



Installation and Operations Manual

Model DTX-TC100
Helium analyzer

Firmware version 2.22



Document number: 007986

Revision level: B

Manual part number: 5-06-4900-70-2

Revision date: January 4, 2016

Welcome

The Model DTX-TC100 analyzer is a compact microprocessor controlled instrument designed for helium measurement. This manual provides detailed information on how to operate and maintain the DTX-TC100 analyzer from Neutronics.

For additional information regarding the maintenance and service of the Model DTX-TC100 analyzer, please contact the technical support team at Neutronics. If you have questions or comments, we would like to hear from you.

Neutronics Inc.
Gas Analysis Solutions
456 Creamery Way
Exton, PA 19341
Tel: +1-610-524-8800
Toll Free: 800-378-2287 (US only)
Fax: +1-610-524-8807
Email: info@neutronicsinc.com
Web: <http://www.analyzegas.com/>

Equipment Serial Number: _____

Notice

Product enhancements are driven by our efforts to improve customer satisfaction and business results. Beginning with an accurate understanding of customer needs, our continuous improvement activities focus on upgrading our processes so that we can deliver better design, quality, and cost. As a result, the specifications and information contained in this document are subject to change without notice.

Neutronics, Inc. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this manual.

No part of this document may be photocopied, reproduced, or translated to another language without the prior written consent of Neutronics, Inc.

This work is protected under Title 17 of the US Code and is the sole property of Neutronics Inc. No part of this document may be copied or otherwise reproduced, or stored in any electronic information retrieval system, except as specifically permitted under US copyright law, without the prior written consent of Neutronics Inc.

Copyright ©2015 Neutronics Inc.

Table of Contents

Welcome	ii
Notice	ii
Safety instructions.....	v
Operational safety	v
Designated use	v
1 Introduction.....	1
1.1 Functional overview	1
1.2 Features	1
1.3 System hardware overview	1
1.3.1 DTX-TC100 controller	1
1.3.2 DTX-TC100 Controller inputs and outputs.....	2
1.3.3 TC100 Sensor assembly	2
1.3.4 Power supply.....	3
1.3.5 Sensor interface cable	3
1.3.6 Sensor flow-through head (optional).....	4
2 System installation and start-up.....	5
2.1 Step 1 – Install the components.....	5
2.1.1 Locate and install DIN rail mounted controller	5
2.1.2 Locate and install the remote sensor assembly.....	6
2.2 Step 2 – Make the connections.....	7
2.2.1 24 VDC power	7
2.2.2 Helium sensor	8
2.2.3 Analog output	8
2.3 Step 3 – Power up the Model DTX-TC100	9
2.3.1 Power up check list	9
2.3.2 Power up the unit	9
2.3.3 Calibrate the unit	9
3 Operation.....	10
3.1 Basic setup.....	10
3.1.1 Configuration settings	10
3.2 Controller user interface.....	10
3.2.2 Power indicator LED	10
3.2.3 Alarm indicator LED	10
3.2.4 Fault indicator LED.....	10
3.2.5 Display.....	10
3.2.6 “A” pushbutton.....	11
3.2.7 “B” pushbutton.....	11
3.3 Access to the operating menus via the control panel	11

- 3.3.1 Push button operation 11
- 3.3.2 Network menu 11
- 3.3.3 Option menu..... 11
- 4** Maintenance and spare parts..... 12
 - 4.1 Routine periodic maintenance..... 12
 - 4.2 Spare parts..... 12
- 5** Specifications 13
- 6** Limited warranty 14

Safety instructions



- ▶ Installation, operation, and maintenance of the analyzer must be performed by trained technical personnel.
- ▶ Technical personnel must be authorized by the owner-operator to perform the tasks.
- ▶ Electrical connections must be established by a trained electrical technician.
- ▶ To prevent personal injury, technical personnel must read, understand, and follow all warnings and instructions in this manual before attempting installation or operation of the unit.
- ▶ If the operator cannot read these instructions, operating instructions and safety precautions must be read and discussed in the operator's native language.
 - Si el operador no puede leer las instrucciones, las instrucciones de operación y las precauciones de seguridad deberán leerse y comentarse en el idioma nativo del operador.
 - Si l'utilisateur ne peut lire les instructions, les instructions et les consignes de sécurité doivent lui être expliquées dans sa langue maternelle.
- ▶ No operator access is permitted inside the enclosure or sensor housing. Repairs not described in the operating instructions may only be performed by the manufacturer or the factory authorized service team.

