TX6400
Sentrum

User Manual

TROLEX

TX6400 Sentrum

Contents

TX6400 Sentrum
Contents

1. Principle of Operation

TX6400	RS485 Modbus output signal to transmit live data and interface with surface control room SCADA system.

The Trolex TX6400 Sentrum Monitoring System is designed to provide the complete solution for Methane Recovery Monitoring applications. Using proven technology, the TX6400 was developed to measure methane at source and at strategic points throughout the methane pipe network.

Complex algorithms are used to correct for the effects of non-methane hydrocarbon cross sensitivity, together with mass flow calculations, providing all the required information in one package to monitor the efficiency of the methane recovery system allowing purity problems to be resolved quickly, thus improving safety and methane capture.

Simple plug-in connections for monitoring allow for easy installation and maintenance. Using RS485 Modbus communication protocol, live data can be transmitted to the surface control room SCADA for continuous real time monitoring and data logging.

2. Application

- Coal Mine Methane Extraction
- Coal Bed Methane Extraction
- Abandoned Mine Methane Extraction
- Gas to Energy Projects
- Clean Development Mechanism (CDM) Projects
- Methane Purity Monitoring
- Underground monitoring at coal face boreholes
- Underground monitoring at strategic points along the methane pipe network
- Monitoring the methane purity and gas flow either before or after the surface methane extraction pump

Group 1: TX6400	**Supply Voltage:** 12 V dc

2.1 System Overview

The system will monitor the quality and quantity of methane being extracted. A Gas Chromatograph Analysis of the gas to be monitored will be required before commissioning. The results from the Gas Chromatograph Analysis are entered in the TX9042 Programmable Sensor Controller. These values can be adjusted as gas concentrations change over time. Regular Gas Chromatograph Analysis will be required to verify system accuracy and enable gas composition adjustment. Sensor recalibration will be required on a six monthly basis. Refer to the individual sensor User Manuals and Product Data Sheets for specific information on the sensors.

2.1.1 Gas Detection

Gas travelling along a transport pipe prior to being used, destroyed or stored will be sampled using infrared gas sensing equipment. Using mathematical algorithms, the methane purity will be calculated and displayed on the TX9042 Programmable Sensor Controller. The values displayed will be corrected for the effects of non-methane hydrocarbons (ethane, propane and butane).

The gas will pass through a drying process to remove moisture prior to being sampled. Pressure and flow regulating equipment in conjunction with a sampling pump, will be used to ensure a constant sample is applied to the sensors. The gas sensors will also compensate for fluctuations in pressure and temperature.

The system is designed to calculate the methane concentration from hydrocarbon gas mixtures. Various algorithms are incorporated to extract the methane concentration from a hydrocarbon mixture by monitoring the infrared signature of the mixture, the temperature, the pressure and the oxygen concentration. The infrared signature from the Trolex TX6363 head is compensated for temperature and pressure and the compensated signature level is sent to the controller system, where it is treated mathematically to extract the methane content of the mixture.

The system uses an initial analysis of the gas mixture to extract the known amount of methane in that analysis. It then tracks the infrared signature of the mixture to continue monitoring the methane content. Under normal conditions, a complex ratio metric algorithm is used to extract the methane content.

Infrared sensors are molar sensors and so respond both to changes in the gas mixture composition and changes in the overall gas concentration. The system is tolerant to such changes in extracting the overall methane content.

In addition to monitoring methane gas the Sentrum system has options for monitoring the concentrations of both oxygen and carbon dioxide. These should be requested at the time of specifying and ordering your Sentrum system.

2.1.2 Flow Monitoring

The velocity of gas travelling in the pipe network is monitored using a differential pressure sensor mounted via an orifice plate. In some applications it may be possible to use a Vortex type flow sensor but this dependent upon the moisture levels in the pipe network. The system will also monitor the temperature of the gas and the process pressure. The parameters methane purity, mass and volume will be calculated and displayed by the TX9042 Programmable Sensor Controller.

