



WARNING

Please read the user manual carefully
and operate according to the regulations.

EN_V0

AUTOOL®

**Im 120
DIGITAL MANIFOLD GAUGE**

USER MANUAL

CE

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1. Overview

Intelligent electronic refrigerant group instrument is an auxiliary instrument for the installation, testing and maintenance of refrigeration equipment such as air conditioners and cold storage. The instrument has double pressure test, dual temperature test, digital readout, multi-unit switching, multi-mode function and built-in refrigerant database.

The instrument uses high-strength engineering plastics and flexible non-slip silicone design, the whole machine is solid and comfortable to hold. Built-in 32-bit digital processing unit and high-precision data acquisition unit, high data and stability. Large-size liquid crystal display, LCD backlight support, data display clear and easy to read, convenient light operation. Long-life valve switch, 1/4-inch standard interface design to ensure that the instrument's durability and versatility.

The instrument can measure double pressure (gauge pressure) at the same time, as well as dual temperature measurement, with automatic multi-unit pressure conversion, automatic conversion of temperature Celsius / Fahrenheit, to facilitate different needs. Built-in 89 kinds of refrigerant pressure-evaporation temperature database, also calculate the subcooling superheat, to facilitate direct reading of operating process data. Also it tests percentage of vacuum measurement; pressure leak measurement, leak time speed record. It is deserved to have this multi-functional, accurate and simply operated digital manifold let you do the job right.

2. Safety rules and precautions

This manual includes the use of instrument instructions and warnings for safe operation and maintenance. Failure to use the meter in accordance with the manual may damage the instrument. This instrument strictly follows the

IEC/EN61010-1 safety standards for design and production.

1) The pressure measured by the digital manifold pressure tester is gauge pressure.

2) Pressure testing ranges from -101Kpa to 6Mpa (-0.1bar to 60bar).

3) The limit pressure is 10 Mpa (100 bar).

4) The maximum operating pressure of standard hose is 600 PSI (approximate 4.13 Mpa, 41.3 bar). The limit pressure is 3000 PSI approximate 20.68 Mpa, 206.8 bar).

5) Please confirm the rated pressure value of the tested equipment before testing. Do not use it if it exceeds the range of the instrument. If the packed hoses does not match the pressure requirement, you can use suitable replacements for testing.

6) Do not use and store the instrument in high temperature, high humidity, flammable, explosive and strong electromagnetic fields.

7) Please do not change the instrument internal circuit, to avoid any damage of the instrument or danger occurring.

8) Please wear qualified protective equipment to protect user during testing.

9) Please use the instrument in a well-ventilated environment to prevent inhalation of toxic gases.

3. International electrical symbols

	DC
	AC
	DC/AC
	warning
	dangerous voltage (electric shock)
	earth
	double insulation
	fuse
	battery

4. Product specifications

Pressure test: gauge pressure

Pressure test unit: Kpa; Mpa; bar; inHg; PSI.

Pressure test range: 0 Kpa – 6000 Kpa

Pressure test resolution: 1 Kpa

Pressure test accuracy: +/- 0.5 % (FS) + 5dgt

Pressure overload limit: 10000 Kpa (10 Mpa; 100 bar;)

Vacuum test: relative vacuum

Vacuum test unit: Kpa; Mpa; bar; inHg; PSI.

Vacuum test range: -101 Kpa – 0 Kpa

Vacuum test resolution: 1 Kpa

Temperature test unit: °C (Celsius), °F (Fahrenheit)

Temperature test range: -40°C–150°C (-40°F–302°F)

Temperature test resolution:

0.1°C (-40°C–99.9°C), 1°C (100°C–150°C)

0.1°F (-40°F–99.9°F), 1°F (100°F–302°F)

Temperature test accuracy: +/- 0.5 °C + 2dgt
+/- 0.9 °F + 2dgt

Built-in 89 kinds of refrigerant NIST:

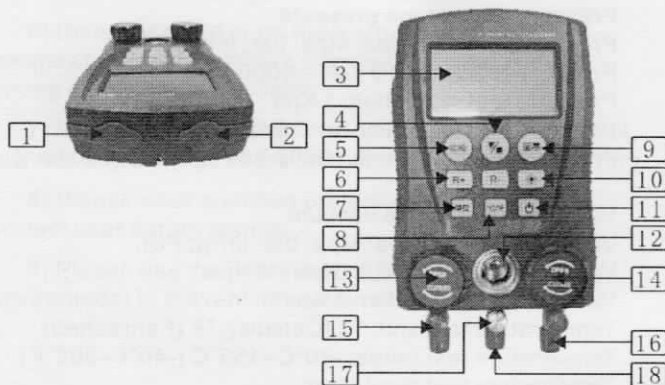
◆ According to American NIST standard

R11	R113	R114	R115	R116	R12	R123	R124	R125	R1270
R13	R134A	R14	R141B	R142B	R143A	R152A	R170	R21	R218
R22	R227EA	R23	R236EA	R245CA	R245FA	R290	R32	R401A	R401B
R401C	R402A	R402B	R403A	R403B	R404A	R405A	R406A	R407A	R407B
R407C	R407D	R407E	R408A	R409A	R409B	R41	R410A	R410B	R411A
R411B	R412A	R413A	R414A	R414B	R415A	R415B	R416A	R417A	R418A
R419A	R420A	R421A	R421B	R422A	R422B	R422C	R422D	R423A	R424A
R425A	R426A	R427A	R428A	R50	R500	R501	R502	R503	R504
R507A	R508A	R508B	R509A	R600	R600A	R717	R744 (Co2)	R1234	

Power Supply: 4 X 1.5V (SIZE.AA / LR6)

Dimensions: 170*110*50mm weight: 950g

5. Product Icon and description



- 1) Clamp-on temperature probe socket
- 2) Clamp-on temperature probe socket
- 3) LCD display
- 4) Run/Stop button: In Leak Test Mode, Test Control Button
- 5) Function button: test function mode switch button
- 6) R+/R-Refrigerant Type Selection Buttons: Switch to select different types of working refrigerants
- 7) Unit button: pressure unit switch button

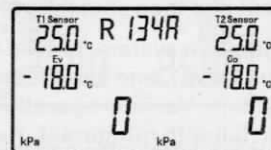
- 8) °C/°F button: temperature unit switch button
- 9) Zero button: pressure display zero button
- 10) Backlit button
- 11) Power button
- 12) Refrigerant observation window
- 13) Low pressure valve
- 14) High pressure valve
- 15) 1/4 inch low pressure inlet
- 16) 1/4 inch high pressure inlet
- 17) Pressure release valve
- 18) Refrigerant inlet/vacuum pump inlet

6. Function instructions

6-1. Refrigerant filling and pressure inspection

A. Turn off the blue valve and red valve.

B. Power on the instrument. Then make sure if the LCD displays pressure test status as below picture. If not, press the Function button to switch it.

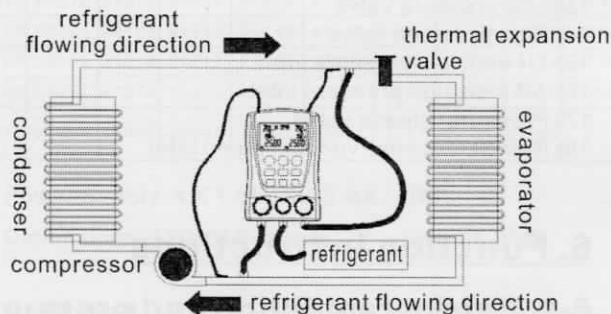


C. If the temperature probe accessories have been connected to the instrument, the real-time temperature will be displayed. If not, no display of it.

D. Press R+/R- buttons, Unit button and °C/°F button to select tested refrigerant and reading display respectively.

E. When the instrument is turned on, there may be 10 digits in the high and low pressure display area. At this time, press the zero button long until it returns to zero.

F. Connect the instrument to the refrigeration system according to the chart below. (pay attention to the direction of the refrigerant flowing!!!!)



G. Turn on the refrigerant valve and gently press the pressure release valve to vent the air in the connecting hose.

H. When the refrigeration system stops, turn on the high pressure valve (red valve) and fill with a certain amount of refrigerant and then shut the valve quickly.