Operational safety



- ▶ Follow all local standards, safety regulations, and installation guidelines. Observe proper safety procedures when working with pressurized gases.
- ▶ Mount the unit in a manner that will guard against excessive vibration, collapse, and exposure to liquids, flammable gases, flames, or high temperatures.
- ▶ Mount the unit in an area of free airflow to prevent the unit from exceeding the operating temperature specifications. Do not mount the analyzer or sensor against hot surfaces.
- ▶ Do not expose the Model DTX-TC100 chassis to water, high humidity or moisture. The analyzer chassis is not watertight.
- ▶ Do not expose the Model DTX-TC100 to flame or high temperatures.
- ▶ Do not expose the Model DTX-TC100 to flammable gases or vapors. The unit is not rated explosion proof or intrinsically safe.
- ▶ Ensure that the pressure of gas entering the remote sensor unit is compatible with the operating instructions.
- ▶ Do not expose the unit directly to an unregulated gas supply. High gas pressures may cause a failure in the sensor assembly.
- ▶ The unit operating voltage is: 110 VAC +/-10%, 50/60Hz, 3.5A, single phase, 3-wire.
- ▶ Failure to use the proper operating power may result in damage to the sensor assembly.
- ▶ Prior to commissioning, check that all connections are in accordance with the specifications listed in this manual.

Designated use

- ▶ The analyzer is a microprocessor-based instrument for measuring helium in clean gas applications. It is designed to minimize all effects of static discharges and interference from RFI and EMI emissions.
- ▶ If the equipment is used in a manner other than as described, the protection provided by the equipment may be impaired and may pose a threat to the safety of personnel.
- ▶ The manufacturer does not accept liability for damage caused by improper or non-designated use.

1 Introduction

1.1 Functional overview

The DTX-TC100 is a microprocessor-based gas analyzer designed to measure helium. The analyzer features the Model TC100 thermal conductivity sensor. The TC100 sensor uses a thermal conductivity gauge to measure the thermal conductivity of the gas stream and then compare it to the factory calibration measurement.

The DTX controller is a DIN rail mounted module with analog output. A sensor interface cable connects the remote mounted sensor to the controller.

1.2 Features

Features of the DTX-TC100 include the following:

- Rapid response time – $T_{90} < 1$ second
- Long service life – expected life is > 5 years
- Linearized with excellent repeatability and long-term stability
- Wide measurement range – measures helium from 0-100%
- Robust design – the TC100 sensor is unaffected by position or motion

1.3 System hardware overview

1.3.1 DTX-TC100 controller

The DTX-TC100 controller (see Figure 1) is a 35mm DIN rail mounted module designed to provide a gas level display and a 4-20mA loop output and to supply power to the TC100 helium sensor. It can be mounted on a separate DIN rail or added to an existing DIN rail in any existing equipment enclosure.



Fig. 1, analyzer enclosure

1.3.2 DTX-TC100 Controller inputs and outputs

1.3.2.1 Helium sensor input

The DTX controller communicates with the Helium sensor using a RS485 interface. Refer to Section 2.2.3 for details on how to connect the sensor.

1.3.2.2 Analog current output

The analog current output is a dynamic current flow used to transmit the displayed concentration to a remote device during normal analyzer operation and system maintenance. The analog current output follows the concentration readout displayed on the DTX-TC100 controller.

The minimum scale deflection default setting is 4mA. Full-scale is fixed at 20mA. The analog current output is scaled according to the selected range. Maximum electrical loading is 600 Ohms. The analog current output is a negative ground, non-isolated 4-20mA current loop.

The 4-20mA loop is available on the DTX-TC100 controller pins 29 and 31.

Refer to Section 2.2.4 for more details on how to connect the 4-20mA loop.

1.3.3 TC100 Sensor assembly

The sensor assembly (see Figures 2 and 3) measures the amount of helium in the gas mixture and transmits an electrical signal to the DTX controller. An interface cable transmits the output signal from the sensor at the sampling point to the DTX controller.

The TC-100 is a thin-film thermopile thermal conductivity sensor designed with a silicon-nitride closed-membrane structure for high sensitivity and resolution. The measurement principle is based on the decrease in effective thermal resistance between the sensitive area of the sensor and the ambient, caused by the thermal conductance of the surrounding gas.

