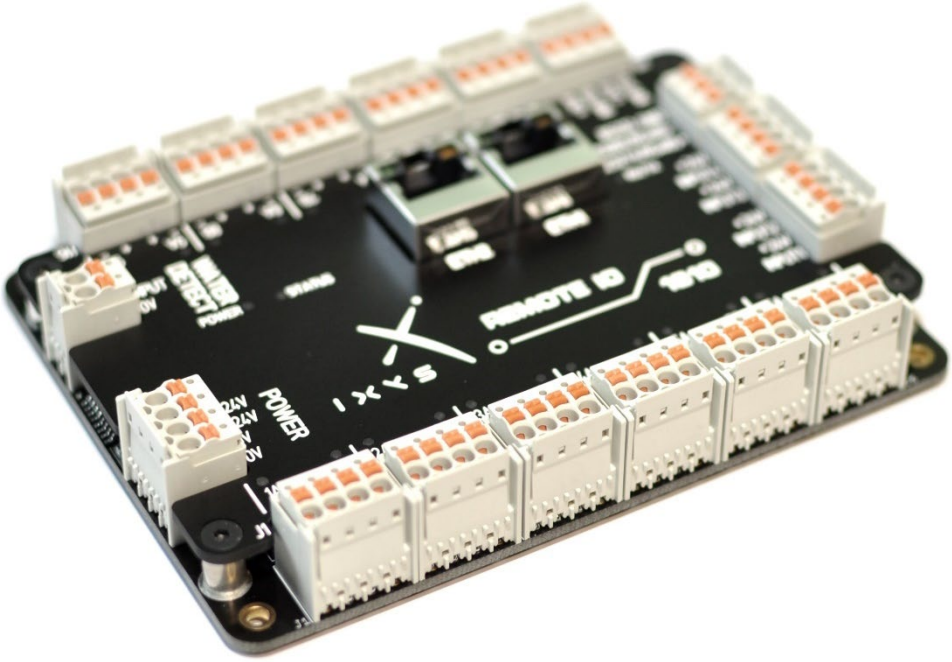
USER MANUAL



Equipment Description	Remote IO 1810
Ixys Part Number:	114554

Document No.:	114554-ICS-PD-UMN-0001	**Document Name.:**	User Manual
Published	**Revision number**	**Revision reason**	**Revised by**
22.01.2024	B	Changed product name	VHA
10.03.2023	A	Issued for release	VHA
Prepared		**Checked**	**Approved**
VHA		OMH	SHA

TABLE OF CONTENTS

1. INTRODUCTION

1.1. GENERAL NOTES

This document outlines and defines the installation, operation, and maintenance procedures for the PCB Remote IO 1810. The manual will contain all relevant data and methods to be able to use and maintain the device for its intended purpose.

It will be stated in the manual everything from technical specifications, installation, and maintenance to troubleshooting.

1.2. PURPOSE AND SCOPE

The purpose of this manual is to give instructions to install, operate and maintain the PCB Remote IO 1810 supplied by Ixys AS.

The manual is to be used by trained and competent personnel only.

1.3. ABBREVIATIONS

Abbreviation	Description
PCB	Printed Circuit Boards
TCP	Transmission Control Protocol
UDP	User Datagram Protocol
ESD	Electrostatic Discharge
IP	Internet Protocol
EEPROM	Electric Erasable Programmable Read Only Memory
PWM	Pulse Width Modulation

1.4. SUPPLIER CONTACT INFORMATION

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2. HEALTH, SAFETY AND ENVIRONMENT

2.1. GENERAL

Safety Notes and General Precautions shall be presented to all personnel concerned prior to testing, operation, maintenance, and repair. The operations shall be performed by the responsible engineer/supervisor. The personnel using this equipment must have knowledge of this type of equipment and have familiarized themselves with the applicable procedures and manuals for this product.

2.2. SAFETY MESSAGE LEVELS

Safety message level		Indication
	**DANGER:**	A hazardous situation which, if not avoided, will result in death or serious injury
	**WARNING:**	A hazardous situation which, if not avoided, could result in death or serious injury
	**CAUTION:**	A hazardous situation which, if not avoided, could result in minor or moderate injury or damage to equipment
	**Electrical Hazard:**	The possibility of electrical risks if instructions are not followed in a proper manner
NOTICE:		A potential situation which, if not avoided, could result in an undesirable result or state. A practice not related to personal injury

3. SPECIFICATIONS

3.1. DESCRIPTION

The Remote IO 1810 is a printed circuit board with dual Ethernet port for connection of multiple Ethernet devices in a network. The board has 18 PWM Outputs and 10 Analog inputs where 6 of these can be configured as digital inputs.

