

BQ370-01 & BQ370-01N
MODBUS ANALOG INPUT DEVICE
USER MANUAL

(Modbus PT Temperature Sensor Reader)

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About BQ370 Device Family

BQ370 device family contains 6 channel Modbus Analog Input devices. "N" letter in device code represents 12 bit ADC (Analog Digital Converter) ; and others are 16bit ADC.

BQ370-01	16Bit	Modbus PT Temperature Reader
BQ370-01N	12Bit	Modbus PT Temperature Reader
BQ370-02	16Bit	Modbus 0-20mA Sensor Reader
BQ370-02N	12Bit	Modbus 0-20mA Sensor Reader
BQ370-03	16Bit	Modbus 0-10V Sensor Reader
BQ370-03N	12Bit	Modbus 0-10V Sensor Reader
BQ370-05	16Bit	Modbus 10K NTC Temperature Sensor Reader
BQ370-05N	12Bit	Modbus 10K NTC Temperature Sensor Reader

About Device

BQ370-01 (or BQ370-01N) is an Modbus analog input device with 6 analog input. This analog inputs can be use for PT Temperature sensors. Also device supports PT100, PT250, PT500 and TP1000 Temperature sensors.

Device supports Modbus RTU over RS485. Holding register and Input Register commands of Modbus RTU is supported.

Device Modbus address can be set by user. Also baudrate of device is adjustable. But 8 Bit , No Parity and 1 Stop bit is fixed. Device addresses between 1 and 14 can be set from switches on device. Also you can set address greater than 14; but you must use device manager program for this.

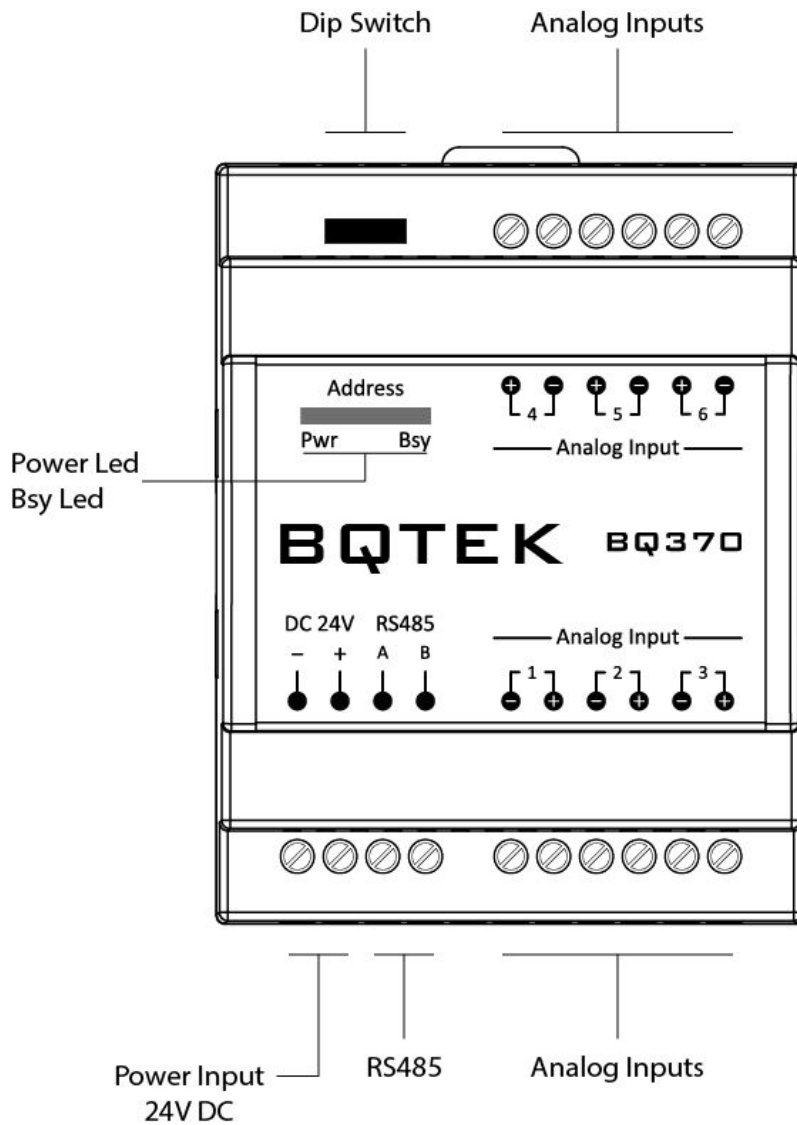
Device Properties

Product Code	BQ370-01 BQ370-01N
Product Name	Modbus Analog Input Device 6 Channel PT Temperature Sensor Reader
ADC (Analog Dijital Converter) Resolution	BQ370-01 : 16Bit ADC BQ370-01N : 12Bit ADC
Power Need	24V DC
Enclosure	Rail Type 70 x 90 x 60 mm
Terminal	Screw type terminal (5.08mm)
Protocol	Modbus RTU over RS485

Factory defaults for communication is 9600 Baud, 8 Bit, No Parity, 1 Stop Bit and Modbus address is 1. You can change modbus address with DIP switch or with Modbus Device Manager Software. Also this default 9600 baud can be adjustable.

