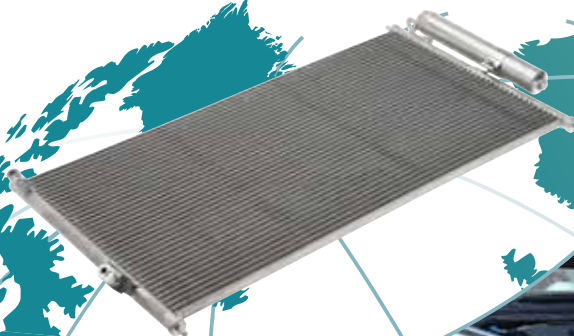




Your Expert
in Parts

HC-CARGO A/C Troubleshooting guide



HC-CARGO Air-Conditioning Troubleshooting

The following guide has been created by HC-CARGO to help our customers and partners troubleshoot both manual air-conditioning systems as well as fully automated systems.

In this guide we provide quick and easy methods for determining the most likely causes of failure in the A/C system.



Detecting A/C System Leaks

Leaks can be found visually with our HC-CARGO tools:
 UV Leak Detection Kit (PN 253519)
 A/C Leak Detector which detects the gas (PN 253582)
 The following gases are detected:

- CFC's: R11, R12, R500, R503 etc.
- HCFC's: R22, R123, R124, R502 etc.
- HFC's: R134a, R404a, R125 etc.
- HFO's: R1234yf

The leak detector can also detect leaks when pressure testing the A/C system. See included owners manual for more information.

For a video instruction on how to use HC-CARGO diagnostic tools please visit our YouTube channel (<https://www.youtube.com/user/HCCARGO>)



253582



253519

Compressor Leaks

The compressor may leak near the pulley, due to a faulty oil-seal. We recommend that the A/C system is switched on at least once a week to keep the oil-seal lubricated to avoid damage.



Leaking oil seal

If the compressor is soaked in oil and U/V dye, the main gaskets may be defective. In most cases it is necessary to replace the compressor.



Leaking main gasket



Leaking main gasket

Hose Leaks

Leaks occurring at the hose connections are primarily due to leaking o-rings, which must be replaced. Remember to lubricate the o-rings with A/C oil.



It is important to use o-rings made of the correct material.

When the hoses are attached to the body of the car, the hose may leak where it is attached with the hose clip, due to vibrations.

Hose clip




Hose connections to the condenser



Condenser Faults: External causes

The main reason for condenser leaks is caused by salt and water, which corrode the aluminum. The condenser is also exposed to external objects, which may damage or block the cooling ribs.

- It is important to check both sides of the condenser for leaks.
-  As the condenser is exposed to dirt and leaves the cooling effectiveness of the condenser is reduced.
- If necessary remove dirt and leaves that reduce cooling effectiveness.





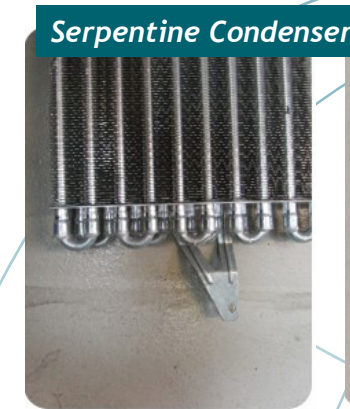
Our HC-CARGO 253528 Temperature Testing Tool can easily diagnose if the condenser is working optimally. See the next pages for further specifications.

HC-CARGO 253528 Temperature Testing Tool
(See temperature sheet on page 8/9)

Condenser Faults: Internal causes

- When a compressor has been blocked it will leave particles in the system. These particles can easily block the condenser making it necessary to replace the condenser after flushing the system*. Only flushing the system will not remove the particles in the condenser.
- Particles also develop if the compressor overheats causing the oil to burn. These particles can block the condenser. If a blockage occurs it is necessary to flush the system.
- Leak stop can potentially also block the condenser.

