Instruction Manual For
Thermistor Vacuum Gauge
GT-430

Myers Vacuum
1155 Myers Lane
Kittanning, PA 16201
Phone: 724-545-8331
Fax: 724-545-8332
www.myers-vacuum.com

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THERMISTOR VACUUM GAUGE GT-430

1.0 INTRODUCTION

1.1 Product Description

The GT-430 thermistor vacuum gauge is a microprocessor controlled, single station, constant temperature thermal conductivity type gauge controller housed in a $1/8^{th}$ DIN case. The unit uses the rugged and proven GT-034 sensor and operates over a pressure range of 1000 Torr to 1 mTorr. The gauge has a large four digit LED display and includes backlit indication of either TORR or MTORR. The unit features two independent process control relays capable of operating over the full range of the gauge. Each relay has a separate high and low set point value, allowing hysteresis to be adjusted. LEDs indicate the status of each relay. Three front panel buttons allow the user to toggle through and adjust the set points as well as calibrate the gauge. A series of LEDs indicate which parameter is currently being displayed. The front panel also contains a 9-element trend sensing LED bar graph that indicates the direction and magnitude of pressure change. This feature assists in vacuum leak detection. The unit features an RS-232 serial interface that allows a remote system to request information and has a log/linear analog voltage output that corresponds to pressure.

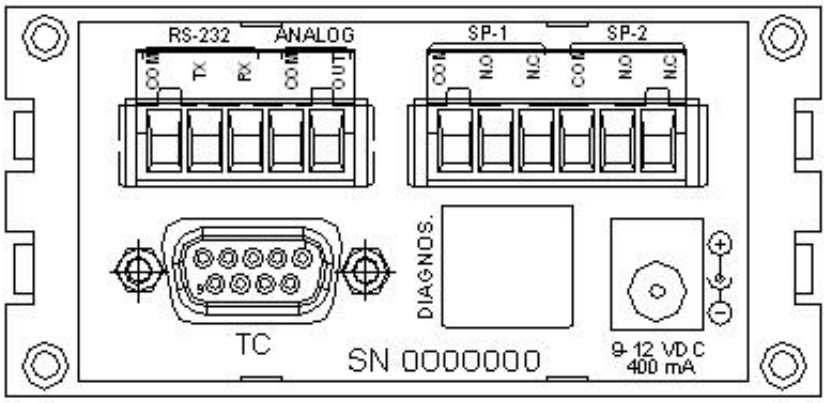
1.2 Operating Principles

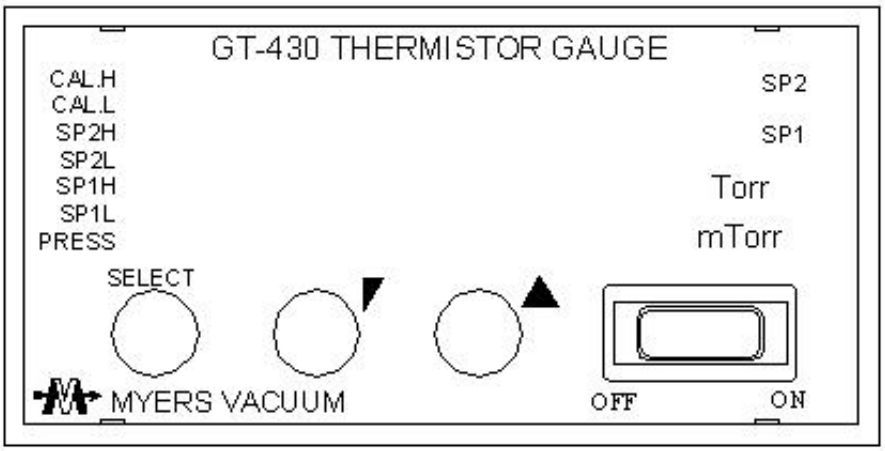
The GT-430 gauge maintains the GT-034 thermistor sensor at a constant temperature by continuously varying the power supplied to the sensor. The amount of power required to maintain this fixed temperature varies according to pressure. A decrease in pressure reduces the number of gas molecules available to transfer heat away from the thermistor element and less power is therefore required to drive the sensor. A microprocessor computes the pressure based on sensor drive power, ambient temperature, and several calibration reference values. The microprocessor also computes the rate of change in pressure and displays this value on the trend sensing bar graph. A digital to analog converter generates the log/linear analog voltage output. The set points and the calibration references are implemented in software and their values are stored in nonvolatile memory within the microprocessor.