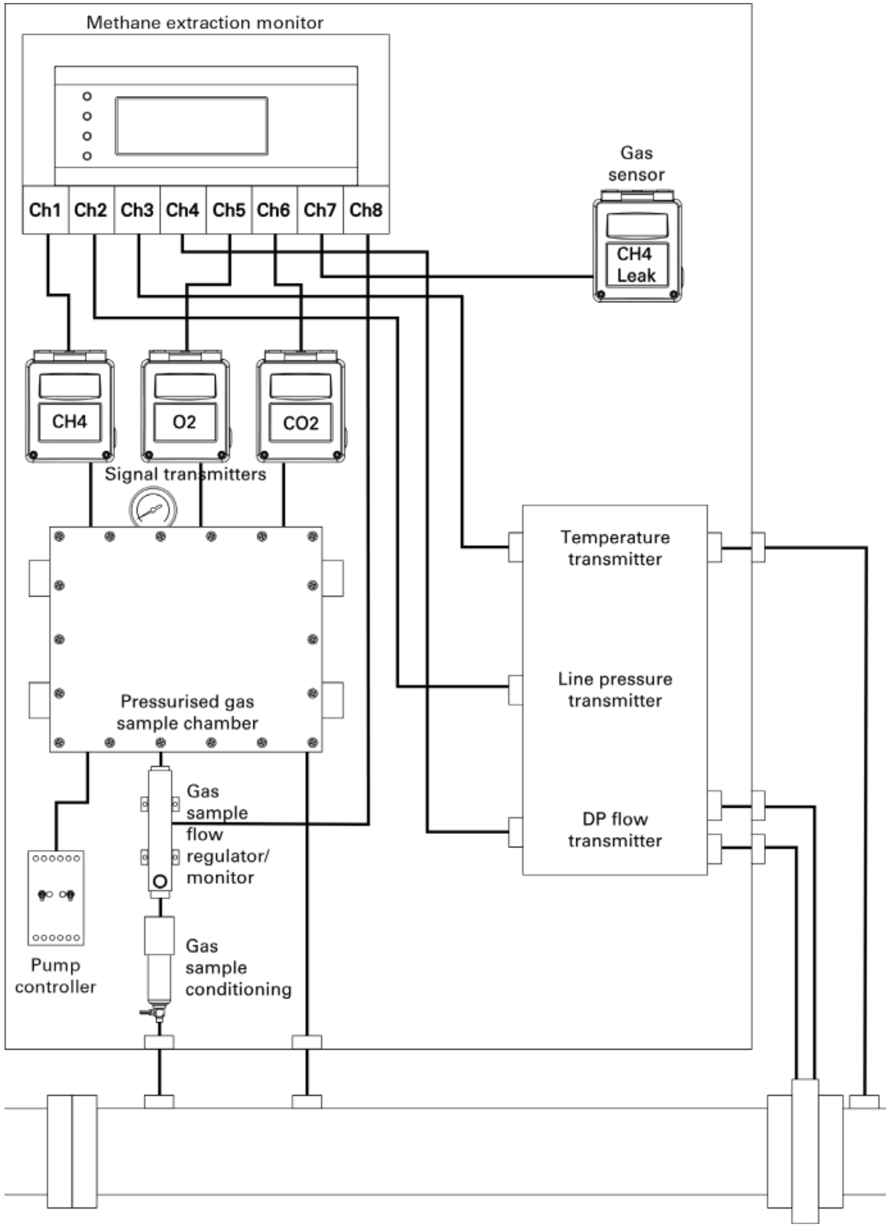
2.1.3 Control and Data Collection

The TX9042 has an RS485 Modbus communications port that can be connected to a suitable master terminal (PC with SCADA). Details of the Modbus structure are to be found in section 7 of this document. Most input and output parameters for the TX9042 can be viewed and adjusted via this link.

The TX9042 can also be set to locally data-log the various inputs. This information is stored locally in the TX9042 and can be accessed via the RS485 communications link. The TX9042 has a logging capacity of 22000 readings per channel.

2.1.4 Sentrum Block Diagram

Example of a typical system.



3. Technical Details

3.1 TX6400 Sentrum Methane Recovery Monitoring System

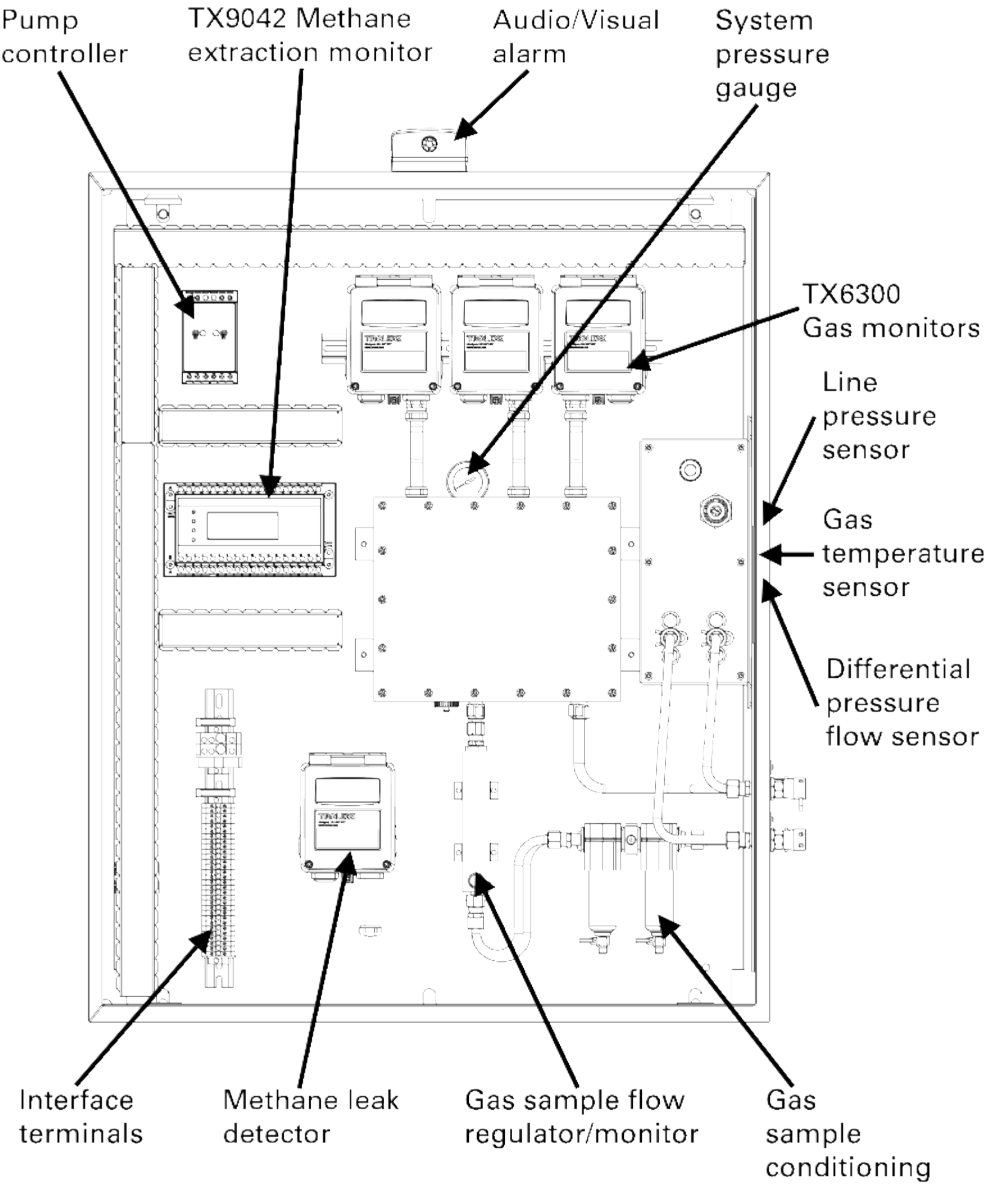
3.1.1 Monitors:

- Methane
- Oxygen - optional
- Carbon dioxide - optional
- Gas velocity
- Gas pressure
- Gas temperature
- System methane leakage

3.1.2 Specification:

Gas temperature limits for gas sensing:	-10°C to 44°C
Gas temperature limits for flow monitoring:	Up to 50°C
Pressure limits for gas sensing:	400 mbar (abs.) to 1200 mbar (abs.)
Pressure limits for flow monitoring:	400 mbar (abs.) to 5 bar
Data communications:	RS485 Modbus

Example of a typical Sentrum system.



3.2 TX6363 Infrared Methane Sensor

3.2.1 Features

- Poison resistant infrared sensor
- Pre-calibrated plug-in sensing module for convenient replacement and servicing
- Calibrated to allow over range conditions caused by non-methane hydrocarbons (NMHCs)
- Intrinsically safe for use in Group I and Group II hazardous areas

3.2.2 Specification

Sensing range:	0 to 100% vol methane
Ambient temperature limits:	-10°C to 44°C
Maximum drift:	±0.05% /month
Repeatability:	±0.1%
Response time (T90):	20 secs
Sensing element life:	2 years

3.3 TX6363 Infrared Carbon Dioxide Sensor

3.3.1 Features

- Poison resistant infrared sensor
- Pre-calibrated plug-in sensing module for convenient replacement and servicing
- Integral sensors for improved temperature and pressure compensation
- Intrinsically safe for use in Group I and Group II hazardous areas

3.3.2 Specification

Sensing range:	0 to 100% vol carbon dioxide
Ambient temperature limits:	-10°C to 44°C
Maximum drift:	±0.01%/month
Repeatability:	±0.1%
Response time (T90):	20 secs
Sensing element life:	>2 years

3.4 TX6373 Oxygen Sensor

3.4.1 Features

- High Accuracy electrochemical sensing elements
- Pre-calibrated plug-in gas sensing module for convenient replacement and servicing
- Convenient push button calibration of ZERO and SPAN
- Intrinsically safe for use in Group I and Group II hazardous areas

3.4.2 Specification

Sensing range:	0 to 25% vol oxygen
Ambient temperature limits:	-10°C to 50°C
Repeatability:	±2%
Response time (T63):	5 secs
Sensing element life:	>1 year

3.5 P5557.13 Mass Flow System

3.5.1 Features

- Differential pressure to monitor flow
- Pressure and temperature sensors
- Installed using an orifice plate between pipe flanges for convenient installation and servicing
- Intrinsically safe for use in Group I and II hazardous areas

3.5.2 Specification

Measuring range:	Dependent upon calibration of orifice plate
Operating temperature:	Up to 50°C

3.6 P5557.11.xx Dual Pump Controller

3.6.1 Features

The TX6400 Methane Recovery Monitoring System is equipped with two intrinsically safe pumps located within the gas monitoring chamber to ensure a constant flow of gas is applied to the gas sensors. These pumps should only be powered by the P5557.11.xx Dual Pump Controller where 'xx' refers to the region of certification -see product codes in section 3.6.2.

LED Off:	Pump switched Off
LED Green:	Pump running and healthy
LED Red:	Pump fail

3.6.2 Certification and Conformity

(N.B. This information only relates to the P5557.11.xx Dual Pump Controller. For certification and conformity information about the other components of the TX6400 Sentrum, please refer to their specific user manuals.)

3.6.2.1 European Union and International Certification

	ATEX (European Union) certification for use in underground mines
	Standards: EN 60079-0:2009 EN 60079-11:2007 EN 50303:2000
	IECEx (International) certification for use in underground mines
	Standards: IEC 60079-0:2007-10 Edition 5 IEC 60079-11:2006 Edition 5

a. Underground mines

Product Code:	Ex Certificate Number:	Ex Certification Code:
P5557.11.19	Baseefa 10ATEX0029X IECEx BAS 10.0011X	I M1 Ex ia I Ma -20 °C ≤ Ta ≤ +40 °C

b. The following Special Conditions for Safe Use apply to the above ATEX and IECEx Certificates:

The pump controller and pump must be mounted inside an enclosure that offers a degree of ingress protection of at least IP54 according to IEC 60529 and be suitable for a mining environment.

3.6.2.2 Australia and New Zealand

	IECEx (International) certification for use in underground mines and surface industry with explosive gas atmospheres in Australia (including Queensland) and New Zealand.
	Standards: IEC 60079-0:2011 Edition 6.0 IEC 60079-11:2011 Edition 6.0

a. Underground mines and Surface industry with explosive gas atmosphere

Product Code:	Ex Certificate Number:	Ex Certification Code:
P5557.11.23	IECEx TSA 11.0029X	Ex ia I Ma -20 °C ≤ Ta ≤ +60 °C Ex ia II T1 Ga -20 °C ≤ Ta ≤ +60 °C

b) The following Conditions of Certification apply to the above IECEx Certificate:

   i. It is a condition of safe use that the pump controller and pump must be mounted inside an enclosure that offers a degree of ingress protection of at least IP54 according to IEC 60529 and be suitable for Group I and Group IIA.

   ii. It is a condition of safe use that the following parameters shall be taken into account during installation:

Input:	**For Group I**	**For Group IIA**
Power Connections: T5 w.r.t T6 (0V)		
Ui	14.4 V	12.6 V
Ci	0 µF	0 µF
Li	0 µH	0 µH