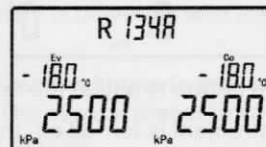
I. Run the refrigeration system, turn on the low pressure valve (blue valve), and fill with the refrigerant into the refrigeration system. Vacuum operation is required if it is filled initially or in full with refrigerant. Refer to the section on vacuum operation.

J. After the filling is completed, shut the low pressure valve (blue valve) and refrigerant valve. Let the refrigeration system running.

K. Shut down the refrigeration system, make sure all valves are turned off, then disconnect the instrument between refrigeration system and source. Do not remove the high pressure valve connection until the pressure drops to the safe point. Then turn off the instrument.

Note: The filling operation of different equipment or refrigerants may vary. Please read carefully the relevant specific operation requirements for filling operation, so as to avoid damage to user or equipment caused by improper operation!!!

◆ The instrument can display the corresponding Evaporation Temperature (EV) and Condensation Temperature (CO) during the refrigerant pressure test, as shown below:



◆ If the clamp-on temperature probes are connected to the instrument, LCD will display the real-time temperature in the spot T1 Sensor and T2 Sensor, as shown below. Please make sure clamp-on temperature probes are connected as step F and contacted fully to the refrigeration pipes.



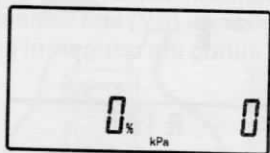
◆ The instrument can calculate the SH - Superheat and SC - Subcooling as shown below as long as the tested refrigerant is preset and clamp-on temperature probes are connected well.



6-2. Vacuum operation

A. Turn off the blue valve and red valve.

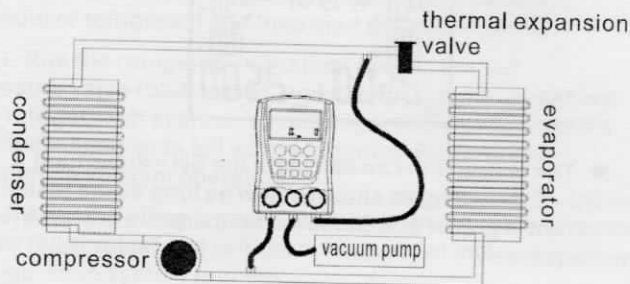
B. Power on the instrument. Then make sure if the LCD displays vacuum test status as below picture. If not, press the Function button to switch it.



C. Press the unit button to adjust the reading unit.

D. When the instrument is turned on, there may be 10 digits in the high and low pressure display area. At this time, press the zero button long until it returns to zero.

E. Connect the instrument to the refrigeration system according to the chart below. (pay attention to the direction of the refrigerant flowing!!!!) (Connected clamp-on temperature probes will not affect the operation..)



F. Turn on the blue valve and red valve, and start the vacuum pump.

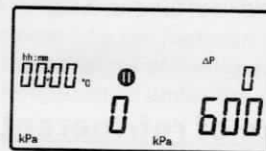
G. After the vacuum operation is completed, turn off the blue valve and red valve, then shut the vacuum pump.

At this time, pressure leak test mode can be used to check leakage in the system (Please refer to 6-3. Pressure Leak Test).

6-3. Pressure Leak Test

A. The instrument is power on with the blue and red valves turned off.

B. Press the Function button to pressure leak test mode shown as below. The current pressure value is displayed at lower right corner of LCD.



C. Press the Run/Stop button to start the leak test, as shown below:



At this time, the lower left corner records the initial pressure value; the lower right corner shows the instantaneous pressure value; the "ΔP" display area shows the difference between initial pressure value and instantaneous pressure value.

The time display area shows how long the leak test lasts in the format of Hour : Minute (HH:MM). All the pressure units on the screen are the same. You can switch different pressure units by pressing the unit button.

7. Common problems

7-1. Low battery power supply

The instruments has low power sign. When it is displayed , it means the battery power is insufficient. At this time, the battery should be replaced as required in order to avoid affecting normal use.

7-2. Damaged refrigerant hose or valve stem

Please check the pipe fittings and the hoses before testing. Once any damage is found , please replace it immediately to avoid improper use or any accident occurring.