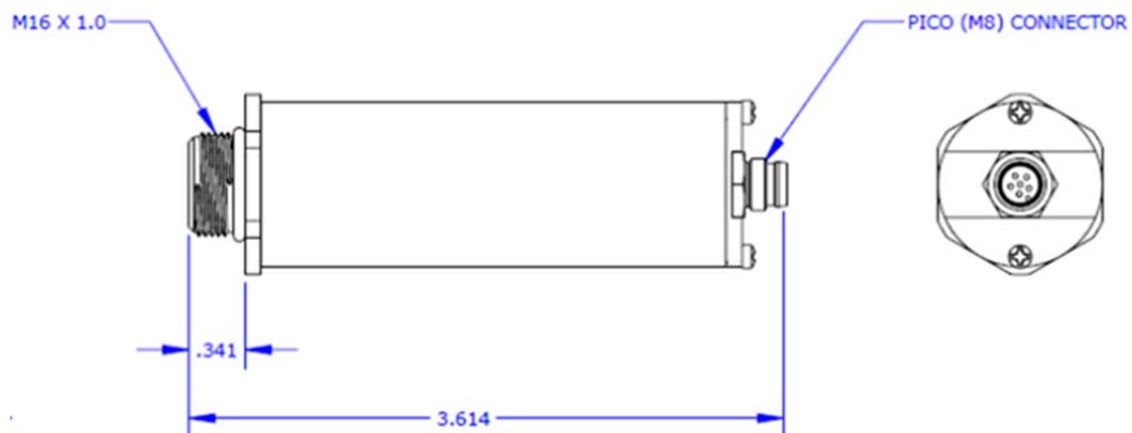


Fig. 2, remote mounted sensor assembly

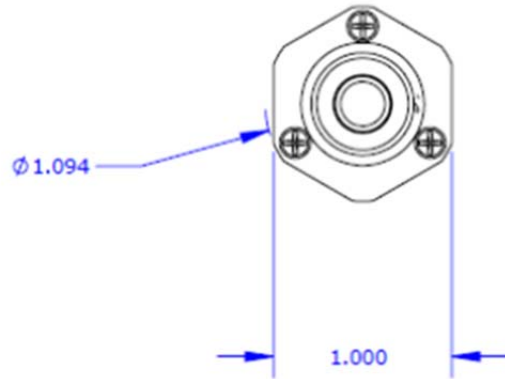


Fig. 3, sensor housing, threaded connection

1.3.4 Power supply

A field-supplied 24VDC power supply is required to power the DTX controller which in turn supplies power to the TC-100 sensor.

Neutronics Part Number 1-12-2240-09-0 is an optional DIN rail mounted single output power supply that features short circuit/overload/over-voltage protection and cooling by free air convection. It includes a built-in DC OK active signal and LED indicator for power on. Rated current output is 1A; rated power output is 24W. Required input voltage is 115VAC.

1.3.5 Sensor interface cable

The sensor interface cable (see Figure 5) provides power and communications connectivity between the DTX-TC100 controller and the TC100 sensor assembly. The cable includes a Turck M8 male right angle, 6-pin connector.

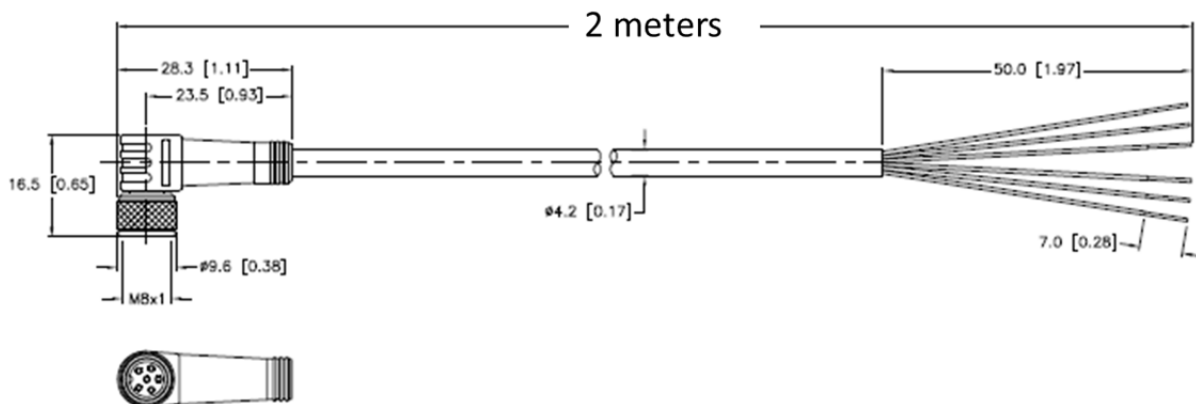


Fig. 5, sensor interface cable with right angle 6-pin connector

1.3.6 Sensor flow-through head (optional)

The sensor mounting base (see Figure 6) allows the TC-100 sensor to be used for process monitoring. It serves as both the receptacle for the sensor and the delivery system for a gas sample from the vessel or sample stream. It includes the sample inlet, flow-through chamber, and sample exhaust.

