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| **105879-ICS-PD-UMN-0001** | **14.06.2023** | **Vidar Haus** |

# USER MANUAL

## SUBSEA CONVERTER


| PUBLISHED | REVISION | REVISION NOTE |
|---|---|---|
| 26.02.2023 | A | Released |
| 14.06.2023 | B | Improved register description |

| PREPARED | CHECKED | APPROVED |
|---|---|---|
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**CONTENTS**

## 1. INTRODUCTION

### 1.1.1. PURPOSE AND SCOPE

This document outlines and defines the configuration and operation of the Subsea Converter.

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

### 1.1.2. ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| EEPROM | Electrically Erasable Programmable Read Only Memory |
| | |
| | |

### 1.1.3. SUPPLIER CONTACT INFORMATION

Ixys AS
Langmyra 11
N-4344 Bryne
Norway

+47 51 42 22 22
post@ixys.no
www.ixys.no

### 1.1.4. DOCUMENT REFERENCES

| DOC No. | Description |
|---|---|
| 105879-ICS-MC-DWG-0001 | GA Drawing |
| | |

## 2. HEALTH, SAFETY AND ENVIRONMENT

### 2.1.1. 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 performing this job shall have knowledge of this type of equipment and have familiarized themselves with the applicable procedures and manuals for this product.

### 2.1.2. USER HEALTH AND SAFETY

This product is made to operate under many circumstances and specific cases for health and safety will not be described here but must be considered by the equipment manufacturer or owner.

**CAUTION:**

- By remote operating equipment, there is always a risk of people accessing the equipment without notice to the operator and it is therefore important to establish safety procedures for the specific equipment involved.

### 2.1.3. QUALIFICATIONS AND TRAINING

It is essential that operating personnel have been given training and education how to operate and maintain the software and equipment described in this manual. It is also essential that operating personnel have general operational experience.

The personnel responsible for the operation of this system must be appropriately qualified. The operating company must do the following tasks:

- Define the responsibilities and competency of all personnel handling this system.
- Provide instruction and training.
- Ensure that the contents of the operating instructions have been fully understood by the personnel.

### 2.1.4. NON-COMPLIANCE RISKS

Failure to comply with all safety precautions can result in the following conditions:

- Death or serious injury due to electrical and mechanical influences
- Product damage
- Property damage
- Loss of all claims for damages

### 2.1.5. UNACCEPTABLE MODES OF OPERATIONS

The operational reliability of this product is only guaranteed when it is used as designated. The operating limits given in this manual shall not be exceeded under any circumstances.

## 3. TECHNICAL INFORMATION AND DATA

### 3.1.1. TECHNICAL DESCRIPTION

The Subsea Converter is designed to be used subsea down to 3000m. It reads the values from external analog or pulse based sensors and transmit it digitally by RS232 or RS485.

### 3.1.2. TECHNICAL DATA

| | |
|---|---|
| Manufacturer | Ixys AS |
| Ixys Part Number | 105879 |
| Description | Subsea Converter |
| Weight in air | TBD |
| Weight in water | TBD |
| Dimensions | 193 x Ø40mm |
| Supply Voltage | 20-28VDC |
| Power Consumption | ~2W |
| Depth Rating | 3000m |
| Resolution | 15bit (0-32767) |
| Communication | RS232, RS485 |
| Default Baudrate | 9600 |
| Connector for communication | 5507-1508 (pigtail PN: 5501-1508) |
| Connector for communication | 5507-1508 (pigtail PN: 5501-1508) |

### 3.1.3. COMMUNICATION

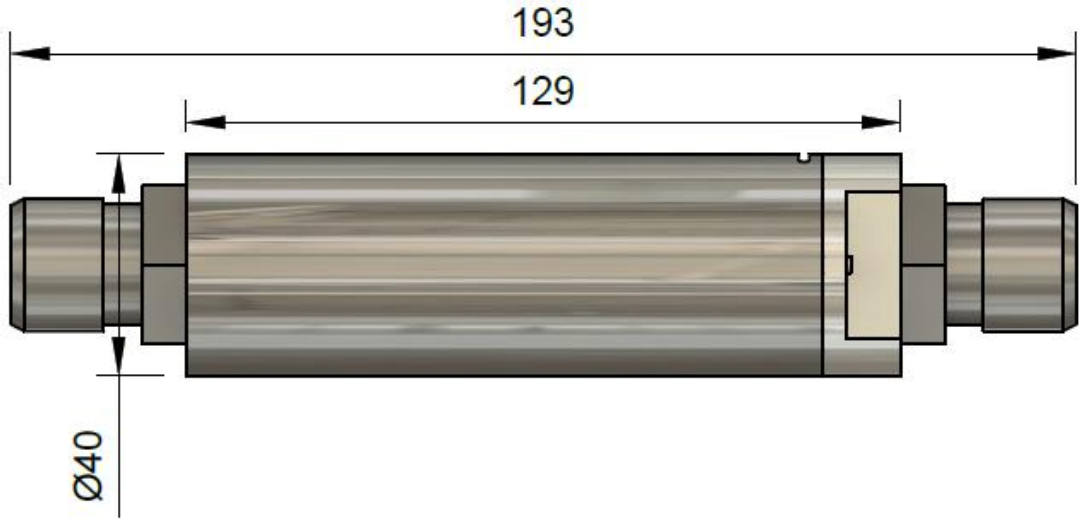
The communication is based on RS232 and RS485 Serial communication. Both communication interfaces can be used simultaneously.

Multiple ASCII based protocols can be selected or the industrial standard Modbus protocol can be used.

### 3.1.4. FEATURES

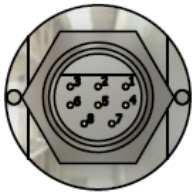
- Raw and Calibrated sensor readout
- High Resolution

## 4. DRAWING




J1
Communication
Interface

1: 0V
2: 24VDC
3: RS485+
4: RS485-
5: RS232 TX
6: RS232 RX
7: RS232 GND
8: NC



J2
Sensor
Interface

1: 0V
2: 24VDC
3: 4-20mA 1
4: 4-20mA 2
5: Dig in 1
6: Dig in 2
7: NC
8: NC

# 5. CONFIGURATION

### 5.1.1. CONNECTING TO CONVERTER

The Subsea Converter can be configured in many ways, and all parameters must be set correct to establish communication. In case the parameters are unknown, there is a simple way to find the current configuration. When power is applied, a “welcome message” is transmitted where the most important settings are shown.

The welcome message is always sent at 9600bps.

Use any type of text based serial terminal application and listen for this welcome message when power is applied.

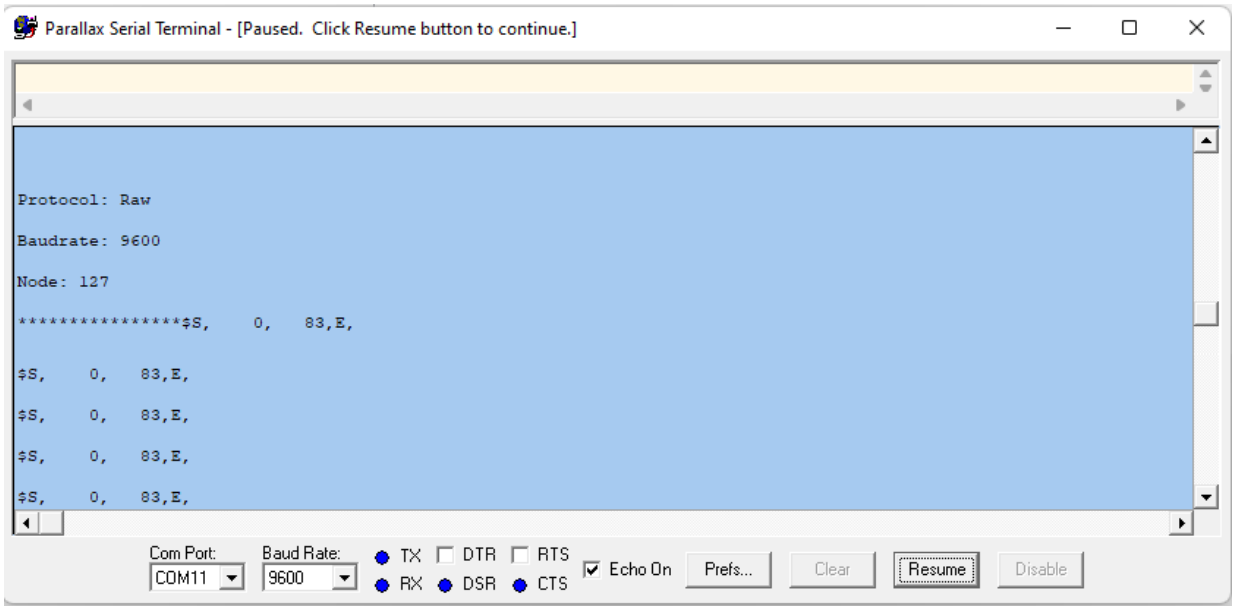



*Figure 1 – Example of “Welcome message” and following communication string*

### 5.1.2. CONFIGURE CONVERTER WITH ASCII PROTOCOL

All protocols except the Modbus can be configured from a terminal application. To enter the configuration menu, type “menu”. The menu shown below will then be sent back to the terminal. Navigate the menu by typing the numbers shown.