Output:	**For Group I**	**For Group IIA**
Pump Motor 1 Connections: T7 w.r.t T8 (0V)		
Uo	14.4 V	12.6 V
Io	615 mA	549 mA
Po	2.22 W	1.73 W
Ci	10.34 µF	10.34 µF
Li	0 µH	0 µH
Pump Motor 2 Connections: T11 w.r.t T12 (0V)		
Uo	14.4 V	12.6 V
Io	615 mA	549 m
Po	2.22 W	1.73 W
Ci	10.34 µF	10.34 µF
Li	0 µH	0 µH

3.6.2.3 South Africa

	MASC certification for use in underground mines
	Standards: SANS (IEC) 60079-0:2009 SANS (IEC) 60079-11:2007

a. Underground mines

Product Code:	Ex Certificate Number:	Ex Certification Code:
P5557.11.05	M/11-221X	Ex ia I Ma -20 °C ≤ Ta ≤ +40 °C

b) The following Special Conditions for Safe Use apply:

The pump controller and pump must be mounted inside an enclosure that offers a degree of ingress protection of at least IP54 according to IEC 60529 and be suitable for a mining environment.

3.6.2.3 Eurasian Customs Union

	Certification for use in underground mines
	Standards: ГОСТ 30852.0-2002 (МЭК 60079-0:1998) ГОСТ 30852.10-2002 (МЭК 60079-11:1999)

a. Underground mines

Product Code:	Ex Certificate Number:	Ex Certification Code:
P5557.11.14	TC RU C-GB.ГБ05.B.01161	PO Ex ia I Ma X -20 °C ≤ Ta ≤ +40 °C

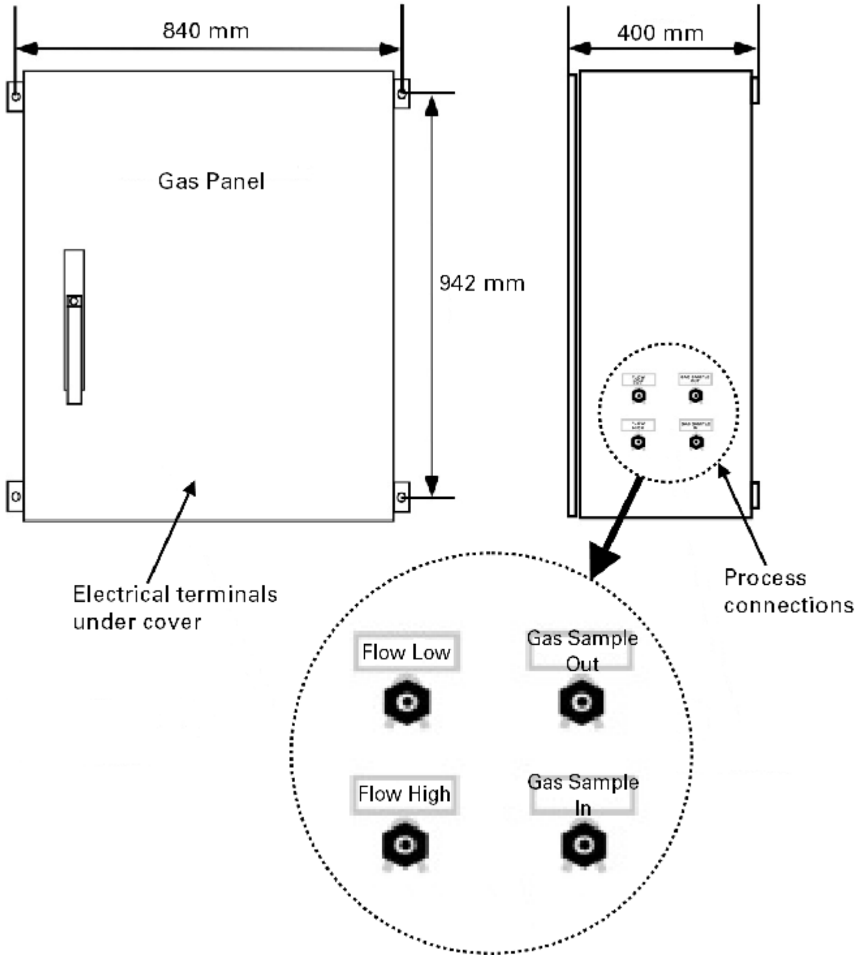
b) The following Special Conditions for Safe Use apply:

The pump controller and pump must be mounted inside an enclosure that offers a degree of ingress protection of at least IP54 according to IEC 60529 and be suitable for a mining environment.

4. Installation

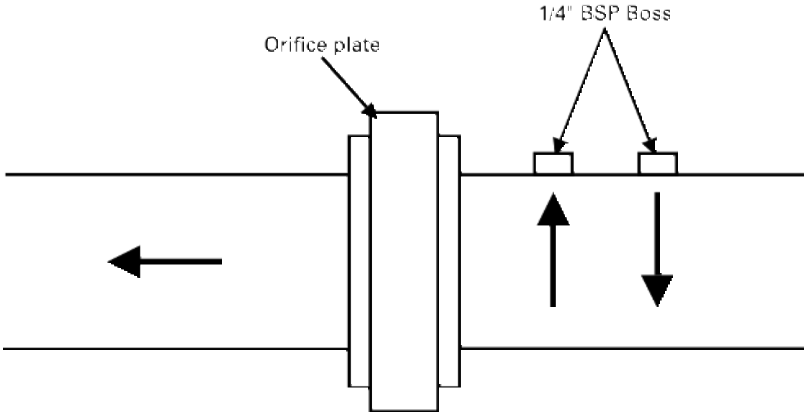
4.1 Main Enclosure

The Methane Monitoring System and Gas Flow System are located in the main enclosure. However, they will be interfaced with the methane drainage transport pipe independently of each other. The main enclosure houses the TX9042 Programmable Sensor Controller and Gas Sample Flow Regulator. The main enclosure is designed to be frame or wall mounted to eliminate vibration and movement which may affect the accuracy of the differential (pressure) flow sensor. It should be located within two metres of the gas connection points.



