

more than cooling parts >



AIR-CONDITIONING

NRF offers a full range of more than 1750 different OE quality Mobile AC products and shop-equipment for nearly all brands.

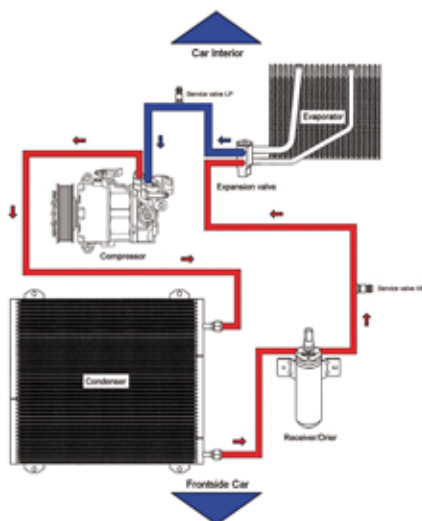


More than 80% of all new cars have factory installed Air-Conditioning systems.

This is a very growth orientated market that needs qualified AC specialist and approved replacement parts to service the system and to protect the environment.

Automotive air-conditioning

Technically speaking, an AC system does not produce cold air but it absorbs heat (cold is an absence of heat). By evaporating a liquid (refrigerant) in the car's interior, heat is absorbed. A second effect is that the humidity in the fresh air condenses at the evaporator surface and drains off. The evaporated refrigerant is then transported to the engine compartment where it, after a pressure increase, condenses. During this condensation it rejects the stored heat (which was absorbed in the interior). After condensation, the liquid refrigerant travels to the interior compartment where it, after a pressure drop, evaporates. The whole process starts again (to cycle).



General installation instructions for AC-replacement parts

- ◆ Always refer to local laws and regulations that cover mobile air-conditioning.
- ◆ Always wear safety goggles and gloves while handling refrigerants and don't smoke during repair!
- ◆ Before installing the replacement part, always check if connections, supports and other important items are similar to the old part.
- ◆ When the system is still under pressure, recover the refrigerant with a certified recovery unit, before disconnecting any connections.
- ◆ Always use two spanner wrenches when connecting or disconnecting fittings to avoid twisting of the tubes.
- ◆ After removing an old part, always seal the inlet and outlet hoses (or tubes) with caps.
- ◆ Before removing the compressor caps/plugs, store it on a warm place for a while. This reduces the attraction of moisture from the oil inside.
- ◆ Always replace the receiver-drier or accumulator whenever the system has been opened for a while or when a compressor, evaporator or condenser has been replaced.
- ◆ With bigger system leaks (broken hose, crash) often big amounts of oil will escape the system. If this has happened, check the amount of oil and if necessary, correct the level with the specified oil (Type and amount are often indicated on the compressor).
- ◆ In order to avoid contamination with dirt and moisture, do not remove dust caps/plugs until absolutely necessary.
- ◆ This is valid for all parts, but especially important for the drier-receiver, accumulator and compressor. Always use new o-rings/seals.
- ◆ Apply a thin film of lubricant/oil on o-rings/seals and check if they are positioned against the pilot bump before connecting. Tightening with a too high or too low torque might cause leakage.

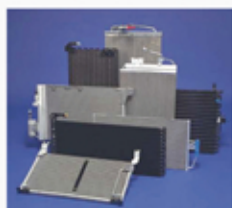
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Brief explanation of Expansion Valve (Receiver/Drier) System



Compressor

Function: Pressurizes vaporized refrigerant coming from the evaporator (between 0.8 and 2.2 bar) up to condensation pressure (between 6 and 15 Bar). Compresses only gas, no liquid.
Location in vehicle: Attached to engine, driven by crankshaft and belt. Can be switched on and off by electric magnetic clutch. On newer cars also continuously running (clutch less), but with variable displacement from ± 3 to 100%
Types: Fix or variable displacement Piston compressor (up to 10 cylinders), Rotary vane compressor and Scroll compressor.



Condenser

Function: Cools the pressurized refrigerant (vapor, pressure between 6 and 15 Bar) below the condensation temperature and supplies liquid refrigerant.
Location in vehicle: Always in front of the radiator and in direct air stream. **Types:** Round tube/fin, Serpentine, Parallel Flow (PF)



Receiver/Drier

Function: Absorbs moisture (Water), Filters small particles (from compressor), stores liquid refrigerant (only at systems with thermostatic expansion valve)
Location in vehicle: Somewhere in engine compartment, vertical or horizontal (preferable in direct air stream).
Types: Vertical, Horizontal, Steel, Aluminium.



