

# APPLICATION NOTE

## AQ-2xx implementing ADAM units

<b>Revision</b>	<b>1.11</b>
Date	18.1.2019
Status	Public
Last saved by	JLe
Checked by	
<b>Revision</b>	<b>1.12</b>
Date	24.2.2020
Status	Public
Last saved by	JLe
Checked by	

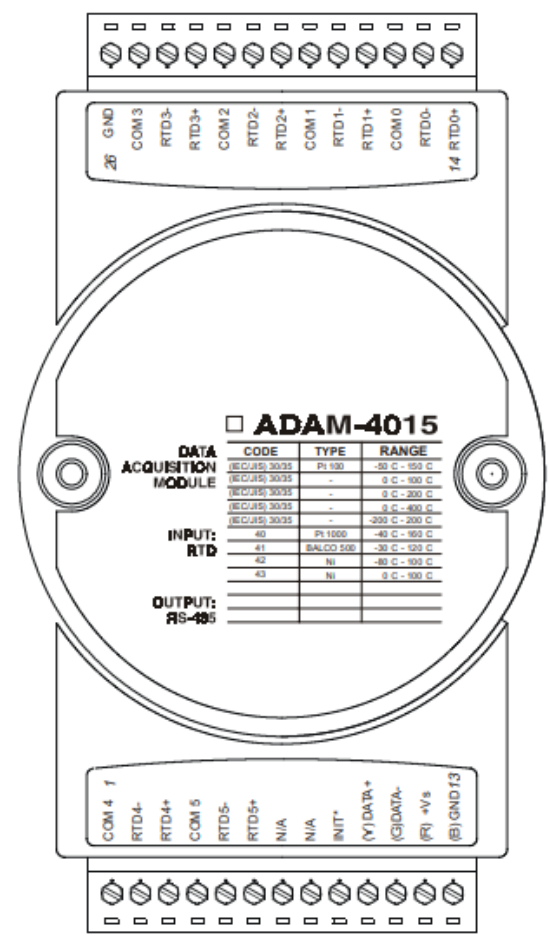
## TABLE OF CONTENTS

1	ADAM-4015 6CH RTD MODULE WITH MODBUS.....	3
1.1	Basic technical data .....	3
1.2	Connections .....	5
2	ADAM-4018+ 8CH ANALOG MODULE WITH MODBUS.....	8
2.1	Basic technical data .....	8
2.2	Connections .....	10
3	COMMISSIONING ADAM MODULE TO AQ2XX.....	13
3.1	AQ-2xx version information.....	13
3.2	Factory default ADAM unit.....	13
3.3	Pre-configured ADAM unit.....	17
3.4	Setting up RS485 communication for ADAM in the AQ2xx .....	18
3.5	Setting protection function according to temperature .....	19
3.6	Setting on load tap changer function according to mA signal .....	21
4	REFERENCE INFORMATION .....	23

# 1 ADAM-4015 6CH RTD MODULE WITH MODBUS

## 1.1 BASIC TECHNICAL DATA

ADAM-4015 provides six RTD input channels for different types of RTD signal as an effective solution in industrial & building automation. Usually, broken external wiring will lead to inaccurate current value. The ADAM-4015 provides a broken wiring detecting function so users can easily troubleshoot broken wiring problems.



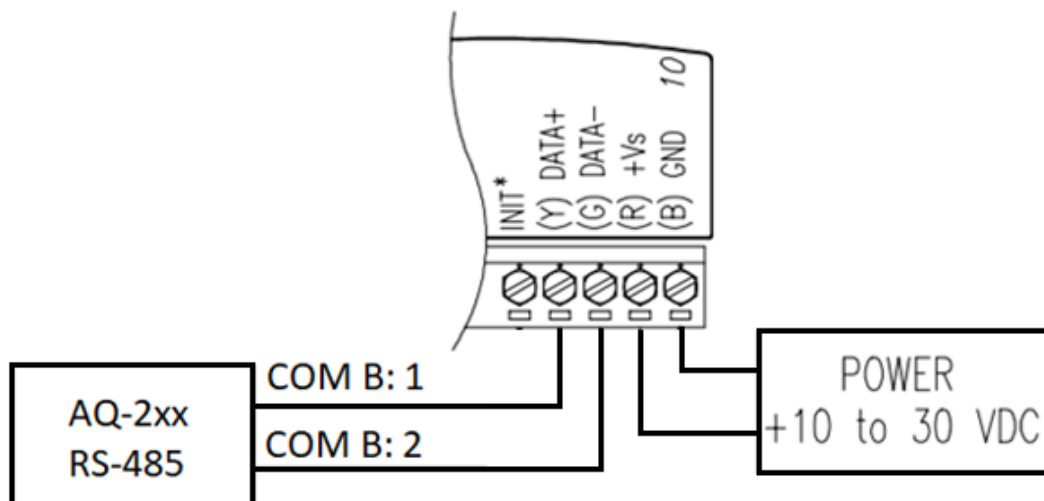
Picture 1: ADAM-4015 6-ch RTD input module

Channel Number	6 differential
Support Protocol	ADAM ASCII and MODBUS/RTU
Input Type	Pt100, Pt1000, BALCO500, Ni
Input Connections	2 or 3 wires
Wire Burnout Detection	Yes
Input Type and Temperature Range	Pt100: -50 to 150° C 0 to 100° C 0 to 200° C 0 to 400° C -200 to 200° C Pt1000: -40 to 160° C Balco500: -30 to 120° C Ni 50 RTD: -80 to 100° C Ni 508 RTD: 0 to 100° C
Isolation Voltage	3000 V <sub>DC</sub>
Sampling Rate	10 sample/second (total)
Input Impedance	10 MΩ
Resolution	16-bit
Accuracy	±0.1% (Typical)
CMR@50/60Hz	120 dB
NMR@50/60Hz	100 dB
Span Drift	± 25 ppm/°C
Zero Drift	± 3 μV/°C
Watchdog Timer	System (1.6 second) and Communication
Power Input	+10~+30 V <sub>DC</sub> (non-regulated)
Power Consumption	1.2 W @ 24V <sub>DC</sub>

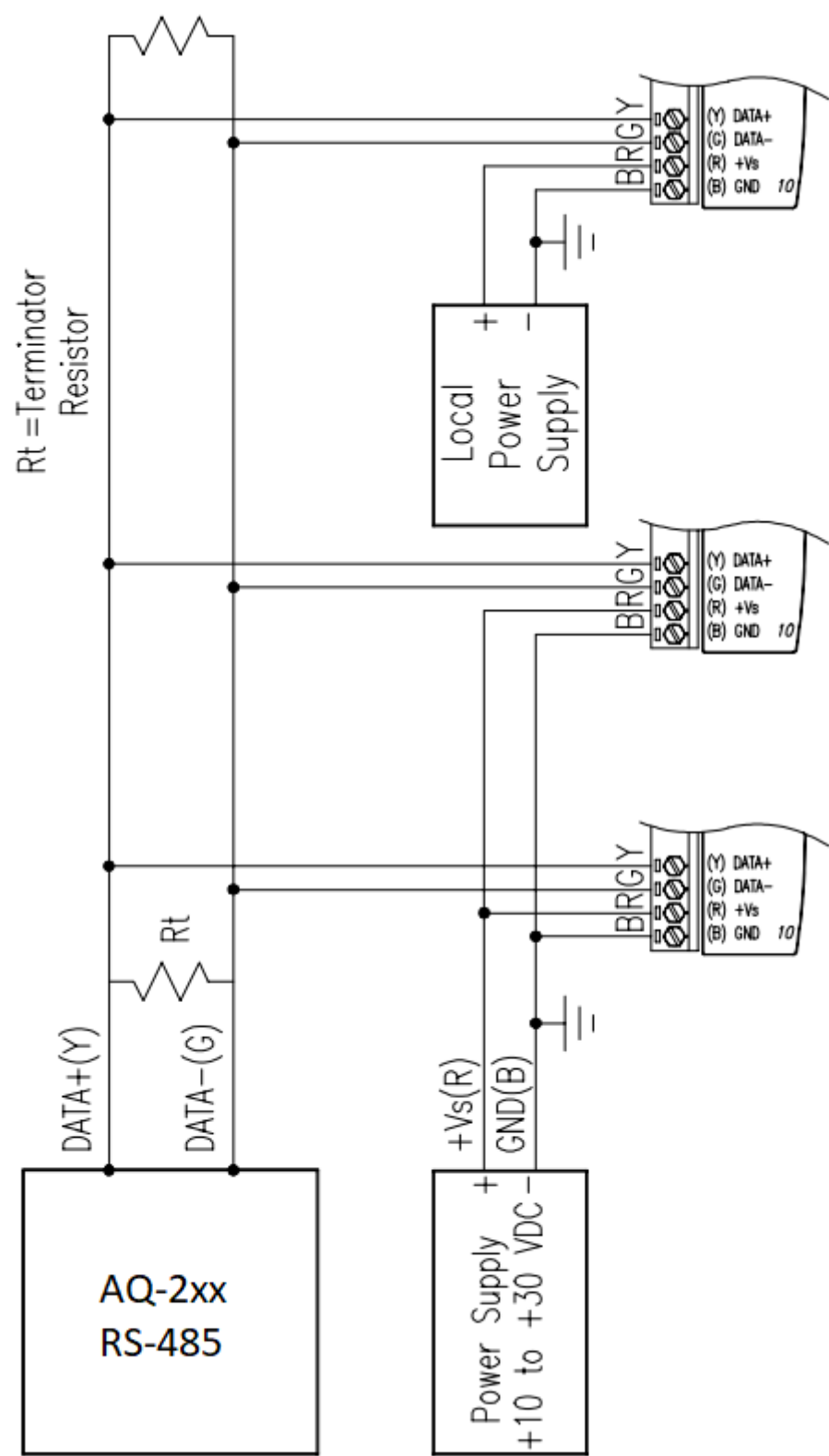
<b>ADAM-4015</b>		
RTD type	Temperature Range	Accuracy
Platinum 100 (IEC)	-50 ~ 150°C 0 ~ 100°C 0 ~ 200°C 0 ~ 400°C -200 ~ 200°C	0.10%
Platinum 100 (JIS)	-50 ~ 150°C 0 ~ 100°C 0 ~ 200°C 0 ~ 400°C -200 ~ 200°C	0.2% or better
Platinum 1000	-40 ~ 160°C	0.10%
BALCO 500	-30 ~ 120°C	0.50%
Ni 508	-50 ~ 200°C	0.10%
Ni 604	-80 ~ 100°C 0 ~ 100°C	0.10%

