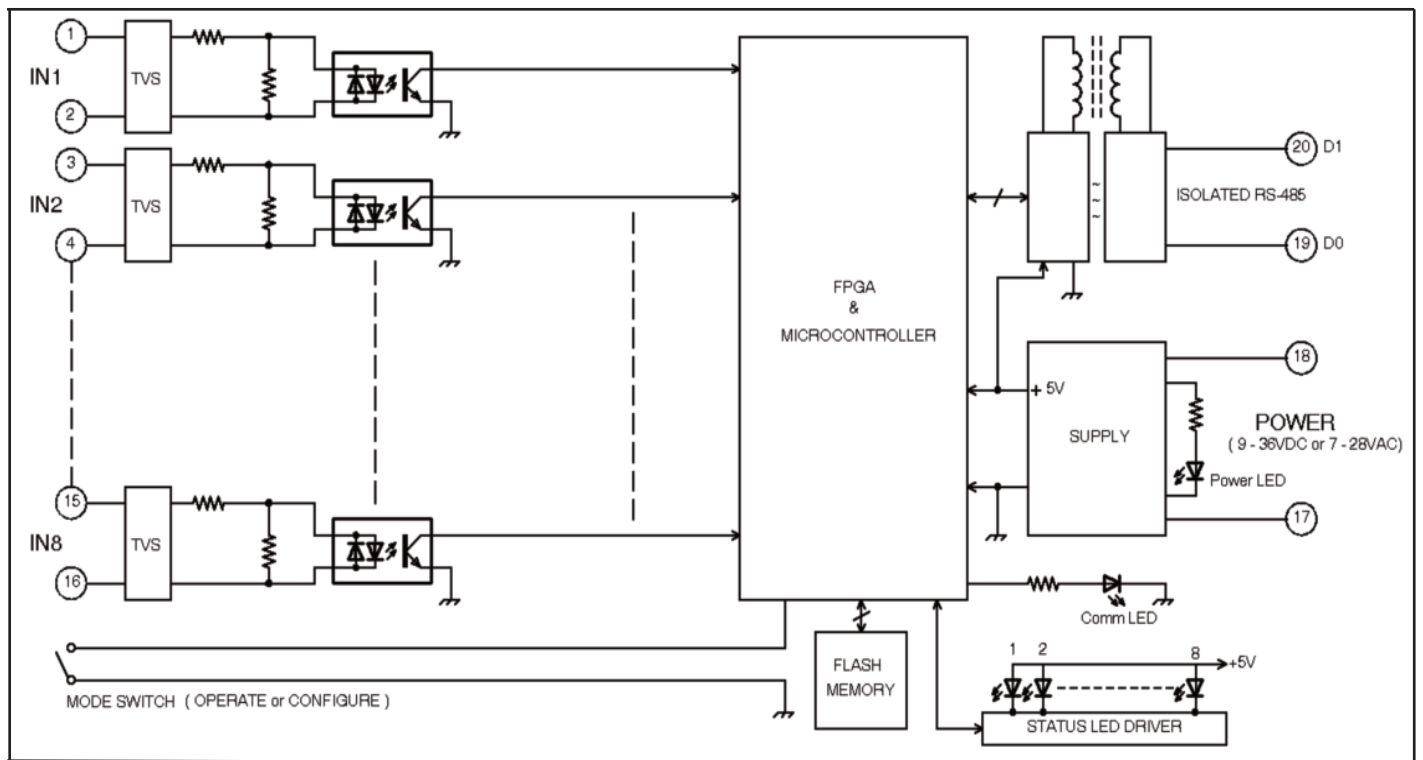
#### RS-485 Interface

Protocol	Modbus RTU
Baud Rate	2400 to 921.6K standard baud rates, default = 19200
Duplex	Half duplex
Parity	None
Data bits	8
Stop bits	2
Response Delay	0 to 6553.5 msec in 0.1 msec increments
Module Address	1 to 247
Max nodes	1 to 31 without repeater
Max distance	4000 ft, 1230 meters (varies with baud rate)

#### Environmental & Mechanical

Operating Temperature	-40 to 85 °C
Relative Humidity	< 95 % Non Condensing
Overall Dimensions	113.6 x 117.2 x 22.5 (mm ), 4.47 x 4.62 x 0.89 ( in )
Enclosure material	PA 66 GF 30
PC Board material	FR4
Protection Class	IP20
Conductor Size	AWG26 min, AWG14 max

