

**Instruction Manual For  
Thermocouple Vacuum Gauge  
GTC-395**



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## THERMOCOUPLE VACUUM GAUGE TYPE GT-395

### 1.0 INTRODUCTION

#### 1.1 *Product Description*

The GTC-395 thermocouple vacuum gauge is a microprocessor controlled single station thermally conductivity type gauge and controller housed in a 1/8<sup>th</sup> DIN case. The unit uses the rugged and proven GTC-036 sensor and covers a pressure range of 1 mTorr to 3000 mTorr with an atmosphere indication. The gauge features two independent relays that can be set within the range of the gauge, each set point includes a separate high and low pressure value. Three front panel buttons allow the user to toggle through and adjust the values. Separate LED's indicate which value is being displayed and there are separate LED's to indicate the status of the set points. The unit features an RS-232 serial interface that allows a remote system to request information and has a separate linear analog voltage output that is proportional to pressure.

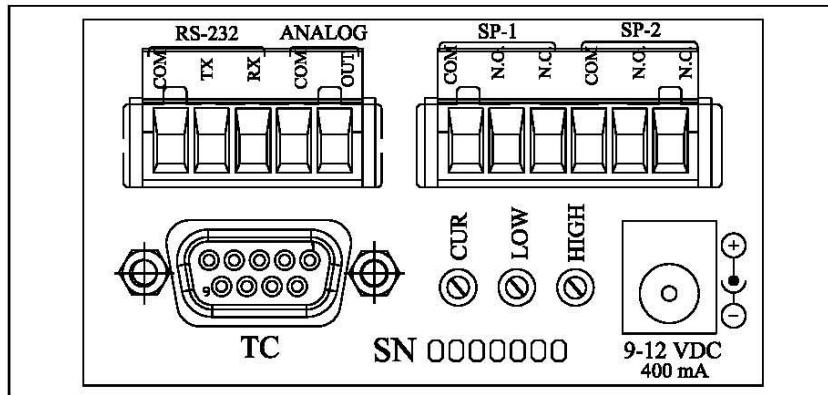
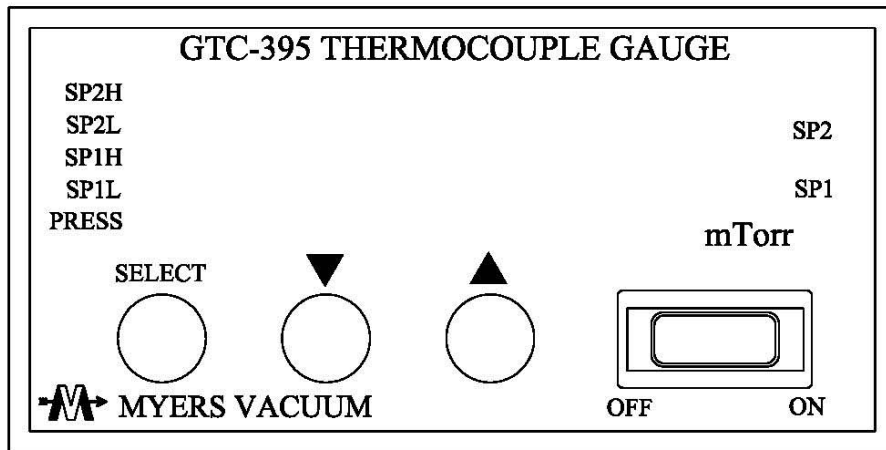
#### 1.2 *Operating Principles*

The GTC-395 gauge supplies a constant current source to the heating element of the GTC-036 sensor. The thermocouple junction in the sensor generates a voltage signal that varies with the temperature of this heating element. A decrease in pressure reduces the number of gas molecules available to transfer heat away from the heating element, resulting in a temperature rise and an increased output from the sensor. This signal is filtered and amplified, and then sent to an analog to digital converter. The microprocessor reads this signal, does further filtering and uses the result as an index into a lookup table for pressure. This value is written to the display and to a digital to analog converter that generates the analog voltage output. The set points are implemented in software and their values are stored in nonvolatile memory on the microprocessor.

### 1.3 Specifications

#### GT-395 Thermocouple Vacuum Gauge

Power Input	100-120 VAC 50/60 Hz 40 watts or 9-12 VDC 6 watts
Pressures Scales	1 mTorr to 3,000 mTorr with atmosphere indication of "ATM"
Number of Sensing Stations	One
Pressure Sensing Tube	Type GTC-036 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 Points 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, 1 mV per 1 mTorr (COM and OUT)



## 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. To install into a panel you must make a panel cut out of 3.64" wide x 1.75" high and 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 GTC-395 gauge.

The gauge is provided with a 100-120 Vac to 9Vdc adaptor. Plug the power cord into a suitable 50/60 Hz outlet.

## 2.5 *Connecting Load To Relay Control Contacts*

The relay-controlled outputs of the GTC-395 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 coil is controlled by a signal from the gauge. Power must be supplied to the common relay contacts.