Device Layout

You can see device layout at the picture below. Terminals are screw type terminals. You can also find descriptions about device connections on the device enclosure.



Power Supply

Device works with 24V DC power. Max current is about 70mA. Connect + and - terminals to power supply.

RS485

A and B terminals are for RS485 communication. Please obey RS485 cabling rules and use suitable cable for RS485

Dip Switch

Dip switches are for device settings mode and for adjusting and address. Please read this document for usage of dip switch.

Analog Inputs (PT Temperature Sensor)

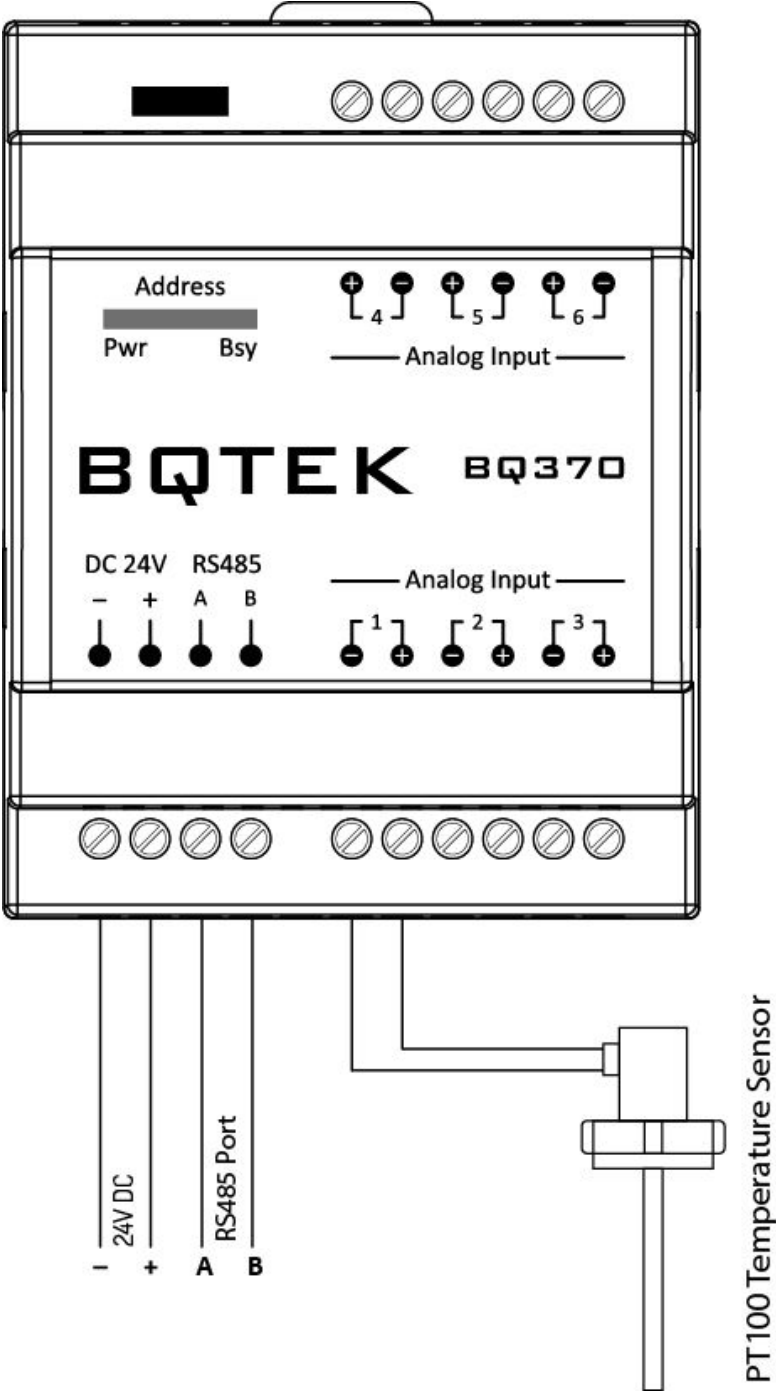
Temperature sensors are not included with device. Device has 6 analog input. These analog inputs can be used with PT Temperature sensors. PT100, PT250, PT500 and PT1000 sensors are suitable for device but you must adjust device for which type of sensor will be use. This settings can be done with "BQTEK Modbus Device Manager" application.