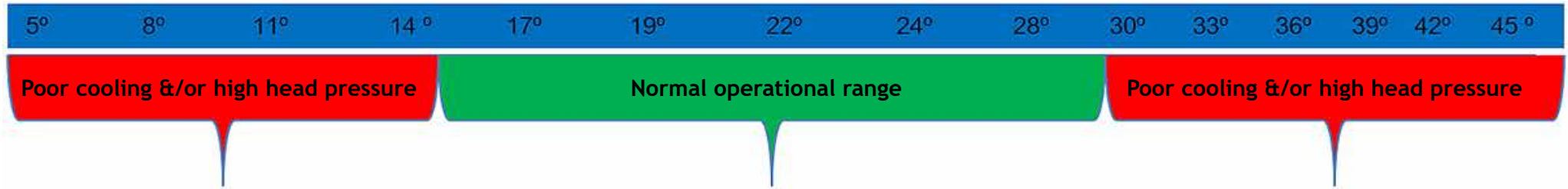
** Only replace if the condenser is Parallel Flow*



Temperature Testing tool: Condenser Testing

Condenser Testing Chart

Temperature change from condenser inlet (top) to condenser outlet (bottom) in Celsius



Potential symptom causes

- Poor air flow across condenser
- Bent/damaged fins
- Debris on surface or between condenser/radiator/other coolers
- Missing air dams
- Bad/slow cooling fan motors, weak thermal fan clutch, inoperative electronic fan clutch, broken/missing fan clutch
- System overcharge of refrigerant may be due to improper service or replacement of original condenser with upgraded design

1970-1996

- Lower range: 14-17 ° Celsius difference - typical of tube and fin design

1996-2008

- Upper range: 19-28° Celsius difference - typical of multi-flow
- 6 mm round tubes grouped together unable to flush
- May fall into higher temperature range if some tubes are stopped up

2001 - current

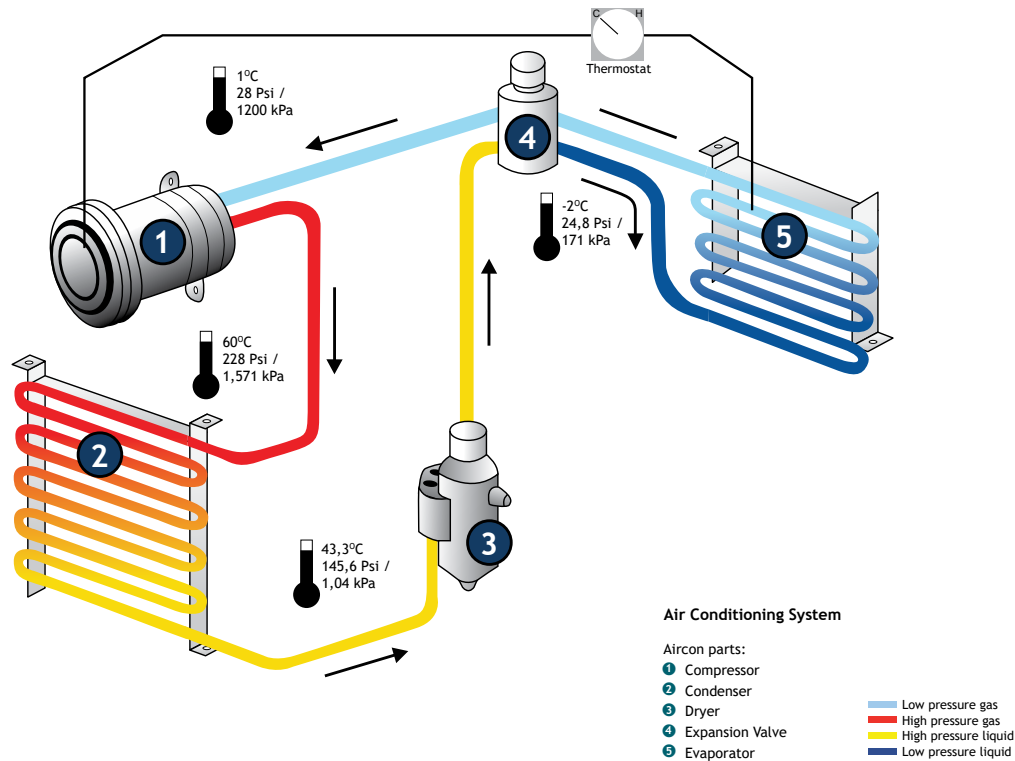
- 19-28° Celsius difference - typical of parallel flow
- Can have hundreds of tubes, smaller than the diameter of a paper clip, that cannot be flushed. May fall into higher temperatures range if some passages are stopped up

- Parallel flow condensers vary by the tube count, number and size of passages, which change the refrigerant required (typically less refrigerant with smaller, more narrow tubes)
- Since late model systems and front end crash vehicles require condenser replacement when repaired it is possible a condenser with different configuration than the original factory unit may have been installed requiring an adjusted refrigerant charge from the factory specifications (less charge)

Potential symptom causes

- Internal restrictions - will distort all pressure/temperature readings and must be resolved in order to evaluate compressor function and the balance of the system (especially variable compressors)
- Orifice tubes may appear very clean because of extremely small passages in parallel flow designs trap debris flowing through the condenser
- Condensers in this temperature range will usually require replacement to produce an efficient A/C system, especially when a failed compressor is replaced.

