MICHELL Instruments
A PST BRAND

Liquidew I.S.
Process Moisture Analyzer
User Manual

97092 Issue 6.2
February 2024

Please fill out the form(s) below for each instrument that has been purchased.

Use this information when contacting Michell Instruments for service purposes.

Product Name	
Order Code	
Serial Number	
Invoice Date	
Installation Location	
Tag Number	

Product Name	
Order Code	
Serial Number	
Invoice Date	
Installation Location	
Tag Number	

Product Name	
Order Code	
Serial Number	
Invoice Date	
Installation Location	
Tag Number	

Liquidew I.S.
Process Moisture Analyzer

For Michell Instruments' contact information please go to
www.ProcessSensing.com

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Safety

The instrument is designed to be completely safe when installed and operated correctly in accordance with the information provided in this manual.

This manual contains all the required information to install, operate and maintain this product. Prior to installation and use of this product, this entire manual should be read and understood. Installation and operation of this product should be carried out by suitably competent personnel only. The installation and operation of this product must be in accordance with the instructions provided and according to the terms of any associated safety certificates. Incorrect installation and use of this product other than those described in this manual and other than its intended purpose will render all warranties void.

This product meets the essential protection requirements of the relevant EU & UK directives. Further details of applied directives may be found in the product specification.

Electricity and pressurized gas can be dangerous. This product must be installed and operated only by suitable trained personnel.

No user serviceable parts inside

Where this hazard warning symbol appears in the following sections, it is used to indicate areas where potentially hazardous operations need to be carried out and where particular attention to personal and personnel safety must be observed.

Where this symbol appears in the following sections it is used to indicate areas of potential risk of electric shock.

This product is intended for use only under the following conditions:

a. indoor use

b. altitude up to 2 000 m

c. temperature 5 °C...40 °C

d. maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 %, relative humidity at 40 °C

e. MAINS supply voltage fluctuations up to ±10 % of the nominal voltage

f. TRANSIENT OVERVOLTAGES up to the levels of OVERVOLTAGE CATEGORY II

g. TEMPORARY OVERVOLTAGES occurring on the MAINS supply

h. applicable POLLUTION DEGREE 2 of the intended environment

Electrical Safety

Ensure electrical safety is complied with by following the directions provided here and observing all local operation & installation requirements at the intended location of use.

This product is completely safe when using any options and accessories supplied by the manufacturer of this product for use with it. Refer to Section 2 (Installation) of this manual for further details.

Pressure Safety

For this product to operate satisfactorily, pressurized gas must be connected to it. Observe all the information contained within this manual and all local operation & installation requirements at the intended location of use. Refer to Section 2 (Installation) of this manual for further details.

Hazardous Materials (WEEE, RoHS3 & REACH)

This product does not contain or release any prohibited chemicals listed on the SVHC (Substances of Very High Concern) Candidate List. During the intended normal operation of this product it is not possible for the user to come into contact with any hazardous materials. This product is designed to be recyclable except where indicated.

Repair and Maintenance

The instrument must be maintained either by the manufacturer or an accredited service agent. For contact information visit the website at www.ProcessSensing.com.

Calibration

Periodic re-calibration is recommended in order to maintain the highest quality of measurement in your application. Michell Instruments recommends that you have your Liquidew I.S. transmitter re-calibrated annually unless it is used in a mission-critical application or in a contaminated environment, in which case the calibration interval should be reduced accordingly.

Michell Instruments can offer a variety of re-calibration and exchange transmitter schemes to suit your specific needs. A local representative will be pleased to provide detailed custom advice.

Safety Conformity

This product meets the essential protection requirements of the relevant EU & UK directives. Further details of applied standards may be found in Appendix E.

Abbreviations

The following abbreviations are used in this manual:

A	Ampere
AC	alternating current
barg	pressure unit (=100 kP or 0.987 atm) gauge
°C	degrees Celsius
°F	degrees Fahrenheit
DC	direct current
dp	dew point
GPM	gallons per minute
”	inch(es)
lbf-ft	pound force per foot
l/min	liters per minute
Nm	newton meter
mA	milli Ampere
psig	pressure in pound(s) per square inch (gauge)
ppm_w	parts per million by weight
T	temperature
V	Volts

Warnings

The following general warnings listed below are applicable to this instrument. They are repeated in the text in the appropriate locations.

Where this hazard warning symbol appears in the following sections it is used to indicate areas where potentially hazardous operations need to be carried out.

Where this symbol appears in the following sections it is used to indicate areas of potential risk of electric shock.

1 INTRODUCTION

The Liquidew I.S. Process Moisture Analyzer is a continuous, on-line instrument for the measurement of absolute moisture content in a liquid. It is designed to fulfil a wide range of applications and provide for the monitoring and/or control of moisture in liquids. The instrument consists of two component parts: the control unit and the sensors (moisture and temperature transmitters). They are individually calibrated to a single standard allowing for total interchangeability between combinations of sensors and control units.

The range of the instrument is 0...500 parts per million by weight (ppm_W). There are 8 pre-set liquid options available for the C_S data used in moisture calculation, together with 2 user-defined solutes and an ability to mix any 2 liquids from the list. Four alarm relay contacts are provided which are user-configurable in set-point and operating mode. The current output is factory set at 4...20 mA.

The Liquidew I.S. Control Unit must be placed in a non-hazardous area suitable for electronic analytical equipment. The moisture and temperature transmitters can be positioned close to the process sample take-off point in a Zone 1 or Zone 2 (Class I, Division 1, Groups A, B, C & D) hazardous area. The control unit and transmitters are connected via a standard 2-wire instrumentation cable protected by safety isolation interface units.

Figure 1 *Liquidew I.S. Control Unit*

1.1 Performance Features

- State-of-the-art ceramic metal-oxide moisture sensor with chemically inert materials coupled with physical resilience provides long-term reliability in the most arduous applications. Robust construction is exceedingly durable in liquid. Not affected by pressure shocks.
- High integrity moisture in liquid measurement from 0.01ppm$_W$ to saturation level at +20 °C (68 °F).
- Sample Analysis over temperature range 0...+50 °C maximum (32...122 °F)
- Three 4...20 mA outputs with configurable units / ranges. RS485 Modbus RTU communication. Four built-in user-adjustable alarm contacts.
- Assured measurement accuracy with each sensor calibrated across the entire measurement range and certified traceable to NPL (UK) and NIST (USA).
- Certified intrinsically safe.
- Replaceable sensor element with Michell Calibration Exchange Service for professional, scheduled and low cost recalibration to minimize downtime and cost.
- Up to four independent measurement channels with any combination of moisture in gas and moisture in liquid and oxygen measurement at low per-channel cost.
- Customized sampling systems to meet even the most demanding applications.

1.2 Applications

- Naphtha feedstock to isomerization catalyst
- Hexane solvent in HDPE and LDPE process
- Benzene in styrene manufacture
- LNG LPG production and product checking
- Diesel and aero fuels to avoid liquid water phase separation
- BTX process monitoring – benzene, toluene and xylene
- Ethylene and propylene feed to polymer processes
- Butadiene and styrene for the manufacture of synthetic rubber
- Gas generation industries

1.3 Theory of Operation

Reliable and robust sensor design is fundamental to achieving accurate measurement of moisture in liquids over a long period of time. Proprietary thick- and thin-film techniques are applied in the Michell ceramic metal-oxide moisture sensor. Base metal layers, on semi-conductor grade ceramic substrate, sense dissolved moisture within the sample liquid flow. The inert materials of the sensor have a high resistance to aggressive media while the inherent strength of the sensor and the thermal bonded connections to the active device ensures reliable operation even in dense fluid samples.

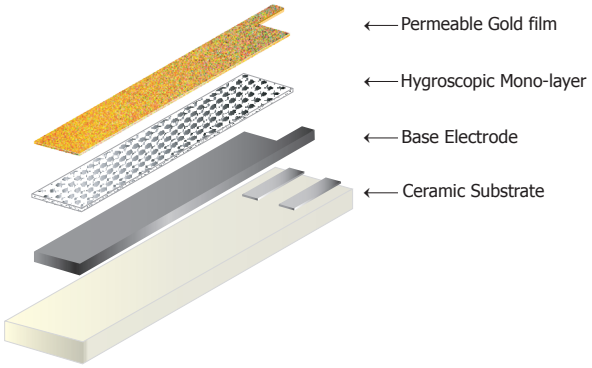


Figure 2 *Structure of the Michell Ceramic Metal-Oxide Moisture Sensor*

The ceramic metal-oxide moisture sensor exhibits a direct response to partial pressure of moisture vapor. Calibration is certified traceable to NPL (UK) and NIST (USA) through the use of dew-point transfer standards.

With the Liquidew I.S. the amount of dissolved moisture dispersed throughout the immiscible process liquid is measured on-line in real time (in units of ppm_W moisture content) using Henry's Law.

According to Henry's Law:

$$C = \frac{C_S}{P_{sat}} \times P_W$$

Where:

C = Moisture content
C_S = Saturation moisture content at the analysis temperature
P_W = Water vapor pressure from dew-point sensor measurement
P_{sat} = Saturation water vapor pressure at the analysis temperature

$C_S / P_{sat} = K$ (Henry constant)

The impedance sensor measures P_W. To calculate C, the C_S must be known.

The advanced firmware of the Liquidew I.S. provides moisture measurements in ppm_W through the application of Henry's Law using pre-programmed saturation concentration (C_S) values for the most common pure hydrocarbon liquid applications. A proportional mixing setting can be used for mixtures of two solutes, i.e. propane and butane in LPG.

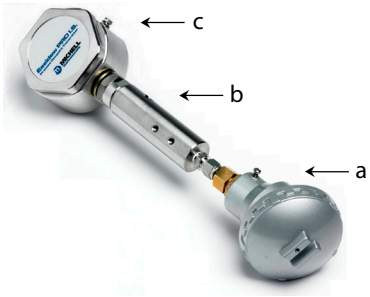
Two user-programmable entry tables enable C_S values to be entered for other solutes or for complex fluid compositions where the user may wish to enter C_S values from:

- their own sources
- laboratory analysis of process samples
- estimated values from proportional calculation based on the C_S values for each of the major components in the solute mix

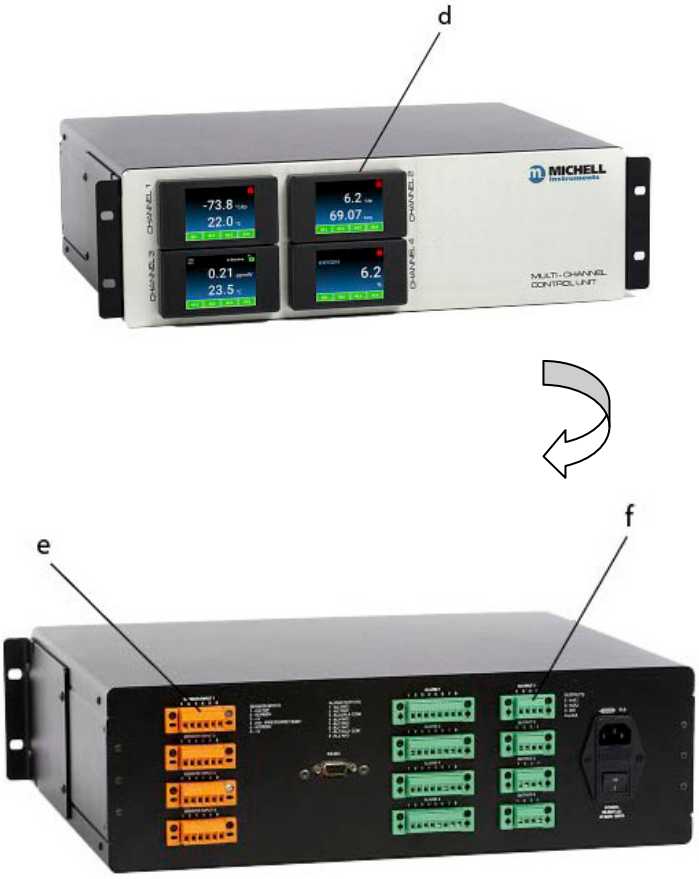
1.4 System Components

The Liquidew I.S. Process Moisture Analyzer consists of:

- the sensor assembly
- the multi-channel control unit



Sensor Assembly



Control Unit

(Up to four channels can have any combination of Liquidew I.S., Promet I.S. or Minox-i O_2 sensors*)

a	Temperature transmitter
b	Sensor block
c	Dew-point transmitter
d	User interface
e	Electrical connections - to hazardous area
f	Electrical connections - non-hazardous

Figure 3 *Major Components of the Liquidew I.S.*

** Promet I.S. is a sister product of the Liquidew I.S. and is used for moisture in gas measurement; Minox-i is an electrochemical oxygen sensor*

1.4.1 Input/Output Signal

The terminal blocks for the signal input, signal output and alarm output are located on the back panel of the control unit (see *Figure 8)*.

- **Signal Input**

  There are two 4...20 mA signal input channels from the dew-point and temperature sensors to the control unit. Both input channels are isolated by built-in galvanic type I.S. barriers. See Appendices A and D for barrier configuration.

- **Signal Output**

  There are three 4...20 mA linear signal output channels.

  There is one RS485 Modbus RTU digital communication port. Please refer to Appendix B.

