Audi > C5 > 1998-2005
Refrigerant R134a - Servicing
87 - General Information

Refrigerant Circuit and Components

⇒ **Components**

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⇒ **Refrigerant Circuit Repair Information**

- All components of the refrigerant circuit submitted for quality observation are always to be sealed (use original sealing caps of replacement part).

- Replace damaged or leaking components of refrigerant circuit Refrigerant Circuit Components, Replacing .

Note:

- *To date, the following replacement parts (compressor, reservoir, evaporator and condenser) have been filled with nitrogen gas. This charge is being gradually discontinued. Little or no pressure equalization is therefore noticeable on unscrewing sealing plugs from replacement parts.*

Refrigerant Circuit Components, Arrangement and Influence on High and Low Pressure Sides

High pressure side: Condenser, receiver and restrictor or expansion valve to separate the high and low pressure liquid ends

High pressure results from the restrictor or expansion valve forming a constriction and causing the refrigerant to accumulate, thus leading to an increase in pressure and temperature.

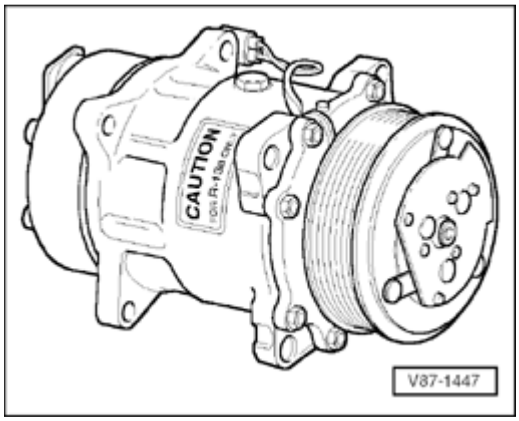
Excess pressure occurs if too much refrigerant or refrigerant oil is used, the condenser is contaminated, the coolant fan is malfunctioning, the system is blocked or in the event of moisture in the refrigerant circuit (icing-up of restrictor or expansion valve).

Low pressure side: Evaporator, evaporator temperature sensor and compressor to separate high and low pressure gas ends

A drop in system pressure can be caused by loss of refrigerant, the restrictor or expansion valve (blockage), a malfunctioning compressor or an iced-up evaporator.

Components

Compressor



The compressor is driven via a poly V-belt by the vehicle engine.

Compressor with A/C clutch:

An electromagnetic coupling attached to the compressor provides the power link between pulley and compressor crankshaft when the air conditioning is switched on.

Compressor with no A/C clutch:

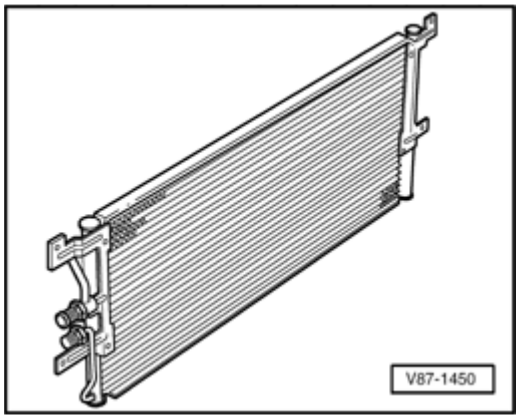
An overload safeguard attached to the pulley of the compressor is tripped if the compressor does not move freely, thus protecting the belt drive against overload.

The compressor draws in refrigerant gas from the evaporator, compresses it and conveys it to the condenser.

Note:

- *The compressor contains refrigerant oil which mixes with refrigerant R134a at all temperatures.*
- *The rating plate indicates the refrigerant for which the compressor is designed. A valve regulates the pressure on the low-pressure side within the specified range (control characteristic).*
- *On compressors with no A/C clutch, a regulator valve is externally actuated.*
- *On compressors with no A/C clutch, the engine is only to be started following complete assembly of the refrigerant circuit.*
- *To prevent compressor damage if the refrigerant circuit is empty, the A/C clutch is deactivated and the A/C Compressor Regulator Valve N280 no longer actuated (compressor idles with engine).*
- *If the refrigerant circuit is empty, a compressor with no A/C Clutch N25 (with A/C Compressor Regulator Valve N280) is switched to internal lubrication by way of a valve.*

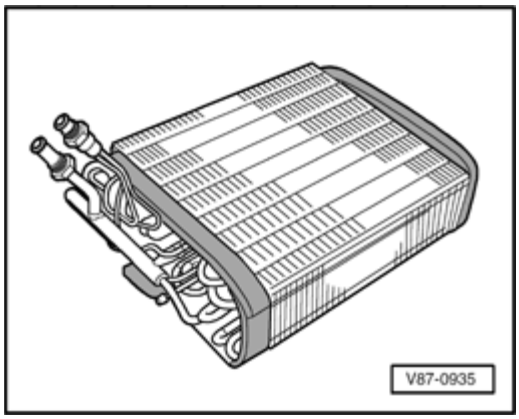
Condenser



The condenser dissipates heat from the compressed refrigerant gas to the surrounding air.

In this process, the refrigerant gas condenses to form liquid.

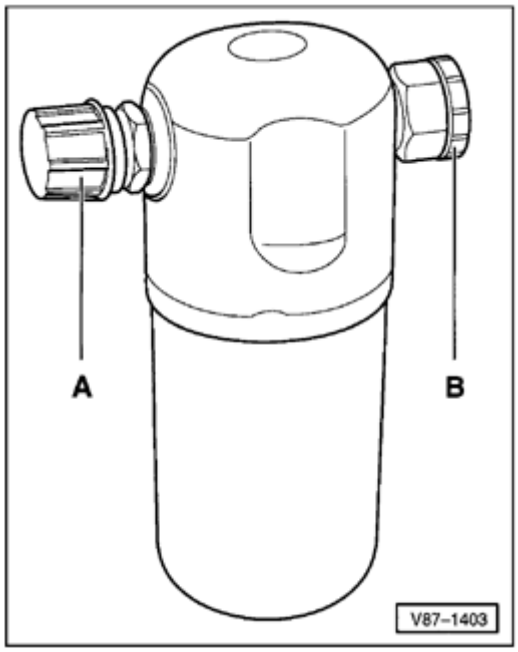
Evaporator



The liquid refrigerant evaporates in the coiled pipes of the evaporator. The heat required for this is extracted from the air flowing past the evaporator fins. The air cools down. The refrigerant evaporates and is drawn in by the compressor together with the absorbed heat.