When changes are made, type 9 for saving to EEPROM and 0 to restart for effect.

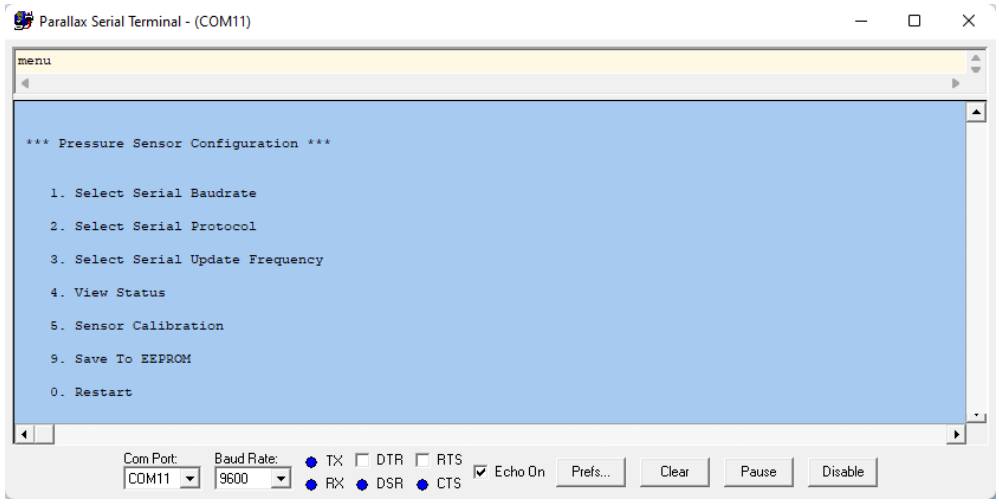



*Figure 2 – Configuration menu*

Serial number, firmware version, raw sensor and scaled values can be seen in the “View Status” submenu.

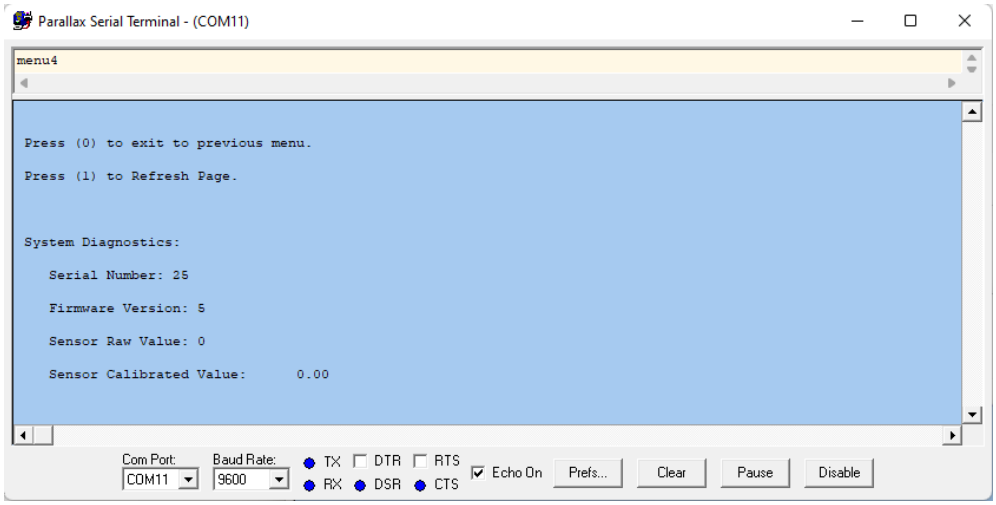



*Figure 3 – View Status*

To calibrate the converter “scaled value”, enter the “Sensor Calibration” submenu and follow these steps:

1. **Set the “Max Process Value” to the full range value of the sensor connected to the sensor input (or highest available from test equipment).**
2. **Set the “Min Process Value” to zero.**
3. **Set the “Calibrate Min” Value to current raw value (while no signal is applied to the converter).**
4. **Apply signal to the converter equal to the value set in “Max Process Value”.**
5. **Set the “Calibrate Max” value to the current raw value (while the max signal is still applied).**
6. **Go back to main menu and save to EEPROM.**