Picture 2: Technical specification of ADAM-4015 6-ch RTD input module

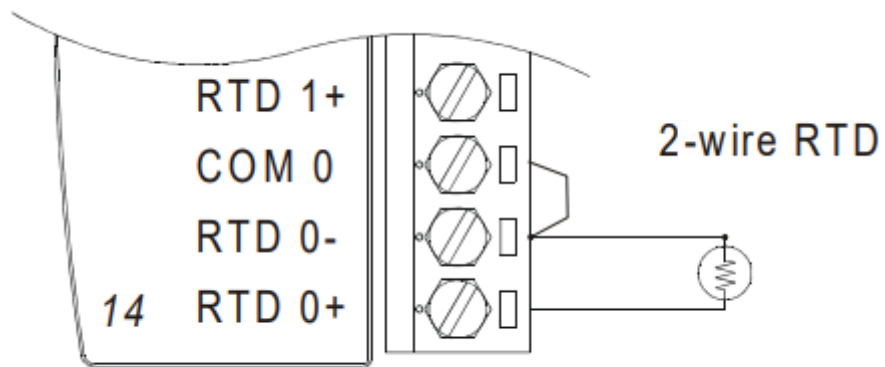
## 1.2 CONNECTIONS



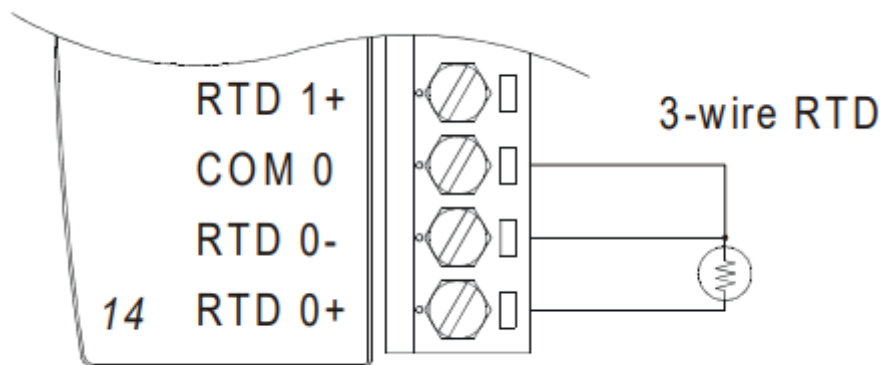
Picture 3: Connecting power supply and RS485 communication to ADAM-4015



Picture 4: Connecting multiple ADAM-4015 units to AQ-2xx



Picture 5: Connecting RTD measurement with 2-wire connection to ADAM-4015

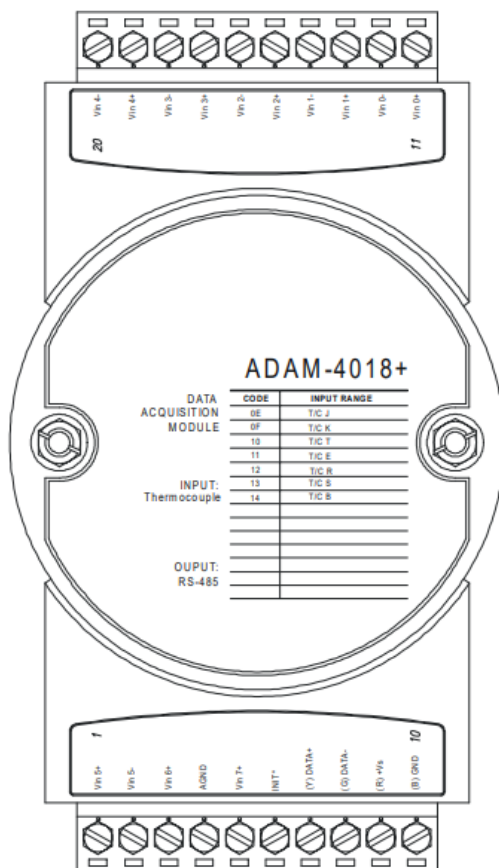


Picture 6: Connecting RTD measurement with 3-wire connection to ADAM-4015

## 2 ADAM-4018+ 8CH ANALOG MODULE WITH MODBUS

## 2.1 BASIC TECHNICAL DATA

ADAM-4018+ enables eight differential channels with multiple input types. This multi-ch/multi-type structure allows channels with different input types at the same time, say channel 1 with K input type meanwhile the others with R and S types. ADAM-4018+ is an 8-channel T/C input module. It is rather dedicated to T/C and 4 ~ 20 mA inputs for those with special request. Usually, broken external will lead to inaccurate current value. ADAM-4018+ provides burned-out detection so that users can easily troubleshoot broken wiring problems.



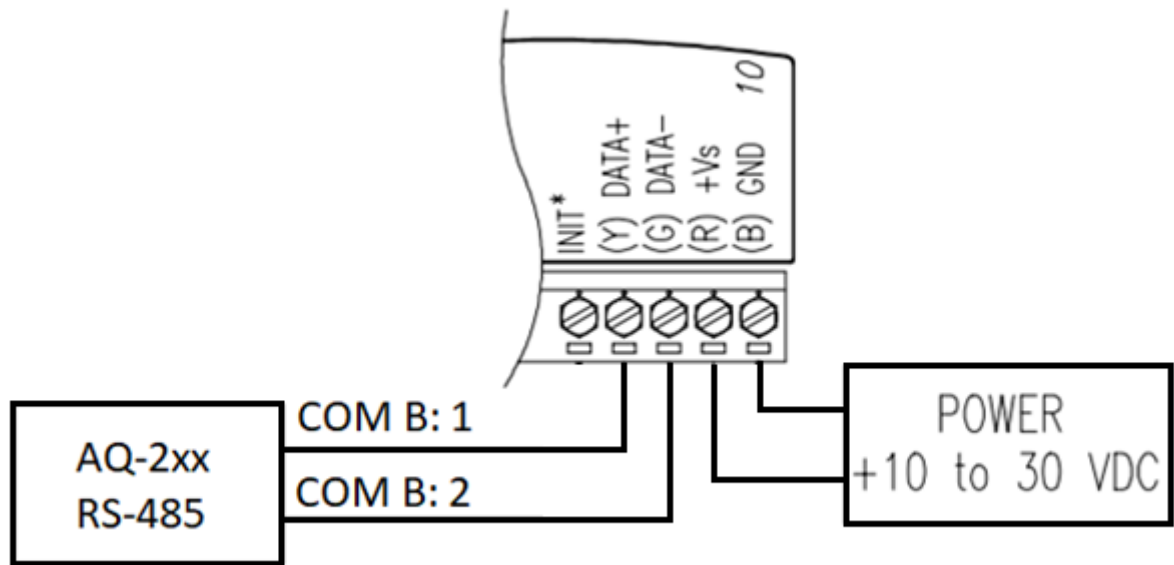
Picture 7: ADAM-4018+ 8-ch thermocouple input module