A defined quantity of refrigerant is supplied to the evaporator by way of a restrictor or expansion valve. In systems with an expansion valve the flow rate is regulated such that only gaseous refrigerant emerges at the evaporator outlet.

Reservoir



To ensure that the compressor draws in only gaseous refrigerant, the reservoir collects the mixture of vapor and gas coming from the evaporator. The vapor becomes gaseous refrigerant.

An oil extraction hole ensures that refrigerant oil entrained in the circuit does not remain in the reservoir.

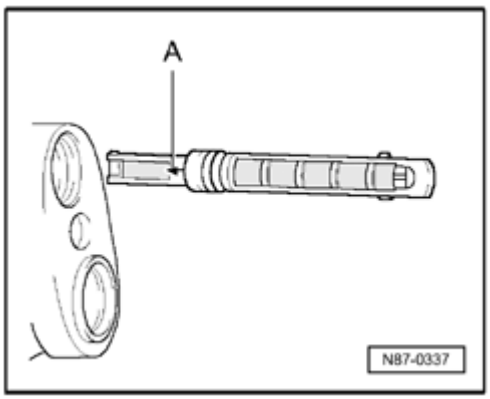
Any moisture penetrating into the refrigerant circuit during assembly is trapped by a filter (desiccant bag) in the reservoir.

Gaseous refrigerant with oil is drawn in by the compressor.

Note:

- *Replace reservoir if refrigerant circuit has been open for a lengthy period and moisture has penetrated or if replacement is stipulated on the basis of a specific complaint ⇒ Refrigerant Circuit Components, Replacing .*
- *Do not remove sealing plugs - **A** - and - **B** - until immediately prior to installation.*
- *If a reservoir is not sealed, the desiccant bag soon becomes saturated with moisture and can no longer be used.*
- *On installation, note arrow indicating direction of flow if applicable.*

Restrictor



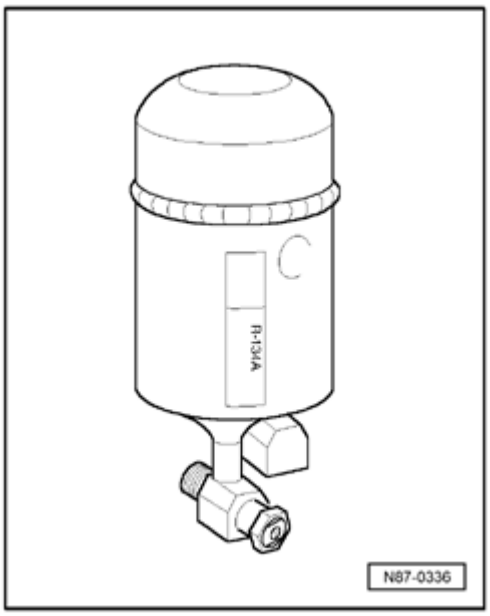
The restrictor forms a constriction. This constriction restricts the flow, thus separating the refrigerant circuit into high and low pressure sides. Upstream of the restrictor, the refrigerant is warm due to the high pressure. Downstream of the restrictor, the refrigerant is cold due to the low pressure. A strainer is provided upstream of the constriction to trap dirt. The strainer downstream of the constriction is designed to atomize the refrigerant before it enters the evaporator.

Note:

- *Arrow - **A** - on restrictor faces evaporator.*
- *Always replace after opening circuit.*
- *Different versions, observe notes in various customer service information sources ⇒ Heating, air conditioning or ⇒ Air conditioning and ⇒ Electronic Parts Catalog*

ETKA .

Receiver

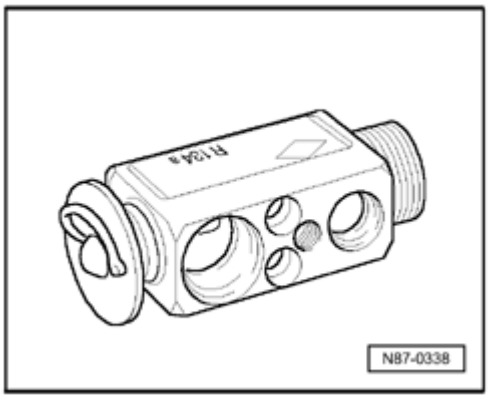


The receiver collects the droplets of liquid and conveys them in a continuous stream to the expansion valve. Any moisture penetrating into the refrigerant circuit during assembly is collected by a dryer in the receiver.

Note:

- *Replace receiver if refrigerant circuit has been open for a lengthy period and moisture has penetrated or if replacement is stipulated on the basis of a specific complaint ⇒ Refrigerant Circuit Components, Replacing .*
- *Only remove sealing plugs immediately prior to installation.*
- *If a receiver is not sealed, the desiccant bag soon becomes saturated with moisture and can no longer be used.*
- *On installation, note arrow indicating direction of flow if applicable.*
- *Depending on the construction of the refrigerant circuit, the receiver may also be secured on the condenser or installed in the condenser. ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 and ⇒ Electronic Parts Catalog ETKA*
- *Depending on the construction of the refrigerant circuit, the desiccant bag as the dryer cartridge may also be installed in the condenser. ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 and ⇒ Electronic Parts Catalog ETKA*

Expansion Valve

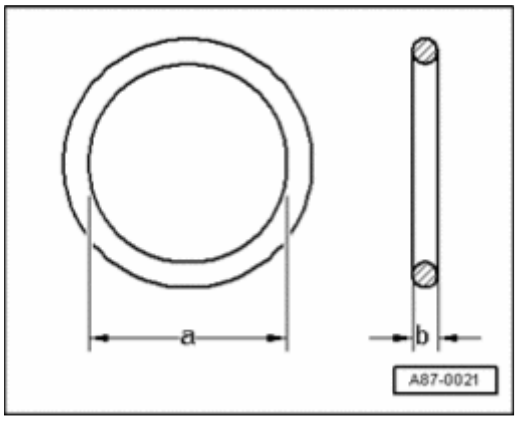


The expansion valve atomizes the refrigerant flowing in and controls the flow rate in line with the quantity of heat transferred such that gas does not form until it reaches the evaporator outlet.

Note:

- *Pay attention to correct part number when replacing expansion valve. ⇒ Electronic Parts Catalog ETKA*
- *Different characteristic curves matched to the appropriate circuit with Internally Regulated Compressor ⇒ Pressure Checking, Vehicles with Restrictor, Reservoir and A/C Compressor Regulator Valve with Externally Regulated Compressor with Externally Regulated Compressor ⇒ Pressure Checking, Vehicles with Expansion Valve, Receiver, and A/C Compressor Regulator Valve with Externally Regulated Compressor and ⇒ Electronic Parts Catalog ETKA .*

O-Rings



These rings seal the joints between the individual components of the refrigerant circuit.