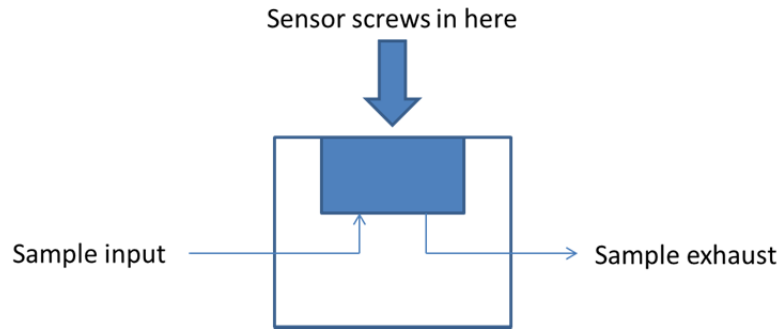


Fig. 6, sensor mounting base

2 System installation and start-up

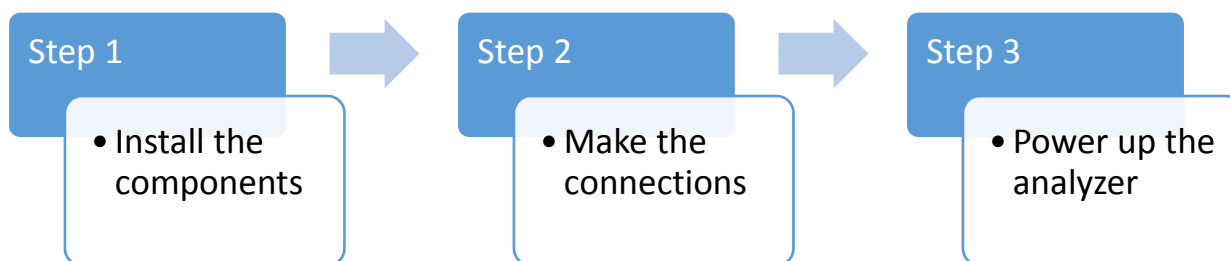


Fig. 7, installation and start-up

2.1 Step 1 – Install the components

2.1.1 Locate and install DIN rail mounted controller

The controller is designed to be installed on a 35mm DIN rail. Select a suitable location for the analyzer so that the unit can be accessed easily when necessary. The digital display, status LEDs, and the interface buttons should be visible and unobstructed.

The analyzer is suitable for IP30 environments when properly installed. It should not be exposed to water, adverse temperature, or shock. The analyzer should be mounted in an area with free airflow to prevent the unit from exceeding the operating temperature specifications. Do not install the analyzer next to hot surfaces.



DANGER: Electrical connections on the DTX-TC100 analyzer module may have hazardous voltages present once power has been applied to the unit. High voltages may remain present for a short time even after power has been disconnected from the analyzer. Observe standard practices when making electrical connections.

CAUTION: The DTX-TC100 analyzer is not rated intrinsically safe or explosion proof. Be certain that no flammable gases are present in the area where the analyzer will be installed.

WARNING: Be certain that all power is OFF to the analyzer and associated wiring (cables) before attempting installation. **DO NOT WORK WITH LIVE WIRES!** Do not leave any exposed wire at the terminal blocks. Before applying power, ensure that all wires are properly connected to the analyzer.

The terminal blocks feature screwed terminals. The pluggable terminal blocks are also removable for ease of wiring or removal of the analyzer module.

2.1.2 Locate and install the remote sensor assembly

The TC100 sensor assembly (see Figure 8) is designed for remote mounting. It can be installed in the head space of an enclosure or vessel or it can be installed in ductwork or piping. The sensor may be installed in a horizontal or vertical orientation. It includes an O-Ring seal to ensure a leak-tight connection to the wall of the enclosure.

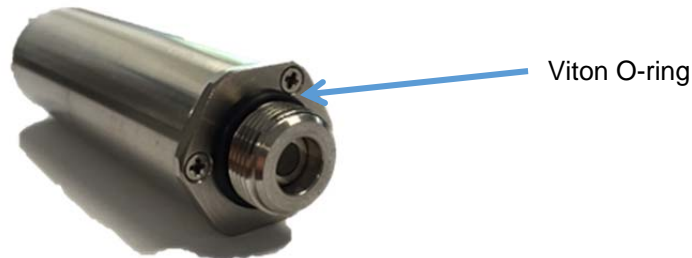


Fig. 8, remote sensor assembly

2.1.2.1 Flow-through head (optional)

Surface mount the flow-through head horizontally (see Figure 9) or vertically on a stationary panel. The flow-through head is 1.25" diameter. It is machined to accommodate two #6-32 machine-type screws (1-inch on center). Do not overtighten the mounting screws. Allow sufficient space for installation of the sensor and the sample inlet and exhaust tube fittings.