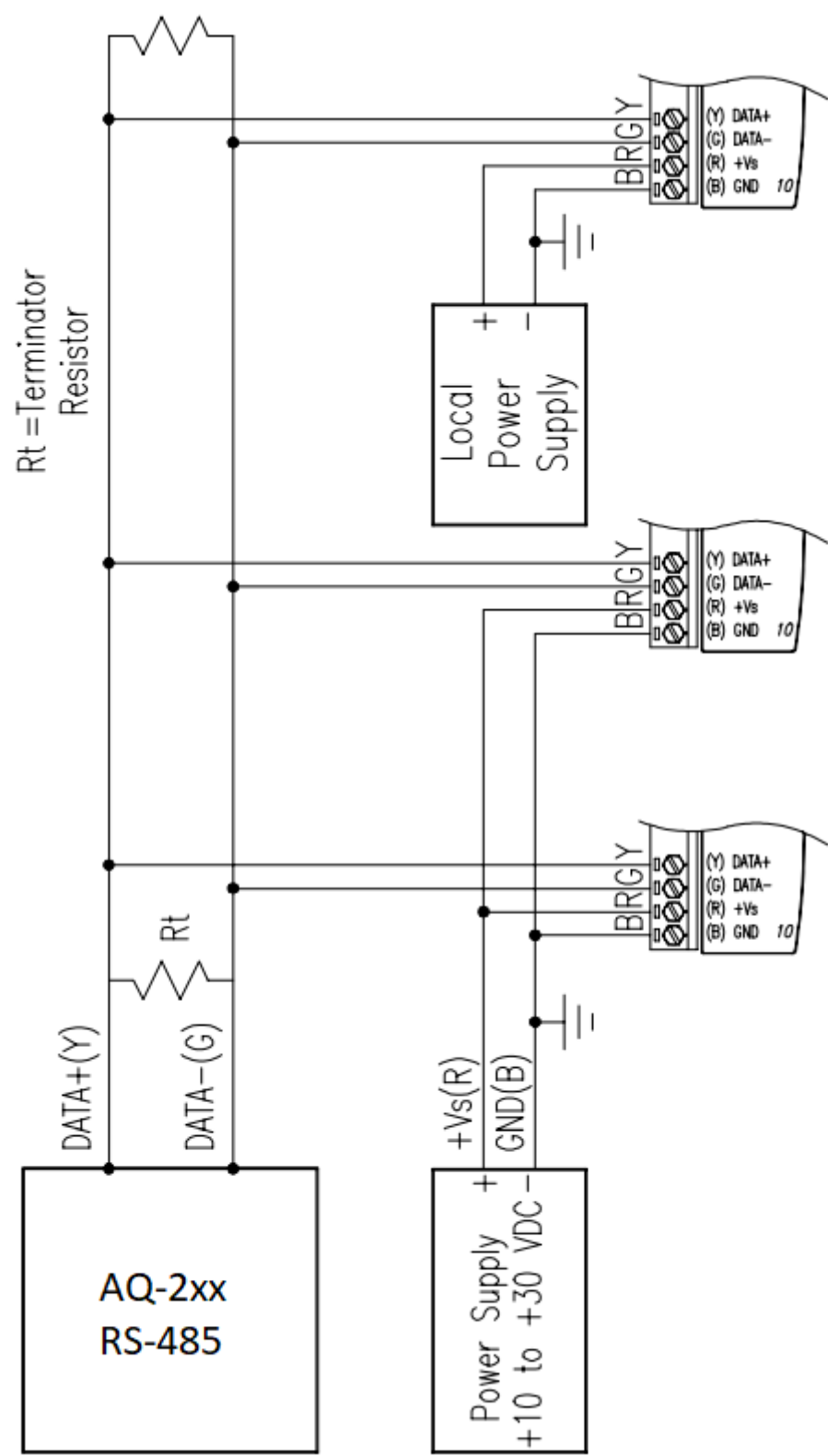
Channel	8
Input Type T	Thermocouple
Input range and T/C type	$\pm 20$ mA, 4~20 mA J 0 ~ 760° C K 0 ~ 1370° C T -100 ~ 400° C E 0 ~ 1000° C R 500 ~ 1750° C S 500 ~ 1750° C B 500 ~ 1800° C
Isolation Voltage	3000 V <sub>DC</sub>
Fault and over-voltage protection	Withstands over voltage up to $\pm 35$ V
Sampling Rate	10 sample/sec (total)
Input Impedance	Voltage: 20 M $\Omega$ , Current: 120 $\Omega$
Accuracy	$\pm 0.1\%$ or better
Power Consumption	0.8 W @ 24V <sub>DC</sub>
I/O Connector Type	10 pin plug-in terminal

Picture 8: Technical specification of ADAM-4018+ 8-ch thermocouple input module

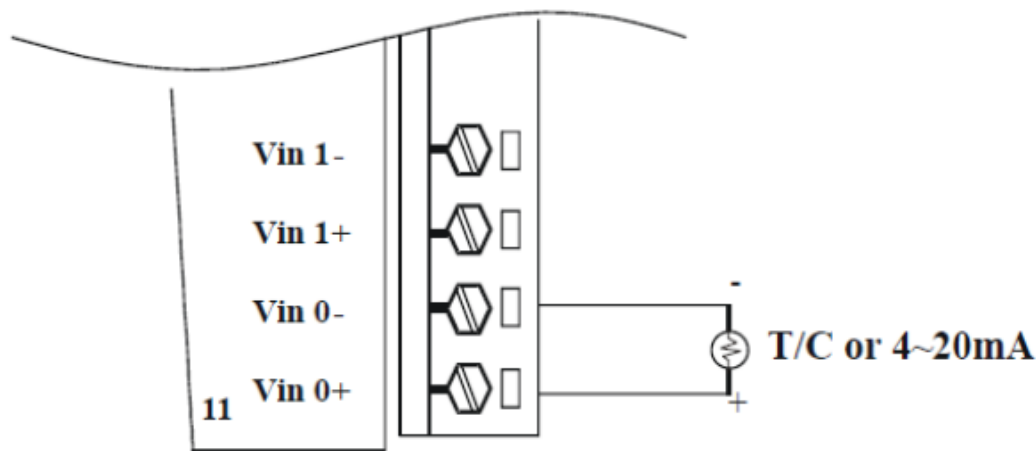
## 2.2 CONNECTIONS



Picture 9: Connecting power supply and RS485 communication to ADAM-4018+

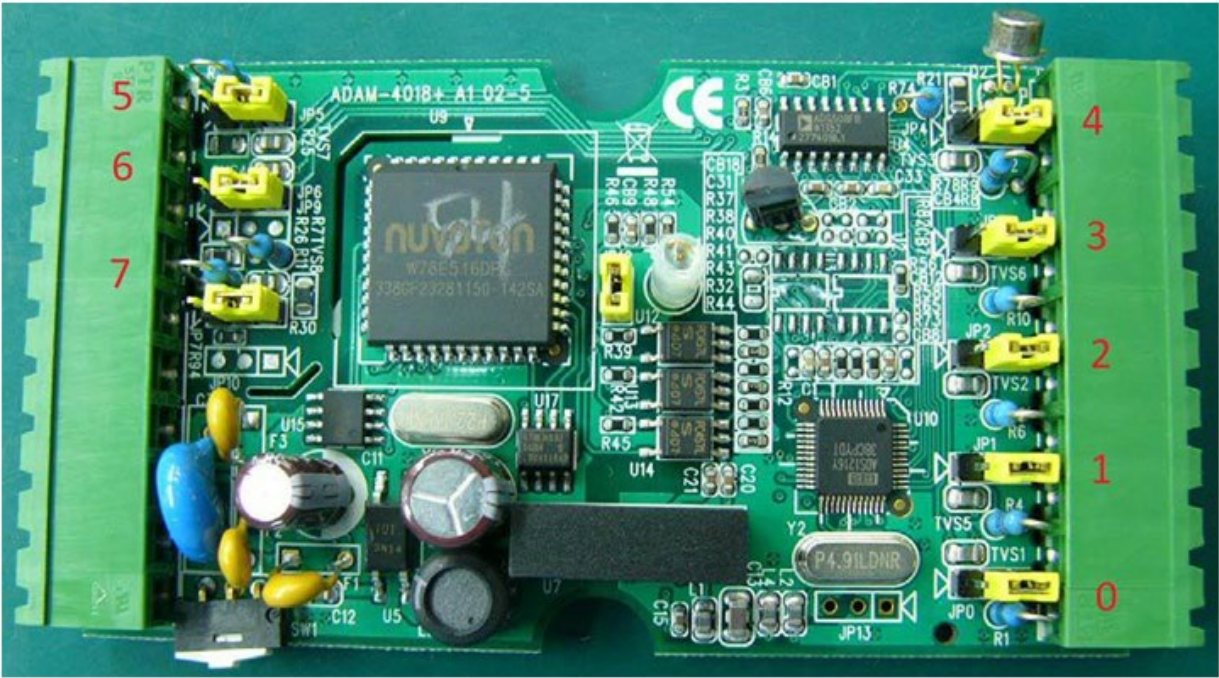


Picture 10: Connecting multiple ADAM-4018+ units to AQ-2xx



Picture 11: Connecting mA or thermocouple measurement to ADAM-4018+

JP0~JP7		4~20 mA Input Range							
		Voltage Input range							
Mapping to Channel		Ch.0	Ch.1	Ch.2	Ch.3	Ch.4	Ch.5	Ch.6	Ch.7
		JP 0	JP 1	JP 2	JP 3	JP 4	JP 5	JP 6	JP 7



Picture 12: Selecting between thermocouple and mA measurement mode in ADAM-4018+

## 3 COMMISSIONING ADAM MODULE TO AQ2XX

### 3.1 AQ-2XX VERSION INFORMATION

Following versions are required in AQ-2xx relays to have this latest functionality with ADAM-4015 and ADAM-4018+ modules.