1.3 Specifications

GT-430 Thermistor Vacuum Gauge

Power Input	100-120 VAC 50/60 Hz 15 watts or 9-12 VDC 6 watts
Pressures Scale	1000 Torr to 1 mTorr
Number of Sensing Stations	One
Pressure Sensing Tube	Type GT-034 with 1/8” pipe thread or 0.406” diameter O-Ring sealing surface.
Tube Cable	10 ft length standard with both 9-pin gauge and octal sensor connector
Cabinet Dimensions	3.78” wide 5.1” deep 1.89” high
Mounting Hole Dimensions	3.64 wide x 1.75” high (allow 8” for mounting depth)
Relay Connections	One removable six position terminal block with common, normally closed, normally open connections for each set point.
Relay Trip Point Adjustments	Entire range of gauge
Relay Types	SPDT 5 Amp 250 VAC Max
RS-232	RX, TX, and COM (9600 Baud)
Analog Output	0-3 Volt, log/linear, 0.5v per decade (COM and OUT)


RS-232
ANALOG
SP-1
SP-2
COM
TX
RX
COM
OUT
COM
N.O
N.C
COM
N.O
N.C
DIAGNOS.
TC
SN 0000000
9-12 VDC
400 mA


GT-430 THERMISTOR GAUGE
CAL.H
CAL.L
SP2H
SP2L
SP1H
SP1L
PRESS
SP2
SP1
Torr
mTorr
SELECT
MYERS VACUUM
OFF
ON

2.0 INSTALLATION

2.1 Unpacking

Unpack and inspect the carton and contents for damage or shortages. Damages in transit are normally the responsibility of the Transportation Company and should be reported to them.

2.2 Installing the Pressure Sensing Tube.

The tube may be installed in any position. For accurate pressure response and freedom from zero drift, the tube elements must remain clean. Therefore, the tube should be installed to minimize the entrance of oil vapor or process contaminants.

Install the sensing tube in any of the following ways:

Thread the tubulation into a mating 1/8" pipe thread opening in the vacuum system. Seal the threads with Teflon tape, Celvaseal Leak Sealant (Part No. 271375), or other low vapor pressure sealing material.

Or

Place the end of the tubulation tightly against a similar-sized tube installed in the system and enclose the butt joint in a short piece of heavy-wall rubber vacuum tubing. Put a thin coat of vacuum grease, such as Celvacene-Medium, on the tubulation and the system connections. The grease lubricates the connecting parts and provides a vacuum seal.

Or

Place the tubulation end of the sensor into a 0.406" diameter O-Ring seal.

2.3 Installing the Gauge Unit

The gauge can be used either as a bench top unit or mounted into a panel. Panel installation requires a panel cut out of 3.64" wide x 1.75" high. Allow ~8" for mounting depth (allow 1" space between each unit). Insert the unit into the mounting cut out. From the back of the gauge install the two side mounting clamps (supplied with gauge) and tighten the Phillip screw on each side. Do not over tighten, over tightening could damage the mounting bracket.

2.4 Electrical Connections

Plug the tube cable octal end into the sensing tube and the 9-pin end into the rear of the GT-430 gauge. The gauge is provided with a 100-120 Vac to 9 Vdc adaptor. Plug the power cord into a suitable 50/60 Hz outlet.