- **Alarm Output**

  There are four alarm relays. Alarms 1 and 2 are Form C contacts rated 30 V DC 5A, non-inductive load. Alarms 3 and 4 are Form A contacts rated 30 V DC 5A, non-inductive load. The control actions and set points of these four alarms are user-programmable. A fault alarm with adjustable set points is also included.

1.5 Sampling System

The Liquidew I.S. requires a clean sample of the process liquid that meets the temperature, pressure and flow requirements of the transmitter. The design of the sampling system will depend on the specific application.

The requirements for the sample liquid going into the sensor block are as follows:

- Temperature: 0...+40 °C (+32...+104 °F) (maximum +60 °C (+140 °F))

  NOTE: Sample temperature must be above the moisture saturation temperature of the sample fluid

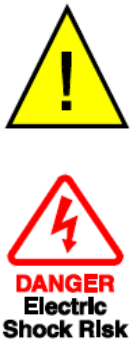
- Maximum pressure: 5 MPa (50 barg / 725 psig)

- Flow rate: 0.1...0.3 l/min (0.026...0.079 GPM)

NOTE: Contact Michell Instruments if you wish to order a specific sampling system.

Please refer to the ES70L Premium Sampling System Instructions if a Michell sampling system has been ordered with the Liquidew I.S.

2 INSTALLATION



It is essential that the installation of the electrical and liquid supplies to this analyzer be undertaken by suitably qualified personnel.

2.1 Unpacking the Analyzer

Unpack carefully as follows:

a. Remove the accessories (if ordered).

b. If no accessories have been ordered the delivery should contain following items:

- Liquidew I.S. multi-channel control unit
- Liquidew I.S. sensor assembly (if a sampling system has been ordered the sensor assembly should already be mounted in the sampling system)
- Certificates of calibration and conformity
- Power lead (only for 85...265 V AC version)

c. Remove the Liquidew I.S. sensor assembly from the box.

d. Lift out the control unit together with its end packing pieces.

e. Remove the end packing pieces and set the control unit down at the site of installation. Save all the packing materials for the purpose of returning the instrument to the manufacturer for service.

If ordered, the ES70L Premium Sampling System will be shipped in a separate box.

2.2 Environmental Requirements

The Liquidew I.S. sensor assembly is intrinsically safe and designed to be installed on-site, indoors or outdoors, directly at the point of measurement within a Hazardous Area. The sensor assembly is ATEX, IECEx, UKCA and QPS certified. To operate correctly, the sensor assembly must be installed within a suitable sampling system (Michell Instruments can supply standard and custom designed sampling systems).

The Liquidew I.S. control unit is NOT designed for use in a Hazardous Area and should only be installed in a safe area. The control unit is intended for indoor installation only and operates within environmental limits of 0...+50 °C (+32...+122 °F) and <90 %rh. The control unit contains built-in isolation barriers permitting connection, direct from the Hazardous Area, of the Liquidew I.S. sensor assembly.

2.3 Mounting

2.3.1 Control Unit Installation

The Liquidew I.S. control unit is contained in a 19" sub-rack case (size 3U). It should be installed in a 19" rack using the mounting holes provided. It must be placed in a position free from any appreciable vibration and shaded from direct sunlight.

NOTE: The materials and construction of the control unit allow for operation in an indoor, clean, non-hazardous only, control room environment.

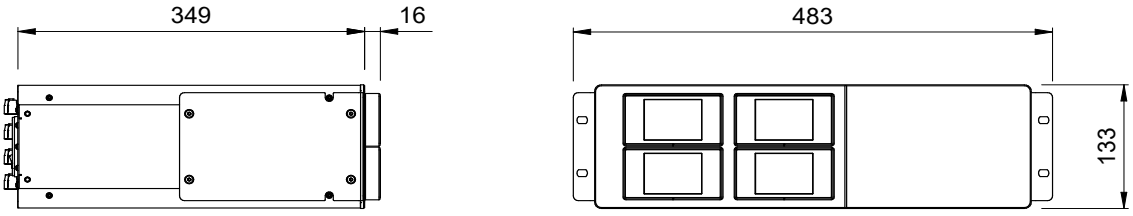


Figure 4 *Dimensions of the Control Unit (in mm)*

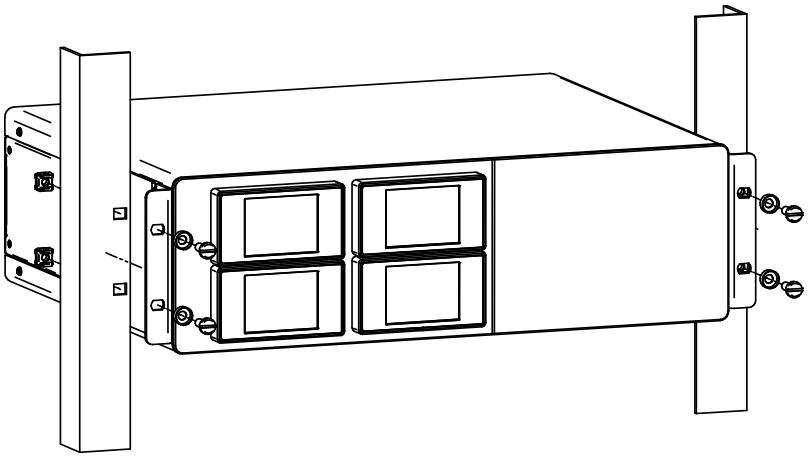


Figure 5 *Rack Mounting Method*

Figure 5 illustrates the general method for fitting a rack mount instrument into a standard 19” rack. To fit the unit proceed as follows:

a. Remove all terminal blocks for the electrical connections.

b. If necessary, remove any covers from the rack cabinet to gain access to the rear and side.

c. Connect up the sensor input, analog and alarm output terminal blocks to the internal rack wiring, ensuring that there is sufficient free cable to permit withdrawal of the instrument from the rack.

d. Slide the instrument into the rack and support its weight while the four fixing screws are inserted.

e. Ensure that the front panel of the instrument is flush and square with the front of the rack and tighten the fixing screws.

f. Insert the terminal blocks into their respective sockets on the rear of the instrument.

g. Connect the power supply cable and switch the **ON**/**OFF** switch to **ON**.

h. Re-fit any covers to the rack as necessary.

NOTE: Allow a minimum clearance depth of 100 mm (4”) behind the instrument housing for cables and vents.

2.3.2 Mounting the Liquidew I.S. Sensor Assembly into the Sampling System

HIGH PRESSURE! High pressure liquids are potentially hazardous. Energy stored in these liquids can be released suddenly and with extreme force. High pressure systems should be assembled and operated only by people who have been trained in proper safety practices.

NOTE: If the analyzer has been ordered with a sampling system, the Liquidew I.S. sensor assembly will have been installed and tested in the factory. In that case disregard the following section and go to Section 2.3.3.

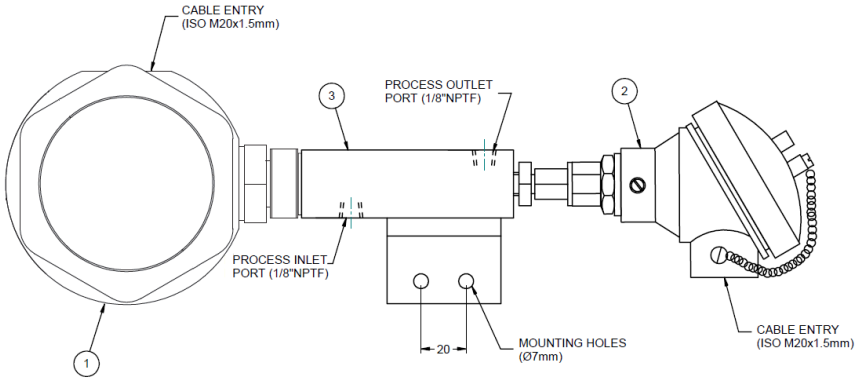


Figure 6 *Liquidew I.S. Sensor Assembly*

The Liquidew I.S. sensor assembly consists of:

1. Dew-point transmitter – Easidew PRO I.S.
2. Temperature transmitter
3. Sensor block

To assemble, proceed as follows:

a. Remove the protective cap on the dew-point transmitter (Easidew PRO I.S.) before installation and retain for future use. Take care to prevent any contamination of the sensor before installation (**do not touch or handle the sintered guard - located on the tip of the Easidew PRO I.S.**).

b. The dew-point transmitter has a 5/8" UNF parallel mounting thread which should be installed directly into the sampling block with the bonding seal provided. **The bonded seal provided should be placed over the transmitter mounting thread before it is screwed into the sampling block.**

c. Finger-tighten the dew-point transmitter by gripping the spanner/wrench flats on the body - NOT the transmitter body cover. Completely tighten using a spanner/wrench until the bonded seal is fully compressed to a minimum torque of 30.5 Nm (22.5 lbf-ft).

d. The temperature transmitter has a 6mm diameter probe. It is suitable for installing into the 1/8" NPT female port at the other end of the sensor block, by using the Swagelok® 6mm to 1/8" NPT, ordering code SS-6M0-1-2, 'bored-through' male connector. Follow the standard Swagelok® installation instructions to make the connection.

To install the complete Liquidew I.S. sensor assembly into the sampling system, follow these steps:

a. Select a location to mount the sensor assembly which has sufficient clearance for connecting and disconnecting the inlet/outlet tubing and cable. The surface should be strong enough to hold the analyzer.

b. Mount the Liquidew I.S. sensor assembly into the sampling system via its two mounting holes.

NOTE: The orientation of the sensor assembly should be vertical with the moisture sensor uppermost to minimize spillage of sample liquid when removing the moisture sensor for calibration maintenance.

c. Sample liquid connections are made via the process inlet and process outlet ports as shown in *Figure 6*. Both the process inlet and outlet ports are 1/8" NPT female ports. Michell recommends using Swagelok® 6mm to 1/8" NPT (ordering code SS-6M0-1-2) or 1/4" to 1/8" NPT (ordering code SS-400-1-2) male connectors to connect these two ports to the 6mm or 1/4" sampling system tubing. Follow standard Swagelok® installation instructions to make the connections.

Although the operation of the Easidew PRO I.S. dew-point transmitter is not sample flow-rate dependant, it is important to ensure that the flow velocity through the sample line to the sampling block is high enough to avoid long time lags in response to changes in moisture at the sample source. Michell recommends that a flow-rate of 0.1...0.3 l/min (0.026...0.079 GPM) (or equivalent at pressure) be set and that the dew-point transmitter is mounted as close as practicably possible to the point of measurement.

2.3.3 Sampling System Installation

HIGH PRESSURE! High pressure liquids are potentially hazardous. Energy stored in these liquids can be released suddenly and with extreme force. High pressure systems should be assembled and operated only by people who have been trained in proper safety practices.

To install the sampling system follow the steps below:

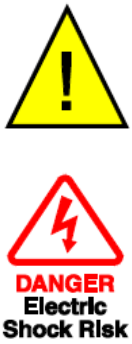
a. Select a location close to the measurement point. The ambient temperature should be within the range of -20...+60 °C (-4...+140 °F) (preferably 0...+40 °C (+32...+104 °F) for optimum performance). Consult Michell Instruments for special heating or cooling options if the temperature is outside of this range.

b. Fasten the sampling system to a vertical surface or instrument stand using the four M8 size mounting holes at each corner.

c. Connect the liquid inlet and outlet tubing to the fittings of the inlet/outlet ports on the sampling system. If the sampling system has been ordered from Michell Instruments, the fitting is a 6mm or 1/4” Swagelok® bulkhead union. Follow standard Swagelok® installation instructions when fitting these unions.

NOTE: The sampling line between the process point and the sampling system should be as short as possible to minimize the lag time.

2.4 Wiring



These tasks are to be undertaken only by suitably qualified personnel. All the connections to the rear panel are electrical connections. Exercise due caution, particularly when connecting to external alarm circuits which could be at high potential.