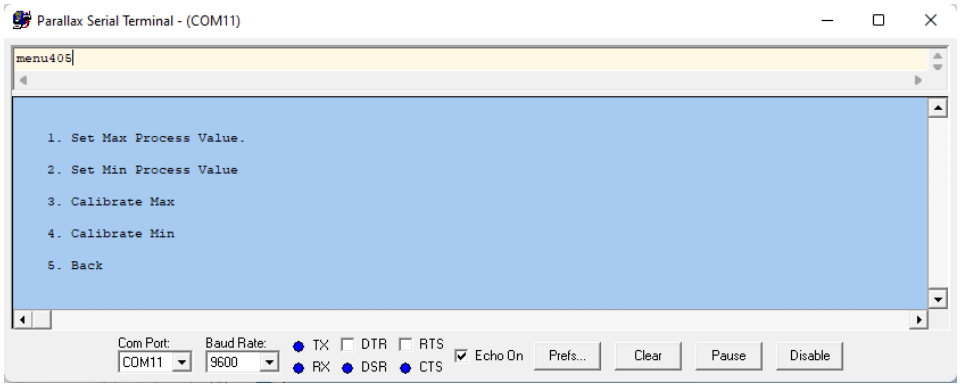



*Figure 4 – Sensor Calibration*

These serial protocols are available to configure:

1. **None**
   No Data is sent
2. **Raw Value**
   The Raw value is sent at the configured interval
3. **Calibrated**
   The calibrated scaled value is sent at the configured interval
4. **Calibrated Rounded**
   The calibrated scaled value is sent at the configured interval
5. **Modbus**
   In this configuration, the sensor is not available from the terminal except for the welcome message. A Modbus application is needed to establish communication by request/respond method.

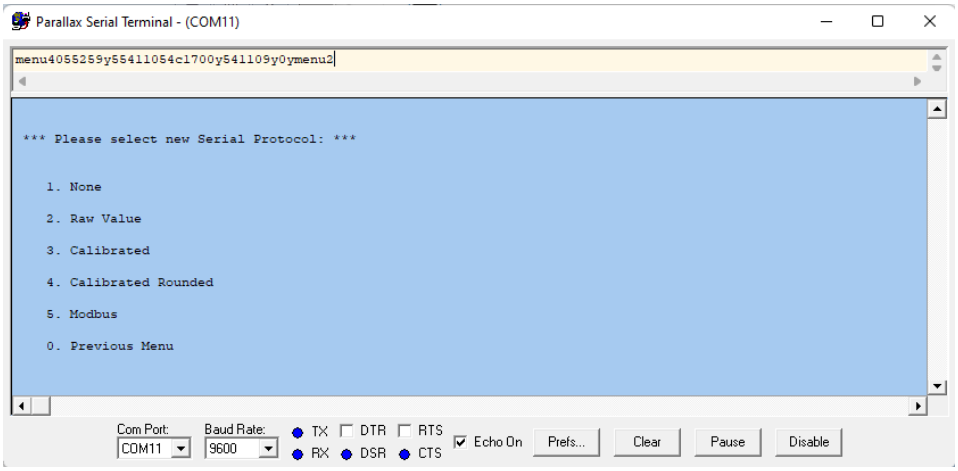



*Figure 5 – Select Serial Protocol*

### 5.1.3. CONFIGURE CONVERTER WITH MODBUS PROTOCOL

If the converter protocol is set to Modbus, then the converter will not respond to the menu command and a Modbus application must be used to establish communication. “Modbus Poll” is one flexible application for this purpose and is shown below.