#### AQ-21x

F/V/S/P/E models: FVSPE\_1.0.11-384 or newer

T model: T\_1.0.11-313 or newer

G model: G\_1.0.11-342 or newer

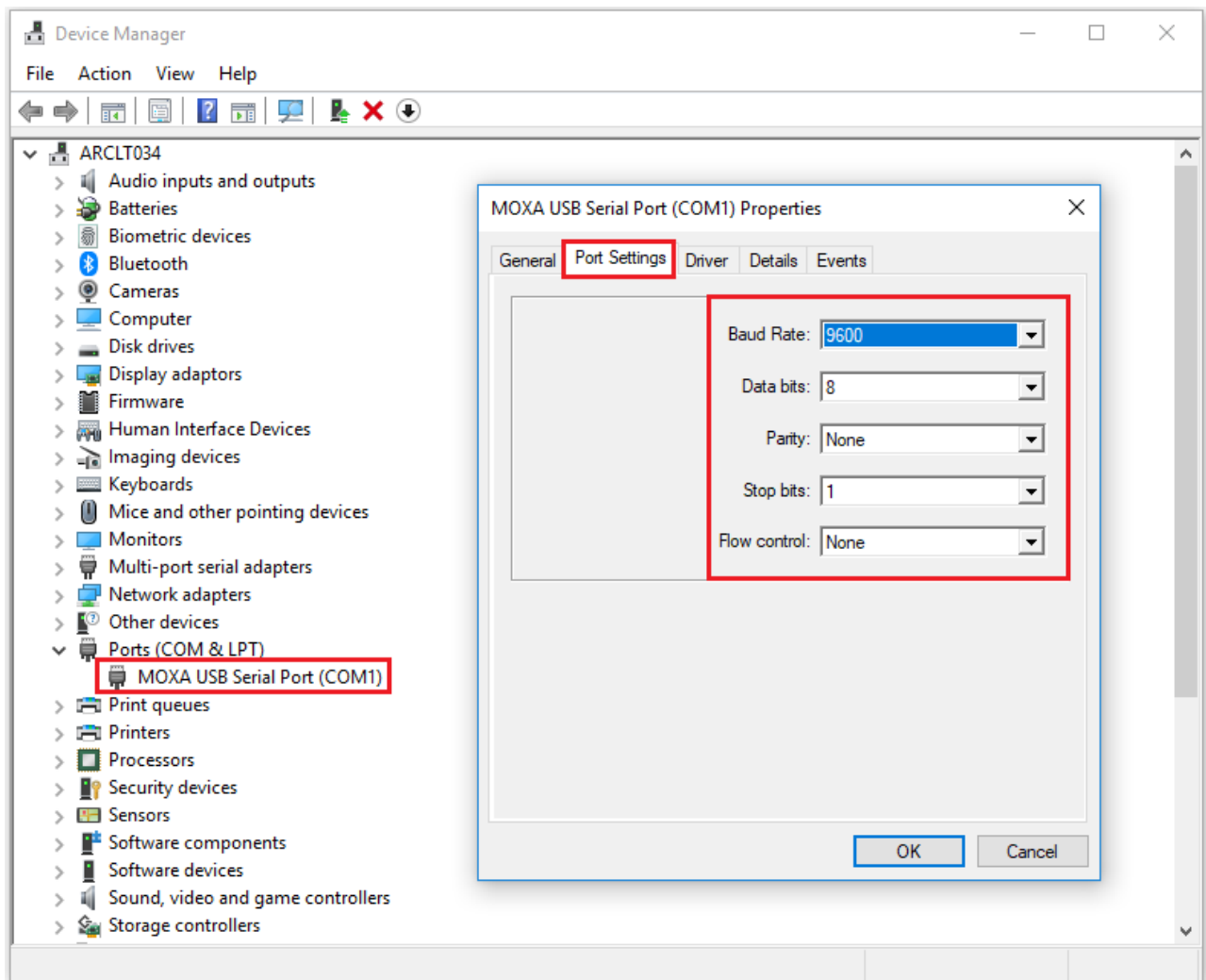
M model: M\_1.0.11-370 or newer

#### AQ-25x

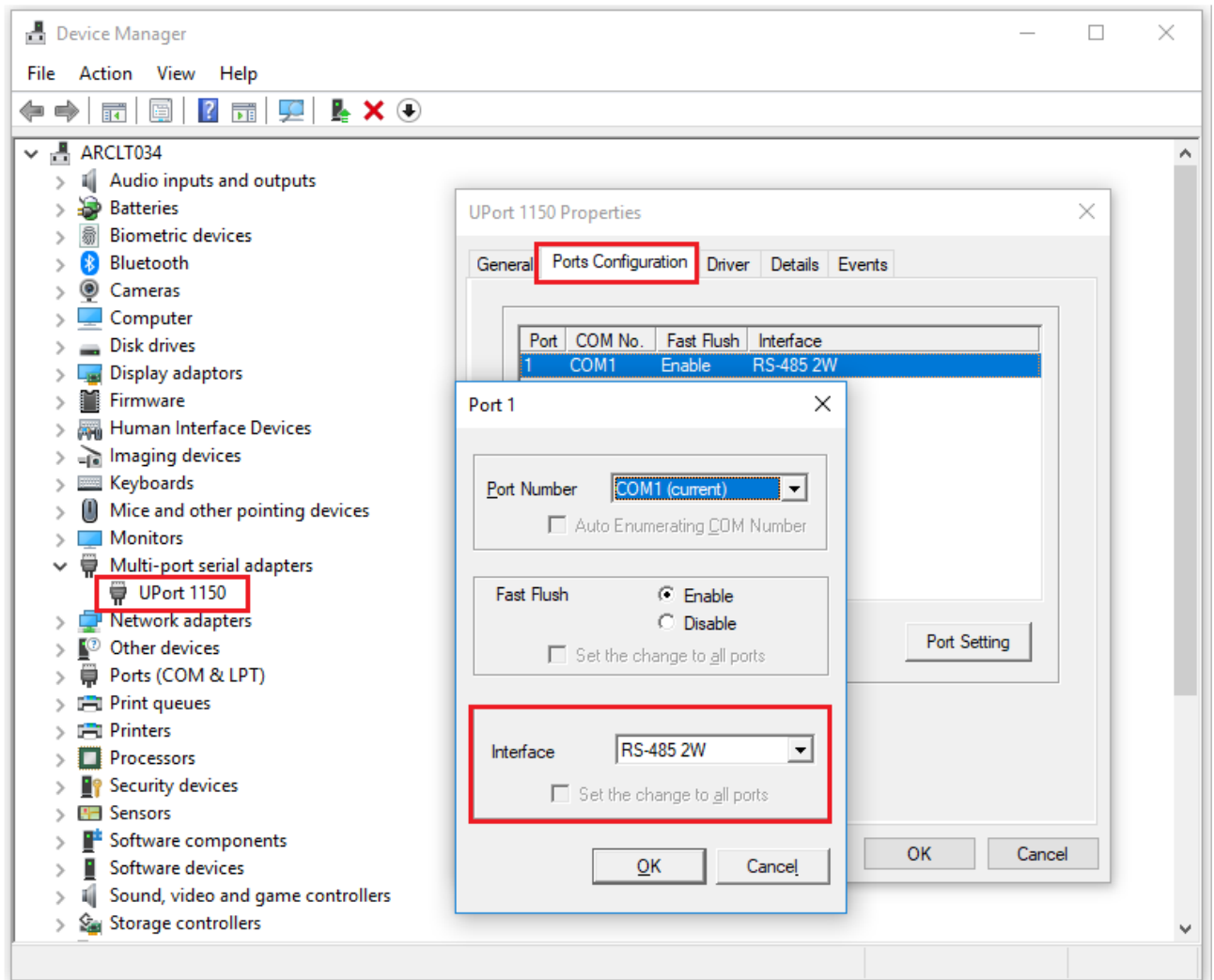
All models: v.2.5.6.1-1 or newer

### 3.2 FACTORY DEFAULT ADAM UNIT

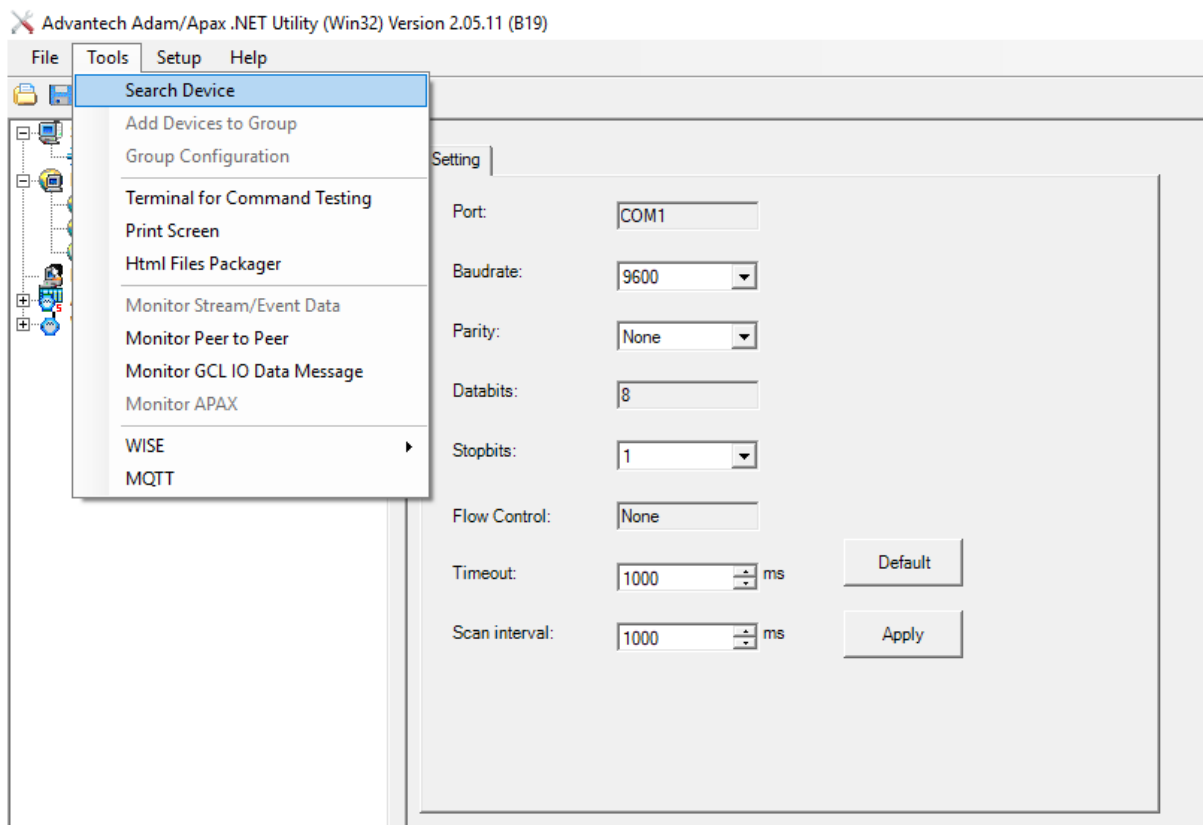
First thing needed is RS485 to USB converter which can be used to configure ADAM unit. If ADAM unit is with Advantech factory settings then communication protocol and ModBus