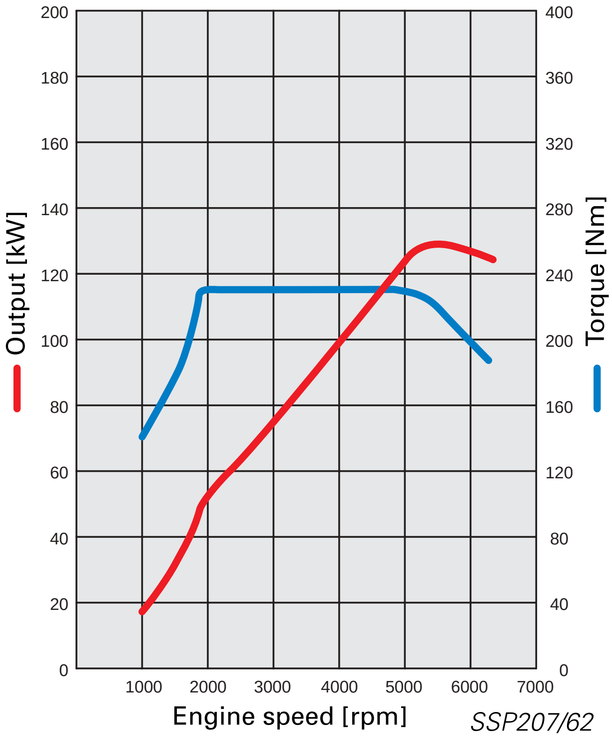
Drive units

Engine and gearbox



SSP207/62

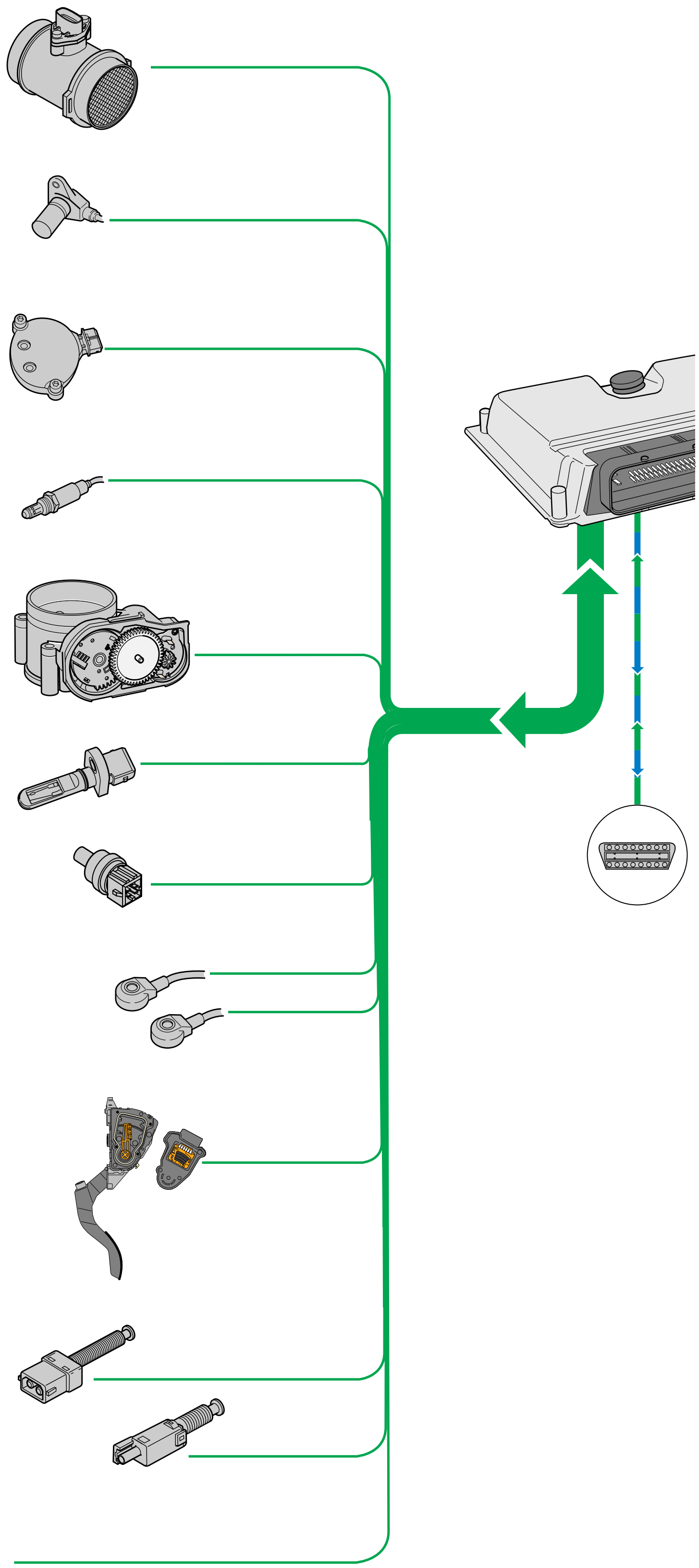
Technical modifications:
Basic 110 kW (150 bhp)