Configuration is possible through Web interface and by Modbus RTU/UDP/TCP. The board has built-in monitoring of supply voltage and water ingress detector.

3.2. TECHNICAL DATA

General	
Manufacturer	Ixys AS
Description	PCB Remote IO 1810
Weight	~150g
Dimensions	120 x 90 x 22mm

Electrical Data	
Supply Voltage	24 VDC (10 – 30)
Power Consumption	< 5W

Cable Connectors	
Ethernet Ports	RJ45
2pin (Water Detect, RS485)	Wago 2091-1122
3pin (RS232)	Wago 2091-1123
4pin (Power, PWM, Inputs)	Wago 2091-1124

Other	
Speed on Ethernet ports	10/100 Mbps
Default IP address	10.0.37.248

3.3. WARRANTY CONDITIONS AND GUARANTEE

- Improper use of equipment where use is not reflected in what it was intended to.
- Where general maintenance is not performed, leading to defective parts or other types of defects.
- Incorrect handling or use of equipment.
- Packing not carried out in an ESD protective way.

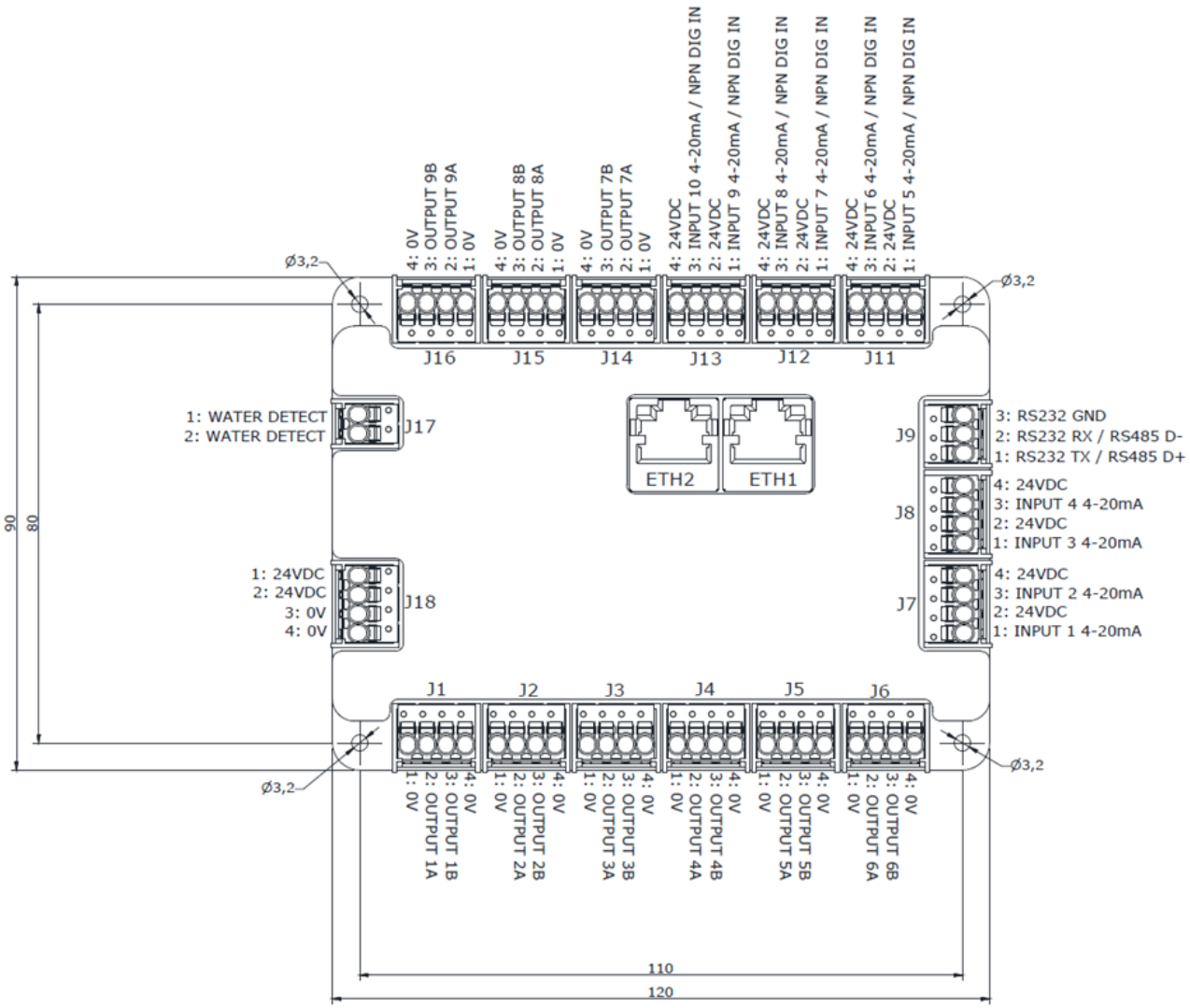
3.4. ORDERING

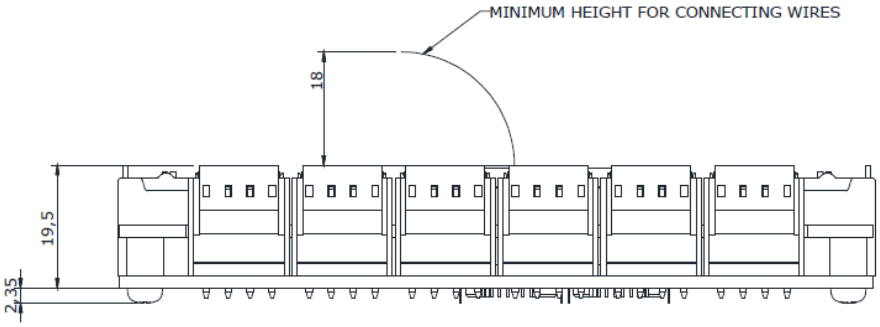
Ixys Part Number	Description
114554	PCB Remote IO 1810

3.5. ACCESSORIES

Ixys Part Number	Description

4. DRAWING


4: 0V
3: OUTPUT 9B
2: OUTPUT 9A
1: 0V
4: 0V
3: OUTPUT 8B
2: OUTPUT 8A
1: 0V
4: 0V
3: OUTPUT 7B
2: OUTPUT 7A
1: 0V
4: 24VDC
3: INPUT 10 4-20mA / NPN DIG IN
2: 24VDC
1: INPUT 9 4-20mA / NPN DIG IN
4: 24VDC
3: INPUT 8 4-20mA / NPN DIG IN
2: 24VDC
1: INPUT 7 4-20mA / NPN DIG IN
4: 24VDC
3: INPUT 6 4-20mA / NPN DIG IN
2: 24VDC
1: INPUT 5 4-20mA / NPN DIG IN
Ø3,2
J16
J15
J14
J13
J12
J11
1: WATER DETECT
2: WATER DETECT
J17
ETH2
ETH1
J9
3: RS232 GND
2: RS232 RX / RS485 D-
1: RS232 TX / RS485 D+
J8
4: 24VDC
3: INPUT 4 4-20mA
