

## Seven steps of a complete A/C Service

A thorough air-conditioning service will take between 45 minutes and one hour and should comprise at least these 7 basic steps:

**STEP 1** - When receiving the car from your customer the first and very important step is to confirm operation and performance of the air conditioning system. Clarify the date and scope of the last maintenance and confirm whether there are any complaints or problems such as noticeable decrease in performance, noise or bad smell in the interior. Check A/C cooling performance by measuring the air outlet temperature in order to have a precise reference value for later when performing the final check.

**STEP 2** - Identify the refrigerant inside the system. 'Drop in' or imitation refrigerants can easily reduce performance and damage the system components, such as your compressor.

**STEP 3** - Identify the quality of the refrigerant and oil. Many times improper oils are used and improper or too much UV leak detection fluid is used. This does reduce lifetime of your compressor and is one of the main reasons why compressors fail. Moreover, check if there is water or other contaminants in your refrigerant.



**STEP 4** - Check if the vehicle is equipped with an interior filter and if this filter needs replacement. When an interior filter is not replaced in time, the airflow going into your interior is reduced and in some severe cases even blocked. Not only cooling performance will reduce, but also the air flow resistance increases the load on the blower motor and thereby reducing the life expectancy of the blower motor or causing damage to the blower motor speed controller.

**STEP 5** - Check for refrigerant leakage. As there is not one perfect method for leak test best practice is to combine two or three

different methods. You can use an electronic gas leak detector, an UV leak detector (light + goggles) or specific leak detection equipment consisting of special electronic detector and special gas (nitrogen/hydrogen).

**STEP 6** - Check the state of the system parts. Check parts, hoses and connections if there is any damage, such as stone hitting, corrosion or dirt. Not only check the outside surface, but more important, check between the condenser and radiator. When vehicles get older dirt accumulates between condenser and radiator and restricts air flow. This will increase condensing pressure and reduce lifetime of hoses and compressor.

**STEP 7** - Test air-conditioning system for proper operation. When checking the system operation, you not only test performance, but also check for noise, operation of condenser fan and air flow, air mixing (heating and cooling) and a bad smell in the interior when in A/C mode.

**Equipment and tools necessary for A/C maintenance:**

- 1. Sight glass** - used to determine refrigerant and oil quality. A sample is taken from the air-conditioning system, which gives a clear view if there is any contamination or too much UV dye or wrong oil.
- 2. Leak detection** – using UV leak dye and UV leak detector (light + goggles) only is not sufficient. The UV detection dye is mixed with oil which means the leak must be big enough to leak oil as well, therefore it is not possible to detect all leaks and additional gas leak detection is necessary e.g. through the hydrogen method with electronic gas leak detector and forming gas.
- 3. Thermometer** - preferable with 2 probes for measuring DeltaT and with the possibility to connect tube clamp for measuring tube temperatures.
- 4. PWM signal generator** - Variable compressors are many times controlled using an electronic valve. This valve is operated using a PWM signal. To simulate this signal and check operation and maximum performance of the compressor a signal simulator is necessary.
- 5. Flushing equipment** (separate unit, not included in the automatic filling station!) - necessary for cleaning the refrigerant cycle when compressor is replaced or when the system is contaminated with wrong oil or UV-dye.
- 6. Oil and UV injection kits** - for each type of oil and UV dye, a separate injection kit is necessary to charge oil to the system.
- 7. A/C service station** - the type of charging equipment depends on user preference. You can choose automatic, semi-automatic or manual equipment, for performance it does not matter which you choose. If you are well experienced manual equipment is the best choice to make. More important than the type of equipment is regular maintenance and calibration. which are highly sensitive to contamination.

**Investment in A/C Service equipment pays off!**

As an expert in Air-Conditioning, DENSO recognises that the investment needed to carry out effective service and repair is not only essential but also at considerable cost. All your equipment needs maintenance and some calibration. Yes, this will cost money but it will deliver a return on investment. It is estimated that no maintenance or calibration of tools and equipment results in approximately fifteen percent of all air conditioning system failures. These type of failures are not covered under warranty by any of your suppliers and therefore end up on your own expense

**Sight glass analysis will help you diagnose the failure:**



**Refrigerant R134a**  
mixed with  
- DENSO ND8 (PAG46)

Clear mixture with slight streaks



**Refrigerant R134a**  
mixed with  
- DENSO ND8 (PAG46)  
- UV Leak Dye

All liquids are mixed with each other



**Refrigerant R134a**  
mixed with  
- Universal Oil (PAO68)

Clear liquids that do not mix with each other



**Refrigerant R134a**  
mixed with  
- DENSO ND8 (PAG46)  
- Universal Oil (PAO68)

R134a and PAG46 Oil are mixed. PAO68 Oil floats on top. Slight milky appearance.



**Refrigerant R134a**  
mixed with  
- DENSO ND8 (PAG46)  
- DENSO ND11 (POE-Insulating Oil)

All liquids are mixed with each other. Slight milky appearance.



**Refrigerant R134a**  
mixed with  
- DENSO ND8 (PAG46)  
- UV Leak Dye  
- Universal Oil (PAO68)

R134a, PAG46 Oil and UV leak dye are mixed. PAO68 Oil floats on top. Slight milky/coloured appearance.