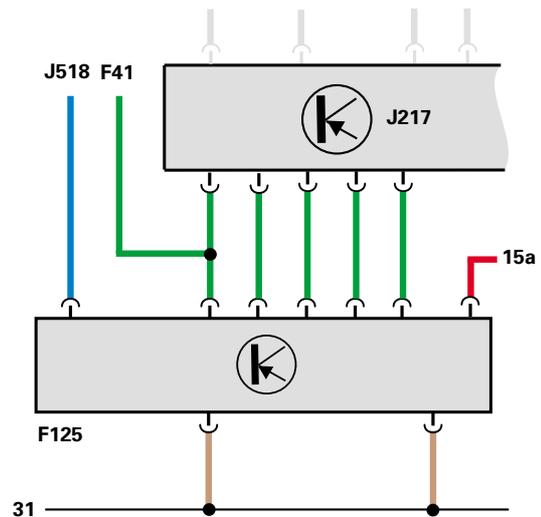


300_029



Electric circuitry

- F41 - reverse gear switch
- F125 - multifunction switch
- J217 - control unit for automatic gearbox
- J518 - control unit for access and start authorisation



300_046

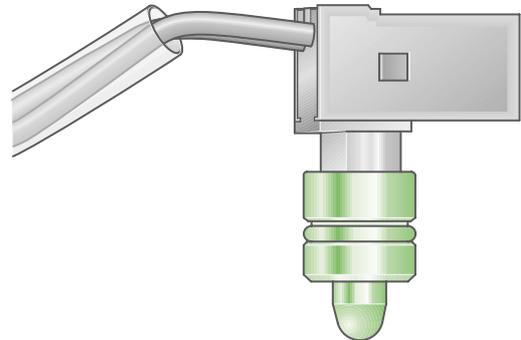
Sensors

The gearbox oil temperature sender G93

is located in the control valve assembly within the ATF.

It checks the ATF temperature and reports this to the control unit for the automatic gearbox.

It is an NTC resistor (NTC - negative temperature coefficient), i.e. the electrical resistance of the sender drops with increasing temperature.



300_016

Signal utilisation

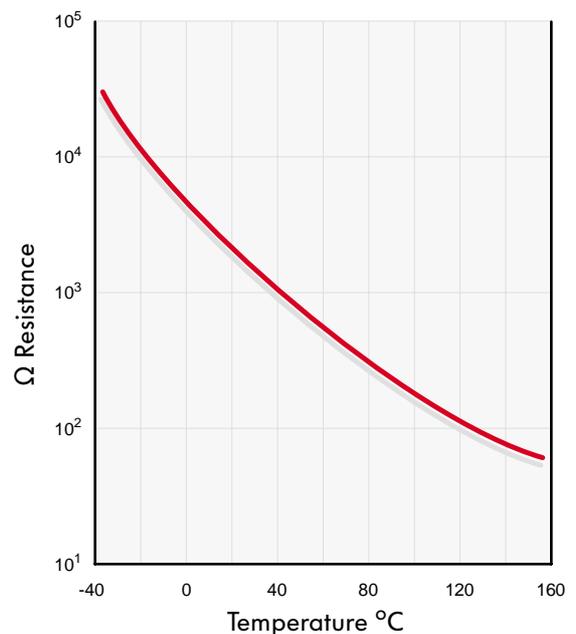
Starting at an ATF temperature of 150 °C, the torque converter bypass coupling is closed more frequently.

If this does not result in cooling of the ATF, reduction of the engine torque is initiated starting at 170 °C.

Effects of signal drop-out

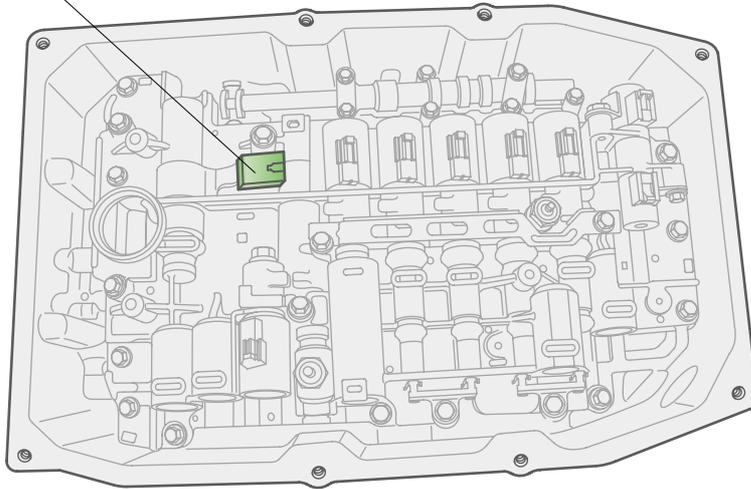
Harder gear shifts may occur.

Example of an NTC resistor characteristic curve



300_074

Geber G93

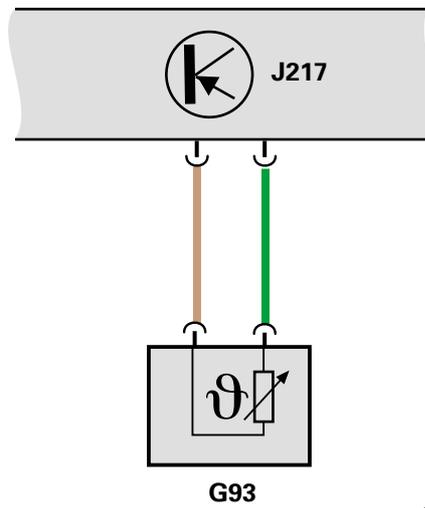


300_013a



Electric circuitry

G93 - gearbox oil temperature sender
J217 - control unit for automatic gearbox



300_047

Sensors

The sender 1 G193 and sender 2 G194 for hydraulic pressure

have the same design and are located in the control valve assembly. They monitor the ATF pressure behind the safety slides in the control valve assembly. This prevents couplings that do not correspond to the switch programme from closing. As a result, blocking of the gearbox is hindered.

They function as diaphragm pressure senders. If the ATF pressure reaches a critical value, the pressure membranes are bent, closing the electrical circuit.



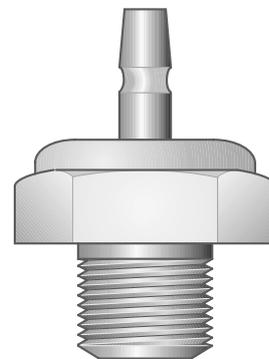
Signal utilisation

The signal is used to monitor the clutch control unit.

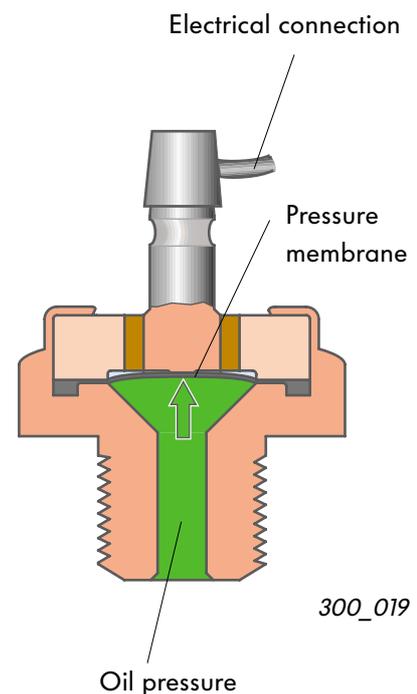
If the ATF pressure is incorrect, the clutches are not activated.

Effects of signal drop-out

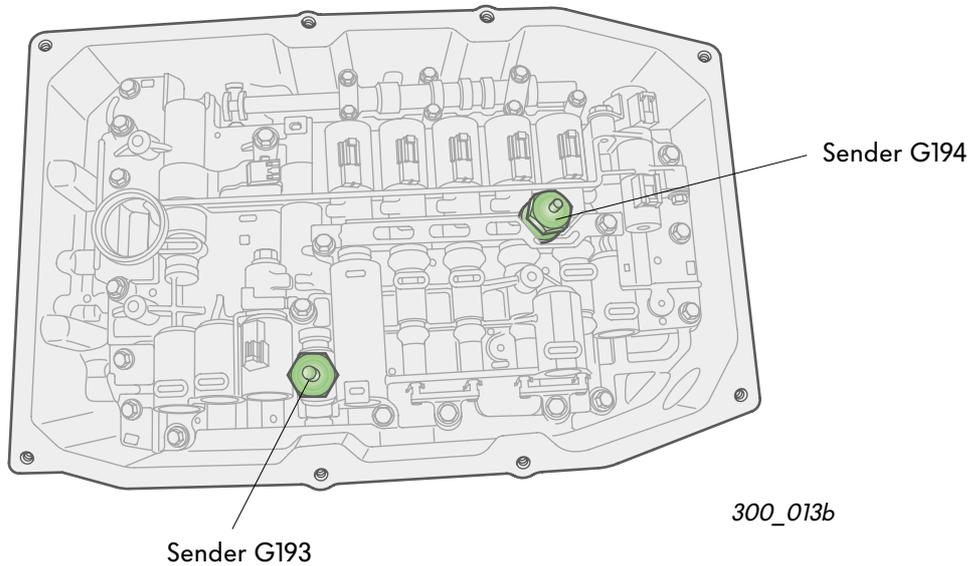
Incorrect pressure signals can have effects in the control unit of the shifting unit.



300_015

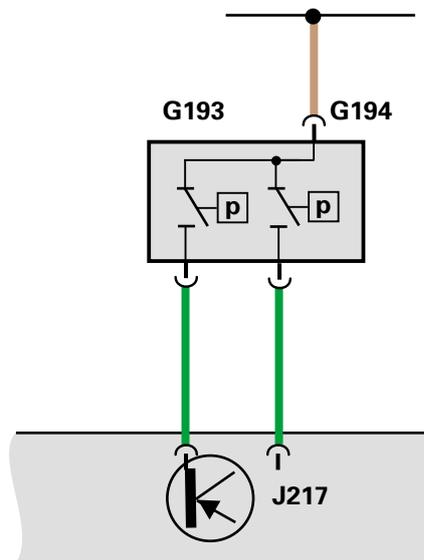


300_019



Electric circuitry

- G193 - sender 1 for hydraulic pressure, automatic gearbox
- G194 - sender 2 for hydraulic pressure, automatic gearbox
- J217 - control unit for automatic gearbox



300_048

Sensors

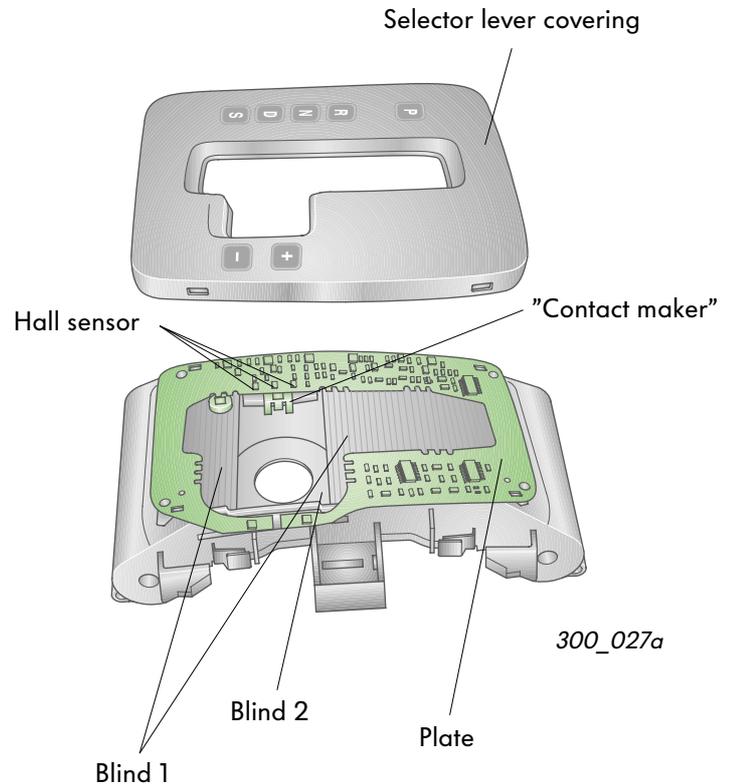
The switch for Tiptronic F189

is located under the selector lever covering on the plate.

A ferromagnetic "contact maker" is attached to each blind of the selector lever.

The combination of the contact maker on blind 2 and the three Hall sensors on the plate form the switch for Tiptronic F189.

When the blinds are moved, the contact makers change their position under the plate. In this way, a different Hall sensor is always activated – "switched" – and sends a signal to the control unit for the automatic gearbox.



Signal utilisation

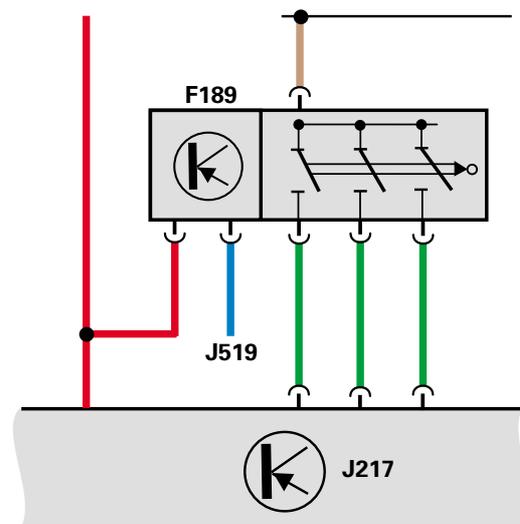
In the Tiptronic channel, tipping "to the front" results in moving up a gear and tipping "to the back" results in moving down a gear by the control unit for the automatic gearbox.

Effect of signal drop-out

When the signal drops out, the Tiptronic function using the selector lever can no longer be used.

Electric circuitry

- F189 - switch for Tiptronic
- J217 - control unit for automatic gearbox
- J519 - control unit for on-board network
(The link to the selector lever lighting is required.)



300_049

The switches for Tiptronic in the steering wheel F438 and F439

are located to the left and right behind the steering wheel.

The gears are switched by tipping the switches towards the steering wheel.

The right switch (E438) is used to move up a gear "+" and the left switch (E439) is used to move down a gear "-".

Signal utilisation

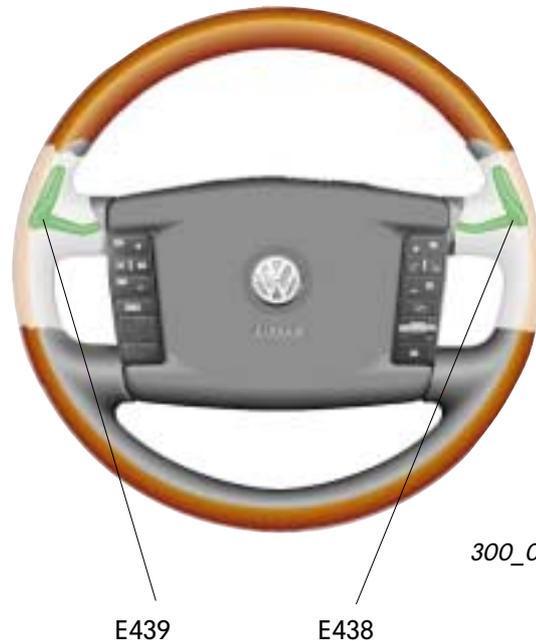
In Tiptronic mode, these switches can also be used to change gears. The switching signal is sent to the control unit for the automatic gearbox.

If the Tiptronic switches on the steering wheel are pressed in the automatic mode, the gearbox control unit enters the Tiptronic mode.

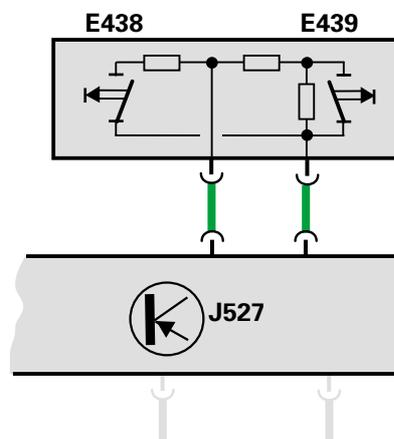
If the Tiptronic switches on the steering wheel are no longer pressed, the gearbox control unit automatically enters the Automatic mode.

Effect of signal drop-out

If the signal drops out, the Tiptronic functions using the steering wheel switch can no longer be used.



300_028



300_050

Electric circuitry

- E438 - switch for Tiptronic in the steering wheel
- E439 - switch for Tiptronic in the steering wheel
- J527 - control unit for steering wheel electronics

Actuators

Solenoid valves

Solenoid valves are used as electrohydraulic switching elements in the electronically controlled automatic gearbox.

There are switching solenoid valves (yes/no valves) and control solenoid valves (modulation valves).

The solenoid valve N88

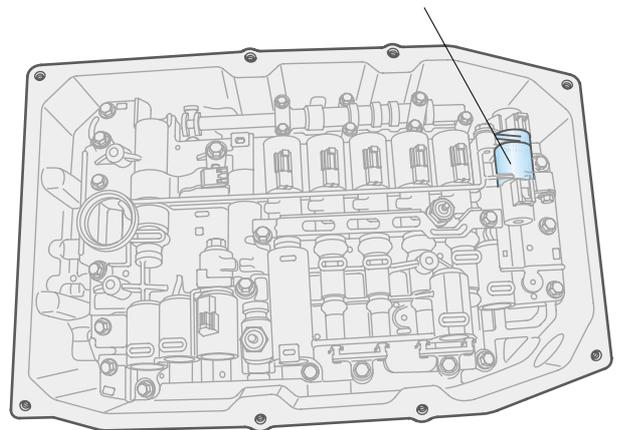
works as a yes/no solenoid valve, opening or closing an ATF channel.

If the solenoid valve is open, the gears 4 to 6 can be activated.

The solenoid valve also improves the switching transition from 5th to 6th gear.

If it is not under power, the solenoid valve is closed.

Solenoid valve N8



300_013c



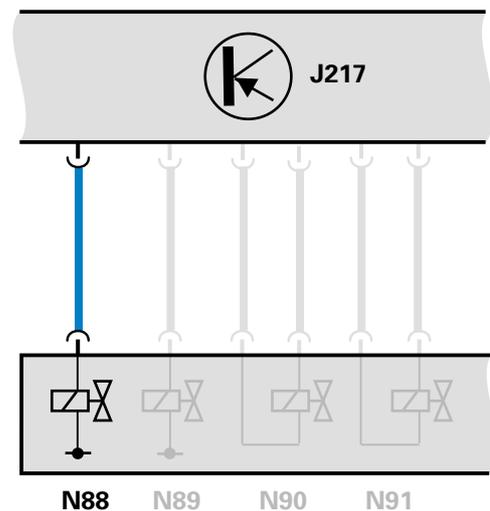
Effect of signal or actuator drop-out

The gears 4 to 6 can no longer be activated.

Electric circuitry

J217 - control unit for automatic gearbox

N88 - solenoid valve



300_051

The solenoid valve N89

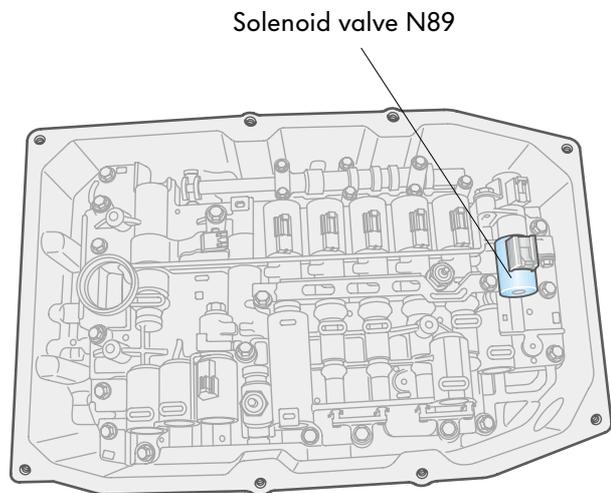
is located in the control valve assembly.

It works as a yes/no solenoid valve, opening or closing an ATF channel.

When the solenoid valve is opened, the ATF pressure on the converter bypass coupling is increased.

If the solenoid valves N88 and N89 are opened simultaneously, the brake B2 closes so that the "engine brake" is effective in Tiptronic mode, 1st gear.

If it is not under power, the valve is closed.



300_013d

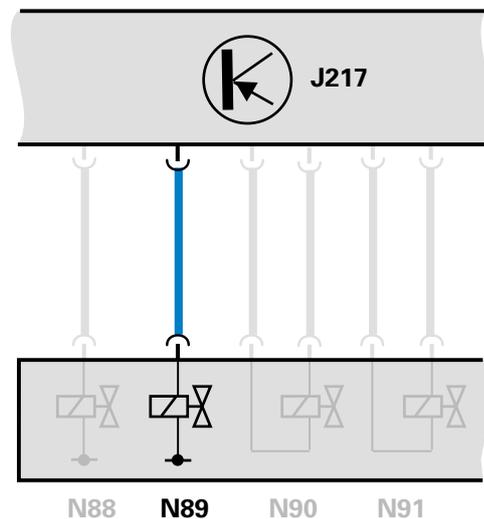
Effect of signal drop-out

If the signal to the solenoid valve N89 drops out, the converter bypass coupling can no longer be subjected to the maximum ATF pressure. Driving with the "engine brake" is impossible.

Electric circuitry

J217 - control unit for automatic gearbox

N89 - solenoid valve



300_052



Actuators

The solenoid valve N90

is located in the control valve assembly.

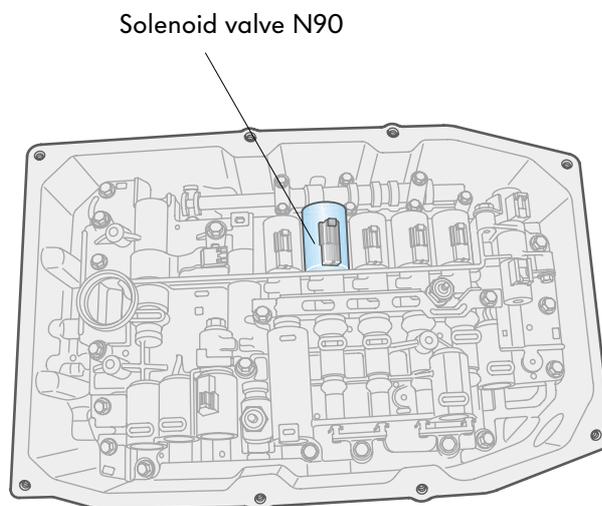
It is a modulation valve that controls the ATF pressure to the multi-disc coupling K1.

If it is not under power, the solenoid valve is closed.

In this switching state, the maximum ATF pressure works on the coupling.

Effect of signal drop-out

If the solenoid valve is defective or if it cannot be activated, switching of gears 1 to 4 may be harder.



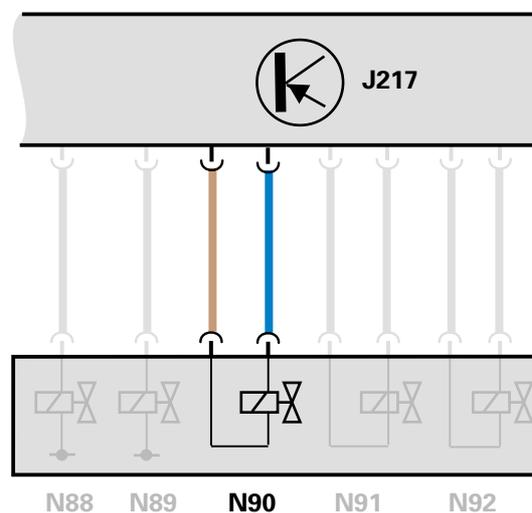
300_013e



Electric circuitry

J217 - control unit for automatic gearbox

N90 - solenoid valve



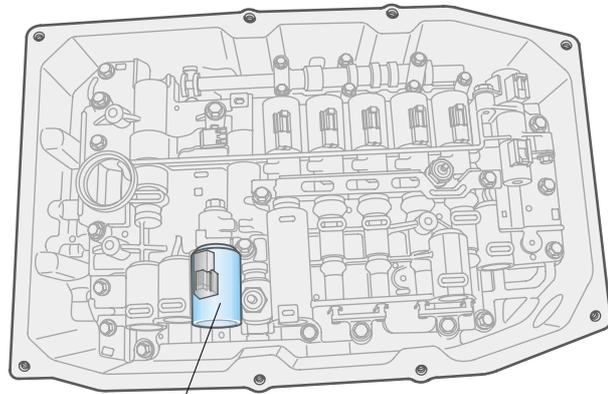
300_055

The solenoid valve N91

is located in the control valve assembly.

It is a modulation valve that controls the ATF pressure on the converter bypass coupling.

If the solenoid valve N91 is not under power, the converter bypass coupling is open.



300_013f

Solenoid valve N91



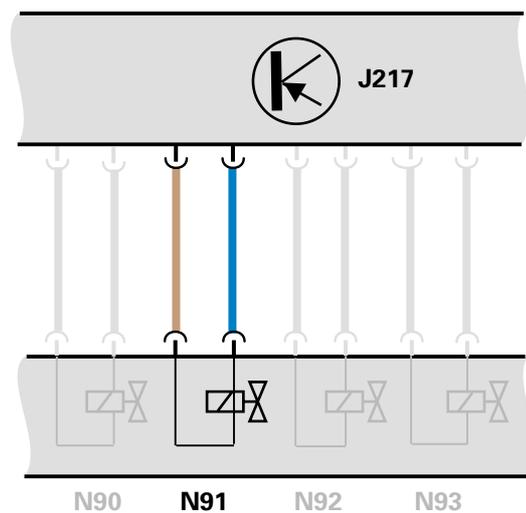
Effect of signal drop-out

The converter bypass coupling is not closed.

Electric circuitry

J217 - control unit for automatic gearbox

N91 - solenoid valve



300_057

Actuators

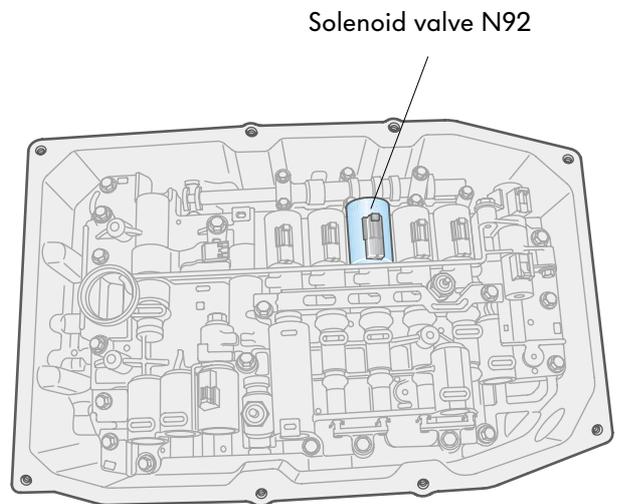
The solenoid valve N92

is integrated in the control valve assembly.

It is a modulation valve that controls the ATF pressure to the multi-disc coupling K3.

If it is not under power, the solenoid valve is closed.

In this switching state, the maximum ATF pressure works on the coupling.



300_013g



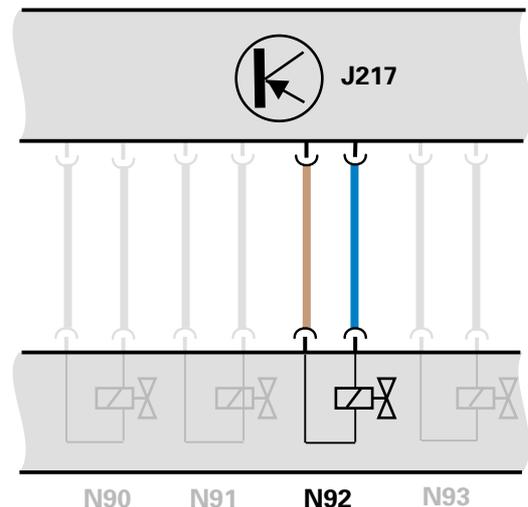
Effect of signal drop-out

If the solenoid valve is defective or if there is a fault in the circuit, switching of gears 3, 5 and R may be harder.

Electric circuitry

J217 - control unit for automatic gearbox

N92 - solenoid valve



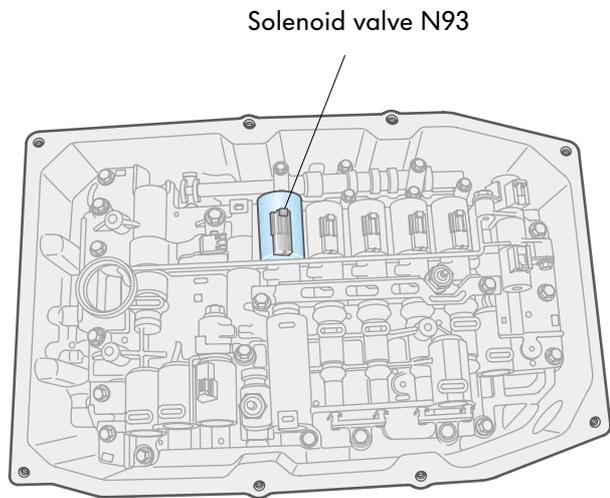
300_053

The solenoid valve N93

is located in the control valve assembly.

It is a modulation valve that controls the main ATF pressure in the gearbox, depending on the engine torque.

If it is not under power, the solenoid valve is closed, so that the gearbox works with the maximum ATF pressure.



300_013h

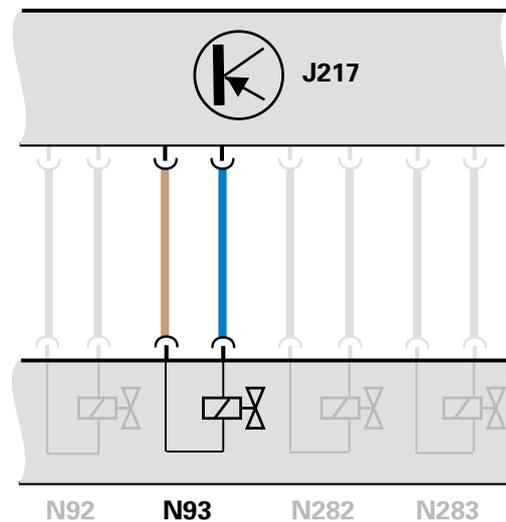
Effect of signal drop-out

If the solenoid valve is defective or if there is a fault in the circuit, switching of all gears may be harder.

Electric circuitry

J217 - control unit for automatic gearbox

N93 - solenoid valve



300_058



Actuators

The solenoid valve N282

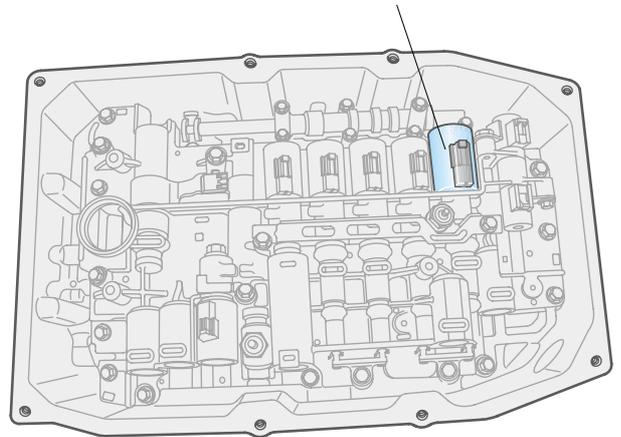
is located in the control valve assembly.

It is a modulation valve that controls the ATF pressure to the multi-disc coupling K2.

If it is not under power, the solenoid valve is closed.

In this switching state, the coupling is closed with the maximum pressure.

Solenoid valve N282



300_013i

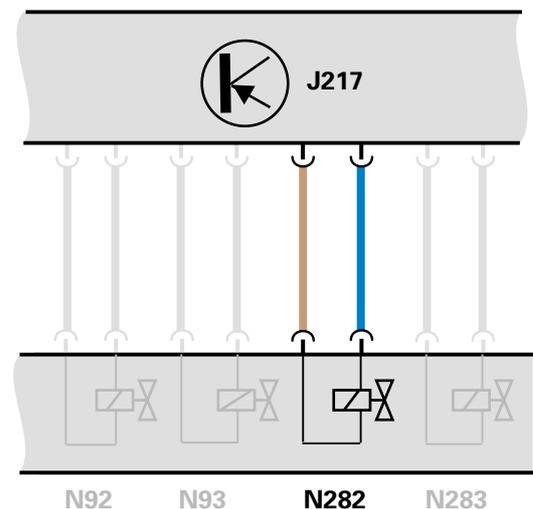


Effect of signal drop-out

If the solenoid valve is defective or if there is a fault in the circuit, switching of gears 4 to 6 may be harder.

Electric circuitry

J217 - control unit for automatic gearbox
N282 - solenoid valve



300_054

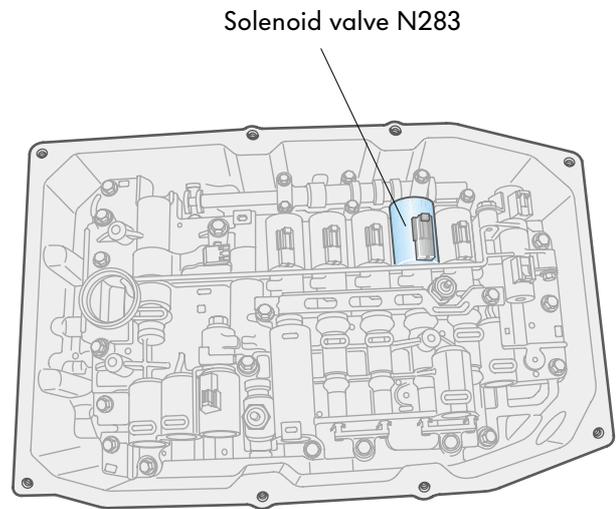
The solenoid valve N283

is located in the control valve assembly.

It is a modulation valve that controls the ATF pressure to the multiple-disc brake B1.

The solenoid valve closes depending on the current strength.

If it is not under power, the brake is closed with the maximum ATF pressure.



300_013j

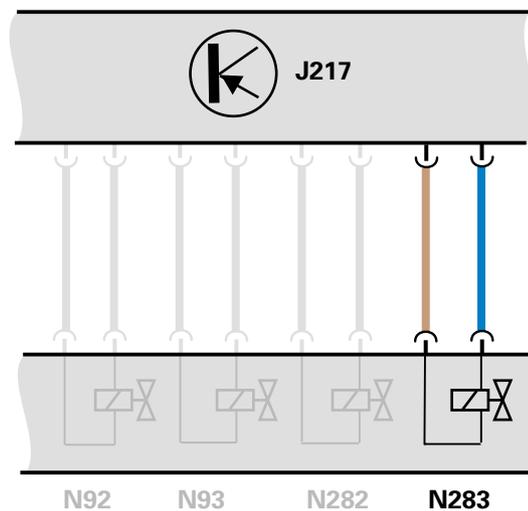
Effect of signal drop-out

If the solenoid valve is defective or if there is a fault in the circuit, switching of gears 2 and 6 may be harder.

Electric circuitry

J217 - control unit for automatic gearbox

N283 - solenoid valve



300_056



Actuators

The magnet for selector lever lock N110

is located in the selector lever frame.

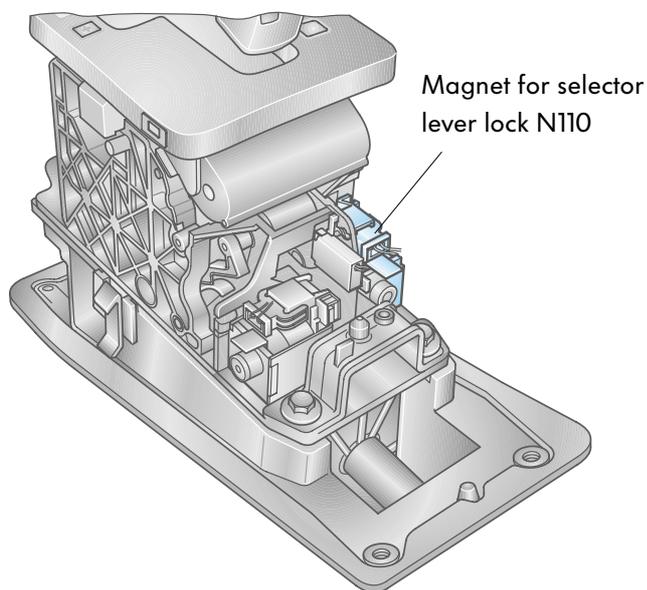
It is an electromagnet that prevents the selector lever from moving out of the "P" position when the ignition is switched on.

If the selector lever is to be moved from this position, the foot brake must be pressed.

If the ignition is switched on, the control unit for the automatic gearbox supplies the magnet with power.

The magnet blocks the selector lever.

If the foot brake is pressed, the control unit switches off the power to the magnet so that the selector lever can be pressed.



300_021a



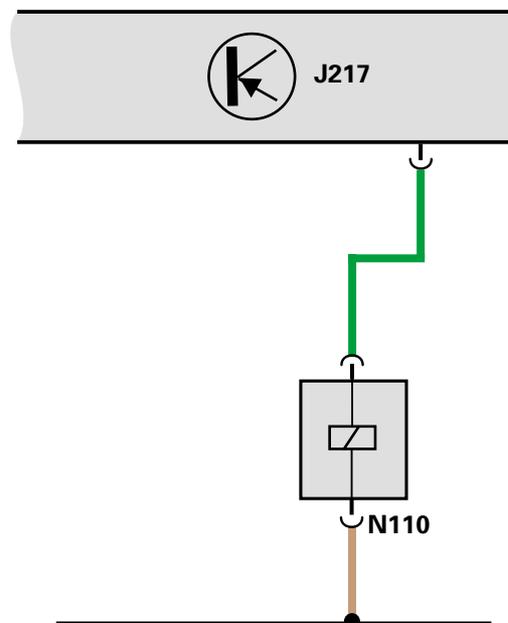
Effect of signal drop-out

If the solenoid valve is defective or if there is a fault in the circuit, the selector lever can be pressed without having to press the foot brake.

Electric circuitry

J217 - control unit for automatic gearbox

N110 - magnet for selector lever lock



300_059

Check your knowledge

Which answers are correct?

One, several or all answers can be correct.

1. Name two types of solenoid valves that are used for the gearbox control unit.

.....

2. On which part(s) of the automatic gearbox are brakes B1 and B2 supported?

.....

3. Name the components of a simple planetary gear set.

.....

4. What is the replacement interval for the ATF filling of the automatic gearbox?

- a) 20,000 km
- b) 2 years
- c) none (lifetime filling)

.....

5. On which principle is the Lepelletier arrangement based?

- a) two series-connected simple planetary gear sets
- b) one simple and one subsequent dual planetary gear set
- c) two series-connected dual planetary gear sets



1. Yes/no valves and modulation valves; 2. On the gearbox housing; 3. Internal gear, planetary wheels, sun wheel and planetary carrier; 4. c; 5. b

Operational diagram

Component

E438 - switch for Tiptronic in the steering wheel
 E439 - switch for Tiptronic in the steering wheel

F125 - multifunction switch
 F189 - switch for Tiptronic
 F319 - switch for selector lever in P

G93 - gearbox oil temperature sender
 G182 - gearbox input speed sender
 G193 - sender 1 for hydraulic pressure, automatic gearbox
 G194 - sender 2 for hydraulic pressure, automatic gearbox
 G195 - gearbox output speed sender

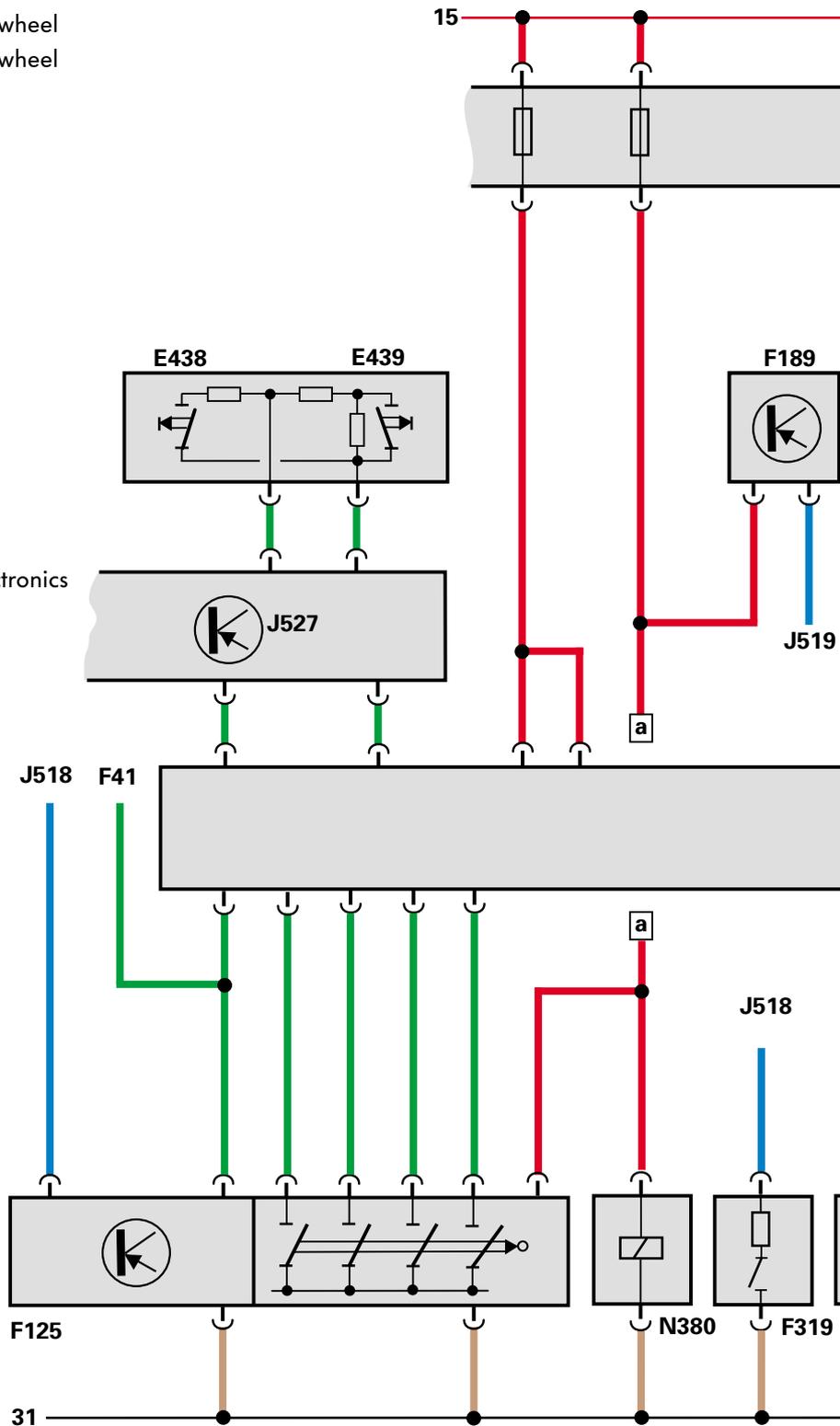
J217 - control unit for automatic gearbox
 J527 - control unit for steering wheel electronics

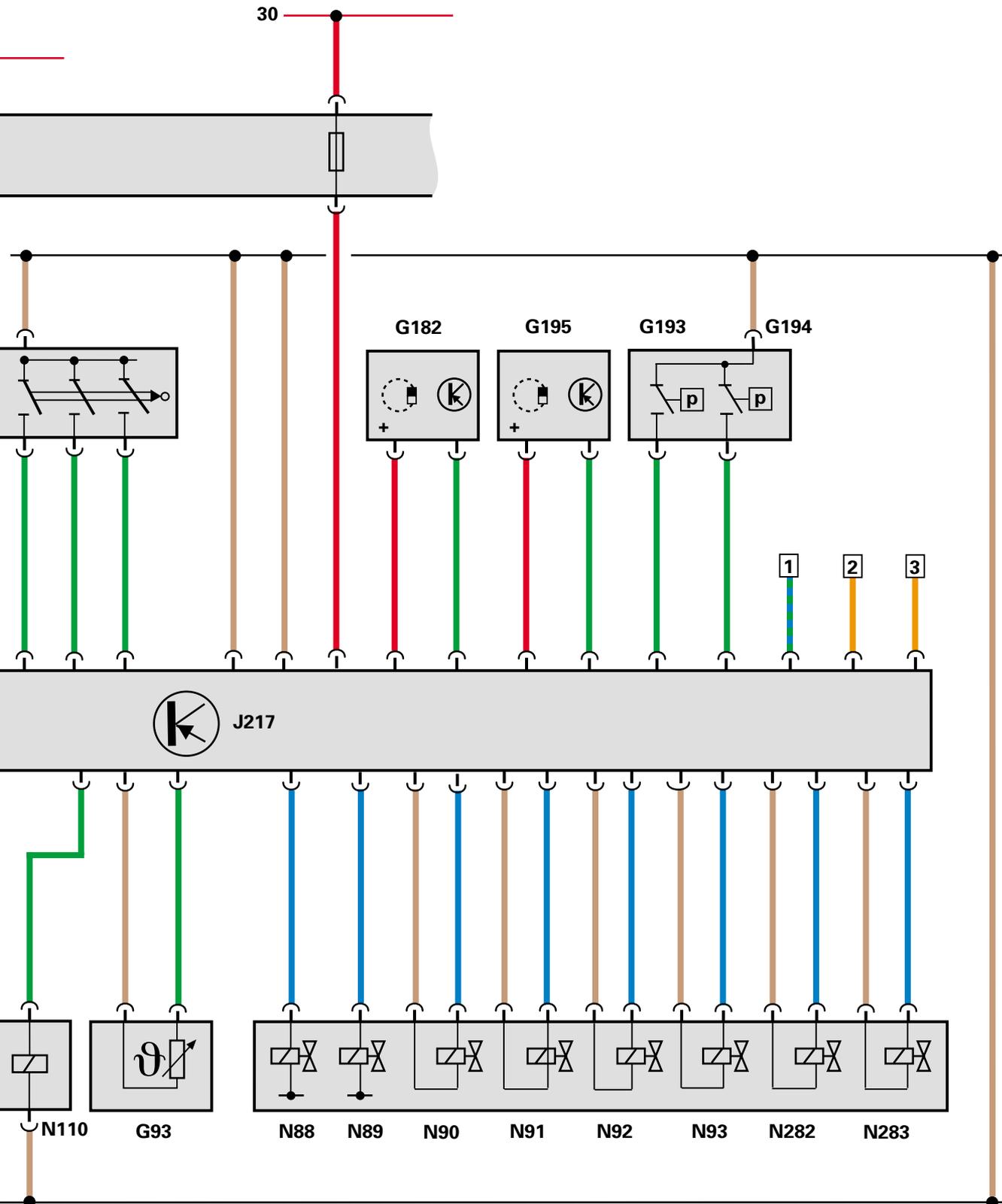
N88 - solenoid valve 1
 N89 - solenoid valve 2
 N90 - solenoid valve 3
 N91 - solenoid valve 4
 N92 - solenoid valve 5
 N93 - solenoid valve 6
 N110 - magnet for selector lever lock
 N282 - solenoid valve 9
 N283 - solenoid valve 10
 N380 - magnet for selector lever lock P

Additional signals

F41 - reverse gear switch
 J518 - control unit for access and start authorisation
 J519 - control unit for on-board network

- 1 Self-diagnosis
- 2 CAN data bus high
- 3 CAN data bus low





300_032

Self-diagnosis

Diagnostics

For vehicle diagnostics, measurement and information systems VAS 5051 and VAS 5052, the operating modes

- Guided error search and
- Mobile vehicle self-diagnosis are available

The operating mode "Guided error search"

carries out a vehicle-specific check of all installed control units for incorrect entries and automatically compiles an individual checking plan from the results.

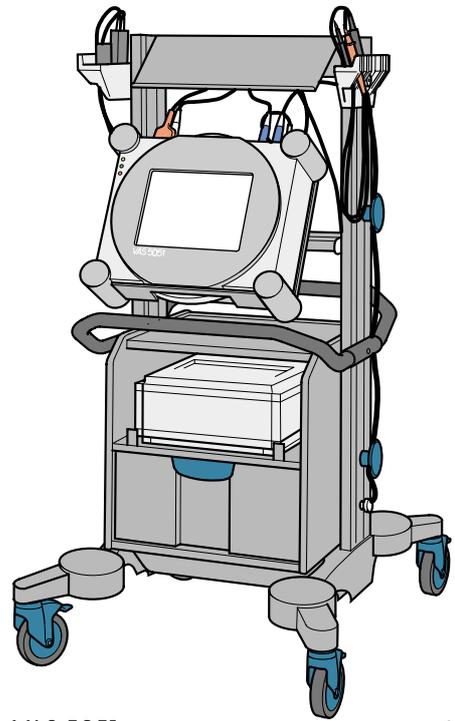
Together with the ELSA information, such as circuit diagrams or repair guidelines, this provides a specific target for trouble-shooting.

Independent of this, you can compile your own checking plan.

The function and component selection incorporates the checks that you select into the checking plan; these can be processed in the continued diagnostics procedure in any order.

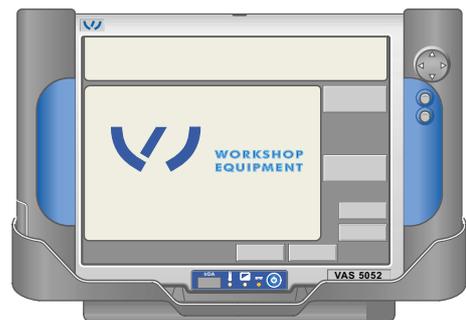
Although the "Vehicle self-diagnosis"

operating mode can still be used, ELSA no longer provides any additional information.



VAS 5051

300_060



VAS 5052

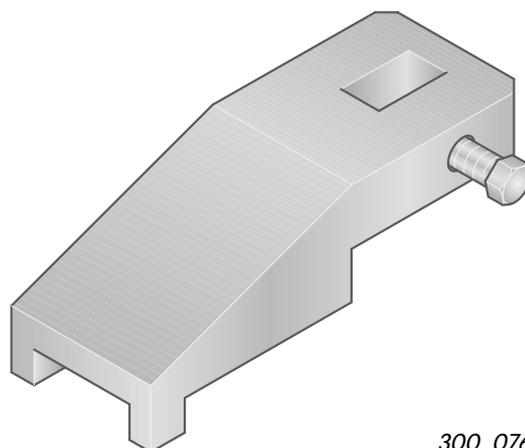
300_084



New tools

Setting gauge for multifunction switch T10173

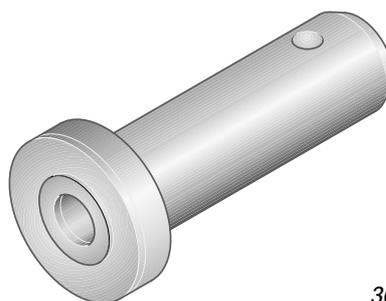
This is required to set the multifunction switch when repairs are completed.



300_076

Pressure piece T10174

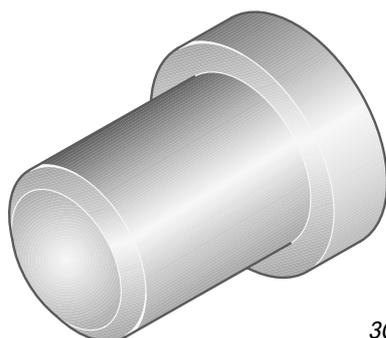
This is required to knock in the gaskets on the shaft for the multifunction switch.



300_077

Pressure piece T10180

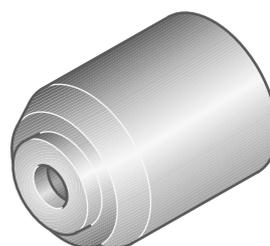
This is required to knock in the gaskets of the drive shaft.



300_078

Sleeve T10186

This must be placed on the serration of the drive shaft before the gasket is attached to prevent damage during attachment of the gasket.



300_079





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000.2811.20.20 Technical status 08/02

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