Fieldpiece

4-Port Wireless Manifold & Vacuum Gauge

OPERATOR'S MANUAL

Model SMAN4

Quick Start

1. Power on your SMAN4 by holding the ON/OFF button for 1 second.
2. Select desired units (English or Metric or a combination) by holding ENTER for 1 second.
3. Connect hoses and pipe clamps to the system.
4. Press the circular button to select between Actual Superheat and Subcooling, Target Superheat, Direct Temperature Display (T1 T2 Direct) or Saturation Temperature Display.

Certifications

FCC ID: VEARF915

C-Tick (N22675)

CE

RoHS Compliant

Description

Your SMAN4 is the first true wireless-enabled digital refrigerant 4-port manifold and vacuum gauge for HVACR service. Use optional wireless transmitters like SDP2 Dual In-Duct Psychrometer to receive temperature measurements over-the-air for real-time target superheat calculations. Your SMAN4 can wirelessly send data to the HG3 HVAC Guide for more extensive analysis, data logging, or printing reports for your customers.

Your SMAN4 combines high precision, absolute pressure manifold gauges, a superheat/subcooling calculator, true micron gauge for vacuum, and dual temperature measurements into one easy-to-use instrument. Your SMAN4 calculates and simultaneously displays target superheat and actual superheat to verify proper charging of a unit. Your SMAN4's 4-port manifold has a large 3/8" vacuum port and 3/8" bore throughout the block for quicker recovery and evacuations.

Your SMAN4 is designed to meet the demands of the HVACR technician with a ruggedized rubber boot for durability, a strong metal hanger for easy storage and a form fitting, water resistant, padded nylon pouch.

bar	Pressure (bar)
Psig	Pressure (pounds/in²)
MkPa	Pressure (kilopascals or Megapascals)
inHg	Negative Pressure (inches of mercury)
cmHg	Negative Pressure (cm of mercury)

SH	Superheat
T1	T1 Direct
VSAT	Vapor Saturation Temperature
IDWB	Indoor Wet Bulb

Stable	Micron Reading Has Stabilized
Set	Set Mode
Alarm	Alarm Mode
Hi	High Alarm
Lo	Low Alarm
Microns	Vacuum (Microns of Mercury)
T1-T2	T1 thermocouple - T2 thermocouple
Target SH	Target Superheat

|	
bar	Pressure (bar)
Psig	Pressure (pounds/in²)
MkPa	Pressure (kilopascals or Megapascals)
inHg	Negative Pressure (inches of mercury)
cmHg	Negative Pressure (cm of mercury)

SC	Subcooling
T2	T2 Direct
LSAT	Liquid Saturation Temperature
ODDB	Outdoor Dry Bulb
⏱	Vacuum Stopwatch
HH:MM:SS	Hours:Minutes or Minutes:Seconds

🔋	Battery Life
📶	Connection Strength
APO	Auto Power Off Enabled
No Signal	Wireless Signal Lost
R-	Selected Refrigerant of System

Controls
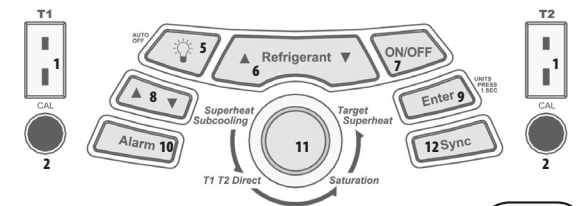
1. Insert Type K thermocouple plugs here.
2. Temperature calibration pots.
3. Press to zero atmospheric pressure.
4. Press to calibrate to refrigerant tank. (See Advanced Pressure Calibration section.)
5. Press to turn on backlight. Hold when powering on to toggle Auto Power Off.
6. Press/hold to cycle through refrigerants.
7. Hold 1 second to toggle power on/off.
8. Press up or down arrow to adjust values.
9. Press to confirm selection. Hold 1 second to adjust units.
10. Press to turn on/off the Hi/Lo vacuum alarms and hold to change alarm settings.
11. Press to toggle through temperature tests.
12. Hold 1 second to Sync to a wireless enabled partner device.
13. Turn clockwise to close High side port.
14. Turn clockwise to close Low side port.
15. Turn clockwise to close 3/8" Vacuum port.
16. Turn clockwise to close Refrigerant port.