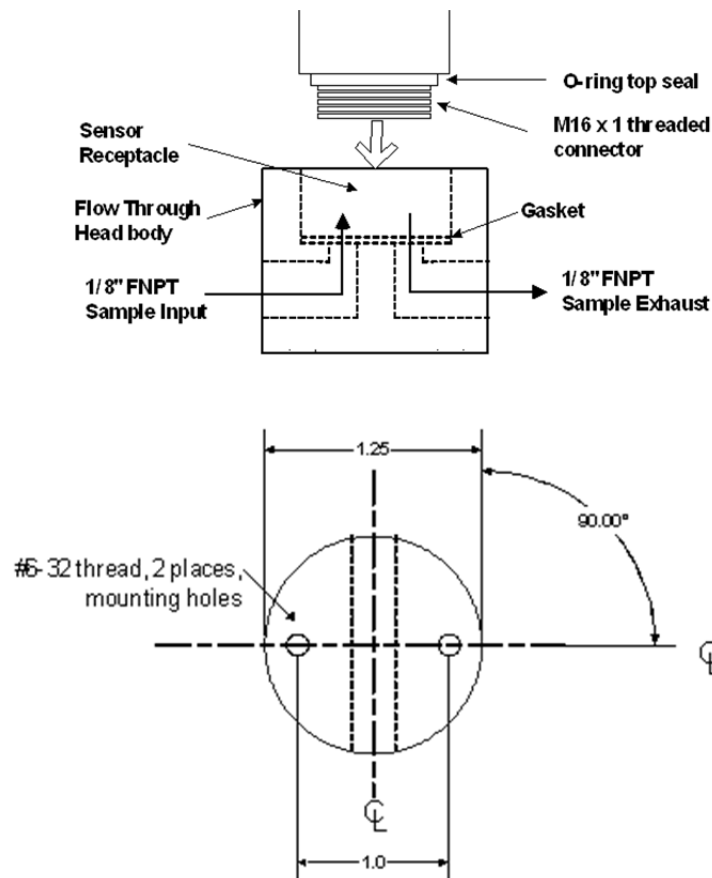


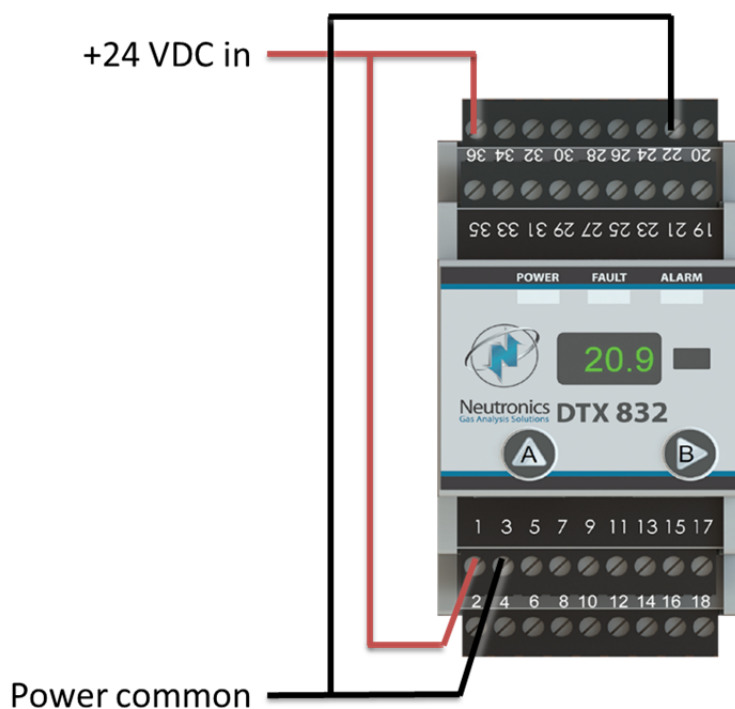
Fig. 9, flow-through mounting head

2.2 Step 2 – Make the connections

2.2.1 24 VDC power

The DTX-TC100 controller requires a field supplied 24 VDC power source. Nominal current draw for the controller is approximately 250mA. Additional power may be required for alarm/control relays. Use a power source that is capable of supplying a minimum of 1A or 50W to the controller.

Connect the 24 VDC power supply to the controller as shown in Figure 10.