address must be set for the ADAM before it can be connected to AQ-2xx RS485 port. Arcteq uses Moxa Uport 1150 RS-232/422/485 USB-to-Serial converter. This can be purchased from Arcteq with code: SP-ADAM-KIT.



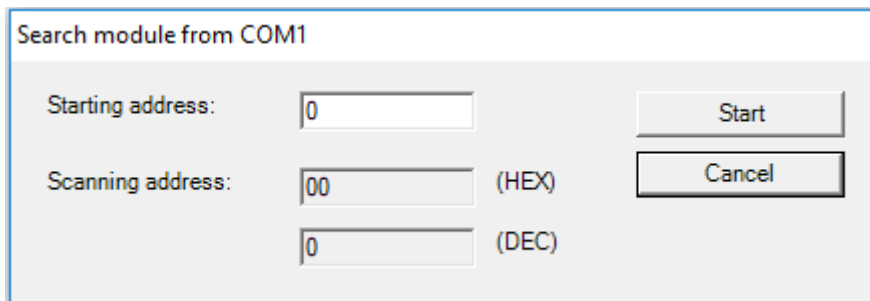
Picture 13: Settings for Moxa USB-to-Serial converter, general.



Picture 14: Settings for Moxa USB-to-Serial converter, Interface.

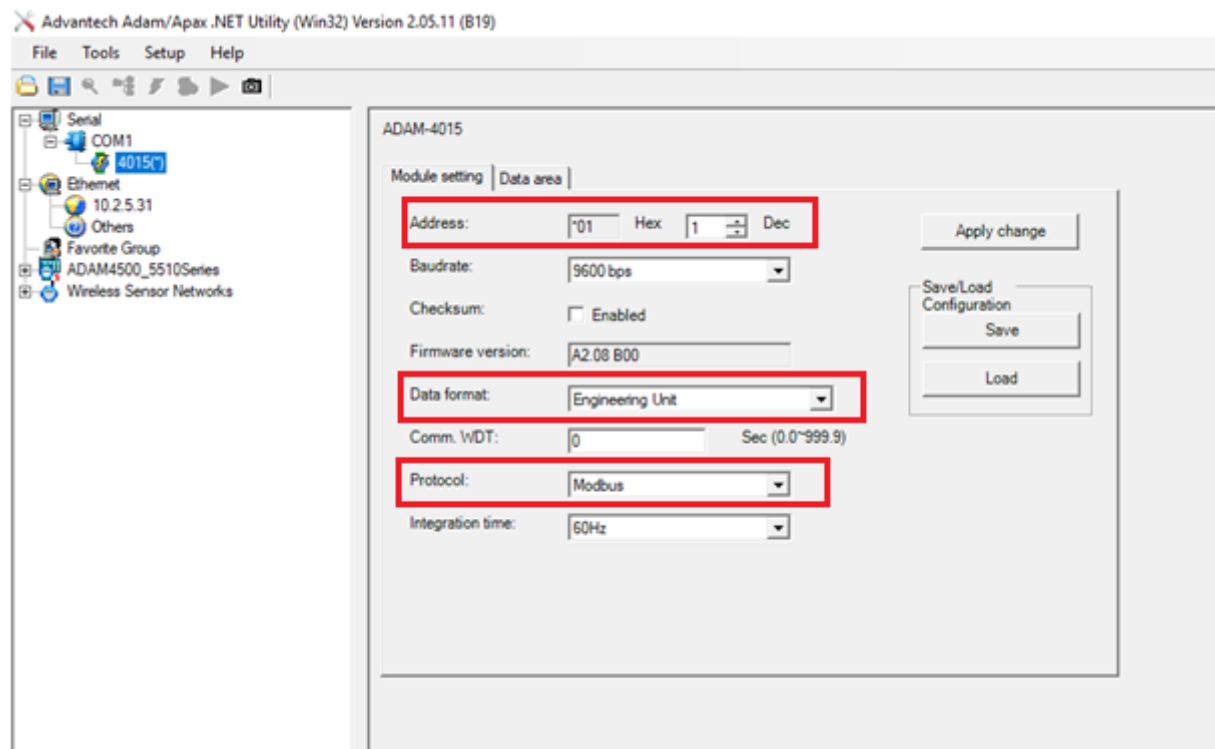


Picture 15: Open ADAM/Apax.NET Utility and Search devices.



Picture 16: Start searching from address 0.