2.4.1 Overall Wiring Arrangement

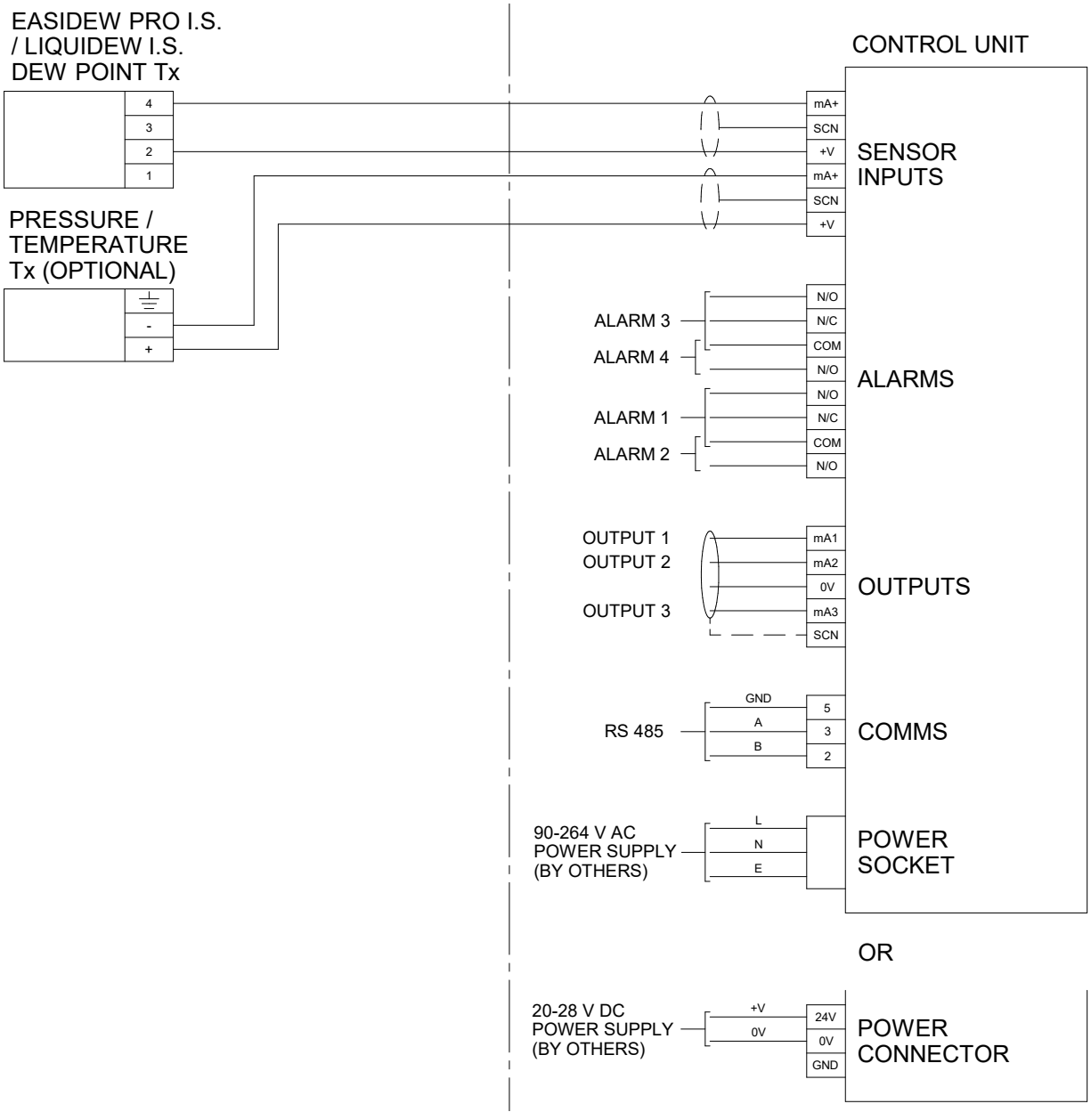


Figure 7 *Overall Wiring Arrangement*

2.4.2 Control Unit Wiring

The electrical connections are located at the rear panel of the control unit. There are spaces for four individual channels.

HAZARDOUS AREA INFORMATION:

The only connections on the control unit which can take cables from hazardous area are the connectors labelled
I.S. SENSOR INPUTS.

ALL OTHER CONNECTORS MUST NOT BE CONNECTED TO CABLES FROM HAZARDOUS AREA

NOTE: Make sure channels are connected correctly.

Connections for each channel are identical.

The following text will only refer to one channel.

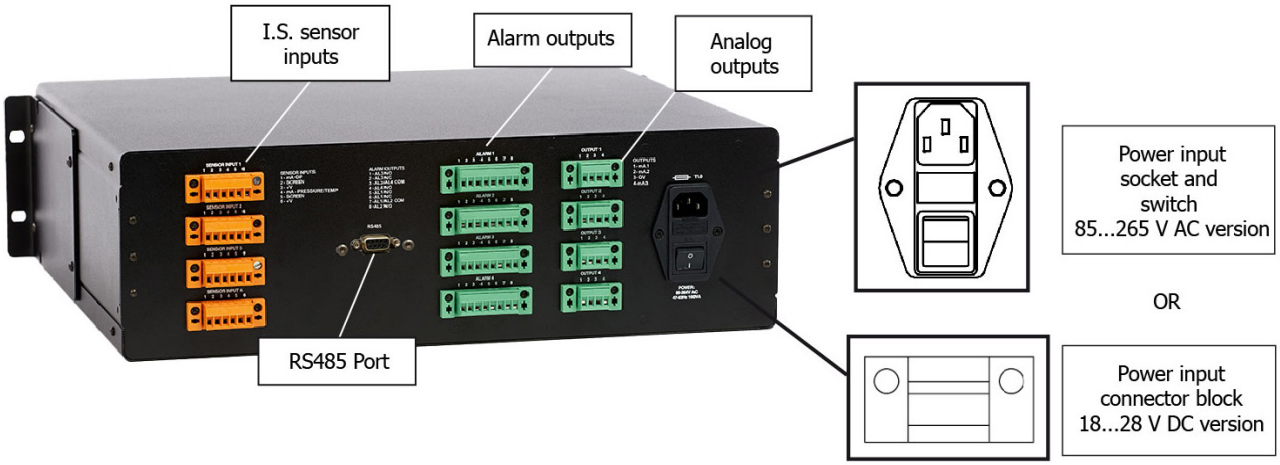


Figure 8 *Control Unit Electrical Connections*

2.4.2.1 Power Supply Input Connection

85...265 V AC

The AC power supply connection is a push fit socket labelled **POWER INPUT** as shown below.

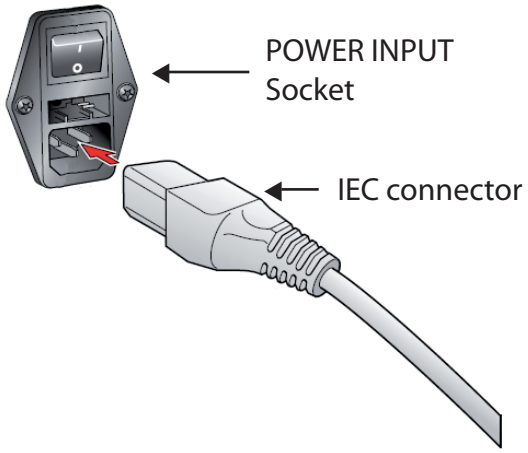


Figure 9 *POWER INPUT Socket*

The method of connection is as follows:

a. Turn off the AC power. Ensure that both ends of the power cable are potential free, i.e. not connected to an AC power supply.

b. Check that the **ON/OFF** switch is switched to **OFF**.

c. Push the IEC connector firmly into the **POWER INPUT** socket.

d. Connect the free end of the power cable to a suitable AC power supply source (voltage range 85...265 V AC, 47/63 Hz) and switch on the AC supply. The instrument may then be switched on, as required, by pressing the **ON** switch.

20...28 V DC

If a DC power supply version is ordered it will come with a 3-way push fit connector block labelled **POWER INPUT** as shown below:

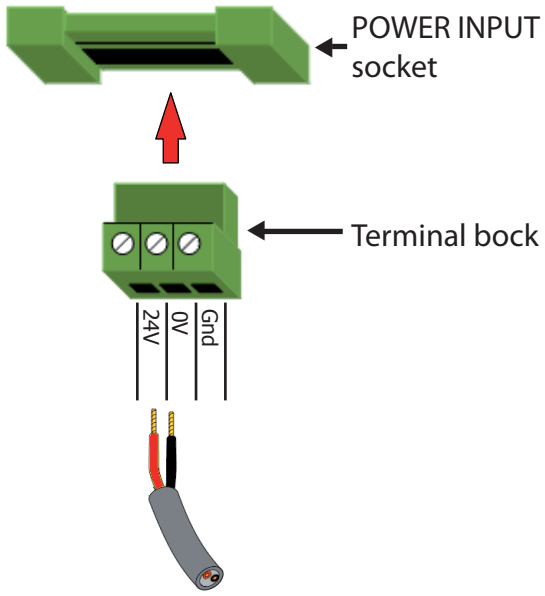


Figure 10 *POWER INPUT Connector Block*

The method of connection is as follows:

a. Turn off the power. Ensure that both ends of the power cable are potential free i.e., not connected to a power supply.

b. Remove the terminal block from the **POWER INPUT** socket.

c. Strip back the wires of the power cable, exposing approximately 6mm (0.2") - the use of crimps/wire ferrules is recommended.

d. Insert the +24 V DC lead into the **24 V** terminal way on the terminal block and tighten the screw.

e. Insert the 0V lead into the **0 V** terminal way on the terminal block and tighten the screw.

f. Check that the wiring has been completed correctly.

g. Push the terminal block firmly back into the **POWER INPUT** socket.

NOTE: There is no power switch for the DC power supply version; the analyzer will be turned on automatically as soon as power is supplied. Connect the free end of the power cable to a suitable DC power supply source (voltage range 20...28 V DC). The instrument may then be switched on, as required, by the power switch at the source.

2.4.2.2 Sensor Signal Input Connection

HAZARDOUS AREA INFORMATION

Cables from transmitters mounted in hazardous areas can be connected directly to the SENSOR INPUTS connector block. There are built-in Galvanic I.S. barriers for all connections made to this connection block. See Appendices A and D for barrier configuration.

Refer to ATEX/UKCA/QPS/IECEx certificates for the dew-point and temperature transmitters' connection cable requirements which stipulate maximum permissible mutual capacitance and inductance to resistance ratio.

All wiring procedures should be in accordance with local electrical codes.

Two input ports are provided for signals from the dew-point transmitter and the temperature transmitter respectively. They are connected via a single 6-way push fit connector block labelled **SENSOR INPUTS** as shown below.

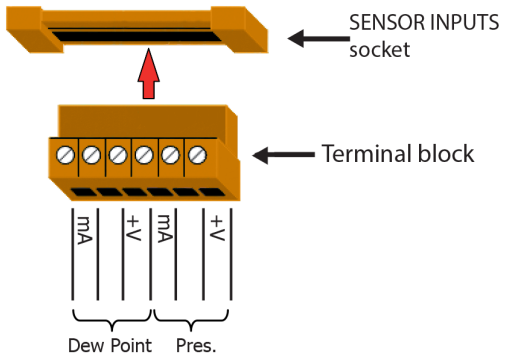


Figure 11 *SENSOR INPUTS Connector Block*

The method of connection is as follows:

a. Remove the terminal block from the **SENSOR INPUTS** socket.

b. Strip back the wires of the dew-point transmitter signal cable, exposing approximately 6mm (0.2")-the use of crimps/wire ferrules is recommended.

c. Insert the +ve (4...20 mA) wire into the **Dew Point** → **+V** terminal way on the terminal block and tighten the screw.

d. Insert the -ve (4...20 mA) wire into **Dew Point** → **mA** terminal way on the terminal block and tighten the screw.

e. Strip back the wires of the temperature transmitter signal cable, exposing approximately 6 mm (0.2") – the use of crimps/wire ferrules is recommended.

f. Insert the +ve (4...20 mA) wire into the **Temp./Press.** → **+V** terminal way on the terminal block and tighten the screw.

g. Insert the -ve (4...20 mA) wire into the **Temp./Press.** → **mA** terminal way on the terminal block and tighten the screw.

h. Check that the wiring has been completed correctly.

i. Push the terminal block firmly back into the **SENSOR INPUTS** socket.

2.4.2.3 Analog Output Connection

Three analog output ports are provided for moisture content signal and temperature signal respectively. They are connected via a single 5-way push-fit connector block labelled **OUTPUT** as explained below.

Terminal Block Pin	Output
1	mA1
2	mA2
3	0V
4	mA3
5	Screen

The method of connection is as follows:

a. Remove the terminal block from the **OUTPUT** socket.

b. Strip back the wires of the moisture content signal cable, exposing approximately 6 mm (0.2") – the use of crimps/wire ferrules is recommended.

c. Insert the +ve (4...20 mA) wire into the **mA1** terminal way on the terminal block and tighten the screw.

d. Insert the -ve (4...20 mA) wire into the **0V** terminal way on the terminal block and tighten the screw.

e. Strip back the wires of the temperature signal cable, exposing approximately 6 mm (0.2") – the use of crimps/wire ferrules is recommended.

f. Insert the +ve (4...20 mA) wire into the **mA2** terminal way on the terminal block and tighten the screw.

g. Insert the -ve (4...20 mA) wire into the **0V** terminal way on the terminal block and tighten the screw.

If the third output is required:

h. Insert the +ve (4...20 mA) wire into the **mA3** terminal way on the terminal block and tighten the screw.

i. Insert the -ve (4...20 mA) wire into the **0V** terminal way on the terminal block and tighten the screw.

j. Check that the wiring has been completed correctly.

k. Push the terminal block firmly back into the **OUTPUT** socket.

2.4.2.4 Alarm Output Connection

Four alarm output ports are provided and are connected to the instrument via a single 8-way push fit connector block labelled **ALARMS** as shown below.