Temperature Testing tool: A/C System




Temperature Testing Tool



By measuring the temperature difference at the inlet and outlet, you can easily test if the component is working correctly



Filling Valve Leaks

 When gas has been refilled in the system it is important to check the filling valves for leaks.

Always remember to tighten the cap after refilling the system.



Pressure switches:

The A/C pressure switch is a safety switch that is mounted on both the high and low pressure sides of the A/C system. It monitors the pressure of the refrigerant on its respective side of the system. There is a high side pressure switch and low side pressure switch, which both serve to monitor the system for pressure faults that can damage the compressor.

The pressure switch will cut off the compressor if the pressure is too high or too low, to avoid damaging the compressor.



Electrical / Mechanical Fault

In compressors with a clutch coil, faults are often caused by a burnt coil. If the clutch coil becomes overheated then the thermal fuse will stop working causing the clutch coil to malfunction.

If the thermal fuse malfunctions then you can repair the compressor with a new clutch coil. Otherwise you need to change the compressor.

Please note that not all clutch coils have a thermal fuse.



Thermal Fuse



Burnt Clutch Coil



Clutch Coil

Electrical Faults

Our HC-CARGO 253527 is used for clutchless compressors as well as for a clutch compressors with an electronic control valve. The 253527 tester makes it possible to diagnose the compressor in three easy steps:

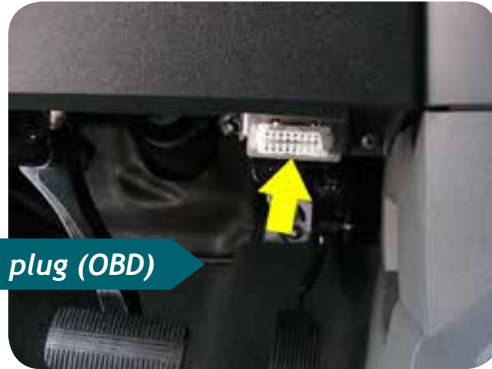
1. Resistance of the control valve
2. Pulse wide signal from the ECU to the compressor
3. Operation of the compressor



HC-CARGO
253527

Electrical Errors

We recommend that the error codes in the CPU memory are checked, to determine if any error codes have been registered.



Diagnose plug (OBD)

Noise

When noise is registered in the cabin it is most likely due to an incorrect gas amount, which can be caused by either be too little gas (leak) or too much gas. Always follow the manufacturers recommended guidelines for applying the correct amount of oil and gas.

Another reason for excessive noise can be external particles or too little oil in the system, which will damage the compressor. Other components, e.g. a defective alternator freewheel pulley or a belt tensioner can also damage the compressor.




Belt drive (Compressor, Alternator, Belt tensioner)

Noise

Blocked compressor:

The most common causes leading to a blocked system are insufficient oil or external particles in the system.

 If the compressor has been blocked it is important to flush the system.



Damaged safety-hub (Blocked compressor)

Receiver Dryer



When the A/C System has been opened it is very important to replace the receiver dryer in order to absorb any possible moisture in the system. The desiccant loses its ability to absorb moisture if the system has been opened.

- In older vehicles the receiver dryer is often attached to the pipes. In newer vehicles it is often attached to the condenser in a desiccant bag.
- Excessive amounts of oil, UV dye and leak stop can also clog the receiver dryer. It is important to follow the manufacturer's recommended guidelines when adding any type of lubrication.

Receiver desiccant bag



Condensor with receiver desiccant bag



Condensor with receiver dryer



A/C Lubrication

Filling oil on the compressor: Be sure to apply the correct amount of oil and the correct oil type*. Drain the oil from the compressor to ensure that the amount is as prescribed by the manufacturer. If necessary add the missing amount of oil. Always follow the manufacturers recommended guidelines regarding oil amount and oil type.

For a video instruction on how to apply the correct amount of oil, please visit our YouTube channel. (<https://www.youtube.com/user/HCCARGO>)

Leak Stop: We recommend that you use a Leak Detector, U/V light or a pressure test to diagnose the system to identify the leak and afterwards replace the broken part. We discourage the use of Leak Stop as it may damage the A/C System.