7-3. Failure of refrigerant filling

There is a valve core in the refrigerant inlet of the refrigeration system. When connecting the instrument, pay attention to the two terminals of the hoses. Connect one terminal with a core to the refrigeration system, while another terminal without a core to the instrument.

7-4. Potential leak points

- Every hose terminal comes with a nylon pad that is limited a certain life of using. Over use or other situation will make it defective, which result in leakage.

- The instrument refrigerant inlet (the middle port of the instrument) has a port with valve core , which is used to vent the air in the hoses after connecting the refrigerant to the instrument.

The port is equipped with a copper plug screw. It is required to tighten it every time before or after operation.

- Check the refrigeration system's pipes and connectors.

8. Glossary

◆ Saturation

The state of saturation is the coexistence of a refrigerant in a liquid and gas state.

◆ Condensation temperature and evaporation temperature

Condensation temperature: in the condenser, the refrigerant is condensed by the high-temperature gaseous refrigerant to the temperature of the liquid refrigerant, that is, the saturation temperature under the condensing pressure.

Evaporation temperature: in the evaporator, the refrigerant evaporates from the liquid refrigerant to the temperature of the gaseous refrigerant, that is, the saturation temperature under the evaporation pressure.

◆ Degree of subcooling and superheat

Subcooling: condensing temperature - condensing outlet temperature.

Superheat: evaporation outlet temperature - evaporation temperature.

The lower subcooling can make the refrigeration capacity of the system better. Adding subcooling circuit and economizer in the refrigeration system is to increase the subcooling for refrigerant increasing.

The degree of expansion of the expansion valve (refrigerant charge) affects the degree of superheat. The greater the degree of superheat, the smaller the opening of the expansion valve can be determined (the refrigerant charge is less).

◆ Sensible heat and latent heat

The amount of heat required to raise the water temperature from 0 degrees to 100 degrees is sensible heat, the water is heated to 100 degrees, and the hot water becomes water vapor, but the temperature is still 100 degrees. The heat required for this process is called latent heat.

◆ Gauge pressure and absolute pressure

Gauge pressure: Gauge pressure refers to the pipeline pressure, refers to the pressure measured by pressure gauges, vacuum gauges, U-shaped tubes, etc., also known as relative pressure. The "table pressure" starts with atmospheric pressure and the symbol is P_g .

Absolute pressure: The pressure directly acting on the surface of a container or object is called "absolute pressure", the absolute pressure value is absolute vacuum as a starting point, the symbol is PABS (ABS is a subscript) and the absolute pressure is atmospheric pressure + gauge pressure.

At atmospheric pressure, the gauge pressure is 0 and the absolute pressure is 1.013 bar.

◆ Dry bulb temperature, wet bulb temperature and black ball temperature

Dry bulb temperature: the temperature measured by ordinary thermometers.

Wet bulb temperature: a wet cloth is wrapped around the thermometer, and the temperature indicates a drop due to the evaporation of water. The temperature at this time is called the wet-bulb temperature.

The device, which has both the dry ball thermometer and the wet bulb thermometer, is called the dry hydrometer, which can be used to measure the relative humidity in the atmosphere.

Black ball temperature: also called actual temperature, it indicates the actual sensory temperature expressed by temperature when a person or an object is combined with radiant heat and convective heat in a radiant heat environment.

The black ball temperature measured is generally higher than the ambient temperature, which is the air temperature.

◆ Relative humidity and absolute humidity

Absolute humidity: the mass of water vapor in a unit volume of air is called the "absolute humidity" of air. It is a representation of the physical quantity of atmospheric dryness and humidity. It is usually expressed in grams of water vapor contained in 1 cubic meter of air.

Relative humidity: the actual water vapor density in air and the percentage of saturated water vapor density at the same temperature are called the "relative humidity" of air.

The degree of dryness and humidity of the air is related to the degree of saturation of water vapor contained in the air, but it is not directly related to the absolute amount of water vapor contained in the air.

◆ COP and EER

EER: the ratio of the cooling capacity to the effective input power when the air conditioner performs a cooling operation under rated conditions and specified conditions, the value of which is expressed in W/W.

COP: under rated operating conditions (high temperature) and specified conditions, when the air-conditioning heat pump heating operation, the ratio of heating and effective input power, the value of W/W.