– EU II + D3
– electronic throttle control
– "Tumble" duct
(For details of the tumble duct in the intake system, refer to SSP 198)
– Engine control unit (characteristic curves adapted)
– CAN-BUS with TCS/EDL/ESP
– electr. activated air divert control valve

Drive units

System overview – 1.8-ltr. 132 kW 5V turbocharged

Sensors



Hot-film air mass meter G70

Engine speed sender G28

Hall sender G40

Lambda probe G39

Throttle valve control unit J338
with angle sender G187 for
throttle valve gear G186

Intake air temperature sender G42

Coolant temperature sender
G2 and G62

Knock sensor 1 (cyl. 1 - 2) G61
Knock sensor 2 (cyl. 3 - 4) G66

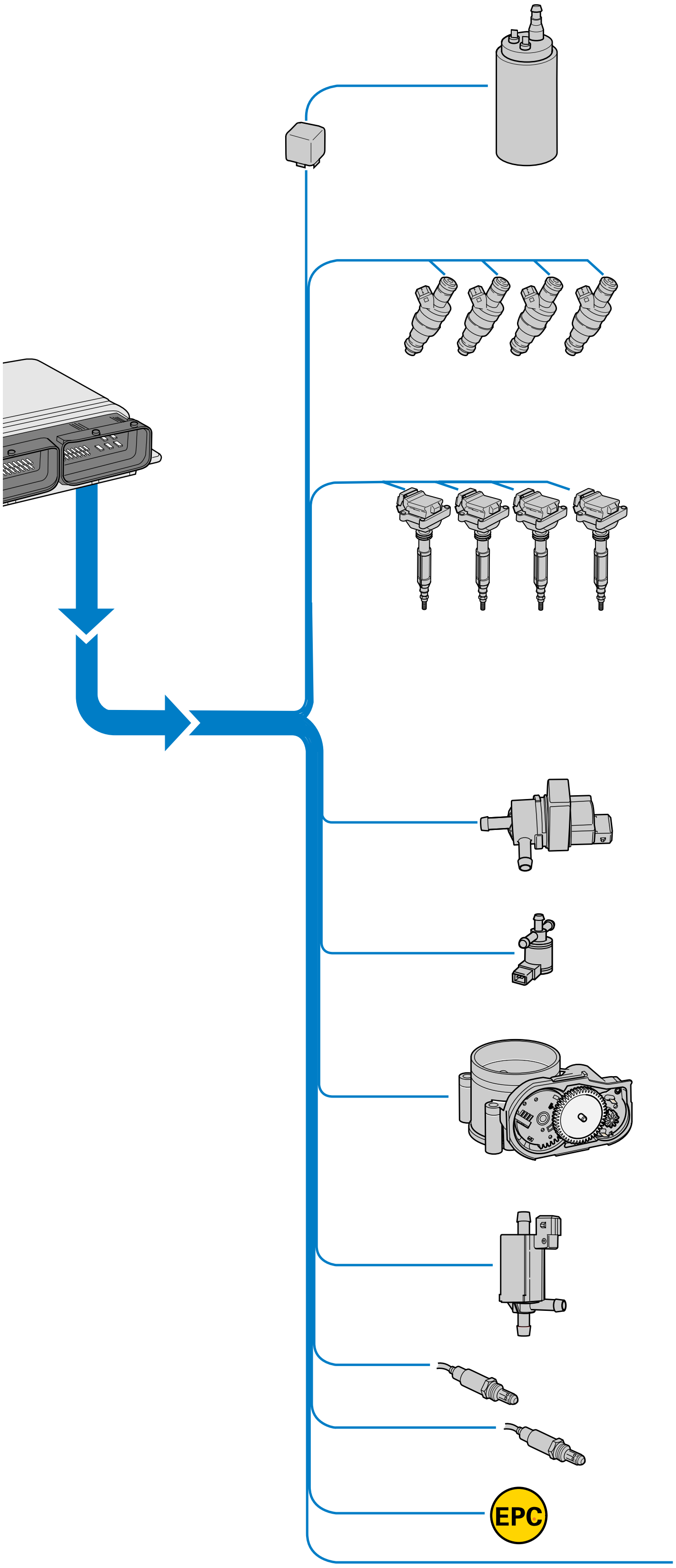
Accelerator pedal module with accele-
rator position sender G79 and G185