**Important not to mix oil types*

Damaged compressor due to leak stop



Learn more here:



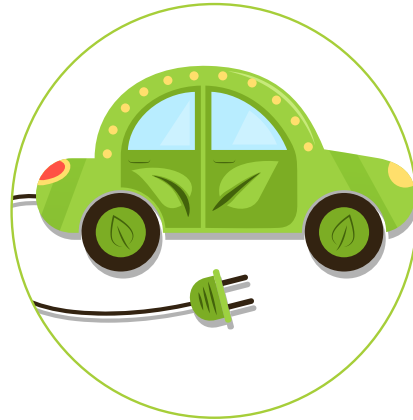
HCC-CARGO wide range of oils

Hybrid compressor:

It is important to add the correct oil in electronic compressors for hybrid vehicles, otherwise it may damage the compressor.



HC-CARGO
240997



Evacuation:

After the recovery process is complete and all available refrigerant has been removed from the system, it's ready for evacuation. When a system is low on refrigerant or has been opened for repair, moisture and air enter the system. It is important to remove the moisture and air by evacuating the system at least 20 minutes or more.



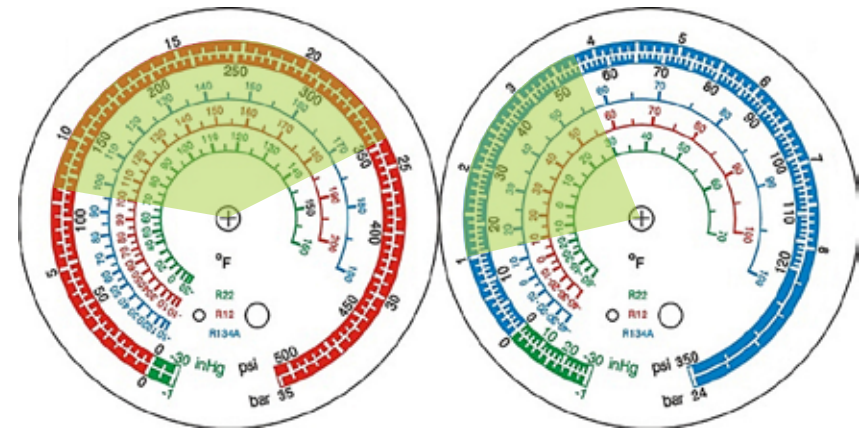
A/C: System Operating Pressure R134a

Typical problems causing the LP/HP to register outside the recommended operational pressure values:

1. Adding too little or too much refrigerant
2. Excessive use of oil will result in overpressure
3. Component or system blockages
4. Condenser malfunction
5. Condenser fan malfunction
6. Air circulation system malfunction
7. Compressor malfunction

There may be other problems causing the wrong operating pressure, however, the above points are the most common.

System Operating Pressure based on pressure temperature chart for R134a



See chart on page 22

A/C: System Operating Pressure R134a Continued

- This is a basic introduction to gauge reading, which is relevant to most vehicles, but not all, and as such it should only be used as a guide. The vehicle should be recovered, vacuumed and charged prior to testing.
- When reading your gauges there are a couple of basic facts that should be considered:
 - Ambient temperature
 - Compressor type

AMBIENT TEMPERATURE

- The system should be recovered, vacuumed (min 20 minutes) and charged. The gauge readings will depend on the ambient temperature. With the A/C turned OFF - On a cold day the pressure will be low, on a hot day the pressure will be high. The table below shows the comparison between temperature and pressure for R134a.
- Pressure and temperature will change together, as one goes up the other goes up, as one goes down the other goes down. Different refrigerants will have different figures.

R134a Pressure Temperature Chart


Ambient temperature C°	Low pressure gauge	High pressure gauge
18	1,7 - 2,4	9,3 - 10,7
21	2,4 - 2,8	10,0 - 11,0
24	2,4 - 3,1	10,3 - 11,7
27	2,8 - 3,4	12,0 - 14,5
30	3,1 - 3,8	15,5 - 17,2
32	3,1 - 3,8	17,2 - 18,6
35	3,1 - 3,8	19,0 - 20,7
38	3,1 - 3,8	21,7 - 22,4
41	3,1 - 3,8	22,7 - 23,1
43	3,1 - 3,8	23,4 - 23,8

Ambient temperature is the outside atmospheric temperature

A/C System Flushing


Flushing detergent:

Highly efficient flushing method for removing all kinds of particles and residues.