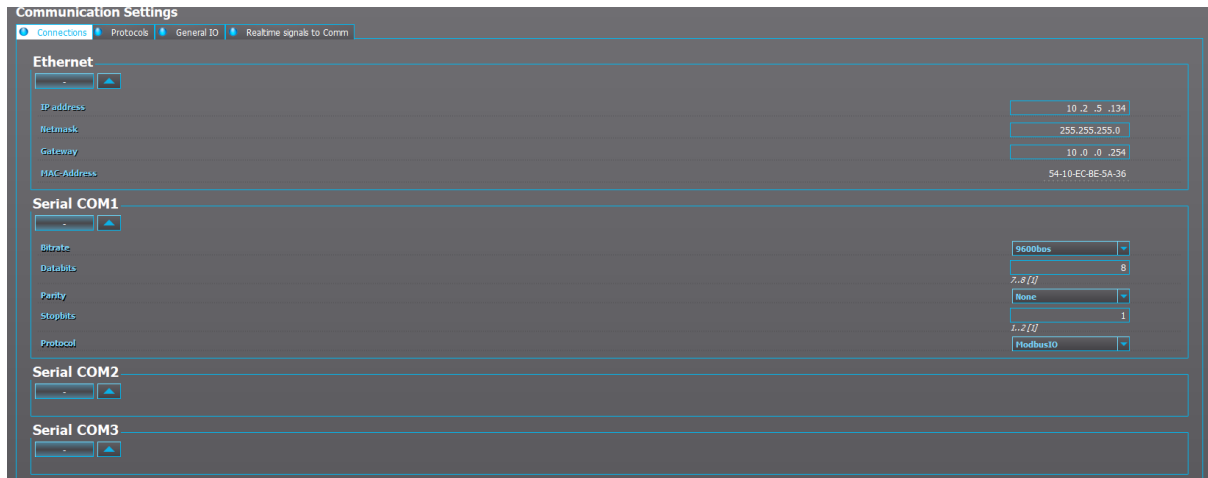
Picture 17: ADAM unit should appear under COMx and with clicking the ADAM unit it's automatically connected to your PC. Address should be unique for all ADAM units in same RS485 loop. Data format should be: "Engineering Unit" and Protocol: "Modbus". **These settings are visible only when INIT\*-pin is connected to the ADAM GND-pin and unit is powered up with this connection done.**

After changing the settings "Apply change" must be pressed and after writing to ADAM is completed the ADAM unit must be rebooted (power off/ power on) to validate the changed parameters. **Only after rebooting the ADAM unit the changes take effect.**

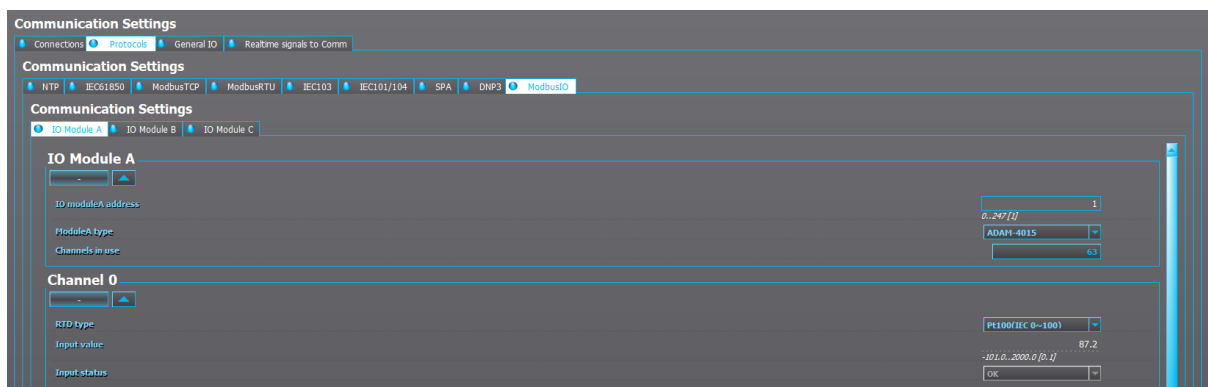
### 3.3 PRE-CONFIGURED ADAM UNIT

If you have purchased ADAM-4015 or ADAM-4018+ from Arcteq directly then you can skip point 3.1 as units sold by Arcteq have pre-configuration inside the unit. Therefore, no need to set the address and protocol for ADAM-unit as they are already set. Address of the unit can be found from the sticker attached to the side of the ADAM.

### 3.4 SETTING UP RS485 COMMUNICATION FOR ADAM IN THE AQ2XX

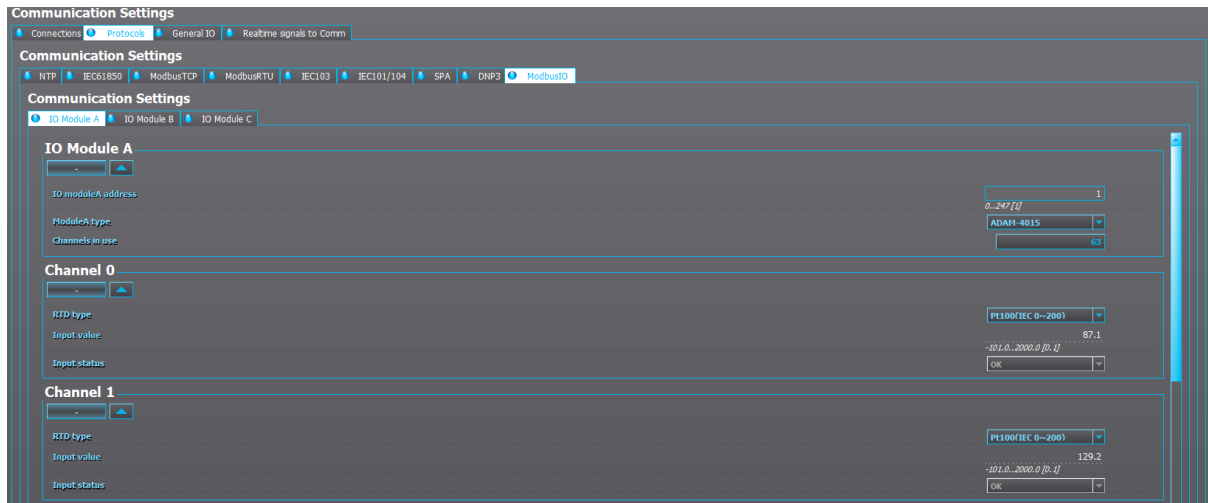


Picture 18: Set Serial COM1 to 9600bps, 8N1, ModbusIO

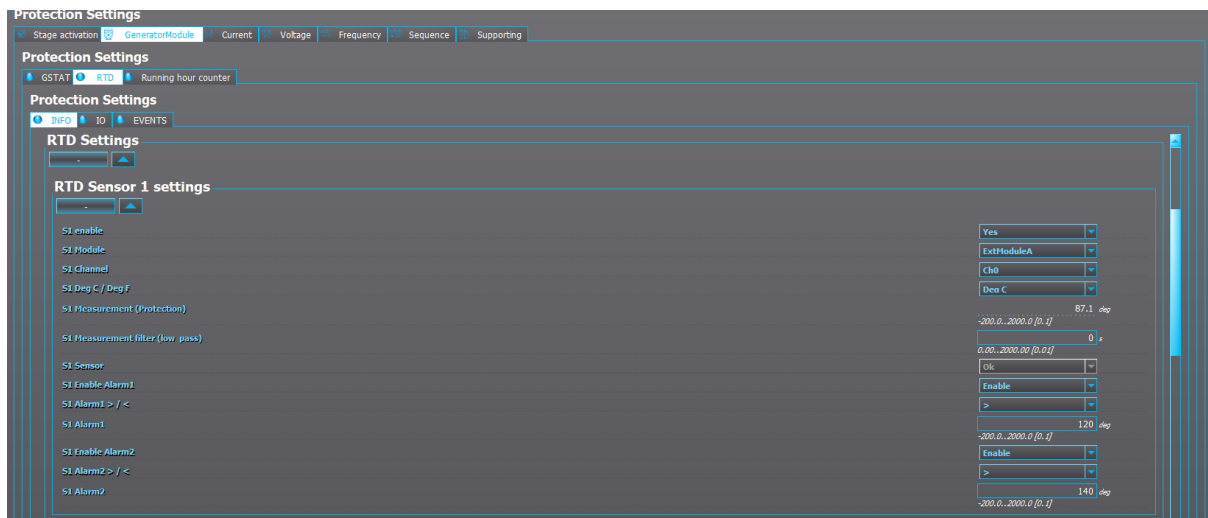


Picture 19: Set IO module A address to the same as set to the ADAM unit connected. Then set correct ADAM-module type: ADAM-4015 or ADAM-4018+.