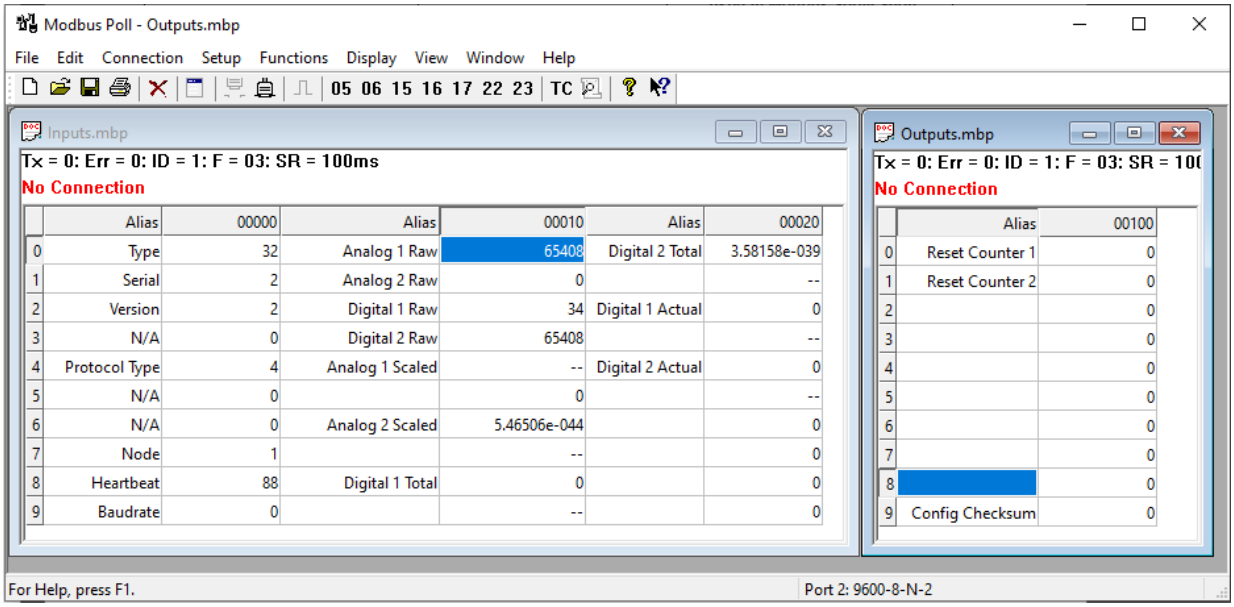



*Figure 6 – Modbus Poll*

#### DATA TYPES

The following table describes the data types used on iCsys boards. For 32bit 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 |

## HEADER REGISTERS

Protocol type, Slave address and Baudrate are automatically stored to EEPROM on change.

| Address | Description | Note | Data Type |
|---|---|---|---|
| 0 | PCB Type | Subsea Converter = 32 | UINT16 |
| 1 | Serial Number | | UINT16 |
| 2 | Firmware Version | | UINT16 |
| 3 | Reserved | | UINT16 |
| 4 | Protocol Type | 0 = None<br>1 = Raw Value<br>2 = Calibrated<br>3 = Calibrated Rounded<br>4 = Modbus | UINT16 |
| 5 | Reserved | | UINT16 |
| 6 | Reserved | | UINT16 |
| 7 | Slave Address | Modbus Slave Address (default = 1) | UINT16 |
| 8 | Heartbeat | 1Hz counter. Rolls over to zero after 65535 | UINT16 |
| 9 | Baudrate | 0 = 9600<br>1 = 19200<br>2 = 28800<br>3 = 38400<br>4 = 57600<br>5 = 115200<br>6 = 230400 | UINT16 |

## INPUT REGISTERS

| Address | Description | Note | Data Type |
|---|---|---|---|
| 10 | Analog 1 Raw | 0-32767 = 0-20mA | UINT16 |
| 11 | Analog 2 Raw | | UINT16 |
| 12 | Digital 1 Raw | 0 = off<br>1 = on | UINT16 |
| 13 | Digital 2 Raw | | UINT16 |
| 14 | Analog 1 Scaled MSB | Scaled analog inputs.<br>To adjust settings, swap to protocol type 0 and use terminal menu to access scaling parameters | REAL32 |
| 15 | Analog 1 Scaled LSB | | |
| 16 | Analog 2 Scaled MSB | | REAL32 |
| 17 | Analog 2 Scaled LSB | | |
| 18 | Digital 1 Counter Total MSB | Number of total pulses counted since last reset | REAL32 |
| 19 | Digital 1 Counter Total LSB | | |
| 20 | Digital 2 Counter Total MSB | | REAL32 |
| 21 | Digital 2 Counter Total LSB | | |
| 22 | Digital 1 Counter Actual MSB | Actual number of pulses per minute | REAL32 |
| 23 | Digital 1 Counter Actual LSB | | |
| 24 | Digital 2 Counter Actual MSB | | REAL32 |
| 25 | Digital 2 Counter Actual LSB | | |

## 6. TROUBLESHOOTING / FAULTFINDING

The below list is meant to provide some hints for troubleshooting but does not guarantee that the issue is covered by the list. Operational feedback will be used to extend the list in future revisions.

| Trouble shooting | | |
|---|---|---|
| **Symptom** | **Possible Causes** | **Remedy** |
| **No "Welcome message" presented** | • **Wrong wiring** | • **Check pin configuration according to drawing (remember crossing Tx-Rx)** |
| | • **Lack of power** | • **Measure voltage applied to sensor and verify correct voltage according to specification** |
| **No Modbus communication** | • **Wrong Modbus Slave Address used** | • **Check "Node" in welcome message and verify correct used in Modbus application** |
| **Wrong Values Displayed in software** | • **Converter not calibrated** | • **Calibrate converter** |
| | • **Raw value used in software and wrong calibration in software** | • **Check if raw value is used in software and perform calibration of sensor in software** |