



# DIGIVAC 22W Series

## INSTRUCTION MANUAL

Wide Range Linearized Vacuum Transmitter  
and Controller

*YOU MUST READ THIS MANUAL BEFORE USE*



**The DigiVac Company**

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## 1.0 DESCRIPTION AND PRINCIPLE OF OPERATION

The DIGIVAC Model 22W (LCD) Vacuum Transmitter is an active gauge compact digital vacuum sensing instrument. It works in conjunction with a DC powered Vacuum Gauge tube to produce a linear and RS-232 output proportional to the sensed vacuum. This instrument has a set point enabling it to control external equipment.

The DigiVac Model 22W operates when the unit's vacuum gauge tube produces a millivolt output proportional to its temperature rise above ambient. This millivolt signal is amplified and conditioned by the microprocessor. A control algorithm in the processor adjusts the excitation of the gauge tube so as to hold the tube at an essentially constant temperature. The pressure is communicated with the user as a number on the digital display, a signal on the unit's serial port, and as an analog voltage.

Consult the DigiVac website [www.DigiVac.com](http://www.DigiVac.com) for information about other DigiVac vacuum controllers and gauges.

## 2.0 CONSTRUCTION

The Model 22W consists of indicating and controlling instrument, and the gauge tube.

The gauge tube houses the various thermocouple sensing, heating and compensating elements and terminates in an octal connector. Regulating circuitry in the compact controller provides proper current for gauge tube excitation, and thus compensates for resistance in the probe leads.

The Model 22W LCD option includes a .62 x 1.49 inch LCD screen that provides a digital readout of real time vacuum pressure.

### 3.0 UNPACKING AND INSPECTION

After the DIGIVAC Model 22W is received, it should be carefully unpacked and inspected for damage during shipment and for completeness. In the event of a loss shipment, a claim should immediately be made to the common carrier or the postal service, as applicable. The DigiVac warranty pertains only to the instrument, and does not cover losses in shipping. For more information regarding our warranty visit [www.digivac.com](http://www.digivac.com)

Each Model 22W should come with:

- A vacuum gauge controller
- A thermocouple vacuum gauge tube (vacuum sensor)
- An AC adapter that runs on 100–230VAC, 50/60 Hz with line cord adapter
- Pre-tested under actual vacuum against a NIST standard

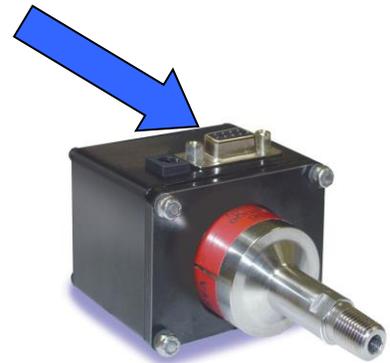
It is also available with an optional output vacuum reading to LCD display.



## 4.0 INSTALLATION

The instrument should be mounted into a clean, dry part of a vacuum system. The electrical connections can be made as follows:

- Pin 1 Analog Input (Set point)
- Pin 2 RS232 Transmit Output (9600 N81)
- Pin 3 No connection
- Pin 4 Analog Output
- Pin 5 Power and Signal ground
  
- Pin 6 Relay Normally Open
- Pin 7 Relay Common
- Pin 8 Relay Normally Closed
- Pin 9 See packing list. 5 to 24 VCD (adjacent to pin 5)



- The Gauge Tube should be installed stem down in a clean, dry vacuum system to facilitate drainage
- The axis of the tube should be vertical, although angles of up to 45 degrees are generally well tolerated. The unit should not be mounted directly on a vacuum pump
- It is best to avoid mounting the unit where it will be subjected to excessive vibration or oil vapors
- If it must be placed close to a vacuum pump, it is desirable to have at least two 90 Degree turns in the piping, this way, there will be no direct optical path for oil vapors, and gauge tube life and calibration will be maximized
- The vacuum sensor has a 1/8 pipe thread connection. If any significant torque is to be applied to this connection, Use a 7/16 open-end wrench
- Do not use the body of the instrument as a wrench!

## 5.0 OPERATION

After installation, the instrument is ready for immediate operation. The unit consists of the instrument housing with interface connector and a Vacuum Gauge tube. It can be powered by an external source of 5.0V or with the included external 115/230 VAC power adapter.