2: 24VDC
1: INPUT 3 4-20mA
J7
4: 24VDC
3: INPUT 2 4-20mA
2: 24VDC
1: INPUT 1 4-20mA
1: 24VDC
2: 24VDC
3: 0V
4: 0V
J18
90
80
J1
J2
J3
J4
J5
J6
1: 0V
2: OUTPUT 1A
3: OUTPUT 1B
4: 0V
1: 0V
2: OUTPUT 2A
3: OUTPUT 2B
4: 0V
1: 0V
2: OUTPUT 3A
3: OUTPUT 3B
4: 0V
1: 0V
2: OUTPUT 4A
3: OUTPUT 4B
4: 0V
1: 0V
2: OUTPUT 5A
3: OUTPUT 5B
4: 0V
1: 0V
2: OUTPUT 6A
3: OUTPUT 6B
4: 0V
110
120


MINIMUM HEIGHT FOR CONNECTING WIRES
18
19,5
2,35

5. OPERATION

5.1. NORMAL OPERATION

The sensor inputs are read by the corresponding Modbus registers together with diagnostic data like supply voltage and water ingress alarm.

The PWM outputs are activated by setting the corresponding “Active” register to 1 and the “Value” register to desired duty cycle of 0-65535 (0-100%).

A proprietary asynchronous protocol is provided in case more rapid communication than Modbus is needed.

A power saving feature is available on each output. This is activated by setting a power save timeout. This feature can be used for on/off solenoids to reduce power consumption after switching to the “on” state or this can be used on latching valves to only draw current while switching the valve state. If this feature is used, the Value register is only used to read back the current output duty cycle and any writing to this register will be ignored.

Each voltage output on the input connectors is protected by individual auto-resettable fuses at 160mA.

5.2. SETUP

Most of the configuration can be done by the web interface that is accessed by entering the PCB IP address in a web browser.

Some parameters can only be configured by writing to the Modbus registers.