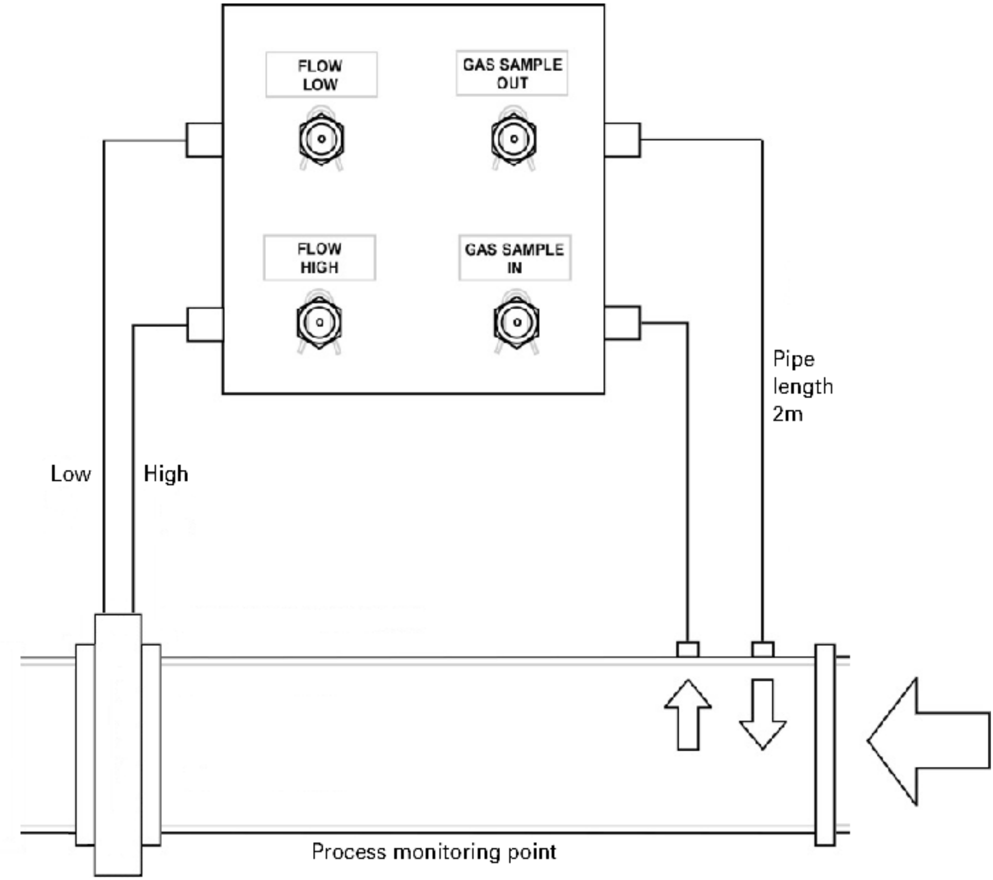
4.2 Transport Pipe Preparation

1. Separate the two pipe flanges where the orifice plate is to be installed. Insert the orifice plate and bolt the two flanges and orifice plate together. Tighten as necessary.
2. Install the 2 x ¼" BSP threaded boss for methane sampling and fit one ¼" supplied tap.
3. Staple lock banjo fitting into each boss.
4. Ensure the tap is closed upon completion.



4.3 Gas Monitoring System

1. Connect two of the supplied hoses from the staple lock fittings on the side of the main enclosure marked Gas Sample In and Gas Sample Out, to the staple lock fittings on the transport pipe and secure using the supplied staples.

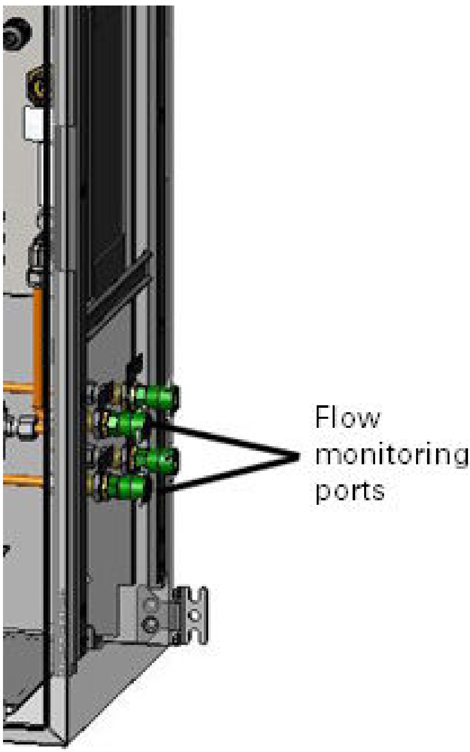


4.4 Flow Monitoring System

1. Connect the supplied hoses to the two orifice plate fittings taking note of which is connected to Hi and which is connected to Lo.
2. Connect the free end of the hoses to the corresponding staple lock fitting on the side of the main enclosure. Hi to FLOW Hi and Lo to FLOW Lo.
3. Connect the temperature probe cables to the appropriate terminals in the main enclosure as indicated on the supplied system drawings.

4.5 Power Supply

1. Remove the fuse from terminal F1 and connect a 12 V dc intrinsically safe power supply to terminals F1 and L1.



5. Commissioning

This procedure assumes that the methane extraction process is running and methane is being transported through the methane pipe network.