Only O-rings resistant to R134a refrigerant and the related refrigerant oils are to be used. This is guaranteed by genuine replacement parts.

O-rings:

- Always use only once.
- Make sure diameters - **a** - and - **b** - are correct.
- Moisten with refrigerant oil before installing ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 and ⇒ Electronic Parts Catalog ETKA

Note:

- *The color coding of O-rings for R134a refrigerant circuits has been discontinued. Use is made of black and colored seals ⇒ Electronic Parts Catalog ETKA and ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 .*

Refrigerant Circuit Pipes and Hoses

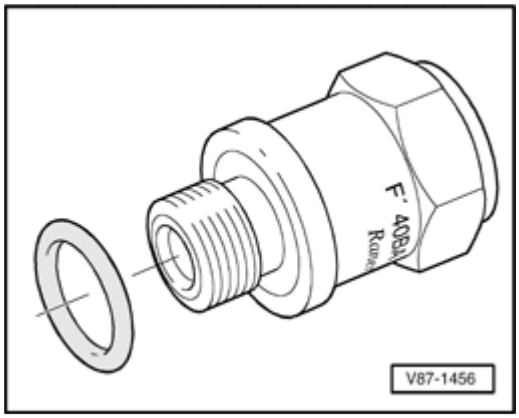
The mixture of refrigerant oil and refrigerant R134a corrodes certain metals (e.g. copper) and alloys and dissolves certain hose materials. Genuine replacement parts are therefore always to be used.

The pipes and hoses are linked by threaded joints or special connectors.

Note:

- *Observe specified torques for threaded joints and use the specified release tools for connectors.*

Pressure Relief Valve



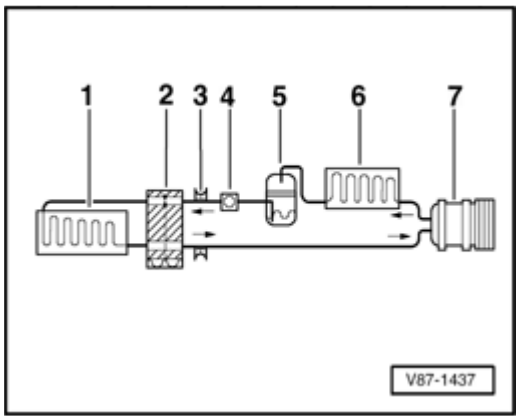
The pressure relief valve is attached to the compressor or receiver.

The valve opens at a pressure of approx. 38 bar and closes again once the pressure has dropped (approx. 30 bar).

Not all the refrigerant escapes.

Certain versions feature a transparent plastic disc which breaks off as soon as the valve responds.

Refrigerant Circuit Design

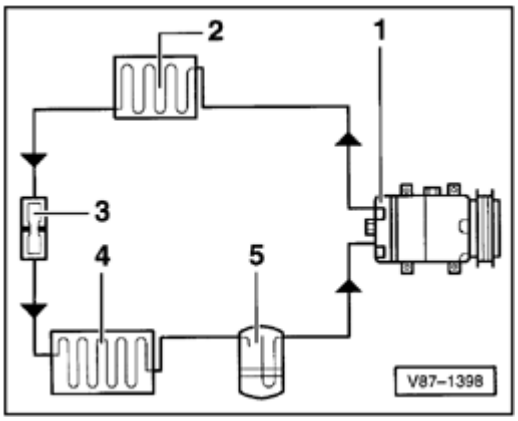


Refrigerant Circuit with Expansion Valve and Evaporator

1. Evaporator
2. Expansion valve
3. Valve for extraction, charging and measurement
4. Inspection port (not installed with R134a circuits)
5. Receiver with dryer
6. Condenser
7. Compressor

Note:

- *Arrows show direction of refrigerant flow.*



Refrigerant Circuit with Restrictor and Reservoir

1. Compressor
2. Condenser
3. Restrictor
4. Evaporator
5. Reservoir

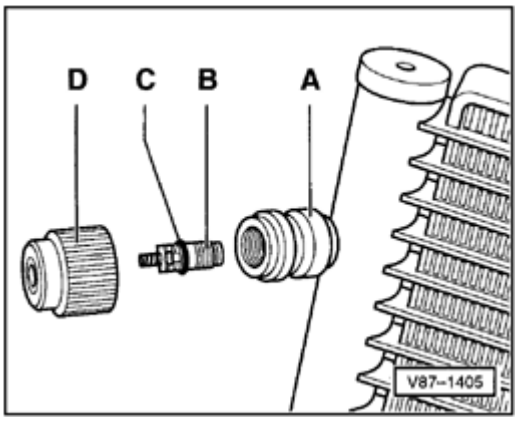
Note:

- *Arrows show direction of refrigerant flow.*

Refrigerant Circuit Quick-Release Connections

- Only valves and connections resistant to R134a refrigerant and the related refrigerant oils are to be used.
- There are different connections (OD) for high and low pressure sides.
- Discharge refrigerant circuit before removing valves or valve inserts.
- Always screw on sealing caps.

Arrangement in vehicle ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87



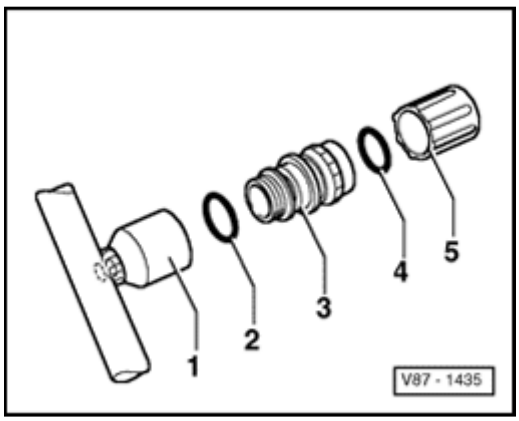
Connections with Schrader Valve

A - Service connection (soldered in)
B - Schrader valve insert
C - O-ring (for valve)
D - Cap with seal

Connections with Primary Sealing Valve

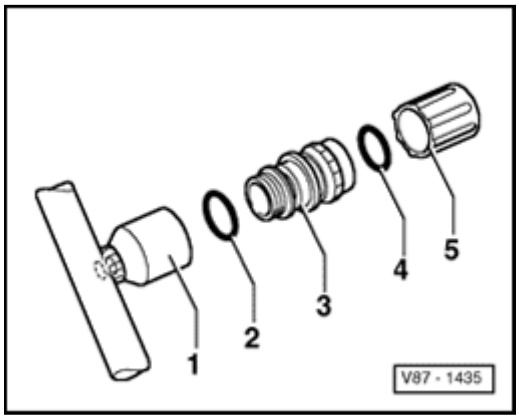
CAUTION!