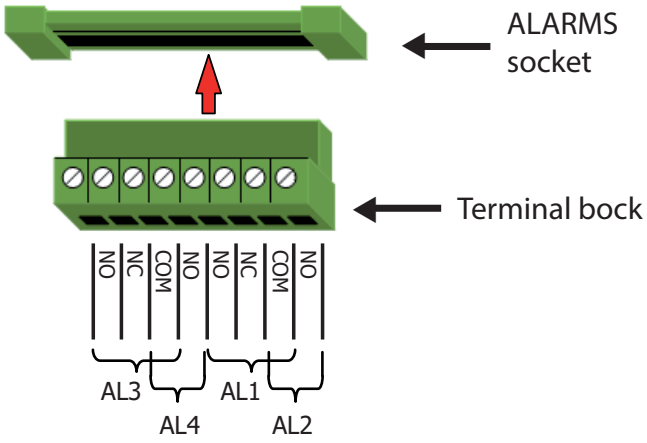
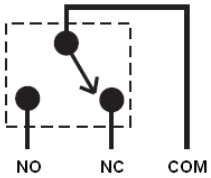


Figure 12 *ALARM Connector Block*

Alarm 1 (connection labelled as AL1) and Alarm 2 (connection labelled as AL2) are Form C (single pole, double throw) relays.

The method of connection is as follows:



a. Remove the terminal block from the **ALARMS** socket.

b. Strip back the wires of the Alarm 1 cable, exposing approximately 6mm (0.2") - the use of crimps/wire ferrules is recommended.

c. Insert the **N/O** connection lead into the **AL1** → **NO** terminal way on the terminal block and tighten the screw.

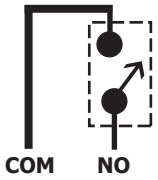
d. Insert the **N/C** connection lead into the **AL1** → **NC** terminal way on the terminal block and tighten the screw.

e. Insert the common lead into the **AL1** → **COM** terminal way on the terminal block and tighten the screw.

f. Repeat operations b. to e. for connecting the Alarm 2 cable to the AL2 terminals.

Alarm 3 (connection labelled as AL3) and Alarm 4 (connection labelled as AL4) are Form A (single pole, single throw, normally open) relays.

The method of connection is as follows:



a. Strip back the wires of the Alarm 3 cable, exposing approximately 6mm (0.2”) - the use of crimps/wire ferrules is recommended.

b. Insert the **N/O** connection lead into the **AL3** → **NO** terminal way on the terminal block and tighten the screw.

c. Insert the common lead into the **AL3** → **COM** terminal way on the terminal block and tighten the screw.

d. Repeat operations a. to c. for connecting the Alarm 4 cable to the AL4 terminals.

e. Check that the wiring has been completed correctly.

f. Push the terminal block firmly back into the **ALARMS** socket.

2.4.2.5 RS485 Port Connection

The RS485 connection is a push-fit 9-pin socket, as shown in *Figure 8*.

The method of connection is as follows:

Pin Number	Function
2	B
3	A
5	0 V

a. Check the orientation of the RS485 connector and gently push it into the socket.

b. Tighten the two screws on the connector.

2.4.3 Sensor Assembly Wiring

NOTE: If the analyzer has been ordered with a sampling system, the Liquidew I.S. sensor assembly will be factory-wired to the junction box. In that case disregard the following instructions and go to Section 3.

2.4.3.1 Dew-point Transmitter Wiring

HAZARDOUS AREA INFORMATION

The dew-point transmitter (Easidew PRO I.S.) is certified intrinsically safe for use in hazardous areas.

Before using the Easidew PRO I.S. in any hazardous environment ensure that personnel are completely familiar with the above standards relating to the certification of this instrument and also with the further information relating to intrinsically safe apparatus to be found in standard EN 60079-14:2014 or equivalent, and up-to-date codes of practice in the country of installation.

Installation of the Easidew PRO I.S. MUST be as per system drawing in order to comply with the intrinsic safety regulations.

Refer to ATEX/UKCA/QPS/IECEx certificates for the dew-point and temperature transmitters' connection cable requirements which stipulate maximum permissible mutual capacitance and inductance to resistance ratio.

Preparation of the Sensor Cable

In order to comply with hazardous area certification of the product it is essential that the crimps/wire ferrules supplied must be attached on to any cable installed into the connector.

a. As shown in *Figure 13* below, the crimps/wire ferrules should be applied so that there is no possibility of a conductor strand of a core becoming free.

When the crimp/wire ferrules are applied they should have a minimum of two positions of crimping. After the crimp/wire ferrules are applied they should be trimmed to a length of 5 mm (0.2") (see *Figure 14).*

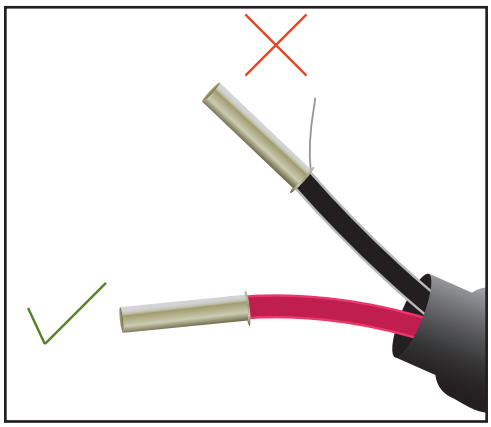


Figure 13 *Crimped Wires*

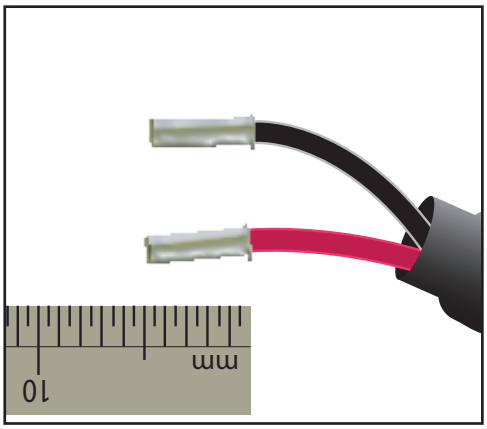


Figure 14 *Cut to 5 mm*

b. Cable connection to the dew-point transmitter is made via the terminal block (4) (see *Figure 15)*. Remove the terminal housing lid (2) to access.

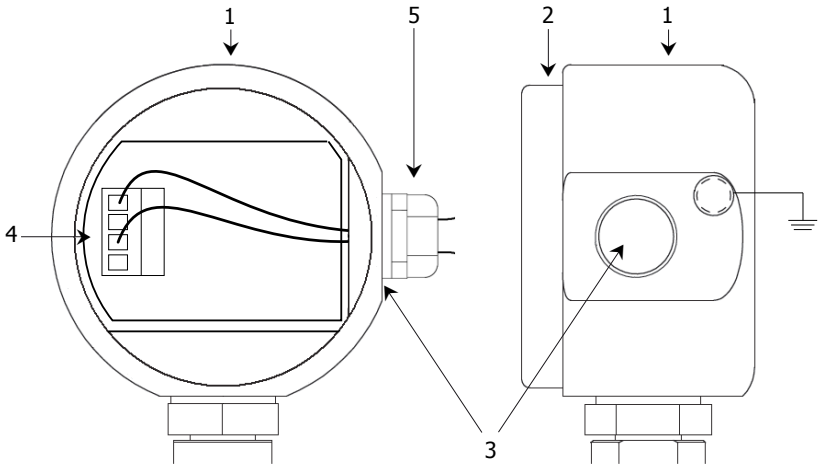


Figure 15 *Dew-Point Transmitter Housing*

c. Ensure that the outer diameter of the selected cable is matched to an EExe M20 cable gland (5). Unscrew the cable gland (5) and slide the cable through the cable gland (5) and into the terminal housing (1) through the cable entry (3).

d. Remove the terminal block (4) from the PCB for easier operation. Connect the signal cable leads with the crimps/wire ferrules to the screw terminals on the terminal block (4) in accordance with the following pin-assignment drawing.

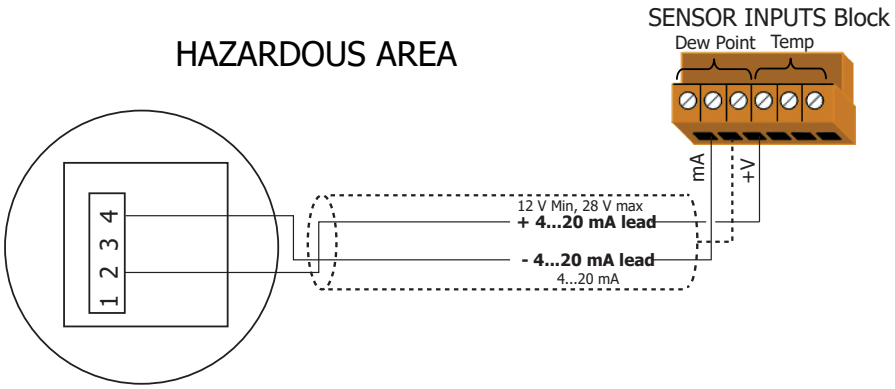


Figure 16 *Dew-Point Transmitter Pin Assignment Drawing*

Always connect the 4...20 mA return signal to a suitable load (in this case, back into the control unit) before the power is applied. Without this connection the transmitter may be damaged if allowed to operate for prolonged periods. The maximum load is 500 Ω at 24 V or 250 Ω at 12 V.

When the crimps/wire ferrules are installed into the connector terminal block ensure that they are inserted completely. When all wire connections are made, ensure that there is a minimum clearance distance of 2mm (0.008”) between each terminal.

e. Press the terminal block (4) back into its socket firmly.

f. Tighten the cable gland (5) around the cable. Ensure that the sealing is not damaged and that the cable gland and seals are assembled correctly in order to ensure ingress protection.

g. Install and tighten the terminal housing lid (2).

2.4.3.2 Temperature Transmitter Wiring

HAZARDOUS AREA INFORMATION

The temperature transmitter is certified intrinsically safe for use in hazardous areas.

Before using the temperature transmitter in any hazardous environment, ensure that personnel are completely familiar with the above standards relating to the certification of this instrument and also with the intrinsically safe apparatus information in EN 60079-14:2014 or equivalent codes of practice in the country of installation.

If the temperature transmitter is not ordered together with the analyzer, it is the user's responsibility to make sure that the temperature transmitter is compatible with the I.S. barrier in the control unit. See Appendices A and D for barrier configuration.

Refer to ATEX/UKCA/QPS/IECEx certificates for the dew-point and temperature transmitters' connection cable requirements which stipulate maximum permissible mutual capacitance and inductance to resistance ratio.

a. Cable connection to the temperature transmitter is made via the terminal block (4) accessed by removing the terminal housing lid (2) *(Figure 17)*.

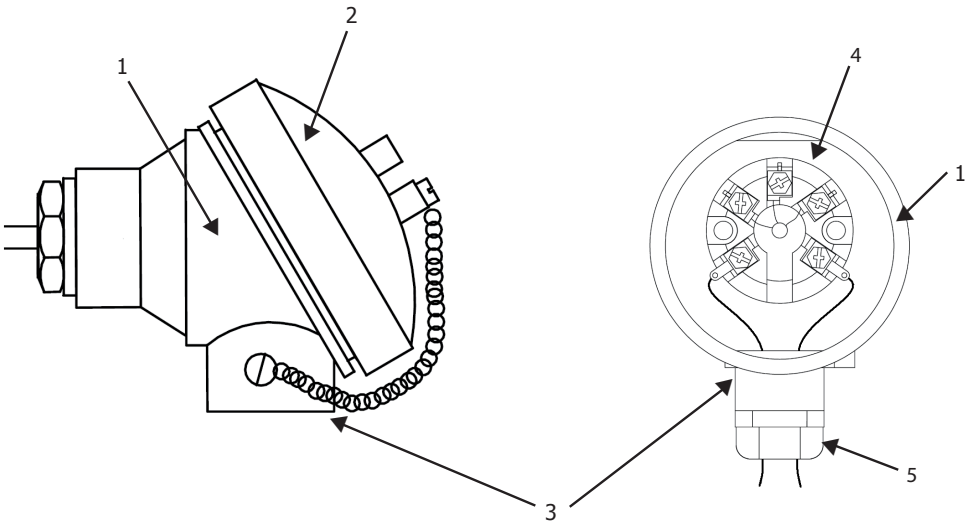


Figure 17 *Temperature Transmitter Housing Example*

b. Ensure that the outer diameter of the selected cable is matched to an EExe M20 cable gland (5). Unscrew the cable gland (5) and slide the cable through the cable gland (5) and into the terminal housing (1) through the cable entry (3).

c. Connect the signal cable leads to the terminals on the terminal block (4) in accordance with the following pin-assignment drawing. Pin designations are marked adjacent to each pin.

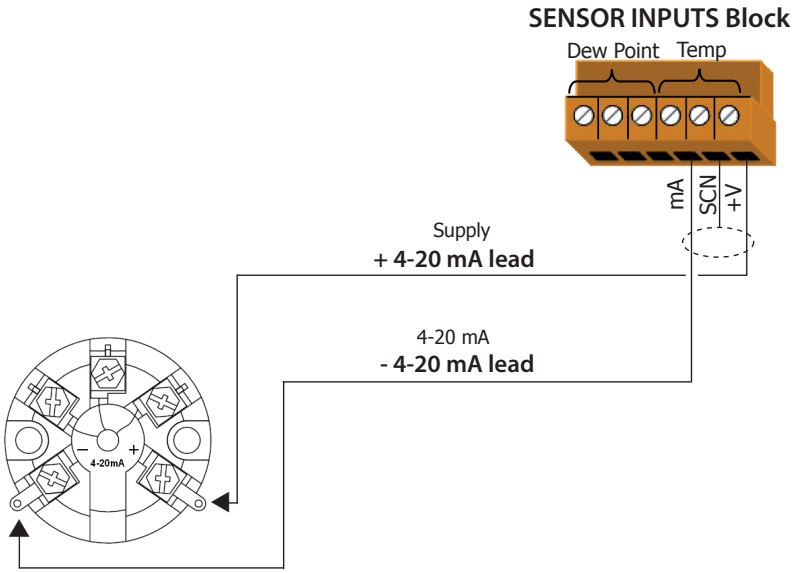


Figure 18 *Temperature Transmitter Pin Assignment Drawing Example*

d. Tighten the cable gland (5) around the cable. Ensure that the sealing is not damaged and that the cable gland and seals are assembled correctly in order to ensure ingress protection.

e. Install and tighten the terminal housing lid (2).

3 OPERATION

3.1 Preparation

Before applying power and beginning sample flow ensure that the system has been properly installed following the instructions in Section 2 and that all sample connections are tight and leak free. Check that the wiring has been correctly completed.

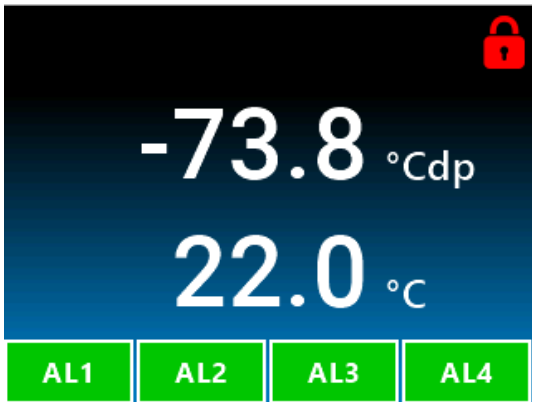
Ensure that personnel are familiar with Sections 1, 2 and 3 of this manual in which the equipment controls, indicators, elements of the display and overall menu structure are described, before starting operation.

Prior to operation, the instrument must be connected to the correct electrical power supply, sensor signal input, relevant analog and alarm outputs as described in Section 2.

On delivery, the instrument will have been set-up with a standard set of default parameters defining the operation of the analyzer. These parameters can be changed as required by means of the Set-up menus.

3.2 Start-Up

3.2.1 Main Display

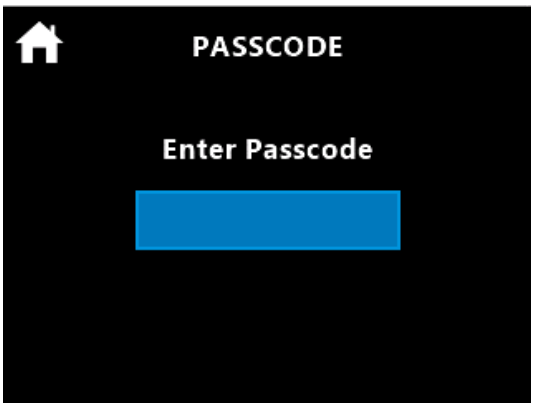


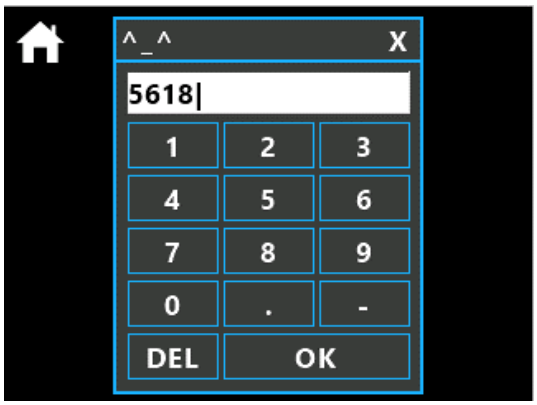
The main display shows a humidity and a temperature value, the status of four alarms and a display locked/unlocked symbol.

The upper value will always represent a humidity and the lower the temperature value from a temperature transmitter.

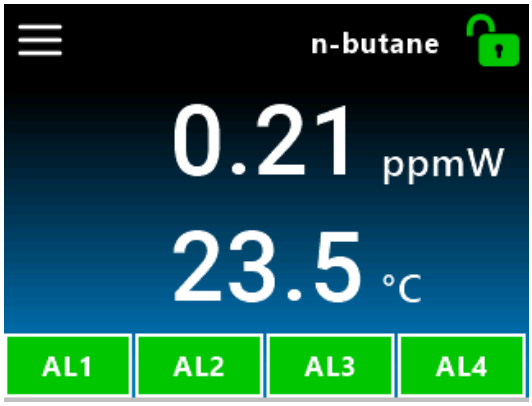
To change the displayed humidity value

Press the **LOCK** icon and enter the passcode (5618) using the keypad.



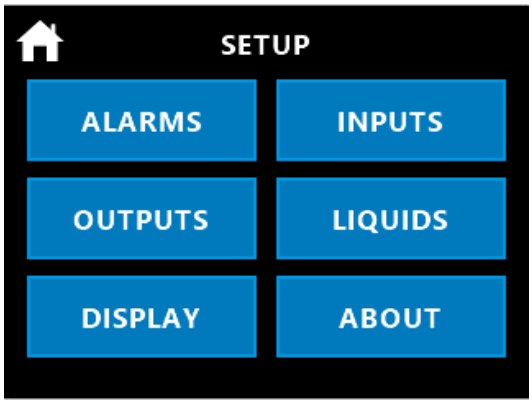


Then press the upper value to toggle between dew point and moisture concentration in ppm_W. The selected liquid will be displayed next to the padlock, as shown below (e.g. n-butane).



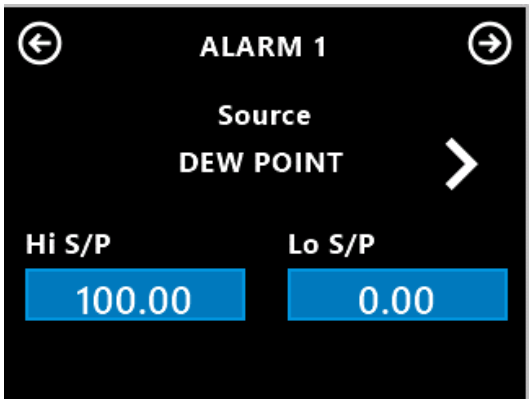
3.2.2 Setup Menu

To enter the Setup Menu, press the **LOCK** icon and enter the password as described above.



Alarm Menu

The alarm menu sets the Source and High (Hi) and Low (Lo) set points for all 4 alarms, whereby the Source can be set, selected from Dew Point, Temperature, Moisture (ppm_W) and FAULT whereby the units for the dew point and temperature are set in the Display menu.

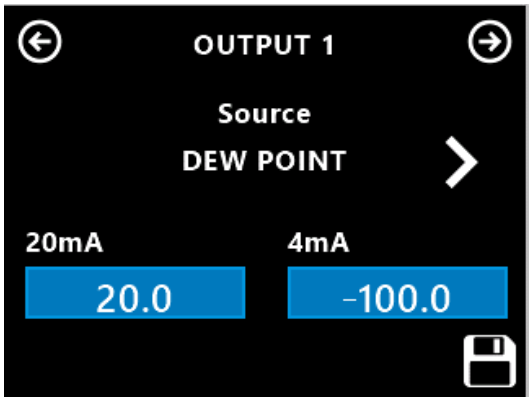


Defaults:

- AL1 = Moisture (low = 0.0, high = 100.0)
- AL2 = Moisture (low = 0.0, high = 10.0)
- AL3 = FAULT (low = high = 0.0)
- AL4 = FAULT (low = high = 0.0)

Output Menu

This menu sets the range and the parameter (Source) of outputs 1 to 3. Each output can be set for either Dew Point, Temperature or Moisture (ppm_W), whereby the units for Dew Point and Temperature are set in the Display Menu.



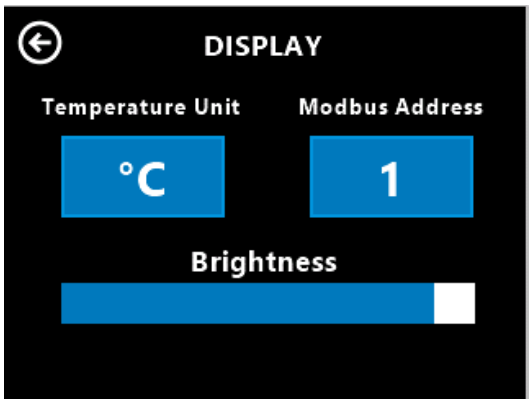
Defaults:

- OP1 = Dp (-100.0...+20.0)
- OP2 = Temperature (0.0...+50.0)
- OP3 = Moisture (0.0...+100.0)

Display Menu

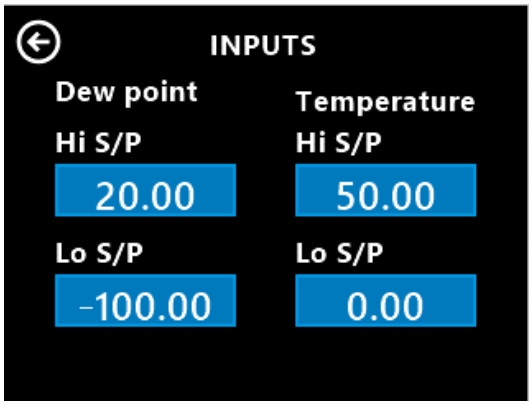
The display menu is used to:

- Select the units for Dew Point and Temperature (°C or °F). Default = °C
- Set the Modbus address. Default = 1



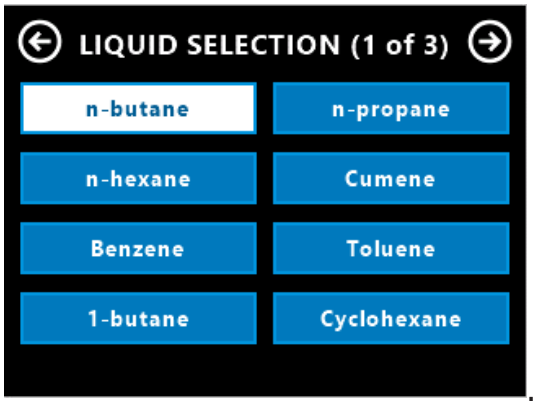
Inputs Menu

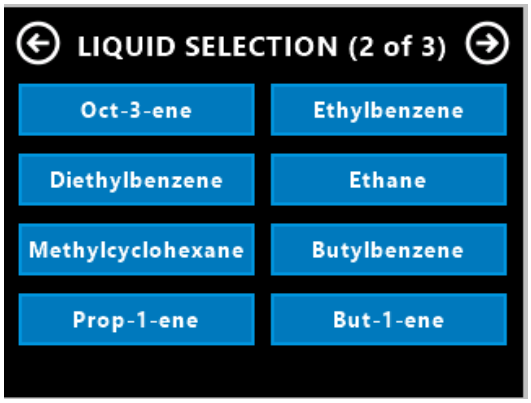
Used to change to range of the Dew Point and Temperature input in the units set in the display menu.



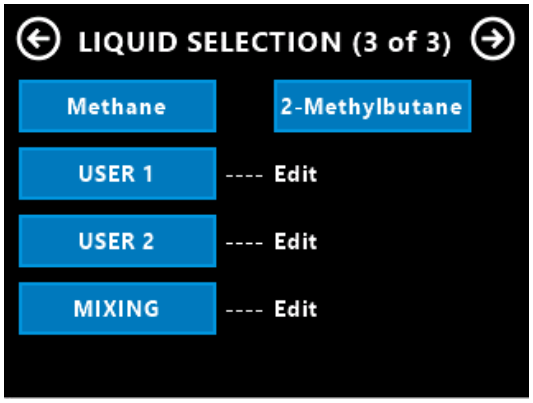
Liquids Menu

These menu pages allow the user to select the required liquid for the ppm_W calculation.

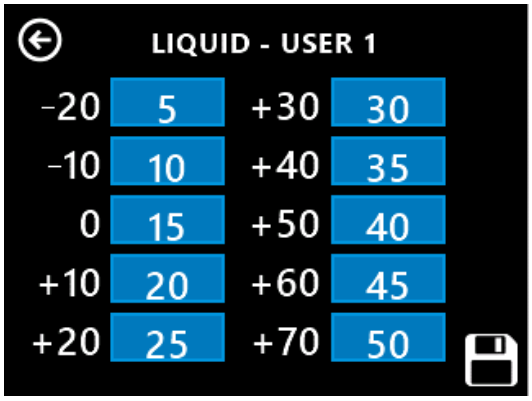




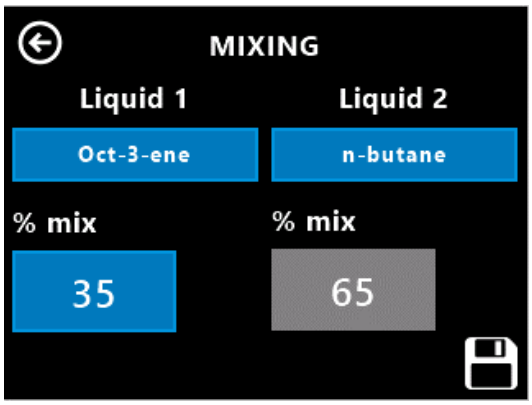
Page 3 allows the user to edit the two user pages:



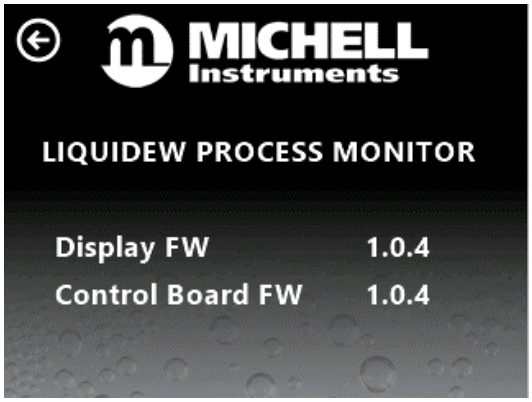
whereby the Cs values for a particular liquid can be inputted.



