

We measure it.



TESTO INDUSTRY REPORT

Making the Change to Digital:

How Electronic Refrigeration Manifolds can Save Time and Optimise Efficiency for Refrigeration, Air Conditioning and Heat Pump Engineers



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Introduction

Digital technology is found in all areas of life, often simplifying our daily routine; the refrigeration trade is no exception, yet, analogue manifolds are still very widespread in refrigeration technology; this is a worrying state of affairs, because according to a number of studies, up to 74% of all refrigeration systems are incorrectly adjusted using the analogue measurement method*. This is not the fault of the refrigeration technicians, but as a result of the insufficient accuracy and possibilities provided by analogue manifolds.

Why Digital?

Checking pressures on refrigeration systems using an analogue manifold has been established practice for many years. By connecting the analogue manifold to the system or appliance by refrigerant hoses, and using a thermometer the relevant pressures and temperatures are measured and superheating and subcooling temperatures are calculated using a scale. However, analogue manifolds are basic gauges and will only measure high and low pressures. Additional measuring instruments are required for the determination of the refrigerant temperature, as well as for other measurement and testing tasks. All calculations and recording are done manually and, due to the limitations of the gauges and the difficulty of using several instruments to obtain a reading, the measurements are often approximate and inaccurate. It has been estimated that a properly adjusted system will be up to 30% cheaper to run than an incorrectly adjusted system, so it is clear that accurate measurements are the key to obtaining the most efficient outcome!

* Source: Energy Star study, www.energystar.gov



Digital manifolds are increasingly being used in the refrigeration trade. The manifold records various operating parameters, thus meaning that pressure as well as temperature values can be measured with one digital manifold. Two temperature inputs on the manifold ensure the simultaneous calculation and display of superheating and subcooling of the system. In addition, the temperature difference can also be displayed. Switching between the individual measurement tasks is carried out quickly and easily at the press of a button. Many digital manifolds also support the evacuation of the system with the help of an integrated vacuum measurement. Additionally, a temperature-compensated tightness test is also possible.

In addition to the significant saving in time and effort afforded by combining several functions into one instrument, some manifolds such as the Testo 570 also have the capability not just to display data, but also to store and document measurements automatically. This function puts users in a position to conduct precise real-time measurements, and directly to display the results graphically. This considerably eases the search for system errors and ensures fast elimination of any malfunctions.

Manifolds need to be tough and the Testo manifolds have acquired an enviable reputation in the trade for being arguably the most robust manifolds on the market. The instrument's design incorporates many features designed to protect the manifold both during use, but also crucially when 'in the van'. Features include a recessed screen, protective rubberised housing, a secure carry-hook and protected connections on the manifold block; these are just some of the standard features to be found on the entire manifold range from Testo. Additionally, the robust carry-case affords the manifold an even higher degree of protection for when not in use.

Ease of use is another feature of the manifold range from Testo; the instruments can be operated and intuitively guided through the menu via a few clearly arranged buttons, thus ensuring that not only are electronic manifolds infinitely more accurate, so saving considerable time in comparison with an analogue manifold, but also they are easy to use.

Changing to digital has never been easier!



The Applications

The jobs involved in the management of refrigeration systems are diverse, ranging from project planning via installation and commissioning, to maintenance and servicing of refrigeration and air conditioning systems. However, the critical factor in ensuring the smooth and efficient operation of a system is always having regard to the respective pressures and temperature of the refrigerant and, in particular, the superheating and subcooling of the system. From these measured parameters, the status of the system can be determined, providing information on the operational safety and efficiency of the system. This applies to almost all appliances in refrigeration technology, whether classical refrigeration systems, heat pumps or air conditioning systems.

Superheating and Subcooling

For a refrigerated system to function and heat to be removed, the absorption of energy by the refrigerant is critical. A so-called 'superheating' is relevant in order to ensure this process. This is the value at which point the saturation temperature of a refrigerant is exceeded or undercut. Testo manifolds all have at least two temperature channels and can measure the refrigerant temperature as well as pressure and will calculate the superheating and subcooling simultaneously at the touch of a button!



Heat Pumps

Heat pumps work like refrigeration systems. The only difference is that excess heat is utilised. On Testo manifolds, if the user activates the heat pump mode, the manifold changes the display of the high and low pressure and the relevant temperatures. As a result, refrigerant hoses don't need to be switched.

Temperature-Compensated Tightness Test

Pressure is affected by temperature; the most visual example is the effect hot or cold weather can have on car or bicycle tyres. The same effect applies to pressure in a refrigeration system. To prove a system-tightness, just measuring pressure over a period of time is not sufficient; in addition, the pressure measurement needs to be adjusted with regard to the ambient temperature. The tightness test incorporated in the range of Testo manifolds is temperature-compensated and thus will ensure the tightness test measurement is accurate. If pressure continues to drop even taking into consideration changes in temperature, this may indicate a leak in the system.