Functions

Superheat and Subcooling

1. Press circular button to cycle through temperature modes until SH and SC are shown. The SMAN4 can calculate and display both superheat and subcooling simultaneously.
2. Select the appropriate refrigerant using the REFRIGERANT button.
3. Connect EPA approved refrigerant hoses to low and high side on SMAN4. Plug Type K thermocouple pipe clamps into T1 and T2.
4. Connect your SMAN4 to the system:

   Superheat: Hand tighten low side hose to suction line service port. Place the T1 pipe clamp thermocouple on the suction line between the evaporator and compressor, no closer than 6 inches to compressor.

   Subcooling: Hand tighten high side hose to liquid line service port. Attach the T2 pipe clamp thermocouple on the liquid line between the condenser and expansion valve (TXV), as close to the service port as possible.
5. After turning the system on or making any adjustments to the system wait 15 minutes before charging by superheat or subcooling to ensure that the system is running normally.
6. To add or remove refrigerant connect a refrigerant or recovery tank to the REF port on SMAN4. Use the low side, high side, and REF valves on SMAN4 to charge or recover refrigerant as needed. Let system stabilize again for 15 minutes.

T1 T2 Direct

1. Press circular button until T1 and T2 are shown.
2. Plug in any Type K thermocouple into T1 and/or T2.
3. Read the temperature directly from the display.
4. T1-T2 is displayed in the lower left corner of the display.

Saturation

Shows vapor (VSAT) and liquid (LSAT) saturation temperatures calculated from the pressures measured and the refrigerant selected.

Target Superheat

Target Superheat is only used for charging fixed orifice air conditioning systems. Your SMAN4 allows you to receive real-time indoor wet bulb (IDWB) and outdoor dry bulb (ODDB) temperatures wirelessly to calculate target superheat. These values can also be entered manually or input directly by connecting the included wet and dry bulb thermocouples to T1 and T2 respectively.

Receive IDWB and ODDB temperatures wirelessly

1. Press circular button until you've entered Target SH mode.
2. Press UP or DOWN ARROW. *IDWB* icon will begin blinking.
3. Hold SYNC on SMAN4 until a beep is heard (>1 sec).
4. Attach an accessory head (like ARH5, ARH4, or AAT3) capable of measuring indoor wet bulb temperature to a Fieldpiece wireless transmitter (sold separately). Ready instrument to measure indoor wet bulb temperature and place at the return of the evaporator between the filter and the coil.
5. Select transmit mode on Fieldpiece wireless transmitter and hold SYNC until wireless partner searching begins. For SDP2 Dual In-Duct Psychrometer, power on and press SYNC button for 1 second. Once SMAN4 is connected with transmitter, the real-time wet bulb temperature measurement will display on SMAN4. The ODDB icon will begin blinking.
6. Repeat steps 3 -5 for outdoor dry bulb measurements (ODDB). For outdoor dry bulb measurement, place the accessory head onto the side of the condenser. For accurate results, keep it shaded from direct sunlight.

7. Real-time target superheat is calculated and located in lower left corner of display when SMAN4 is receiving real-time indoor wet bulb and outdoor dry bulb measurements from the wireless devices.

Note: For real-time target superheat calculations, both IDWB and ODDB measurements must be received wirelessly.

Note: When the IDWB or ODDB is wirelessly synced with SMAN4, and the signal/sync is lost, "NSG" will display. The SMAN4 will try to sync with partner device for 4 minutes while the unit is powered ON. During these 4 minutes IDWB or ODDB can be synced wirelessly to a different Fieldpiece transmitter but manual entry or entry though thermocouple will be disabled.

Note: Retrieval of IDWB and ODDB wireless measurements will be temporarily disabled for 30 seconds (nSG will display) if SMAN4 loses communication with HG3, the wireless tower (📶) will blink and "nSG" will be displayed on SMAN4 until HG3 reconnects or 30 seconds has elapsed. At this time, IDWB and ODDB wireless measurements will resume.