 Always remember to remove all cleaning agent residues after flushing. The system must be dried by vacuum. After flushing the system we recommend that you use nitrogen to remove any flushing agent remains and to effectively dry the A/C system.

Refrigerant and filling station:

Effectively removes loose particles, however, not as effective as a flushing detergent. The system must be dried by vacuum.

 It is important to flush the system:

- If you suspect that there are particles in the system
- If the compressor has seized
- If excessive amounts of UV dye and oil has been used
- If clogs or stoppages have been diagnosed
- If the receiver dryer fails

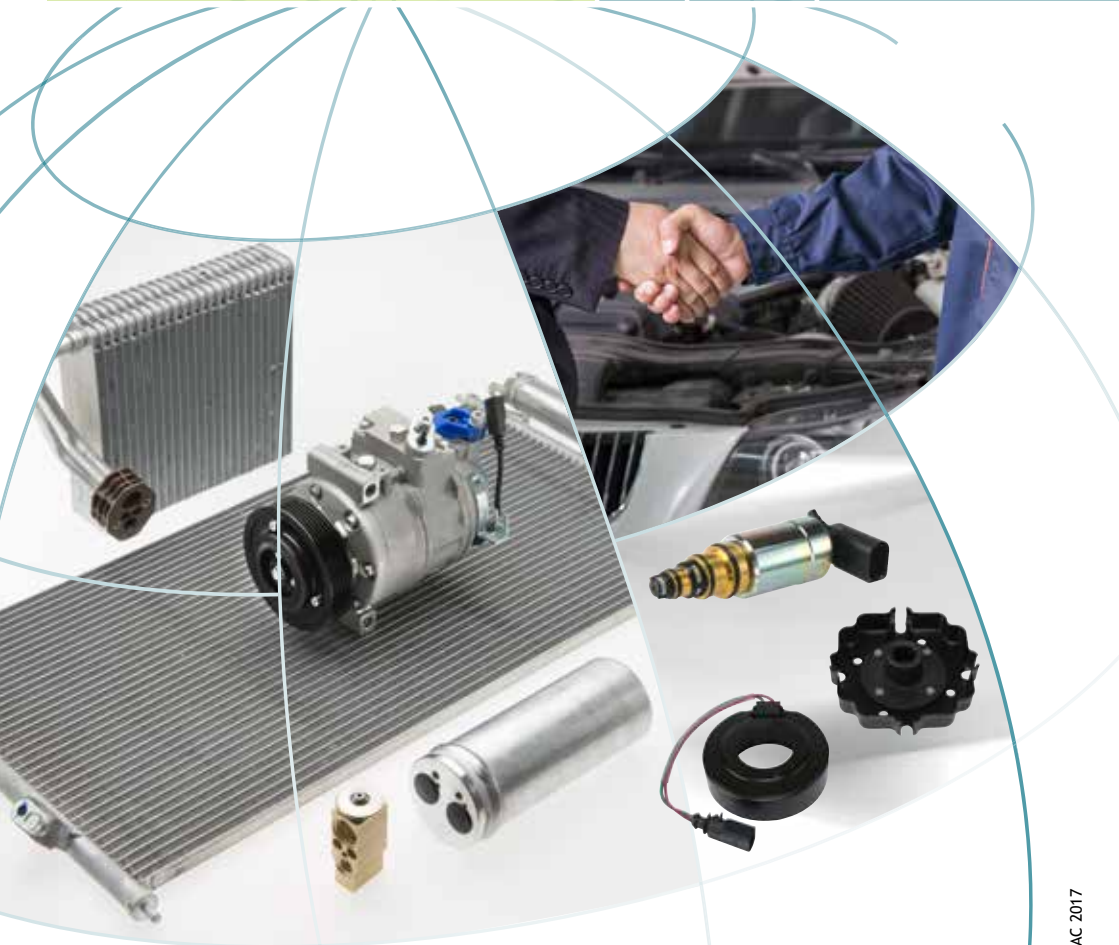
**If leak stop has been applied it is necessary to replace the parts. Flushing does not eliminate leak stop*

Components not to flush:

1. Compressor
2. Expansion valves* / Orifice tubes*
3. Receiver dryer*
4. If you have a parallel flow condenser it must be replaced after flushing the system as it is not possible to remove all particles in the small pipes

**Bypass or install new component after flushing*

Always flush after the manufacturers recommended guidelines.



www.hc-cargo.com