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2.5 Process Control Relay Contact Connections

The relay-controlled outputs of the GT-430 unit are available at the 6-pin removable screw terminal block connector on the right rear panel. Relay contact connections are marked on the panel. The relay contacts are rated at 250VAC at 5 Amperes. Do not over tighten; the recommended torque is 0.5 Nm.

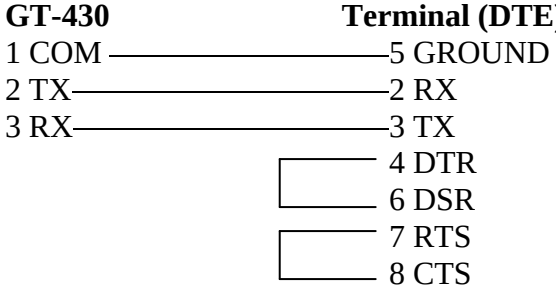
The relay coils are controlled by signals from the gauge. Power must be supplied to the common relay contacts.

2.6 RS-232

The connections for the RS-232 interface are located on the left rear of the unit. They are the first three pins of the five-pin connector and are labeled on the unit. Remove the connector from the unit and make the necessary electrical connections to the "COM", "TX" and "RX" connectors. Do not over tighten; the recommended torque is 0.5 Nm.

Interface Type	RS-232
Baud Rate	9600
Stop Bits	1
Data Bits	8
Parity Bits	None
Flow Control	None
Voltage of Logic	0 +9VDC
Voltage of Logic	1 -9VDC

Cable Pin Out



Software Commands

All commands must terminate with a <CR>

- Standard ASCII is used
- Commands are **not** case sensitive
- 'b' refers to a binary digit (0, 1)
- 'n' refers to a decimal digit (0 - 9)
- 'h' refers to a hexadecimal digit (0 - F)

Command	Response	Example	Description
=RPR	pressure nnnn Torr pressure nnn Torr pressure nn Torr pressure n.n Torr pressure n.nn Torr pressure nnn mTorr pressure nn.n mTorr pressure n.n mTorr pressure ----	=RPR pressure 760 Torr	Read Pressure
=RSP1S	SP1 b	=RSP1S SP1 0	Read Set Point 1 Status (0=off, 1=on)
=RSP2S	SP2 b	=RSP2 SP2 1	Read Set Point 2 Status (0=off, 1=on)
=RSP1L	SP1L nnnn Torr SP1L nnn Torr SP1L nn Torr SP1L n.n Torr SP1L n.nn Torr SP1L nnn mTorr SP1L nn.n mTorr SP1L n.n mTorr	=RSP1L SP1L 1.04 Torr	Read Set Point 1 Low Trip
=RSP1H	SP1H nnnn Torr SP1H nnn Torr SP1H nn Torr SP1H n.n Torr SP1H n.nn Torr SP1H nnn mTorr SP1H nn.n mTorr SP1H n.n mTorr	=RSP1H SP1H 5.0 Torr	Read Set Point 1 High Trip
=RSP2L	SP2L nnnn Torr SP2L nnn Torr SP2L nn Torr SP2L n.n Torr SP2L n.nn Torr SP2L nnn mTorr SP2L nn.n mTorr SP2L n.n mTorr	=RSP2L SP2L 25.3 mTorr	Read Set Point 2 Low Trip
=RSP2H	SP2H nnnn Torr	=RSP2H	Read Set Point 2 High Trip