5.3. TROUBLESHOOTING / FAULTFINDING

Preliminary fault isolation Check

- ✓ The electrical connections are correct as described in the drawing in chapter 4.

Trouble shooting		
Symptom	**Possible Causes**	**Remedy**
No communication with the PCB by Ethernet	• No power to the board.	• Be sure power is provided to the PCB according to the specifications in chapter 3.2.
	• Faulty network wiring.	• Verify the link status LEDs on the RJ45 connector.
	• Client device in wrong subnet.	• Verify the client (typically a computer) is in the same subnet as the PCB (all first three numbers in the IP address must be the same as the PCB).
	• Wrong IP address being used.	• Verify correct IP address being used (heartbeat can be observed on Wireshark to identify the PCB IP address).
No communication with the PCB by RS232/485	• Wrong baud rate being used.	• The default baud rate is 115.2kbps, but this can have been altered after delivery and all possible rates must be tried to find the current configured rate.
No pulses are counted on digital inputs	• Wrong signal type applied (PNP instead of NPN).	• Verify that the sensor signal is NPN, otherwise use an external NPN transistor to convert the signal.

6. COMMUNICATION PROTOCOL

6.1. MODBUS RTU

Default Baud rate	115 200 bps
Data bits	8
Parity	None
Stop bits	1

6.2. MODBUS TCP/UDP

An integrated switch on the board enables daisy chaining multiple boards.

Default IP address	10.0.37.248
Default Modbus Node	1
Modbus port	502

6.3. IXYS REMOTE IO ASYNC PROTOCOL

An integrated switch on the board enables the possibility of daisy chaining of multiple boards.

Default IP address	10.0.37.248
Default async port	65123

6.4. HEARTBEAT

Heartbeat messages containing the board`s IP and serial number are sent once per second to broadcast IP 255.255.255.255 port 65000. These messages can be used to determine the IP of a board.

6.5. DATA TYPES

The following table describes the data types used on Ixys boards. For 32-bit values two Modbus registers is used where the first is the most significant.

Name	Size	Value Range
INT16	2 byte	-32,768 to 32,767
UINT16	2 byte	0 to 65,535
INT32	4 byte	-2,147,483,648 to 2,147,483,647
UINT32	4 byte	0 to 4,294,967,295
REAL32	4 byte	1.2E-38 to 3.4E+38

7. REGISTERS

7.1. READ REGISTERS

7.1.1. HEADER

Register 4, 6 and 7 are stored in non-volatile memory when changed.

Address	Description	Default	Note	Data Type
0	PCB Type	N/A	37	UINT16
1	Serial Number	N/A		UINT16
2	Firmware Version	N/A		UINT16
3	Status	N/A	Bit0 = Reserved Bit1 = Water Alarm	UINT16
4	Serial Baud rate (RTU)	5	The Baud rate is indicated by a single digit: 0 = 9600 1 = 19200 2 = 28800 3 = 38400 4 = 57600 5 = 115200	UINT16
5	Supply Voltage	N/A	Unit = 0.1V	UINT16
6	Timeout	1000	Milliseconds without communication before Com Fail is triggered	UINT16
7	Slave Address	1	Modbus Slave Address	UINT16
8	Heartbeat	N/A	Increments by one each second and rollover at 65535	UINT16
9	Spare	N/A		UINT16

7.1.2. INPUTS

Address	Description	Note	Data Type
10	Input 1 Scaled MSB	Input raw value scaled according to input settings registers and presented as floating-point number. Inputs configured as digital will have pulse counter in these registers. The pulse counters are common for each pair of digital inputs. Input 5 & 6, 7 & 8 and 9 & 10 share the same pulse counter and will count both up and down if used as incremental encoder. If only the first input of the digital pair is pulsed the counter will only count up and if only the second digital input is used the counter will not count.	Analog: REAL32 Digital: INT32
11	Input 1 Scaled LSB		
12	Input 1 Raw	16-bit value where 4mA = 12500, 20mA = 62700 Digital Inputs will either be presented as 0 or 1 or if input setting register for Per/Min Active is set to 1 then this register will present the actual per minute value after scaling is added.	UINT16
13 - 39	Input 2 - 10		

7.2. WRITE REGISTERS

7.2.1. OUTPUTS

Address	Description	Note	Data Type
200	Output 1A Active	Set to 1 for output to become active	UINT16
201	Output 1A Value	16-bit value (0-65535) representing the PWM duty cycle from 0 to 100%	UINT16
202 - 235	Output 1B - 9B		

7.3. READ/WRITE REGISTERS

These registers are stored in non-volatile memory when changed.