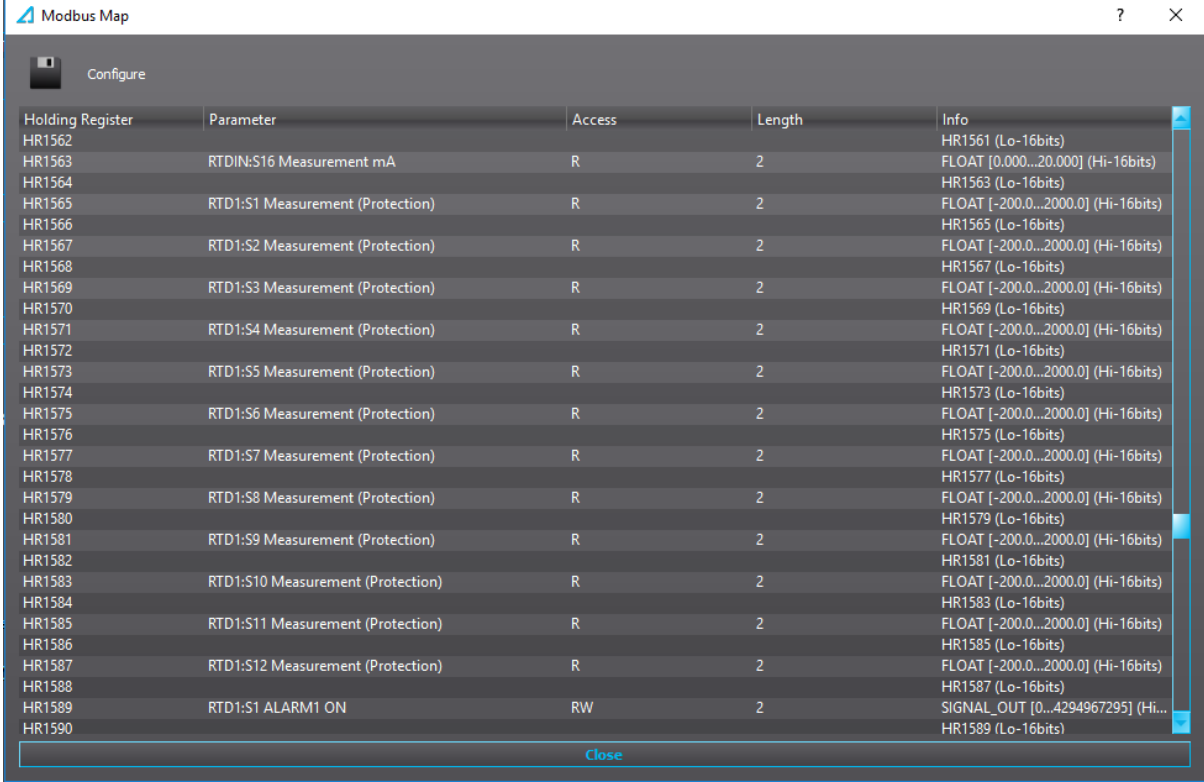
### 3.5 SETTING PROTECTION FUNCTION ACCORDING TO TEMPERATURE



Picture 20: Set channels 0-5 according to the type of RTD sensor connected to the ADAM-4015. AQ-2xx writes this RTD sensor type directly to the ADAM-4015 with Modbus.



Picture 21: Set RTD protection module according to your application. **Note: S1 module: ExtModuleA (B,C)**



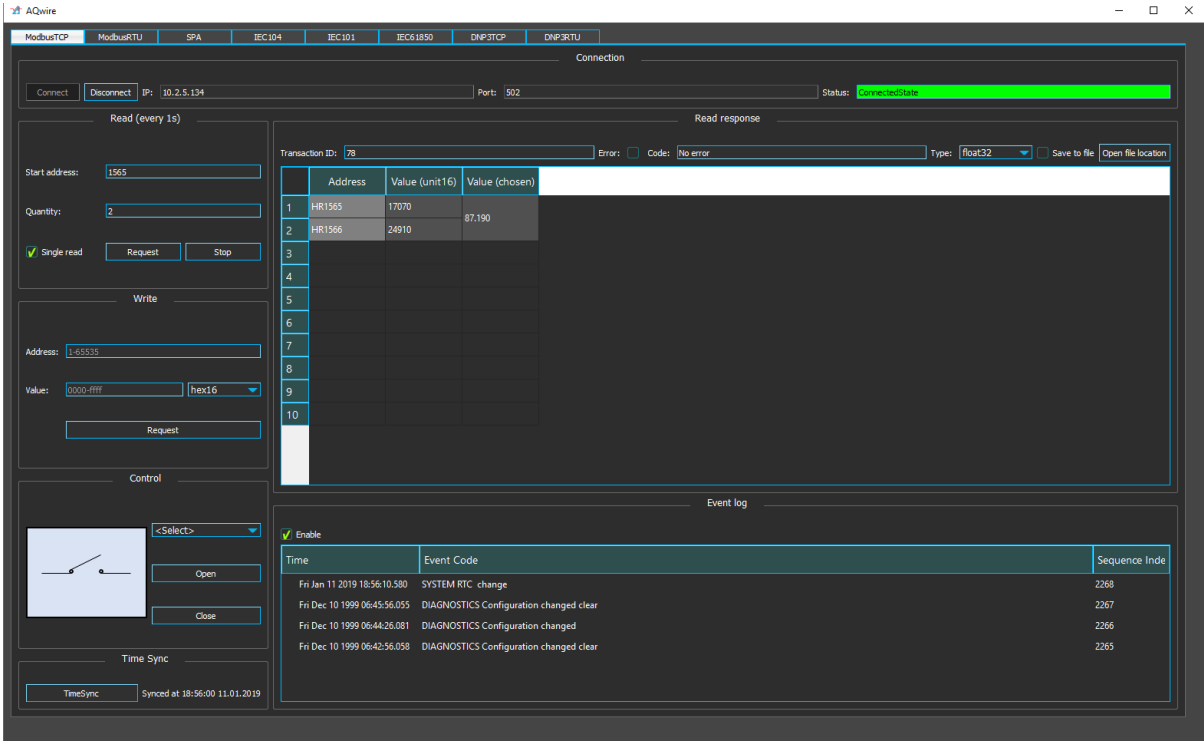
Modbus Map

Configure

Holding Register	Parameter	Access	Length	Info
HR1562				HR1561 (Lo-16bits)
HR1563	RTDIN:S16 Measurement mA	R	2	FLOAT [0.000...20.000] (Hi-16bits)
HR1564				HR1563 (Lo-16bits)
HR1565	RTD1:S1 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1566				HR1565 (Lo-16bits)
HR1567	RTD1:S2 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1568				HR1567 (Lo-16bits)
HR1569	RTD1:S3 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1570				HR1569 (Lo-16bits)
HR1571	RTD1:S4 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1572				HR1571 (Lo-16bits)
HR1573	RTD1:S5 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1574				HR1573 (Lo-16bits)
HR1575	RTD1:S6 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1576				HR1575 (Lo-16bits)
HR1577	RTD1:S7 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1578				HR1577 (Lo-16bits)
HR1579	RTD1:S8 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1580				HR1579 (Lo-16bits)
HR1581	RTD1:S9 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1582				HR1581 (Lo-16bits)
HR1583	RTD1:S10 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1584				HR1583 (Lo-16bits)
HR1585	RTD1:S11 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1586				HR1585 (Lo-16bits)
HR1587	RTD1:S12 Measurement (Protection)	R	2	FLOAT [-200.0...2000.0] (Hi-16bits)
HR1588				HR1587 (Lo-16bits)
HR1589	RTD1:S1 ALARM1 ON	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1590				HR1589 (Lo-16bits)

Close

Picture 22: Reading measurements to Modbus TCP. RTD1:S1 Measurement (Protection) is the correct register for picture 21 configuration.



AQWire

ModbusTCP ModbusRTU SPA IEC104 IEC101 IEC61850 DNP3TCP DNP3RTU

Connection

Connect Disconnect IP: 10.2.5.134 Port: 502 Status: ConnectedState

Read (every 1s)

Start address: 1565

Quantity: 2

☒ Single read Request Stop

Write

Address: 1-5535

Value: 0000-FFFF (hex16) Request

Control

☒ Enable

Time Sync

TimeSync Synced at 18:56:00 11.01.2019

Read response

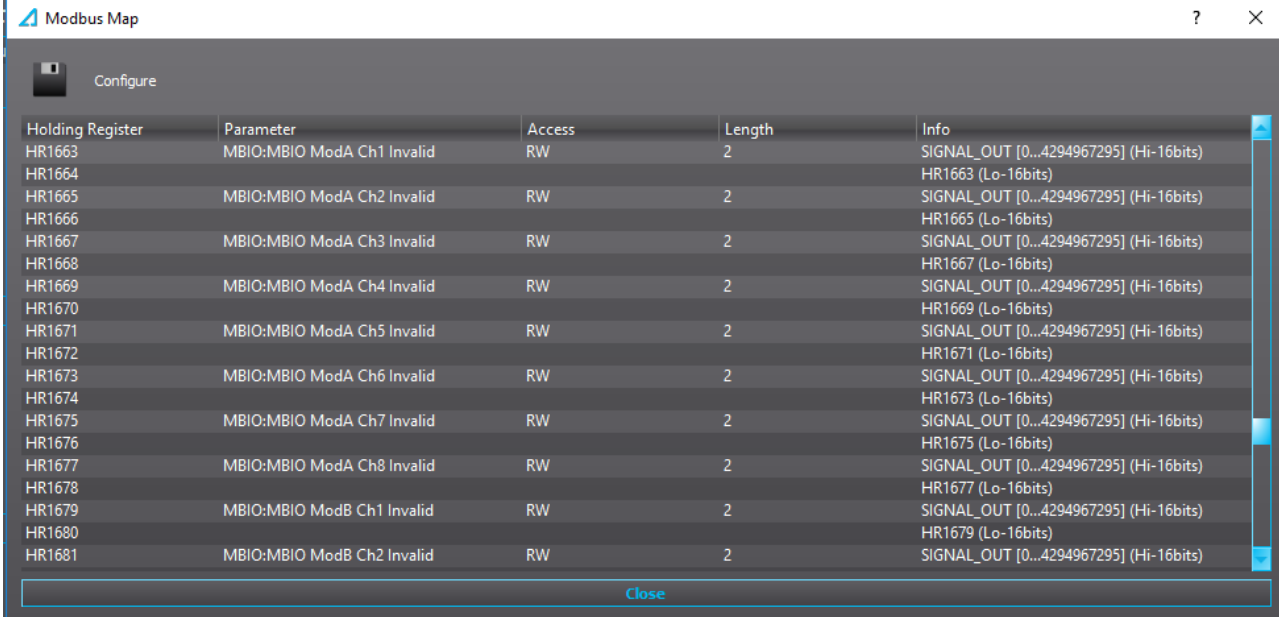
Transaction ID: 78 Errors: No error Code: No error Type: Float32 Save to file Open file location