## Functional Block Diagram

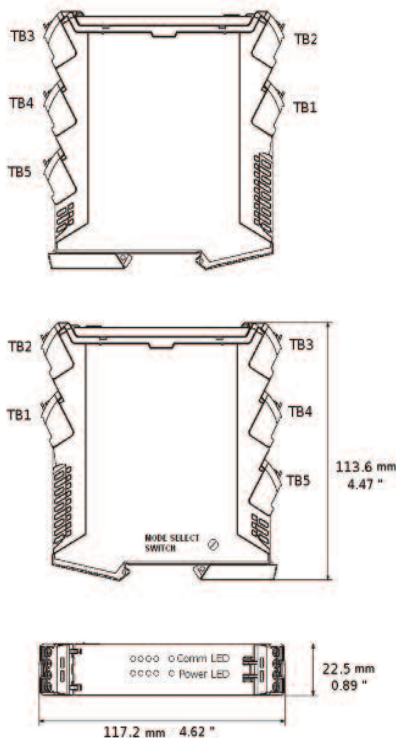


## OPERATION

The Functional Block Diagram shows how the external Digital Inputs are connected to the eight identical isolated processing channels. Each channel has a Transient Voltage Suppressor Network across the input terminals, followed by an AC type optocoupler. The channel input resistance is 12 Kohm.

External power at the POWER terminals is indicated by the "Power" LED. The "Comm" LED turns ON when the module is transmitting. A Status LED for each channel is ON when the Input voltage is applied.

An isolated RS-485 interface drives the network cable. A watchdog timer will restart the module if any unusual event disrupts normal operation.



## INSTALLATION

### Enclosure

All ISODIN modules offer IP20 level protection to withstand typical industrial environments. The thermoplastic package is non-flammable per UL94 V-0 with high impact resistance.

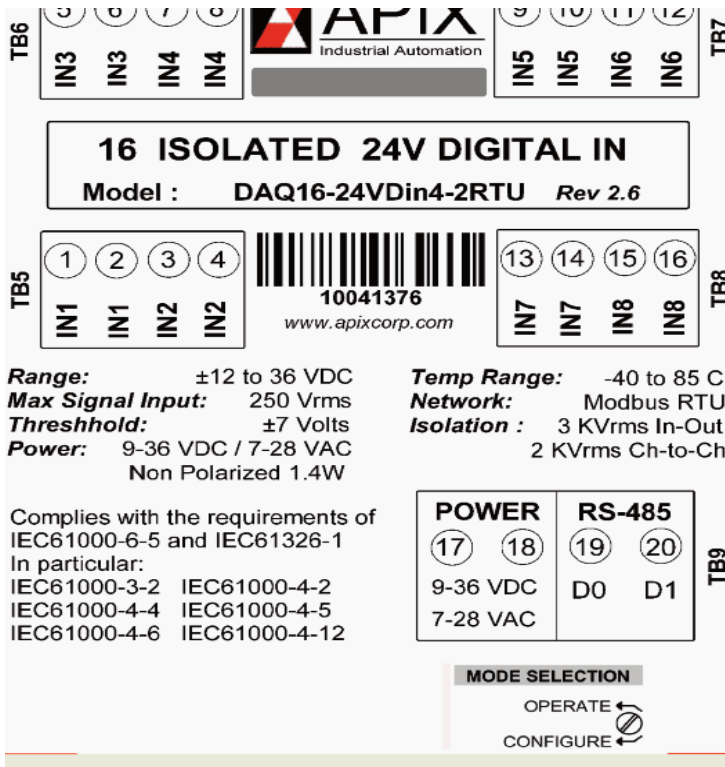
They feature surge protection on each input and have low radiated emissions and high immunity tolerance.

### Mounting

This module must be mounted vertically on a 35mm "T" type DIN rail as per EN50022.

Module attachment is done by locating the top groove of the adapter over the upper lip of the rail then pushing the unit downwards until it snaps into place.

Removal is accomplished by inserting a screwdriver into the groove of the bottom side latch and using it as a lever to open the latch until the module disconnects from the rail.



## CONNECTIONS

There are 5 plug-in terminal blocks, TB1—TB4 for Signal input wiring and one 4 pin terminal, TB5 for power and RS-485 connections. These terminal blocks and Input Signal polarities are clearly indicated on the module side label. TB1-TB5 have a convenient lever mechanism for easy ejection.