### Analog Output

The unit has an analog output, which can be used to transmit vacuum to external equipment such as PLC's or chart recorders. This analog output is normally scaled by 5V5T volts. LBD volts are also available, as described below.

The settings are scaled, linear-by-decade, as follows:

0.0 to 0.999 volts	=	0 to 999 millitorr
1.1 to 1.99 volts	=	1.0 to 9.9 torr
2.1 to 2.99 volts	=	10.0 to 99 torr
3.1 to 3.76 volts	=	100 to 760 torr

<b>Torr</b>	<b>Display</b>	<b>Scale</b>	<b>LBD Volts</b>	<b>5V5T Volts</b>
.000	0 0 0	0	0.000	0.000V
.100	1 0 0	0	0.100	0.100V
.200	2 0 0	0	0.200	0.200V
.500	5 0 0	0	0.500	0.500V
.925	9 2 5	0	0.925	0.925V
1.00	1.0 0	1	1.100	1.000V
2.20	2.2 0	1	2.200	2.200V
5.18	5.1 8	1	1.518	5.000V
8.86	8.8 6	1	1.886	5.000V
11.9	11. 9	2	2.119	5.000V
34.7	34. 7	2	2.347	5.000V
55.3	55. 3	2	2.553	5.000V
71.9	71. 9	2	2.719	5.000V
96.4	96. 4	2	2.964	5.000V
110	110	3	3.110	5.000V
340	340	3	3.340	5.000V
550	550	3	3.550	5.000V
760	760	3	3.760	5.000V

## **6.0 SERVICING AND MAINTENANCE**

### **GAUGE TUBE SERVICING**

In many cases, a gauge tube may become fouled with oil or other foreign matter. It is often possible to restore the functionality of contaminated probes with cleaning. If the contaminant is known, the tube should be filled with a fluid that is known to be a solvent to that contaminant. As an example, Acetone is often effective in removing residues of some oils. Commercial carburetor cleaners are very powerful solvents and are highly effective against some contaminants.

After cleaning with solvents, the gauge tube should be completely dried or flushed with a volatile solvent to assure that it is dry prior to re-installing it. If this is not done, it may result in contamination of the system.

### **MAINTENANCE**

Your vacuum instrument should give you many years of trouble free service. There are no regularly scheduled maintenance intervals. If consistent accuracy is required, it is recommended that the gauge, tube and power supply be returned for a yearly calibration check.

## **6.1 FACTORY REPAIR AND CALIBRATION**

The vacuum gauge assembly is designed to provide years of trouble-free service, and the liberal internal use of plug-in components make it easily repairable. No field servicing of the unit is recommended, other than replacement of the gauge tube, but factory servicing and calibration are available at a nominal cost and fast turn-around times.

## **6.2 FIELD CALIBRATION**

Each DigiVac vacuum gauge controller is calibrated to the particular vacuum gauge sensor that is shipped with the unit. While changing the gauge tube is possible, it will result in a slightly different reading as all

gauge tubes are not created equal. Although it is preferable that all calibration be performed at DigiVac, field calibration can be accomplished.

Before re-calibrating the instrument, it should be ascertained that the instrument is in fact incorrect. In many cases, the problem will be with a tube that is fouled, or a system that is operating improperly. It is recommended that a spare tube be kept on hand and stored in a clean, dry place. Then, in cases of suspect readings, the tube should be changed before proceeding further.

Calibration: The unit arrives to the factory calibrated, and re-calibrations are best performed by the DigiVac Company. User calibrations are possible, however using the following procedure:

Remove the four screws holding the top housing in place and carefully remove the top and bottom exposing the printed circuit board.

High End: At atmosphere, adjust the potentiometer adjacent to the INA 122 and set it so that pin 2 of the microprocessor, (same as Pin 6 of the INA 122) is at 4.25 VDC at atmospheric pressure.