Before unscrewing connection, connect A/C service station and extract refrigerant. Refrigerant circuit must be empty to avoid possible injury.



Connection with High-Pressure Valve

1. Socket with external or internal thread
2. O-ring: 10.8 mm; 1.8 mm, identification: black or colored
3. Valve with groove for O-ring and external or internal thread M 8x1 for cap
4. O-ring for cap: 10.8 mm; 1.8 mm, identification: black or colored
5. Cap



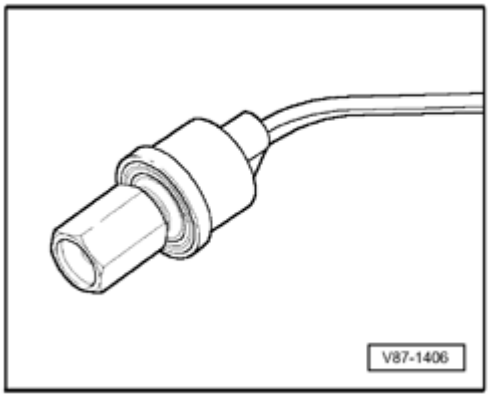
Connection with Low-Pressure Valve

1. Socket with external thread and groove for O-ring
2. O-ring: 7.6 mm; 1.8 mm, identification: black or colored
3. Valve internal thread for cap M 8x1
4. O-ring for cap: 7.6 mm; 1.8 mm, identification: black or colored
5. Cap

Refrigerant Circuit Switches, Sensors, and Related Connections

Note:

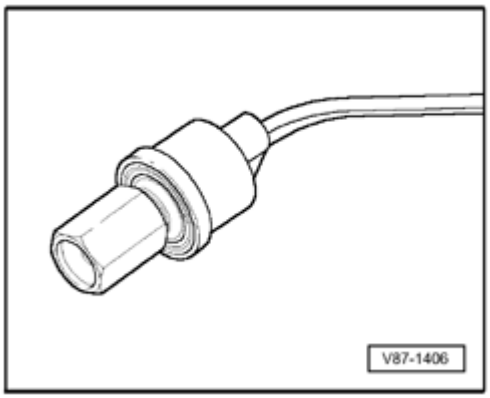
- *Refer to vehicle-specific refrigerant circuit for switching pressures, switch removal/installation and switch layout/design ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 .*



A/C Refrigerant High Pressure Switch F23

Function:

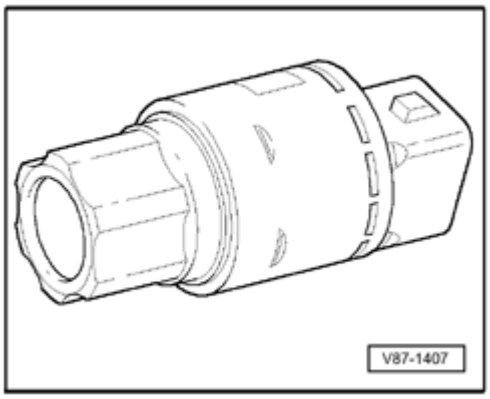
Switches coolant fan up to next speed setting in the event of pressure increase (approx. 16 bar) in refrigerant circuit.



A/C Refrigerant High Pressure Switch F118

Function:

Switches off compressor in the event of excess pressure in the refrigerant circuit (approx. 32 bar).



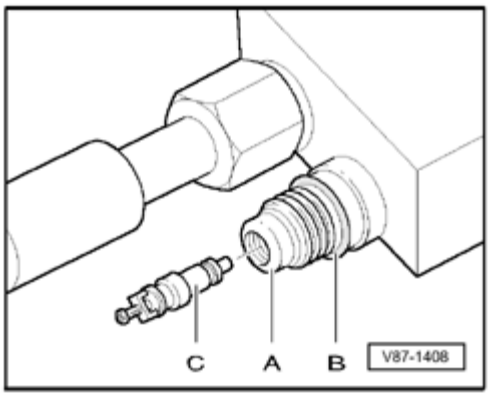
A/C Refrigerant Low Pressure Switch F73

Function:

Switches off compressor in the event of pressure drop in the refrigerant circuit (approx. 2 bar).

Connections with Valve for Refrigerant Circuit Switches

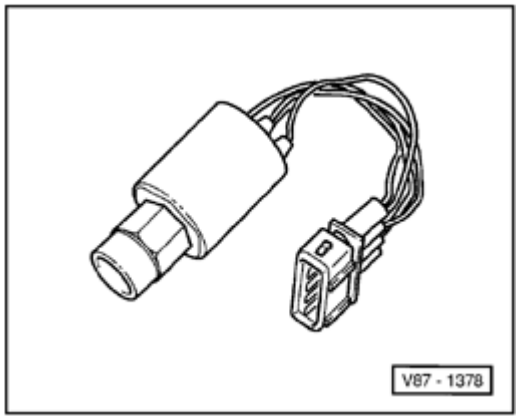
- There are different threads for switches on high and low pressure sides.



- Only valves and O-rings resistant to R134a refrigerant and the related refrigerant oils are to be used.

A - Connection (soldered in)
B - O-ring
C - Valve (with O-ring)

A/C Pressure Switch F129



This pressure switch has 3 functions:

1. Switches coolant fan up to next speed setting in the event of pressure increase (approx. 16 bar) in refrigerant circuit.

2. Switches off air conditioner in the event of excessive pressure (approx. 32 bar) caused for example by inadequate engine cooling.

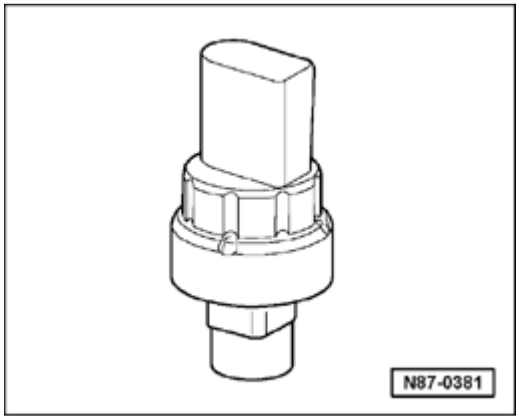
3. Switches off air conditioner in the event of insufficient pressure (approx. 2 bar) caused for example by loss of refrigerant.