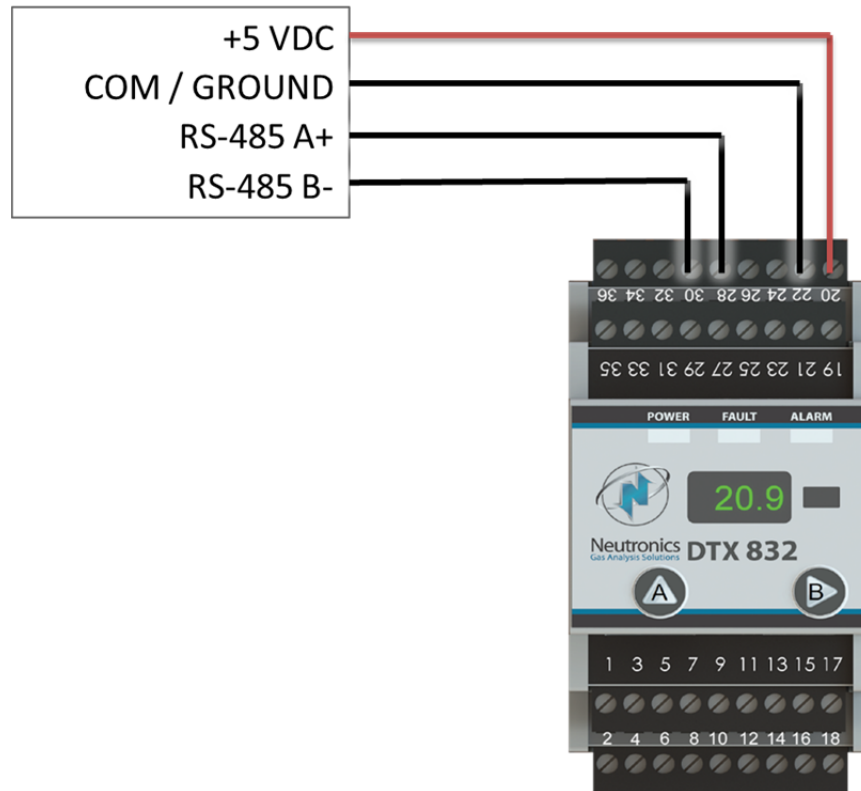


Terminal	Description
1	+24VDC in
3	Power common
22	Power common
36	+24VDC in

Fig. 10, 24 VDC power connections

2.2.2 Helium sensor

The sensor interface cable connects the helium sensor to the DTX controller. Connect the 6-pin locking connector to the sensor. Connect the helium sensor to the controller as shown in Figure 11.



Terminal	Description
20	+5 VDC
22	Common/Ground
28	RS-485A+
30	RS-485B-

Fig. 11, sensor input

2.2.3 Analog output

The analog current output is a dynamic current flow used to communicate the displayed helium concentration to a remote device or process control system. The analog current output follows the concentration readout displayed on the DTX controller.

The minimum scale deflection may be set to either 0mA or 4mA. Full-scale is fixed at 20mA. The analog current output is scaled according to the 0 to 100% measurement range. The default analog output is 4 to 20mA. Maximum electrical loading is 600 Ohms. The analog current output is a negative ground, non-isolated 4-20mA current loop.

Use shielded cable, 20-AWG, 2-conductor, stranded-wire, twisted pairs for the connections. The shielded cable should be drained to earth or chassis ground at the auxiliary equipment. Connect the DTX controller to the process control system as shown in Figure 12.