Input temperatures with Type K thermocouples

1. Press circular button until Target SH is shown on the bottom, center of display.
2. Plug ATWB1 Wet bulb Type K thermocouple into T1 and ATA1 Dry bulb Type K thermocouple into T2. Both included with SMAN4.
3. Press UP or DOWN ARROW to toggle between *IDWB* or *ODDB* input. The icons will begin blinking. Press ENTER to select which temperature you want to input first, either *IDWB* or *ODDB*. The real-time temperature from the thermocouple will be displayed.
4. For IDWB input, wet the sock of the ATWB1. Clip it to the return of the evaporator between the filter and coil. When the wet bulb temperature reaches its lowest point and stabilizes, press ENTER to lock the reading. If the inputted temperature is above or below the wet bulb range, "OL" or "-OL" will blink and a beep will be heard. Retake the measurement if this occurs.

5. For ODDB input, clip the ATA1 thermocouple to the side of the condenser. Once reading is stable, press ENTER. If the inputted temperature is above or below the dry bulb range, "OL" or "-OL" will blink and a beep will be heard. Retake the measurement if this occurs. For accurate results, keep the ATA1 shaded from direct sunlight.
6. Once both IDWB and ODDB are locked in, the Target Superheat will show in the lower left corner of the display. If the Target Superheat calculated from the IDWB and ODDB temperatures is outside the range in which air conditioning is recommended then "OL" is displayed. Usually, raising the indoor temperature will bring the conditions within manufacturer's recommendations. If your target superheat is out of the recommended range, re-take your measurements.
7. To re-take either IDWB or ODDB, press UP or DOWN ARROW until the icon (*IDWB* or *ODDB*) you wish to re-take is blinking. Press ENTER. Re-do the measurement and press ENTER to lock it in. The newly calculated target superheat will be displayed.

Input temperatures manually

1. Press circular button until Target SH is shown at the bottom, center of display. **Unplug thermocouples** from T1 and/or T2.
2. Press UP or DOWN ARROW to toggle between *IDWB* or *ODDB* input. The icons will begin blinking. Press ENTER to select which temperature you want to input first, either *IDWB* or *ODDB*. The far left digit of *IDWB* or *ODDB* will begin blinking indicating manual input mode is ready.
3. Press the UP or DOWN ARROW to change values and press ENTER to lock in each digit. Once the last digit for *ODDB* or *IDWB* is locked in, the calculated target superheat will show in the lower left corner of the display.

   Note: When pressing ENTER to lock in the last digit for *IDWB* or *ODDB*, if the inputted temperature is below or above the wet bulb or dry bulb range, "OL" or "-OL" will flash once and a beep will be heard. In both instances you must re-input the measurement.

Pulling a Vacuum

Follow all manufacturers' evacuation procedures over those in this manual.
1. Connect your SMAN4 in-line with your vacuum pump and the system, then power on your SMAN4.
2. Draw a vacuum on the system. The SMAN4 will automatically sense the negative pressure and display the vacuum in microns.
3. Press Alarm to activate the High (Hi) alarm or Low (Lo) alarm. No display of Lo or Hi means alarm is off. Note: The stopwatch will start when an alarm is activated. Pressing Alarm will reset the stopwatch.
4. When the rate of change in pressure is less than 1 micron per 10 seconds, *Stable* will appear to the left of the micron reading.

Additional Tips:
To achieve a deep vacuum as quickly as possible:
1. Use the shortest hoses with the largest diameter available.
2. Remove schrader cores and core depressors. Core removal tools like the "MegaFlow Valve Core Removal Tool" can be purchased from Appion, Inc. to help with this process.
3. Inspect the rubber seals at both ends of your hoses for damage that may result in leakage.
4. Do not use hoses with low loss fittings when evacuating or pulling a vacuum on a system.