Note:

- *The A/C Pressure Switch F129 replaces the A/C Refrigerant High Pressure Switch*

F23 , the A/C Refrigerant Low Pressure Switch F73 and the A/C Refrigerant High Pressure Switch F118 .

High Pressure Sensor G65



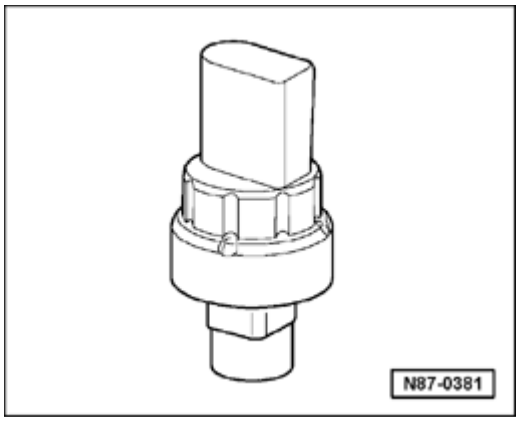
The High Pressure Sensor G65 is installed instead of the A/C Pressure Switch F129 or the A/C Pressure/temperature Sensor G395 .

The A/C Pressure/temperature Sensor G395 ("grey" housing at present) and the High Pressure Sensor G65 ("black" housing at present) currently only differ in terms of housing color and attention is therefore to be paid to correct assignment on replacement (part number ⇒ Electronic Parts Catalog ETKA). As these two sensors emit different signals, the relevant control module can only evaluate the signal to which it has been matched.

The High Pressure Sensor G65 generates a square-wave signal or data telegram when voltage is applied. This signal changes with the pressure in the system.

The downstream control modules (coolant fan control module, Engine Control Module (ECM), A/C Control Head E87 , Climatronic Control Module J255 etc.) use this signal to calculate the pressure in the refrigerant circuit and to actuate the coolant fans, fan motor and A/C Clutch N25 accordingly or to modify actuation of the A/C Compressor Regulator Valve N280 .

A/C Pressure/Temperature Sensor G395



The A/C Pressure/temperature Sensor G395 is installed instead of the High Pressure Sensor G65 .

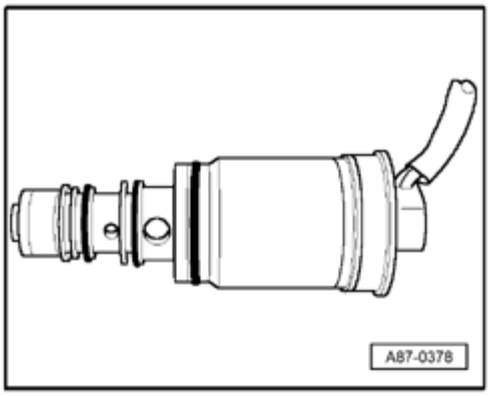
Externally, the A/C Pressure/temperature Sensor G395 ("grey" housing at present) and the High Pressure Sensor G65 ("black" housing at present) currently only differ in terms of housing color and attention is therefore to be paid to correct assignment on replacement (part number ⇒ Electronic Parts Catalog ETKA). As these two sensors emit different signals, the relevant control module can only evaluate the signal to which it has been matched.

When voltage is applied, the A/C Pressure/temperature Sensor G395 exchanges information via the air conditioner data bus system ("LIN bus") with the corresponding control module. The relevant control module uses this information to calculate the pressure and temperature in the refrigerant circuit and any faults detected are signalled to the control module.

The temperature measured by the A/C Pressure/temperature Sensor G395 differs on account of the design of the A/C Pressure/temperature Sensor G395 and the component location from the actual temperature of the refrigerant in the refrigerant circuit. It is therefore not evaluated at present by all control modules and used for air conditioner control.

This information is used for example by the control head, Climatronic Control Module J255 to calculate the pressure in the refrigerant circuit and to actuate the downstream control modules (coolant fan control module, Engine Control Module (ECM) etc.) by way of the data bus system. These control modules then regulate, for example, the coolant fans and engine accordingly ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 .

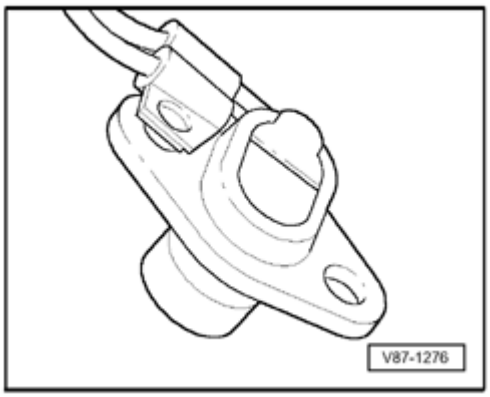
A/C Compressor Regulator Valve N280



The regulator valve is installed in the compressor. It is actuated by the A/C Control Head E87 or the Climatronic Control Module J255 . The pressure on the low pressure side is influenced by way of the regulator valve, thus regulating the temperature in the evaporator.

Note:

- *The A/C Compressor Regulator Valve N280 is part of the compressor and cannot be replaced separately.*



A/C Compressor Speed Sensor G111

Inductive sensor

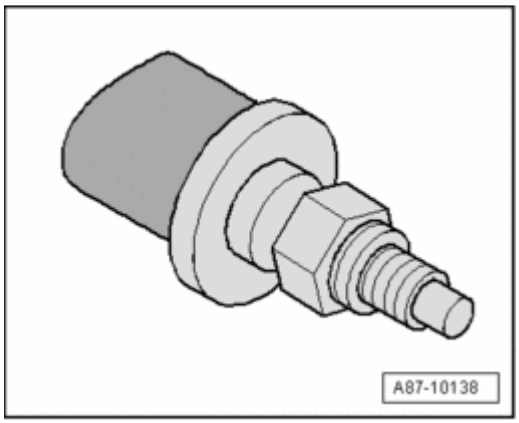
The sensor pulses (4 per compressor revolution) and the engine speed enable the A/C Control Head E87 or the Climatronic Control Module J255 to calculate belt slip.

If the belt slip exceeds a specified value, the compressor is switched off by the control module via the A/C clutch.

Note:

- *The sensor is installed in Audi vehicles with compressor drive via poly V-belt and*

Zexel compressor.



Refrigerant Temperature Sensor G454

The Refrigerant Temperature Sensor (with temperature-dependent resistor) is installed e.g. in high pressure line in vicinity of the compressor.