Brake light switch F and brake
pedal switch F47

Clutch pedal switch F36

Auxiliary signals:
Pressure switch for power steering F88
Cruise control
Intake manifold pressure sender G71

Actuators



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Fuel pump relay J17 and fuel pump G6

Injection valves N30, N31, N32, N33

Power output stage N122 and ignition coils N (1st cyl.), N128 (2nd cyl.), N158 (3rd cyl.) and N163 (4th cyl.) with integrated power output stage

Solenoid valve for activated charcoal canister N80

Solenoid valve for charge pressure limitation N75

Throttle valve control unit J338 with throttle valve gear G186

Air recirculation valve for turbocharger N249

Heater for lambda probe Z19

Fault lamp for electronic throttle control K132

Auxiliary signals

Function chart

Turbocharged 1.8-ltr. 132 kW 5V engine

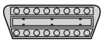
Motronic ME 7.5

Components

A	Battery
E45	Switch for cruise control system
E227	Button for cruise control system
F	Brake light switch
F36	Clutch pedal switch
F88	Power steering (pressure switch)
G6	Fuel pump
G28	Engine speed sender
G39	Lambda probe
G40	Hall sender with quick-start sender wheel
G42	Intake air temperature sender
G61	Knock sensor 1
G62	Coolant temperature sender
G66	Knock sensor 2
G70	Air mass meter
G71	Intake manifold pressure sender
G79	Accelerator position sender
G186	Throttle valve gear (electronic throttle control)
G187	Throttle valve drive angle sender 1
G888	Throttle valve drive angle sender 1
J17	Fuel pump relay
J220	Motronic control unit
K132	Fault lamp for electronic throttle control
M9/10	Stop lights
N	Ignition coil
N30...33	Injection valves
N75	Solenoid valve for charge pressure limitation
N80	Solenoid valve for activated charcoal canister
N128	Ignition coil 2
N158	Ignition coil 3
N163	Ignition coil 4
N249	Air recirculation valve for turbocharger
P	Spark plug socket
S	Fuse
Q	Spark plugs
Z19	Heater for lambda probe

Auxiliary signals

CAN-BUS H = } Databus drive
CAN-BUS L = }

A	Engine speed signal (out)
B	Fuel consumption signal (out)
C	Road speed signal (in)
D	Air-conditioner compressor signal (in-out)
E	Air conditioning ready (in)
F	Crash signal (in) from airbag control unit
G	Alternator terminal DF/DFM (in)
	W- line (in-out)

For the applicable Fuse No. and amperage, please refer to the current flow diagram.