Set Vacuum Alarms

1. Hold ALARM for one second to enter Alarm Set mode.
2. Press ALARM to toggle between Alarm Hi and Lo.
3. Use UP or DOWN ARROW to select the value and press ENTER to lock in each digit. Once last digit in *Alarm Lo* is locked, your SMAN4 will automatically revert to normal testing mode.

SMAN4 to HVAC Guide® (HG3)

Your SMAN4 can wirelessly send measurements to the HG3 System Analyzer (FW v 3.42 or higher) for deeper analysis and data logging. Your SMAN4 can send suction and liquid line pressures and temperatures, superheat/subcooling calculations, indoor wet bulb and outdoor drybulb temperatures with target superheat calculation (if SMAN4 is wirelessly receiving these measurements), and vacuum micron measurements (for datalogging) all in real-time. From the HG3, you can print reports on a PC to hand to customers and/or file for your own record-keeping.

The HG3 System Analyzer can receive wireless measurements from the SMAN4 to the following tests: CheckMe!®, Superheat, Subcooling, Charging Jacket, and Data Logger.
1. Connect your SMAN4 to the system for measurement of suction and liquid line pressures and temperatures.
2. Sync wireless devices to SMAN4 to receive indoor wet bulb and outdoor dry bulb measurements. See Target Superheat section for wireless IDWB and ODDB instructions.
3. Press circular button on SMAN4 to enter Superheat/Subcooling, T1 T2 Direct, or Saturation temperature modes.
4. Hold the SYNC button until a beep is heard (>1 sec). Wireless signal bars icon in lower right corner of display will appear and begin searching.
5. Set HG3 to one of the following tests: CheckMe!®, Superheat, Subcooling, Charging Jacket, or Data Logger.
6. With HG3, highlight a test line that corresponds to one of the measurements being sent from the SMAN4.
7. Hold SYNC button on HG3 until search pattern shows on right of test line. All receivable real-time measurements from the SMAN4 will populate corresponding test lines on HG3.
8. Press OUTPUT on HG3 to view deeper analysis of the system.
Note: The SMAN4 and HG3 must be within 10 feet (3m) for initial sync to occur. Once synced, the wireless range is 100 feet (30m).

Specifications

Mini-USB port: For updating to newer versions of firmware
Display size: 5 inches (diagonal)
Backlight: Blue (On for 1 minute unless turned off manually)
Battery: 6 x AA (Battery life below based on alkaline type)
Battery life: Approx. 135 hours (without backlight and wireless)
Low battery indication: ⬚ is displayed when the battery voltage drops below the operating level
Auto shut off: 30 minutes of inactivity when APO is activated
Over range: "OL" or "-OL" is displayed
Operating environment: 32°F to 122°F (0°C to 50°C) at <75% RH
Temperature coefficient: 0.1 x (specified accuracy) per °C (0°C to 18°C, 28°C to 50°C), per 0.6°F (32°F to 64°F, 82°F to 122°F
Storage temperature: -4°F to 140°F (-20°C to 60°C), 0 to 80% RH (with battery removed)
Weight: 4.03 lbs (1.83 kg)

Pressure
Sensor type: Absolute pressure sensors
Connector type: Standard 1/4" and 3/8" NPT male flare fitting
Range: 29"HgV to 580psig (English), 74 cmHgV to 0 to 4000KPa (Metric), 4.000MPa (Metric), and 40.00bar (Metric)
Resolution: 0.1 psi/inHg; 1 kPa/cmHg; 0.001MPa; 0.01bar
Accuracy: 29"HgV to 0"HgV: ±0.2"HgV
74 cmHgV to 0 cmHgV: ±1 cmHgV
0 to 200 Psig: ±1 Psi; 0 to 1378 KPa: ±7 KPa; 0 to 1.378MPa: ±0.007MPa; 0 to 13.78 bar ±0.07 bar
200 to 580 Psig: ±0.3%+1 Psi; 1378 to 4000KPa: ±0.3%+7 Kpa; 1.378 to 4.000MPa: ±0.3%+0.007MPa; 13.78 to 40.00bar: ±0.3%+0.07bar
Maximum overload pressure: 800 psig
Units: Psig, kPa, MPa, bar, inHg, and cmHg