Low End: Locate the markings on the printed circuit board adjacent to pins 26, 27, and 28 of the microprocessor. It reads "+Z -"

- Connect the serial output of the unit to a PC set at 9600 baud
- Observe the readings on the PC screen
- Operate the unit at the lowest attainable vacuum value. (Must be 100 mtorr or lower)
- Short pin 27 ("Z") to pin 28 ("+") to increase the reading
- Short pin 27 ("Z") to pin 26 ("-") to decrease the reading

## **7.0 NOTES ON CALIBRATION**

The instrument is calibrated in nitrogen, which has thermal properties virtually identical to air. Other gasses will affect the readings by an amount

proportional to the thermal conductivity of the gases. In most cases, the gases present in a vacuum system will be air, nitrogen, or oxygen, and no appreciable errors will occur.

Certain other gases, however, have thermal conductivity significantly greater than air and will cause the instrument to read higher than the actual amount of pressure. Examples of such gasses are water vapor, fluorocarbon refrigerants, and acetone. Conversely, other gasses have thermal conductivity significantly lower than air and will cause the instrument to read lower than actual pressure. Examples of such gasses include helium, oxygen and to a lesser extent, CO<sub>2</sub>.

When interpreting readings using gasses other than air, it should be borne in mind that the DIGIVAC Model 22W reads Torr, which is a measure of absolute pressure – that is the opposite of vacuum. Thus, a lower numerical reading actually is a higher level of vacuum. For more information, refer to section 8.0.

When in doubt, consult DigiVac.

## **8.0 UNDERSTANDING TORR**

The DIGIVAC vacuum instrument and many similar instruments are calibrated in microns or "milliTorr." It is appropriate to discuss what microns are and to relate microns to other measures of pressure and vacuum. Microns are not really a measure of vacuum at all, but rather of absolute pressure. It will be recalled that the pressure of the atmosphere is 14.696 or approximately 14.7 pounds per square inch at sea level. This pressure is due to the weight of all of the air in the earth's atmosphere above any particular square inch. This 14.696 psi is equivalent to the pressure produced by a mercury column of approximately 29.92 inches high or .76 meters (about 3/4 of a yard) or 760 millimeters of mercury. Atmospheric pressure varies greatly with altitude. It decreases approximately 1 inch of mercury per thousand feet of altitude. It also varies widely with local weather conditions. (Variations of one half inch in a single day are common.)

The word vacuum means pressure lower than atmospheric or "suction," but, in describing negative pressure, the atmosphere is only a satisfactory reference if we are dealing with values of vacuum down to about 27 inches of mercury. Below that, it is much more useful to talk in terms of absolute pressure, starting from absolute zero.

The Model 22W measures from 1 micron ( $1 \times 10^{-3}$  Torr) all the way up to 760,000 Microns (760 Torr) or Atmosphere. Since this gauge measures through the full range of rough vacuum, you can easily pinpoint either gross or fine process errors or leaks.

One TORR, a commonly used unit, is an absolute pressure of one millimeter of mercury. A milliTorr is equal to one thousandth of a TORR. A MICRON is the same as a milliTorr.

## 9.0 Accessories and Modifications

Please consult the product guide and website for the latest available

## 10.0 SPECIFICATIONS

Range	.001–760
Units	Torr or mbar
Vac Interface	1 / 8 inch MNPT or KF/NW
Sensor	Varian 531 or 536
Display	16 digit character display
Dimensions	1.6" x 1.8" x 2.4"
Analog Output	0–5 VDC
Power	100–240VAC 50/60Hz CE rated

#### INSTRUMENT ACCURACY

.001 to .010 Torr	+/- .001 Torr
.010 to 2.00 Torr	+/- 10% of reading
2.0 to 160 Torr	+/- 50% of reading
160 to 760 Torr	+/- 25% of reading

For repair or recalibration, return gauges to:

The DigiVac Company  
105B Church Street  
Matawan, NJ 07747  
Ph: 732.765.0900  
Fax: 732.765.1800

E-mail: Direct from our website [www.DigiVac.com](http://www.DigiVac.com)

*The DigiVac Company manufactures a complete line of vacuum gauges and process computers. Contact us or your distributor if you wish for further information.*

See [www.DigiVac.com](http://www.DigiVac.com) for our latest offerings

# 11.0 Terms and Conditions

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**Warranty:** All DigiVac products are warranted against any manufactured defect for a period of thirty (30) days from date of purchase, unless such product is a custom-work for you and not a standard DigiVac product. Any product qualifying as a custom-work shall not be warranted against any defects for any purpose, and your acceptance of such custom-work shall relieve DigiVac of any liability for any purpose.

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