The MIXING page allows the user to mix any of the predetermined liquids or the User settable liquids as a ratio.



About



3.3 Menu Structure

The Liquidew I.S. main menu has a two level menu structure. There are three sub-menus - **LIQUID SETUP, OUTPUT SETUP** and **FAULT SETUP**. The **ALARM SETTINGS** are not in the main menu and are accessed separately. These are described in detail in following sections. See *Figure 19* for the complete menu structure:

NOTE: represents the Main Reading Page

Select Alarms 1 to 4

Pressure > Dp > ppmV(I) > LBMMSCF > mg/M3 > ppmV(N) > Fault >

Save Setting for exiting menu or selecting another alarm

Select Outputs 1 to 3

Pressure > Dp > ppmV(I) > LBMMSCF > mg/M3 > ppmV(N) >

Save Setting before exiting menu or selecting another output

Temperature Unit (C or F) & Pressure Unit (Psig or Barg) set the units for both Inputs and Outputs.

ISO & IGT selection for Natural Gas Calculations

Save Setting before exiting menu

Sets the 4-20mA range for the Dew point & Pressure Transmitters, which are in the units selected in the display menu above.

Save Setting before exiting menu

Transducer > Fixed Value >

Fixed Pressure Value in the units selected in the Display menu; used for operation without a pressure transducer to calculate moisture concentration values.

Save Setting before exiting menu

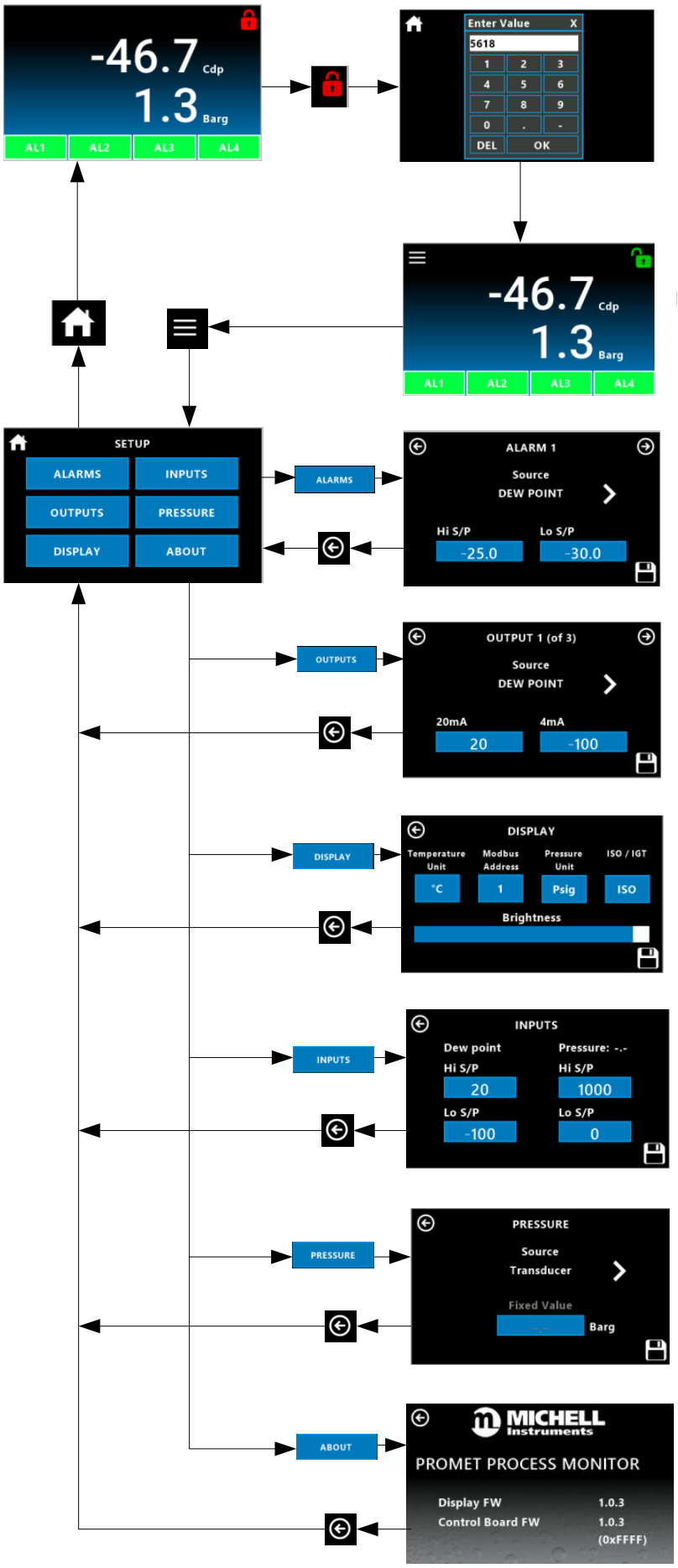


Figure 19 *Menu Map*

Appendix A

Technical Specifications

Appendix A Technical Specifications

Sensors		
Sensor Technology		Michell Ceramic Metal-Oxide Moisture Sensor
Sensor Version		Easidew PRO I.S.
Measurement Range		0.001...1000 ppm_W Higher range on request Actual range dependent on solubility of sample fluid
Calibration Range		-100...+20 °Cdp (-148...+68 °Fdp)
Accuracy	Dew point:	±1 °C from -59.9 to +20 °Cdp (±1.8 °F from -75.9 to +68 °Fdp) ±2 °C from -60 to -100 °Cdp (±3.6 °F from -76 to -148 °Fdp)
	Moisture content:	±10% of reading ±20% of reading
Resolution		0.1 °C from +20 to -100 °Cdp (+68...-148 °Fdp)
Temperature Measurement		Pt100 with 4...20 mA transmitter
Temperature Measurement Range		-20...+70 °C (-4...+158 °F)
Temperature Measurement Accuracy		Accuracy ±0.2 °C
Analysis Pressure		Up to 5 MPa (50 barg / 725 psig)
Analysis Temperature		0...+50 °C (32...+122 °F)
Sample Flow Rate		Minimum 0.01 l/min (0.003 GPM), Maximum 10 l/min (2.64 GPM)) 0.1...0.3 l/min (0.026...0.079 GPM) recommended
Calibration		Traceable to British (NPL) and American (NIST) National Humidity Standards
Control Unit		
Display		2.8” color touch screen LCD, displaying moisture content / dew point or O_2 and analysis temperature
Analog Output		Three 4...20 mA (max. load 500 Ω) user-definable outputs
Digital Output		RS485 Modbus RTU
Display Mode		Moisture content (ppm_W) Dew point (°C or °F) Temperature (°C or °F) % or ppm_V O_2
Display Resolution		0.1 °Cdp, 0.1 °Fdp, 0.01 ppm_W, 0.1 °C temp, 0.01 % / 0.5 ppm_V O_2
Alarms		Four alarm relays. Control action and set point are user programmable Two Form C contacts rated 30 V DC, 5A Non-inductive load Two Form A contacts rated 30 V DC, 5A Non-inductive load
I.S. Barriers		Galvanic isolation type, integrated to Control Unit KFD0-CS-Ex1.50P (1 Channel) – PRO I.S. only KFD0-CS-Ex2.50P (2 Channel) – PRO I.S. and Transmitter Refer to Appendix D
Power Supply		85...265 V AC 47/63Hz or 20...28 V DC 30 V A maximum power consumption

Enclosure	19” sub rack unit Dimensions: 132 x 483 x 375mm (5 x 19 x 14.75”) (h x w x d) (100mm (4”) minimum rear clearance depth for cables and vents)
Operating Environment	Indoor, safe area, 0...+50 °C (+32...+122 °F), < 90 %rh
Premium Sampling Systems	
Refer to relevant ES70L data sheet (97550)	
Hazardous Area Certification	
Certification Codes	See Appendix D

A.1 Dimensional Drawings

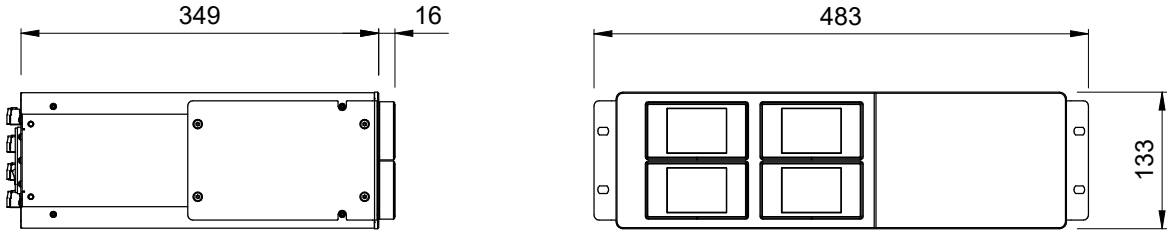


Figure 20 *Dimensional Drawings (in mm)*

Appendix B

Serial Communications

Appendix B Serial Communications

To communicate with the monitor:

- Connect to the serial port using the wiring defined below.
- Set the address of the monitor using the front panel.
- Set the desired communication protocol (ASCII or Modbus RTU) via the front panel or over the serial interface.
- Determine the register number of the parameter to be read.
- Send the correct command to the monitor and decode the response.

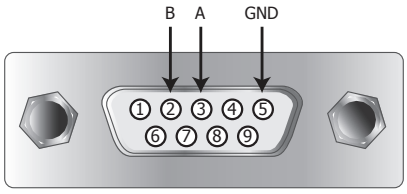
RS485 Wiring

The Liquidew I.S. monitor uses a 2-wire RS485 connection.

Pin Name	Liquidew DB9 Pin
A	3
B	2
GND	5

Pin numbers in the manual refer to standard pins on the DB9 D-Sub connector on the rear panel of the MCU:

Male DB9 Pinout (Liquidew I.S. Monitor on MCU Panel)



It will be necessary to match up the A/B (Differential data pair) and GND (0 V) pins with the wiring of your own third party adaptor.

Process Monitor Register Map:

Address	Function Description	Read/ Write	Default Value	Register Configuration	Notes
0	Modbus Address	R/W		A1	1...32
1	Alarm Configuration	R/W		D	
2	mA output Configuration	R/W		E	
3	System Configuration	R/W		C	
4	O/p 1 low s/p hi word	R/W		FLOAT	
5	O/p 1 low s/p lo word	R/W		FLOAT	
6	O/p 1 high s/p hi word	R/W		FLOAT	
7	O/p 1 high s/p lo word	R/W		FLOAT	
8	O/p 2 low s/p hi word	R/W		FLOAT	
9	O/p 2 low s/p lo word	R/W		FLOAT	
10	O/p 2 high s/p hi word	R/W		FLOAT	
11	O/p 2 high s/p lo word	R/W		FLOAT	
12	O/p 3 low s/p hi word	R/W		FLOAT	
13	O/p 3 low s/p lo word	R/W		FLOAT	
14	O/p 3 high s/p hi word	R/W		FLOAT	
15	O/p 3 high s/p lo word	R/W		FLOAT	
16	I/p 1 min. hi word	R/W		FLOAT	
17	I/p 1 min. lo word	R/W		FLOAT	
18	I/p 1 max. hi word	R/W		FLOAT	
19	I/p 1 max. lo word	R/W		FLOAT	
20	I/p 2 min. hi word (n/a for Oxygen only)	R/W		FLOAT	
21	I/p 2 min. lo word (n/a for Oxygen only)	R/W		FLOAT	
22	I/p 2 max. hi word (n/a for Oxygen only)	R/W		FLOAT	
23	I/p 2 max. lo word (n/a for Oxygen only)	R/W		FLOAT	
24	Fixed pressure input value hi word (n/a for O_2 only)	R/W		FLOAT	
25	Fixed pressure input value lo word (n/a for O_2 only)	R/W		FLOAT	

