



COMPONENTS FOR THE NEW REFRIGERANT R744/CO₂

R744 COMPONENTS FROM BEHR HELLA SERVICE

Behr Hella Service is one of the first suppliers to exclusively stock selected components for R744 refrigerant circuits for the independent parts market.

In doing so, Behr Hella Service combines the OE know-how of BEHR, the developer of the world's first R744 air-conditioning system, with the sales expertise of HELLA.

The components are perfectly tailored to the respective system conditions and satisfy the most stringent requirements in terms of functionality and operational safety.

STATUTORY FRAMEWORK CONDITIONS

Since the start of 2014, all newly type-approved vehicle models have been required to be filled with an environmentally friendly air-conditioning system refrigerant. Furthermore, since January 2017, all newly certified passenger cars in Europe have also needed to use a refrigerant for which the global warming potential (GWP) is less than 150. This value is a relative figure for the contribution a certain substance makes to the greenhouse effect, and reflects the harm a refrigerant poses to the environment in relation to the climate impact of CO₂. In this case, the GWP indicates the average warming effect over a period of 100 years.

R1234YF AS AN ALTERNATIVE TO R134A

In order to satisfy the GWP requirements outlined above, R1234yf (= tetrafluoropropene) has been used as an alternative to R134a (= tetrafluoroethane) for several years. This is a synthetically manufactured refrigerant with a GWP of 4. The thermodynamic properties of refrigerants R134a and R1234yf are similar. Air-conditioning systems can be operated efficiently with similar components and minor modifications, while still maintaining comparable refrigeration performance.

ONE OTHER ALTERNATIVE: R744 (= CARBON DIOXIDE)

Naturally occurring carbon dioxide (R744) is used as an additional alternative refrigerant: This is considered to be particularly environmentally friendly, and exhibits a very low GWP value of 1. However, the thermodynamic properties of R744 fundamentally differ from the chemical alternatives R134a and R1234yf used up until now.

The first main difference

In order to be able to operate efficiently, it requires pressures of between 60 and 130 bar on the high-pressure side of the air-conditioning system's refrigerant circuit. This is several times the pressure of the refrigerants used up until now. Pressures as high as 35 to 50 bar are even present on the low-pressure side. These are up to 10 times higher than previous typical values.

The second major difference

Above an external temperature of around 25 °C, the refrigerant pressure exceeds the so-called "critical point". Above this level, the R744 refrigerant can no longer be liquefied through cooling.

In such conditions, the refrigerant is therefore continuously air-cooled by the so-called "gas cooler" accommodated in the front end.

R744: ALTERED REQUIREMENTS FOR THE AIR-CONDITIONING SYSTEM

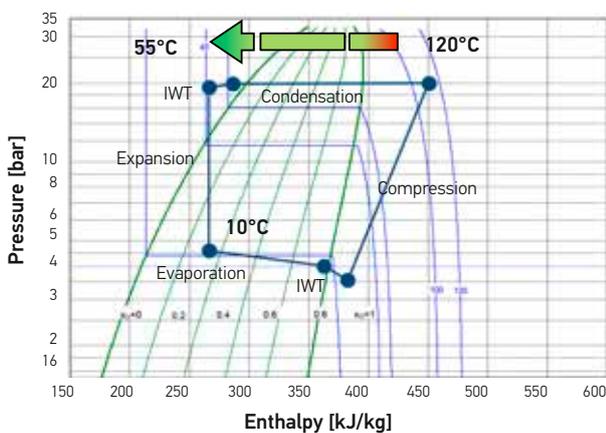
The differences outlined previously, particularly the high pressure levels in the air-conditioning system, result in altered requirements and necessary modifications to the refrigerant circuit for R744 systems and the associated components. One particular challenge in this case is ensuring that the refrigerant circuit is leak-tight. The small size of the molecules and the high CO₂-permeability of conventional polymer hoses necessitate the use of metallic sealing rings and flexible, coated polymer hoses. Furthermore, corrugated stainless steel hoses are required downstream of the compressor on the hot gas line.

When using R744 refrigerant, two particular aspects must be considered for reasons of operational safety:

- The refrigerant circuit must be secured to prevent components from bursting. This protection is provided in the form of a pressure-temperature sensor and pressure limiting valves on the high-pressure and low-pressure sides alike.
- A CO₂ concentration of over 5 % in the air may cause headaches and dizziness, or even loss of consciousness at even higher concentrations. For this reason, the system must be equipped with a CO₂ sensor that measures the concentration of refrigerant in the vehicle interior, switches off the air-conditioning system in an emergency, and ensures a sufficient supply of fresh air.