Before fuse F1 is fitted, ensure that:

1. All electrical connections are secure.
2. All pneumatic connections are secure.
3. The cover on the gas sample chamber is secure.
4. The valve on the flow regulator is fully open.
5. Both switches on the dual pump controller are set to off.
6. The tap on the water filter is closed.

Please note that the differential pressure sensor has been factory configured to the information available at the time of manufacture. If the conditions have changed, then it will be necessary to reconfigure the differential pressure sensor. To do that a Hart communicator will be required. To use this:

1. Disconnect the wire marked "SIG FLOW" from terminal A6 on the TX9042 Programmable Sensor Controller.
2. Connect one wire of a Hart Protocol Communicator to Terminal A6.
3. Connect the other wire of a Hart Protocol Communicator to the wire marked "SIG FLOW".
4. Fit fuse F1 and the Sentrum Methane Monitoring System will energise.
5. After the TX9042 Programmable Sensor Controller has initialised, it will go to the main screen where all eight channels can be read. LED R4 on the Programmable Sensor Controller will remain lit.
6. Open both taps on the gas sample hose connection. The pressure gauge located on the gas sample chamber will indicate the expected pressure within the transport pipe.
7. Using the Dual Pump Controller, switch Pump 2 on. Ensure the LED for pump 2 is green and the R4 LED on the Programmable Sensor Controller has extinguished. On the flow regulator, note the volume of gas flowing to the gas sampling chamber. This volume should be >1 lpm and <3 lpm when pump 1 is running.
8. Adjust the flow using the potentiometer on the dual pump controller to obtain a flow between 1 lpm and 3 lpm.

Checkpoint
Never use the valve on the flow regulator to regulate flow when the system is using the intrinsically safe pumps to provide flow.

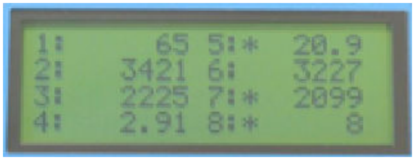
9. Switch pump 2 off and note that R4 LED on the Programmable Sensor Controller is lit.
10. Switch pump 1 on. Ensure the LED for pump 1 is green, the R4 LED on the Programmable Sensor Controller has extinguished and the volume flow is between 1 lpm and 3 lpm. The system is now pumping gas across the gas sensors.
11. To let the sensors stabilise it is recommended that the system be allowed to settle for 2 hours.

5.1 The TX9042 Programmable Sensor Controller

The information below is in addition to the information found in the TX9042 Installation and Operating Data (IOD).

5.1.1 TX9042 Signal Display

The Main Signal display screen, replaces the standard signal display described in section 9.2 of the TX9042 IOD. This screen displays the following information:

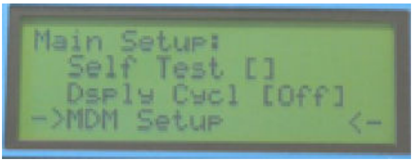


Channel 1	Corrected methane concentration (%v/v)
Channel 2	Gas volume flow (l/s)
Channel 3	Methane volume flow (l/s)
Channel 4	Methane mass flow (kg/s)
Channel 5	Oxygen (%v/v)
Channel 6	Normalised gas volume flow (l/s)
Channel 7	Normalised methane volume flow (l/s)
Channel 8	Accumulated total gas mass (tonnes)

Use the Cursor to select a channel number, press the Confirm key and the display will change to show the following detailed information:

Channel 1	Uncorrected methane concentration (%v/v)
Channel 2	Gas velocity (l/s)
Channel 3	Gas temperature (°C)
Channel 4	Line pressure (kpa)
Channel 5	Oxygen (%v/v)
Channel 6	Carbon dioxide (v/v)
Channel 7	Methane leakage (%v/v)
Channel 8	Flow switch status

To return to the Signal Display Screen pressing the Escape key.



5.2 TX9042 Main Methane Drainage Monitor Setup

The configuration setting for the Methane Drainage Monitor (MDM) functions of the TX9042 are accessible from the "MDM Setup" menu.

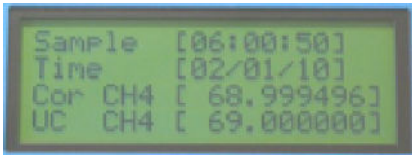
1. Using the navigation keys on the TX9042, navigate to the main menu and scroll down to the bottom of this menu to the "MDM Setup".
2. Press the Confirm key to enter MDM Setup. The following functions are available from this menu:

5.3 Resetting the Accumulated Mass Totals

Selecting and confirming the Reset option will reset the accumulated mass totals displayed on the main signal display screen.

5.4 Taking a Gas Sample for Analysis

For Sentrum to accurately track the fluctuating methane concentration in the gas transport pipe, it needs to acquire knowledge about the “Gas Signature” of the installation. This information is derived from gas chromatograph analysis of a gas sample collected from the installation.



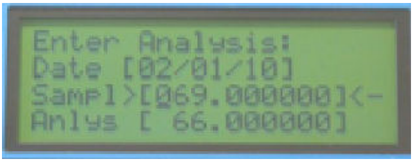
To collect a sample of gas for analysis the following procedure must be followed:

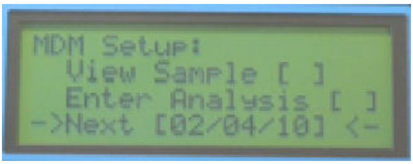
1. Physically extract the sample of gas from the main line extraction point.
2. Then enter the MDM Setup menu and confirm that the sample has been taken.
3. Selecting and confirming the Sample Taken option will save the uncorrected methane sensor output with the corresponding time and date. This information is used by the controller to calibrate the correction factors once the results of the analysis are available.
4. Information about the last sample taken can be viewed by selecting the View Sample option.

5.5 Updating the Analysis Values

Once the results from the sample are available then the gas analysis values held in the controller should be updated.