Microns for Vacuum

Connector type: Standard 1/4" and 3/8" NPT male flare fitting
Range: 50 to 9999 microns of mercury
Resolution: 1 micron (50 to 2000 microns), 250 microns (2001 to 5000 microns), 500 microns (5001 to 8000 microns), 1000 microns (8001 to 9999 microns)
Accuracy: ±10% or ±10 microns, whichever is greater (50 to 1000 microns)
Maximum overload pressure: 580 psig
Units: Microns of mercury

Temperature
Sensor type: Type K thermocouple
Range: -95°F to 999.9°F (-70°C to 537.0°C)
Resolution: 0.1°F/°C
Accuracy: ±(1.0°F) -95°F to 199.9°F; ±(0.5°C) -70°C to 93°C ±(2.0°F) 200°F to 999.9°F; ±(1.0°C) 93°C to 537.0°C
Note: All accuracies are after a field calibration.

Wireless
Wireless range: 1 to 100 feet (30m)
Initial wireless sync range: More than 1 foot and less than 10 feet
Wirelessly transmit to Fieldpiece HG3
Wirelessly receive indoor wet bulb (IDWB) and outdoor dry bulb (ODDB) from Fieldpiece transmitters
Note: If the indoor wet bulb or outdoor dry bulb measurements result in an uncalculable TSH, *"OL"* or *"-OL"* will display in the lower left corner.
Note: If any one of the parameter IDWB or ODDB is synced wirelessly to SMAN4 then the other parameter ODDB or IDWB has to be synced wirelessly too.

Maintenance

Clean the exterior with a dry cloth. Do not use liquid.

Battery Replacement

The battery must be replaced when the battery life indicator ⬚ is empty. Turn your SMAN4 off and replace with 6 AA batteries.

Cleaning the Micron Sensor

Over time, the vacuum sensor of the SMAN4 may become contaminated with dirt, oil, and other contaminants introduced from pulling vacuums.

1. ***Never*** use an object such as a cotton swab to clean the sensor, you may cause damage to the sensor.
2. Open all knobs/valves, and cap all the ports except for the VAC port.
3. Drop enough Isopropyl (rubbing) alcohol into the VAC port using an eye dropper or funnel so that it can flush out contaminants.
4. Cap VAC port and gently shake your SMAN4 upside down to clean sensor.
5. Turn right side up. Open a port to pour out the rubbing alcohol and open all ports to allow sensors to dry out. Drying usually takes about an hour.

Calibration

Temperature

To calibrate your SMAN4 temperature thermocouples, adjust the pot on the front of the meter labeled T1 Cal or T2 Cal. The best way to calibrate is to match to a known temperature. Ice water is very close to 32°F and is readily available. Accuracies of one degree or better are obtained through field calibration.

1. Stabilize a large cup of ice water by stirring. Pure, distilled water will be the most accurate.
2. Press the circular button until your SMAN4 enters Direct Temperature (T1 T2) mode.
3. Immerse the temp probe in ice water from T1 and adjust the T1 Cal pot with a flat head screwdriver and let it stabilize, keep stirring.
4. Repeat Step 3 for temp probe in T2.

Pressure Zeroing

To calibrate your SMAN4 pressure sensors to atmospheric pressure, ensure that your SMAN4 is disconnected from any pressure source and at equilibrium with the ambient pressure.
1. SMAN4 must be in Superheat/Subcooling, Saturation, or T1 T2 Direct mode.
2. Press the CAL Atmospheric Pressure button and your SMAN4 will set the zero point of pressure to the ambient pressure.