Address	Function Description	Read/ Write	Default Value	Register Configuration	Notes
26	Liquid Selection	R/W		G	
27	Liquid Mix Ratio (% of Mixed Liquid 1)	R/W		A1	
28	User Cs Table 1, Cs Value at -20 °C	R/W		A1	
29	User Cs Table 1, Cs Value at -10 °C	R/W		A1	
30	User Cs Table 1, Cs Value at 0 °C	R/W		A1	
31	User Cs Table 1, Cs Value at 10 °C	R/W		A1	
32	User Cs Table 1, Cs Value at 20 °C	R/W		A1	
33	User Cs Table 1, Cs Value at 30 °C	R/W		A1	
34	User Cs Table 1, Cs Value at 40 °C	R/W		A1	
35	User Cs Table 1, Cs Value at 50 °C	R/W		A1	
36	User Cs Table 1, Cs Value at 60 °C	R/W		A1	
37	User Cs Table 1, Cs Value at 70 °C	R/W		A1	
38	User Cs Table 2, Cs Value at -20 °C	R/W		A1	
39	User Cs Table 2, Cs Value at -10 °C	R/W		A1	
40	User Cs Table 2, Cs Value at 0 °C	R/W		A1	
41	User Cs Table 2, Cs Value at 10 °C	R/W		A1	
42	User Cs Table 2, Cs Value at 20 °C	R/W		A1	
43	User Cs Table 2, Cs Value at 30 °C	R/W		A1	
44	User Cs Table 2, Cs Value at 40 °C	R/W		A1	
45	User Cs Table 2, Cs Value at 50 °C	R/W		A1	
46	User Cs Table 2, Cs Value at 60 °C	R/W		A1	
47	User Cs Table 2, Cs Value at 70 °C	R/W		A1	
48	Dew point (O_2) Channel – ADC Val 4mA	R/W		A1	0...4095
49	Dew point (O_2) Channel – ADC Val 20mA	R/W		A1	0...4095
50	Pressure (P) /Tempr (L) Channel – ADC Val 4mA (n/a for O_2 only)	R/W		A1	0...4095
51	Pressure (P) /Tempr (L) Channel – ADC Val 20mA (n/a for O_2 only)	R/W		A1	0...4095
53	Analog Output 1 – DAC 4 mA Value	R/W		A1	0...65535

Address	Function Description	Read/ Write	Default Value	Register Configuration	Notes
54	Analog Output 1 – DAC 20 mA Value	R/W		A1	0...65535
55	Analog Output 2 – DAC 4 mA Value	R/W		A1	0...65535
56	Analog Output 2 – DAC 20 mA Value	R/W		A1	0...65535
57	Analog Output 3 – DAC 4 mA Value	R/W		A1	0...65535
58	Analog Output 3 – DAC 20 mA Value	R/W		A1	0...65535
59	Display brightness	R/W		A1	0...100
60	Alarm 1 Low S/P Hi Word	R/W		FLOAT	
61	Alarm 1 Low S/P Lo Word	R/W		FLOAT	
62	Alarm 1 High S/P Hi Word	R/W		FLOAT	
63	Alarm 1 High S/P Lo Word	R/W		FLOAT	
64	Alarm 2 Low S/P Hi Word	R/W		FLOAT	
65	Alarm 2 Low S/P Lo Word	R/W		FLOAT	
66	Alarm 2 High S/P Hi Word	R/W		FLOAT	
67	Alarm 2 High S/P Lo Word	R/W		FLOAT	
68	Alarm 3 Low S/P Hi Word	R/W		FLOAT	
69	Alarm 3 Low S/P Lo Word	R/W		FLOAT	
70	Alarm 3 High S/P Hi Word	R/W		FLOAT	
71	Alarm 3 High S/P Lo Word	R/W		FLOAT	
72	Alarm 4 Low S/P Hi Word	R/W		FLOAT	
73	Alarm 4 Low S/P Lo Word	R/W		FLOAT	
74	Alarm 4 High S/P Hi Word	R/W		FLOAT	
75	Alarm 4 High S/P Lo Word	R/W		FLOAT	
76	Virgin PCB	R	12345	A1	
77	Command register	W		H	
78	Number of alarms (not used)	R/W		A1	
80	Dew point in set unit (or O_2 for O_2 only)	R		B2	-3276.8 ...3276.7
81	Pressure (P) / Temperature (L) in set unit (n/a for O_2 only)	R		B2	-3276.8 ...3276.7
82	Moisture – ppm_W – Hi Word	R		IEEE754	

Address	Function Description	Read/ Write	Default Value	Register Configuration	Notes
83	Moisture – ppm_W – Lo Word	R		IEEE754	
84	Moisture – ppm_V (Ideal) – Hi Word	R		IEEE754	
85	Moisture – ppm_V (Ideal) – Lo Word	R		IEEE754	
86	Moisture – ppm_V (Nat Gas) – Hi Word	R		IEEE754	
87	Moisture – ppm_V (Nat Gas) – Lo Word	R		IEEE754	
88	Moisture – mg/m^3 (Nat Gas) – Hi Word	R		IEEE754	
89	Moisture – mg/m^3 (Nat Gas) – Lo Word	R		IEEE754	
90	Moisture – lb/mmscf (Nat Gas) – Hi Word	R		IEEE754	
91	Moisture – lb/mmscf (Nat Gas) – Lo Word	R		IEEE754	
92	Status Register	R		F	
93	Firmware version (Main Board)	R		A3	
94	Input CH1 (Dp or O_2) Live ADC Count	R		A1	
95	Input CH2 (Pressr/Tempr) Live ADC Count (n/a for O_2 only)	R		A1	
96	Product I.D.	R	Promet 52822 Liquidew 52823 Oxygen 52830	A1	
97	Password (volatile)	R/W	4792	A1	
101	Dew point (or O_2) in set unit as float – Hi Word	R		IEEE754	
102	Dew point (or O_2) in set unit as float – Lo Word	R		IEEE754	
103	Pressure / Temp. in set unit as float – Hi Word (n/a for O_2 only)	R		IEEE754	
104	Pressure / Temp. in set unit as float – Lo Word (n/a for O_2 only)	R		IEEE754	

Register Configuration A

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

A1: Unsigned Short. Range = 0...65535
A2: Unsigned Short /10. Range = 0...6553.5
A3: Unsigned Short /100. Range = 0...655.35

Conversion: float*x = unsigned integer
Unsigned integer/x = float

Or cast:

float value to read= ((float) (value))/x;
unsigned short value to write= (unsigned short) (value*x)

Register Configuration B

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

B1: Signed Short. Range -32768...+32767
B2: Signed Short /10. Range -3276.8...+3276.7
B3: Signed Short /100. Range -327.68...+327.67

Most languages will cast from one type to another

Values to write into register manually:

if value is a negative number: (value*x) +65536
if value is 0 or a positive number: value*x

e.g. for type B3

(-5.39*100) + 65536 = 64997
(2.01*100) = 201

Or Cast:

(unsigned short) (value*x)

Reading values from register manually:

If value in register is greater than 32767: (value-65536)/x
If value in register is less than or equal to 32767: value/x

e.g. for type B3

(64997-65536)/100 = -5.39
201/100 = 2.01

Or Cast:
((float) ((signed short)value))/x;

Register Configuration C – System Configuration

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
		PP	MOD	CA	PR	IT	IT		TU	PU	PU	N/A	MU	MU	MU

Pressure Units (PU) 00 = Bar.G (def) 01 = Psi.G 10 = Mpag 11 = Spare	Temperature Unit (TU) 0 = C (def) 1 = F
Main Unit 0 = Dp (O_2 %) 1 = ppm_V(I) (O_2 ppm) 2 = lbmmscf 3 = mg/m^3 4 = ppm_V(N)	Instrument Type (IT) – not used 00 = Promet IS 01 = Liquidew IS 10 = Pura 11 = O_2
Pressure Source (PR) 0 = Sensor 1 = Fixed User	ISO or IGT calculations (CA) 0=IGT 1=ISO
Model (MOD) 0 = Promet 1 = Easidew Advanced	Pressure or ppm_V (I) secondary parameter (PP) – Easidew Advanced only 0 = Pressure 1 = ppm_V (ideal)

Register Configuration D – Alarm Configuration

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
A4	A4	A4	A4	A3	A3	A3	A3	A2	A2	A2	A2	A1	A1	A1	A1

Alarm1 Parameter (A1) 0000 = Dew point (O2) 0001 = Pressure/Temperature 0010 = ppm_W 0011 = ppm_V (Ideal) 0100 = ppm_V (Nat Gas) 0101 = mgm^3 0110 = lbmmscf 1000 = Fault	Alarm2 Parameter (A2) 0000 = Dew point (O2) 0001 = Pressure/Temperature 0010 = ppm_W 0011 = ppm_V (Ideal) 0100 = ppm_V (Nat Gas) 0101 = mgm^3 0110 = lbmmscf 1000 = Fault
Alarm3 Parameter (A3) 0000 = Dew point (O2) 0001 = Pressure/Temperature 0010 = ppm_W 0011 = ppm_V (Ideal) 0100 = ppm_V (Nat Gas) 0101 = mgm^3 0110 = lbmmscf 1000 = Fault	Alarm4 Parameter (A4) 0000 = Dew point (O2) 0001 = Pressure/Temperature 0010 = ppm_W 0011 = ppm_V (Ideal) 0100 = ppm_V (Nat Gas) 0101 = mgm^3 0110 = lbmmscf 1000 = Fault

Register Configuration E – mA Output Config

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
				O3	O3	O3	O3	O2	O2	O2	O2	O1	O1	O1	O1

Ouput1 Parameter (O1)	Output2 Parameter (O2)	Output3 Parameter (O3)
0000 = Dew point (O2) 0001 = Pressure/ Temperature 0010 = ppm_W 0011 = ppm_V (Ideal) 0100 = ppm_V(Nat Gas) 0101 = mgm^3 0110 = lbmmscf	0000 = Dew point (O2) 0001 = Pressure/ Temperature 0010 = ppm_W 0011 = ppm_V (Ideal) 0100 = ppm_V(Nat Gas) 0101 = mgm^3 0110 = lbmmscf	0000 = Dew point (O2) 0001 = Pressure/ Temperature 0010 = ppm_W 0011 = ppm_V (Ideal) 0100 = ppm_V(Nat Gas) 0101 = mgm^3 0110 = lbmmscf

Register Configuration F – Status Register

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
A4	A4	A3	A3	A2	A2	A1	A1							PS	DS

Relay Alarm Status flags (A1, A2, A3, A4)	Dew point Sensor Status (DS)
Example: A1 = 00=OK (relay de-energized) A1 = 01=High (or Fault) (relay energized) A1 = 10=Low (relay energized)	0=OK 1=Fault (or not available)
Pressure/Temperature Sensor Status (PS) 0=OK 1=Fault (or not available)	

Register Configuration G – Liquid Selection

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	M2	M2	M2	M2	M2	M1	M1	M1	M1	M1	LQ	LQ	LQ	LQ	LQ

Liquid Selection (LQ)	Mixed Liquid 1 (M1)	Mixed Liquid 1 (M2)
0 = n-Butane	0 = n-Butane	0 = n-Butane
1 = n-Propane	1 = n-Propane	1 = n-Propane
2 = n-Hexane	2 = n-Hexane	2 = n-Hexane
3 = Cumene	3 = Cumene	3 = Cumene
4 = Benzene	4 = Benzene	4 = Benzene
5 = Toluene	5 = Toluene	5 = Toluene
6 = 1-butane	6 = 1-butane	6 = 1-butane
7 = Cyclohexane	7 = Cyclohexane	7 = Cyclohexane
8 = Oct-3-ene	8 = Oct-3-ene	8 = Oct-3-ene
9 = Ethylbenzene	9 = Ethylbenzene	9 = Ethylbenzene
10 = Dimethylbenzene	10 = Dimethylbenzene	10 = Dimethylbenzene
11 = Ethane	11 = Ethane	11 = Ethane
12 = Methylcyclohexane	12 = Methylcyclohexane	12 = Methylcyclohexane
13 = Butylbenzene	13 = Butylbenzene	13 = Butylbenzene
14 = Prop-1-ene	14 = Prop-1-ene	14 = Prop-1-ene
15 = But-1-ene	15 = But-1-ene	15 = But-1-ene
16 = Methane	16 = Methane	16 = Methane
17 = 2-Methylbutane	17 = 2-Methylbutane	17 = 2-Methylbutane
18 = USER1	18 = USER1	18 = USER1
19 = USER2	19 = USER2	19 = USER2
20 = MIXING		

Register Configuration H – Instrument Setup and Command Register (Reg 30)

2 = Set Dew point Channel 4 mA ADC Value
3 = Set Dew point Channel 20 mA ADC Value
4 = Set Pressure/Temperature Channel 4 mA ADC Value
5 = Set Pressure/Temperature Channel 20 mA ADC Value

10 = Force Analog Output 1...4 mA
11 = Force Analog Output 1...20 mA
12 = Force Analog Output 2...4 mA
13 = Force Analog Output 2...20 mA
14 = Force Analog Output 1...12 mA
15 = Force Analog Output 2...12 mA
16 = Force Analog Output 3...4 mA
17 = Force Analog Output 3...20 mA
18 = Force Analog Output 3...12 mA

19 = All Alarm Relays de-energized
20 = Energize Alarm Relay1
21 = Energize Alarm Relay2
22 = Energize Alarm Relay3
23 = Energize Alarm Relay4

25 = Send Test String to Display Comms Channel

30 = Set control board to default register map values

31 = Enable Setup Mode (Alarms and Analog output updates disabled)
32 = Disable Setup Mode (Alarms and Analog output updates enabled)

Defaults (auto-loaded when PCB is brand new or forced via Modbus)

Modbus ID	1
System config.	Main unit = °CDp, temp. unit = °C
Alarm config.	AL1 = Moisture (low = 0.0, high = 100.0) AL2 = Moisture (low = 0.0, high = 10.0) AL3 = FAULT (low = high = 0.0) AL4 = FAULT (low = high = 0.0)
Input scales	Dp = -100...+20.0 Temp. = -20.0...+70.0
Output config.	OP1 = Dp (-100.0...+20.0) OP2 = Temperature (-20.0...+70.0) OP3 = Moisture (0.0...+100.0)
Mixing	Liq 1 = Oct-3-ene, Liq 2 = n-butane, Liq 1 = 50%
Liquid selection	n-butane

User 1 & 2 liquids

T.	CS
-20	0
-10	10
0	20
10	30
20	40
30	50
40	60
50	70
60	80
70	90

Appendix C

Hazardous Area Certification

Appendix C Hazardous Area Certification

The Liquidew I.S. Process Moisture Analyzer utilizes the Easidew PRO I.S. dew-point transmitter

The Easidew PRO I.S is certified compliant to the ATEX Directive (2014/34/EU), the IECEx scheme and SI 2016 No. 1107 UKCA product marking scheme for use within Zone 0, 1 and 2 Hazardous Areas and has been assessed as being so by CML Bv Netherlands (Notified Body 2776) and EUROFINS CML UK (Approved Body 2503).