1. From the MDM Setup menu select Enter Analysis.
2. The user is offered the option to change the sample reading, but this is not normally required and should be skipped. The methane concentration from the analysis results should be entered into the “Anlys” option. The controller will then correct the internal algorithm.
3. Entering this methane analysis will also update the original entry for Methane in the MDM Setup menu.
4. It is not necessary to adjust the values of the other hydrocarbons, these are not used by the algorithm in this configuration.
5. The date of the next scheduled gas analysis can be manually entered in the MDM Setup menu.





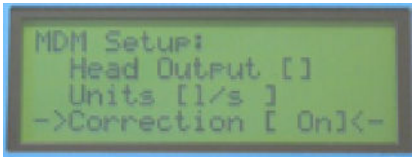
5.6 Mass Flow Setup

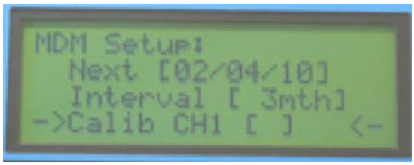
The following parameters are calculated and displayed:

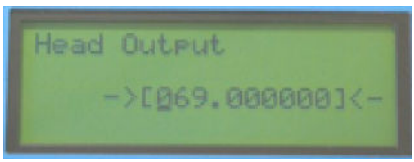
- Methane Volume Flow (l/s)
- Methane Mass Flow (kg/s)
- Normalised Gas Volume Flow (l/s)
- Normalised Methane Volume Flow (l/s)
- Accumulative Total Gas Mass (tonnes)

To ensure their accuracy it is important that the TX9042 is configured with the correct system parameters:

1. Enter the system pipe diameter.
2. The gas parameter is the molecular weight of the target gas. This is defaulted to methane at 16.04 g/mol.
3. The balance gas molecular weight is entered in most gases this will be Air at 28.96 g/mol.
4. The units parameter allows the user to select imperial or metric units.
5. The Methane correction can be enabled or disabled via the correction parameter. This can be useful during commissioning but should normally be set to On.
6. The Calib CH1 parameter allows the user to calibrate channel 1. This is an advanced function used during commissioning and should not be adjusted by the user.
7. Head Output is used during commissioning only.







5.7 Flow Monitoring

When the system is securely mounted, checks need to be made to ensure the flow monitoring system is at zero when there is no flow in the transport pipe.

1. Switch on the previously installed Hart Protocol Communicator (see section 5).
2. Temporarily disconnect the FLOW Hi and FLOW Lo pneumatic hoses from the enclosure staple lock fittings.
3. Using the Hart Protocol Communicator, adjust the analogue output of the differential pressure sensor to 4 mA if required. Note that the output needs to be 4.00 mA to ensure flow monitoring accuracy.
4. When the 4.00 mA has been achieved, save this data to the DP sensor, disconnect the Hart Protocol Communicator and reconnect the pneumatic hoses.
5. Channels 2, 3, 5 and 6 will now be displaying expected values.

5.8 Gas Monitoring

The TX6373 oxygen sensor and TX6363 carbon dioxide sensors will be factory calibrated and will not require any initial setting-up on site.

The oxygen sensor will require periodic calibration and will require cell replacement after approximately one year. Refer to the TX6373 Installation and Operating Data manual for further information.

6. Operation and Maintenance

6.1 Monitoring Accuracy

To ensure the Methane Monitor is accurate, the system will require regular Gas Chromatograph Analysis for comparison. The frequency of the Gas Chromatograph Analysis is determined by the stability of the gas composition. Adjusting the hydrocarbon parameters as described in section 5.1 will ensure system accuracy.

6.2 Water Filter

The water filter will remove water from the gas as it flows to the gas sample chamber. The rate at which the filter bowl will start to fill with water depends on how wet the gas is. The bowl will need emptying before it is full to stop water entering the flow regulator.

1. Switch the sample pump off.
2. Close the flow regulator valve fully.
3. Close the tap connected to the Sample Gas In pipe.
4. Remove the pipe from the tap.
5. The vacuum in the water filter will now reduce to atmospheric pressure and the tap on the water filter can be opened to let the water drain.
6. When the bowl is empty, close the tap.
7. Reconnect the Gas Sample In pipe and open the tap.
8. Fully open the Flow Regulator Valve.
9. Switch sample pump on.

> **Checkpoint**
> There may be a small drop in methane purity readings due to the process of draining the filter. This is temporary and will clear in a few moments.

6.3 Pump Maintenance

There are two pumps in the sampling system. Under normal use only one pump is required to draw a sufficient sample for analysis. The pumps should run under normal load for approximately 10 to 12 months. The second pump is intended as a standby pump in case of primary pump failure. It is recommended that pumps should be replaced prior to the 10 months life expectancy.

7. Modbus Address Registers

Modbus Address:	Data:	Data Type:	Unit:
00005	Write 1 Reset Accumulators		
00006	Write 1 Initiates Methane Calibration Screen		
00007	Write 1 indicates Sample Taken		
00008	Write 0 for PD847 Sensor. Write 1 for PD857 Sensor		
00029	Write 0 for 32 bit FP. Write 1 for 16 bit integer		
00030	1 = Analysis Due		
00035	1 = Display Volume Flow in Imperial Units		
30001	Methane (uncorrected)	int	%v/v
30002	Gas Velocity	int	m/sec
30003	Gas Temperature	int	°C
30004	Line Pressure	int	kpa
30005	Oxygen	int	%v/v
30006	Carbon Dioxide	int	%v/v
30007	Carbon Monoxide	int	ppm
30008	Flow Switch	int	-
30031..32	Corrected Methane	float	%v/v
30033..34	Volume Flow	float	See Note 1
30035..36	Methane Mass Kg/s	float	kg/sec
30037..38	Total Mass Kg/s	float	kg/sec
30039..40	Accumulated Methane Mass	float	tonnes
30041..42	Accumulated Total Gas Mass	float	tonnes
30043..44	Uncorrected Methane	float	%v/v
30045..46	NTP Total Gas Volume Flow (Channel 6 display)	float	See Note 1
30047..48	NTP CH4 Volume Flow (Channel 7 Display)	float	See Note 1