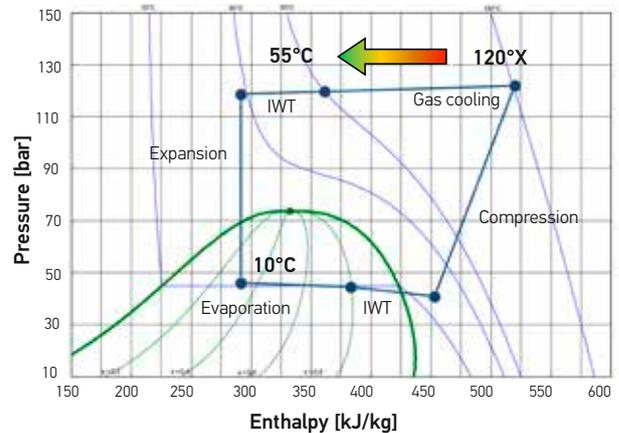
THERMODYNAMIC DIFFERENCES

R1234YF



High-pressure level: 10-20 bar
 Low-pressure level: 3-5 bar
 Hot gas temperature: Up to 140 °C
 Heat dissipation: Condensation
 IHE: Internal heat exchanger

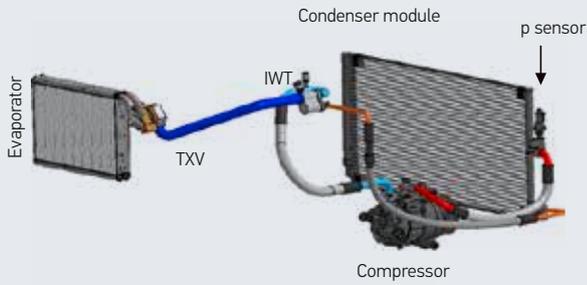
R744



High-pressure level: 60-130 bar
 Low-pressure level: 30-50 bar
 Hot gas temperature: Up to 165 °C
 Heat dissipation: Gas cooling
 Supercritical process with full load

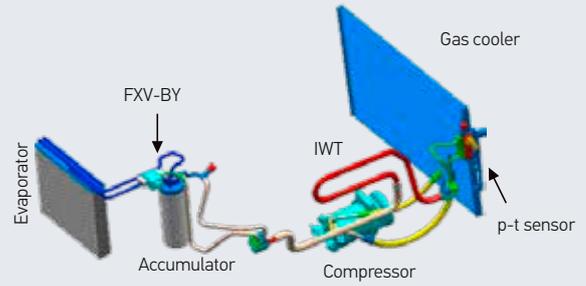
SYSTEM COMPARISON

R134A / R1234YF

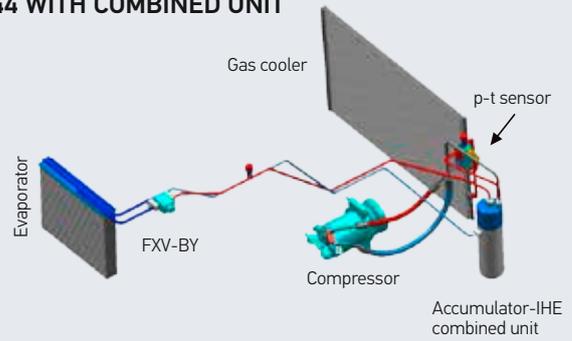


TXV: Thermal expansion valve
 FXV-BY: Fixed restrictor with bypass valve
 IHE: Internal heat exchanger
 p sensor: Pressure sensor
 p-t sensor: Pressure-temperature sensor

R744 WITH ACCUMULATOR/IHE



R744 WITH COMBINED UNIT



PRODUCT OVERVIEW

| Part number | Description | Vehicle application | VERSION | PREMIUM LINE* | OE numbers** |
|-----------------|--|---------------------|---------------------|------------------|--------------|
| 8FV 351 003-571 | Front evaporator, without expansion valve, left-hand-drive vehicles | MB S-CLASS (W222) | produced by BEHR | ■ | A2228300003 |
| 8FV 351 003-591 | Front evaporator, without expansion valve, right-hand-drive vehicles | MB S-CLASS (W222) | produced by BEHR | ■ | A2228300103 |
| 8FV 351 003-601 | Rear evaporator, without expansion valve | MB S-CLASS (W222) | produced by BEHR | ■ | A2228301303 |

For further differentiation, please see information from Behr Hella Service catalogues, TecDoc and also the manufacturer's specifications.
 This list is not exhaustive and may contain errors.

* More information can be found online at www.behrhellaservice.com/premiumline.

** OE numbers are for comparative purposes only.