Evacuation

It is essential that a system is properly evacuated to prevent moisture and subsequent acid build-up, which in turn can lead to compressor failure. The Testo 557 and Testo 570 manifolds have an in-built vacuum gauge to aid evacuation. The vacuum gauge is accurate to 1% and has selectable measurement units including Torr and Microns.



Ambient Pressure Compensation

To avoid measurement faults, the measured pressure (relative) needs to be adjusted to the ambient pressure (absolute). With most manifolds, it is necessary to measure the pressure manually, however, with the Testo 557 and Testo 570, this is not necessary and the instrument will automatically calculate the pressure via a separate absolute pressure sensor, thus considerably reducing measuring faults.



Troubleshooting

The data logging function within the Testo 570 manifold allows monitoring of a system over a longer period, making it possible to conduct detailed error analysis, which would not be possible using spot measurements. You can also view the system live via a connected PC. The documentation of the measurement results helps the customer to understand the work that has been carried out, and provides proof of this for the technician. The intuitive operation of the software, route planning for larger systems, customer data management and the graphic representation of the measurement results are welcome additions.

Documentation and Refrigerant Management

The F-Gases Directive dictates that refrigeration systems are checked at certain intervals depending on their capacity. Refrigerant leakage from the system is prevented or reduced by regular inspections and the activities carried out and the operational data of the system must be documented by the operator. Traditionally, a system logbook is kept, detailing maintenance and servicing work on the system, as well as documenting the system data and measured parameters. At present there is no legal obligation to carry out the measurements or document them electronically; as a result, many contractors continue to measure using analogue gauges and write the values into the log book manually. However, experience has shown that electronic data recording and documentation minimises measurement errors and increases the efficiency and life cycle of a system. As a result, an increasing number of manufacturers and system operators now require electronically created reports and verifiable proof of the readings.

As well as using the Testo “EasyKool” software to store measurements and create reports on the measured readings, the Testo software will also detail work undertaken, as well as recording and managing refrigerant filling levels. Additionally, as new refrigerants become available, these can be downloaded into the Testo 570 instrument using the Testo software, ensuring that the manifold is always up to date with the latest refrigerants.

Testo Easykool Software Features:

- Real-Time Measurement
- Real-Time graph of values, helps to identify trends
- Report designer with choice of custom or standard report templates.



Ten Reasons to Choose a Digital Manifold

1. Higher accuracy
2. Calculation of saturation temperatures for every common refrigerant (temperature pressure chart no longer needed)
3. Calculation of real-time superheating and subcooling
4. Temperature-compensated tightness test
5. Digital displays are easier to read
6. Backlight for easy viewing while charging
7. Altitude compensation adjustment
8. Differential Temperature calculation. Perfect for checking temperature drops across filter driers
9. Time-saving compared to hand calculations
10. More professional – Higher accuracy and quicker, fewer calculation errors benefit everyone



The Testo Digital Refrigerant Manifolds Range

Testo 550

- 2-way-valve block and sight glass
- 39 refrigerants integrated
- 2 temperature probes connectable
- Simultaneous calculation of superheating and subcooling
- Heat pump mode
- Temperature-compensated tightness test
- Pressure range up to 50 bar
- Pressure accuracy: 0.75 % fs
- Vacuum indication



Testo 557

- 4-way-valve block and sight glass
- 40 refrigerants integrated
- 2 external temperature probes
- Integrated vacuum measurement
- Ambient pressure compensation
- Automatic absolute pressure measurement
- Pressure accuracy: 0.5 % fs
- Precise and robust vacuum measurement



Testo 570

- Refrigerant up-date by customer
- Optional Software EasyKool
- Internal data memory
- Up to 3 probes attachable
- Optional current clamp probe and oil pressure probe
- Interface for wireless IR-printer




Case Study: ESS rely on Testo instruments to meet legislative and customer needs

Having just celebrated their 10th anniversary, Birmingham based ESS is a progressive electrical and air conditioning contractor. ESS cover both the industrial and domestic sectors and are always looking to take the next step in terms of quality work and customer satisfaction.



The air conditioning division has especially taken advantage of the Testo 570 Digital Refrigerant Manifold. Mike Plant of ESS takes up the success story “We learned about the 570 from Steve Fisher at the Red Dragon Air Conditioning Training specialists in Wales and he was excellent as regards guidance and training. The product is absolutely brilliant and we can’t fault it when it comes to quick and easy checking of pressure and temperature; it is very reassuring for all concerned in every aspect of health and safety and checking the proper values involved. It’s a big leap in technology and convenience, for example with the means to fit three probes, trustworthy software print-outs and charging facility. Given the constant media attention to our profession and its standards it is especially reassuring to customers that the Testo product looks good and professional in our hands. This aspect is especially evident by virtue of the smart protective Testo case which comes complete with all necessary accessories including the software and USB cable, batteries, pliers, probes and calibration protocol.”





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Mike Plant of ESS

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