Leds

Power led shows device is working. Busy led means there is an communication over RS485. Each relay led means status of relay. Also in device settings mode Power led and busy light is on together during power on. Detailed information about settings are explained next pages in document.

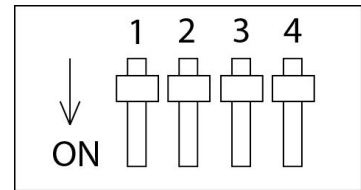
Sample Connection

You can see a sample connection in picture below.



DIP Switch and Address Settings

You can change device modbus address between 1-14 with DIP switch on device. Address greater than 14 can be set from Modbus Device manager software. Making changes and applying changes also needs DIP switch settings.



DIP Switch Modes

Description	1	2	3	4
Settings Mode (Changing device settings from RS485)	OFF	OFF	OFF	OFF
Address 1	ON	OFF	OFF	OFF
Address 2	OFF	ON	OFF	OFF
Address 3	ON	ON	OFF	OFF
Address 4	OFF	OFF	ON	OFF
Address 5	ON	OFF	ON	OFF
Address 6	OFF	ON	ON	OFF
Address 7	ON	ON	ON	OFF
Address 8	OFF	OFF	OFF	ON
Address 9	ON	OFF	OFF	ON
Address 10	OFF	ON	OFF	ON
Address 11	ON	ON	OFF	ON
Address 12	OFF	OFF	ON	ON
Address 13	ON	OFF	ON	ON
Address 14	OFF	ON	ON	ON
Get Address from Settings (Apply Settings that made from RS485)	ON	ON	ON	ON

Device default baudrate is 9600 baud. (8bit, No Parity, 1 Stop) Adjust any address between 1..14 and easily start to use. For other baudrates and addresses read the document.

Supported Modbus Commands

Device supports listed commands below. These are standard Modbus RTU commands. Most PLC, HMI and Scada applications supports this commands.

Command Description	Command (HEX)
Read Holding Register	03
Read Input Register	04
Write Multiple Register	10
Write Single Register	06

Writing commands are for Offset Registers (Calibration)

Modbus Register Table

Global Modbus specifications says first address is 1 but sometimes some PLC or scada applications accept 0 as first modbus register address. Our documents are prepared for based 1. If your plc accept 0 based register addresses; you can decrease -1 from the addresses below.

Register Number	Register Type	R/W	Description
1	Signed Integer	R	Channel 1 Temperature Value (Multiplied with 10)
2	Signed Integer	R	Channel 2 Temperature Value (Multiplied with 10)
3	Signed Integer	R	Channel 3 Temperature Value (Multiplied with 10)
4	Signed Integer	R	Channel 4 Temperature Value (Multiplied with 10)
5	Signed Integer	R	Channel 5 Temperature Value (Multiplied with 10)
6	Signed Integer	R	Channel 6 Temperature Value (Multiplied with 10)
7	Float	R	Channel 1 Temperature Value
9	Float	R	Channel 2 Temperature Value
11	Float	R	Channel 3 Temperature Value
13	Float	R	Channel 4 Temperature Value
15	Float	R	Channel 5 Temperature Value
17	Float	R	Channel 6 Temperature Value
19	Unsigned Integer	R	Channel 1 Sensor Status (0: OK, 1: Error)
20	Unsigned Integer	R	Channel 2 Sensor Status (0: OK, 1: Error)
21	Unsigned Integer	R	Channel 3 Sensor Status (0: OK, 1: Error)
22	Unsigned Integer	R	Channel 4 Sensor Status (0: OK, 1: Error)
23	Unsigned Integer	R	Channel 5 Sensor Status (0: OK, 1: Error)
24	Unsigned Integer	R	Channel 6 Sensor Status (0: OK, 1: Error)
102	Signed Integer	RW	Calibration for Channel 1
103	Signed Integer	RW	Calibration for Channel 2
104	Signed Integer	RW	Calibration for Channel 3
105	Signed Integer	RW	Calibration for Channel 4
106	Signed Integer	RW	Calibration for Channel 5
107	Signed Integer	RW	Calibration for Channel 6

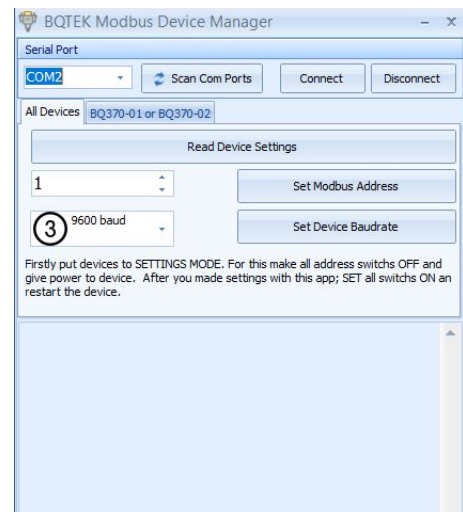
R: Read Only Register, RW: Readable or Writeable Register

Device Settings with “Modbus Device Manager”

Device default baudrate is 9600 baud. (8 Bit, No parity, 1 Stop)
You can adjust device address from DIP switch and you can start using device with 9600 baud easily.