	SP2H nnn Torr SP2H nn Torr SP2H n.n Torr SP2H n.nn Torr SP2H nnn mTorr SP2H nn.n mTorr SP2H n.n mTorr	SP2H 54.2 mTorr	
=RTMP	temperature nn.nn C temperature n.nn C	=RTMP temperature 24.35 C	Read Ambient Temperature (Celsius)
=RPADC	pressure ADC $hhhhh	=RPADC pressure ADC $D9A16	Read Pressure Analog to Digital Converter
=RTADC	temperature ADC $hhhhh	=RTADC temperature ADC $49E77	Read Ambient Temperature Analog to Digital Converter
=RDAC	recorder DAC $hhh	=RDAC recorder DAC $0A2	Read Recorder Digital to Analog Converter
=RCAL	cal H$hhhhh HT$hhhhh M$hhhhh MT$hhhhh L$hhhhh LT$hhhhh	=RCAL cal H$DA596 HT$DCACC M$B712C MT$B8815 L$1DEE8 LT$1ED68	Read Calibration References
=RVER	Version n.n	=RVER version 1.0	Read Software Version

2.7 Analog Output

The connections for the analog output are located on the left rear of the unit. They are the last two pins of the five-pin connector and are labeled on the unit. Remove the connector from the unit and make the necessary electrical connections to the “COM” and “OUT” connectors. Do not over tighten; the recommended torque is 0.5 Nm.

The analog output is 0-3 Vdc, log/linear, 0.5v per decade with one mvolt resolution.

Voltage	Pressure
0.000 V	1 mTorr
0.500 V	10 mTorr
1.000 V	100 mTorr
1.500 V	1 Torr
2.000 V	10 Torr
2.500 V	100 Torr
3.000 V	1000 Torr

3.0 OPERATION

3.1 Measuring Pressure

After proper installation and connection, the gauge may be turned on. The gauge will briefly enter a warm-up period as indicated by animation of the display. When the warm-up is complete the unit will display the pressure (if connected to a sensing tube). The display will indicate the pressure within the sensing tube in units of "Torr" or “mTorr”. The gauge is calibrated for dry air.

3.2 Adjusting Process Control Relay Set Points

The set points of the two-process control relays are programmed using the buttons **SELECT**, **UP**, and **DOWN** on the front panel. Each set point is defined by two parameters, set point low (SPL) and set point high (SPH). A relay is energized when the pressure falls below the low set point and de-energized when the pressure rises above the high set point. To adjust these values press the **SELECT** button until the LED next to the desired parameter is illuminated. Press the **UP** or **DOWN** buttons to change the value (holding the buttons down will cause a rapid change). If no buttons are pressed, after a period of thirty seconds the gauge will save any changes to the currently selected parameter and revert to displaying pressure. Setting the low parameter (SPL) to a value greater than or equal to the high parameter (SPH) will disable the relay.

3.3 Leak Detection Techniques

In using this gauge for locating leaks, it is necessary to allow the system pressure to stabilize. The suspected area is then probed with a gas having a thermal conductivity, which is substantially different than that of air. Hydrogen or hydrogen rich gases such as propane, acetylene, and natural gas will provide up-scale readings.

Argon is also a fairly good probe gas and may be used with complete safety. It provides a down-scale reading.

Acetone or isopropyl alcohol, in a fine tipped squirt bottle, may also be used to probe for leaks; however, solids carried in with the liquid can plug small leaks. Such leak closures are usually temporary.

CAUTION: Acetone and other solvents will attack most paints and

plastics and some gasket materials.

NOTE: ALL OF THE ABOVE MATERIALS OTHER THAN ARGON ARE INFLAMMABLE. USE CAUTION.

Another method for leak hunting is to apply vacuum putty over suspected areas and watch for a pressure drop when the leak is covered.

3.4 Trend Sensing™ And Leak Detection

The Trend Sensing™ feature assists the operator in leak detection by displaying the instantaneous rate of change in pressure on a nine element bar graph. When the pressure is static, only the center segment is illuminated. Increasing pressures cause the right-hand segments to progressively illuminate. Likewise, the left-hand segments progressively illuminate with decreasing pressures. This allows the operator to quickly identify small changes in pressure as well as in the thermal conductivity of gases present within the vacuum system caused by a probing gas or liquid entering the system through a leak as outlined in the previous section.