## 2.6 *RS-232*

The connection for the RS-232 is located on the back of the unit. It is part of a five-pin connector. The connections 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**

<b>GTC-395</b>	<b>Terminal (DTE) DB9 Female</b>
1 COM	5 GROUND
2 TX	2 RX
3 RX	3 TX
	4 DTR
	6 DSR
	7 RTS
	8 CTS

### 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 mTorr pressure nnn mTorr pressure nn.n mTorr pressure n.n mTorr pressure ---- pressure ATM	=RPR pressure 94.5 mTorr	Read Pressure
=RSP1S	SP1 b	=RSP1S SP1 0	Read Setpoint 1 Status (0=off, 1=on)
=RSP2S	SP2 b	=RSP2 SP2 1	Read Setpoint 2 Status (0=off, 1=on)
=RSP1L	SP1L nnnn mTorr SP1L nnn mTorr SP1L nn.n mTorr SP1L n.n mTorr	=RSP1L SP1L 503 mTorr	Read Setpoint 1 Low Trip
=RSP1H	SP1H nnnn mTorr SP1H nnn mTorr SP1H nn.n mTorr SP1H n.n mTorr	=RSP1H SP1H 1000 mTorr	Read Set Point 1 High Trip
=RSP2L	SP2L nnnn mTorr SP2L nnn mTorr SP2L nn.n mTorr SP2L n.n mTorr	=RSP2L SP2L 10.6 mTorr	Read Set Point 2 Low Trip
=RSP2H	SP2H nnnn mTorr SP2H nnn mTorr SP2H nn.n mTorr SP2H n.n mTorr	=RSP2H SP2H 74.0 mTorr	Read Set Point 2 High Trip
=RCUR	Current nn.n mA Current n.n mA	=RCUR current 86.0 mA	Read Sensor Drive Current
=RPADC	Pressure ADC \$hhhh	=RCADC pressure ADC \$ F42B	Read Pressure Analog to Digital Converter
=RCADC	Current ADC \$hhhh	=RCADC current ADC \$35C	Read Sensor Drive Current Analog to Digital Converter
=RDAC	Recorder DAC \$hhh	=RDAC recorder DAC \$0A2	Read Recorder Digital to Analog Converter
=RVER	Version n.n	=RVER version 1.0	Read Software Version



## 2.7 *Analog Output*

The connection for the analog output is located on the back of the unit. It is part of a five-pin connector. The connections 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 one mvolt per one mTorr. The output range is 0-3 Vdc to with one mvolt resolution.

## 3.0 OPERATION

### 3.1 *Measuring Pressure*

After proper installation and connection, the gauge may be turned on. Allow 1 minute for warm-up time. The thermocouple gauge tubes are not harmed by operation at pressures up to full atmospheric pressure.

The pressure meter will indicate the pressure within the sensing tube in units of “MilliTorr”. The gauge is calibrated for dry air.

### 3.2 *Adjusting Relay Control Set Points*

There are two relay control set points; they are both adjustable from the front panel. The set points operate by having a low (SPL) and high (SPH) value. The relay is energized once the pressure is below the low set point and the relay is de-energized once the pressure is above the high set point. To adjust the set points press the select button until it illuminates the LED next to the parameter that needs changed and press the up or down arrows as needed (holding the arrow buttons down will cause a rapid change). Every time the select button is depressed the LED indicator will be lit next to the parameter that is being adjusted. If the select button or a change in the parameter is not done within thirty seconds the unit returns to reading pressure. Having low (SPL) at a value equal to or higher than the high (SPH) will disable the set point.

## 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-395 Gauges are carefully calibrated at the factory before shipment. Each GTC-036 Sensing Tube is also pre-calibrated so that it can be plugged into a gauge circuit and used without the need for further adjustment.

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-036 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 at the atmospheric end of the scale.

Should the gauge fail to read properly when used with a new tube, the following adjustments should be made.

Locate the three adjustment potentiometers located on the back of the instrument. These are labeled cur, low and high.

To adjust and check the sensor current turn the unit off and press down the select, up, and down arrow switches while turning the unit on. The unit is now displaying the current in milliamps to the sensor (it should be set at 86)

To adjust the high and low calibration points have the sensing tube exposed to atmospheric pressure and at normal room temperature. Pump the sensing tube down to less than 1 millitorr and adjust the “cal low” potentiometer. Recheck the atmospheric full-scale reading and adjust the potentiometer labeled “cal high”.

Recheck the above steps. If the gauge is still reading incorrectly see assistance in section 7.0.

## 5.0 REPLACEMENT PARTS LIST FOR THE GT-395

DESCRIPTION	PART NO.
Sensing Tube, Type GTC-036	5504358
Power Supply 9VDC	500618

## 6.0 ACCESSORIES

Cable Assemble for Sensing Tube

10 ft. length	500601-1
15 ft. length	500601-2
25 ft. length	500601-3
50 ft. length	500601-4
100 ft. length	500601-5
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 500642:

