HVAC

Refrigerant R134a - Servicing

87 - AIR CONDITIONING

LAWS AND REGULATIONS

--> **Converting R12 Refrigerant Circuit to R134a Refrigerant Circuit and Servicing**

--> **Keeping Refrigerant Records**

NOTE:

- **The laws and regulations listed below are applicable in Germany. Different or additional laws and regulations may apply in other countries.**

8 Operation, maintenance, shutdown, obligation to accept return

(1) With regard to operation, repair and shutdown of items containing refrigerants as defined in 3, it is prohibited to contravene the state of the art by allowing the substances they contain to escape into the atmosphere.

A record must be kept of the quantities used during operation and maintenance (refrigerant log, refer to Environmental Protection Vol. 2-2. 43.2) and presented to the relevant authorities on request.

(2) Distributors of the substances and preparations listed in 1 Para. 1 and 2 are obliged to accept the return of such substances and preparations after use or to appoint a third party to accept return of these.

(3) The maintenance and shutdown of items containing refrigerants as defined in 3, as well as acceptance of return of the substances and preparations listed in 1 Para. 1 and 2 may only be undertaken by persons with the necessary expert knowledge and technical equipment.

9 Criminal offences and infringements of the law

(3) An infringement of the law in terms of 26 Para. 1 No. 7 of the Law on Chemicals is constituted by wilful or negligent contravention of 8 Para. 1 Clause 1 during operation, maintenance or shutdown of items containing refrigerants as defined in 3 by allowing substances contained in these to escape into the atmosphere contrary to the state of the art, or by wilful or negligent contravention of the obligation to keep records as defined by 8 Para. 1 Clause 2.

TRG (technical regulations for compressed gases) 400, 401, 402

Only excerpts concerning vehicle manufacturers and workshops are listed below.

TRG 400 (general regulations for charging systems)

2. Definition of terms and explanatory notes

2.1 Charging systems

2.1.1 Charging systems are systems for filling mobile compressed-gas vessels. The charging system includes the premises and facilities concerned.

2.4 Charging systems requiring a permit

Charging systems requiring a permit are ones used to transfer compressed gases to mobile compressed-gas vessels for supplying to third parties.

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

TRG 401 (installation of charging systems)

Does not apply to vehicle manufacturers or workshops.

TRG 402 (operation of charging systems)

2. Employees and employee instruction

2.1 Charging systems are only to be operated and maintained by personnel

- Aged 18 and above
- Possessing the necessary technical knowledge
- Who can be relied on to work diligently

2.2 Supervised work may also be performed by personnel not satisfying the requirements stipulated in item 2.1, points 1 and 2.

2.3 Employees are to be given instruction on the following topics before beginning work and at regular, appropriate intervals, however at least once a year:

- Hazards specifically associated with handling compressed gases
- Safety regulations, particularly the applicable TRG
- Procedures in the event of malfunction, damage and accidents
- The use of fire-extinguishing and protective equipment

- Operation and maintenance of the charging system on the basis of the instructions for use

Charging (a separate TRG applies to vessels from other countries and their charging)

A compressed-gas vessel is only to be filled with the compressed gas declared on it and the quantity must comply with the stipulated pressure, weight or volume data (refer to g15, Para. 2, pressure vessel regulations).

2. In the case of vessels approved for use with several types of compressed gas, the compressed gas with which it is to be filled and - if the compressed gas has a tc not = -10 C (tc = critical temperature) - the maximum permissible charging weight in line with TRG 104 No. 3.3 must be marked on the vessel prior to connection for filling.

3. Compressed-gas vessels marked with the maximum permissible charge pressure in bar at 15 C must be filled manometrically. If, at the time of filling, the temperature is not 15 C, the pressure corresponding to the prevailing temperature must be established; it must be ensured that the permissible charge pressure at 15 C is not exceeded in the compressed-gas vessel. The charged vessels are to be checked by way of random pressure measurements to determine possible overfilling.

4. Compressed-gas vessels on which the maximum permissible capacity is indicated by the net weight (filling weight, permissible weight of fill) in kilograms must be filled gravimetrically. The vessels are to be weighed during filling and subsequently subjected to a weight check on special scales to establish possible overfilling. Scales used for this purpose must be calibrated.

5. Under certain conditions, gases with a tc not = +70 C may be transferred volumetrically from compressed-gas vessels with a maximum volume of 150 l to compressed-gas vessels with a volume of max. 1000 ccm. The stipulations of the TRG apply to the transfer of liquefied gas to cylinders used by workmen.

6. Vessels in vehicles for

(1) Gases with tc not = +70 C (refer to TRG 101 Annex 3)

(2) Industrial gas mixtures with tc not = +70 C (refer to TRG 102 Annex 1 Groups 3) or

(3) Liquefied extremely low-temperature compressed gases (refer to TRG 103) may, contrary to item 4, be filled volumetrically if the charging system and/or the vessels is/are equipped with devices for measuring or limiting the volume of the charge and with the exception of motor vehicle vessels as per item 3 for measuring the temperature of the charge. When filling volumetrically, it must be ensured that the permissible charge weight indicated on the vessel is not exceeded. To determine possible overfilling, the filled containers are to be checked gravimetrically on a calibrated scale or provided that the pressurized gases are not highly toxic volumetrically. Volumetric checking requires the use of appropriate equipment with completely separate charging and checking devices.

7. Charging and check measurements are to be performed by different people. Check measurements must be performed immediately upon completion of the filling process.

8. Overfilled vessels must be drained immediately and in a safe manner until the permissible fill is attained. The compressed-gas fill is then to be determined again.

9. Items 4 to 7 do not apply to vessels for liquefied, extremely low-temperature compressed gases which are neither flammable nor toxic; this does not affect the provisions of road traffic legislation.

10. When filling compressed gas vessels with liquefied gases at charging temperatures not = -20 C, the compressed gas vessel (if the vessel material has not been tested for temperatures not = -20 C) is not to be released from the charging system for transportation until the vessel wall temperature is not = +20 C.

Recycling and refuse law

Legislation on the handling and disposal of refrigerants and refrigerant oils is contained in the BIMISCH (German Immission Protection Law) and the Recycling and Refuse law --> Audi-ServiceNet, Handbooks, HSO Environment 2 and 3.

Disposal of refrigerant

Refrigerants intended for disposal are to be transferred to marked recycling containers, observing the permissible filling quantity.

Disposal of refrigerant oil

Used refrigerant oils from systems employing halogenated hydrocarbons are to be disposed of as waste subject to special supervision. They are not to be mixed with other oils or substances. Proper storage and disposal must be ensured in line with local regulations.

German technical, work safety and accident prevention regulations can be obtained from (addresses in other countries can be obtained from the relevant authorities):

BeuthVerlag GmbH

Burggrafenstr. 6

10787 Berlin

Carl Heymanns Verlag KG

Luxemburger Str. 449

50674 Koln

Converting R12 Refrigerant Circuit to R134a Refrigerant Circuit and Servicing

NOTE:

- **For environmental reasons and on account of the corresponding legislation, refrigerant R12 can no longer be manufactured or supplied. Refrigerant R134a has been developed as a replacement for R12.**
- **Air conditioning systems developed and designed for refrigerant R12 cannot however simply be charged with refrigerant R134a. To ensure trouble-free operation of the air conditioning system even after conversion, various components of the refrigerant circuit must be replaced.**
- **A precise description of the conversion procedure and information on the servicing of converted refrigerant circuits can be found in --> Repair Manual: Air conditioner with refrigerant R12 Parts 2 and 3. (This repair manual is only available in hard copy).**

Keeping Refrigerant Records

The environmental statistics law requires records to be kept on the use of refrigerants.

Consequently, motor vehicle workshops may well have to provide the relevant local authorities with information on their use of refrigerant. It is therefore advisable to keep records --> Audi ServiceNet, Handbooks, HSO Environment Vol. 2-2. 43.2

GENERAL INFORMATION

--> **Introduction**

--> **Air Conditioning System Principles**

--> **Refrigerant R134a**

--> **Refrigerant R134a Properties**

--> **Refrigerant Oil**

--> **Air Conditioning System, Operation**

--> **General Work Safety**

--> **Product Properties**

--> **Refrigerant, Handling**

--> **Pressure Vessels, Handling**

--> **Safety Regulations for Working with Extraction and Charging Systems**

--> **R134a Safety Precautions**

--> **Basic Rules for Working on Refrigerant Circuit**

Introduction

The purpose of this publication is to provide foremen and mechanics with the basic knowledge needed to ensure expert working.

NOTE:

- **Only the careful study of this documentation and practical implementation of the information contained, training on A/C systems and expert knowledge (with or without certificate) can guarantee expertise in the field of motor vehicle air conditioning systems.**

This information is a compact reference work which should be kept at the workplace. It should also be available for presentation to the responsible supervisory agency on request.

Air Conditioning System Principles

Physical Principles

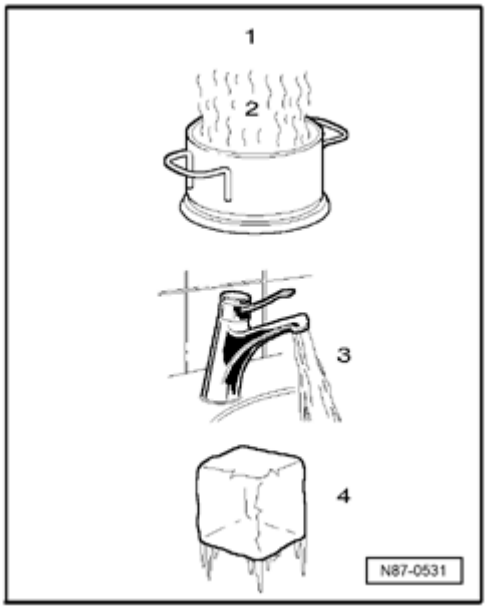

Fig. 1: Four States Of Water
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The four known states of water also apply to air conditioning system refrigerants.

1. Gas (invisible)
2. Vapor
3. Liquid
4. Solid

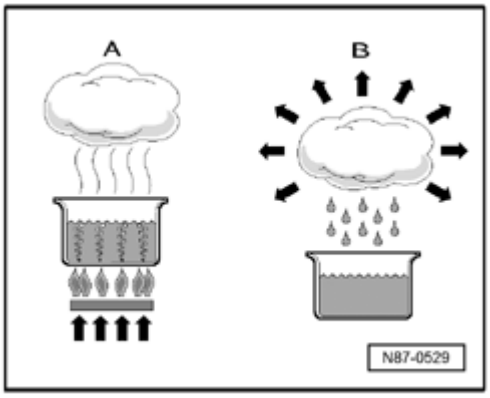

Fig. 2: Diagram Of Heat Absorption & Heat Emission
Courtesy of VOLKSWAGEN UNITED STATES, INC.

When water is heated in a vessel (heat absorption), water vapor can be seen to rise. If the vapor is further heated through heat absorption, the visible vapor turns into invisible gas. The process is reversible. If heat is extracted from water in gaseous form - **A** - , it changes first to vapor - **B** - , then to water and finally to ice.

A - Heat absorption

B - Heat emission

Heat Flow

Any substance consists of a mass of moving molecules. The fast moving molecules of a warmer substance give off some of their energy to the cooler and thus slower molecules. As a result, the molecular motion of the warmer substance slows down and that of the colder substance is accelerated. Heat always flows from a warmer to a colder substance. This process continues until the molecules of both substances are moving at the same speed. They are then at the same temperature and no further heat exchange takes place.

Pressure and Boiling Point

The boiling point given in tables for a liquid is always referenced to an atmospheric pressure of 1 bar. If the pressure acting on a fluid changes, its boiling point also changes.

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).**

For example, water boils at a lower temperature the lower the pressure.

The vapor pressure curves for water and refrigerant R134a show for example that, at constant pressure, reducing the temperature changes vapor to liquid (in condenser) or that, for instance, reducing pressure causes the refrigerant to change from liquid to vapor state (evaporator).

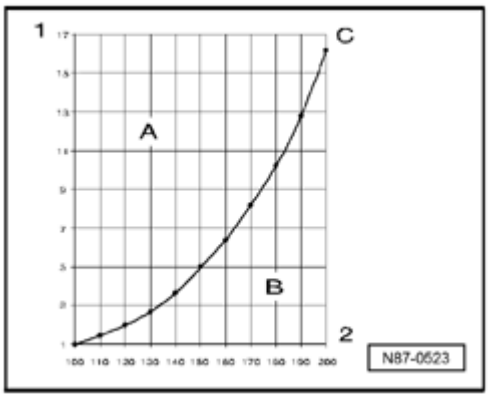

Fig. 3: Vapor Pressure Curve Of Water Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vapor pressure curve for water

A - Liquid

B - Gas

C - Vapor pressure curve for water

1 - Pressure acting on liquid in bar (absolute)

2 - Temperature in C

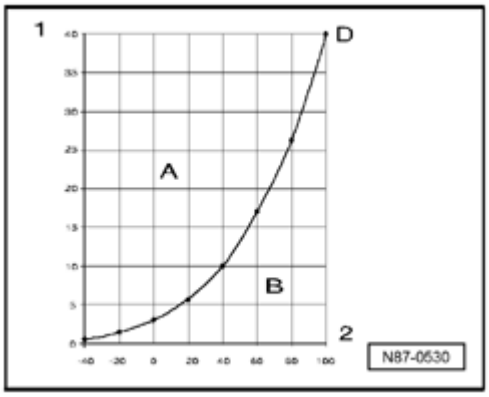

Fig. 4: Vapor Pressure Curve Of Refrigerant R134a Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Vapor pressure curve for refrigerant R134a

A - Liquid

B - Gas

D - Vapor pressure curve for refrigerant R134a

1 - Pressure acting on liquid in bar (absolute)

2 - Temperature in C

Refrigerant R134a Vapor Pressure Table

The vapor pressure table for every refrigerant is published in literature for refrigeration system engineers. This table makes it possible to determine the vapor pressure acting on the column of liquid in a vessel if the temperature of the vessel is known.

As there is a characteristic vapor pressure table for every refrigerant, refrigerant can be identified by measuring pressure and temperature.

NOTE:

- **At absolute pressure, "0 bar" corresponds to an absolute vacuum. Normal atmospheric pressure corresponds to "1 bar" absolute. On the scales of most pressure gauges, "0 bar" corresponds to an absolute pressure of 1 bar (can be seen from "-1 bar" mark below "0").**
- **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).**

Temperature in ° C	Pressure in bar R134a
-45	-0.61
-40	-0.49
-35	-0.34
-30	-0.16
-25	0.06
-20	0.32
-15	0.63
-10	1.00
-5	1.43
0	1.92
5	2.49
10	3.13
15	3.90
20	4.70
25	5.63
30	6.70
35	7.83
40	9.10
45	10.54
50	12.11
55	13.83
60	15.72
65	17.79
70	20.05
75	22.52
80	25.21
85	28.14
90	31.34

Refrigerant R134a

Vehicle air conditioning systems make use of the vaporization and condensation process. Use is made of a substance with a low boiling point.

The refrigerant employed is tetrafluoroethane R134a, which boils at -26.5 C at a vapor pressure of "1 bar".

Physical Data

Chemical formula	CH2FCF3 or CF3CH2F
Chemical designation	Tetrafluoroethane
Boiling point at 1 bar	- 26.5 ° C
Solidification point	-101.6 ° C
Critical temperature	100.6 ° C
Critical pressure	40.56 bar (absolute)

Critical Point

The critical point (critical temperature and critical pressure) is that above which there is no longer a boundary between liquid and gas.

A substance above its critical point is always in the gaseous state.

At temperatures below the critical point, all types of refrigerant in pressure vessels exhibit both a liquid and a gas phase, i.e. there is a layer of gas above the liquid.

As long as both liquid and gas are present in the vessel, the pressure is governed by ambient temperature. Refer to --> **Air Conditioning System Principles**.

NOTE:

- **Different types of refrigerant are never to be mixed. Exclusive use is to be made of the refrigerant specified for the respective air conditioning system.**

Environmental Aspects

- R134a is a fluorocarbon and contains no chlorine.
- R134a has a shorter atmospheric lifespan than refrigerant R12.
- R134a does not deplete the ozone layer.
- The global warming effect of R134a is "ten" times less than that of refrigerant R12.

Refrigerant R134a Properties

Trade Names and Designations

The refrigerant R134a is currently available under the following trade names:

- H-FKW 134a
- SUVA 134a
- KLEA 134a

NOTE:

- **Different trade names may be used in other countries.**
- **Of the wide range of refrigerants available, this is the only one which may be used for vehicles. The designations Frigen and Freon are trade names. They also apply to refrigerants which are not to be used in vehicles.**

Color

Like water, refrigerants are colorless in both vapor and liquid form. Gas is invisible. Only the boundary layer between gas and liquid is visible (liquid level in tube of charging cylinder or bubbles in inspection port). Liquid refrigerant R134a may have a colored (milky) appearance in an inspection port. This cloudiness is caused by partially dissolved refrigerant oil and does not indicate a fault.

Vapor Pressure

In a partially filled, closed vessel, the quantity of refrigerant evaporating from the surface equals the quantity returning to the liquid state as vapor particles condense. This state of equilibrium occurs under the influence of pressure and is often called vapor pressure. Vapor pressure is a function of temperature. Refer to --> **Air Conditioning System Principles**.

Physical Properties

As the vapor pressure curves of R134a and other refrigerants are sometimes very similar, unequivocal identification cannot be made simply on the basis of pressure.

When using R134a, the compressor is lubricated by means of special synthetic refrigerant oils, e.g. PAG oils (polyalkylene glycol oils).

Reaction with Metals

In its pure state, refrigerant R134a is chemically stable and does not corrode iron or aluminum.

Refrigerant impurities such as chlorine compounds however cause corrosion of certain metals and plastics. This can lead to blockage, leaks or deposits on the compressor piston.

Critical Temperature/Critical Pressure

The refrigerant R134a remains chemically stable up to a gas pressure of 39.5 bar (corresponding to a temperature of 101 C). Above this temperature, the refrigerant decomposes (refer to "Combustibility").

Water Content

Only very small amounts of water are soluble in liquid refrigerant. On the other hand, refrigerant vapor and water vapor mix in any ratio.

Any water in the refrigerant circuit will be entrained in droplet form once the dryer in the receiver or reservoir has absorbed as little as approx. 7 g of water. This water flows as far as the nozzle of the expansion valve or restrictor and turns to ice, the A/C system no longer has a cooling effect.

Water destroys the air conditioner as it combines with other impurities at high pressures and temperatures to form acids.

Combustibility

Refrigerant is non-flammable. In fact, it has a fire-retardant or extinguishing effect. Refrigerant decomposes when exposed to flames or red-hot surfaces. UV light (occurring for example during electric welding) also causes refrigerant decomposition. The resultant decomposition products are toxic and are not to be inhaled. However, irritation of the mucous membranes provides an adequate and timely warning.

Charge Factor

A vessel must have space for vapor as well as liquid. As the temperature rises, the liquid expands. The vapor-filled space becomes smaller. At a certain point, there will only be liquid in the vessel. Beyond this, even a slight increase in temperature causes great pressure to build up in the vessel as the liquid attempts to continue expanding despite the absence of the necessary space. The resultant forces are sufficient to rupture the vessel. To avoid overfilling of vessels, regulations governing compressed gases specify the number of kilograms of refrigerant with which a vessel may be filled per liter of internal vessel volume. The product of multiplying this "charge factor" by the internal volume of the vessel is the permissible capacity. The figure for refrigerant used in vehicles is 1.15 kg/liter.

Leaks, Detecting

External damage, for example, can cause a leak in the refrigerant circuit. The small quantity of refrigerant escaping from minor leaks can be detected for example using an electronic leak detector or by introducing a leak detection additive into the refrigerant circuit. Electronic leak detectors are capable of registering leaks with refrigerant losses of less than 5 g per year.

NOTE:

- **Use must be made of leak detectors designed for the composition of the respective refrigerant. For example, a leak detector for R12 refrigerant is not appropriate for R134a, as R134a refrigerant has no chlorine atoms and the leak detector does not therefore respond.**

Refrigerant Oil

Refrigerant oil mixes with the refrigerant (about 20-40%, depending on compressor type and amount of refrigerant) and circulates constantly in the system, lubricating the moving parts.

Special synthetic refrigerant oils, e.g. polyalkylene glycol (PAG) oil, are used in conjunction with R134a air conditioning systems. This is necessary as mineral oil, for example, does not mix with R134a. In addition, the materials of the R134a air conditioning system could be corroded as a result of mixture flowing through the refrigerant circuit under pressure at high temperatures or breakdown of the lubricating film in the compressor. The use of non-approved oils can lead to the failure of the air conditioning system and exclusive use is therefore to be made of authorized oils.

--> Electronic Parts Catalog ETKA

Type of oil for R134a in motor vehicles: PAG

NOTE:

- **Do not store refrigerant oils in open containers as they are extremely hygroscopic (water-absorbing).**
- **Always keep oil containers sealed.**
- **Do not re-use old refrigerant oil. Dispose of as used oil of unknown origin (refer to Disposal/Environmental Protection, Vol. 2-2. 43.1).**
- **Ester-based oils are only intended for use with large systems (not for motor vehicle air conditioners).**

Properties

The most important properties are a high degree of solubility with refrigerant, good lubricity, absence of acid and minimal water content. It is therefore only permissible to use certain specified oils. For list of approved refrigerant oils and capacities, refer to --> **Approved Refrigerant Oils**.

PAG oils, which are appropriate for refrigerant R134a, are highly hygroscopic and do not mix with other oils. Opened containers should therefore be closed again immediately to prevent ingress of moisture. Moisture and acids promote ageing of refrigerant oil, causing it to become dark and viscous as well as corrosive towards metals.

NOTE:

- **On account of its chemical properties, refrigerant oil is not to be disposed of together with engine or gear oil (--> Audi-ServiceNet, Handbooks, HSO Environment 2).**
- **Only oil approved for the compressor may be used for refrigerant circuits containing refrigerant R134a --> Electronic Parts Catalog ETKA and capacities --> Approved Refrigerant Oils.**

Comfort

A basic requirement for concentration and safe driving is a feeling of comfort in the passenger compartment. Especially when it is hot and humid, comfort can only be attained through the use of air conditioning. Comfort can of course also be enhanced by opening windows/sun roof or increasing the air output. Such a course of action is however associated with certain drawbacks for the occupants of the vehicle, e.g. more noise, draughts, exhaust fumes and unfiltered pollen (unpleasant for allergy sufferers).

Climate control together with a good heating and ventilation system concept can create a sense of well-being and comfort by regulating temperature, humidity and air circulation in the passenger compartment to suit ambient conditions, with the vehicle both stationary and moving.

Other important advantages of air conditioning:

- Purification of the air supplied to the passenger compartment (dust and pollen, for example, are washed out by the moist fins of the evaporator and removed with the condensate).
- Pleasant temperature levels (example: Mid-size car after short travelling time, ambient temperature 30 C in the shade and vehicle exposed to sunlight)

	With air conditioning	Without air conditioning
At head height	23 ° C	42 ° C
At chest level	24 ° C	40 ° C
In footwell	30 ° C	35 ° C

Environmental Aspects

Since roughly 1992, the air conditioning systems of newly manufactured cars have been successively converted to refrigerant R134a. This refrigerant contains no chlorine and therefore does not deplete the ozone layer.

Until roughly 1992, refrigerant R12 was used for air conditioning systems. Due to its chlorine atoms, this CFC has a high potential for depleting the ozone layer as well as a tendency to increase the greenhouse effect.

Conversion programs are available for old existing systems filled with the ozone-depleting substance R12 --> Repair Manual for air conditioners with refrigerant R12 (this repair manual is only available in hard copy).

For environmental protection reasons, refrigerants must not be released into the atmosphere --> **Laws and Regulations** (laws and regulations).

Air Conditioning System, Operation

The temperature in the passenger compartment depends on the amount of heat radiated through the windows and conducted by the metal parts of the body. In hot weather it is possible to achieve a more comfortable temperature for the passengers by pumping off some of the heat.

As heat spreads into cooler areas, the passenger compartment is equipped with a unit for generating low temperatures with constant evaporation of refrigerant. The heat required for this is extracted from the air flowing through the evaporator.

After absorbing heat, the refrigerant is pumped off through the compressor. The action of the compressor increases the heat content and temperature of the refrigerant. Its temperature is then substantially higher than that of the surrounding air.

The hot refrigerant flows with its heat content to the condenser, where the refrigerant dissipates its heat to the surrounding air via the condenser due to the temperature gradient between the refrigerant and the surrounding

air.

The refrigerant thus acts as a heat transfer medium. As it is to be re-used, the refrigerant is returned to the evaporator.

For this reason all air conditioning systems are based on the refrigerant circulation principle. There are however differences as regards the units used.

General Work Safety

- As per VBG 20, German industrial liability insurance association (other regulations may apply in other countries)
- Observe workshop specific instructions --> Audi ServiceNet, handbooks, Environmental Protection Vol. 2-2. 23.0) , which are to be displayed at refrigerant workplaces.

Product Properties

Refrigerants used in motor vehicle air conditioning systems belong to the new generation of refrigerants based on chlorine-free, partially fluorinated hydrocarbons (H-FKW, R134a; other names may be used in other countries).

With regard to their physical properties, these are refrigerants which have been liquefied under pressure. They are subject to the regulations governing pressure vessels and use is only to be made of approved and appropriately marked containers.

Compliance with specific conditions is required to ensure safe and proper use.

Refrigerant, Handling

If refrigerant vessels are opened, the contents may escape in liquid or vapor form. The higher the pressure in the vessel, the more vigorous the process.

The pressure level is governed by two factors:

- The type of refrigerant in the vessel. "Rule: The lower the boiling point, the higher the pressure"
- The temperature level. "Rule: The higher the temperature, the higher the pressure"

CAUTION:

- **Do not open vessels containing refrigerant.**

Wear safety goggles

Put on safety goggles to prevent refrigerant getting into the eyes, as this could cause severe injury from exposure to cold.

Wear protective gloves and apron

Greases and oils dissolve readily in refrigerants. They would therefore destroy the protective layer of grease if allowed to come into contact with the skin. Degreased skin is however sensitive to the cold and germs.

Do not allow liquid refrigerant to come into contact with the skin

The refrigerant draws heat for evaporation from the surrounding area - even if this is the skin. This may give rise to extremely low temperatures and result in local frostbite (boiling point of R134a: -26.5 C at ambient pressure).

Do not inhale refrigerant vapors

If highly concentrated refrigerant vapor escapes, it mixes with the surrounding air and displaces the oxygen necessary for breathing.

Smoking is absolutely prohibited

A burning cigarette can cause refrigerant to decompose. The resultant substances are toxic and must not be inhaled.

Welding and soldering on refrigeration systems

Before performing welding or soldering work on vehicles in the vicinity of air conditioning system components, extract refrigerant and remove remnants by blowing out with nitrogen.

The products of refrigerant decomposition due to the effect of heat are not only toxic, but may also have a highly corrosive effect on pipes and system components. They mainly take the form of hydrogen fluoride.

Pungent odor

A pungent odor indicates that the products of decomposition mentioned above have already formed. Avoid inhaling these substances under all circumstances, as otherwise the respiratory system, lungs and other organs could be damaged.

First aid

- Following contact with eyes or mucous membranes, immediately rinse with copious amounts of running water and consult an eye specialist.
- Following contact with the skin, immediately remove clothing affected and rinse skin with copious amounts of water.
- Following inhalation of highly concentrated refrigerant vapors, person concerned is to be taken immediately into the open air. Call a doctor. Administer oxygen in the event of breathing difficulties. If the person affected is having great difficulty breathing or is not breathing at all, tilt back head and administer artificial respiration.

Pressure Vessels, Handling

- Secure vessels to prevent them falling over.

Secure upright cylinders to stop them falling over and cylinders lying flat to stop them rolling away.

- Vessels are never to be thrown.

If dropped, the vessels could be so severely deformed that they rupture. The refrigerant evaporates immediately, liberating considerable force. Flying fragments of cylinders can cause severe injuries.

Valves may break off if cylinders are not properly transported. To protect the valves, cylinders are only to be transported with protective cap screwed on.

- Never store in the vicinity of radiators.

High temperatures may occur in such areas. High temperatures are also accompanied by high pressures and the maximum permissible vessel pressure may be exceeded.

Do not heat in excess of 50 C

To avoid possible risk, pressure vessel regulations specify that vessels are not to be heated to in excess of 50 C.

Do not heat in an uncontrolled manner

Do not heat with a naked flame under any circumstances. Localized overheating can cause structural changes in the vessel material, which then reduce its ability to withstand pressure. There is also a danger of refrigerant decomposition due to localized overheating.

Seal empty vessels

Empty refrigerant vessels must always be sealed to prevent the ingress of moisture. Moisture causes corrosion of steel vessels. This weakens the vessel walls. In addition, rust particles penetrating into refrigeration systems from vessels will cause malfunctioning.

Safety Regulations for Working with Extraction and Charging Systems

- Make sure the shut-off valves are closed before connecting the charging system to the air conditioning system.
- Before disconnecting the charging system from the air conditioning system, make sure the charging process has been completed to stop refrigerant escaping into the atmosphere.
- Once the purified refrigerant from the charging system has been transferred to an external compressed-gas cylinder, close the hand shut-off valves at the cylinder and charging system.
- Do not expose charging system to moisture or use it in a wet environment.
- Disconnect from power supply before performing service work on the charging system.
- Never use an extension cable on account of the fire hazard. If the use of an extension cable is

unavoidable, the minimum cross-section should be 2.5 mm^2 .

- In case of fire, remove external cylinder.
- Entrained oil from the air conditioning system drawn by the suction unit into the measurement vessel supplied is subsequently to be transferred to a sealed container, as it contains a small quantity of refrigerant which must not be released into the environment.

- Following shutdown, A/C service station is to be secured to stop it rolling away.

R134a Safety Precautions

CAUTION:

- **It is advisable to keep an eye bath to hand.**
- **Should liquid refrigerant come into contact with the eyes, rinse them thoroughly with water for about 15 minutes. Then administer eye drops and consult a doctor immediately even if no pain is felt.**
- **The doctor must be informed that the injury was caused by refrigerant R134a. Should refrigerant come into contact with other parts of the body despite compliance with safety regulations, these must likewise be rinsed immediately for at least 15 minutes with cold water.**
- **Work may only be performed on the refrigerant circuit of an air conditioning system in well ventilated areas. Workshop extraction systems are to be switched on.**

- **Refrigerant must not be stored in low-level areas (e.g. cellars) or corresponding exits or light wells.**

- Welding, brazing and soldering work must not be performed on components of air conditioning system when charged. This also applies to vehicle welding and soldering work if there is a danger of air conditioner components becoming hot. When performing paintwork repairs, the temperature in the drying booth or preheating zone must not exceed 80 C.

Reason:

Exposure to heat gives rise to considerable pressure in the system, which could cause the pressure relief valve to open.

Corrective action:

- Discharge refrigerant circuit using A/C service station.

NOTE:

- **Damaged or leaking components of the air conditioning system are not to be repaired by welding or soldering. They must always be replaced.**

Refrigerant vessels (e.g. charging cylinders of A/C service station) must never be subjected to excessive heat or

exposed to direct sunlight.

Corrective action:

- Vessels must never be completely filled with liquid refrigerant. Without sufficient room for expansion (gas cushion), vessels will rupture with devastating effect in the event of an increase in temperature --> **Refrigerant R134a Properties**.

Refrigerant is never to be transferred to systems or vessels in which air is present.

Corrective action:

- Evacuate systems and vessels before charging with refrigerant.

Basic Rules for Working on Refrigerant Circuit

General

- Follow workplace-specific instructions --> Audi ServiceNet, handbooks, HSO Environment 2-2.23.0.
- Ensure absolute cleanliness when working.
- Wear safety goggles and gloves when working with refrigerant and nitrogen.
- Workshop extraction systems are to be switched on.

- Use A/C service station to discharge refrigerant circuit, then unfasten screw connections and replace malfunctioning components.
- Use caps to seal off opened assemblies and hoses to prevent ingress of moisture and dirt.
- Make exclusive use of tools and materials intended for refrigerant R134a.
- Re-seal opened refrigerant oil vessels to guard against moisture.

NOTE:

- **After completing service work, screw sealing caps (with seals) onto all connections with valves as well as service connections.**
- **Before starting up air conditioning system, pay attention to vehicle-specific capacities --> Refrigerant R134a/Refrigerant Oil Capacities and Specifications.**
- **Do not top up refrigerant. Extract existing refrigerant and recharge system.**

Refrigerant Circuit, Cleaning

Flush refrigerant circuit with refrigerant R 134a --> **Refrigerant Circuit, Flushing with Refrigerant R134a** (or with compressed air and nitrogen --> **Refrigerant Circuit, Flushing with Compressed Air and Nitrogen**) if:

- Moisture or dirt has entered into refrigerant circuit (e.g. following an accident)
- Refrigerant oil is dark and viscous.

- There is too much refrigerant oil in the refrigerant circuit after compressor replacement.
- The A/C compressor had to be replaced on account of "internal" damage (e.g. noise or no output).

NOTE:

- **When flushing components with compressed air and nitrogen, always extract the gas mixture escaping from the components using suitable extraction units (workshop extraction system).**

Additional Notes for Vehicles with A/C Compressor Regulator Valve N280)

- The engine is only to be started following complete assembly of the refrigerant circuit (constant compressor operation).
- If engine has to be operated with the refrigerant circuit empty, only do so for as long as absolutely essential and avoid high engine speeds.

O-Rings

- Use only seals which are resistant to refrigerant R134a and the related refrigerant oils. Color coding of O-rings is no longer employed. Black and colored O-rings are used.
- Pay attention to correct ID of seals used --> Electronic Parts Catalog ETKA.
- Seals are only to be used once.
- Before installing, moisten seals slightly with refrigerant oil (PAG oil).

Before starting up Air Conditioning System after Charging

- Rotate compressor roughly 10 times by hand using the clutch plate or pulley of the A/C clutch.
- Start engine with air conditioning system switched off (A/C Clutch N25 and A/C Compressor Regulator Valve N280 are not actuated).
- Following engine idling speed stabilization, switch on compressor and run it for at least 10 minutes at idling speed with maximum cooling output.

REFRIGERANT CIRCUIT AND COMPONENTS

--> **Components**

--> **Refrigerant Circuit Design**

--> **Refrigerant Circuit Quick-Release Connections**

--> **Refrigerant Circuit Switches, Sensors, and Related Connections**

--> **Refrigerant Circuit Pressures and Temperatures**

--> **Refrigerant Circuit with Expansion Valve**

--> **Refrigerant Circuit with Restrictor and Reservoir**

--> **Using Pressure Gauge**

--> **Service and Recycling Units**

--> **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

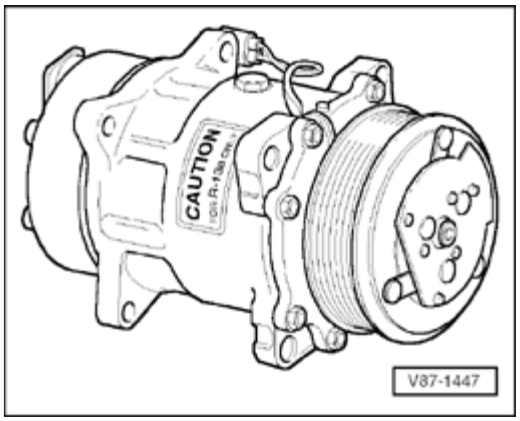

Fig. 5: Identifying A/C Compressor With Magnetic Clutch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

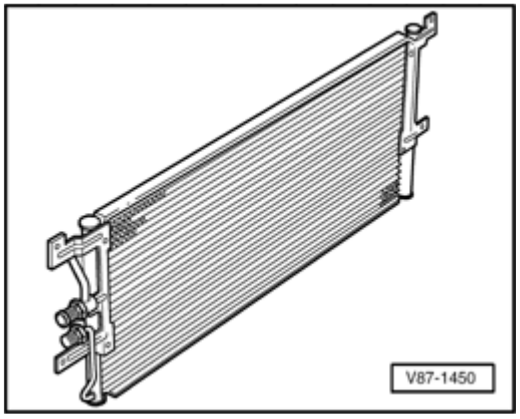

Fig. 6: Identifying A/C Refrigerant System Condenser
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

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

Evaporator

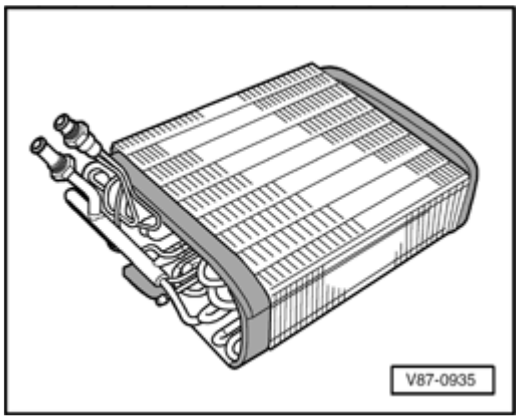

Fig. 7: Identifying A/C Refrigerant System Evaporator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

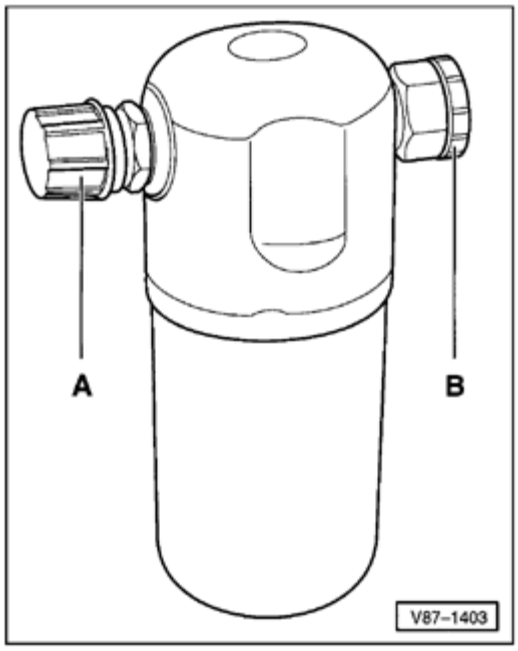

Fig. 8: Identifying Accumulator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

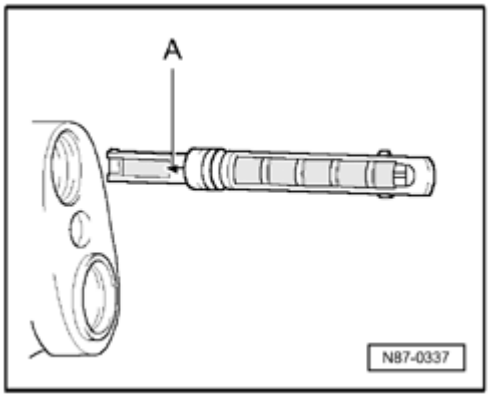

Fig. 9: Identifying Restrictor
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

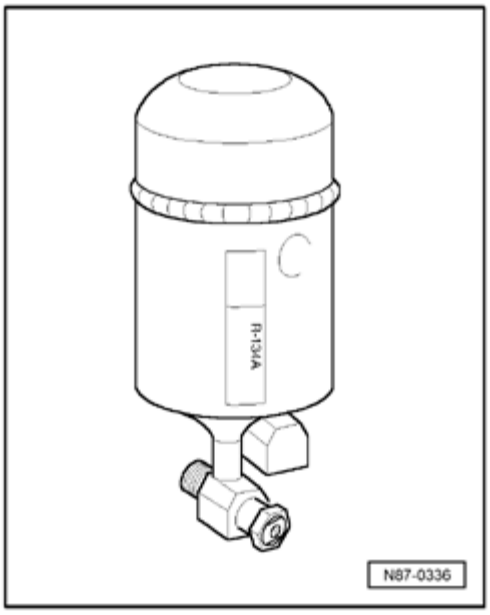

Fig. 10: Identifying Receiver
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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. --> 87 - AIR CONDITIONING 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. --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA**

Expansion Valve

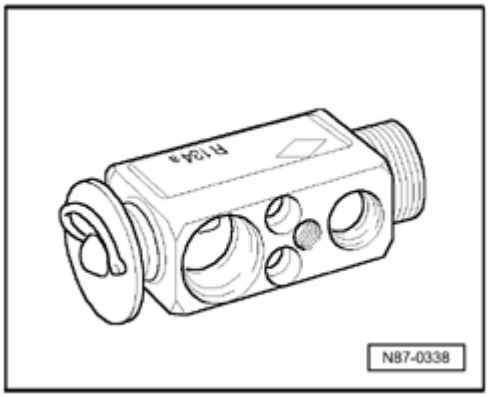

Fig. 11: Identifying A/C Refrigerant System Expansion Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

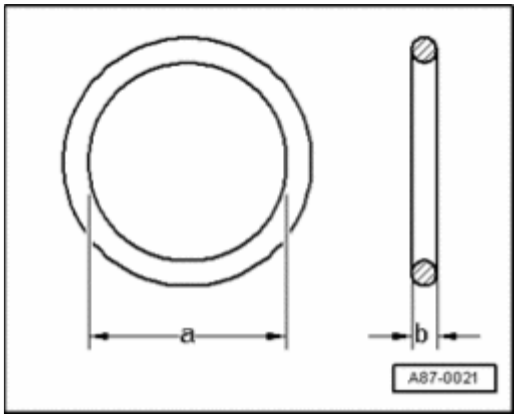

Fig. 12: Identifying A/C Refrigerant System O-rings
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 --> **87 - AIR CONDITIONING** 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 --> 87 - AIR CONDITIONING .**

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

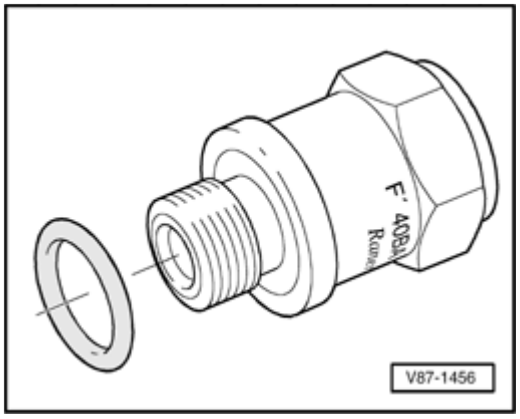

Fig. 13: Identifying A/C Refrigerant System Pressure Relief Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

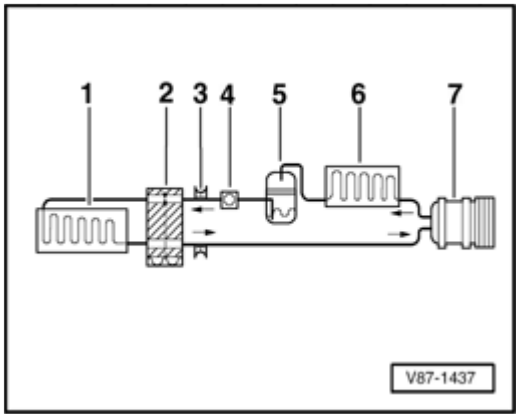

Fig. 14: Refrigerant Circuit With Expansion Valve And Evaporator
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.**

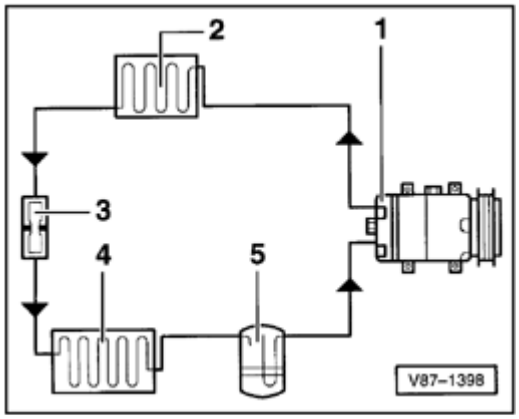

Fig. 15: A/C Refrigerant Circuit And Components

Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 --> **87 - AIR CONDITIONING**

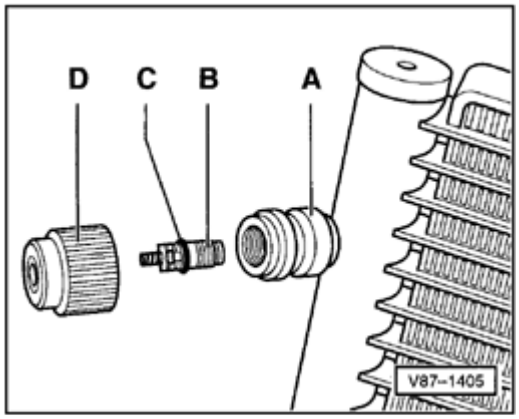

Fig. 16: Identifying A/C Service Connection Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.

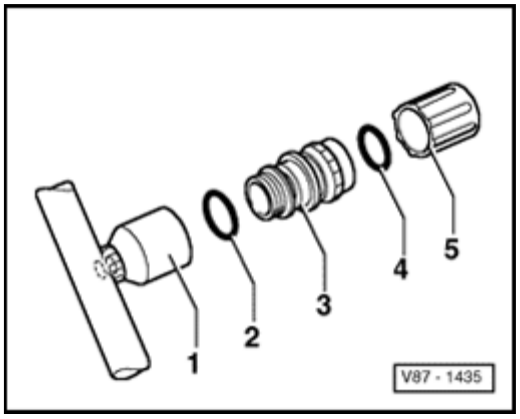

Fig. 17: Identifying High Pressure Service Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

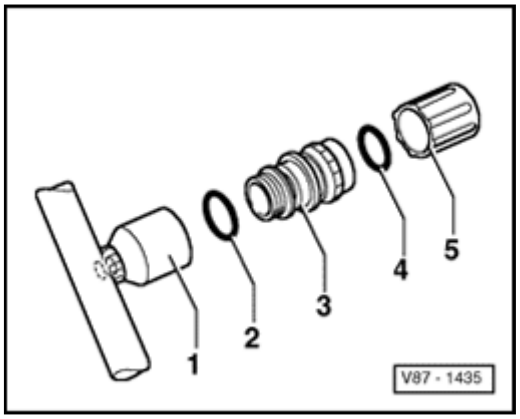

Fig. 18: Identifying High Pressure Service Valve
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 --> 87 - AIR CONDITIONING .**

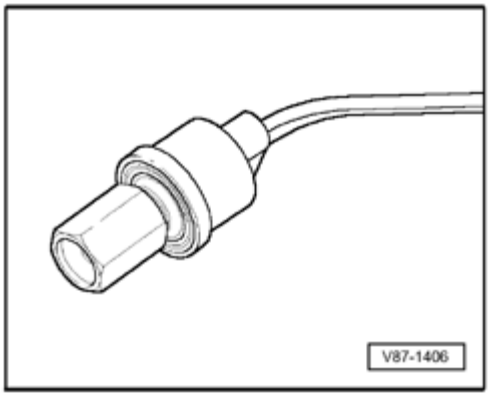

Fig. 19: A/C Refrigerant High Pressure Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.

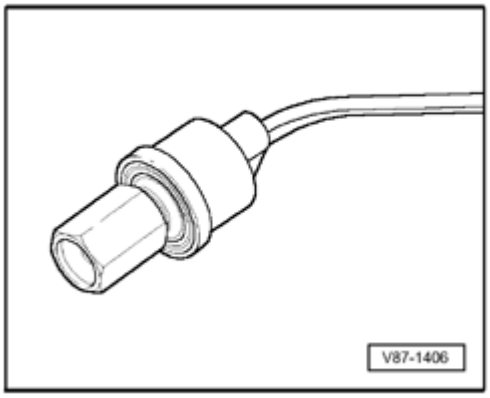

Fig. 20: A/C Refrigerant High Pressure Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A/C Refrigerant High Pressure Switch F118

Function:

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

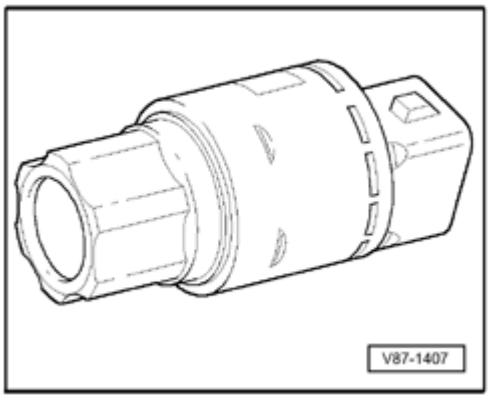

Fig. 21: A/C Refrigerant Low Pressure Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.

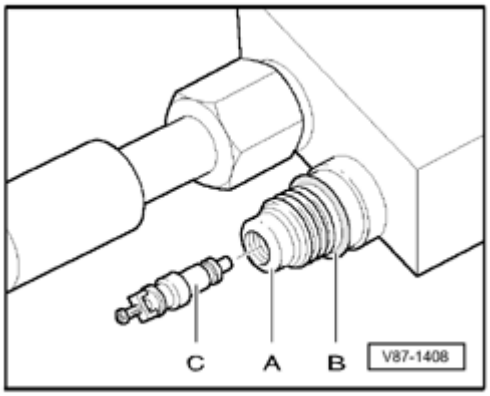

Fig. 22: Identifying Service Port Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- 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

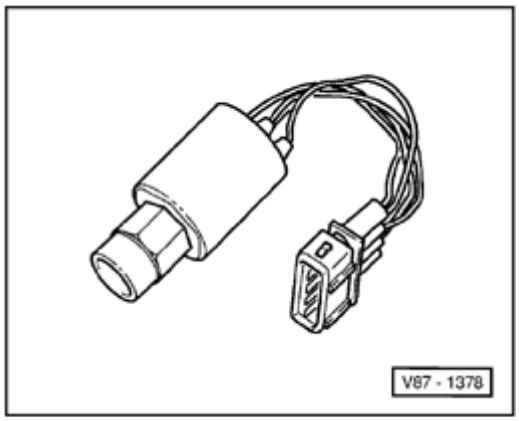

Fig. 23: A/C Pressure Switch - F129
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

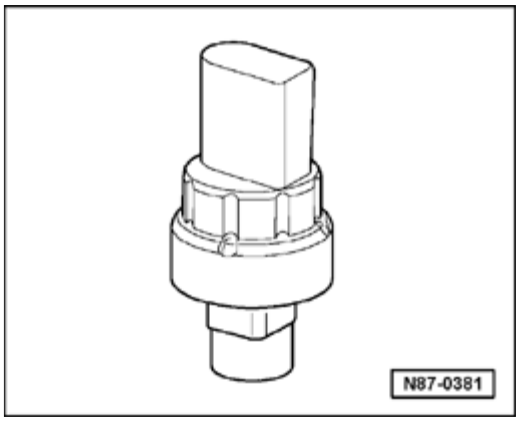

Fig. 24: High Pressure Sensor - G65
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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

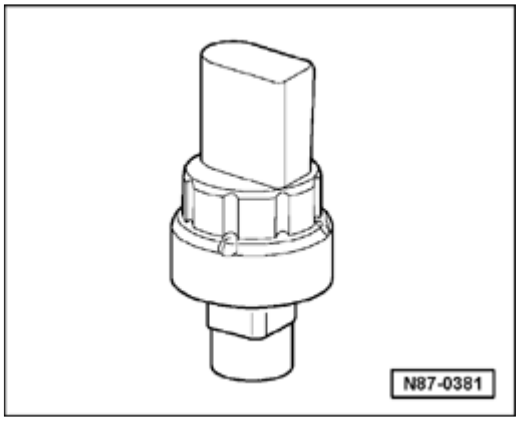

Fig. 25: High Pressure Sensor - G65
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 --> **87 - AIR CONDITIONING** .

A/C Compressor Regulator Valve N280

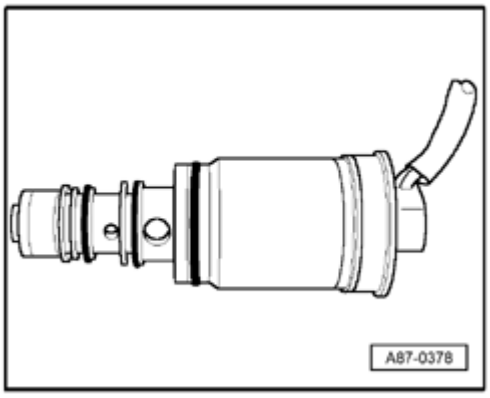

Fig. 26: Identifying A/C Compressor Regulator Valve - N280
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.**

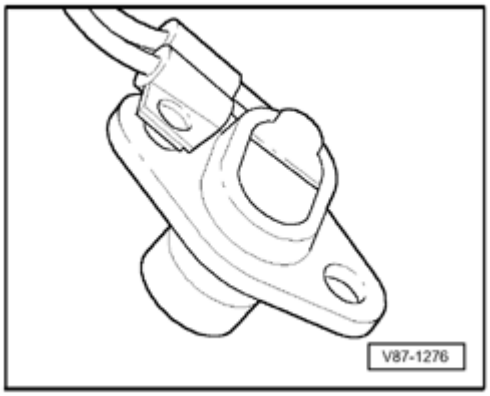

Fig. 27: Identifying A/C Compressor Speed Sensor G111
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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.**

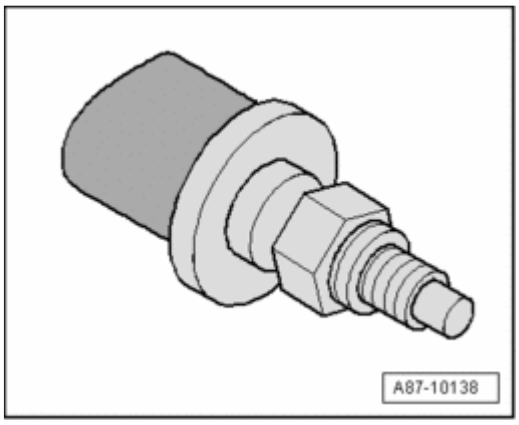

Fig. 28: Refrigerant Temperature Sensor G454
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 --> 87 - AIR CONDITIONING 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 --> 87 - AIR CONDITIONING and in the Guided Fault Finding function of A/C system**

Coolant Fan Control Module J293

(Not on refrigerant circuit)

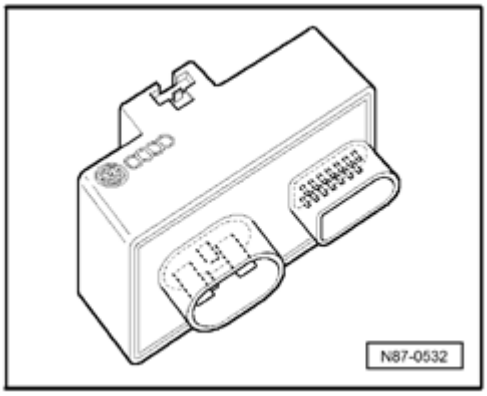

Fig. 29: Coolant FC (Fan Control) Control Module - J293
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 --> **87 - AIR CONDITIONING** .

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 C after about 20 minutes.

Refer to vehicle-specific refrigerant circuit for locations of pressure gauge connections --> **87 - AIR CONDITIONING** .

At 20 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	approx. -7 ° C 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	approx. -1 ° C 2
10 Pre-volume (not present in all vehicles) and 11 Service connection, LP (ND) side	Gas	approx. 1.2 bar 1	approx. -1 ° C 2

* 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 --> **Refrigerant Circuit, Checking Pressures with A/C Service Station**.

* 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 --> **Refrigerant Circuit, Checking Pressures with A/C Service Station**.

NOTE:

- **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 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.

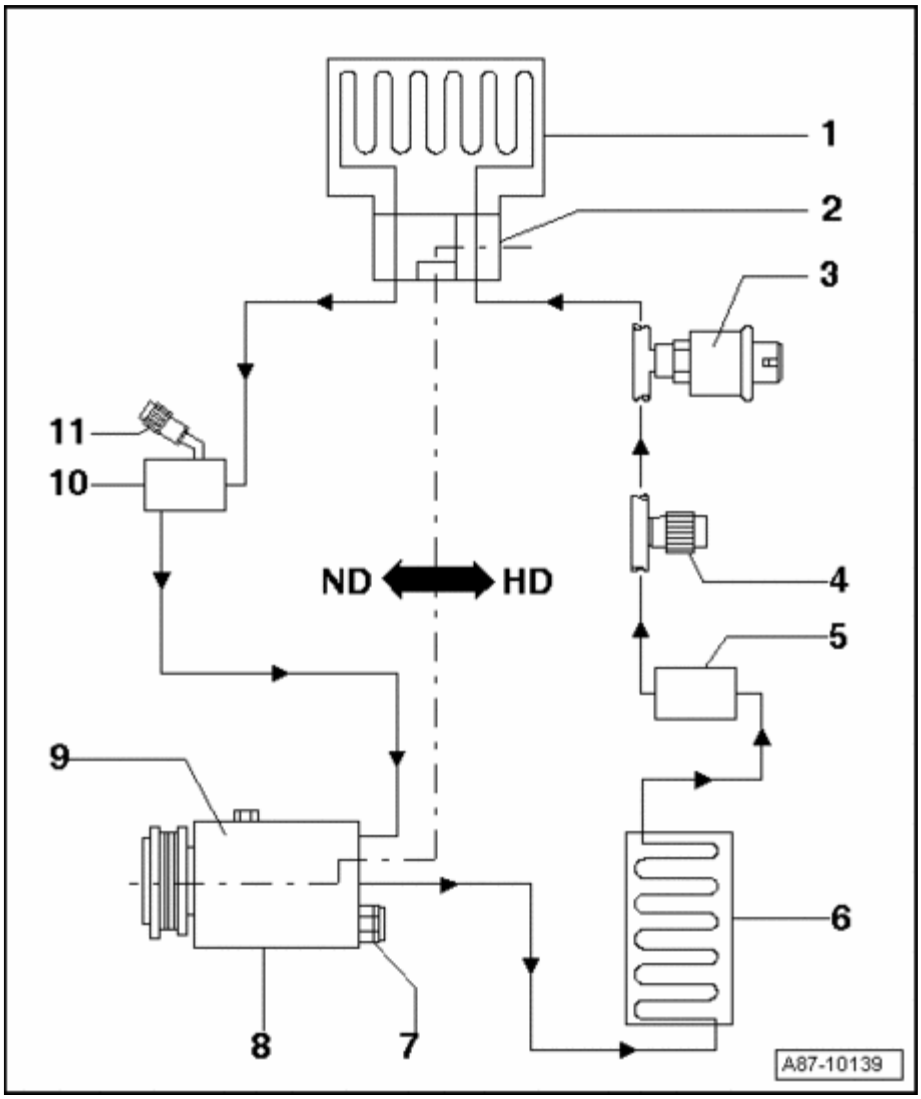

Fig. 30: Refrigerant Circuit With Expansion Valve Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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		
6 Compressor, LP (ND) side	Gas		

The pressures on the low pressure side 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.

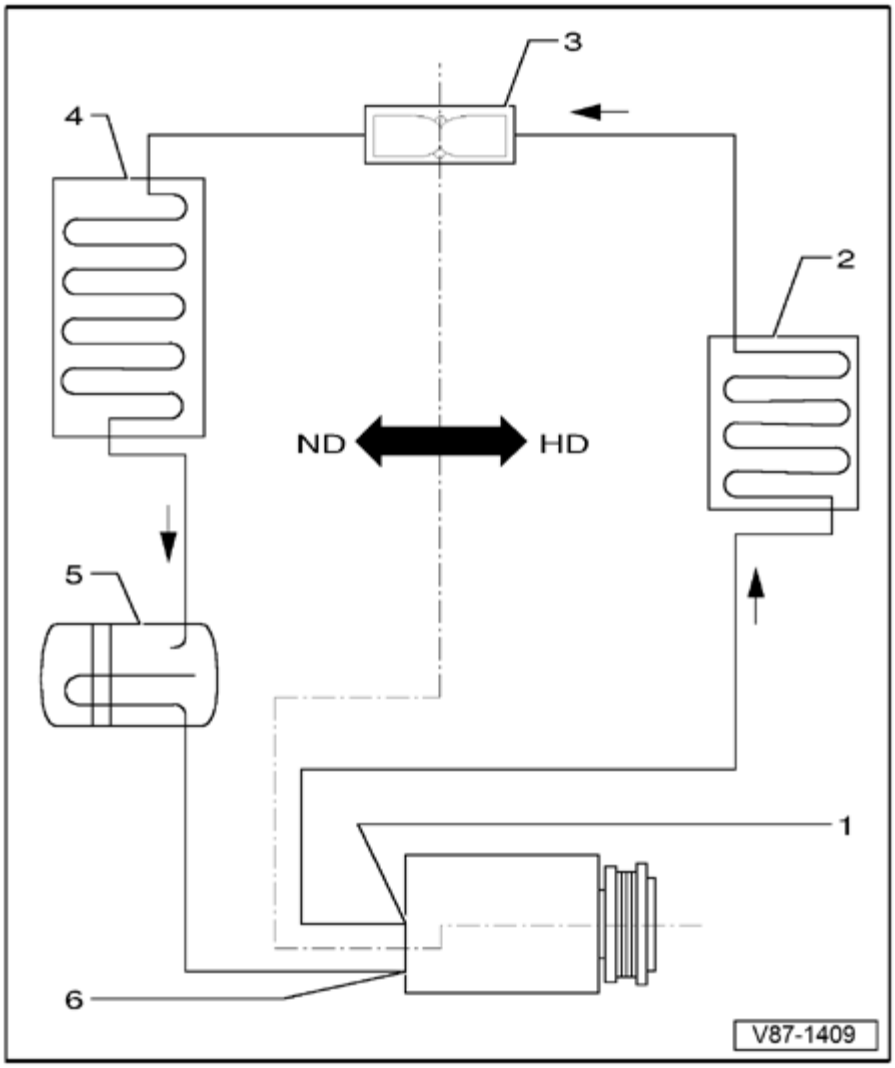

Fig. 31: Refrigerant Circuit With Restrictor And Reservoir Overview
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - Compressor, HP (HD) side

2 - Condenser

3 - Restrictor

4 - Evaporator

5 - Reservoir

6 - Compressor, LP (ND) side

Using Pressure Gauge

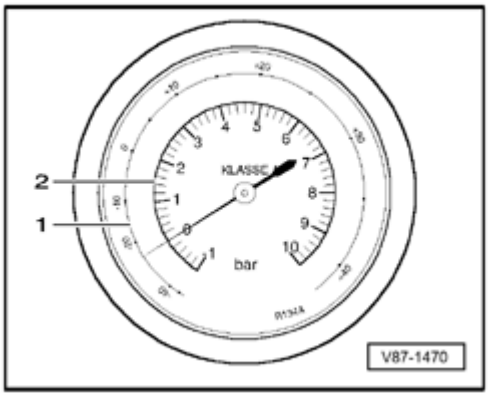

Fig. 32: Indicators On Pressure Gauge
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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 C to 30 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 Systems

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:

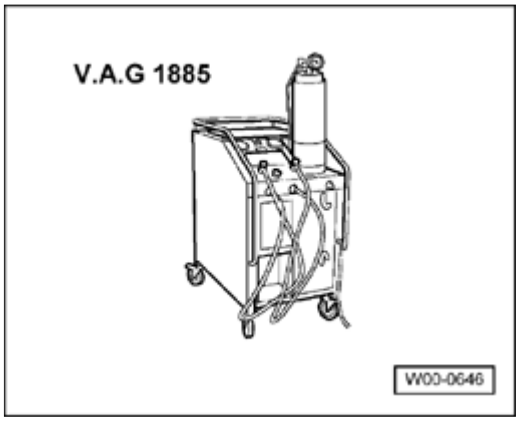

Fig. 33: Identifying V.A.G. 1885
Courtesy of VOLKSWAGEN UNITED STATES, INC.

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).**

REFRIGERANT CIRCUIT

--> **Important Repair Notes**

--> **Refrigerant Circuits, Converting from R12 Refrigerant to R134a**

--> **Working with A/C Service Station**

--> **Refrigerant Circuit, Discharging with A/C Service Station**

--> **Refrigerant Circuit, Evacuating with A/C Service Station**

--> **Refrigerant Circuit, Charging with A/C Service Station**

--> **Air Conditioner, Starting after Charging**

--> **Transferring Refrigerant to Charging Cylinder or Reservoir Bottle**

--> **A/C Service Station, Draining**

--> **Refrigerant Circuit, Flushing with Compressed Air and Nitrogen**

--> **Refrigerant Circuit, Flushing with Refrigerant R134a**

--> **Refrigerant Circuit, Determining Leaks**

Important Repair Notes

- Air conditioning systems designed for refrigerant R12 are only to be filled with refrigerant R134a if certain requirements are fulfilled. Refer to --> **Refrigerant Circuits, Converting from R12 Refrigerant to R134a** and --> Repair manual: Air conditioner with R12 Parts 2 and 3 (this repair manual is only available in hard copy).
- The refrigerant oils specifically developed for R134a and R12 refrigerant circuits are never to be mixed.
- A/C service stations which come in contact with the refrigerant are only to be used for the intended refrigerant.
- Components of R134a refrigerant circuits can be recognized from their labelling, green stickers or design (e.g. different threads) to prevent interchange with components for refrigerant R12.
- A label indicating the refrigerant used is provided in the engine compartment on the lock carrier or in the plenum chamber.
- Different refrigerants are never to be mixed.

NOTE:

- **When working on the refrigerant circuit, always pay attention to the information given in the Sections on "Safety measures" --> R134a Safety Precautions and "Basic rules for working on refrigerant circuit" --> Basic Rules for Working on Refrigerant Circuit.**

Refrigerant Circuits, Converting from R12 Refrigerant to R134a

CFC refrigerants are no longer used in the automotive industry.

Converting refrigerant circuits from R12 to R134a and servicing converted circuits

--> Repair Manual: Air conditioner with refrigerant R12 Parts 2 and 3 (this Repair Manual is only available in printed form).

Working with A/C Service Station

Important Notes

Observe the following with regard to A/C service station operation (e.g. V.A.G 1885) --> Catalog V.A.G equipment :

- The filters and dryers installed must be replaced at the latest on completion of the service life specified in the relevant operating instructions.
- If an A/C service station is also used for flushing the refrigerant circuit, dryer and filter must be replaced in shorter intervals --> **Refrigerant Circuit, Flushing with Compressed Air and Nitrogen**.
- Exclusive use is to be made of refrigerant oils which have been approved for the vehicle-specific refrigerant circuit (if necessary, fill refrigerant oil directly into refrigerant circuit). --> Electronic Parts Catalog ETKA

Extracted refrigerant is not to be reused if there is any doubt about the composition of the refrigerant extracted, even after cleaning in the A/C service station.

- The A/C service station is to be drained in all these cases --> **A/C Service Station, Connecting** , the system cleaned if necessary and the filters, dryers and refrigerant oil replaced.

Commercially available A/C service stations can be classified in 2 groups:

- A. A/C service stations which clean extracted refrigerant for re-use (so-called extraction and recycling stations), e.g. V.A.G 1885 (currently available A/C service stations --> Catalog V.A.G tools)
- B. A/C service stations which transfer extracted refrigerant to recycling containers (for large-scale recycling). These are referred to as extraction systems.

Connecting for Measurement and Testing

- Work procedure may vary depending on the type of tools selected (the tool-specific operating instructions should therefore be followed).

NOTE:

- **The work procedure is always to be performed as described in the operating instructions for the relevant A/C service station (e.g. V.A.G 1885).**

The charging hoses are to be connected as follows to prevent the ingress of air or moisture into the refrigerant circuit:

- Switch off ignition.
- Connect A/C service station to power supply.
- Unscrew caps from service connections or connections with valve (refer to vehicle-specific refrigerant circuit) --> **87 - AIR CONDITIONING** .
- Evacuate charging hoses if necessary.
- Connect quick-release coupling to service connection of refrigerant circuit.

CAUTION:

- **Never open valves on low or high-pressure side with engine running, as otherwise compressor or A/C service station could be destroyed by a short circuit between high and low-pressure sides of refrigerant circuit if air conditioning system is switched on.**

NOTE:

- **Screw valve adapters V.A.G /9 , V.A.G /10 or air conditioning adapter set V.A.G 1786 to refrigerant circuit connections with valve and bleed charging hoses during connection to adapters (faintly audible escape of refrigerant gas is permitted) --> A/C Service Station, Connecting.**

Vehicles with one service connection only:

- The charging hose must be installed with a valve opener for opening valve in valve adapter.
- Only screw handwheel into quick-release coupling adapter to the extent required to reliably open valve in service connection (observe pressure gauge; take care not to strain valve).
- Start engine and perform planned tests and measurements.
- Compare values determined to specified measured values --> **Refrigerant Circuit, Checking Pressures with A/C Service Station**.
- Before disconnecting quick-release coupling, close it by screwing out handwheel.

Refrigerant Circuit, Discharging with A/C Service Station

- Work procedure may vary depending on the type of tools selected (follow tool-specific operating instructions).
- The refrigerant circuit is to be discharged if parts of the refrigerant circuit are to be removed, if there is any doubt about the quantity of refrigerant in the circuit or if safety precautions so require.
- All the necessary usage information for working with the refrigerant A/C service station can be found in

the A/C service station operating instructions.

Discharging:

- Switch off ignition.
- Connect A/C service station in line with operating instructions to vehicle service connections (refer to vehicle-specific refrigerant circuit) and start up A/C service station --> **87 - AIR CONDITIONING** .

NOTE:

- **There is a possibility of refrigerant oil being extracted from the refrigerant circuit together with the refrigerant. To ensure compressor lubrication, the refrigerant oil in the circuit must be topped up with fresh oil --> Refrigerant R134a/Refrigerant Oil Capacities and Specifications.**
- **On vehicles equipped with a compressor with no A/C clutch (with A/C Compressor Regulator Valve N280), the engine should not be run for longer than absolutely necessary with the refrigerant circuit empty and high engine speeds are to be avoided (compressor always in operation as well).**
- **On vehicles with a compressor with no A/C clutch, the engine is only to be started following complete assembly of the refrigerant circuit (avoid high engine speeds).**

Refrigerant Circuit, Evacuating with A/C Service Station

- The work procedure is always to be performed as described in the operating instructions for the A/C service station.
- Quantity of refrigerant oil in circuit checked and if necessary corrected --> **Refrigerant R134a/Refrigerant Oil Capacities and Specifications**
- Quantity of refrigerant in A/C service station checked

The refrigerant circuit must be evacuated before it is filled with refrigerant. Moisture is also extracted from the circuit.

Evacuation:

- Switch off ignition.
- Connect A/C service station to power supply.
- Connect charging hoses of A/C service station to vehicle refrigerant circuit with quick-release coupling adapter (refer to vehicle-specific refrigerant circuit) --> **87 - AIR CONDITIONING** .
- Screw in handwheel of quick-release coupling adapters until valves of service connections are definitely open (take care not to strain valve).

NOTE:

- **If pressure is to be measured after charging system on vehicles with a service connection on one side of the refrigerant circuit only, use valve adapter and charging hose with valve opener --> A/C Service Station,**

Connecting.

- **Switch on A/C service station and evacuate refrigerant circuit for at least 30 minutes. The pressure reading must indicate an absolute pressure of less than 10 mbar (corresponding to 990 mbar vacuum).**

NOTE:

- **At this pressure, both green LEDs light for example on A/C service station V.A.G 1885 (currently available A/C service stations --> Catalog V.A.G tools).**
- **Switch off A/C service station and allow to stand for at least 1 hour.**
- **If the vacuum display (LED chain) does not change, the system is free of leaks and can be charged.**

NOTE:

- **A current vacuum reading (LED) is only obtained using A/C service station V.A.G 1885 , for example (currently available A/C service stations --> Catalog V.A.G tools) after pressing the "Evacuate" button again.**

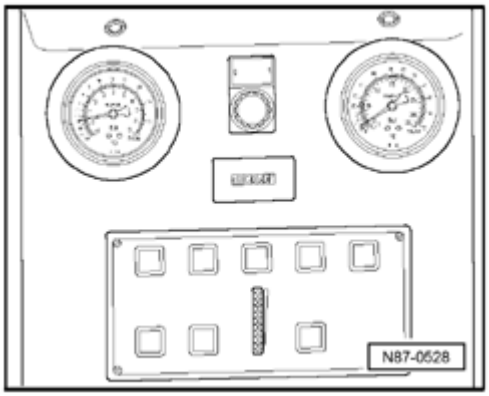

Fig. 34: A/C Service Station
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If with this A/C service station the upper (green) LEDs do not light immediately after switching on, either the refrigerant circuit is leaking or there is still residual moisture/refrigerant in the circuit.

Proceed as follows if the vacuum is not maintained:

- Fill the circuit with 100 g of refrigerant, localize any leaks using leak detector and eliminate accordingly.
- Evacuate and again observe the vacuum display over a period of hours. Charging may only be performed if vacuum is maintained.

Refrigerant Circuit, Charging with A/C Service Station

NOTE:

- **The entire refrigerant charge can be added to either the high or low-pressure side --> Refrigerant R134a/Refrigerant Oil Capacities and**

Specifications.

- **The work procedure is always to be performed as described in the operating instructions for the A/C service station.**
- **Before pouring in refrigerant, correct quantity of refrigerant oil --> Refrigerant R134a/Refrigerant Oil Capacities and Specifications.**
- **Switch off ignition.**
- **Evacuate refrigerant circuit using A/C service station. Refer to --> Refrigerant Circuit, Evacuating with A/C Service Station**
- **Screw out handwheel at quick-release coupling adapter (to close it).**
- **Allow refrigerant to flow into charging hose.**
- **Take charging cylinder reading.**
- **Screw in handwheel at quick-release coupling adapter (to open it) and charge with the specified quantity of refrigerant.**
- **Switch off A/C service station.**

Air Conditioner, Starting after Charging

NOTE:

- **If the compressor has been removed, rotate it about 10 times by hand prior to initial start-up to prevent damage caused by liquid impact when first switched on (any oil in compressor cylinder is forced out on rotation).**

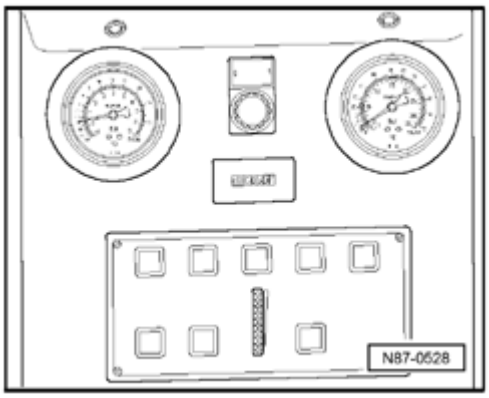

Fig. 35: A/C Service Station
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Start engine with compressor switched off (version with A/C clutch).
- Set compressor to minimum output, i.e. "Econ" or A/C off mode (version with no A/C clutch with regulator valve).
- Wait until idling speed has stabilized.
- Switch on compressor and operate system for at least 2 minutes at idling speed.
- If necessary, check pressures in refrigerant circuit using A/C service station.

- Switch off engine.
- Screw out handwheel on quick-release coupling adapter.
- Disconnect charging hoses from refrigerant circuit.
- Screw protective caps back on.

Transferring Refrigerant to Charging Cylinder or Reservoir Bottle

- The work procedure is always to be performed as described in the operating instructions for the A/C service station.
- A certain quantity of refrigerant is specified as charge for each air conditioning system. To ensure that neither too much nor too little refrigerant is added (either would reduce the cooling output), the charging cylinder has a scale indicating the weight.
- The volume of a refrigerant changes as a function of pressure. The scale must therefore be set according to the pressure in the charging cylinder.

NOTE:

- **Do not completely drain the reservoir (charging cylinder or bottle) as the liquid column boundary layer cannot be traced in the tube during filling (outside visible range).**

CAUTION: Do not overfill. A completely filled reservoir (charging cylinder or bottle) will explode when the temperature rises.

A/C Service Station, Draining

NOTE:

- **If it is necessary to drain the A/C service station (e.g. due to extraction of contaminated refrigerant), all filters and dryers must always be replaced (do not remove filter and dryer from the airtight packaging until immediately before installation to minimize moisture absorption).**
- **Refrigerant containers filled with contaminated used refrigerant are referred to as "Recycling containers".**
- **Always evacuate recycling containers prior to initial filling with refrigerant (if there is air in a refrigerant container it is not to be filled with refrigerant).**
- **Different types of refrigerant are not to be mixed (refrigerant mixtures cannot be recycled and are to be disposed of). If there is any doubt about the composition of the contents of the container, the refrigerant recycling company is to be informed accordingly.**

CAUTION:

- **When filling recycling containers (compressed-gas vessels), observe applicable regulations, technical rules and laws.**
- **Recycling containers are never to be overfilled (overfilled containers do not have a sufficient gas cushion to accommodate the liquid**

expansion caused by the effects of heat. There is a danger of rupture).

- **To ensure safety, make exclusive use of recycling containers equipped with a safety valve.**
- **Recycling containers must be weighed on calibrated scales during the filling process. The maximum permissible capacity is 75% (charge factor 0.75) of the charge weight indicated on the recycling container (the possibility of refrigerant oil entering the recycling container along with the refrigerant cannot be ruled out).**

Refrigerant Circuit, Flushing with Compressed Air and Nitrogen

Refrigerant circuit must be flushed with refrigerant R134a or blown through with compressed air and nitrogen in order to remove moisture and other contaminants as well as old refrigerant oil as efficiently as possible, without wasting refrigerant, without the need for extensive assembly work and without endangering the environment.

NOTE:

- **Blowing through the refrigerant circuit with compressed air or nitrogen mostly requires a significantly higher amount of work than flushing with refrigerant R134a. As flushing with refrigerant R134a cleans the components more efficiently, always flush in case of a complaint (blowing through should only be used for certain complaints and individual components).**
- **Under certain circumstances, it may be sufficient to blow through certain components (e.g. individual refrigerant lines or hoses) with compressed air or nitrogen (e.g. for pressing out old refrigerant oil of individual removed components).**
- **Certain impurities cannot or can only insufficiently be removed from the refrigerant circuit using compressed air, these impurities can be removed by e.g. flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a**
- **When blowing through, the maximum work pressure of 15 bar must not be exceeded (corresponding to pressure that is reached in a filled refrigerant circuit with an ambient temperature of approx. 60 C, if necessary use pressure reducer also for compressed air)**

CAUTION:

- **Make exclusive use of pressure reducers for nitrogen cylinders (maximum work pressure 15 bar).**
- **Use appropriate extraction units to draw off gas mixture escaping from components.**

- Always flush or blow through components in direction opposite to refrigerant flow.

NOTE:

- **Restrictor, expansion valve, compressor, receiver and reservoir cannot be flushed with compressed air and nitrogen.**
- **Remove dryer cartridge on condensers on which the dryer cartridge is installed in the integrated receiver.**
- **First flush out old refrigerant oil and dirt using compressed air and then use nitrogen to remove component moisture.**
- **Adapters for connecting pressure hose to refrigerant circuit --> A/C Service Station, Connecting and --> 87 - AIR CONDITIONING**

Pay attention to the following items to prevent oil and moisture from the compressed-air system penetrating into the refrigerant circuit.

- The compressed air must be routed through a compressed-air purifier for cleaning and drying. Use is therefore to be made of filter and dryer for compressed air (included in scope of delivery as tool for painting work) --> Workshop equipment and special tools catalog.
- For refrigerant pipes with thread or union nut at connection, make use of adapters from Adapter set refrig cir R 134a V.A.G 1785 (adapter V.A.G 1785/1 to adapter V.A.G 1785/8) for connection of 5/8" -18 UNF charging hoses (part of these adapters is also included in Adapter case for VW/Audi passenger cars VAS 6338/1).
- For refrigerant pipes with no thread or union nut at connection (for installing adapters), make use of adapter from Adapter case for VW/Audi passenger cars VAS 6338/1 or commercially available flushing gun with rubber end piece.

NOTE:

- **The refrigerant circuit is only to be blown through with compressed air and nitrogen afterwards if there is no possibility to flush the refrigerant circuit or flushing of individual components would require too much effort (it is possible to blow out minor impurities and moisture from the refrigerant pipes without much time needed).**
- **Compressed air/nitrogen emerging from components is to be drawn off by way of an appropriate system (workshop extraction system).**

The circuit (or individual components) must be blown through (if there is no possibility for flushing or flushing is not recommended):

- In the event of dirt or other contamination in the individual components of the circuit.
- If vacuum reading is not maintained on evacuating a leak-free refrigerant circuit (pressure build-up due to moisture in refrigerant circuit).
- If refrigerant circuit has been left open for longer than normal (e.g. following an accident).
- If pressure and temperature measurements in the refrigerant circuit indicate the likelihood of moisture.
- In the event of doubt about the amount of refrigerant oil in the circuit.
- The A/C compressor had to be replaced on account of internal damage (e.g. noise or no output).
- If stipulated by the vehicle-specific repair manual following replacement of certain components.

NOTE:

- **Certain impurities and old refrigerant oil cannot or can only insufficiently be removed from the refrigerant circuit using compressed air, these impurities can be removed by e.g. flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a**

Blowing through Refrigerant Circuit

NOTE:

- **In the case of vehicles on which the refrigerant pipes have no threads for connection of Adapter set refrig cir R 134a V.A.G 1785 , use e.g. a flushing gun with rubber end piece or an adapter from the adapter case for VW/Audi passenger cars VAS 6338/1 for blowing through the individual components. When using a flushing gun with rubber end piece, take special care not to damage the connections (crushing or scratching).**
- **Evaporator is to be flushed by way of connection for low-pressure pipe (large diameter) after removing expansion valve or removing restrictor.**
- **Always flush or blow through components in direction opposite to refrigerant flow.**
- **Check expansion valve and replace if dirty or corroded.**
- **Replace any components on which dark, sticky deposits cannot be removed with compressed air. Flush these components using refrigerant R134a or replace.**
- **Thin, light grey deposits on the insides of pipes do not impair the function of the components.**
- **After flushing, always replace receiver or reservoir and restrictor. Replace dryer cartridge on condensers on which the dryer cartridge is installed in the integrated receiver.**

After blowing through the refrigerant circuit:

- Replace these components depending on equipment (restrictor and reservoir, expansion valve and fluid reservoir or dryer cartridge) and --> Electronic Parts Catalog ETKA
- Depending on the kind of complaint, replace compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA or drain the remaining refrigerant oil from the compressor removed --> **Refrigerant Circuit Components, Replacing** (replace components of refrigerant circuit) and refill the prescribed amount of fresh refrigerant oil --> **Approved Refrigerant Oils** (Approved refrigerant oils and capacities for refrigerant oil)

NOTE:

- **There is a defined and prescribed amount of refrigerant oil in the replacement compressor. If necessary, a certain amount of refrigerant oil must be filled into the circuit in addition on vehicles with two evaporators --> 87 - AIR CONDITIONING and --> Approved Refrigerant Oils (Approved refrigerant oils and capacities for refrigerant oil).**
- **If the compressor will not be replaced, the refrigerant oil in the**

compressor must be topped up to the prescribed amount (pour out refrigerant oil and fill the prescribed amount into the compressor or the refrigerant circuit) --> Refrigerant Circuit Components, Replacing (Replacing components of refrigerant circuit) and --> Approved Refrigerant Oils (Approved refrigerant oils and capacities of refrigerant oil)

- **Reassemble the refrigerant circuit completely --> 87 - AIR CONDITIONING .**
- **Evacuate and recharge refrigerant circuit according to specification.**
- **Start up A/C system according to specification.**

Refrigerant Circuit, Flushing with Refrigerant R134a

- Flush refrigerant circuit using refrigerant R134a in order to force out moisture and other contaminants (e.g. shavings from a malfunctioning compressor) as well as old refrigerant oil as efficiently as possible, without wasting refrigerant, without the need for extensive assembly work and without endangering the environment.

Flush the refrigerant circuit:

- In the event of dirt or other contamination in the circuit.
- If vacuum reading is not maintained on evacuating a leak-free refrigerant circuit (pressure build-up due to moisture in refrigerant circuit).
- If refrigerant circuit has been left open for longer than normal (e.g. following an accident).
- If pressure and temperature measurements in the refrigerant circuit indicate the likelihood of moisture.

- In the event of doubt about the amount of refrigerant oil in the circuit.
- The A/C compressor had to be replaced on account of internal damage (e.g. noise or no output).
- If stipulated by the vehicle-specific repair manual following replacement of certain components.

Tools required

- A/C service station with flushing equipment VAS 6336 or A/C service station with flushing equipment VAS 6337 (these A/C service stations include the additional function for "flushing the refrigerant circuit" and the required equipment for flushing refrigerant circuits) --> Workshop equipment and special tools catalog
- Adapter case for VW/Audi passenger cars VAS 6338/1 --> **Adapter for Assembly of Flushing Circuits** and --> Workshop equipment and special tools catalog

NOTE:

- **If there is neither of the mentioned A/C service stations, it is possible to flush the refrigerant circuit using flushing equipment for refrigerant circuits VAS 6336/1 or flushing equipment for refrigerant circuits VAS 6337/1 depending on the A/C service station used, flushing must then be performed manually. --> Process of flushing (process is performed automatically according to the A/C service station program)**
- **On vehicles with threaded connections to the refrigerant circuit, the**

adapters V.A.G 1785/7 and adapters V.A.G 1785/8 from the adapter case for VW/Audi passenger cars VAS 6338/1 can be used; on vehicles with threaded connections to compressor and to reservoir, the adapter V.A.G 1785/8 is needed twice.

- **There is also a fill hose VAS 6338/31 with connections 5/8 -18 UNF and large inner diameter in short version (commercially available) included in the adapter case for VW/Audi passenger cars VAS 6338/1.**

Preparation

- Discharge A/C refrigerant system.
- Remove compressor --> **87 - AIR CONDITIONING**

On a vehicle with restrictor and reservoir

- Remove restrictor (vehicle-specific) and reconnect lines --> **87 - AIR CONDITIONING**
- Remove reservoir (vehicle-specific) and reconnect the lines (use adapters and fill hose VAS 6338/31 from the adapter case for VW/Audi passenger cars VAS 6338/1) --> **Adapter for Assembly of Flushing Circuits** , --> **87 - AIR CONDITIONING**

NOTE:

- **The reservoir could be flushed but because of its large internal volume it will take too much refrigerant, the reservoir would ice-up too much when extracting the refrigerant, the refrigerant would evaporate too slowly and extraction would be extended too much.**

On a vehicle with expansion valve and fluid reservoir

- Remove fluid reservoir (vehicle-specific) and reconnect the lines (use adapters and fill hose VAS 6338/31 from the adapter case for VW/Audi passenger cars VAS 6338/1) --> **Adapter for Assembly of Flushing Circuits** , --> **87 - AIR CONDITIONING**

NOTE:

- **The fluid reservoir can be flushed depending on the version (remove dryer cartridge if necessary) --> Adapter for Assembly of Flushing Circuits , --> 87 - AIR CONDITIONING**
- **The fluid reservoir connected to the condenser (e.g. on model Audi A3 from model year 2004) remains installed during flushing (it can be flushed due to its design and is only replaced after flushing) --> Adapter for Assembly of Flushing Circuits and --> 87 - AIR CONDITIONING**
- **Remove dryer cartridge from vehicles with dryer partridge in fluid reservoir that is connected to the condenser (vehicle-specific), and re-seal opening on fluid reservoir --> 87 - AIR CONDITIONING**
- **Remove expansion valve (vehicle-specific) and install one adapter from the adapter case for VW/Audi passenger cars VAS 6338/1 --> Adapter for Assembly of Flushing Circuits , --> 87 - AIR CONDITIONING .**

NOTE:

- **If there is no appropriate expansion valve in the adapter case for VW/Audi passenger cars VAS 6338/1 , the removed expansion valve may be drilled (the old expansion valve will be replaced in most cases and therefore is no longer needed).**
- **Remove regulating element before drilling and drill expansion valve e.g. using a suitable drill (diameter of drill e.g. 6 mm).**

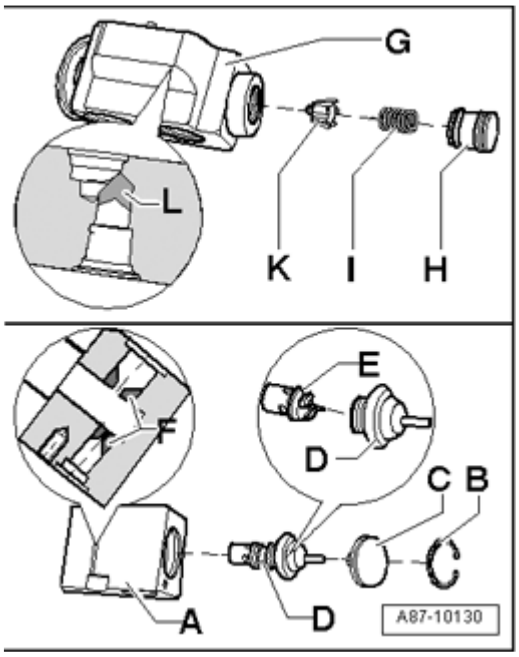

Fig. 36: Expansion Valve Components
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Expansion valves are available in different versions and designs. For version - **A** - , there must be removed components - **B** - , - **C** - and - **D** -. Then remove component part - **E** - (regulating element) from component - **D** -. Drill expansion valve in area - **F** - using suitable drill.
- For version - **G** - , parts - **H** - , - **I** - and - **K** - must be removed and then drill area - **L** - using suitable drill.
- Clean drilled expansion valve from drilling remains (shavings)
- Install parts - **B** - , - **C** - and - **D** - for version - **A** - or - **H** - for version - **G** -

NOTE:

- **On vehicles with two evaporators, disconnect second evaporator circuit from first evaporator circuit and flush separately --> 87 - AIR CONDITIONING and --> Adapter for Assembly of Flushing Circuits.**

Flushing

- Check amount of refrigerant in A/C service station, there must be at least 7 kg of refrigerant R134a

NOTE:

- **If necessary, switch on heating installed in A/C service station for the refrigerant container before first flushing (to increase the pressure in the refrigerant container) and switch off before first extraction during flushing.**
- **Drain container for used oil on A/C service station**
- **Connect supply line (high pressure side) of A/C service station to low pressure line to compressor (line with larger diameter) using an adapter --> Adapter for Assembly of Flushing Circuits**
- **Connect return line (low pressure or intake side) of the A/C service station to the flushing equipment output of refrigerant circuits**
- **Connect the input of the flushing equipment for refrigerant circuits to the high pressure line toward compressor (line with smaller diameter) using an adapter --> Adapter for Assembly of Flushing Circuits**

NOTE:

- **Always flush components in direction opposite to refrigerant flow with A/C system operated. --> Block Diagrams for Flushing Circuits**
- **When flushing, impurities get from the refrigerant circuit to the flushing equipment and to the A/C service station, and are retained in the filter and dryer installed there. Depending on the impurities, these components must be replaced in shorter intervals corresponding to the operating instructions on the A/C service station or the flushing equipment for refrigerant circuits. (filter of flushing equipment for refrigerant circuits after approx. 5 to 10 flushing cycles, depending on impurities of flushed refrigerant circuits).**
- **Depending on the kind of impurity, dirt is deposited at the sight glass of the flushing device for refrigerant circuits (old refrigerant oil and shavings from the compressor). Clean the sight glass after flushing if necessary, and flush the refrigerant circuit again for checking (one cycle is sufficient).**
- **Liquid refrigerant cannot be led through the expansion valve, restrictor and dryer bag of certain fluid reservoirs at an appropriate speed, therefore these components must be removed and replaced by adapters if necessary --> 87 - AIR CONDITIONING**
- **Adapters for connecting the A/C service station and for bridging certain components of the refrigerant circuit --> Adapter for Assembly of Flushing Circuits**
- **Switch on the A/C service station and flush the refrigerant circuit (duration for one flushing cycle with three flushing procedures is approx. 1 to 1.5 hours)**

NOTE:

- **Flushing procedure must be performed according to the operating instructions of the A/C service station**
- **Depending on the version of A/C service station, the reservoir for used oil contains only approx. 125 cm ^{3} refrigerant oil; in case it should be**

necessary to flush a system with a larger amount of refrigerant oil, it may be necessary to drain the reservoir for used oil after the first flushing procedure of a flushing cycle.

- **Observe the refrigerant that flows back from the refrigerant circuit into the A/C service station; only when the refrigerant flows clear and completely colorless through the sight glass of the flushing equipment for refrigerant circuits into the A/C service station, the refrigerant circuit is cleaned.**
- **When flushing, the complete amount of refrigerant oil is washed out of the refrigerant circuit (except for minor remains e.g. in the evaporator which can be neglected).**
- **If very dirty, it may be necessary to repeat the flushing procedure (i.e. two flushing cycles with three flushing procedures each).**

Process of flushing (process is performed automatically according to the A/C service station program)

- After switching on, the flushing circuit (refrigerant circuit with connecting hoses and flushing equipment for refrigerant circuits) is evacuated first and the refrigerant circuit is checked for leaks during this. (Depending on the version of the A/C service station, manually advancing may be necessary).
- A specified amount (e.g. 5 kg) of refrigerant is filled into the evacuated refrigerant circuit via the high pressure side of the A/C service station (in direction opposite to the normal flow when the air conditioning is operating, and therefore on the low pressure side of the vehicles refrigerant circuit), or refrigerant is filled up until the refrigerant circuit and the sight glasses of the flushing equipment for refrigerant circuit are completely filled with liquid refrigerant (depending on the version of A/C service station it is detected whether e.g. no refrigerant was flowing for a certain time).
- After the specified amount of refrigerant has been filled in, e.g. the heating for the flushing equipment is switched on, depending on the version of the A/C service station and the flushing equipment for refrigerant circuits (only in case, the refrigerant is extracted in the gaseous state from the flushing device for refrigerant circuits).
- After the refrigerant was extracted, the heating of the flushing device for refrigerant circuits is switched off (if present), it may occur that the refrigerant circuit is shortly evacuated again, depending on its version. After evacuation, the refrigerant extracted from the refrigerant circuit is deposited by the A/C service station.

- The procedure of filling with refrigerant, extracting (and evacuating) is repeated two times (i.e. performed three times all in all).
- Depending on the A/C service station version, the flushing circuit is evacuated after extracting for the third time.

  - After the flushing procedure has ended, check the one or more sight glasses of the flushing device for refrigerant circuits; if dirty, clean according to operating instructions of the flushing equipment for refrigerant circuits or the A/C service station and repeat the flushing procedure for check (one cycle is sufficient, duration approx. 30 min.)
  - Check pressure in refrigerant circuit, there must be no positive pressure in the refrigerant circuit (if necessary, shortly evacuate again).
  - Remove connections to A/C service station from refrigerant circuit of the vehicle (there must be no

positive pressure in the refrigerant circuit)

- Replace these components depending on equipment (restrictor and reservoir, expansion valve and fluid reservoir or dryer cartridge in fluid reservoir) --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

- Depending on the kind of complaint, replace compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA or drain the remaining refrigerant oil from the compressor removed --> **Refrigerant Circuit Components, Replacing** (replace components of refrigerant circuit) and refill the prescribed amount of fresh refrigerant oil --> **Approved Refrigerant Oils** (Approved refrigerant oils and capacities for refrigerant oil)

NOTE:

- **There is a defined and prescribed amount of refrigerant oil in the replacement compressor. If necessary, a certain amount of refrigerant oil must be filled into the circuit in addition on vehicles with two evaporators --> 87 - AIR CONDITIONING and --> Approved Refrigerant Oils (Approved refrigerant oils and capacities for refrigerant oil).**
- **If the compressor is not to be replaced, the refrigerant oil in the compressor must be topped up to the specified amount (pour out refrigerant oil and fill the prescribed amount into the compressor or the refrigerant circuit) --> Refrigerant Circuit Components, Replacing (Replacing components of refrigerant circuit) and --> Approved Refrigerant Oils (Approved refrigerant oils and capacities of refrigerant oil).**
- **Reassemble refrigerant circuit completely --> 87 - AIR CONDITIONING .**
- **Evacuate and recharge refrigerant circuit according to specification.**
- **Start up A/C system according to specification --> 87 - AIR CONDITIONING .**

Block Diagrams for Flushing Circuits

NOTE:

- **The arrows in the following illustration show the refrigerant flow when flushing (when flushing, the refrigerant flows in direction opposite to the flow when the air conditioning is operating, therefore the high pressure side of the A/C service station is connected to the low pressure connection toward the compressor).**
- **These block diagrams indicate a refrigerant circuit with restrictor and reservoir and a refrigerant circuit with expansion valve, fluid reservoir and a second evaporator (optional equipment on certain vehicles)**
- **Depending on the A/C service station design, there may be check valves installed between the refrigerant circuit and the A/C service station (to ensure the correct direction of flow of the refrigerant when flushing).**

Refrigerant circuit with restrictor and reservoir

NOTE:

- **On vehicles with restrictor and reservoir, the restrictor and reservoir are**

removed, the lines disconnected for removing the restrictor are reconnected again. The connections to the reservoir removed are connected by means of two adapters and the fill hose VAS 6338/31 (from the adapter case for VW/Audi passenger cars VAS 6338/1)

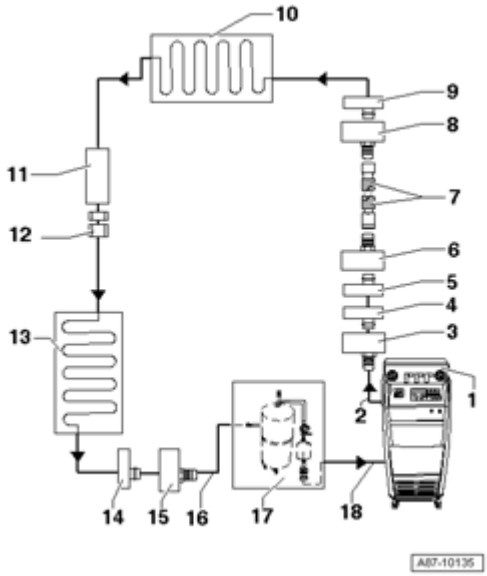

Fig. 37: Block Diagrams For Flushing Circuits (Type 1)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - A/C service station

- With electronics and a program for flushing, e.g. A/C service station with flushing equipment VAS 6336 or A/C service station with flushing equipment VAS 6337
- If an A/C service station with no flushing program is used, the procedure must be performed manually (evacuating, flushing 3 times with at least 4 kg refrigerant each, extracting the refrigerant, evacuating).

2 - Refrigerant hose of the A/C service station

- From the high pressure side of the A/C service station (mostly red) to the connection for the low pressure side of the compressor on the refrigerant circuit (larger diameter)

3 - Adapter for connecting low pressure side to refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

4 - Connection of low pressure side to refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- On refrigerant line from compressor to reservoir

5 - Connection to reservoir

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- On refrigerant line from compressor to reservoir

6 - Adapter for bridging removed reservoir

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

7 - Fill hose for refrigerant --> **Adapter for Assembly of Flushing Circuits**

- For example fill hose VAS 6338/31 (from the adapter case for VW/Audi passenger cars VAS 6338/1)

8 - Adapter for bridging removed reservoir

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

9 - Connection to reservoir

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**

10 - Evaporator

11 - Component location of restrictor

- The restrictor is removed.
- Removing restrictor --> **87 - AIR CONDITIONING**

12 - Threaded connections in refrigerant line

- Thread together again after removing restrictor --> **87 - AIR CONDITIONING**

13 - Condenser

14 - Connection of high pressure side to refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**

15 - Adapter for connection of high pressure side on refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

16 - Fill hose to flushing device for refrigerant circuits

- From connection to high pressure side of compressor on refrigerant circuit (smaller diameter) to input of flushing device for refrigerant circuits.

17 - Flushing equipment for refrigerant circuits

- Different versions and different designs, e.g. flushing equipment for refrigerant circuits VAS 6336/1 or flushing equipment for refrigerant circuits VAS 6337/1
- With filter, sight glass, safety valve, heating, refrigerant vessel etc. (depending on version).
- Depending on the A/C service station design and the flushing device for refrigerant circuits, there may be a check valve installed at the output of the flushing device for refrigerant circuits (to ensure the correct flow direction of the refrigerant when flushing).

18 - Refrigerant hose of the A/C service station

- From the low pressure side of the A/C service station (mostly blue) to the output of the flushing device for refrigerant circuits.

Refrigerant circuit with expansion valve, fluid reservoir and second evaporator

NOTE:

- **This block diagram shows a refrigerant circuit with expansion valve, fluid reservoir and a second evaporator (optional equipment on certain vehicles).**
- **On vehicles with expansion valve and fluid reservoir, the expansion valve is removed and replaced by an adapter. Depending on the vehicle, the fluid reservoir is also removed and the connections to the fluid reservoir are connected by means of two adapters and a fill hose.**
- **On a vehicle with only one evaporator, components from item "16" are not present or are not needed.**

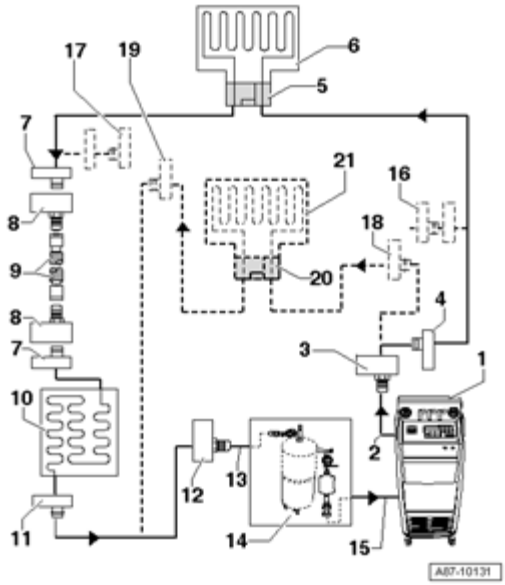

Fig. 38: Block Diagrams For Flushing Circuits (Type 1)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

1 - A/C service station

- With electronics and a program for flushing, e.g. A/C service station with flushing equipment VAS 6336 or A/C service station with flushing equipment VAS 6337
- If an A/C service station with no flushing program is used, the procedure must be performed manually (evacuating, flushing 3 times with at least 4 kg refrigerant each, extracting the refrigerant, evacuating).

2 - Refrigerant hose of the A/C service station

- From the high pressure side of the A/C service station (mostly red) to the connection for the low pressure side of the compressor on the refrigerant circuit (larger diameter)

3 - Adapter for connecting low pressure side to refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

4 - Connection of low pressure side to refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**

5 - Adapter for the removed expansion valve

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

6 - Evaporator

7 - Connection to fluid reservoir

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- Neither installed on vehicles with dryer cartridge in fluid reservoir at condenser nor with fluid reservoir installed in condenser --> **87 - AIR CONDITIONING** .

8 - Adapter for bridging removed fluid reservoir

- Not installed in all vehicles
- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

9 - Fill hose for refrigerant --> **Adapter for Assembly of Flushing Circuits**

- For example fill hose VAS 6338/31 (from the adapter case for VW/Audi passenger cars VAS 6338/1)

10 - Condenser

- If a fluid reservoir with dryer cartridge is installed at the condenser, the dryer cartridge must be removed (reseal fluid reservoir at or in condenser) --> **87 - AIR CONDITIONING**
- If the fluid reservoir is directly installed at the condenser, the fluid reservoir must be removed and replaced only after flushing --> **87 - AIR CONDITIONING**

11 - Connection of high pressure side to refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**

12 - Adapter for connection of high pressure side on refrigerant circuit

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- From the adapter case for VW/Audi passenger cars VAS 6338/1

13 - Fill hose to flushing device for refrigerant circuits

- From connection to high pressure side of compressor on refrigerant circuit (smaller diameter) to input of flushing device for refrigerant circuits.

14 - Flushing equipment for refrigerant circuits

- Different versions and different designs, e.g. flushing equipment for refrigerant circuits VAS 6336/1 or flushing equipment for refrigerant circuits VAS 6337/1
- With filter, sight glass, safety valve, heating, refrigerant vessel etc. (depending on version).
- Depending on the A/C service station design and the flushing device for refrigerant circuits, there may be

a check valve installed at the output of the flushing device for refrigerant circuits (to ensure the correct flow direction of the refrigerant when flushing).

15 - Refrigerant hose of the A/C service station

- From the low pressure side of the A/C service station (mostly blue) to the output of the flushing device for refrigerant circuits.

16 - Adapter to seal output to second evaporator

- Only necessary on certain vehicles with optional equipment "second evaporator"
- From the adapter case for VW/Audi passenger cars VAS 6338/1

17 - Adapter to seal output to second evaporator

- Only necessary on certain vehicles with optional equipment "second evaporator"
- From the adapter case for VW/Audi passenger cars VAS 6338/1

18 - Connection of low pressure side on refrigerant circuit to second evaporator

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- Only present on certain vehicles with optional equipment "second evaporator"

19 - Connection of high pressure side on refrigerant circuit to second evaporator

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- Only present on certain vehicles with optional equipment "second evaporator"

20 - Adapter for removed expansion valve at second evaporator

- Different versions depending on vehicle --> **Adapter for Assembly of Flushing Circuits**
- Only necessary on certain vehicles with optional equipment "second evaporator"
- From the adapter case for VW/Audi passenger cars VAS 6338/1

21 - Second evaporator

- Only present on certain vehicles with optional equipment "second evaporator"

Adapter for Assembly of Flushing Circuits

- The following table lists the different adapters necessary for the connection of the A/C service station to the refrigerant circuit, flushing and bridging of the removed fluid reservoir or reservoir and the expansion valve (vehicle-specific).
- Connect the two adapters that were installed when reservoir or fluid reservoir was removed (included in adapter case for VW/Audi passenger cars VAS 6338/1) with a fill hose with connections 5/8 -18 UNF

(short version e.g. fill hose VAS 6338/31).

- If a flushed refrigerant circuit is not reassembled immediately after flushing, adapters remain at connections and seal the connections at the adapters using shipping caps VAS 6338/30 (from adapter case for VW/Audi passenger cars VAS 6338/1).
- Depending on the version of the compressor and time period of production, different connection and sealing techniques can be found for the refrigerant circuit --> **87 - AIR CONDITIONING**

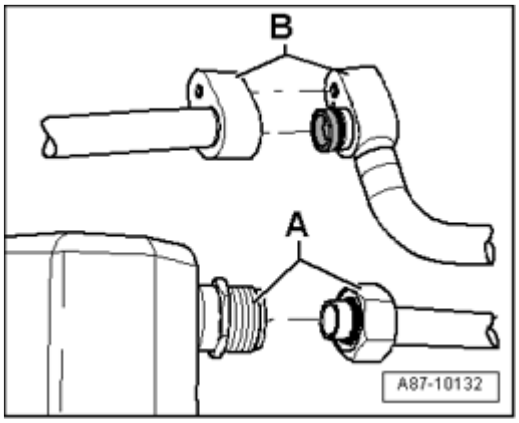

Fig. 39: Identifying Screw & Block Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Block or threaded connections

- Threaded connection - **A** -
- Block connection - **B** -

Block connections with various types of sealing

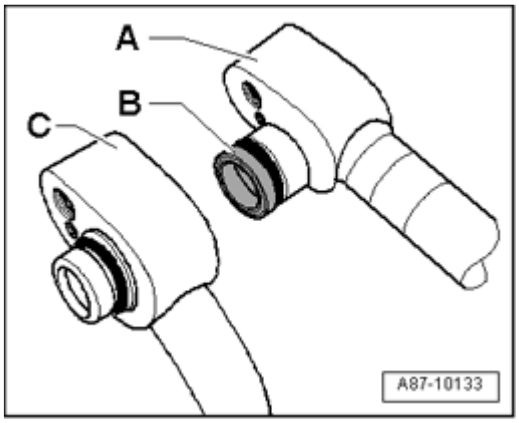

Fig. 40: Identifying Different Types Of Block Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Block connection with radially sealed connection - **A** - (with plastic or metal guide - **B** -)
- Block connection with axially sealed connection - **C** -

Audi A3, Audi TT and Audi A2

Vehicle	Adapters necessary for the connections to the compressor	Adapters necessary for the connections to the reservoir or fluid reservoir	Miscellaneous
Audi A2 (8Z_) 2001	Compressor manufacturer Denso Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/2	Accumulator Threaded connection at input adapter VAS 6338/9 Block connection with axial sealing at output adapter VAS 6338/10	- Restrictor removed, connections reconnected
A3 (8L_) 1997 up to 2004 and Audi TT (8N_) 1999 -->	Compressor manufacturer Sanden or Zexel Low pressure side adapter VAS 6338/7 High pressure side adapter VAS 6338/2	Receiver Block connections with axial sealing at input and output adapter VAS 6338/2 (necessary 2 times)	Expansion valve removed and adapter VAS 6338/19 installed (or drilled expansion valve, e.g. 6N0 820 679 C installed)
A3 (8P_) 2004 -->	Compressor manufacturer Sanden , Denso or Zexel Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/3	Receiver No adapter needed, the receiver remains installed	Expansion valve removed and adapter VAS 6338/18 installed (or drilled expansion valve, e.g. 1K0 820 679 installed)

Audi 80 , Audi 90, Audi Coupe, Audi Cabriolet and Audi A4

Vehicle	Adapters necessary for the connections to the compressor	Adapters necessary for the connections to the accumulator	Miscellaneous
Audi 80 (8A_/8C_), Audi Coupe (8B_), Audi Cabriolet (8G_) --> 2002 Audi A4 (8D_) 1995 up to 2002	Compressor manufacturer Zexel (threaded connections) Low pressure side adapter VAG 1785/8 High pressure side adapter VAG 1785/7	Accumulator with various versions of connections Version 1 Threaded connection at input adapter VAS 6338/9 Threaded connection at output adapter VAG 1785/8	- Restrictor removed, connections reconnected
	Compressor manufacturer Denso (block connections with radial and axial sealing) Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/2	Version 2 Threaded connection at input adapter VAS 6338/9 Block connection with axial sealing at output adapter VAS 6338/10	
A4 (8E_) 2001 --> , Audi A4 Cabriolet (8H_) 2003 -->	Compressor manufacturer Denso (block connections with radial and axial sealing) Low pressure side adapter VAS 6338/12 High pressure	Accumulator with various versions of connections Version 1 Block connections with axial sealing at input and output	- Restrictor removed, connections

	side adapter VAS 6338/2	Adapter VAS 6338/10 (2x needed)	reconnected
	Compressor manufacturer Denso (block connections with radial sealing) Heating, Ventilation and Air Conditioning 87 Compressor, Removing and Installing Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/3	Version 2 Block connections with radial sealing at input and output Adapter VAS 6338/8 (2x needed)	

Audi 100, Audi A6, Audi Allroad and Audi V8

Vehicle	Adapters necessary for the connections to the compressor	Adapters necessary for the connections to the accumulator	Miscellaneous
Audi 100/Audi A6 (4A_) through 1998 Audi A6 (4B_) from 1998 Audi Allroad Audi V8 (4C_) through 1994	Compressor manufacturer Zexel (threaded connections) Low pressure side adapter VAG 1785/8 High pressure side adapter VAG 1785/7	Accumulator with various versions of connections Version 1 Threaded connection at input adapter VAS 6338/9 Threaded connection at output adapter VAG 1785/8	- Restrictor removed, connections reconnected
	Compressor manufacturer Denso (block connections with radial and axial sealing) Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/2	Version 2 Threaded connection at input adapter VAS 6338/9 Block connection with axial sealing at output adapter VAS 6338/10 Version 3 Block connections with axial sealing at input and output adapter VAS 6338/10 (necessary 2 times)	
Audi A6 (4F_) from 2005	Compressor manufacturer Denso (block connections with radial sealing) Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/3	Accumulator with radially sealed block connections at input and output Adapter VAS 6338/8 (2x needed)	- Restrictor removed, connections reconnected

Audi A8

Vehicle	Adapters necessary for the connections to the compressor	Adapters necessary for the connections to the accumulator	Miscellaneous
Audi A8 (4D_) 1994 up to 2002	Compressor manufacturer Zexel (threaded connections) Low pressure side adapter VAG 1785/8 High pressure side adapter VAG 1785/7	Accumulator with various versions of connections Version 1 Threaded connection at input adapter VAS 6338/9 Threaded connection at output adapter VAG 1785/8	- Restrictor removed, connections reconnected

	Compressor manufacturer Denso (block connections with radial and axial sealing) Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/2	Version 2 Threaded connection at input adapter VAS 6338/9 Block connection with axial sealing at output adapter VAS 6338/10 Version 3 Block connections with axial sealing at input and output adapter VAS 6338/10 (necessary 2 times)	
Audi A8 (4E_) from 2003	Compressor manufacturer Denso (block connections with radial sealing) Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/3	Accumulator Block connections with radial sealing at input and output Adapter VAS 6338/8 (2x needed)	- Restrictor removed, connections reconnected

Audi Q7

Vehicle	Adapters necessary for the connections to the compressor	Required adapters for connections to fluid reservoir / to second evaporator.	Miscellaneous
Audi Q7 (4L_) from 2006 Vehicles with one evaporator (2 zone A/C system)	Compressor manufacturer Denso (block connections with radial sealing) Low pressure side adapter VAS 6338/12 High pressure side adapter VAS 6338/3	No adapter required, dryer is removed from fluid reservoir on condenser and the opening is re-sealed.	Expansion valve removed and adapter VAS 6338/17 installed (or drilled expansion valve, e.g. 7L0 820 712 A installed).
Additional on vehicles with 2 evaporators (4 zone A/C system)		To flush circuit with evaporator in front A/C unit Adapter VAS 6338/5 for sealing the low-pressure side connection (to second evaporator) Adapter VAS 6338/11 for sealing the high-pressure side connection (to second evaporator)	
		To flush second evaporator and corresponding lines Adapter VAS 6338/3 for connecting service station to the low-pressure side connection (to second evaporator). Adapter VAS 6338/4 for connecting service station to the high-pressure side connection (to second evaporator).	Expansion valve on second evaporator removed and adapter VAS 6338/17 installed (or drilled expansion valve, e.g. 7L0 820 712 A installed).

NOTE:

- **In vehicles with two evaporators, refrigerant circuit is flushed in two work steps.**

Refrigerant Circuit, Determining Leaks

--> **Refrigerant Circuit, Tracing Leaks with Electronic Leak Detector V.A.G 1796**

--> **Refrigerant Circuit, Locating Leaks with Leak Detection System VAS 6201**

--> **Leak Detection Additive, Adding with Refrigerant Circuit Charged**

--> **Refrigerant Circuit, Locating Leaks with UV Lamp VAS 6196/4**

Refrigerant Circuit, Tracing Leaks with Electronic Leak Detector V.A.G 1796

Minor leaks can be detected using an electronic leak detector or UV leak detector lamp for example.

NOTE:

- **Currents of air quickly disperse refrigerant gas. Draughts must therefore be avoided during leak detection.**

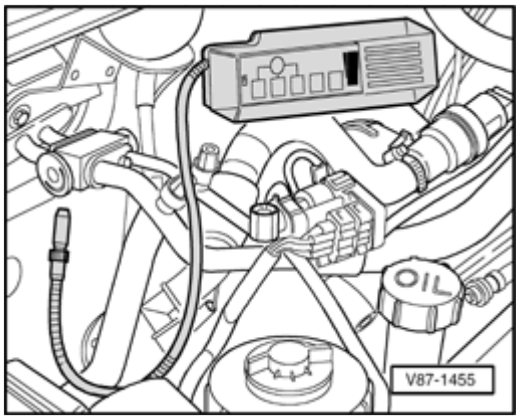

Fig. 41: Checking For A/C Refrigerant System Leaks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- If the refrigerant circuit is completely empty, charge with about 100 g of refrigerant.

Leak detection:

- Start up leak detector in line with relevant operating instructions.
- Always hold test probe beneath suspected leak.

Depending on the model, leak detection is indicated by an increase in clicking rate or a warning tone (refer to operating instructions for leak detector).

Refrigerant Circuit, Locating Leaks with Leak Detection System VAS 6201

NOTE:

- **Certain leaks are difficult or even impossible to locate using an electr. leak detector. In such cases, use can be made of the leak detection system**

VAS 6201.

- **Refrigerant circuit leaks result in a loss of refrigerant oil together with the refrigerant. This oil generally remains in the vicinity of the leak location. Adding a small quantity of fluorescent fluid to the refrigerant circuit makes this oil visible under UV light. The fluid (PAG oil containing an additive which shows up under UV light) is poured into the refrigerant circuit and becomes distributed with the refrigerant oil when the air conditioner is switched on.**
- **The air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (compressor must run).**
- **The refrigerant oil containing the additive (which shows up under UV light) can either be poured directly into the open circuit or pumped in with the circuit charged using the hand pump VAS 6201/1 (from leak detection system VAS 6201) via the service connection on the low-pressure side.**
- **If the leak detection additive is applied via the service connection on the low-pressure side with the refrigerant circuit charged, a small quantity of additive remains in the service connection. This is to be carefully removed so as to avoid subsequent erroneous leak detection.**
- **If a component forming part of a circuit into which the leak detection additive is poured has to be replaced, thoroughly clean joints with other components after assembling refrigerant circuit. Otherwise, the remnants could lead to erroneous leak detection.**
- **On discharging the refrigerant circuit, refrigerant oil and thus also leak detection additive enters into the A/C service station. The oil is removed from the refrigerant in the oil separator of the A/C service station and discharged from the A/C service station via the drain. The refrigerant oil drained off is not to be poured back in. It is to be replaced with fresh refrigerant oil.**
- **Pay attention to the following if leak detection fluid has already been poured into a refrigerant circuit in the course of previous repair work: Only add new leak detection fluid if refrigerant oil is replaced. If only some of the refrigerant oil has been replaced, just add the corresponding quantity of leak detection fluid. If, for example, 100 ml of refrigerant oil has been replaced on a vehicle containing 250 ml, only add 1 ml (cm^3) of leak detection additive.**
- **Certain materials and their compounds (e.g. oxidation products on aluminum components, anti-corrosion waxes) also show up under UV light.**

Fig. 42: Identifying Tools & Items Required -- Refrigerant Circuit, Locating Leaks With Leak Detection System VAS 6201
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Tools and other items required:

1. Hand pump with low-pressure service hose, service coupling and non-return valve VAS 6201/1
2. Cartridge VAS 6201/2
3. Cleaning agent VAS 6201/3
4. UV leak detection lamp VAS 6201/4
5. UV-absorbing safety goggles VAS 6201/6
6. Sticker VAS 6201/7
7. Tube VAS 6201/8 VAS 6201/8
8. Protective gloves VAS 6201/9

Pouring in leak detection additive with refrigerant circuit empty

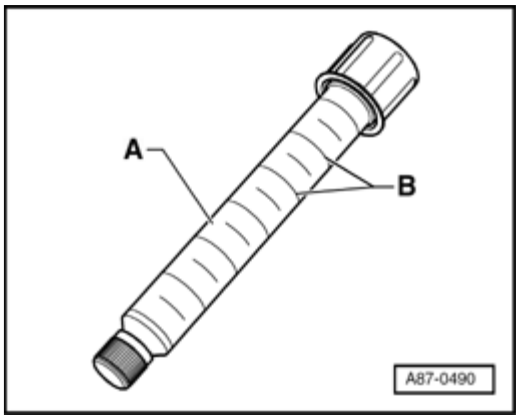

Fig. 43: Identifying Cartridge & One Unit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The cartridge - **A** - contains 15.4 ml of leak detection additive (one unit - **B** - corresponds to 2.5 ml).

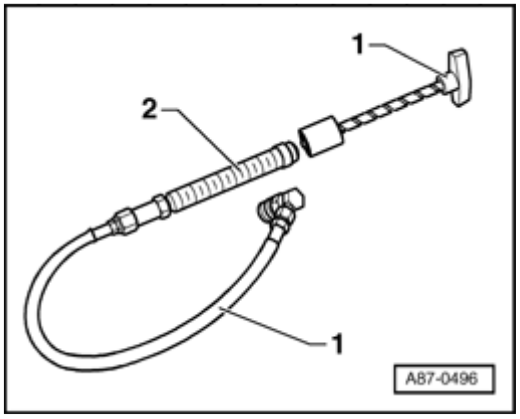

Fig. 44: Assembling Hand Pump VAS 6201 With Cartridge - VAS 6201/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble hand pump VAS 6201 , item - **1** - with cartridge, item - **2** - VAS 6201/2.
- Insert tube VAS /8 (**VAS 6201/8** item - **7** -) in hand pump.
- Open hand pump service valve.

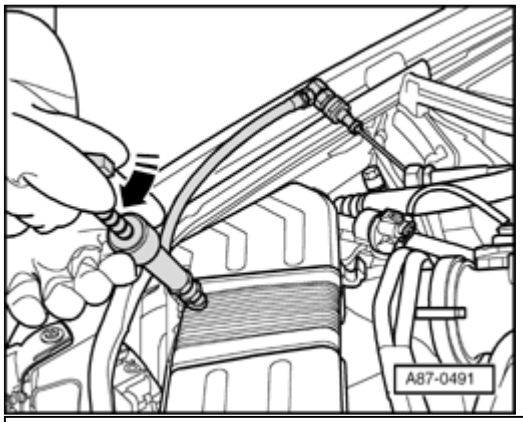

Fig. 45: Identifying Leak Detection Additive Poured In Via An Open Connection
Courtesy of VOLKSWAGEN UNITED STATES, INC.

With refrigerant circuit empty, the leak detection additive can best be poured in via an open connection.

- Open the refrigerant circuit at a readily accessible connection.
- Cover the surrounding area with sheeting or absorbent paper.
- Hold tube upwards.
- Screw in toggle of hand pump until leak detection additive emerges from tube.
- Fill the refrigerant circuit with $2.5^{+}/_{-}0.5$ ml (milliliter = cm^3) of leak detection additive.
- Replace O-ring at open connection.
- Assemble refrigerant circuit.
- Affix sticker next to service connections to indicate that leak detection fluid has been added to the refrigerant circuit.
- Evacuate and charge refrigerant circuit as specified.

NOTE:

- **Pay attention to the following if leak detection fluid has already been poured into a refrigerant circuit in the course of previous repair work: Only add new leak detection fluid if refrigerant oil is replaced. If only some of the refrigerant oil has been replaced, just add the corresponding quantity of leak detection fluid. If, for example, 100 ml of refrigerant oil has been replaced on a vehicle containing 250 ml, only add 1 ml (cm^3) of leak detection additive.**
- **The air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (compressor must run).**
- **Depending on the magnitude and location, it may take several days for sufficient refrigerant oil and additive to emerge to clearly identify the leak.**

Leak Detection Additive, Adding with Refrigerant Circuit Charged

NOTE:

- **Pay attention to the following if leak detection fluid has already been poured into a refrigerant circuit in the course of previous repair work: Only add new leak detection fluid if refrigerant oil is replaced. If only some of the refrigerant oil has been replaced, just add the corresponding quantity of leak detection fluid. If, for example, 100 ml of refrigerant oil has been replaced on a vehicle containing 250 ml, only add 1 ml (cm^3) of leak detection additive.**
- **A small quantity of leak detection additive remains in the service connection. This is to be carefully removed so as to avoid subsequent erroneous leak detection.**

- **The air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (compressor must run). Depending on the magnitude and location, it may take several days for sufficient refrigerant oil and additive to emerge to clearly identify the leak.**

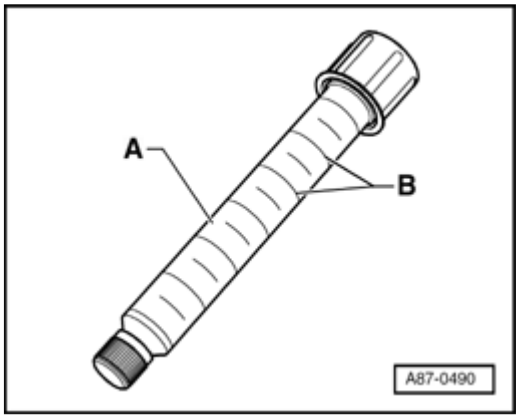

Fig. 46: Identifying Cartridge & One Unit
Courtesy of VOLKSWAGEN UNITED STATES, INC.

The cartridge - **A** - contains 15.4 ml of leak detection additive (one unit - **B** - corresponds to 2.5 ml).

- Switch off ignition.
- Remove cap from service connection on low-pressure side of refrigerant circuit.

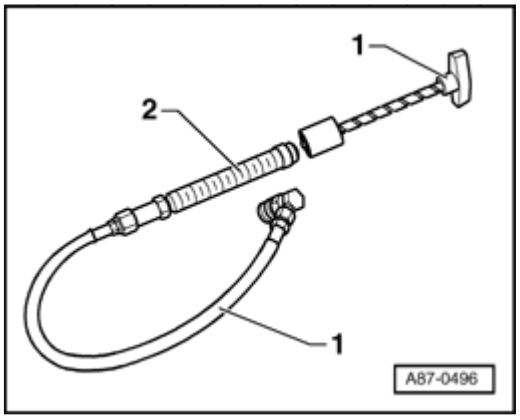

Fig. 47: Assembling Hand Pump VAS 6201 With Cartridge - VAS 6201/2
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Assemble hand pump VAS 6201 , item - **1** - with cartridge, item - **2** - VAS 6201/2.
- Insert tube VAS 6201/8 (**VAS 6201/8** item - **7** -) in service coupling and open service coupling by screwing in handwheel. Hold hose upwards and screw in toggle of hand pump until leak detection additive starts to emerge from tube.

NOTE:

- **Make sure hand pump hose is completely filled with refrigerant.**

- **Close service coupling and remove tube from locking mechanism.**

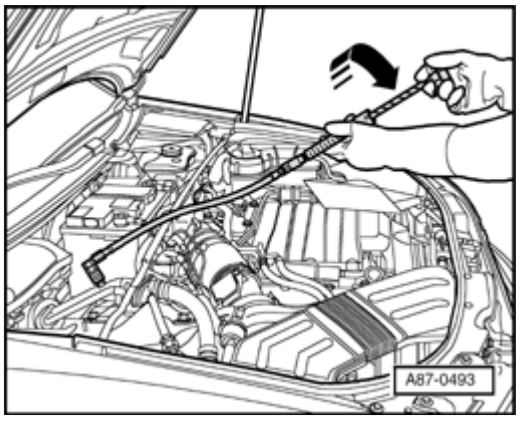

Fig. 48: Inserting Tube VAS 6201/8 In Service Coupling
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Cover area around service connection on vehicle with sheeting or absorbent paper.
- Connect filler unit to refrigerant circuit service connection on vehicle.
- Open service connection by screwing in handwheel.
- Screw in toggle of hand pump to transfer 2.5 $^{+}$ /- 0.5 ml (milliliter= cm ^{3}) of leak detection additive to refrigerant circuit.

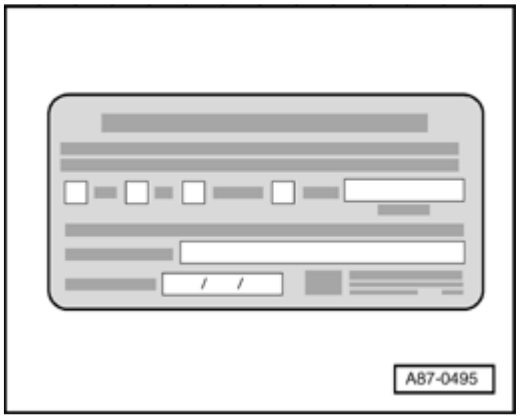

Fig. 49: Identifying Leak Detection Fluid Added Sticker
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Disconnect filler unit from service connection.
- Use absorbent paper, for example, to remove remnants of leak detection additive from service connection.
- Seal service connection with cap.
- If necessary, use cleaning agent to clean area around service connection.

- Affix sticker next to service connections to indicate that leak detection fluid has been added to the refrigerant circuit.

Refrigerant Circuit, Locating Leaks with UV Lamp VAS 6196/4

CAUTION: Never look into UV lamp.

Never point UV lamp at other people.

NOTE:

- **After filling, the air conditioner must be operated for at least 60 min. to distribute the additive throughout the refrigerant circuit (compressor must run/be actuated).**
- **Depending on the magnitude and location, it may take several days for sufficient refrigerant oil and additive to emerge to clearly identify the leak.**
- **In the event of leaks at the evaporator, the additive may be washed out with the condensate and emerge via the condensate drain. As on most vehicles the evaporator is not accessible without considerable effort, checking the condensate drain for example can provide an indication of evaporator leakage. This does however require the additive to have been in the refrigerant circuit for a lengthy period (several days).**
- **The safety goggles are not only designed to provide eye protection. They also make the additive more readily visible under UV light.**
- **Depending on the accessibility of various parts of the refrigerant circuit, it may be necessary to remove certain vehicle components (e.g. bumper or air cleaner).**

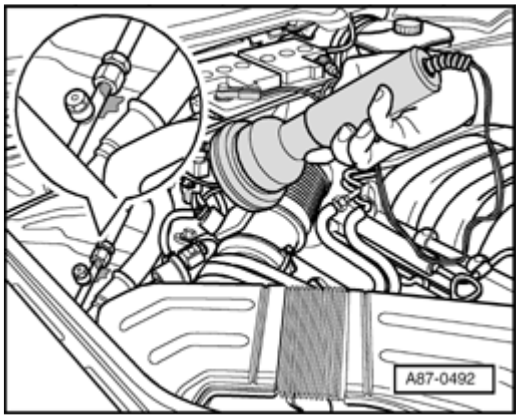

Fig. 50: Refrigerant Circuit, Locating Leaks With UV Lamp VAS 6196/4
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Move vehicle to a less brightly lit area of the workshop (daylight or bright artificial lighting diminishes the effect of the UV light).
- Check accessibility of various parts of the refrigerant circuit and remove components in area of refrigerant circuit which would block view of refrigerant circuit components (e.g. noise insulation and bumper).
- Wear safety goggles to protect eyes.
- Connect UV lamp to a 12V battery (vehicle battery). Take care to ensure correct polarity of connections.

- Switch on UV lamp and illuminate components of refrigerant circuit. Locations at which leakage has resulted in the emergence of refrigerant, refrigerant oil and thus also leak detection additive show up under UV light (fluorescent).

POSSIBLE REFRIGERANT CIRCUIT CONCERNS

Test requirements

- Electrical system, vacuum system and air duct fault-finding has not revealed any faults , air conditioner Guided Fault Finding function --> Electrical Wiring Diagrams, Troubleshooting and Component Locations and --> **87 - AIR CONDITIONING**
- No fault revealed by air conditioner On Board Diagnostic (OBD) (e.g. using fault read out device V.A.G 1551 --> **87 - AIR CONDITIONING** or , air conditioner Guided Fault Finding function); no compressor shutoff criterion displayed in measured value block (vehicles with "air conditioner" On Board Diagnostic (OBD) only)

Possible Concerns

NOTE:

- **For all complaints marked *, refer to --> Refrigerant Circuit, Checking Pressures with A/C Service Station "Checking pressures".**
- **If a malfunction occurs at only one evaporator in vehicles with two evaporators, also check pressures in the refrigerant circuit.**
- **Total cooling system failure ***
- **Insufficient cooling output at all vehicle or engine speeds ***
- **No or insufficient cooling after driving a few miles ***
- **No cooling or insufficient cooling at one or both evaporator(s) (on vehicles with two evaporators).***
- **Compressor, A/C Clutch N25 or A/C Compressor Regulator Valve N280 shut off by pressure switch (e.g. A/C Refrigerant Low Pressure Switch F73 , A/C Refrigerant High Pressure Switch F118 , A/C Pressure Switch F129 or A/C Control Head E87 or Climatronic Control Module J255) on account of excessive or inadequate pressure ***
- **No or sharp decrease in fresh-air supply after driving several miles (evaporator iced up) ***

Other possible problems:

Compressor noise

- Re-tighten securing bolts for compressor and compressor bracket using a torque wrench.
- Check routing of refrigerant pipes; they must not touch other components and must not be subject to strain (align if necessary).

Noise (refrigerant hammer) occurring immediately after switching on air conditioner and/or when cornering or

braking:

- Discharge, evacuate and recharge refrigerant circuit (too much refrigerant in circuit).

NOTE:

- **Too much refrigerant oil in the circuit may also result in this problem (no adjustment of refrigerant oil quantity, for example, on replacing compressor).**

Water sprays out of vents (in instrument panel or footwell) although air conditioning system is otherwise functioning properly:

- Check proper routing of condensate drain; it must not be crushed or kinked.
- Check condensate drain valve; it must not be gummed up with wax or underseal and must close properly.
- Check plenum chamber cover; it must not be damaged and must be properly installed (to stop water running into evaporator).
- Check water drains in plenum chamber; they must not be blocked (e.g. by leaves).

A/C SERVICE STATION, CONNECTING

Vehicles with Connection on Low- and High-Pressure Side of Refrigerant Circuit

- Switch off ignition.
- Connect A/C service station to power supply.
- Connect quick-release coupling adapter to charging hoses of A/C service station (handwheels not screwed in/hand shut-off valve not open).
- Switch on A/C service station and evacuate charging hoses (only necessary if there is air in hoses).
- Switch off A/C service station.
- Unscrew caps from service connections (with valve).
- Connect A/C service station via service connections with quick-release coupling adapters to vehicle refrigerant circuit.
- Screw in handwheel of quick-release coupling adapters until valves are definitely open at refrigerant circuit connection (observe pressure gauge, do not strain valves).
- Perform planned tests and measurements.

Vehicles with no Connection on Low-Pressure Side of Refrigerant Circuit

On the following vehicles, no service connection is provided for the A/C service station on the low-pressure side of the refrigerant circuit. Adapters are required for connecting the A/C service station to the refrigerant circuit of these vehicles.

- Audi 80, Audi Cabrio, Audi Coupe
- Audi A4 up to 07.96

- Audi 100/ Audi A6 up to 03.97
- Audi A8 up to 11.97

NOTE:

- **On vehicles with no or inaccessible connection at compressor, remove A/C Refrigerant Low Pressure Switch F73 (jumper contacts in connector for A/C Refrigerant Low Pressure Switch F73) and screw adapter to this connection --> 87 - AIR CONDITIONING .**

NOTE:

- **The tools listed below are commercially available or can be obtained from regional sales center/importer.**
- **Should it be necessary to measure pressures at switch connections on high-pressure side, make use of adapter from adapter set for refrigerant circuit V.A.G /9 and proceed in the same manner.**

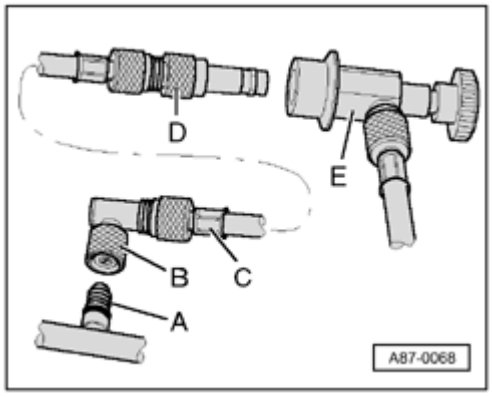

Fig. 51: Connecting With Air Conditioning Adapter Set V.A.G 1786
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Connecting with Air Conditioning Adapter Set V.A.G 1786

A - Connection with valve (small valve insert) on low-pressure side of refrigerant circuit

B - Adapter with union nut V.A.G /1

C - Commercially available charging hose (short version with 5/8" thread on each end)

D - Adapter with service connection V.A.G /2 (for connection of quick-release coupling of A/C service station - **E** -)

NOTE:

- **Assemble adapter and charging hose as shown and connect first to connection with valve - A -.**
- **Adapter with union nut V.A.G /1 is only to be used at connections with "small" valve insert (standard for connection with valve for A/C Refrigerant**

Low Pressure Switch F73 and also gradually introduced as of 10.94 at compressor).

- **Instead of adapter with union nut V.A.G /1 , use can also be made of adapter V.A.G /10 (remove valve from adapter V.A.G /10 or install valve opener in charging hose).**

Connecting with Adapter VAG/10

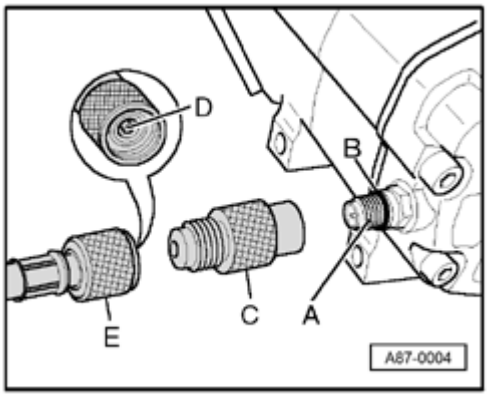

Fig. 52: Connecting With Air Conditioning Adapter Set VAG/10
Courtesy of VOLKSWAGEN UNITED STATES, INC.

- Unscrew cap from connection with valve - **A** - (at compressor).
- Attach O-ring - **B** - to connection (8.9 mm; 1.8 mm).
- Screw adapter V.A.G /10 - **C** - to connection - **B** -.
- Install valve opener - **D** - with appropriate seal in charging hose connection.

NOTE:

- **The type of valve opener - D - and seals required depends on the charging hose used (specific to manufacturer).**
- **The quick-release coupling adapter is not required for connection on the low-pressure side of Audi vehicles.**
- **Screw charging hose - E - (to A/C service station) to adapter V.A.G /10.**

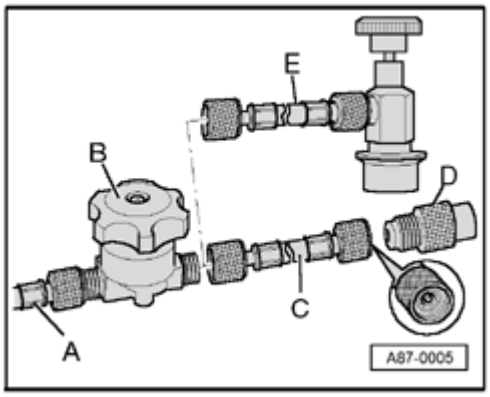

Fig. 53: Identifying Charging Hoses Should Be Connected Together
Courtesy of VOLKSWAGEN UNITED STATES, INC.

NOTE:

- **To minimize the amount of air and moisture penetrating into the charging hoses and thus into the refrigerant circuit, the charging hoses should be connected together as illustrated.**

A - Charging hose to A/C service station

B - Hand shut-off valve

C - Charging hose (short version) with valve opener for connection to adapter - **D** -

D - Adapter V.A.G /10

E - Charging hose (short version) with quick-release coupling adapter (for vehicles with quick-release coupling adapter on low-pressure side)

- Perform planned tests and measurements.

REFRIGERANT CIRCUIT, CHECKING PRESSURES WITH A/C SERVICE STATION

NOTE:

- **All test conditions marked * are vehicle-specific and are described in the Repair Information for the relevant vehicle.**
- **Check cooling output.**
- **Connections with valve and service connections for measurement and testing --> 87 - AIR CONDITIONING**

Under certain operating conditions, residual moisture in the coolant circuit may lead to the formation of ice on the compressor regulator valve. Such ice formation impedes compressor control. The evaporator is cooled excessively and ices up. Icing-up of the evaporator may be the cause of the following problems:

- Repeated or sporadic failure of the air conditioner (no cooling/heating output) after a lengthy journey;

operation of air conditioner soon returns to normal after switching off engine

- Windows mist up on inside after a lengthy journey and situation is initially not even remedied by pressing "Defrost" button; air conditioner operation soon returns to normal after switching off engine

Corrective action:

- In the case of vehicles as of Model Year 2001 and a compressor with A/C Compressor Regulator Valve N280 , read measured value of evaporator outflow temperature Evaporator Vent Temperature Sensor G263 (by way of function "Reading measured value block"). If sensor measured value is too low under usage conditions outlined by customer (at ambient temperature above 0 C, colder than 0 C for lengthy period although A/C Compressor Regulator Valve N280 not actuated) or too high (greater than approx. 10 C although air conditioner is functioning properly), evaporator may ice up due to the incorrect measured value , air conditioner "Guided Fault Finding function and --> **87 - AIR CONDITIONING** .
- On vehicles with no Evaporator Vent Temperature Sensor G263 use Footwell Outlet Temperature Sensor G192 for example to check vent temperature under the usage conditions described by the customer in the following settings: "Lo temperature" for drivers and passengers side, 4 or 5 bars for fresh-air blower speed, air outlet to footwell and fresh-air mode. If measured value of sensor is too low (at ambient temperature above 0 C, colder than 0 C for lengthy period):
- Check refrigerant pipe between evaporator and reservoir (thick pipe, low-pressure side) with engine running. If pipe is severely iced up when problem occurs (thin ice layer is permissible), this is a further indication that the temperature in the evaporator is too low.
- Discharge refrigerant circuit, replace reservoir or receiver with dryer and then evacuate refrigerant circuit for at least 3 hours.

Test conditions

- Radiator and condenser clean (clean if necessary)
- Thermal insulation at expansion valve OK and properly installed*
- Poly V-belt OK and properly tensioned / belts for compressor and alternator OK and properly tensioned*
- All air ducts, covers and seals OK and properly installed

- Electrical system and vacuum system fault-finding has not revealed any faults* , air conditioner Guided Fault Finding function and --> **87 - AIR CONDITIONING**
- Air conditioner On Board Diagnostic (OBD) has not revealed any faults (with engine running and air conditioner switched on), no compressor shutoff criterion displayed in measured value block (vehicles with "air conditioner" On Board Diagnostic (OBD) only)* , air conditioner Guided Fault Finding function and --> **87 - AIR CONDITIONING**
- Air flow through dust and pollen filter not impeded by contamination*
- Air conditioner unit not drawing in secondary air at maximum fresh-air blower speed; evaporator and heater not drawing in secondary air at maximum fresh-air blower speed*

- Air flaps in air conditioner unit, heater and evaporator reach end position*
- Fresh-air intake ducts beneath hood and in passenger compartment as well as corresponding water drain valves OK* --> **87 - AIR CONDITIONING**

- Engine warm
- Vehicle not exposed to sunlight --> **87 - AIR CONDITIONING**

- Ambient temperature above 15 C
- All instrument panel vents open

- Start engine.

Settings on A/C Control Head E87 or Climatronic Control Module J255 (and Rear A/C Control Head (Climatronic) E265 in vehicles with two A/C units):

- Preselect "Auto" mode (compressor on).
- Set "LO" temperature for drivers and front passengers side (and left and right rear seats in vehicles with two A/C units).

Settings on heater controls:

- Press A/C button and "Rec" or recirculated air button.
- Turn rotary temperature control towards "Cold" stop.
- Set rotary fresh-air blower control to "4".

The following system test conditions should then be met:

- Operation of Coolant Fan(s) V7 (at least speed 1)*

NOTE:

- **With some versions, the fan is not switched on until the pressure in the refrigerant circuit has exceeded a specified value.**
- **Operation of Fresh Air Blower V2 (and Rear Fresh Air Blower V80 in vehicles with two A/C units) at maximum speed**
- **Recirculated/fresh-air flap set to "Recirculated air mode" (within 1 min. after starting vehicle, air flow flap is closed and recirculated-air flap opened)***
- **Coolant shutoff valve closed***
- **Valves of pump valve unit closed and no coolant circulation pump delivery***
- **Compressor is actually driven (A/C Clutch N25 energized, overload safeguard (if installed) not tripped)***

Pressures, Checking

- Switch off ignition.
- Connect A/C service station --> **A/C Service Station, Connecting**.
- Take pressure gauge readings (two possible results).

Ambient temperature (in degrees C)	Pressure in refrigerant circuit in bar
+ 15 ° C	3.9
+ 20 ° C	4.7
+ 25 ° C	5.6
+ 30 ° C	6.7
+ 35 ° C	7.8
+ 40 ° C	9.1
+ 45 ° C	10.5

NOTE:

- **Temperature of refrigerant circuit components should be equal to ambient temperature (pressure will deviate from values in table if individual components of refrigerant circuit are warmer or colder).**
- **At absolute pressure, 0 bar corresponds to an absolute vacuum. Normal atmospheric pressure corresponds to 1 bar absolute. On the scales of most pressure gauges, 0 bar corresponds to an absolute pressure of 1 bar (can be seen from -1 bar mark below 0).**
- **On vehicles with High Pressure Sensor G65 or A/C Pressure/temperature Sensor G395 for which measured pressure is displayed in measured value block, pressure measured should coincide with values in table , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**
- **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).**

Pressure in refrigerant circuit lower than indicated in table

Not enough refrigerant in circuit

- Determine whether refrigerant circuit is leaking --> **Refrigerant Circuit, Determining Leaks**.
- Check pressure relief valve.

If pressure relief valve has responded:

- Check actuation of coolant fans.
- Check for constricted refrigerant pipe and hose cross-sections caused by inadequate bending radii.
- Check refrigerant pipes and hoses for external damage.
- If no fault is found, clean refrigerant circuit (flush using refrigerant R134a --> **Refrigerant Circuit, Flushing with Refrigerant R134a** or blow through using compressed air and nitrogen --> **Refrigerant Circuit, Flushing with Compressed Air and Nitrogen**)

Pressure in refrigerant circuit in line with table or higher

- Start engine.
- Set air conditioning system to maximum cooling output.

NOTE:

- **On vehicles with A/C Compressor Regulator Valve N280 , control current can be read out in measured value block , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

If compressor is not driven with engine running or regulator valve is not actuated:

- Establish and eliminate cause e.g. by checking air conditioner DTC memory.
- Observe test conditions.
- Check power supply for A/C Clutch N25. If OK, service A/C clutch.
- Check actuation of A/C Compressor Regulator Valve N280 , air conditioner Guided Fault Finding function and --> **87 - AIR CONDITIONING** .

NOTE:

- **If low-pressure switch has been removed to connect A/C service station, jumper electrical connections in relevant connector for pressure measurement.**
- **Compressor is driven by engine via A/C Clutch N25.**
- **A/C Compressor Regulator Valve N280 is actuated by A/C Control Head E87 or Climatronic Control Module J255 , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Continuation of Test Depending on Design of Refrigerant Circuit

--> **Pressure Checking, Vehicles with Restrictor and Reservoir with Internally Regulated Compressor**

--> **Pressure Checking, Vehicles with Expansion Valve and Receiver with Internally Regulated Compressor**

--> **Pressure Checking, Vehicles with Restrictor, Reservoir and A/C Compressor Regulator Valve with Externally Regulated Compressor**

--> **Pressure Checking, Vehicles with Expansion Valve, Receiver, and A/C Compressor Regulator Valve with Externally Regulated Compressor**

Pressure Checking, Vehicles with Restrictor and Reservoir with Internally Regulated Compressor

NOTE:

- **Connecting A/C service station --> A/C Service Station, Connecting**
- **Observe test conditions --> Refrigerant Circuit, Checking Pressures with A/C Service Station.**
- **Set engine speed to 2000 rpm.**

- **Observe pressure display (e.g. pressure gauge) of A/C service station.**

NOTE:

- **Switching pressures for refrigerant circuit switches are vehicle-specific.**
- **Connection with valve for low-pressure switch or at evaporator is only to be used for vehicles with no service connection on low-pressure side and inaccessible connection at compressor or reservoir (measurement accuracy). Only applies to certain vehicles --> 87 - AIR CONDITIONING .**

Specifications

High-pressure side:

Increasing from initial pressure (on connecting pressure gauges) to max. 20 bar

Low-pressure side:

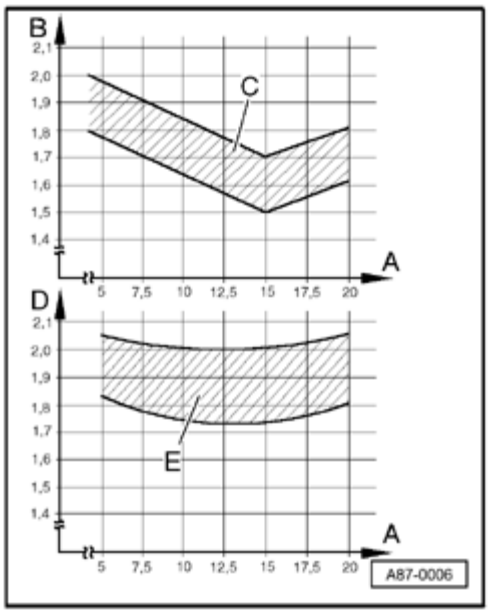

Fig. 54: Permissible Tolerance Range Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

A - High pressure (measured at service connection) in bar

B - Low pressure (measured at connection with valve at compressor or reservoir) in bar

C - Permissible tolerance range

D - Low pressure (measured at connection with valve for low-pressure switch or at service connection) in bar

E - Permissible tolerance range

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure remains constant or only increases slightly (above pressure with engine stopped) Low pressure quickly drops to value in graph or below Required cooling output is not attained	Not enough refrigerant in circuit	Localize leak using leak detector and eliminate Recharge refrigerant circuit
High pressure normal Low pressure in line with value in graph Required cooling output is not attained		
High pressure normal Low pressure too low (see graph) Required cooling output is not attained		

NOTE:

- **If no fault is found in relation to this complaint, clean refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen).**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure only increases slightly above pressure with engine stopped Low pressure only drops slightly Required cooling output is not attained	Compressor malfunctioning	Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) Replace compressor

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure increases above specification Low pressure quickly drops to value in graph or below Required cooling output is not attained	Constriction or obstruction in refrigerant circuit	Run hand over refrigerant circuit to check for differences in temperature If difference in temperature is found at one component: Replace hose or pipe if kinked or constricted In the event of an obstruction, clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) If no fault is found: Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)
High and low pressure normal at first After some time, high pressure increases above specification and Low pressure drops to value in graph or below Required cooling output is no longer attained	Moisture in refrigerant circuit	Check and if necessary replace reservoir (with dryer) and restrictor, then evacuate refrigerant circuit for min. 3 hours (see note) Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)
High and low pressure normal at first After lengthy operating		

period, low pressure drops excessively (evaporator ices up)		

NOTE:

- **If problem involving moisture in refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to replace the dryer (adjust quantity of refrigerant oil). Refrigerant circuit is then to be evacuated for at least 3 hours.**
- **It is not initially necessary to clean the refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen) when this problem occurs since normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal Low pressure too low (see graph) Required cooling output attained	Compressor malfunctioning	Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) Replace compressor

NOTE:

- **Pay attention to the following as regards fault "High pressure normal, low pressure too low" : This fault may cause the evaporator to ice up or the A/C Refrigerant Low Pressure Switch F73 to shut off the compressor although the amount of refrigerant in the circuit is OK.**
- **On the Audi 100, Audi A6 (up to and including Model Year 1997) and Audi V8, this fault may result in compressor being shut off by control head (if temperature at fresh-air blower drops below -3 C) --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal or too high Low pressure too high (see graph) Compressor noise (particularly after switch-on) Required cooling output is not attained	Too much refrigerant in circuit	Extract refrigerant from refrigerant circuit If quantity of refrigerant extracted roughly corresponds to specified capacity: Replace compressor If quantity of refrigerant extracted is substantially greater than specified capacity: Recharge refrigerant circuit Repeat test

Possible deviation from specification	Possible cause of trouble	Corrective action
	Too much	Discharge refrigerant circuit Clean refrigerant

High and low pressure normal Required cooling output is not attained	refrigerant oil in circuit	circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)
High and low pressure normal Compressor noise (particularly after switch-on) Required cooling output attained		

NOTE:

- **Overfilling with refrigerant oil can occur if, for example, the compressor has been replaced without adjusting the quantity of refrigerant oil.**
- **If there is too much refrigerant oil in the circuit, drain compressor and replace reservoir. After cleaning the refrigerant circuit (flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen), the correct quantity of refrigerant oil is filled into the circuit --> Approved Refrigerant Oils.**

Pressure Checking, Vehicles with Expansion Valve and Receiver with Internally Regulated Compressor

NOTE:

- **Connecting A/C service station --> A/C Service Station, Connecting**
- **Observe test conditions --> Refrigerant Circuit, Checking Pressures with A/C Service Station.**
- **Set engine speed to 2000 rpm.**
- **Observe pressure display (e.g. pressure gauge) of A/C service station.**

NOTE:

- **Switching pressures and design of refrigerant circuit switches are vehicle-specific.**
- **Pressures must be measured at service connections; component locations of these connections are vehicle-specific --> 87 - AIR CONDITIONING .**

Specifications

High-pressure side:

Increasing from initial pressure (on connecting pressure gauges) to max. 20 bar

Low-pressure side:

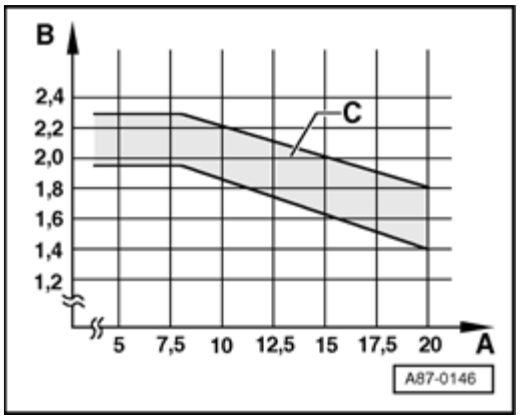

Fig. 55: Permissible Tolerance Range Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

A - High pressure in bar

B - Low pressure in bar

C - Permissible tolerance range

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure remains constant or only increases slightly (above pressure with engine stopped) Low pressure quickly drops to value in graph or below Required cooling output is not attained	Not enough refrigerant in circuit or expansion valve malfunctioning	Extract refrigerant from refrigerant circuit If quantity of refrigerant extracted roughly corresponds to specified capacity: Replace expansion valve Recharge refrigerant circuit Repeat test
High pressure normal Low pressure in line with value in graph Required cooling output is not attained		If quantity of refrigerant extracted is substantially less than specified capacity: Localize leak using leak detector and eliminate Recharge refrigerant circuit Repeat test

NOTE:

- **If no malfunction can be found and air conditioner operation is not OK when test is repeated, clean refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen).**

Possible deviation from specification	Possible cause of trouble	Corrective action
		Run hand over refrigerant circuit to check for differences

High pressure increases above specification Low pressure quickly drops to value in graph or below Required cooling output is not attained	Constriction or obstruction in refrigerant circuit Expansion valve malfunctioning	in temperature If difference in temperature is found at one component: Replace hose or pipe if kinked or constricted In the event of an obstruction, clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen and replace expansion valve if necessary) If no fault is found: Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen and replace expansion valve if necessary) Repeat test

NOTE:

- **If operation is not OK after cleaning refrigerant circuit (flushing with R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen), expansion valve must be replaced.**

Possible deviation from specification	Possible cause of trouble	Corrective action
High and low pressure normal at first After some time, high pressure increases above specification and low pressure drops to value in graph or below Required cooling output is no longer attained	Expansion valve malfunctioning Moisture in refrigerant circuit	Replace receiver (with dryer) and evacuate refrigerant circuit for at least 3 hours (see notes) Examine expansion valve for dirt or corrosion; replace if necessary Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)
High and low pressure normal at first After lengthy operating period, low pressure drops excessively (evaporator ices up)		

NOTE:

- **It is not initially necessary to clean the refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen) when this problem occurs since normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.**
- **If problem involving moisture in refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to replace the dryer (adjust quantity of refrigerant oil). Refrigerant circuit is then to be evacuated for at least 3 hours.**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal or too		Extract refrigerant from refrigerant circuit If

high Low pressure too high (see graph) Required cooling output is not attained Compressor noise (particularly after switch-on)	Too much refrigerant in circuit Expansion valve or compressor malfunctioning	quantity of refrigerant extracted roughly corresponds to specified capacity: Replace expansion valve Recharge refrigerant circuit Repeat test If quantity of refrigerant extracted is substantially greater than specified capacity: Recharge refrigerant circuit Repeat test

NOTE:

- **If air conditioner operation is not OK when test is repeated, re-install old expansion valve, clean refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen). Then replace A/C compressor and receiver.**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure only increases slightly above pressure with engine stopped Low pressure only drops slightly Required cooling output is not attained	Compressor malfunctioning	Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) Replace compressor and receiver

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal Low pressure too low (see graph) Required cooling output attained	Expansion valve or compressor malfunctioning	Replace expansion valve Recharge refrigerant circuit Repeat test

NOTE:

- **If air conditioner operation is not OK when test is repeated, re-install old expansion valve, clean refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen). Then replace compressor and receiver.**
- **With this fault, evaporator may ice up although quantity of refrigerant in circuit is OK.**

Possible deviation from specification	Possible cause of trouble	Corrective action
High and low pressure normal Required cooling output is not attained	Too much refrigerant oil in circuit	Discharge refrigerant circuit Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)
High and low pressure normal Compressor noise (particularly after switch-on) Required cooling output attained		

NOTE:

- **Overfilling with refrigerant oil can occur if, for example, the compressor has been replaced without adjusting the quantity of refrigerant oil.**
- **If there is too much refrigerant oil in the circuit, the compressor must be drained and the receiver must be replaced. After cleaning the refrigerant circuit (flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen), the correct quantity of refrigerant oil is filled into the circuit --> Approved Refrigerant Oils.**

Pressure Checking, Vehicles with Restrictor, Reservoir and A/C Compressor Regulator Valve with Externally Regulated Compressor

NOTE:

- **Connecting A/C service station --> A/C Service Station, Connecting**
- **Observe test conditions --> Refrigerant Circuit, Checking Pressures with A/C Service Station.**
- **Set engine speed to 2000 rpm.**
- **Observe pressure display (e.g. pressure gauge) of A/C service station.**

NOTE:

- **Switching pressures for actuation of A/C Compressor Regulator Valve N280 and Coolant Fans V7 are vehicle-specific.**
- **Pressures must be measured at service connections; component locations of these connections are vehicle-specific --> 87 - AIR CONDITIONING .**

Specifications

High-pressure side:

Increasing from initial pressure (on connection of pressure gauges) to 20 bar

Low-pressure side:

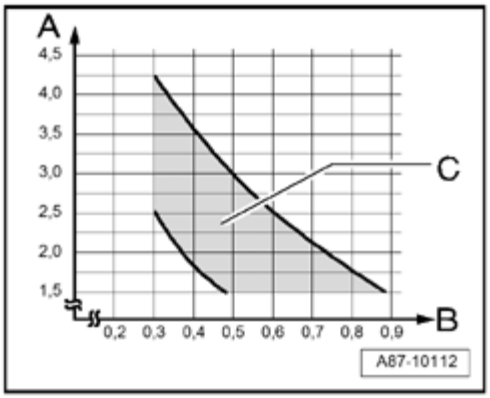

Fig. 56: Permissible Tolerance Range Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

A - Low pressure (measured at service connection) in bar absolute

B - Control current for A/C Compressor Regulator Valve N280 in amps

C - Permissible tolerance range (applicable to compressor capacity utilization of 10...90%)

NOTE:

- **Given high ambient temperature and a low engine speed, compressor may for example no longer be able to adjust pressure on low-pressure side to value given in graph. Compressor is actuated with maximum specified control current, however delivery volume is no longer sufficient at this engine speed to reduce pressure on low-pressure side to value in graph , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

NOTE:

- **Under unfavorable conditions (very high ambient temperatures, high humidity), pressure on high-pressure side may increase to max. 29 bar.**
- **Control current - B - is displayed in measured value block of A/C Control Head E87 or control head, Climatronic Control Module J255.**
- **Pressure in refrigerant circuit measured by High Pressure Sensor G65 or A/C Pressure/temperature Sensor G395 is displayed in measured value block of A/C Control Head E87 or control head, Climatronic Control Module J255 and --> 87 - AIR CONDITIONING .**
- **Low pressure settles as a function of control current for A/C Compressor Regulator Valve N280 within compressor output range in tolerance band.**
- **Under unfavorable conditions (very high ambient temperatures, high humidity), compressor output may not always be sufficient to attain the specified value.**

- **If compressor capacity utilization is greater than 90 %, pressure on low-pressure side may be in excess of tolerance range "C" shown in graph (compressor output no longer suffices).**
- **The specified operating current for the regulator valve must be greater than 0.3 A in order to ensure reliable valve actuation.**
- **At absolute pressure, "0 bar" corresponds to an absolute vacuum. Normal ambient pressure corresponds to "1 bar" absolute. On the scales of most pressure gauges, "0 bar" corresponds to an absolute pressure of 1 bar (can be seen from "-1 bar" mark below "0").**
- **In "maximum cooling output" setting, control current is regulated to approx. 0.65 (vehicle-specific up to 0.85 A) (displayed in measured value block) , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure remains constant or only increases slightly (above pressure with engine stopped) Low pressure quickly drops to value in graph or below Required cooling output is not attained	Problem with actuation of A/C Compressor Regulator Valve N280 Not enough refrigerant in circuit	Check actuation of A/C Compressor Regulator Valve N280 Localize leak using leak detector and eliminate Recharge refrigerant circuit
High pressure normal Low pressure too low (see graph) Required cooling output is not attained		
High pressure normal Low pressure too low (see graph) Required cooling output is not attained		

NOTE:

- **If no fault is found with this complaint, clean refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen).**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure only increases slightly above pressure with engine stopped Low pressure only drops slightly Required cooling output is not attained	Problem with actuation of A/C Compressor Regulator Valve N280 Compressor malfunctioning	Check actuation of A/C Compressor Regulator Valve N280 Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) Replace compressor
High pressure increases	Problem with actuation	Check actuation of A/C Compressor Regulator Valve N280 Run hand over refrigerant circuit to check for differences in temperature If difference in

above specification Low pressure quickly drops to value in graph or below Required cooling output is not attained	of A/C Compressor Regulator Valve N280 Constriction or obstruction in refrigerant circuit	temperature is found at one component: Replace hose or pipe if kinked or constricted In the event of an obstruction, flush refrigerant circuit with compressed air and nitrogen If no fault is found: Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)

Possible deviation from specification	Possible cause of trouble	Corrective action
High and low pressure normal at first, after some time high pressure increases above specification and Low pressure drops to value in graph or below Required cooling output is no longer attained	Problem with actuation of A/C Compressor Regulator Valve N280 Moisture in refrigerant circuit	Check actuation of A/C Compressor Regulator Valve N280 Replace reservoir (with dryer) and evacuate refrigerant circuit for at least 3 hours (see note) Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)
High and low pressure normal at first After lengthy operating period, low pressure drops excessively (evaporator ices up)		

NOTE:

- **It is not initially necessary to clean the refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen) when this problem occurs since normally, there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.**
- **If problem involving moisture in refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to replace the dryer (adjust quantity of refrigerant oil). Refrigerant circuit is then to be evacuated for at least 3 hours.**
- **Problem with Evaporator Vent Temperature Sensor G263 can also cause icing-up of refrigerant circuit. If this problem is encountered, also pay attention to measured value of Evaporator Vent Temperature Sensor G263 , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal Low pressure too low (see graph) Required cooling output attained	Problem with actuation of A/C Compressor Regulator Valve N280 Compressor malfunctioning	Check actuation of A/C Compressor Regulator Valve N280 Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) Replace compressor

NOTE:

- **Pay attention to the following as regards fault "High pressure normal, low pressure too low" : This fault may lead to icing-up of evaporator although quantity of refrigerant in circuit is OK. Check measured values of Evaporator Vent Temperature Sensor G263 and actuation of A/C Compressor Regulator Valve N280. If measured value of Evaporator Vent Temperature Sensor G263 is incorrect, evaporator may ice up or cooling output is not attained , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal or too high Low pressure too high (see graph) Compressor noise (particularly after switch-on) Required cooling output is not attained	Problem with actuation of A/C Compressor Regulator Valve N280 Too much refrigerant in circuit	Check actuation of A/C Compressor Regulator Valve N280 Extract refrigerant from refrigerant circuit If quantity of refrigerant extracted roughly corresponds to specified capacity: Replace compressor If quantity of refrigerant extracted is substantially greater than specified capacity: Recharge refrigerant circuit Repeat test
High and low pressure normal Required cooling output is not attained	Problem with actuation of A/C Compressor Regulator Valve N280 Too much refrigerant oil in circuit	Check actuation of A/C Compressor Regulator Valve N280 Discharge refrigerant circuit Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)
High and low pressure normal Compressor noise (particularly after switch-on) Required cooling output attained		

NOTE:

- **Overfilling with refrigerant oil can occur if, for example, the compressor has been replaced without adjusting the quantity of refrigerant oil.**
- **If there is too much refrigerant oil in the circuit, the compressor must be drained and the accumulator must be replaced. After cleaning the refrigerant circuit (flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen), the correct quantity of refrigerant oil is filled into the circuit --> Approved Refrigerant Oils.**

Pressure Checking, Vehicles with Expansion Valve, Receiver, and A/C Compressor Regulator Valve with Externally Regulated Compressor

NOTE:

- **Connecting A/C service station --> A/C Service Station, Connecting**

- **Observe test conditions --> Refrigerant Circuit, Checking Pressures with A/C Service Station.**
- **If a malfunction occurs at only one evaporator in vehicles with two evaporators, check pressures in the refrigerant circuit; if they are OK, check line connection between malfunctioning evaporator and line connection end at distribution point of refrigerant lines (for constrictions or blockage). If no malfunction can be detected, discharge refrigerant circuit and re-charge it with the specified refrigerant quantity. Then check pressures and cooling performance of A/C system again; if the malfunction occurs again, replace the expansion valve which is prematurely switched by the malfunctioning evaporator --> 87 - AIR CONDITIONING .**
- **Set engine speed to 2000 rpm.**
- **Observe pressure display, (e.g. pressure gauge) of A/C service station.**

NOTE:

- **Switching pressures for actuation of A/C Compressor Regulator Valve N280 and Coolant Fans V7 are vehicle-specific.**
- **Pressures must be measured at service connections; component locations of these connections are vehicle-specific --> 87 - AIR CONDITIONING .**

Specifications

High-pressure side:

Increasing from initial pressure (on connecting pressure gauges) to max. 20 bar

Low pressure:

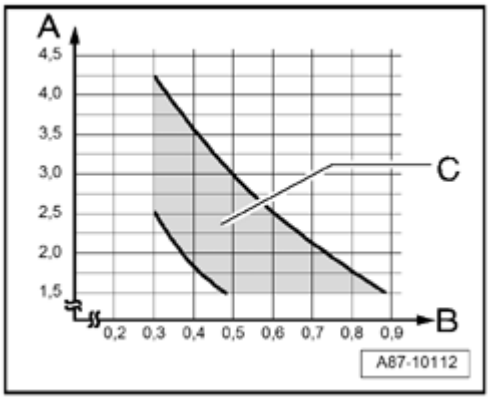

Fig. 57: Permissible Tolerance Range Graph
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Decreasing from initial pressure (on connecting pressure gauges) to value in graph

A - Low pressure (measured at service connection) in bar absolute

B - Control current for A/C Compressor Regulator Valve N280 in amps

C - Permissible tolerance range (applicable to compressor capacity utilization of 10...90%)

NOTE:

- **Given high ambient temperature and a low engine speed, compressor may for example no longer be able to adjust pressure on low-pressure side to value given in graph. Compressor is actuated with maximum specified control current, however delivery volume is no longer sufficient at this engine speed to reduce pressure on low-pressure side to value in graph , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

NOTE:

- **Under unfavorable conditions (very high ambient temperatures, high humidity), pressure on high-pressure side may increase to max. 29 bar.**
- **Control current - B - is displayed in measured value block of A/C Control Head E87 or Climatronic Control Module J255.**
- **High pressure measured by High Pressure Sensor G65 or A/C Pressure/temperature Sensor G395 is displayed in measured value block of A/C Control Head E87 or control head, Climatronic Control Module J255.**
- **Low pressure settles as a function of control current for A/C Compressor Regulator Valve N280 and control characteristic of expansion valve within compressor output range in tolerance band.**
- **Under unfavorable conditions (very high ambient temperatures, high humidity), compressor output may not always be sufficient to attain the specified value.**
- **If compressor capacity utilization is greater than 90 %, pressure on low-pressure side may be in excess of tolerance range "C" shown in graph (compressor output no longer suffices).**
- **Specified operating current for A/C Compressor Regulator Valve N280 must be greater than 0.3 A to ensure reliable valve actuation.**
- **In "maximum cooling output" setting, control current for A/C Compressor Regulator Valve N280 is regulated to approx. 0.65 A (up to 0.85 A). This measured value is vehicle-specific and displayed in measured value block.**
- **At absolute pressure, 0 bar corresponds to an absolute vacuum. Normal ambient pressure corresponds to 1 bar absolute. On the scales of most pressure gauges, 0 bar corresponds to an absolute pressure of 1 bar (can be seen from -1 bar mark below 0) , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure remains constant or	Problem with actuation of A/C	Check actuation of A/C

only increases slightly (above pressure with engine stopped) Low pressure quickly drops to value in graph or below Required cooling output is not attained	Compressor Regulator Valve N280 Not enough refrigerant in circuit Expansion valve malfunctioning	Compressor Regulator Valve N280 Extract refrigerant from refrigerant circuit If quantity of refrigerant extracted is substantially less than specified capacity:
High pressure normal Low pressure in line with value in graph Required cooling output is not attained		Localize leak using leak detector and eliminate Recharge refrigerant circuit Repeat test
High pressure normal Low pressure too low (see graph) Required cooling output is not attained		If quantity of refrigerant extracted roughly corresponds to specified capacity: Replace expansion valve Recharge refrigerant circuit Repeat test

NOTE:

- **If no fault is found with this complaint, clean refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen).**
- **Check measured values of Evaporator Vent Temperature Sensor G263 and actuation of A/C Compressor Regulator Valve N280. If measured value of Evaporator Vent Temperature Sensor G263 is not OK, evaporator may ice up or cooling output is not attained.**
- **If air conditioner operation is not OK when test is repeated after replacing expansion valve, re-install old expansion valve, clean refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen). Then replace compressor and receiver.**
- **With this fault, evaporator may ice up although quantity of refrigerant in circuit is OK.**
- **If expansion valve is malfunctioning (permanently closed or does not open sufficiently), A/C Compressor Regulator Valve N280 is actuated to maximum output and low pressure drops to value in graph or below (compressor draws off refrigerant from low-pressure side). As however refrigerant cannot flow via expansion valve, cooling output is not attained and high pressure may also not increase or only increase slightly due to the absence of energy conversion , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure only increases slightly above pressure with engine stopped Low pressure only	Problem with actuation of A/C Compressor Regulator Valve N280 Compressor	Check actuation of A/C Compressor Regulator Valve N280 Clean refrigerant circuit (flush with refrigerant R134a or

drops slightly Required cooling output is not attained	malfunctioning	blow through with compressed air and nitrogen) Replace compressor

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure increases above specification Low pressure quickly drops to value in graph Required cooling output is not attained	Problem with actuation of A/C Compressor Regulator Valve N280 Constriction or obstruction in refrigerant circuit Expansion valve malfunctioning	Check actuation of A/C Compressor Regulator Valve N280 Run hand over refrigerant circuit to check for differences in temperature If difference in temperature is found at one component: Replace hose or pipe if kinked or constricted In the event of an obstruction, clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) Recharge refrigerant circuit Repeat test If no fault is found: Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) Recharge refrigerant circuit Repeat test, if function is not OK: Replace expansion valve and receiver

NOTE:

- **If the function of the air conditioning system is not OK when the test is repeated, replace expansion valve and receiver.**
- **With this fault, evaporator may ice up although quantity of refrigerant in circuit is OK.**
- **If expansion valve is malfunctioning (permanently closed or does not open sufficiently), A/C Compressor Regulator Valve N280 is actuated to maximum output and low pressure drops to value in graph or below (compressor draws off refrigerant from low-pressure side). As however refrigerant cannot flow via expansion valve, cooling output is not attained and high pressure may also not increase or only increase slightly due to the absence of energy conversion , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**
- **If there is too much refrigerant oil in the circuit, the compressor must be drained and the receiver must be replaced. After cleaning the refrigerant circuit (flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen), the correct quantity of refrigerant oil is filled into the circuit --> Approved Refrigerant Oils.**

Possible deviation from specification	Possible cause of trouble	Corrective action
High and low pressure normal at first After some time, high pressure increases above specification and Low pressure drops to value in graph or below Required cooling output is no longer attained	Problem with actuation of A/C Compressor Regulator Valve N280 Moisture in refrigerant circuit	Check actuation of A/C Compressor Regulator Valve N280 Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen)

High and low pressure normal at first After lengthy driving time, low pressure drops below specification (evaporator ices up)		Replace receiver with dryer. Evacuate refrigerant circuit for at least 3 hours. Recharge refrigerant circuit Repeat test

NOTE:

- **It is not initially necessary to clean the refrigerant circuit (flush using refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen) when this problem occurs since normally there is only a small quantity of moisture in the system which can be removed by lengthy evacuation.**
- **If problem involving moisture in refrigerant circuit only occurs after a lengthy operating period or only infrequently (low pressure drops below specification and evaporator ices up), it is sufficient to replace the dryer in the receiver (adjust quantity of refrigerant oil). Refrigerant circuit is then to be evacuated for at least 3 hours.**
- **With this fault, evaporator may ice up although quantity of refrigerant in circuit is OK.**
- **Problem with Evaporator Vent Temperature Sensor G263 can also cause icing-up of refrigerant circuit. If this problem is encountered, also pay attention to measured value of Evaporator Vent Temperature Sensor G263 , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal Low pressure too low (see graph) Required cooling output attained	Problem with actuation of A/C Compressor Regulator Valve N280 Expansion valve or compressor malfunctioning Compressor malfunctioning	Check actuation of A/C Compressor Regulator Valve N280 Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and nitrogen) (not always necessary, refer to notes). Replace expansion valve and receiver Recharge refrigerant circuit Repeat test, if function is not OK: Replace compressor Recharge refrigerant circuit Repeat test

NOTE:

- **Pay attention to the following as regards fault "High pressure normal, low pressure too low" : This fault may cause the evaporator to ice up although the amount of refrigerant in the circuit is OK.**
- **If the problem is with the A/C Compressor Regulator Valve N280 (regulator valve is not actuated but compressor operates nevertheless), refrigerant circuit does not have to be cleaned (flush with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen). In this case, it is sufficient to replace the**

compressor (observe quantity of refrigerant oil in compressor).

- **If expansion valve is malfunctioning (permanently closed or does not open sufficiently), A/C Compressor Regulator Valve N280 is actuated to maximum output and low pressure drops to value in graph or below (compressor draws off refrigerant from low-pressure side). As refrigerant cannot however flow via expansion valve, cooling output is not attained and high pressure may either not increase or only slightly due to the absence of energy conversion.**
- **Check measured values of Evaporator Vent Temperature Sensor G263 and actuation of A/C Compressor Regulator Valve N280. If measured value of Evaporator Vent Temperature Sensor G263 is incorrect, evaporator may ice up or cooling output is not attained , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High pressure normal or too high Low pressure too high (see graph) Compressor noise (particularly after switch-on) Required cooling output attained	Problem with actuation of A/C Compressor Regulator Valve N280 Too much refrigerant in circuit Expansion valve malfunctioning Compressor malfunctioning	Check actuation of A/C Compressor Regulator Valve N280 Extract refrigerant from refrigerant circuit If quantity of refrigerant extracted roughly corresponds to actual capacity: Replace expansion valve and receiver Recharge refrigerant circuit Repeat test, if function is not OK: Replace compressor If quantity of refrigerant extracted is substantially greater than specified capacity: Recharge refrigerant circuit Repeat test

NOTE:

- **This fault may also be caused by too much refrigerant oil in the circuit. Overfilling with refrigerant oil may occur if, for example, the compressor has been replaced without adjusting the quantity of refrigerant oil.**
- **If expansion valve is malfunctioning (permanently closed or does not open sufficiently), A/C Compressor Regulator Valve N280 is actuated to maximum output and low pressure drops to value in graph or below (compressor draws off refrigerant from low-pressure side). As however refrigerant cannot flow via expansion valve, cooling output is not attained and high pressure may also not increase or only increase slightly due to the absence of energy conversion , air conditioner Guided Fault Finding function and --> 87 - AIR CONDITIONING .**

Possible deviation from specification	Possible cause of trouble	Corrective action
High and low pressure normal Required cooling output attained	Problem with actuation of A/C Compressor Regulator Valve N280 Too much refrigerant in circuit Expansion valve	Check actuation of A/C Compressor Regulator Valve N280 Discharge refrigerant circuit Clean refrigerant circuit (flush with refrigerant R134a or blow through with compressed air and

	malfunctioning	nitrogen)
High and low pressure normal Compressor noise (particularly after switch-on) Required cooling output attained		Add correct quantity of refrigerant to circuit (see note) Recharge refrigerant circuit Repeat test, if function is not OK: Replace expansion valve Recharge refrigerant circuit Repeat test

NOTE:

- **Overfilling with refrigerant oil may occur if, for example, the compressor has been replaced without adjusting the quantity of refrigerant oil.**
- **If expansion valve is malfunctioning (permanently open), evaporator temperature is no longer regulated such that only refrigerant in gas form exits from the evaporator. Under certain usage conditions, liquid droplets may then be drawn in by the compressor and cause noise (liquid cannot be compressed).**
- **If there is too much refrigerant oil in the circuit, the compressor must be drained and the receiver must be replaced. After cleaning the refrigerant circuit (flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen), the correct quantity of refrigerant oil is filled into the circuit --> Approved Refrigerant Oils.**

REFRIGERANT CIRCUIT COMPONENTS, REPLACING

--> **Leaking or Damaged Components except Compressor, Reservoir, or Receiver**

--> **Compressor, Replacing without Flushing Refrigerant Circuit**

--> **Compressor, Replacing Due to Leakage or Internal Damage**

--> **Receiver or Accumulator and Restrictor, Replacing after Cleaning Refrigerant Circuit**

--> **Receiver or Reservoir, Replacing without Flushing Refrigerant Circuit**

- All components of the refrigerant circuit submitted for quality observation are always to be sealed (use original sealing caps of replacement part).
- To date, the replacement parts "compressor, reservoir, receiver, evaporator and condenser" have been filled with nitrogen gas. This charge is being gradually discontinued/the pressure of the nitrogen charge is now so low that escape of gas is no longer perceptible on initial opening.
- On vehicles equipped with a compressor with no A/C clutch, the engine is only to be started following complete assembly of the refrigerant circuit (compressor always in operation as well).
- When the refrigerant circuit is empty, the compressor with A/C Compressor Regulator Valve N280 (without A/C clutch) is switched to internal lubrication with the result that only a minimal amount of oil is pumped from the compressor into the circuit.

NOTE:

- **As parts are sometimes stored for lengthy periods and at different locations within the spare parts organization, it is entirely possible that gas will escape from some parts and not from others on initial opening (even in the case of identical spare part numbers). Sealing caps at replacement part connections are therefore to be removed carefully and the nitrogen gas allowed to escape slowly.**
- **The refrigerant circuit is equipped either with a restrictor and reservoir or an expansion valve and receiver.**
- **Dryer cartridge or components with desiccant bag (reservoir, receiver) are always to be replaced after flushing refrigerant circuit; in doing so, leave sealed as long as possible to minimize absorption of moisture.**
- **Dryer cartridge or components with desiccant bag (reservoir, receiver) are always to be replaced after cleaning refrigerant circuit (flushing with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through using compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen); in doing so, leave sealed as long as possible to minimize absorption of moisture.**
- **The period of time for which a refrigerant circuit may be left open without having to replace a component with desiccant bag (reservoir, receiver) is largely governed by ambient influences. Given a high ambient temperature and a high humidity level or if the vehicle has been standing in the open for example or driven (in wet, foggy weather conditions), the period will be considerably shorter than for a vehicle which has been standing in a heated dry area. The size of the opening through which moisture may enter into the circuit also influences the period for which a refrigerant circuit can be left open without having to replace components with desiccant bag.**
- **Seal open connections and pipes (to prevent absorption of moisture).**
- **Always replace restrictor.**

CAUTION:

- **Contaminated refrigerant oils are to be disposed of as used oils of unknown origin.**

--> Audi-ServiceNet, Handbooks, HSO Environment 2

Leaking or Damaged Components except Compressor, Reservoir, or Receiver

Refrigerant Circuit Completely Empty

NOTE:

- **In the event of only a minor leak with slow escape of refrigerant (e.g. at a small leakage point), the amount of refrigerant oil lost and the amount of moisture penetrating is not sufficient to influence operation of the air conditioner.**

- **The operations marked * are only to be implemented in the case of a major leak (e.g. following an accident).**
- **Remove malfunctioning component.**
- **Remove compressor.***
- **Remove oil drain plug from compressor.***

NOTE:

- **The oil drain plug of "Denso" and "Nippondenso" compressors is equipped with an oil seal instead of an O-ring and this is always to be replaced.**
- **To accelerate drainage of refrigerant oil, rotate compressor by way of clutch plate of A/C clutch for example.**
- **Pour old refrigerant oil out of compressor* (disposal --> Audi-ServiceNet, Handbooks, HSO Environment 2).**
- **Then fill compressor with quantity of fresh refrigerant oil corresponding to quantity of refrigerant oil in replacement compressor --> Approved Refrigerant Oils.***
- **Use different refrigerant oils and quantities for the various compressors --> Approved Refrigerant Oils.**
- **To ensure compressor lubrication on start-up, at least 80 cm ^{3} of refrigerant oil must be poured into the compressor. The remainder can be added for example to the new reservoir or receiver --> Approved Refrigerant Oils.**
- **If dirt has penetrated into the compressor with the refrigerant circuit open (e.g. after an accident), compressor is to be replaced.**
- **Clean refrigerant circuit (flush with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through with compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen)***
- **Replace dryer cartridge, receiver* or reservoir* and restrictor.**
- **Assemble, evacuate and recharge refrigerant circuit --> Electronic Parts Catalog ETKA.**

Refrigerant Circuit Contains Refrigerant

- Discharge refrigerant circuit.
- Remove malfunctioning component, flush with compressed air and collect escaping refrigerant oil.
- The new component is to be filled with the amount of refrigerant oil flushed out (plus 20 cm ^{3} for evaporator, plus 10 cm ^{3} for condenser, refrigerant pipes and refrigerant hoses) as fresh refrigerant oil fill.

NOTE:

- **Disposal of old refrigerant --> Audi-ServiceNet, Handbooks, HSO Environment 2**

- **Replace restrictor.**
- **Assemble, evacuate and charge refrigerant circuit.**

Compressor, Replacing without Flushing Refrigerant Circuit

NOTE:

- **Cleaning refrigerant circuit means flushing it with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through with compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen).**

For example, in the event of external damage following an accident

- Discharge refrigerant circuit.
- Remove compressor.
- Remove oil drain plug from compressor.

NOTE:

- **The oil drain plug of "Denso" (Nippondenso) compressors is equipped with an oil seal instead of an O-ring and this is always to be replaced.**

--> Electronic Parts Catalog ETKA

- To accelerate drainage of refrigerant oil, rotate compressor by way of clutch plate of A/C clutch for example.
- Pour old refrigerant oil out of compressor (disposal --> Audi-ServiceNet, Handbooks, HSO Environment 2).
- Remove oil drain plug from replacement compressor, pour out refrigerant oil and only add a quantity of fresh refrigerant oil equal to the amount poured out of the malfunctioning compressor.

NOTE:

- **If, for example, 70 cm ^{3} of refrigerant oil has been poured out of the malfunctioning compressor and 220 cm ^{3} out of the replacement compressor (a small quantity of refrigerant oil remains in the compressor), fill the compressor to be installed with 70 cm ^{3} of refrigerant oil (use can be made of oil poured out of replacement compressor).**
- **Use different refrigerant oils and quantities for the various compressors --> Refrigerant R134a/Refrigerant Oil Capacities and Specifications.**
- **If a greater quantity of refrigerant oil (more than approx. 80 cm ^{3}) has been poured out of the malfunctioning compressor, the remaining refrigerant oil can also be added to the evaporator or reservoir/receiver --> Refrigerant R134a/Refrigerant Oil Capacities and Specifications.**
- **Replace restrictor.**
- **Assemble, evacuate and charge refrigerant circuit.**

Compressor, Replacing Due to Leakage or Internal Damage

For example, because of noise or no compressor output

- Discharge refrigerant circuit.
- Remove compressor.

NOTE:

- **In the event of internal damage (compressor), check refrigerant hoses and condenser. If, e.g., swarf has penetrated, clean refrigerant hoses and condenser (flush with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blow through using compressed air or nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen), replace refrigerant hoses if necessary.**
- **In vehicles with two evaporators, the refrigerant oil quantity in refrigerant circuit may be greater than the quantity already filled in the replacement compressor, if necessary add the remaining refrigerant oil quantity to the refrigerant circuit --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen.**
- **Replace dryer cartridge, receiver or reservoir and restrictor.**
- **Examine expansion valve for dirt or corrosion and replace if necessary.**
- **Assemble, evacuate and charge refrigerant circuit.**

Receiver or Accumulator and Restrictor, Replacing after Cleaning Refrigerant Circuit

NOTE:

- **Cleaning refrigerant circuit means flushing it with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through with compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen).**

For example, on account of ingress of moisture (refrigerant circuit open for lengthy period) or contamination

- Discharge refrigerant circuit.
- Remove compressor.
- Rectify cause of trouble.
- Clean refrigerant circuit (flush with refrigerant R134a --> **Refrigerant Circuit, Flushing with Refrigerant R134a** or blow through using compressed air and nitrogen --> **Refrigerant Circuit, Flushing with Compressed Air and Nitrogen**).

- Examine expansion valve for dirt or corrosion and replace if necessary.
- Remove oil drain plug from compressor.

NOTE:

- **The oil drain plug of "Denso/Nippondenso" compressors is equipped with an oil seal instead of an O-ring and this is always to be replaced -->**

Electronic Parts Catalog ETKA.

- **To accelerate drainage of refrigerant oil, rotate compressor by way of clutch plate of A/C clutch for example.**
- **Pour old refrigerant oil out of compressor.**

NOTE:

- **Disposal of old refrigerant --> Audi-ServiceNet, Handbooks, HSO Environment 2**
- **Then fill compressor with quantity of fresh refrigerant oil corresponding to quantity of refrigerant oil in replacement compressor (or the specified refrigerant oil quantity in vehicles with two evaporators if necessary) --> Approved Refrigerant Oils.**

NOTE:

- **Use different refrigerant oils and quantities for the various compressors --> Approved Refrigerant Oils.**
- **To ensure compressor lubrication on start-up, at least 80 cm ^{3} of refrigerant oil must be poured into the compressor. The remainder can be added for example to the new reservoir or receiver --> Refrigerant R134a/Refrigerant Oil Capacities and Specifications.**
- **If dirt has penetrated into the compressor with the refrigerant circuit open (e.g. after an accident), compressor is to be replaced.**
- **In vehicles with two evaporators, the refrigerant oil quantity in refrigerant circuit may be greater than the quantity already filled in the replacement compressor, if necessary add the remaining refrigerant oil quantity to the refrigerant circuit --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen.**
- **Replace receiver or reservoir and restrictor.**
- **Assemble, evacuate and charge refrigerant circuit.**

Receiver or Reservoir, Replacing without Flushing Refrigerant Circuit

NOTE:

- **Cleaning refrigerant circuit means flushing it with refrigerant R134a --> Refrigerant Circuit, Flushing with Refrigerant R134a or blowing through with compressed air and nitrogen --> Refrigerant Circuit, Flushing with Compressed Air and Nitrogen).**

For example, in the event of accident damage; no escape of refrigerant and no ingress of moisture and dirt into circuit

- Discharge refrigerant circuit.
- Replace restrictor.
- Remove receiver or reservoir.
- Remove dirt from receiver or reservoir.

- Weigh receiver or reservoir removed.
- Add refrigerant oil to new receiver or reservoir until weight of component removed has been attained.
- Install new receiver or reservoir.
- Assemble, evacuate and charge refrigerant circuit.

REFRIGERANT R134A/REFRIGERANT OIL CAPACITIES AND SPECIFICATIONS

--> **Refrigerant R134a Capacities**

--> **Approved Refrigerant Oils**

Refrigerant R134a Capacities

--> **Capacities for Audi A2 (8Z_) from 2001**

--> **Capacities for Audi A3 (8L_) 1997 to 2004 and Audi TT (8N_) from 1999**

--> **Capacities for A3 (8P_) from 2004**

--> **Capacities for Audi 80 (8A_/8C_), Audi Coupe (8B_), Audi Cabriolet (8G_) through 2002**

--> **Capacities for Audi A4 (8D_) 1995 to 2002**

--> **Capacities for Audi A4 (8E_) from 2001, Audi A4 Cabriolet (8H_) from 2003**

--> **Capacities for Audi 100/Audi A6 (4A_) through 1998**

--> **Capacities for Audi A6 (4B_) from 1998 and Audi Allroad**

--> **Capacities for Audi A6 (4F_) from 2005**

--> **Capacities for Audi V8 (4C_) to 1994**

--> **Capacities for Audi A8 (4D_) 1994 to 2002**

--> **Capacities for Audi A8 (4E_) from 2003**

--> **Capacities for Audi Q7 (4L_) from 2006**

NOTE:

- **When charging the high-pressure side of refrigerant circuits, always fill to the upper tolerance limit (some liquid refrigerant remains in the charging hoses).**
- **For compressor assignment ("Zexel" , "Sanden" or "Denso/Nippondenso"), refer to --> Electronic Parts Catalog ETKA and --> 87 - AIR CONDITIONING .**

NOTE:

- **Refrigerant circuits converted from R12 to R134a are to be filled with the quantity indicated in the repair manual "Air conditioner with refrigerant R12". --> Air conditioner with refrigerant R12 (This repair manual is only available in hard copy).**

Capacities for Audi A2 (8Z_) from 2001

Characteristics of refrigerant circuit:

- Restrictor (colored)
- Reservoir
- "Denso" compressor without A/C clutch and with A/C Compressor Regulator Valve N280

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A2	From 06.00 to 07.01	525 + / - 25	Yellow colored restrictor Condenser with part no. 8Z0 260 401 (403) and index B or C
	07.01 on	500 + / - 25	Red colored restrictor Condenser with part no. 8Z0 260 401 (403) and index D

NOTE:

- **Replacement restrictors with different holes are available (yellow colored 1.54 mm, red colored 1.42 mm).**
- **Depending on manufacturer, color of red restrictor may tend more towards orange.**
- **To avoid altering the cooling output of the air conditioner, restrictors with the same hole diameter must always be used.**
- **A restrictor with a smaller hole (red colored) and a condenser with a smaller internal volume were introduced as of Model Year 2002. The capacity has therefore been slightly modified (condenser -70 g, smaller restrictor +50 g) --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A3 (8L_) 1997 to 2004 and Audi TT (8N_) from 1999

Features of the refrigerant system:

- Expansion valve
- Receiver
- Compressor from manufacturers "Sanden" or "Zexel" --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Capacities Audi A3 (8L_) 1997 up to 2004

Vehicle model	Production period	Capacity in grams	Differing features of this refrigerant circuit
Audi A3	As of 08.96	750 + 50	None

NOTE:

- **Exclusive use was made at the start of production of "Sanden" compressors. As of model year 1999, use was also made of "Zexel" compressors --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**
- **If no condenser with a flat pipe width of 20 mm is available for Audi A3 as a replacement part, and a condenser with a flat pipe width of 16 mm is installed, only 650 + / - 20 g of refrigerant instead of 750 + 50 g may be filled in. In addition, capacity specification must be changed accordingly on sticker (to do so, please observe notes for Audi TT**

Capacities Audi TT (8N_) from 1999

Vehicle model	Production period	Capacity in grams	Differing features of this refrigerant circuit
Audi TT	As of 10.98 up to 10.03 (and as of 06.04 up to 08.04)	750 + 50	Condenser with flat pipe width of 20 mm
	As of 10.03 (except 06.04 up to 08.04)	650 + / - 20	Condenser with flat pipe width of 16 mm

NOTE:

- **Exclusive use was made at the start of production of "Sanden" compressors. As of model year 1999, use was also made of "Zexel" compressors --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**
- **There was a change in production for Audi TT as of 10.03 (from vehicle identification number (VIN) 8N41015239) from condenser with part no. "1J0 820 411 J" (with flat pipe width of 20 mm) to condenser with part no. " 8N0 820 411 A" (with flat pipe width of 16 mm). From 06.04 to 08.04, a certain number of vehicles not specified were equipped again with condensers having a flat pipe width of 20 mm.**
- **Condensers with a flat pipe width of 16 mm require 120 g less of refrigerant than condensers with flat pipe width of 20 mm --> Electronic Parts Catalog ETKA**
- **During production period from 10.03 (vehicles as of vehicle identification no. (VIN) 8N41015239) to 06.04, a condenser with flat pipe width of 16 mm (part no. " 8N0 820 411 A") was installed and 750 + 50 g of refrigerant were filled into the refrigerant circuit. In addition, a sticker indicating the wrong capacity was affixed to these vehicles, i.e. 750 g (or 700 g in 06.04) instead of 650 g. Due to overfilling of the system, the compressor may be switched off under certain circumstances (e.g. high ambient temperatures) since the pressure in the refrigerant circuit is too high; in addition, drivers may complain about the engines performance (e.g. rumbling and buzzing**

sounds, the engine is heavier loaded as the compressor is working steadily against the excessive pressure). Corrective action: Drain refrigerant circuit, then refill correct capacity and replace sticker with one indicating correct capacity specification, or cross out wrong capacity specification on sticker and note correct capacity e.g. using a waterproof marker.

- **If condenser is replaced, observe flat pipe dimensions. If a condenser with another flat pipe dimension is installed, the sticker specifying the capacity for refrigerant R134a is also to be replaced, or the old capacity specification is to be removed and the new capacity is to be noted e.g. using a waterproof marker --> Electronic Parts Catalog ETKA**

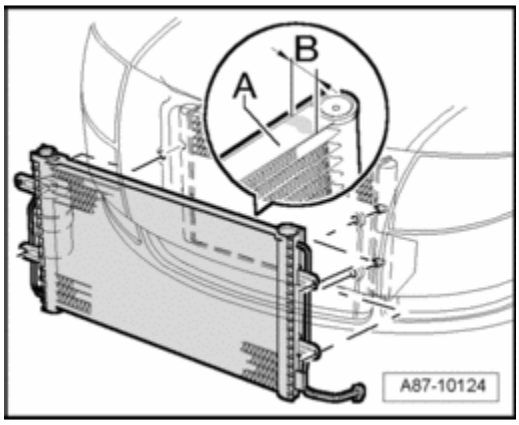

Fig. 58: Determining Dimensions Of Flat Pipes From Condenser
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Determining dimensions of flat pipes from condenser

- Flat pipes of condenser - **A** -
- Width of flat pipes - **B** -

Sticker for capacity of refrigerant R134a

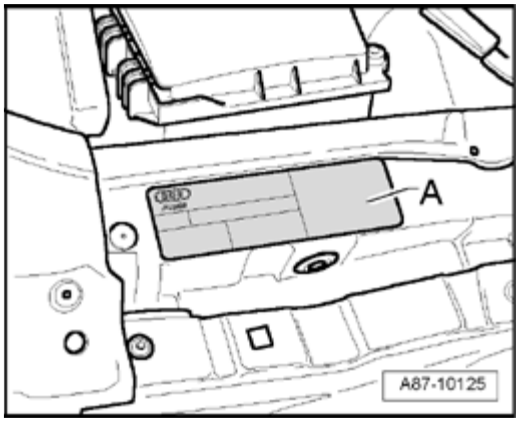

Fig. 59: Sticker For Capacity Of Refrigerant R134A

Courtesy of VOLKSWAGEN UNITED STATES, INC.

If condenser is replaced, observe flat pipe dimensions. If a condenser with different dimensions is installed, the sticker - **A** - specifying the capacity for refrigerant R134a is also to be replaced, or the old capacity specification is to be removed and the new capacity is to be noted e.g. using a waterproof marker --> Electronic Parts Catalog ETKA

Capacities for A3 (8P_) from 2004

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- "Denso" , "Sanden" or "Zexel" compressor with A/C Compressor Regulator Valve N280 --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A3	05.03 on	525 + / - 25	None

NOTE:

- **Various compressors have been installed depending on production period and engine (these compressors have no A/C clutch).**
- **At the start of production exclusive use was made of type "7 SEU 16" compressors from "Denso". With effect from Model Year 2004 a gradual change was made to a different "Denso" compressor (type "7 SEU 17").**
- **With effect from Model Year 2004, "Zexel" (type "DSC17E") and "Sanden" (type "PXE16") compressors are gradually being introduced depending on engine --> Electronic Parts Catalog ETKA and --> 87 - AIR CONDITIONING .**

Capacities for Audi 80 (8A_/8C_), Audi Coupe (8B_), Audi Cabriolet (8G_) through 2002

Characteristics of refrigerant circuit:

- Restrictor (not colored)
- Reservoir
- Compressor from "Zexel" --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi 80 Audi Coupe Audi Cabriolet	10.92 on	750 + 50 Vehicles with 5-cyl. engine	None
		650 + 50 Vehicles with 4 or 6-cyl. engine	

NOTE:

- **Replacement restrictors with different holes are available. If these vehicles are equipped with a yellow colored restrictor, add 50 g more refrigerant than specified in the table. After charging, amend capacity stated on label or affix label indicating new capacity.**
- **In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow colored. The restrictor with the larger hole (1.83 mm) is not colored.**

Capacities for Audi A4 (8D_) 1995 to 2002

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" or "Zexel" compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A4	From 11.94 to 11.97	650 + 50	Restrictor not colored
	11.97 on	700 + 50	Restrictor colored (yellow) Showa condenser (distinguishing feature)
	11.98 on	550 + 50	Restrictor colored (yellow) AWG condenser (distinguishing feature)
Audi RS4	05.00 on	650 + 50	Restrictor colored (yellow)

NOTE:

- **Restrictors with a modified hole have been installed at the factory since November 1997 (yellow colored). The capacity was increased by 50 g for vehicles with yellow colored restrictor.**
- **In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow colored. The restrictor with the larger hole (1.83 mm) is not colored.**
- **The Audi A4 was equipped with different compressors depending on engine and production period. Exclusive use was made at the start of production of "Zexel" compressors. As of Model Year 1996, "Denso" compressors were gradually introduced for vehicles with 6-cylinder engines.**
- **Replacement restrictors with different holes (not colored, yellow colored, red colored) are available. If a vehicle is equipped with a different restrictor, add more or less refrigerant depending on type (--> Table). After charging, amend capacity stated on label or affix label indicating new capacity.**
- **Depending on manufacturer, color of red restrictor may tend more towards**

orange.

- **As of November 1998, Audi A4 models have also been equipped with "AWG" condensers (initially approx. 10000 vehicles with chassis numbers between 8DXA 065 253 and 8DXA 077 026). The specified capacity for vehicles with these condensers differs from those with "Showa" condensers. The condensers can be identified on the basis of certain characteristic features.**
- **If the condenser installed is replaced by one with a different part number, check the capacity indicated on the label in the vehicle and amend if necessary or affix a label with the correct capacity over the existing one --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Distinguishing features of "Showa" and "AWG" condensers

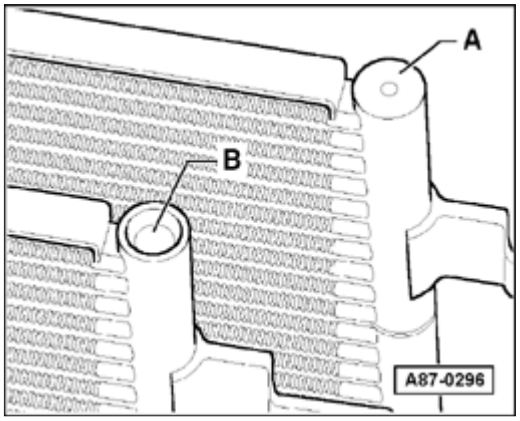

Fig. 60: Identifying Different Manifolds
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Different manifolds:

A - Manifold on "Showa" condenser

B - Manifold on "AWG" condenser

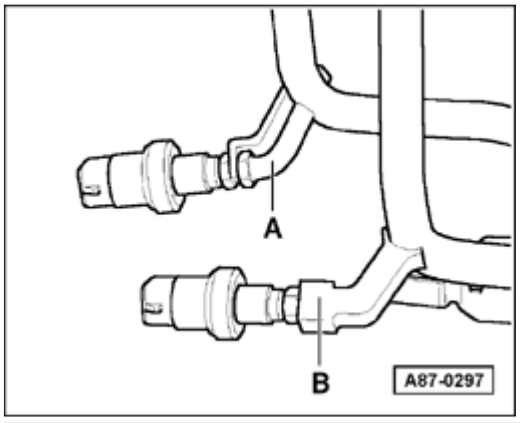

Fig. 61: Identifying Different Connections To Pressure Switch
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Different connections to pressure switch:

A - Connection area on "Showa" condenser

B - Connection area on "AWG" condenser

Capacities for Audi A4 (8E_) from 2001, Audi A4 Cabriolet (8H_) from 2003

Characteristics of refrigerant circuit:

- Restrictor (yellow or red colored)
- Reservoir
- "Denso" compressor with A/C Compressor Regulator Valve N280 (without A/C clutch)

Vehicle model	Production period	Capacity in grams	Differing features of this refrigerant circuit
Audi A4	As of 11.00	500 + / - 20	Restrictor yellow or red colored
Audi RS4	As of 07.05	440 + / - 20	Red colored restrictor

NOTE:

- **Replacement restrictors with different holes are available (yellow colored 1.54 mm, red colored 1.42 mm).**
- **Depending on manufacturer, color of red restrictor may tend more towards orange.**
- **To avoid altering the cooling output of the air conditioner, red or yellow colored restrictors must only be installed. Yellow colored restrictors were installed in model year 2001. Red colored restrictors were installed as of model year 2002. The restrictor modification (a red colored restrictor may also be installed in vehicles of model year 2001 instead of a yellow colored restrictor) does not alter the capacity for these vehicles.**
- **Various compressors have been installed depending on production period and engine (these compressors have no A/C clutch).**
- **At the start of production exclusive use was made of type "6 SEU 12" and "7 SEU 16" compressors from "Denso". With effect from Model Year 2004 a gradual change was made to different "Denso" compressors (types "6 SEU 14" and "7 SEU 17") --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**
- **For the Audi RS4, a condenser with smaller internal volume is installed, therefore the capacity for this model is less than for other models --> Electronic Parts Catalog ETKA.**

Capacities for Audi 100/Audi A6 (4A_) through 1998

Characteristics of refrigerant circuit:

- Restrictor not colored
- Reservoir
- "Denso" or "Zexel" compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi 100/Audi A6	From 10.92 to 03.97	750 + 50	None

NOTE:

- **If a vehicle is equipped with a yellow colored restrictor as replacement for a non-colored restrictor, add 50 g more refrigerant than specified in the table. In addition, the capacity specified on the label in the vehicle is to be checked and amended if necessary or the existing label is to be replaced with one indicating the correct capacity (affix over old label).**
- **Restrictors with modified hole (colored) have been installed at the factory since November 1997. In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow colored. The restrictor with the larger hole (1.83 mm) is not colored.**
- **The Audi 100/Audi A6 features different compressors depending on engine and production period. Exclusive use was made at the start of production of "Zexel" compressors. As of Model Year 1996, "Denso" compressors were gradually introduced for vehicles with 6-cylinder engines.**
- **From September 1994, production was gradually switched from condenser 4A0 260 403 AB to condenser 4A0 260 403 AC.**
- **The refrigerant capacity of 750+50 g applies to all Audi 100 models (regardless of condenser).**
- **Only condensers with part number 4A0 260 403 AC are now available as replacement parts (if necessary make use of label, part no. 8A0 010 126 P).**
- **After charging refrigerant circuit of vehicles manufactured up to October 1994, check capacity stated on label in vehicle and amend if necessary or affix label, part no. 8A0 010 126 P over existing label (modified capacity) --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A6 (4B_) from 1998 and Audi Allroad

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" or "Zexel" compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A6	From 04.97 to 11.97	800 + 50	Restrictor not colored Air conditioner unit version 1 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with flat tube dimensions 20 mm x 3 mm
	From 11.97 to 08.98	850 + 50	Restrictor colored (yellow) Air conditioner unit version 1 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with flat tube dimensions 20 mm x 3 mm

NOTE:

- **Restrictors with a modified hole have been installed at the factory since November 1997 (yellow colored). The capacity was increased by 50 g for vehicles in which a yellow colored restrictor was installed.**
- **In order to distinguish between the two restrictor versions, the one with the smaller hole (1.54 mm) is yellow colored. The restrictor with the larger hole (1.83 mm) is not colored.**
- **If a vehicle is equipped with a colored restrictor as replacement for a non-colored restrictor, add 50 g more refrigerant (see table). In addition, the capacity specified on the label in the vehicle is to be checked and amended if necessary or the existing label is to be replaced with one indicating the correct capacity (affix over old label).**
- **The Audi A6 is equipped with different compressors depending on the engine and production period.**
- **Production was gradually switched in August/September 1998 from air conditioner unit version "1" to air conditioner unit version "2". A reduction in capacity was achieved as the evaporator was also modified together with the air conditioner unit.**
- **The two air conditioner unit versions can be identified on the basis of certain characteristics described in the vehicle-specific Repair Information --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A6 With 4-cyl. engine With 6-cyl. gasoline engine	From 08.98 to 04.99	750 + 50	Restrictor colored (yellow) Air conditioner unit version 2 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with part no. 4B0 260 401 (403) and index D , E or F (flat tube dimensions 20 mm x 3 mm) Electronic Parts Catalog ETKA
Audi A6 With 6-cyl. diesel engine	From 08.98 to 10.98 From 12.98 to 10.99 (see notes)	750 + 50	Restrictor colored (yellow) Air conditioner unit version 2 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with part no. 4B0 260 401 (403) and index D , E or F (flat tube dimensions 20 mm x 3 mm) Electronic Parts Catalog ETKA

	Production	Capacity	

Vehicle model	period	in grams	Differing characteristics of this refrigerant circuit
Audi A6/Audi Allroad With 6-cyl. diesel engine	From 10.98 to 12.98 10.99 on (see notes)	550 + 50	Restrictor colored (yellow) Air conditioner unit version 2 or 3 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with part no. 4B0 260 401 (403) and index G or R (flat tube dimensions 16 mm x 1.7 mm) and Electronic Parts Catalog ETKA
Audi A6/Audi Allroad With 4-cyl. engine except 2.0 l With 6-cyl. gasoline engine except 3.0 l engine With 6-cyl. diesel engine (see notes)	04.99 on	650 + 50	Restrictor colored (yellow) Air conditioner unit version 2 or 3 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with part no. 4B0 260 401(403) and index H , J , K , S , T or N (flat tube dimensions 18 mm x 1.7 mm) and Electronic Parts Catalog ETKA
Audi A6 With 4-cyl. engine 2.0 l With 6-cyl. engine 3.0 l	05.01 on	550 + 50	Restrictor colored (yellow) Air conditioner unit version 3 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with part no. 8E0 260 401(403) and index A (flat tube dimensions 18 mm x 1.7 mm) and Electronic Parts Catalog ETKA A/C Compressor Regulator Valve N280

NOTE:

- **Condensers with A/C Pressure Switch F129 or High Pressure Sensor G65 are supplied for factory use as part no. XXXXXX 401 X. This condenser is supplied without A/C Pressure Switch F129 or High Pressure Sensor G65 for replacement purposes as part no. XXXXXX 403 X.**
- **From 10.98 to 12.98 vehicles with 6-cyl. diesel engine (initially about 10000) were equipped with condensers of a different design. The capacity is different for vehicles with these condensers. The condensers can be identified on the basis of certain characteristics and the part number --> Flat tube dimensions of condenser .**
- **The Audi A6 is equipped with different compressors depending on the engine and production period.**
- **On condenser replacement, pay attention to index of part number (different flat tube versions, flat tube dimensions 16 mm x 1.7 mm, 18 mm x 1.7 mm or 20 mm x 3 mm) and the different capacities involved. If a condenser with a different part number index is installed, the capacity specified on the label must be checked and amended if necessary or a label indicating the modified capacity must be affixed over the existing label. The part number can be found on a sticker attached to the bottom of the condenser.**
- **As of 04.99, production was gradually switched from condensers with flat tube dimensions 20 mm x 3 mm to condensers with flat tube dimensions 18 mm x 1.7 mm or 16 mm x 1.7 mm. The change in production took place gradually during the course of 1999 depending on the engine and existing supplies of the different versions. Refer to Parts List for precise**

assignment of the different condensers --> Electronic Parts Catalog ETKA.

- **Vehicles as of 04.99 with 6-cyl. diesel engine may be equipped with a condenser with index "D" , "G" , "R" or "K". Pay attention to the different capacities --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A6 With 8-cyl. engine	Up to 03.99 and As of 02.00	550 + 50	Restrictor colored (yellow) Air conditioner unit version 2 or 3 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with part no. 4B3 260 401 (403) B, D, E (flat tube dimensions 18 mm x 1.7 mm) Electronic Parts Catalog ETKA
Audi A6 With 8-cyl. engine	From 03.99 to 02.00	650 + 50	Restrictor colored (yellow) Air conditioner unit version 2 Heating, Ventilation and Air Conditioning 87 Refrigerant System, Servicing Condenser with part no. 4B3 260 401 (403) C (flat tube dimensions 18 mm x 1.7 mm) Electronic Parts Catalog ETKA

NOTE:

- **The Audi A6 with 8-cyl. engine is equipped with a "Denso" compressor.**
- **Production was gradually switched in August/ September 1998 from air conditioner unit version "1" to air conditioner unit version "2". Vehicles with 8-cyl. engine are only equipped with air conditioner unit as of version "2".**
- **The different air conditioner unit versions can be identified on the basis of certain characteristics described in --> 87 - AIR CONDITIONING .**
- **Different condensers were installed in vehicles with 8-cylinder engines. Exclusive use was made for USA vehicles of condensers with part no. 4B3 260 401 (403) C, D, E.**
- **In March 1999, production was gradually switched from condensers with part no. 4B3 260 401 (403) B to condensers with part no. 4B3 260 401 (403) C.**
- **If the condenser installed is replaced by one with a different part no., amend capacity specified on label or affix label with modified capacity over existing label. The part number can be found on a sticker attached to the bottom of the condenser --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Flat tube dimensions of condenser

NOTE:

- **Production was gradually switched from calendar week 45, 1998 onwards (initially for Audi A6 with 6-cyl. diesel engine) to a condenser with smaller flat tubes.**
- **Pay attention to part no. on condenser replacement (sometimes the only**

distinguishing feature).

--> Electronic Parts Catalog ETKA

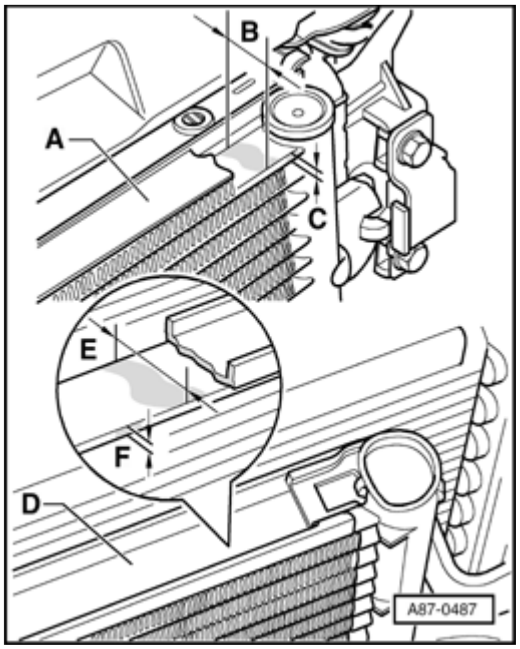

Fig. 62: Flat Tube Dimensions Of Condenser
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Condensers - **A** - with flat tube dimensions - **B** - = 20 mm and - **C** - = 3.0 mm must be filled with more refrigerant than condensers - **D** - with flat tube dimensions - **E** - = 18 mm or 16 mm and - **F** - = 1.7 mm --> Electronic Parts Catalog ETKA.

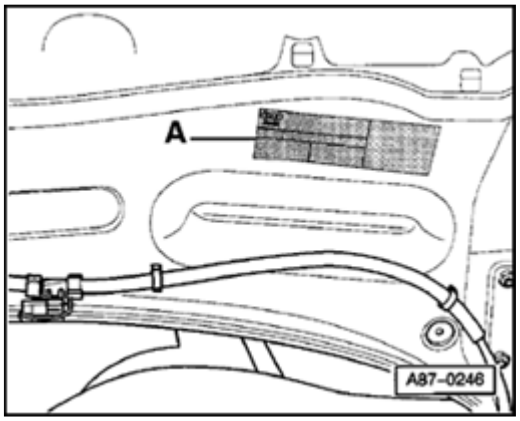

Fig. 63: Identifying Refrigerant R134a Capacity Or Delete Old Capacity Label
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pay attention to flat tube dimensions on condenser replacement. If a condenser with different dimensions is to be installed, also replace label - **A** - indicating refrigerant R134a capacity or delete old capacity and enter new figure using a waterproof pen --> Electronic Parts Catalog ETKA.

Capacities for Audi A6 (4F_) from 2005

Characteristics of refrigerant circuit:

- Restrictor (red colored)
- Reservoir
- "Denso" compressor with A/C Compressor Regulator Valve N280 (without A/C clutch)

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A6	04.04 on	530 + / - 20	Red colored restrictor

NOTE:

- **Replacement restrictors with different holes are available (yellow colored 1.54 mm, red colored 1.42 mm).**
- **Depending on manufacturer, color of red restrictor may tend more towards orange.**
- **To avoid altering the cooling output of the air conditioner, only red colored restrictors are to be installed.**
- **Different compressors are installed depending on model --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi V8 (4C_) to 1994

Characteristics of refrigerant circuit:

- Restrictor (not colored)
- Reservoir
- Compressor from "Zexel" --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi V8	From 10.92 to 10.93	850 + 50	None

NOTE:

- **Replacement restrictors with different holes are available. If these vehicles are equipped with a yellow colored restrictor, add 50 g more refrigerant than specified in the table. After charging, amend capacity stated on label or affix label indicating new capacity.**
- **In order to distinguish between the different restrictor versions, the ones with a smaller hole are colored (yellow or red). The red colored restrictor is not to be used for these vehicles.**
- **Depending on manufacturer, color of red restrictor may tend more towards orange.**

Capacities for Audi A8 (4D_) 1994 to 2002

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" or "Zexel" compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A8	From 05.94 to 11.97	750 + 50	Restrictor not colored
	11.97 on	800 + 50	Restrictor colored (yellow)

NOTE:

- **Restrictors with a modified hole have been installed at the factory since November 1997 (yellow colored). The capacity was increased by 50 g for vehicles with yellow colored restrictor.**
- **In order to distinguish between the different restrictor versions, the ones with the smaller hole are colored yellow (1.54 mm) or red (1.42 mm). The restrictor with the larger hole (1.83 mm) is not colored.**
- **If a vehicle is equipped with a yellow colored restrictor as replacement for a non-colored restrictor, add 50 g more refrigerant (see table). In addition, the capacity specified on the label in the vehicle is to be checked and amended if necessary or the existing label is to be replaced with one indicating the correct capacity (affix over old label). The red colored restrictor is not to be used for these vehicles.**
- **Exclusive use was made at the start of production of "Zexel" compressors. As of Model Year 1996, production was gradually switched to "Denso" compressors --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A8 (4E_) from 2003

Characteristics of refrigerant circuit:

- Restrictor (red colored)
- Reservoir
- "Denso" compressor with A/C Compressor Regulator Valve N280 (without A/C clutch)

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi A8	10.02 on	620 + / - 20	Red colored restrictor

NOTE:

- **Replacement restrictors with different holes are available (yellow colored 1.54 mm, red colored 1.42 mm).**
- **Depending on manufacturer, color of red restrictor may tend more towards orange.**

- **To avoid altering the cooling output of the air conditioner, only red colored restrictors are to be installed.**
- **Different compressors are installed depending on model --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi Q7 (4L_) from 2006

Characteristics of refrigerant circuit:

- Expansion valve
- One or two evaporator(s)
- Dryer cartridge in fluid reservoir on condenser
- "Denso" compressor with A/C Compressor Regulator Valve N280 --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Capacity in grams	Differing characteristics of this refrigerant circuit
Audi Q7	As of 02.06		
Vehicle with one evaporator		700 +50	one evaporator
Vehicle with two evaporators		1050 +50	two evaporators

Approved Refrigerant Oils

--> **Refrigerant Oil Capacities**

--> **Capacities for Audi A2 (8Z_) from 2001**

--> **Capacities for Audi A3 (8L_) 1997 to 2004 and Audi TT (8N_) from 1999**

--> **Capacities for Audi A3 (8P_) from 2004**

--> **Capacities for Audi 80 (8A_/8C_), Audi Coupe (8B_), Audi Cabriolet (8G_)**

--> **Capacities for Audi A4 (8D_) 1995 to 2002**

--> **Capacities for Audi A4 (8E_) from 2001, Audi A4 Cabriolet (8H_) from 2003**

--> **Capacities for Audi 100/Audi A6 (4A_) from 1998**

--> **Capacities for Audi A6 (4B_) from 1998 and Audi Allroad**

--> **Capacities for Audi A6 (4F_) from 2005**

--> **Capacities for Audi V8 (4C_) to 1994**

--> **Capacities for Audi A8 (4D_) 1994 to 2002**

--> **Capacities for Audi A8 (4E_) from 2003**

--> **Capacities for Audi Q7 (4L_) from 2006**

NOTE:

- **As PAG (polyalkylene glycol) oil is highly hygroscopic (attracts water), opened containers are to be immediately re-sealed so as to be airtight.**
- **PAG oil from containers which have been open for a lengthy period is no longer usable.**

NOTE:

- **The oils used with refrigerant R12 are not suitable for refrigerant R134a.**
- **The name of the compressor manufacturer "Nippondenso" has been changed to "Denso".**
- **The refrigerant oil developed specially and exclusively for R134a refrigerant circuits is not commercially available.**
- **Refrigerant oils specifically designed for each compressor can therefore be obtained from the replacement parts range --> Electronic Parts Catalog ETKA.**
- **The use of other refrigerant oils could cause system failure, as they do not always mix and thus circulate with refrigerant R134a (for compressor lubrication).**
- **There are different refrigerant oils for "Zexel" , "Denso" and "Sanden" compressors --> Electronic Parts Catalog ETKA.**
- **The refrigerant oil (G 052 300 A2) for use in refrigerant circuits with "Denso" compressors (old name "Nippondenso") is also included in the retrofit kit (part number 4A0 298 107 A) --> Electronic Parts Catalog ETKA.**
- **Use is to be made for refrigerant circuits with "Zexel" or "Sanden" compressor of refrigerant oil with part no. G 052 154 A2 --> Electronic Parts Catalog ETKA.**
- **For refrigerant circuits with "Zexel" compressors, use can be made of both the refrigerant oil (G 052 154 A2) and the refrigerant oil (G 052 200 A2) contained in the retrofit kit (part no. 4A0 298 107) --> Electronic Parts Catalog ETKA.**

Refrigerant Oil Capacities

NOTE:

- **For compressor assignment ("Zexel" , "Sanden" or "Denso"), refer to vehicle-specific information --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**
- **With "Zexel" , "Denso" and "Sanden" compressors, the amount of**

refrigerant oil in the replacement compressor corresponds to the total quantity of oil to be added. On compressor replacement, the quantity of refrigerant oil in the compressor to be installed must therefore be adjusted (an incorrect refrigerant oil quantity will damage the compressor).

- **When pouring refrigerant oil out of replacement compressor (or malfunctioning compressor), a small quantity of oil generally remains in the compressor (20 to 30 cm ^{3}). This refrigerant oil does not affect the function of the air conditioner and can therefore be ignored (always remains in compressor).**
- **Following initial switch-on, the refrigerant oil is distributed throughout the entire refrigerant circuit.**
- **For refrigerant oil replenishment quantities on replacing malfunctioning refrigerant circuit components, refer to --> Refrigerant Circuit Components, Replacing , --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A2 (8Z_) from 2001

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- Compressor with A/C Compressor Regulator Valve N280 (without A/C clutch)
- Compressor from "Denso" --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3
Audi A2	06.00 on	180 + / -15	180 + /-15

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **As the compressor and engine always operate at the same time and the entire quantity of refrigerant oil is contained in the compressor, the circuit must be completely assembled before starting the engine --> 87 - AIR CONDITIONING .**
- **As replacement compressors of this type are supplied with different oil capacities, the exact part no. must be noted --> Electronic Parts Catalog ETKA.**

Capacities for Audi A3 (8L_) 1997 to 2004 and Audi TT (8N_) from 1999

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- "Sanden" or "Zexel" compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3
Audi A3	08.96 on	135 + / -15	135 + /-15
Audi TT	10.98 on	135 + / -15	135 + /-15

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **Exclusive use was made at the start of production of "Sanden" compressors. With effect from Model Year 1999, use was also made of "Zexel" compressors --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A3 (8P_) from 2004

Characteristics of refrigerant circuit:

- Expansion valve
- Receiver
- Compressor from various manufacturers with A/C Compressor Regulator Valve N280 (without A/C clutch) --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA.

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3	Differing characteristics of this refrigerant circuit
Audi A3	From 05.03 to 10.03	180 + / - 10	180 + / - 10	Denso compressor of 7 SEU 16 type
	10.03 on	120 + / - 10	120 + / - 10	Zexel compressor
		110 + / - 10	110 + / - 10	Sanden compressor
		140 + / - 10	140 + / - 10	Denso compressor of 7 SEU 17 type

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **Different compressors are installed depending on production period and**

engine.

- **At the start of production, exclusive use was made of compressors of type "7 SEU 16" from "Denso" (e.g. compressor with part no. 1K0 820 803 up to index "D"). In Model Year 2004 (as of approx. 10.03), a gradual change was made to a different type of "Denso" compressor ("7 SEU 17" e.g. compressor with part no. 1K0 820 803 as of index "E").**
- **With effect from Model Year 2004 (as of approx. 10.03), "Zexel" (type "DSC17E") and "Sanden" (type "PXE16") compressors are also gradually being introduced depending on engine --> Electronic Parts Catalog ETKA.**
- **This compressor is available as a replacement part with different oil capacities and attention must therefore be paid to oil quantity in compressor as well as exact part number --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**
- **The reason for the different oil quantities in the compressor for an otherwise identical refrigerant circuit is the design of the actual compressor. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and reduced system cooling output; insufficient oil can cause lubrication problems in the compressor.**
- **The compressor may have been installed at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the compressor.**

Capacities for Audi 80 (8A_/8C_), Audi Coupe (8B_), Audi Cabriolet (8G_)

Characteristics of refrigerant circuit:

- Restrictor (not colored)
- Reservoir
- Compressor from "Zexel" --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3
Audi 80 Audi Coupe Audi Cabriolet	10.92 onwards	250 + 50	250+50

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**

Capacities for Audi A4 (8D_) 1995 to 2002

Characteristics of refrigerant circuit:

- Restrictor

- Reservoir
- "Denso" or "Zexel" compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3
Audi A4	11.94 on	250 + 50	250+50

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **The Audi A4 is equipped with different compressors depending on the engine and production period --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A4 (8E_) from 2001, Audi A4 Cabriolet (8H_) from 2003

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" compressor with A/C Compressor Regulator Valve N280 (without A/C clutch) --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3	Differing characteristics of this refrigerant circuit
Audi A4 Audi RS4	From 11.00 to 01.04 All	180 + / - 10	180 + / - 10	Compressor type 6 SEU 12 6 SEU 14 7 SEU 16 or 7 SEU 17 (refer to notes below)
	01.04 on All except 8-cyl. engine	120 + / - 10	120 + / - 10	Compressor type 6 SEU 14 or 7 SEU 17 (refer to notes below)
	01.04 on 8-cyl. engine only	130 + / - 10	130 + / - 10	Compressor type 7 SEU 17 (refer to notes below)

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **The Audi A4 is equipped with different compressors depending on the engine and production period As replacement compressors of this type are supplied with different oil capacities, the exact part no. must be noted -**

-> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.

- **At the start of production, the compressor types in the first line of the table were supplied with a refrigerant oil quantity of 180 cm ^{3} . These compressors can be recognized from the index of the part number (8E0 260 805 with one index or with double index up to "AH"). In Model Year 2004 (as of approx. 01.04), a gradual change was made to other types of compressor with a refrigerant oil quantity of 120 cm ^{3} or 130 cm ^{3} . These compressors can be recognized from the index of the part number 8E0 260 805 (with double index as of " AJ") or 4F0 260 805 (and index "E" for vehicles with 8-cyl. engine) --> Electronic Parts Catalog ETKA.**
- **The reason for the different oil quantities in the compressor for an otherwise identical refrigerant circuit is the design of the actual compressor. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and reduced system cooling output; insufficient oil can cause lubrication problems in the compressor.**
- **The compressor may have been installed at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the compressor.**

Capacities for Audi 100/Audi A6 (4A_) from 1998

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" or "Zexel" compressor --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3
Audi 100/Audi A6	From 10.92 to 03.97	250 + 50	250+50

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **The Audi 100/Audi A6 features different compressors depending on engine and production period. Exclusive use was made at the start of production of "Zexel" compressors. As of Model Year 1996, "Denso" compressors were gradually introduced for vehicles with 6-cylinder engines --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A6 (4B_) from 1998 and Audi Allroad

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" or "Zexel" compressor with A/C Clutch N25 --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3	Differing characteristics of this refrigerant circuit
Audi A6/Audi Allroad 4-cyl. gasoline engine except 2.0 l 6-cyl. gasoline engine except 3.0 l	04.97 on All	250 + 50	250 + 50	Refer to notes below
Audi A6/Audi Allroad 4-cyl. diesel engine 6-cyl. diesel engine (see notes for Audi Allroad)	From 04.97 to 05.01	250 + 50	250 + 50	Refer to notes below
Audi A6 8-cyl. engine (with toothed belt camshaft drive)	04.97 on All	250 + 50	250 + 50	Refer to notes below

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **The Audi A6 is equipped with different compressors depending on the engine and production period.**
- **As of Model Year 2002, the Audi A6 features compressors with A/C clutch or regulator valve (different oil quantities) depending on the engine. This change is being introduced gradually for the Audi Allroad with 6-cyl. diesel engine in Model Year 2003 --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" compressor with A/C Compressor Regulator Valve N280 --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant	Quantity of refrigerant oil in replacement	Differing characteristics of this refrigerant

		circuit in cm 3	compressor in cm 3	circuit
Audi A6 4-cyl. gasoline engine 2.0 l 6-cyl. gasoline engine 3.0 l	All	220 + 20	220 + 20	Compressor type 6 SEU 12 or 7 SEU 16 (refer to notes below)
Audi A6/Audi Allroad 4-cyl. diesel engine 6-cyl. diesel engine (see notes for Audi Allroad)	05.01 on	245 + 20	245 + 20	Compressor type 6 SEU 12 or 7 SEU 16 (refer to notes below)
Audi Allroad 8-cyl. engine (with chain-driven camshaft)	All	220 + 20	220 + 20	Compressor type 7 SEU 17 (refer to notes below)

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **The Audi A6 is equipped with different compressors depending on the engine and production period.**
- **As of Model Year 2002, the Audi A6 features compressors with A/C clutch or regulator valve (different oil quantities) depending on the engine. This change is being introduced gradually for the Audi Allroad with 6-cyl. diesel engine in Model Year 2003.**
- **As the replacement compressor with A/C Compressor Regulator Valve N280 is supplied with different oil capacities, the exact part no. must be noted --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**
- **The reason for the different oil quantities in the compressor for an otherwise identical refrigerant circuit is the design of the actual compressor. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and reduced system cooling output; insufficient oil can cause lubrication problems in the compressor.**
- **The compressor may have been installed at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the compressor.**

Capacities for Audi A6 (4F_) from 2005

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" compressor with A/C Compressor Regulator Valve N280 --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle	Production	Total quantity of oil in refrigerant	Quantity of refrigerant oil in replacement

model	period	circuit in cm 3	compressor in cm 3
Audi A6	04.04 on	130 + / -10	130 + / - 10

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted.**
- **The Audi A6 is equipped with different compressors depending on the engine and production period.**
- **As there are different replacement versions of this compressor, the exact part no. must be noted --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**
- **The compressor may have been installed at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the compressor.**

Capacities for Audi V8 (4C_) to 1994

Characteristics of refrigerant circuit:

- Restrictor (not colored)
- Reservoir
- Compressor from "Zexel" --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3
Audi V8	From 10.92 to 10.93	250 + 50	250 + 50

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**

Capacities for Audi A8 (4D_) 1994 to 2002

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- Compressor from "Denso" or "Zexel" --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle	Production	Total quantity of oil in refrigerant	Quantity of refrigerant oil in replacement

model	period	circuit in cm 3	compressor in cm 3
Audi A8	05.94 on	250 + 50	250 + 50

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **At the start of production, only Zexel compressors were used. As of Model Year 1996, production was gradually switched to "Denso" compressors --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.**

Capacities for Audi A8 (4E_) from 2003

Characteristics of refrigerant circuit:

- Restrictor
- Reservoir
- "Denso" compressor with A/C Compressor Regulator Valve N280 --> **87 - AIR CONDITIONING** and --> Electronic Parts Catalog ETKA

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3	Differing characteristics of this refrigerant circuit
Audi A8 8-cyl. gasoline engine with 3.7 l or 4.2 l (except FSI)	10.02 on All	200 + / - 10	200 + / - 10	Compressor type 7 SEU 16 (refer to notes below)
6 and 12-cyl. gasoline engine 6 and 8-cyl. diesel engine	From 10.02 to 01.04	200 + /-10	200 + /-10	Compressor type 6 SEU 14 , 7 SEU 16 or 7 SEU 17 (refer to notes below)
6, 10 and 12-cyl. gasoline engine 6 and 8-cyl. diesel engine 8-cyl. 4.2 l gasoline engine (FSI only)	01.04 on	150 + / - 10	150 + / - 10	Compressor type 6 SEU 14 or 7 SEU 17 (refer to notes below)

NOTE:

- **The replacement compressor contains the full quantity of oil intended for the refrigerant circuit. On replacement, the quantity of oil in the compressor is therefore to be adjusted --> Refrigerant Circuit Components, Replacing.**
- **The Audi A8 is equipped with different compressors depending on the engine and production period.**
- **As replacement compressors of this type are supplied with different oil**

capacities, the exact part no. must be noted --> 87 - AIR CONDITIONING and --> Electronic Parts Catalog ETKA.

- **At the start of production, the compressor types in the first two lines of the table were supplied with a refrigerant oil quantity of 200 cm ^{3} . These compressors can be recognized from the index of the part number (4E0 260 805 with index "C" , "D" , "E" , "F" , "J" , "L" or "S"). In Model Year 2004 (as of approx. 01.04), a gradual change was made to other types of compressor with a refrigerant oil quantity of 150 cm ^{3} . These compressors can be recognized from the index of the part number (4E0 260 805 with index "G" , "H" , "T" , "M" , "N" , "Q" or double index e.g. " AB") --> Electronic Parts Catalog ETKA.**
- **The reason for the different oil quantities in the compressor for an otherwise identical refrigerant circuit is the design of the actual compressor. Attention is to be paid to these oil quantities. Too much oil in the circuit results in higher pressures and reduced system cooling output; insufficient oil can cause lubrication problems in the compressor.**
- **The compressor may have been installed at the factory with a rating plate indicating the part number and the quantity of refrigerant oil in the compressor.**

Capacities for Audi Q7 (4L_) from 2006

Vehicle model	Production period	Total quantity of oil in refrigerant circuit in cm 3	Quantity of refrigerant oil in replacement compressor in cm 3	Differing characteristics of this refrigerant circuit
Audi Q7	As of 02.06			
Vehicle with one evaporator		145 + /- 15	150 + /-10 (compressor for a vehicle with 8 cyl. engine) 140 + /-10 (compressor for a vehicle with 6 cyl. engine)	One evaporator Compressor type 7 SEU 16 (see notes below)
Vehicle with two evaporators		245 + /- 15	Two evaporators (see notes below)	

NOTE:

- **The replacement compressor is already filled with a specific refrigerant oil quantity (currently 140 or 150 $^+$ / - 10 cm ^{3} , depending on the compressor). This refrigerant oil quantity corresponds to the oil quantity designated for this refrigerant circuit on vehicles with one evaporator. On vehicles with two evaporators, a greater refrigerant oil quantity is required in the refrigerant circuit (currently an additional 100 cm ^{3}) because of the longer refrigerant lines and the second evaporator. If the compressor is replaced after cleaning the refrigerant circuit, this refrigerant oil quantity must therefore be added to the refrigerant circuit (e.g. into opened lines or component connections) in vehicles with two evaporators. If compressor**

is replaced without having to clean the refrigerant circuit, the refrigerant oil quantity in the new compressor to be installed must be adjusted to the oil quantity poured out of the old compressor --> Refrigerant Circuit Components, Replacing.

- **Compressors are available as replacement part with different oil fill capacities, therefore note exact part number --> Electronic Parts Catalog ETKA.**
- **Too much oil in the circuit leads to higher pressures and reduces cooling performance of the A/C system. Too little oil may lead to lubrication problems in the compressor, therefore note the specified refrigerant oil quantities.**
- **A data plate may be attached to the compressor by the manufacturer, indicating the part number and refrigerant oil quantity.**

TESTING EQUIPMENT, TOOLS AND MATERIALS

NOTE:

- **This list outlines the testers, tools and materials required for expert refrigerant circuit repair work.**

--> **Tools and Materials Available from Regional Sales Center or Importer**

--> **Commercially Available Tools and Materials**

--> **Improvised Tools**

Tools and Materials Available from Regional Sales Center or Importer

Designation	Example
A/C service station with flushing equipment VAS 6336 or A/C service station with flushing equipment VAS 6337 (currently available A/C service stations V.A.G workshop equipment catalog) With program installed for flushing the refrigerant circuit using refrigerant R134a, and corresponding flushing equipment	Refer to illustration and V.A.G workshop equipment catalog
Flushing equipment for refrigerant circuits VAS 6336/1 or Flushing equipment for refrigerant circuits VAS 6337/1 (currently available flushing equipments) V.A.G workshop equipment catalog For flushing the refrigerant circuit using refrigerant R134a, also to be used for older A/C service stations with a reservoir capacity of at least 10 kg refrigerant R134a (flushing must be performed manually).	V.A.G workshop equipment catalog
Adapter case for VW/Audi passenger cars VAS 6338/1 For connecting A/C service station to refrigerant circuit and for bridging certain removed components while flushing	V.A.G workshop equipment catalog
Leak detector V.A.G 1796	Refer to illustration
Puller for A/C clutch (Zexel compressor) V.A.G 1719	Refer to illustration
Adapter set refrig cir R 134a V.A.G 1785/1-10 For connecting A/C service station to refrigerant circuit and for bridging certain removed components while flushing and	Refer to illustration

blowing through	
Valve adapters V.A.G /9 and V.A.G /10	Refer to illustration
Air conditioning adapter set with service connection V.A.G 1786	Refer to illustration
Combined fine filter unit for compressed-air system (oil, dirt and water separator as used for painting facilities) Workshop equipment catalog	Refer to illustration
O-rings Electronic Parts Catalog ETKA	Refer to illustration
Refrigerant oil Electronic Parts Catalog ETKA	Refer to illustration
Leak detection system VAS 6201 comprising: Hand pump with low-pressure service hose, service coupling and non-return valve VAS 6201/1 Cartridge VAS 6201/2 Cleaning agent VAS 6201/3 UV leak detection lamp VAS 6201/4 Spare bulb for leak detection lamp VAS 6201/5 Safety goggles VAS 6201/6 Sticker VAS 6201/7 Protective gloves VAS 6201/9 Tube VAS 6201/8 System case VAS 6201/10	Refer to illustration

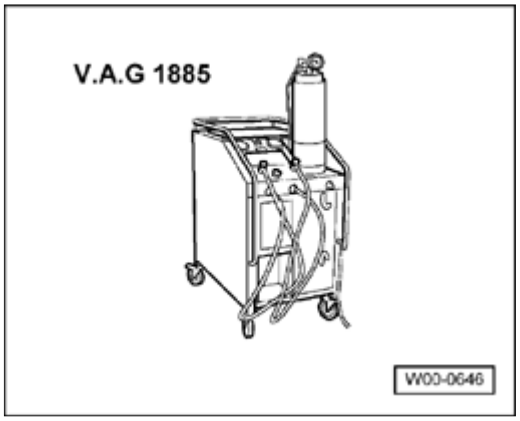

Fig. 64: Identifying V.A.G. 1885
Courtesy of VOLKSWAGEN UNITED STATES, INC.

A/C service station (this illustration shows e.g. A/C service station V.A.G 1885 , currently available A/C service stations --> V.A.G workshop equipment catalog).

- The operations "testing, extraction (recycling), evacuation, flushing and charging" are to be performed in line with the relevant operating instructions.
- The filters and dryers installed are to be replaced at the latest at the end of the period of use specified in the operating instructions and whenever the station has been drained (keep replacement filter to hand; available from equipment manufacturer, refer to operating instructions).
- Use can also be made of A/C service stations not described here --> V.A.G workshop equipment catalog.
- Currently available A/C service stations are equipped with a program for flushing the refrigerant circuit; the flushing equipment required for flushing is also included in delivery --> V.A.G workshop equipment catalog

NOTE:

- **This A/C service station comprises the following standard components: Charging cylinder, pressure gauge set, vacuum pump, shutoff valves and charging hoses.**
- **One quick-release coupling each (for service connections on high and**

low-pressure side) is included in the scope of delivery of this A/C service station.

- **Depending on version, a current vacuum display (LED) may appear after pressing the "Evacuate" button again.**

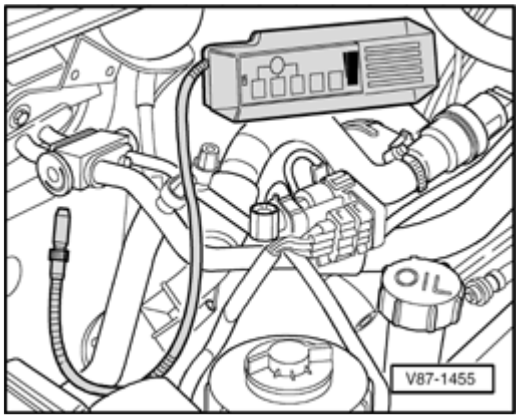

Fig. 65: Checking For A/C Refrigerant System Leaks
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Leak detector V.A.G 1796

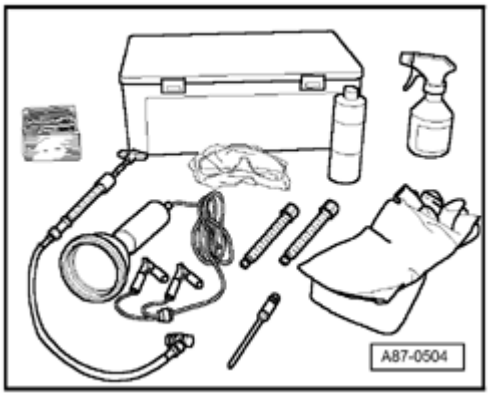

Fig. 66: Leak Detection System VAS 6201
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Leak detection system VAS 6201

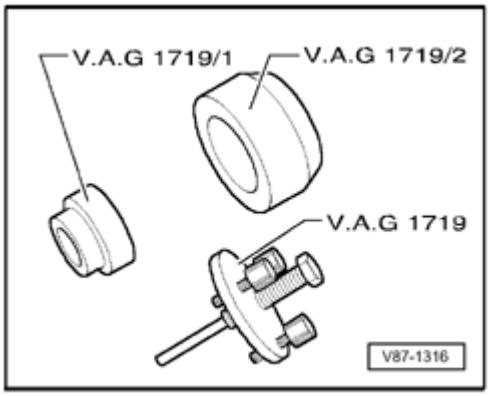

Fig. 67: A/C Clutch Set V.A.G 1719 (For "Zexel" A/C Compressors)
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Puller for A/C clutch V.A.G 1719 (for "Zexel" compressor)

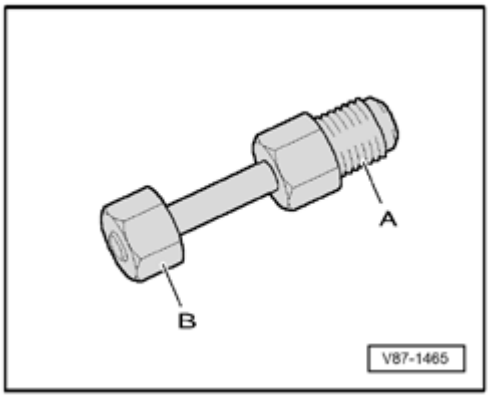

Fig. 68: Adapter Set V.A.G 1785/1-10
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Adapter set refrig cir R 134a V.A.G 1785/1-10

Adapter for cleaning refrigerant circuit (flush with refrigerant R134a --> **Refrigerant Circuit, Flushing with Refrigerant R134a** or blow through with compressed air and nitrogen --> **Refrigerant Circuit, Flushing with Compressed Air and Nitrogen**)

A - 5/8"-18 UNF thread for conical seal

B - Union nut (for connection with O-ring) with thread

- M 18x1.5 V.A.G /1
- M 20x1.5 V.A.G /2
- M 24x1.5 V.A.G /3
- M 28x1.5 V.A.G /4

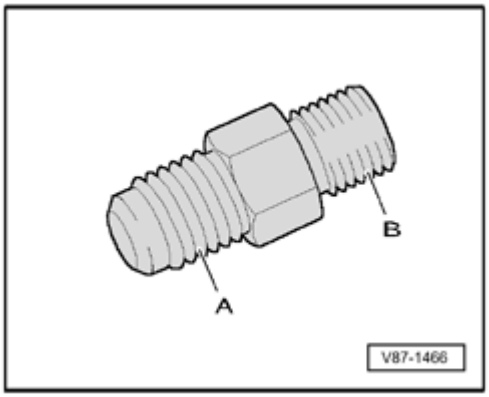

Fig. 69: M 28x1.5 V.A.G 1785/8
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Adapter

A - 5/8"-18 UNF thread for conical seal

B - Threaded connection for O-ring

- M 18x1.5 V.A.G /5
- M 20x1.5 V.A.G /6
- M 24x1.5 V.A.G /7
- M 28x1.5 V.A.G /8

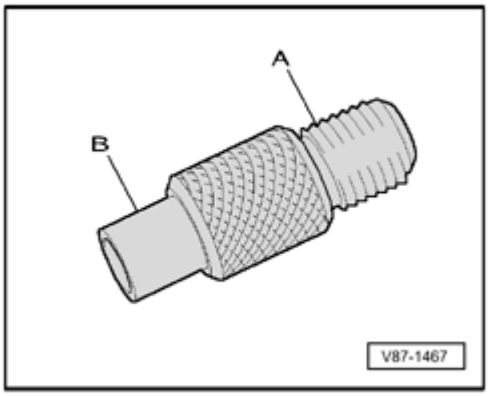

Fig. 70: Valve Adapter
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Valve adapter

A - 5/8"-18 UNF thread for conical seal

B - Internal thread with valve opener

- M 10x1.25 V.A.G /9 (for connections with valve on high-pressure side)
- M 12x1.5 V.A.G /10 (for connections on low-pressure side)

NOTE:

- **A Schrader valve is screwed into connection - A -.**
- **A valve opener must be installed in the charging hose connection.**
- **Various adapters from adapter set are also part of the adapter case for VW/Audi passenger cars VAS 6338/1**

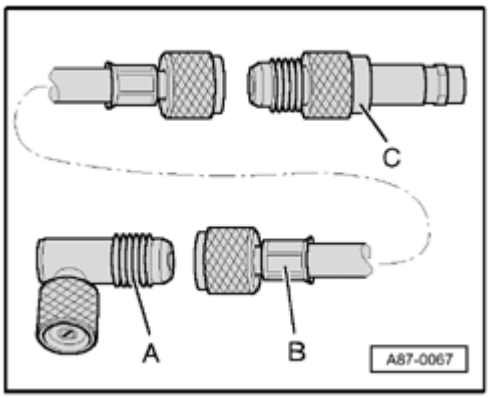

Fig. 71: Air Conditioning Adapter Set V.A.G 1786
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Air conditioning adapter set V.A.G 1786

A - Adapter with union nut V.A.G /1 (only for connections with small valve insert on low-pressure side)

B - Charging hose with union nut 5/8"-18 UNF (short version)

C - Adapter with service connection V.A.G /2

NOTE:

- **For connections with large valve insert (standard on "Zexel" compressors, gradual change to small valve insert as of 10.94), use is to be made of adapter V.A.G /10 (remove valve from adapter V.A.G /10 or install valve opener in charging hose - B -).**

Commercially Available Tools and Materials

Designation	Example
Fin comb	Refer to illustration
Charging hoses 5/8" - 18 UNF with valve opener	Refer to illustration
Connection piece for refrigerant cylinder and seal with quick-release coupling	Refer to

connection or threaded connection 5/8" - 18 UNF	illustration
Valve caps 5/8"-18 UNF	Refer to illustration
Pressure gauge set with pressure reducer for nitrogen	Refer to illustration
Quick-release coupling adapter for service connections, 2x included in scope of delivery of A/C service station	Refer to illustration
Open-ring wrench, size according to threaded joints at refrigerant pipes	Not illustrated
Valve opener for charging hoses	Not illustrated
Connecting nipple for conical seal 5/8"-18 UNF	Not illustrated
Compressed-air gun with rubber end piece	Not illustrated
Valve opener for Schrader valve	Not illustrated
Hand shut-off valve 5/8"-18 UNF	Not illustrated
Recycling container for refrigerant R134a	Not illustrated
Digital thermometer	Not illustrated
Protective gloves	Not illustrated
Safety goggles	Not illustrated
Refrigerant R134a with cylinder (capacity as required)	Not illustrated

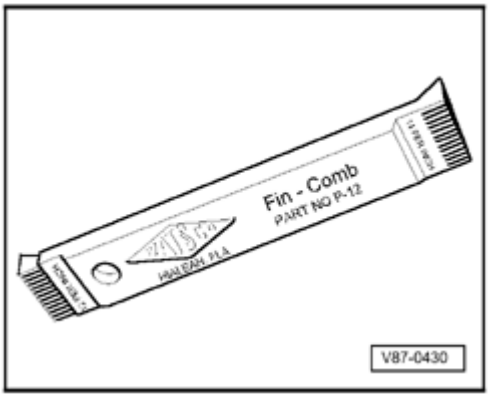

Fig. 72: Fin Comb
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Fin comb

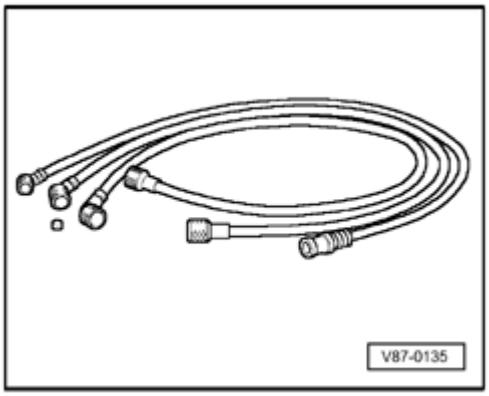

Fig. 73: Charging Hoses
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Charging hoses

5/8"-18 UNF thread

NOTE:

- **Use differently colored charging hoses (1800 mm long).**
- **Have valve opener and spare seals to hand.**
- **A charging hose in short version is also included in adapter case for VW/Audi passenger cars VAS 6338/1.**

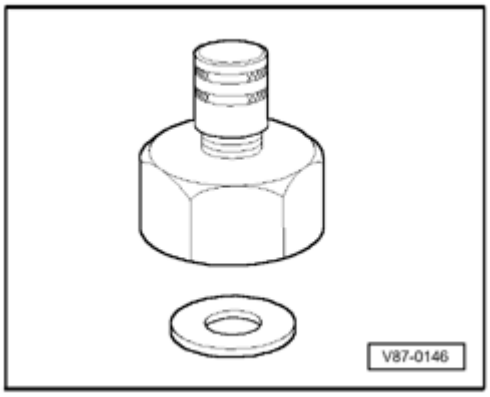

Fig. 74: Connection Piece For Refrigerant Cylinder With Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Connection piece for refrigerant cylinder with seal, quick-release coupling connection or threaded connection 5/8" - 18 UNF

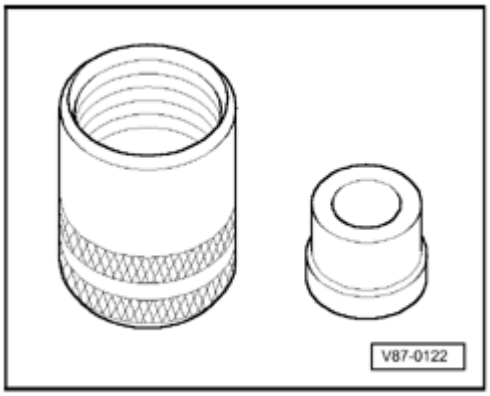

Fig. 75: Valve Caps With Spare Seal
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Valve caps with spare seals (for 5/8"-18 UNF thread)

Seals can also be used for charging hoses.

NOTE:

- **Valve caps with spare seals are also included in adapter case for VW/Audi passenger cars VAS 6338/1.**

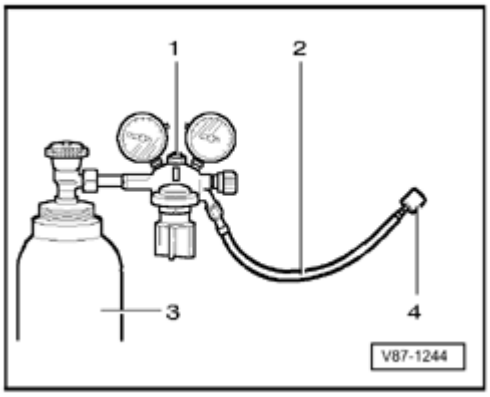

Fig. 76: Pressure Gauge Set With Pressure Reducer For Nitrogen
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Pressure gauge set with pressure reducer for nitrogen (max. reducing pressure: 15 bar)

1. Pressure gauge set
2. Pressure hose (ID 5 mm, length 2 m)
3. Nitrogen
4. Hose fitting

NOTE:

- **For connection to adapter set V.A.G 1785 with 5/8"-18 UNF thread**

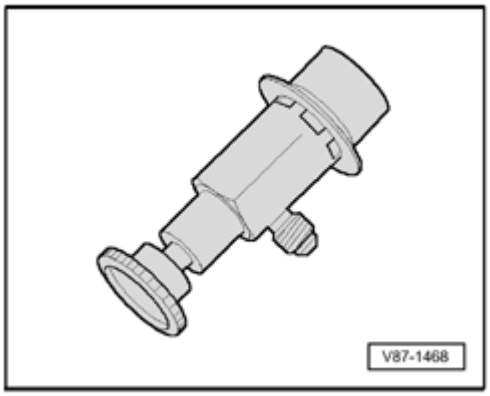

Fig. 77: Quick-release Coupling Adapter For Service Connections
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Quick-release coupling adapter for service connections

- High-pressure side, nominal size 16 mm
- Low-pressure side, nominal size 13 mm
- 2x release tool (Sharan)

NOTE:

- **This quick-release coupling is included in the scope of delivery of the A/C service station.**

Improvised Tools

Designation	Example
Charging hose with connection to workshop compressed-air system	Refer to illustration

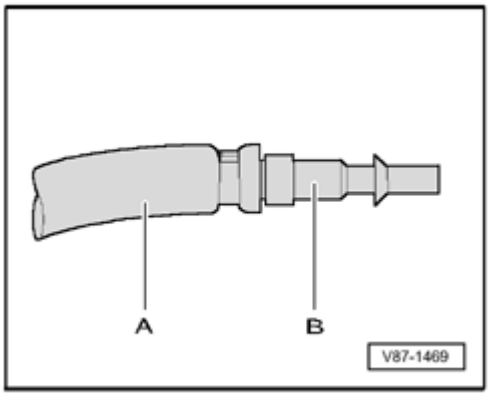

Fig. 78: Identifying Improvised Tool
Courtesy of VOLKSWAGEN UNITED STATES, INC.

Charging hose with connection to workshop compressed-air system

A - Charging hose 5/8" - 18 UNF (version with large ID)

B - Connection for workshop compressed-air system (always use filter)