AUTOOL LM120/LM120+

Digital Manifold Gauge

User Manual

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AUTOOL®

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企业标准/Corporate standard: Q/OR 005-2023

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TABLE OF CONTENTS

CAUTIONS

Warning

⚠ This manual includes instructions and precautions for operation and maintenance. Failure to use the instrument in accordance with this manual could cause damage to instrument.

- The pressure measured by the digtal manifold pressure tester is gauge pressure.
- Pressure testing ranges from -101Kpa to 6Mpa (-0.1bar to 60bar).
- The limit pressure is 10Mpa (100bar).
- The maximum operating pressure of standard hose is 600PSI (approximate 4.13Mpa, 41.3bar). The limit pressure is 3000PSI approximate 20.68Mpa, 206.8bar).
- 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.
- Do not use and store the instrument in high temperature, high humidity, flammable, explosive and strong electromagnetic fields.
- Please do not change the instrument internal circuit, to avoid any damage of the instrument or danger occurring.
- Please wear qualified protective equipment to protect user during testing.
- Please use the instrument in a well-ventilated environment to prevent inhalation of toxic gases.

PRODUCT INTRODUCTION

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.

International Electrical Symbols

⎓	**DC**	≂	**DC/AC**
⚠	**Warning**	⚡	**High Voltage (Electric Shock)**
⏚	**Earth**	⧈	**Double Insulation**
⎓	**Fuse**		**Battery**
~	**AC**		

Specifications

Pressure Test	**Gauge Pressure**
Pressure Test Unit	**Kpa; Mpa; bar; inHg; PSI;**
Pressure Test Range	**0Kpa~6000Kpa**
Pressure Test Resolution	**1Kpa**

Pressure Test Accuracy	**±0.5%(FS) +5dgt**
Pressure Overload Limit	**10000Kpa(10Mpa; 100bar)**
Vacuum Test	**Relative Vacuum**
Vacuum Test Unit	**Kpa; Mpa; bar; inHg; PSI;**
Vacuum Test Range	**-101Kpa~0Kpa**
Vacuum Test Resolution	**1Kpa**
Temperature Test Unit	**°C(Celsius), °F(Fahrenheit)**
Temperature Test Range	**-40~150°C(-40~302°F)**
Temperature Test Resolution	**0.1°C(-40~99.9°C), 1°C(100~150°C) 0.1°F(-40~99.9°F), 1°F(100~302°F)**
Temperature Test Accuracy	**±0.5°C +2dgt, ±0.9°F +2dgt**
Power Supply	**4X1.5V(SIZE.AA/LR6)**
Dimension	**170*110*50mm**
Weight	**950g**

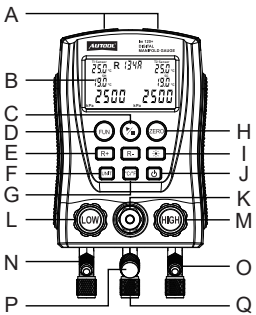
Build-in 89 kinds of Refrigerant NIST:

* 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

PRODUCT STRUCTURE

Structure Diagram

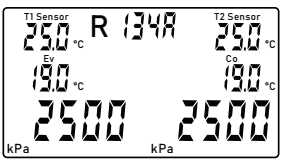


A	Clamp-on temperature probe socket		
B	LCD display		
C	Run / Stop button: In Leak Test Mode, Test Control Button		
D	Function button: test function mode switch button		
E	R+/R-Refrigerant type selection buttons: Switch to select different types of working refrigerants.		
F	Unit button: pressure unit switch button		
G	°C/°F button: temperature unit switch button		
H	Zero button: pressure display zero button		
I	Backlit button	**J**	Power button
K	Refrigerant observation window		
L	Low pressure valve		
M	High pressure valve	**N**	1/4 inch low pressure inlet
O	1/4 inch high pressure inlet	**P**	Pressure release valve
Q	Refrigerant inlet / Vacuum pump inlet		

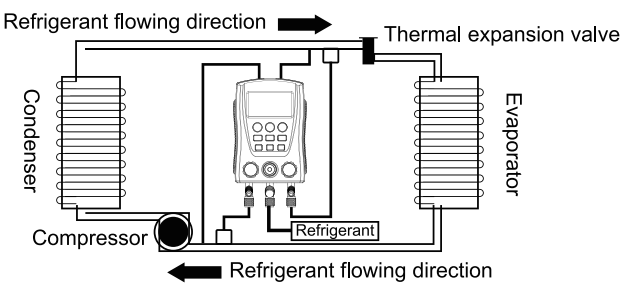
FUNCTION INSTRUCTIONS

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.

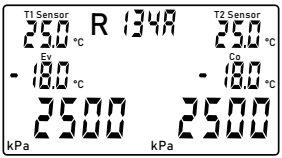
Do not remove the high pressure valve connection until the pressure drops to the safe point. Then turn off the instrument.

⚠ NOTE

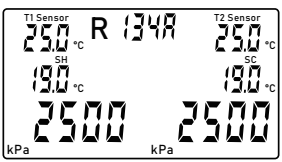
▶ The filling operation of different equipment or refrigerants may vary. Please read carefully the relevant specific operation requirements for filling operation, so as to avoid damage to user or equipment caused by improper operation! ! !

- 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.

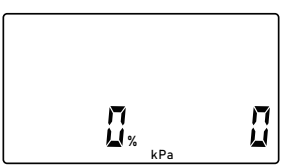


- The instrument can calculate the SH - Superheat and SC - Subcooling as shown below as long as the tested refrigerant is preset and clamp-on temperature probes are connected well.



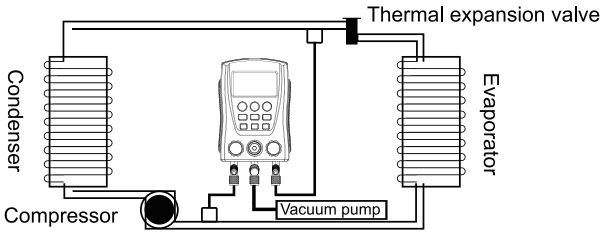
2. Vacuum operation

- 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.
- E-Connect the instrument to the refrigeration system according to the chart below. (pay attention to the direction of the refrigerant

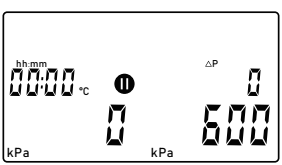
flowing!!!!!) (Connected clamp-on temperature probes will not affect the operation..)



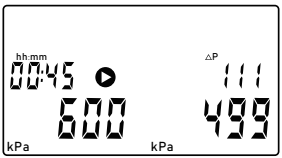
- F-Turn on the blue valve and red valve, and start the vacuum pump.
- G-After the vacuum operation is completed, turn off the blue valve and red valve, then shut the vacuum pump.
- H-At this time, pressure leak test mode can be used to check leakage in the system (Please refer to 3. Pressure Leak Test).

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.

COMMON PROBLEMS

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.

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.

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.

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 hoes 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.

GLOSSARY

Saturation

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

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 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 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 loop and economizer in the refrigeration system is to increase the subcooling for refrigerant increasing.
- 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 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: Refers to the pipeline pressure, or 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 Pg.
- 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 1.013bar.

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 humidimeter, 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.

MAINTENANCE SERVICE

- Our products are made of long-lasting and durable materials, and we insist on perfect production process. Each product leaves the factory after 35 procedures and 12 times of testing and inspection work, which ensures that each product has excellent quality and performance.

Maintenance

To maintain the performance and appearance of the product, it is recommended that the following product care guidelines be read carefully:

- Be careful not to rub the product against rough surfaces or wear the product, especially the sheet metal housing.
- Please regularly check the product parts that need to be tightened and connected. If found loose, please tighten it in time to ensure the safe operation of the equipment. The external and internal parts of the equipment in contact with various chemical media should be frequently treated with anti-corrosion treatment such as rust removal and painting to improve the corrosion resistance of the equipment and extend its service life.
- Comply with the safe operating procedures and do not overload the equipment. The safety guards of the products are complete and reliable.
- Unsafe factors are to be eliminated in time. The circuit part should be checked thoroughly and the aging wires should be replaced in time. Adjust the clearance of various parts and replace worn (broken) parts. Avoid contact with corrosive liquids.
- When not in use, please store the product in a dry place. Do not store the product in hot, humid, or non-ventilated places.

WARRANTY

- From the date of receipt, we provide a three-year warranty for the main unit and all the accessories included are covered by a one-year warranty.

Warranty access

- The repair or replacement of products is determined by the actual breakdown situation of product.
- It is guaranteed that AUTOOL will use brand new component, accessory or device in terms of repair or replacement.
- If the product fails within 90 days after the customer receives it, the buyer should provide both video and picture, and we will bear the shipping cost and provide the accessories for the customer to replace it free of charge. While the product is received for more than 90 days, the customer will bear the appropriate cost and we will provide the parts to the customer for replacement free of charge.

These conditions below shall not be in warranty range

- The product is not purchased through official or authorized channels.
- The product breakdown because the user does not follow product instructions to use or maintain the product.

We AUTOOL pride ourselves on superb design and excellent service. It would be our pleasure to provide you with any further support or services.

Disclaimer

- All information, illustrations, and specifications contained in this manual, AUTOOL resumes the right of modify this manual and the machine itself with no prior notice. The physical appearance and color may differ from what is shown in the manual, please refer to the actual product. Every effort has been made to make all descriptions in the book accurate, but inevitably there are still inaccuracies, if in doubt, please contact your dealer or AUTOOL after-service centre, we are not responsible for any consequences arising from misunderstandings.

RETURN & EXCHANGE SERVICE

- If you are an AUTOOL user and are not satisfied with the AUTOOL products purchased from the online authorized shopping platform and offline authorized dealers, you can return the products within seven days from the date of receipt; or you may exchange it for another product of the same value within 30 days from the date of delivery.
- Returned and exchanged products must be in fully saleable condition with documentation of the relevant bill of sale, all relevant accessories and original packaging.
- AUTOOL will inspect the returned items to ensure that they are in good condition and eligible. Any item that does not pass inspection will be returned to you and you will not receive a refund for the item.
- You can exchange the product through the customer service center or AUTOOL authorized distributors; the policy of return and exchange is to return the product from where it was purchased. If there are difficulties or problems with your return or exchange, please contact AUTOOL Customer Service.

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