Modbus Address:	Data:	Data Type:	Unit:
30053..50	Total Gas Volume Flow (Channel 2 Display)	float	See Note 1
30053..52	Gas Velocity m/s	float	m/sec
30053..54	Head absorbance (0.5 = PD847 - 1.0 = PD857)	float	-
30055..56	Oxygen Level	float	%v/v
30057..58	Normalisation Ratio	float	-
30059..60	Normal Transformation	float	%v/v
30061..62	Actual Total Gas Volume Flow (Channel 3 Display)	float	See Note 1
30063..64	Corrected Methane at Analysis	float	%v/v
40209	Pipe diameter	word	mm
40210	Molecular weight of target gas	word	g/mol
40211	Molecular weight of balance	word	g/mol
40212	Atmospheric pressure	word	mbar
40213..14	C1 analysis	float	%v/v
40215..16	C2 analysis	float	%v/v
40217..18	C3 analysis	float	%v/v
40219..20	C4 analysis	float	%v/v
40221..22	C5 analysis	float	%v/v
40223..24	C1 exponent	float	-
40223..26	C1 power	float	-
40227..28	C1 span	float	-
40229..30	Methane Analysis Absorbance	float	-
40233..34	Analysed_head_absorbance	float	-
40237..38	Transformation_coefficient	float	-
40261..62	Stored Transmitted C1 (U/C methane at analysis time)	float	%v/v
40263	Analysis Interval	word	months
40264	Volume Flow Units	word	-
40265..66	Standard Temperature K	float	K

Modbus Address:	Data:	Data Type:	Unit:
40267..68	Standard pressure	float	kpa
Note 1	Modbus address 40264 sets the units: 0 = l/sec 1 = m3/hr 2 = m3/min 3 = m3/sec 4 = CFM (imperial)		

8. TX9042 Display Formats

Channel Inputs			
Channel:	**Description:**	**Units:**	**Hardware:**
Channel 1	Methane (uncorrected)	0 to 100% v/v	4 to 20 mA or 0.4 to 2 V
Channel 2	Gas velocity	0 to 20 m/sec	4 to 20 mA
Channel 3	Gas temperature	-20 to +80°C	PT100
Channel 4	Line pressure	0 to 200 kpa abs.	4 to 20 mA or 0.4 to 2 V
Channel 5	Oxygen	0 to 25% v/v	4 to 20 mA or 0.4 to 2 V
Channel 6	Carbon dioxide	0 to 10% v/v	4 to 20 mA or 0.4 to 2 V
Channel 7	Methane leakage	0 to 100% v/v	4 to 20 mA or 0.4 to 2 V
Channel 8	Flow switch	Flow/No flow	Digital (Input 1)

Channel Displays			
Channel:	**Value:**	**Units:**	**Derived From:**
Channel 1	Methane (corrected)	0 to 100% v/v	Result of Methane correction algorithm (%vol methane)
Channel 2	Actual volume flow	0 to 99999 l/sec	Channel 2 input plus (user configurable pipe diameter)
Channel 3	Actual pure methane flow	0 to 99999 l/sec	Channel 1 display and Channel 2 Display
Channel 4	Instantaneous methane mass flow	0.00 Kg/s sec	Output from Mass Flow Algorithm
Channel 5	Oxygen	0 to 25% v/v	As per Standard TX9042
Channel 6	Normalised Volume Flow	0 to 99999 l/sec	Channel 2 display plus (Normalising Calculations)
Channel 7	Normalised Pure Methane Flow	0 to 99999 l/sec	Channel 3 display plus (Normalising Calculations)
Channel 8	Accumulative Methane Mass Flow	0 to 99999 tonnes	Output from Mass Flow Algorithm

Individual Channel Displays - (from the front screen press right navigation key)			
Channel:	**Value:**	**Units:**	**Derived From:**
Channel 1	Methane (uncorrected)	0 to 100% v/v	Channel 1 Input
Channel 2	Gas velocity	0 to 20 m/sec	Channel 2 Input
Channel 3	Gas temperature	-20 to +80°C	Channel 3 Input
Channel 4	Line pressure	0 to 200 kpa abs.	Channel 4 Input
Channel 5	Oxygen	0 to 25% v/v	Channel 5 Input
Channel 6	Carbon dioxide	0 to 10% v/v	Channel 6 Input
Channel 7	Methane leakage	0 to 100% v/v	Channel 7 Input
Channel 8	Flow switch	Flow/No flow	Channel 8 Input

Information that is Data Logged			
	Description:	**Units:**	**Hardware:**
1	Methane (uncorrected)	0 to 100% v/v	Channel 1 Input
2	Gas velocity	0 to 20 m/sec	Channel 2 Input
3	Gas temperature	-20 to +80°C	Channel 3 Input
4	Line pressure	0 to 200 kpa abs.	Channel 4 Input
5	Oxygen	0 to 25% v/v	Channel 5 Input
6	Carbon dioxide	0 to 10% v/v	Channel 6 Input
7	Pure methane	0 to 100% v/v	Result of methane correction algorithm (% vol methane)
8	Flow switch	Flow/No flow	Channel 8 Input

Disclaimers

The information provided in this document contains general descriptions and technical characteristics of the performance of the product. It is not intended as a substitute for and is not to be used for determining suitability or reliability of this product for specific user applications. It is the duty of any user or installer to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use. Trolex shall not be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments, or find errors in this publication, please notify us at marketing@trolex.com.

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When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Trademarks

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