7.3.1. INPUT SETTINGS

Address	Description	Default	Note	Data Type
300	Input 1 Type	0	0 = Analog Input 1 = Digital Input This parameter is only applicable to input 5 to 10 that has the option to select input type.	UINT16
301	Input 1 Raw Max	62700	Raw value corresponding to Scaled Max value	UINT16
302	Input 1 Raw Min	0	Raw value corresponding to Scaled Min value	UINT16
303	Input 1 Scaled Max	100	A high reference for calibration of input scaling (typically sensor maximum)	INT16
304	Input 1 Scaled Min	0	A low reference for calibration of input scaling (typically zero)	INT16
305	Input 1 Reserved	N/A		UINT16
306	Input 1 Reserved	N/A		UINT16
307	Input 1 Reserved	N/A		UINT16
308	Input 1 Reserved	N/A		UINT16
309	Input 1 Digital Per/Min Active	0	Digital Inputs: Set to 1 to present per minute value in Input Raw register	UINT16
310-399	Input 2 ….			

7.3.2. OUTPUT SETTINGS

Address	Description	Default	Note	Data Type
500	Output 1A Reserved	N/A		UINT16
501	Output 1A PWM Frequency	500	40-2000 = 40-2000Hz	UINT16
502	Output 1A Dither Amplitude	0	0-65535 = 0-100%	UINT16
503	Output 1A Dither Frequency	100	1-200 = 1-200Hz	UINT16
504	Output 1A Power Save Timeout	0	Time in milliseconds after output activation before the output is reduced to the Power Save Low value. Power save is deactivated for this output if this is set to zero	UINT16
505	Output 1A Power Save Low	0	Duty cycle in Power save low state. 0-65535 = 0-100%	UINT16
506	Output 1A Power Save High	0	Duty cycle in Power save high state. 0-65535 = 0-100%	UINT16
507	Output 1A Reserved	N/A		UINT16
508	Output 1A Reserved	N/A		UINT16
509	Output 1A Reserved	N/A		UINT16
510-679	Output 1B – 9B			

7.3.3. GENERAL SETTINGS

These registers are stored in non-volatile memory when changed.

Address	Description	Default	Note	Data Type
800	RS232/485 Mode	0	0=RS232 1=RS485 with termination resistor disabled 2=RS485 with termination resistor enabled	UINT16
801	IP Byte 3	10		UINT16
802	IP Byte 2	0		UINT16
803	IP Byte 1	37		UINT16
804	IP Byte 0	248		UINT16
805	Gateway Byte 3	10		UINT16
806	Gateway Byte 2	0		UINT16
807	Gateway Byte 1	37		UINT16
808	Gateway Byte 0	1		UINT16
809	Spare	N/A		UINT16
810	Spare	N/A		UINT16
811	Reset	0	1=Reboot the PWM PCB	UINT16

8. IXYS REMOTE IO ASYNC PROTOCOL

The Asynchronous protocol gives quick and asynchronous access via UDP to the most used Modbus registers. Byte endianness is the same as on Modbus, so the most significant byte comes first.

The protocol is used by sending a header less binary message to the Remote IO card on port 65123. This message shall contain all output registers (Active and Value) ranging from 200 and up to 235.

The Remote IO card will then start to respond with a message containing status, voltage and all Input registers (Scaled and RAW) for that Remote IO card. The response is sent back to the IP and port number of the sender.

The async return rate is configurable by this http command (interval set in milliseconds between return messages, sample sets 100ms/10Hz): POST http://10.0.37.248/async/interval/100
To check the current setting: GET http://10.0.37.248/async

When messages from the source is no longer received by the Remote IO card, the returned stream stops after 1 second.

8.1. PC TO REMOTE IO

byte	Description	Note	Data Type
0	Output 1A Active MSB	Same as Register 200	UINT16
1	Output 1A Active LSB		
2	Output 1A Value MSB	Same as Register 201	UINT16
3	Output 1A Value LSB		
4-71	Output 1B – 9B		

8.2. REMOTE IO TO PC

byte	Description	Note	Data Type
0	Status MSB	Same as Register 3	UINT16
1	Status LSB		
2	Voltage MSB	Same as Register 5	UINT16
3	Voltage LSB		
4	Input 1 Scaled b1	Same as Register 10	Analog: REAL32 Digital: INT32
5	Input 1 Scaled b0		
6	Input 1 Scaled b3	Same as Register 11	
7	Input 1 Scaled b2		
8	Input 1 Raw MSB	Same as Register 12	Analog: UINT16 Digital: INT16
9	Input 1 Raw LSB		
10 - 63	Input 2…..		