But sometimes you can need other baudrates or you can need addresses greater than 14. In this situation you can change device settings with RS485.

For this you must put device to “Settings Mode”. After than you can change device settings with our “Modbus Device Manager” application. Also experts users can use Modbus RTU protocol for changing settins instead of Modbus Device Manager. Expert users can reach detailed information about our web page or can contact with us.



Settings Mode

For making settings from “Modbus Device Manager”; you must put device settins mode. Power off device and put all DIP switchs to “OFF” position. Now you can give power to device. You will see power and busy led is ON together; this shows device is in “Settings Mode”

Now connect RS485 to computer and use “Modbus Device Manager” application for reading or changing device settings.

After making changes you must exit from “Settings Mode” For this set all DIP switchs ON position and reset the power of device.

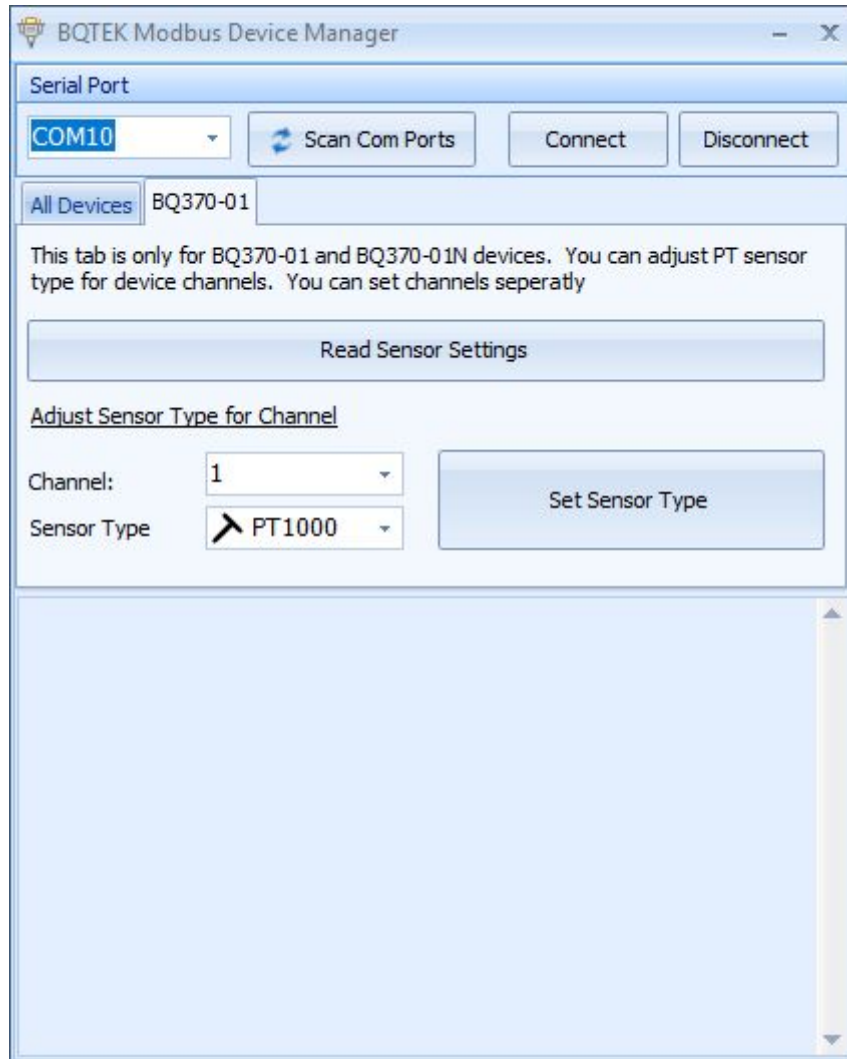
Supported baudrates are 2400, 4800, 9600, 14400, 19200, 28800 and 38400 baud.

If you dont have RS485 port on your computer you can use USB-RS485 converter devices for this.

Also as explained before experts users can change settings from RS485 with Modbus RTU commands. You can find information about this in our web page.

Selecting Sensor Type

Device supports PT100, PT250, PT500 and PT1000 Temperature sensors. You can use any of them for any channel; but you must set this with Modbu Device Manager application.



Put device to Settings mode as described before in this document. There is a tab in this software for BQ370-01. From this tab you can click "Read Sensor Setting" button for getting current sensor selections.

Or you can select channel number and sensor type. If you click "Sen Sensor Type" button; this settings will be applied to device. After making changes check it with reading sensor settings.