	Address	Value (unit16)	Value (chosen)
1	HR1565	17070	87.190
2	HR1566	24910	
3			
4			
5			
6			
7			
8			
9			
10			

Event log

Time	Event Code	Sequence Index
Fri Jan 11 2019 18:56:10.580	SYSTEM RTC change	2268
Fri Dec 10 1999 06:45:56.055	DIAGNOSTICS Configuration changed clear	2267
Fri Dec 10 1999 06:44:26.081	DIAGNOSTICS Configuration changed	2266
Fri Dec 10 1999 06:42:56.058	DIAGNOSTICS Configuration changed clear	2265

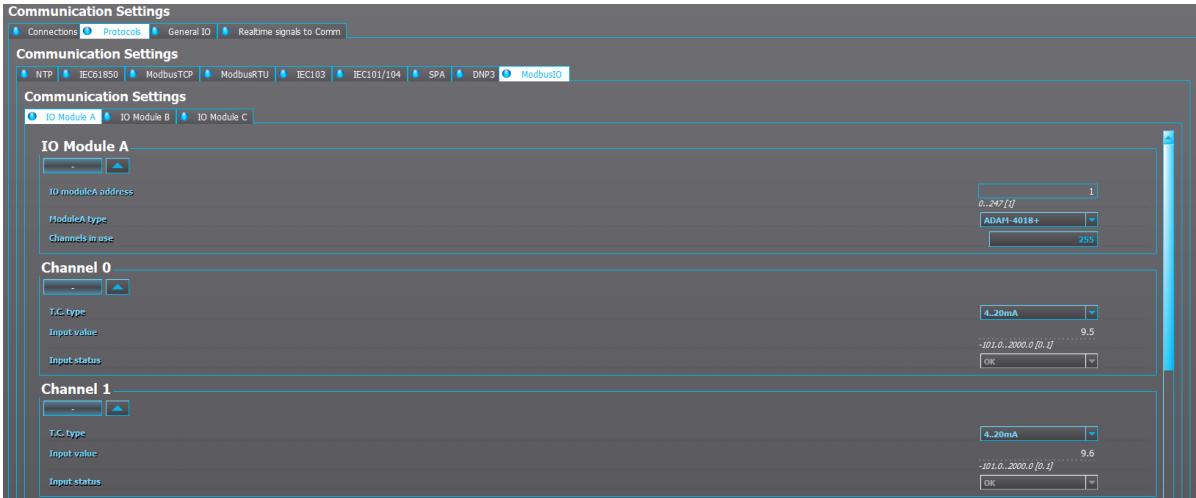
Picture 23: Modbus holding register 1565 read with AQWire protocol tester.



Holding Register	Parameter	Access	Length	Info
HR1663	MBIO:MBIO ModA Ch1 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1664				HR1663 (Lo-16bits)
HR1665	MBIO:MBIO ModA Ch2 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1666				HR1665 (Lo-16bits)
HR1667	MBIO:MBIO ModA Ch3 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1668				HR1667 (Lo-16bits)
HR1669	MBIO:MBIO ModA Ch4 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1670				HR1669 (Lo-16bits)
HR1671	MBIO:MBIO ModA Ch5 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1672				HR1671 (Lo-16bits)
HR1673	MBIO:MBIO ModA Ch6 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1674				HR1673 (Lo-16bits)
HR1675	MBIO:MBIO ModA Ch7 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1676				HR1675 (Lo-16bits)
HR1677	MBIO:MBIO ModA Ch8 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1678				HR1677 (Lo-16bits)
HR1679	MBIO:MBIO ModB Ch1 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)
HR1680				HR1679 (Lo-16bits)
HR1681	MBIO:MBIO ModB Ch2 Invalid	RW	2	SIGNAL_OUT [0...4294967295] (Hi-16bits)

Picture 24: Measurement valid/invalid data can be found from these Modbus holding registers.

### 3.6 SETTING ON LOAD TAP CHANGER FUNCTION ACCORDING TO MA SIGNAL



**Communication Settings**

Connections: Protocols General IO Realtime signals to Comm

Communication Settings

Protocols: NTP IEC61850 ModbusTCP ModbusRTU IEC103 IEC101/104 SPA DNP3 **ModbusID**

IO Module A IO Module B IO Module C

**IO Module A**

IO module address: 0...247 [1]

Module type: ADAM-4018+

Channels in use: 255

**Channel 0**

T.C. type: 4...20mA

Input value: 9.5

Input status: -101.0...2000.0 [0..1] OK

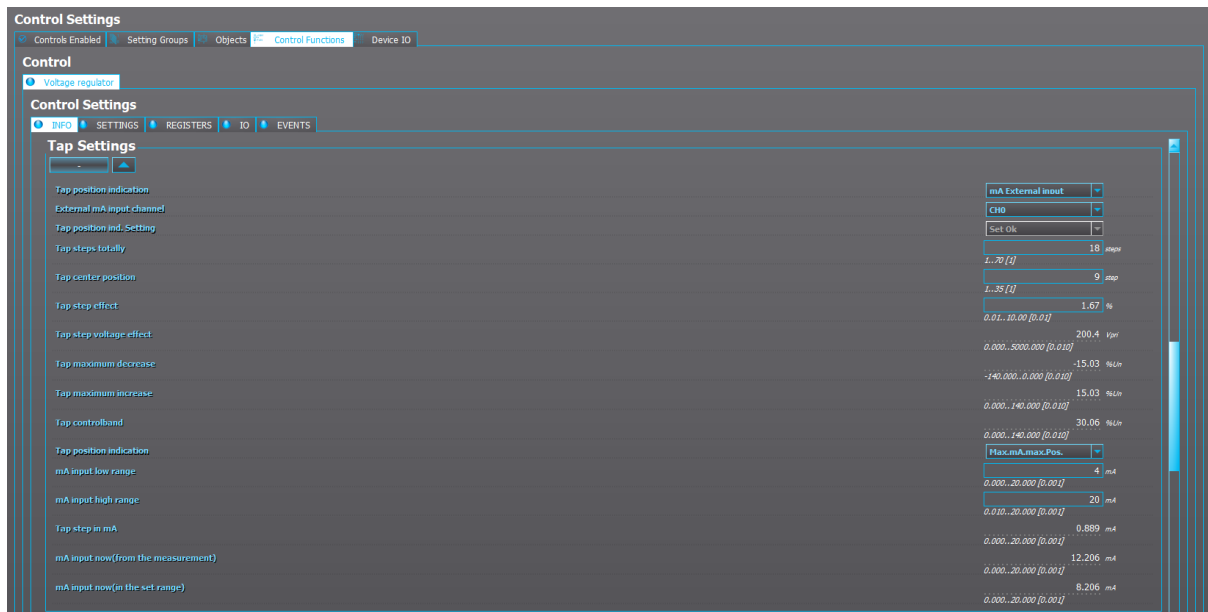
**Channel 1**

T.C. type: 4...20mA

Input value: 9.6

Input status: -101.0...2000.0 [0..1] OK

Picture 25: Set channels 0-7 according to the sensor (or mA measurement) connected to the ADAM-4018+. AQ-2xx writes this sensor type directly to the ADAM-4018+ with Modbus.



Picture 26: Set Tap position indication to “mA External input”. Set “External mA input” channel to the channel where mA input is connected.

## 4 REFERENCE INFORMATION

**Manufacturer information:**

Arcteq Ltd. Finland

**Visiting and postal address:**

Wolffintie 36 F 12

65200 Vaasa, Finland

**Contacts:**

Phone, general and commercial issues (office hours GMT +2): +358 10 3221 370

Fax: +358 10 3221 389

url: [www.arcteq.fi](http://www.arcteq.fi)

email sales: [sales@arcteq.fi](mailto:sales@arcteq.fi)

technical support: <https://arcteq.fi/support-landing/>