Advanced Pressure Calibration

Your SMAN4 has the ability to perform a linear adjustment of the pressure sensors based on refrigerant type, temperature, and pressure.
Calibration setup: For best results, perform both the Temperature and Pressure Zeroing procedures. See Calibration section for details. This will ensure pressure readings are zeroed and thermocouple is properly calibrated to the T1 port of the SMAN. Calibration to T2 port is not necessary for this calibration. The refrigerant cylinder should be stored in a stable ambient environment for at least 24 hours before calibration.
1. Press circular button until your SMAN4 enters T1 T2 Direct mode.
2. Plug in a Type K thermocouple into T1. (A bead type thermocouple, like the ATB1, is recommended.)
3. Connect the SMAN4 to a refrigerant cylinder of a known, single refrigerant using an EPA approved service hose. Be sure to open both HIGH and LOW side valves on your manifold and cap the unused ports. (If caps are not available you can connect both ends of a refrigerant hose to the two unused caps. Note: Some refrigerant will remain in the hoses which will need to be recovered.)
4. Press the REFRIGERANT button to match the refrigerant of the cylinder you are using.
5. Attach bead-type thermocouple to the side of the cylinder using tape. It is recommended to attach in the middle of the cylinder. Important: Let the temperature of the thermocouple stabilize to the refrigerant temperature for 1 to 2 minutes or until stable.
6. Open the refrigerant cylinder. The pressure inside cylinder should now be displayed on both HIGH and LOW side pressure sensors.
7. Press the CAL Test Pressure button. If successful, "Good" will display for 3 seconds. If failed, "Err" will display for same time.

Your SMAN checks with its built-in P-T charts to compare the temperature of the refrigerant in the tank to the vapor saturation temperature based on the refrigerant you selected. If the measured pressures on your SMAN are within ±3psi of the P-T chart pressure corresponding to the vapor saturation temperature, the SMAN will adjust the pressure sensor linearity to match the P-T chart.

Possible causes of failed "Err" pressure calibration:
1. Refrigerant tank was not stored in stable ambient conditions for at least 24 hours.
2. Thermocouple attached to refrigerant tank was not properly calibrated to T1 port of SMAN.
3. Thermocouple was plugged into wrong port T2 instead of T1.
4. Incorrect refrigerant was selected on the SMAN.

Refrigerants

The P-T charts of the following 44 refrigerants come pre-programmed into your SMAN4. In your SMAN4 the refrigerants are listed in order of most commonly used. Here, they are listed in numerical order for easy reference.
R11, R113, R114, R12, R123, R1234YF, R124, R125, R13, R134A, R22, R23, R401A(MP39), R401B, R402A, R402B, R404A, R406A, R407A, R407C, R407F, R408A, R409A, R410A, R414B (Hotshot), R416A, R417A, R417C (HOT SHOT 2), R420A, R421A, R421B, R422A, R422B(NU22B), R422C(Oneshot), R422D, R424A, R427A, R434A(RS-45), R438A(MO99), R500, R502, R503, R507A, R508B (Suva95)

> ⚠ **WARNINGS**
> DO NOT APPLY MORE THAN 800 PSI TO ANY PORT ON THE MANIFOLD.
>
> FOLLOW ALL EQUIPMENT MANUFACTURER'S TESTING PROCEDURES ABOVE THOSE IN THIS MANUAL IN REGARDS TO PROPERLY SERVICING THEIR EQUIPMENT.

Limited Warranty

This meter is warranted against defects in material or workmanship for one year from date of purchase. Fieldpiece will replace or repair the defective unit, at its option, subject to verification of the defect.

This warranty does not apply to defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use of the instrument.

Any implied warranties arising from the sale of a Fieldpiece product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. Fieldpiece shall not be liable for loss of use of the instrument or other incidental or consequential damages, expenses, or economic loss, or for any claim of such damage, expenses, or economic loss.

State laws vary. The above limitations or exclusions may not apply to you.

Obtaining Service

Call Fieldpiece Instruments for current costs on our fixed price warranty service. Send check or money order for the amount quoted. Send your digital manifold, freight prepaid, to Fieldpiece Instruments. Send proof of date and location of purchase for in-warranty service. The meter will be repaired or replaced, at the option of Fieldpiece, and returned via least cost transportation.

For international customers, warranty for products purchased outside of the U.S. should be handled through local distributors.

Fieldpiece
Designed in USA
MADE IN TAIWAN

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