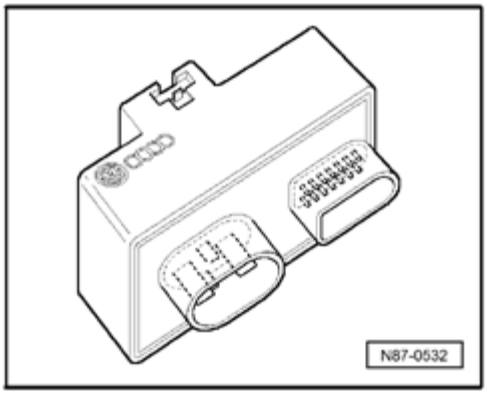
In the refrigerant circuit, there is a direct relationship between temperature and pressure, if there should be too little refrigerant in the refrigerant circuit, the temperature in the refrigerant circuit rises higher than intended for this pressure while A/C system is running.

Note:

- *Installed e.g. in the Audi Q7 with specific engines ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 and ⇒ Electrical Wiring Diagrams, Troubleshooting and Component Locations*
- *The A/C control head, Climatronic Control Module J255 evaluates pressure and temperature in the refrigerant circuit and switches off the compressor in the event the temperature increases above the value stored for this pressure ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 and in the Guided Fault Finding function of A/C system*

Coolant Fan Control Control Module J293

(Not on refrigerant circuit)



This control module switches the A/C clutch and thus the compressor on and off. It switches the coolant fans and calculates the pressure in the refrigerant circuit on vehicles with High Pressure Sensor G65 ⇒ Electrical Wiring Diagrams, Troubleshooting and Component Locations and ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 .

Refrigerant Circuit Pressures and Temperatures

CAUTION!

- **When working on the refrigerant circuit, observe generally valid safety precautions and pressure vessel regulations.**

The pressures and temperatures in the refrigerant circuit depend on the instantaneous operating statuses (e.g. engine speed, coolant fan speed 1, 2, or 3, engine temperature, compressor on or off) as well as environmental influences (e.g. ambient temperature, humidity, required cooling output).

On vehicles with A/C Compressor Regulator Valve N280 the pressure on the low pressure side is altered by actuating the valve.

For this reason, the values given in the following table are only intended as a rough guide. They are attained at an engine speed of 1500 to 2000 rpm and an ambient temperature of 20 degree C after about 20 minutes.

Refer to vehicle-specific refrigerant circuit for locations of pressure gauge connections ⇒ Heating, Ventilation and Air Conditioning - Repair Group 87 .

At 20 degree C with the engine not running, the pressure in the refrigerant circuit is 4.7 bar. Refer to ⇒ Air Conditioning System Principles

Note:

- *Pressure is measured in different units: 1 MPa (mega pascal) corresponds to 10 bar positive pressure or 145 psi, 1 bar absolute pressure corresponds to 0 bar positive pressure and thus to the ambient pressure (atmospheric pressure).*

Refrigerant Circuit with Expansion Valve

HP (HD) High pressure side of refrigerant circuit

LP (ND) Low pressure side of refrigerant circuit

Component	Refrigerant state	Pressure (bar)	Temperature in degrees Celsius
1 Evaporator, from inlet to outlet	Vapor	approx. 1.2 bar [1] 1	approx. -7 °C [2] 2
2 Expansion valve	Liquid, released as vapor	approx. 14 bar	approx. + 55 °C (HP-side), reduces to -7 °C (LP-side)
3 High pressure switch / high pressure sensor	Liquid	approx. 14 bar	approx. + 55 °C
4 Service connection, HP (HD) side and 5 fluid reservoir	Liquid	approx. 14 bar	approx. + 55 °C
6 Condenser	Gas (at inlet) to vapor to liquid (at outlet)	approx. 14 bar	From approx. + 65 °C (at input) to approx. + 55 °C (at outlet)
7 pressure relief valve and 8 compressor, HP (HD) side	Gas	approx. 14 bar	approx. + 65 °C
9 Compressor, LP (ND) side	Gas	approx. 1.2 bar [1] 1	approx. -1 °C [2] 2
10 Pre-volume (not present in all vehicles) and 11 Service connection, LP (ND) side	Gas	approx. 1.2 bar [1] 1	approx. -1 °C [2] 2

Note:

[1] 1 - The pressure in a refrigerant circuit with regulating compressor is maintained at approx. 2 bar absolute pressure (corresponds to approx. 1 bar positive pressure) despite varying heat transfer and fluctuating engine speeds. This however only applies within the output range of the compressor. If the output limits of the compressor are exceeded, the pressure will rise .

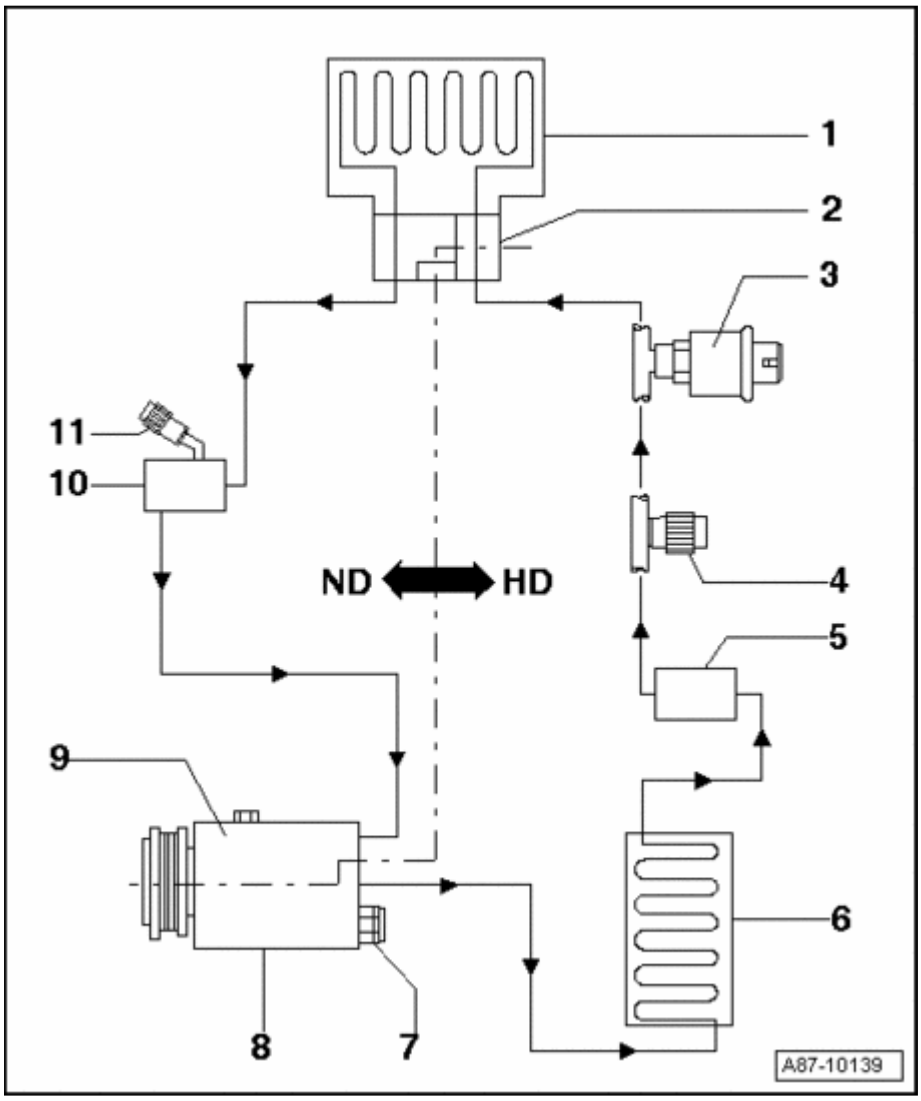
[2] 2 - The temperature in a refrigerant circuit with regulating compressor is maintained within the regulating range of the compressor despite varying heat transfer and fluctuating engine speeds. This however only applies within the output range of the compressor. If the output limits of the compressor are exceeded, the temperature will rise .