All terminals will accept from AWG26 up to AWD14 wire and are rated 10A/400V at ambient temperature and II/2 pollution severity.

The power input is Non-Polarized from 9 to 36VDC or 7 to 28VAC and connects to the POWER terminals. A Green LED, labeled “Power” on the front panel is fed directly by the power input.

A twisted pair cable should be used for the RS-485 signal and daisy chained from module to module, without branching. Terminals labeled D0 and D1, as per the Modbus specification, carry the differential half duplex RS-485 signal. A cable shield is not normally required but if available should be connected to chassis ( DIN rail ) ground. Since this RS-485 link is isolated, there is no current flow along the shield drain wire.

RS-485 line polarization is required for proper operation of this module. This is usually provided by the Modbus Master node via pullup and pulldown resistors. The Master node should also provide a 120 or 150 ohm line termination resistor across the D0 & D1 pins. If the cable is very long and reflections are a problem, then a second termination resistor, at the far end of the cable, may be required.

## CONFIGURATION

An external MODE Rotary Switch must be set to the “CONFIGURE” position ( fully clockwise) in order to permit changes to all internal parameters. The procedure is as follows:

- 1) Power must be OFF
- 2) Turn MODE switch fully clockwise
- 3) Power ON
- 4) Change any parameters as necessary
- 5) Power OFF
- 6) Turn MODE switch fully counterclockwise ( OPERATE position , default)
- 7) Power ON to operate normally

NOTE that the MODE switch state will be recognized only when power is applied.

In the CONFIGURE position , default communication parameters are set as follows:

Module address = 1  
Baud rate = 19200  
Sample rate = 1000

All user accessible parameters are stored in Flash memory and can be read and written to as "Holding Registers", via the Modbus RTU protocol ( function codes 3 and 6 ), in the following locations:

Register Address	Name	Value Range
0	Module ID	10 ( DAQ8-24Din4-2RTU )
1	Module Address	1 to 247
2	Sample Rate	50 to 1000 HZ ( Default = 1000 )
3	Baud Rate	24 to 9216 (Actual rate divided by 100)
4	Parity	0=none
5	Response Delay	0 to 65535 ( equals 0 to 6553.5 msec ) ( Default = 0 )
6	Debounce Time	0 to 1000 ( equals 0 to 10.00 msec ) ( Default = 1000 )
7	Reserved	

Due to the nature of Flash memory, it can be read very quickly but when writing to a single location it actually writes a complete block of 65536 locations. This can take several seconds to complete.

## MODBUS FUNCTIONS

All data values and Flash memory parameters are accessed via the Modbus RTU protocol as per the "Modbus Application Protocol Specification V1.1b". Available at [www.Modbus-IDA.org](http://www.Modbus-IDA.org)

For reading data values of the 8 input channels, use function code 02 (read input status). You must specify the starting address 0 to 7 (for channel 1 to 8) and the number of Inputs to read ( 1 to 8). Example.....

02      Function code - ( Read Discrete Inputs )  
0000   Starting address – ( begin at channel 1 )  
0008   Number of Inputs – ( all 8 channels )

In a similar manner, to read the Flash memory parameters, use function code 03 (read holding registers). Example...

03      Function code  
0002   Read address 2 = Sample rate  
0001   One register

To write parameters into the Flash memory, use function code 06 ( write single register ). Example...

06      Function code  
0002   Write address 2 = Sample rate  
003C   Sample rate value = 3C hex = 60 Hz decimal

## SYNC COMMAND

A Modbus global broadcast command has been implemented to take a synchronized sample of all Input Channels in the network. When this command is received by the module, it immediately starts a new sample (discarding any ongoing sampling) on all 8 channels simultaneously. This broadcast command is 2 bytes ...

00 Broadcast address  
01 Take sample

These samples are then stored in a second set of 8 registers for eventual readout. This second set of registers begins at address 8 and ends at address 15 and can be accessed as "Read Discrete Inputs" in the normal manner, for example...

04 Function code - (Read Discrete Inputs)  
0008 Starting address – (begin at channel 1 of second register set )  
0008 Number of registers – ( all 8 Inputs )

## ERROR CODES

If any error occurs in these message transactions, the appropriate exception code will be returned to the Master node. The supported codes are as follows:

Code	Meaning
01	Illegal function, not supported by this module
02	Illegal data address, not valid for this module
03	Illegal data value, indicates a fault in the structure of the message.