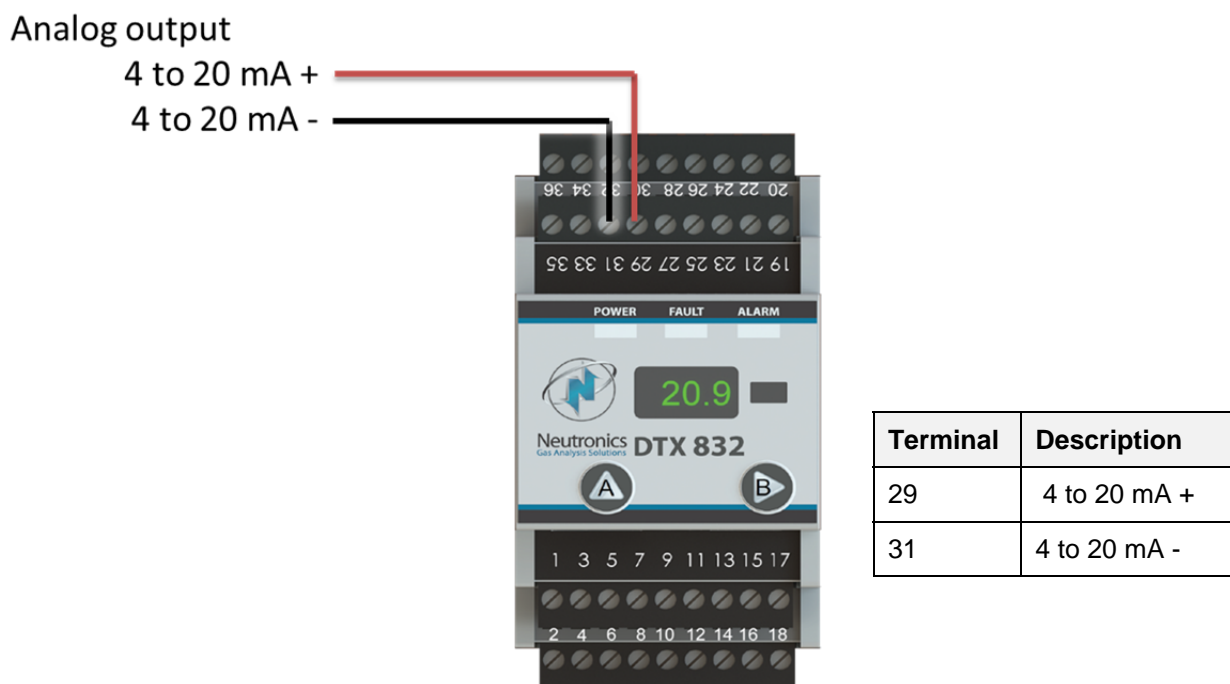


Fig. 12, analog output

2.3 Step 3 – Power up the Model DTX-TC100

2.3.1 Power up check list

Verify the following conditions:

- No flammable vapors are present in the area
- No exposure to rain, dripping water, or hose down
- Wiring installed correctly
- Checked for gas-tight plumbing connection for the sensor
- Ambient temperature is below 40° C (104° F)

2.3.2 Power up the unit

When the DTX-TC100 is powered-up, the LED display will first show “DTX” followed by the firmware version.

After the startup routine is completed, the controller will display three digits with a decimal point for percent range helium measurement.

2.3.3 Calibrate the unit

All units are calibrated at the factory prior to shipment. Field calibration is not supported in this configuration.

3 Operation

3.1 Basic setup

3.1.1 Configuration settings

The DTX-TC100 is shipped ready to use. Factory default configuration settings are listed in the attached configuration report. Review the configuration settings before commissioning your system.

3.2 Controller user interface

3.2.2 Power indicator LED

The Power indicator LED (green) illuminates to provide local status indication that the unit is powered up and operating (see Figure 13). When the power indicator LED is active, the unit is measuring the concentration of the sample gas and updating the display and outputs accordingly. It blinks on and off to indicate that the unit is functioning correctly. When a fault and an alarm are present simultaneously, the green power indicator will turn off.



Status LEDs

Soft key pushbuttons

Fig. 13, controller user interface

3.2.3 Alarm indicator LED

The Alarm indicator LED (red) is not active in this configuration.

3.2.4 Fault indicator LED

The Fault indicator LED (yellow) is not active in this configuration.

3.2.5 Display

The primary purpose of the display is to show the helium concentration. It is also used for feedback of operational status, fault codes, and other information necessary to perform system setup and maintenance.

3.2.6 “A” pushbutton

The “A” pushbutton is used to access menus, select items, and view fault codes.

3.2.7 “B” pushbutton

The “B” pushbutton is used to access menus, run calibration, and view fault codes.

3.3 Access to the operating menus via the control panel

3.3.1 Push button operation

- ▶ Short button press action is < 3 seconds.
- ▶ Long button press action is > 3 seconds.

3.3.2 Network menu

- ▶ Press and hold the “B” button for longer than 3 seconds to access the network menu. The display will show “Network menu”
- ▶ Use short button presses (less than 3 seconds) on the “A” button to scroll through the menu. The display will show the current mode (static or dynamic), IP address, gateway (GW), forced static (>), and forced dynamic (>).
- ▶ If no action is taken for 20 seconds, the unit will exit the menu.

3.3.3 Option menu

- ▶ Press and hold the “A” button for longer than 3 seconds. The display will show “option menu”.
- ▶ Use short button presses (less than 3 seconds) on the “A” button to scroll through the menu. The display will show the firmware version, calibration options (CAL), and reset.
- ▶ If no action is taken for 20 seconds, the unit will exit the menu.

4 Maintenance and spare parts

4.1 Routine periodic maintenance

The unit does not require any major periodic servicing. Use the chart below as a general guide.