- *Non self-regulating compressors are switched off by the relevant control module via the A/C Compressor Regulator Valve N280 at evaporator temperatures below 0 degree C.*
- *On vehicles with A/C Compressor Regulator Valve N280 the pressure on the low pressure side is altered by actuating the valve.*
- *Temperature and pressure in the refrigerant circuit in vehicles with two evaporators and two expansion valves correspond to those in vehicles with only one evaporator and one expansion valve (parallel switching).*

Arrows show direction of refrigerant flow.

HD- High Pressure (HP) side of refrigerant circuit.

ND- Low Pressure (LP) side of refrigerant circuit.



1 - Evaporator

2 - Expansion valve

3 - High pressure switch / high pressure sensor

- Different versions depending on vehicle

4 - Service connection, HP (HD) side

5 - Receiver

- Different versions depending on vehicle

6 - Condenser

7 - Pressure relief valve

8 - Compressor, HP (HD) side

9 - Compressor, LP (ND) side

10 - Pre-volume

- Not present on all vehicles

11 - Service connection, valve LP (ND)

Refrigerant Circuit with Restrictor and Reservoir

HP (HD) High pressure side of refrigerant circuit

LP (ND) Low pressure side of refrigerant circuit

Component	Refrigerant state	Pressure (bar)	Temperature in degrees Celsius
1 Compressor, HP (HD) side	Gas	Up to 20 bar	Up to + 70 °C
2 Condenser	From gas to vapor to liquid	Up to 20 bar	Up to + 70 °C
3 Restrictor	From liquid to vapor	HP (HD) side up to 20 bar LP (ND) side greater than 1.0 bar	HP (HD) side up to + 60 °C LP (ND) side warmer than - 4 °C
4 Evaporator	From vapor to gas	Greater than 1.0 bar	Warmer than - 4 °C

5 Reservoir	Gas			The pressures on the low pressure side
6 Compressor, LP (ND) side	Gas			

are maintained at approx. 2 bar absolute pressure (corresponds to approx. 1 bar positive pressure) by the "regulating" compressor even at varying engine speeds. This however only applies within the output range of the compressor. If the output limits of the compressor are exceeded, refer to ⇒ Refrigerant Circuit, Checking Pressures with A/C Service Station .

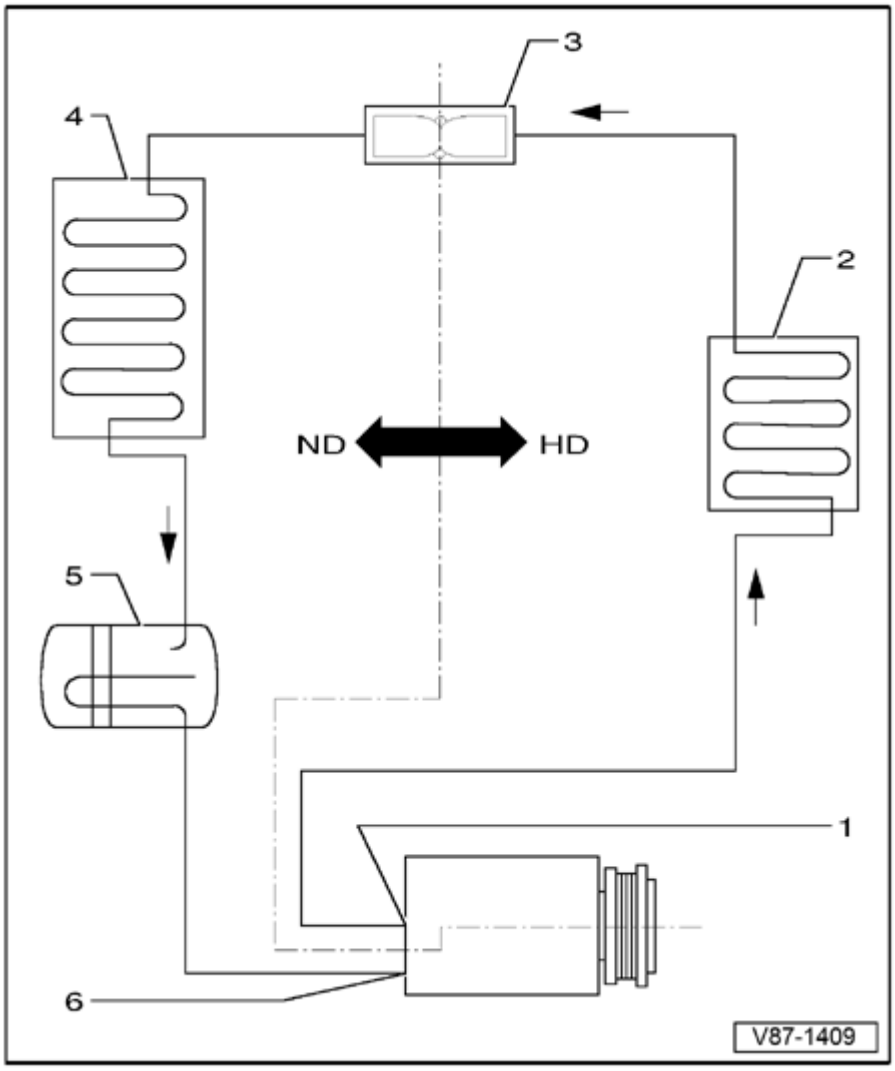
Note:

- *On vehicles with A/C Compressor Regulator Valve N280 the pressure on the low pressure side is altered by actuating the valve.*

Arrows show direction of refrigerant flow.