Evaporator

Function: Evaporates the liquid refrigerant using the interior heat. The absorbed heat is transported by vaporized refrigerant back to the compressor.
Location in vehicle: In most cases in HVAC housing.
Types: Round tube/fin, Serpentine, Plate/Fin.



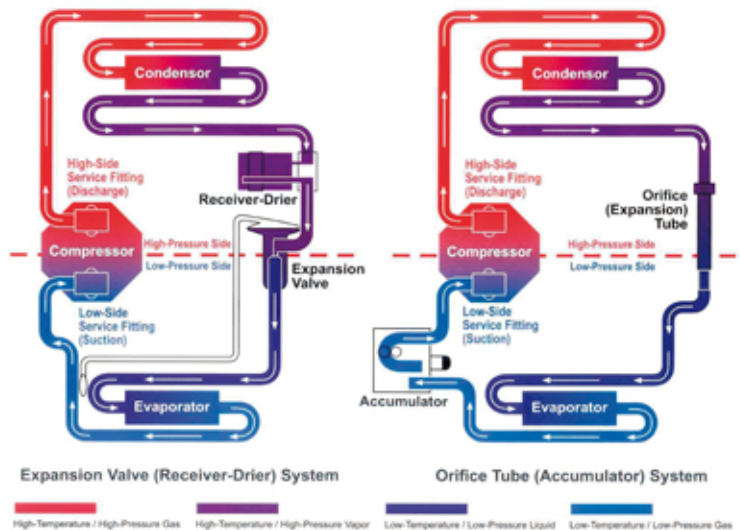
Expansion valve

Function: Reduces refrigerant flow which causes pressure drop in (Thermostatic) evaporator. Controls the amount of refrigerant injected.
Location in vehicle: At evaporator (Firewall, engine compartment or HVAC housing, interior compartment).
Types: Conventional type, block type

Recommended standard Torque specifications on o-ring connections:

Tube outer Ø	Thread size	Torque in Nm
3/8" (9,50 mm)	5/8" (Nr. 6)	15 - 17
1/2" (12,70 mm)	3/4" (Nr. 8)	20 - 27
5/8" (15,80 mm)	7/8" (Nr. 10)	28 - 36
3/4" (19,05 mm)	1 1/16" (Nr. 12)	37 - 47

- ◆ Always pressurise the system with nitrogen (min. 10 bar / 30 minutes) in order to determine possible leaks before charging the system with refrigerant.
- ◆ Evacuate the system for at least 45 minutes.
- ◆ Always charge with the right amount of refrigerant. It is recommended to charge the system using the high pressure service valve only (with engine not running!) in order to avoid fluid compression when compressor is engaged the first time.
- ◆ If present, always check condenser if fan is working correctly.
- ◆ Always check pressure, both discharge and suction.
- ◆ Always check temperature of discharged air in interior to insure system is fully working.



Common AC failures – AC Business opportunities!

Compressor

Failure *: No or insufficient performance, noisy, leaky

Repair: In most cases to replace if mechanical failure + replace Receiver/Drier!

Note: If oil is contaminated with metal particles always flush the system and replace receiver drier/accumulator and expansion valve/orifice tube!

Condenser

Failure: Leaky through corrosion or stone collision, damaged by crash, clogged by dirt

Repair: Always replace when leaky + replace Receiver/Drier! Clogged condensers need to be cleaned carefully

Receiver/Drier

Failure: Granulate contaminated with moisture, filter blocked

Repair: Always replace, especially in case of condenser and compressor replacement

Note: Always replace when system was open for more than one hour!

Expansion valve

Failure: Blocked by particles (from compressor)

Repair: Always replace

Evaporator

Failure: Leaky through corrosion, clogged by dirt

Repair: Always replace when leaky + replace Receiver/Drier! Clogged evaporator to be cleaned carefully. Use disinfectant spray to prevent smell.

* In many cases the compressor fails, because of insufficient refrigerant. The compressor then doesn't get enough lubricant and cooling. Due to the necessary use of flexible hoses and rubber sealing, no automotive AC system is 100% sealed. The leak rate of refrigerant through the flexible hoses and connection sealing can be up to 10% of the charged amount per year. A frequent, yearly service check on the AC systems is recommendable.



NRF BV | Langenboomseweg 64 | NL 5451 JM Mill | T: +31 485 476 476 | F: +31 485 476 403

+ (31) 485 47 64 76

+ (34) 958 405030

+ (43) 1259 3355

+ (44) 1327 300 242

+ (32) 38877676

+ (33) 327 211717

+ (48) 5834 314 77

+ (49) 2822 96740

+ (39) 574 643 388

+ (41) 1 777 2292

www.nrf.eu