Task	Recommended frequency		
	At commissioning	Annually	As required
Clean the housing and display			✓

4.2 Spare parts

Description	Neutronics Part Number
Instruction Manual	5-06-4900-70-2
Controller module	8-32-0000-02-0
Sensor interface cable, 2m length	6-01-1001-92-2
Helium sensor assembly	8-01-1001-38-0

5 Specifications

Parameter	Specification
Controller dimensions	4.16" (105.6mm) x 2.07" (52.5mm) x 2.79" (70.8mm)
Weight	1 lb. (0.45 kg)
Warm up time	1 second
Sensor type	TC100, thermal conductivity
Accuracy (sensor)	0.1%
Accuracy (transmitter)	0.1% full scale
Response time	T ₉₀ < 1 second
Expected sensor service life	> 5 years
Controller mounting	35mm DIN rail mounting bracket
Sensor connection	M16 x 1 thread
Environmental	IP30 rating, no hazardous moving parts or electrical hazards. Not designed for dripping water.
Relative humidity	0-100%, non-condensing
Operating Temperature	0° C to 40° C (32° F to 104° F)
Storage temperature	10°C to 40°C (50°F to 104°F)
EMC	EU directive 2004/108/EC
Marking (controller)	CE, ETL, RoHS
Power supply (controller)	24VDC +/- 0.5V, 1.0A maximum, by field supplied PLC power supply
Power supply (TC100 sensor)	5VDC +/- 10% (from the controller)
Local display	3.7mm four character 5x7 LED dot matrix
Display resolution (controller)	0.1%
Outputs	4-20mA
Helium concentration resolution	0 – 89.9%.....XX.X 90 – 100%..... XX.X
Power (system OK)	Green LED
Warranty	1 year from date of shipment

6

Limited warranty

1. Because of the many and varied circumstances and conditions under which NEUTRONICS, INC.'s products are used, and because NEUTRONICS, INC. has no control over this actual use, NEUTRONICS, INC. makes no warranties which extend beyond the express provisions herein. NEUTRONICS, INC. MAKES NO IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS. NEUTRONICS, INC. makes no express warranties beyond the following provisions, which only apply to the original purchaser.
2. NEUTRONICS, INC. only warrants to the original purchaser as follows: When the products and their component parts are properly installed and maintained in accordance with the published NEUTRONICS, INC. manuals, and if the product has not been modified or tampered with, then only the products actually manufactured by NEUTRONICS, INC. shall be warranted to be free from defects in material and workmanship for a period of one year from shipment by NEUTRONICS, INC., except NEUTRONICS, INC. sensors which shall be free of said defects for a period of time from date of shipment as specified in the NEUTRONICS INC. technical specifications for that specific sensor.
3. The original manufacturers' warranties apply to products and components not manufactured by NEUTRONICS, INC.

NON-ASSIGNABILITY OF WARRANTY

4. The warranty as set forth in these terms and conditions may not be assigned, transferred, sold, or alienated in any other way and extends only to the original purchaser.

PURCHASER'S EXCLUSIVE REMEDY

5. The original purchaser's sole and exclusive remedy, unless varied by written agreement with NEUTRONICS, INC., is that NEUTRONICS, INC. will, at NEUTRONICS, INC.'s option, repair or replace any defective part which is returned to NEUTRONICS, INC. within ninety (90) days of discovery of the defect.

DISCLAIMER OF CONSEQUENTIAL DAMAGES

6. In no event shall NEUTRONICS, INC. be liable for consequential damages, including but not limited to damages for loss of use, damages for lost profits, and damages for resulting harm to property other than the NEUTRONICS, INC. assemblies and their component parts.

Intended use for the Model DTX-TC100

The Model DTX-TC100 helium analyzer was designed to provide the trained operator with useful information regarding the measurement of helium in air. This information may be used for analyzing and controlling manufacturing through timely measurements (i.e., during processing) of critical quality and performance attributes of processes with the goal of ensuring final product quality. Before implementation, the user must fully understand the operation and limitations of this instrument as well as the application for its use. The responsibility for the proper application, operation, installation, and maintenance of the Model DTX-TC100 analyzer is the sole obligation of the trained operator. The purchaser is required to ensure that operators are properly trained in the use of this unit as well as in the possible hazards associated with its use or with the intended application. The purchaser must ensure that all of the proper warnings, labels, instruction manuals, lock outs, redundant components, hazard analysis, and system validation have been completed and provided to the trained operator before installation of the Model DTX-TC100 instrument.

Copyright © 2015, Neutronics, Inc., all rights reserved