HD- High Pressure (HP) side of refrigerant circuit.

ND- Low Pressure (LP) side of refrigerant circuit.



1 - Compressor, HP (HD) side

2 - Condenser

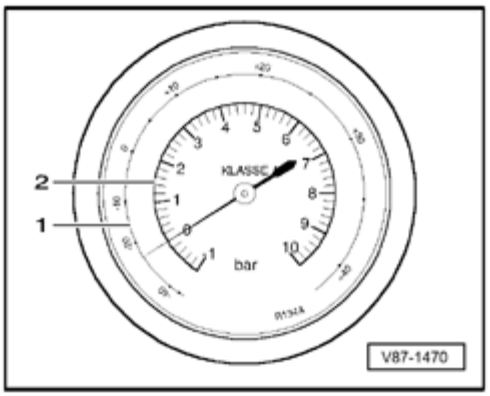
3 - Restrictor

4 - Evaporator

5 - Reservoir

6 - Compressor, LP (ND) side

Using Pressure Gauge



Pressure gauge scales

1. Temperature scale for refrigerant R134a CF3 CH2F or CH2F CF3
2. Pressure scale

Note:

- *Pressure is measured in different units: 1 MPa (mega pascal) corresponds to 10 bar positive pressure or 145 psi, 1 bar absolute pressure corresponds to 0 bar positive pressure and thus to the ambient pressure (atmospheric pressure).*

In addition to the pressure scale, pressure gauges may have one or more temperature scales. The scale values for R134a are assigned according to the vapor pressure table. As different refrigerants develop different vapor pressures at the same temperature, each temperature scale is marked for the appropriate refrigerant.

a Refrigerant circuit pressure and temperature measurements

- The high-pressure gauge measures the pressure and temperature distributed evenly from the compressor outlet via the condenser to the constriction (restrictor or expansion valve) when the air conditioning system is switched on.

- The low-pressure gauge measures the pressure and temperature distributed evenly from the constriction (restrictor or expansion valve) via the evaporator to the compressor inlet when the air conditioning system is switched on.

Note:

- *The relationship between pressure and temperature indicated on the gauges only exists in a refrigerant circuit containing liquid or vapor, but not gas. In the gas state, the temperature is approx. 10 degree C to 30 degree C higher than the gauge reading.*

b Verification of refrigerant in a closed vessel

Refrigerant R134a is present in a closed vessel or refrigerant circuit if the temperature

reading on the gauge corresponds to the temperature of the refrigerant (standing liquid assumes the temperature of its surroundings).

A closed vessel or deactivated refrigerant circuit is empty if the temperature indicated on the gauge is below that of the refrigerant.

Note:

- *The relationship between pressure and temperature indicated on the gauges no longer applies if no liquid is present and the pressure is built up solely by gas.*

Pressure Gauges permit the following tests and measurements

Service and Recycling Units

Service units for the extraction, cleaning and transfer of refrigerant for motor vehicle air conditioning systems are currently available from various manufacturers.

Certain A/C service stations (with appropriate auxiliary device and different adapters if necessary) can also be used for flushing the refrigerant circuit ⇒ Refrigerant Circuit, Flushing with Refrigerant R134a

Classification of Extraction Eystems

Note:

- *The service and recycling units used in motor vehicle workshops are extraction and charging systems not requiring a permit (Group "3") but which are only to be operated by qualified personnel. Instructions for unit operation and maintenance can be found in the relevant manufacturers documentation.*

- *Extraction and charging systems of groups "1" and "2" are not used in motor vehicle workshops.*

Group "3" extraction and charging systems:

Mobile extraction and charging systems for filling compressed-gas vessels permanently connected to the system

The refrigerant or refrigerant/oil mixture is transferred to compressed-gas vessels which are permanently connected to the mobile systems. In line with 3 Para. 5 No. 3 of the German pressure vessel regulations (different regulations may apply in other countries), compressed-gas vessels are classified as pressure vessels in this case.

The charging systems:

- Do not require a permit
- Do not require expert testing, as the gas is transferred to compressed-gas vessels which are classed as being pressure vessels (systems used for transfer from these pressure vessels to compressed-gas vessels for supplying to third parties do however require a permit and are subject to mandatory testing)

Charging Systems Not Requiring a Permit

Charging systems not requiring a permit are ones used for transferring compressed gases to mobile compressed-gas vessels for internal use only.

Note:

Some service units are charging systems not requiring a permit. When working with such equipment, the refrigerant is not transferred to mobile compressed-gas vessels, but rather into a permanently installed charging cylinder with visible level gauge and float switch.

Recommendation:

It is advisable to use a portable cylinder with visible level gauge and pressure relief valve for surplus refrigerant for internal use.

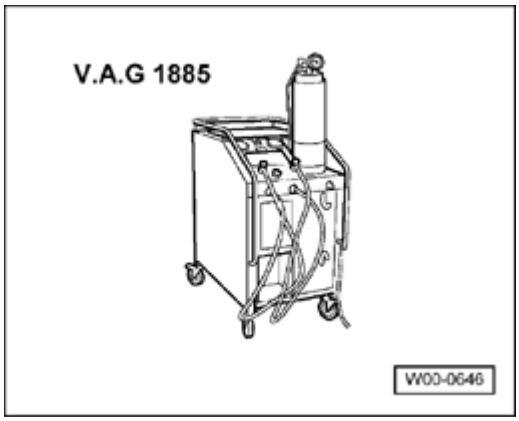
Attention must be paid in Germany to TRG 402 (technical regulations for compressed gases) when transferring compressed gases to other compressed-gas vessels (different regulations may apply in other countries).

Refrigerant Circuit Repair Information

CAUTION!

- **When working on the refrigerant circuit, observe generally valid safety precautions and pressure vessel regulations.**

Special tools and accessories:



The performance of proper workmanlike repairs on an air conditioning system

- Requires the use of special tools and materials as listed in ⇒ Testing Equipment, Tools and Materials .
- Requires compliance with the basic instructions for use of leak detectors ⇒ Refrigerant Circuit, Determining Leaks .
- Requires expert knowledge.

Note:

- *Releasing refrigerant into the environment is prohibited ⇒ Laws and Regulations (laws and regulations).*