4.0 MAINTENANCE

4.1 Cleaning The Sensing Tube

Disconnect and remove the tube from the vacuum system. Wash the tube interior with a hot water and detergent solution (Joy and Alconox are good). Agitate gently.

Rinse thoroughly with hot water.

Rinse with clean acetone or isopropyl alcohol.

Dry tube by heating moderately for several hours and/or by evacuating on a water aspirator. Do not use compressed air.

4.2 Re-calibration

The GT-430 is carefully calibrated at the factory before shipment. If a sensor is purchased with the gauge, the gauge will be calibrated to this sensor. If no sensor is purchased, the gauge will be calibrated to match the output of a typical sensor.
Drift in the calibration or zero setting of the gauge reading is usually due to contamination of the sensing tube by oil vapor or process contaminants. Cleaning as specified in Section 4.1 will frequently restore the original accuracy. Should this fail; installation of a new GT-034 tube is recommended.

4.3 Gauge Circuit Calibration

All gauge circuits are factory adjusted to produce a specified output under standard operating conditions. When new pre-calibrated tubes are connected to a correctly adjusted gauge circuit, the pressure should read properly over the entire scale. Some variation is to be expected, especially at the atmospheric end of the scale. For optimum accuracy the GT-430 should be calibrated to a specific GT-034 sensor.

Calibration of the GT-430 is accomplished by adjusting three calibration reference values: **CAL. HIGH**, **CAL. MID**, and **CAL. LOW** using buttons on the front panel.

CAL. LOW defines the pressure reading at **0.1 mTorr**.
CAL. MID defines the pressure reading at **100 Torr**.
CAL. HIGH defines the pressure reading at **1000 Torr**.

Calibration procedure:

1.) Pump the vacuum sensor to a pressure below **1x10-4 Torr** and allow the gauge to stabilize.

2.) Press the **SELECT** button until the LED beside **CAL. LOW** is lighted.

3.) Use the **UP** and **DOWN** buttons to adjust the pressure reading so it just reaches **0.0 mTorr**.

4.) Raise the pressure to **10 Torr** and allow the gauge to stabilize.

5.) Press the **SELECT** button until both the LED beside **CAL. LOW** and the one beside **CAL. High** are lighted.

6.) Use the **UP** and **DOWN** buttons to adjust the pressure reading to **10 Torr**.

7.) Vent the vacuum sensor to atmosphere and allow the gauge to stabilize.

8.) Press the **SELECT** button until the LED beside **CAL. HIGH** is lighted.

9.) Use the **UP** and **DOWN** buttons to adjust the pressure reading to atmospheric pressure as indicated by a barometer (typically **760 Torr)**.

If the gauge still will not read correctly after performing the previous steps with a new sensor see assistance in section 7.0.

5.0 REPLACEMENT PARTS LIST FOR THE GT-430

	DESCRIPTION	PART NO.
	Sensing Tube, Type GT-034	277289
	Power Supply 9VDC	500618

6.0 ACCESSORIES

Cable Assemble for Sensing Tube

	10 ft. length	500687-1
	15 ft. length	500687-2
	25 ft. length	500687-3
	50 ft. length	500687-4
	100 ft. length	500687-5
	KF-16 to 1/8 FPT	500230-16
	KF-25 to 1/8 FPT	500230-25
	KF-40 to 1/8 FPT	500230-40
	KF-50 to 1/8 FPT	500230-50
	CF-16 to 1/8 FPT	500231-1
	CF-35 to 1/8 FPT	500231-2
Leak Sealant	Celvaseal 2-oz Brush On	271375
Leak Sealant	Celvaseal 6-oz Spray	271373-6

7.0 ASSISTANCE FROM MYERS VACUUM

Gauge repair and re-calibration service is available at the factory. For information, contact the local MYERS VACUUM sales office or the MYERS VACUUM Order Service Dept. Myers Vacuum, Kittanning, Pa 16201.

8.0 SCHEMATIC

This section contains the Electrical Schematic: D500678