The Easidew PRO I.S is certified compliant to the applicable North American Standards (USA and Canada) for use within Class I, Division 1 and Class I, Zone 0 Hazardous Locations and has been assessed as being so by QPS.

C.1 ATEX/UKCA

Certificate: Baseefa06ATEX0330X / BAS21UKEX0014X

Certification: II 1 G Ex ia IIC T4 Ga
Tamb -20°C to +70°C

Standards: EN 60079-0:2012+A11:2013, EN 60079-11:2012

C.2 IECEx

Certificate: IECEx BAS 06.0090X

Certification: Ex ia IIC T4 Ga
Tamb -20°C to +70°C

Standards: IEC 60079-0:2011, IEC 60079-11:2011

C.3 North American (cQPSus)

Certificate: LR1507-10

Certification: Class I, Division 1, Groups A, B, C & D T4
Tamb -20°C to +70°C
Class I, Zone 0
AEx ia IIC T4 Ga / Ex ia IIC T4 Ga
Tamb +70°C

Standards: UL 60079-0-7th ed. / CSA C22.2 No. 60079-0:19
UL 60079-11-6th ed. / CSA C22.2 No. 60079-11:14
UL 61010-1-3rd ed. / C22.2 No. 61010-1:12
FM 3600-2018, FM 3610-2018

These certificates can be viewed or downloaded from our website at:
www.ProcessSensing.com

C.4 Terminal Parameters

Ui	= 28 V
Ii	= 93 mA
Pi	= 820 mW
Ci	= 37 nF
Li	= 0

C.5 Special Conditions

1. The wiring connections to the free socket must be made via crimped connectors in such a way that all the strands of the wire used are held securely by the crimp.
2. The plastic plug and socket create a potential for electrostatic discharge so must not be rubbed with a dry cloth or cleaned with solvents.
3. The Easidew PRO I.S Dew-Point Transmitter does not withstand the 500 V AC insulation test to frame. This must be taken into account when installing the equipment.

C.6 Maintenance and Installation

The Easidew PRO I.S. must only be installed by suitably qualified personnel and in accordance with the instructions provided and the terms of the applicable product certificates.

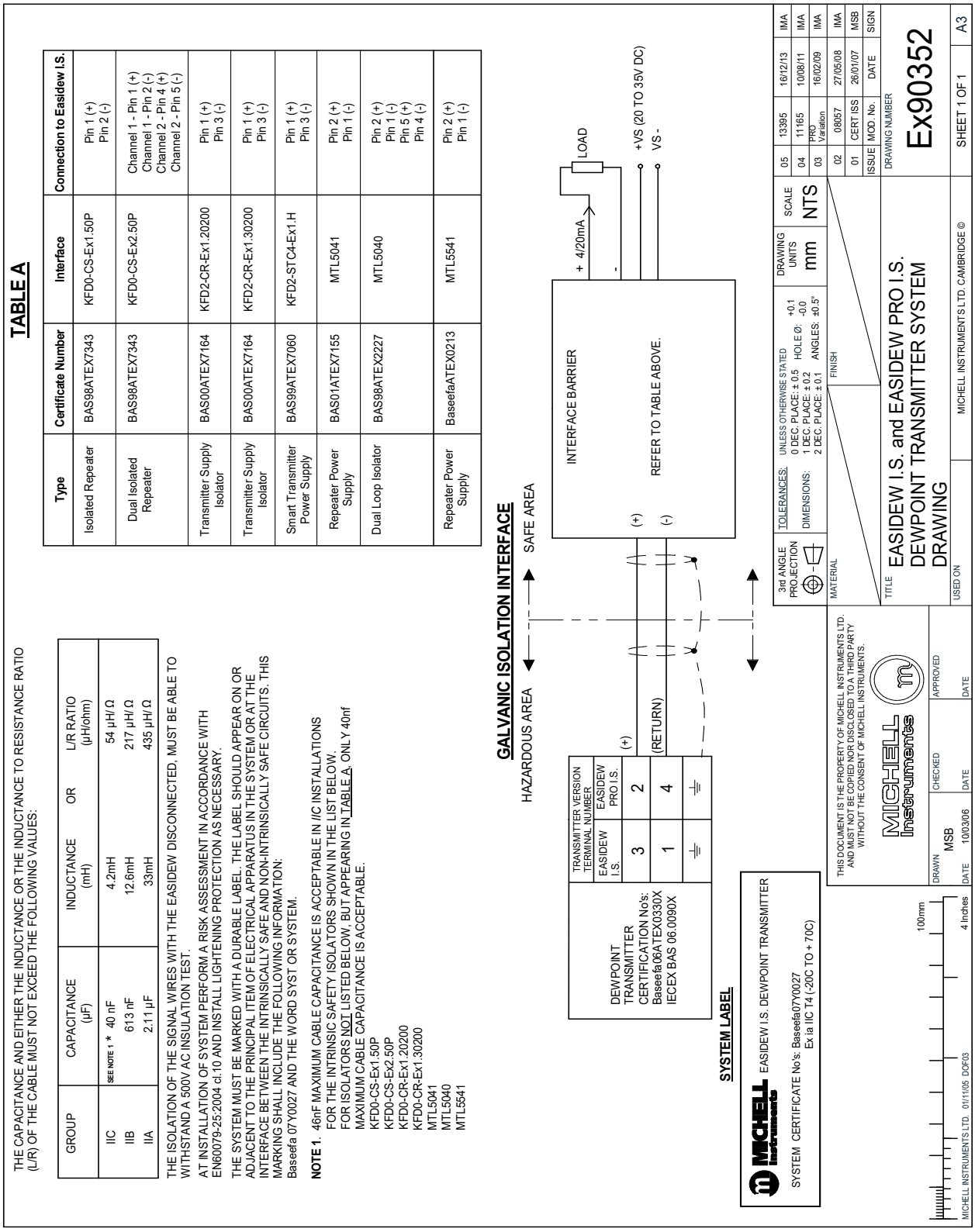
Maintenance and servicing of the product must only be carried out by suitably trained personnel or returned to an approved Michell Instruments Service Center.

Appendix D

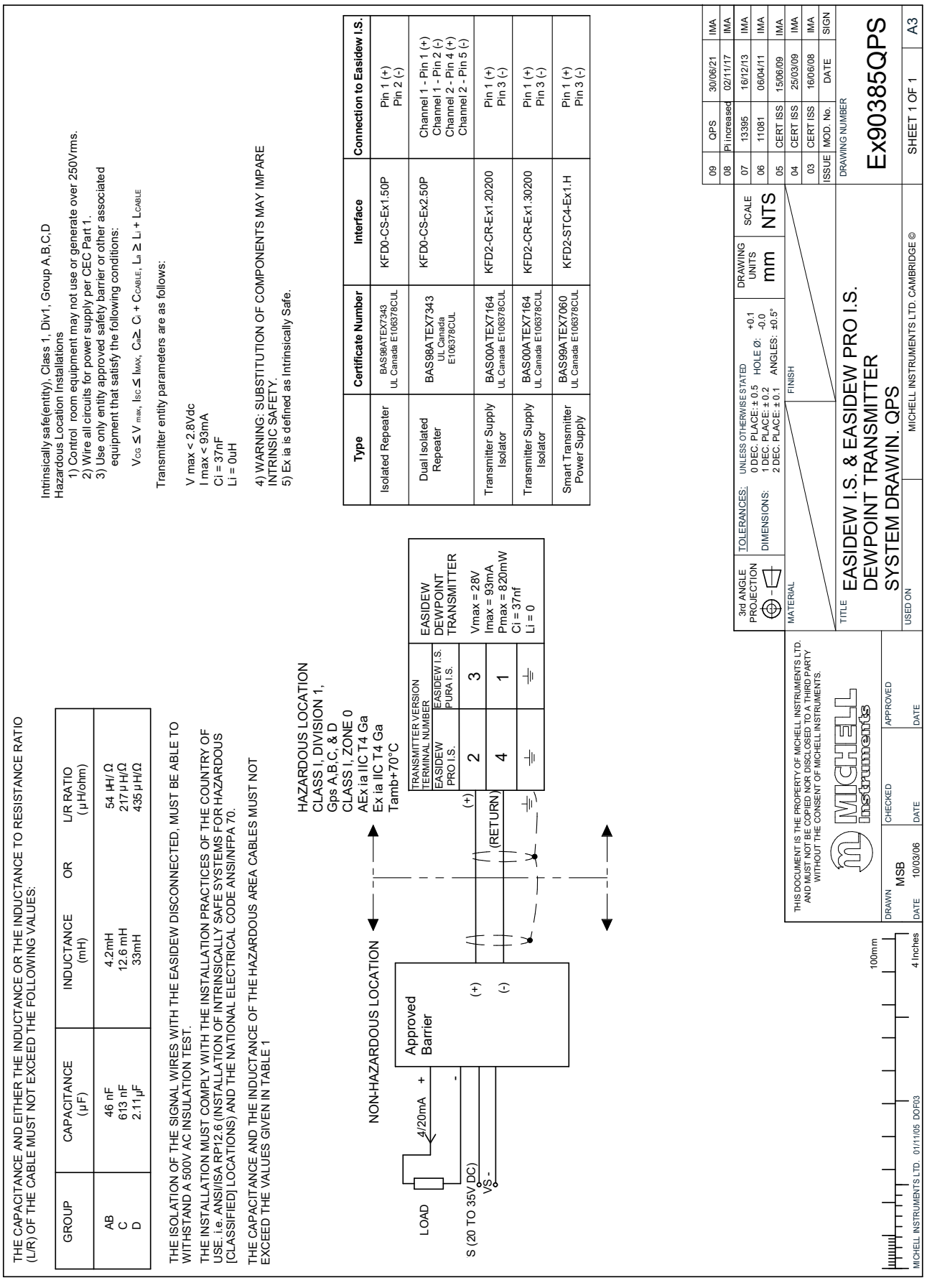
System Drawings

Appendix D System Drawings

D.1 Baseefa Approved System Drawing



D.2 QPS Approved System Drawing



Appendix E

Quality, Recycling & Warranty Information

Appendix E Quality, Recycling & Warranty Information

Michell Instruments is dedicated to complying to all relevant legislation and directives. Full information can be found on our website at:

www.ProcessSensing.com/en-us/compliance

This page contains information on the following directives:

- Anti-Facilitation of Tax Evasion Policy
- ATEX Directive
- Calibration Facilities
- Confl ict Minerals
- FCC Statement
- Manufacturing Quality
- Pressure Equipment Directive
- REACH
- RoHS
- WEEE
- Recycling Policy
- Warranty and Returns

This information is also available in PDF format.

Appendix F

Return Document & Decontamination Declaration

Appendix F Return Document & Decontamination Declaration

Decontamination Certificate

IMPORTANT NOTE: Please complete this form prior to this instrument, or any components, leaving your site and being returned to us, or, where applicable, prior to any work being carried out by a Michell engineer at your site.

Instrument			Serial Number	
Warranty Repair?	YES	NO	Original PO #	
Company Name			Contact Name	
Address				
Telephone #			E-mail address	
Reason for Return /Description of Fault:				

Has this equipment been exposed (internally or externally) to any of the following? Please circle (YES/NO) as applicable and provide details below		
Biohazards	YES	NO
Biological agents	YES	NO
Hazardous chemicals	YES	NO
Radioactive substances	YES	NO
Other hazards	YES	NO
Please provide details of any hazardous materials used with this equipment as indicated above (use continuation sheet if necessary)		
Your method of cleaning/decontamination		
Has the equipment been cleaned and decontaminated?	YES	NOT NECESSARY

Michell Instruments will not accept instruments that have been exposed to toxins, radio-activity or bio-hazardous materials. For most applications involving solvents, acidic, basic, flammable or toxic gases a simple purge with dry gas (dew point <-30°C) over 24 hours should be sufficient to decontaminate the unit prior to return.
Work will not be carried out on any unit that does not have a completed decontamination declaration.

Decontamination Declaration

I declare that the information above is true and complete to the best of my knowledge, and it is safe for Michell personnel to service or repair the returned instrument.

Name (Print)		Position	
Signature		Date	

MICHELL Instruments

F0121, Issue 2, December 2011

NOTES

www.ProcessSensing.com