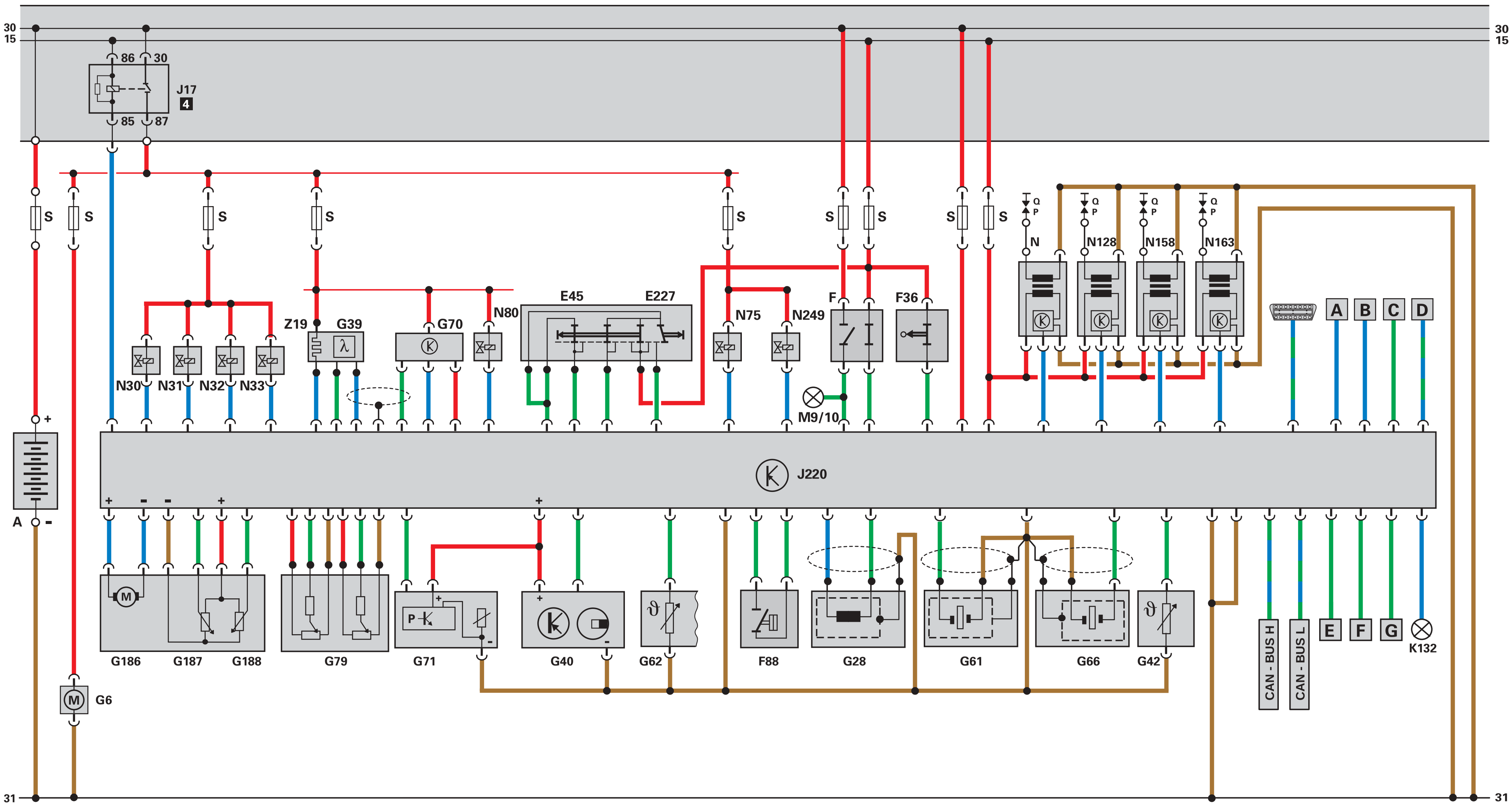
Input signal

Output signal

Positive

Earth

Bidirectional


30
15
J17
4
86
30
85
87
S
A
+
-
N30
N31
N32
N33
Z19
G39
G70
N80
E45
E227
N75
N249
F
F36
M9/10
N
N128
N158
N163
Q
P
A
B
C
D
J220
G186
G187
G188
G79
G71
G40
G62
F88
G28
G61
G66
G42
G6
CAN - BUS H
CAN - BUS L
E
F
G
K132
31

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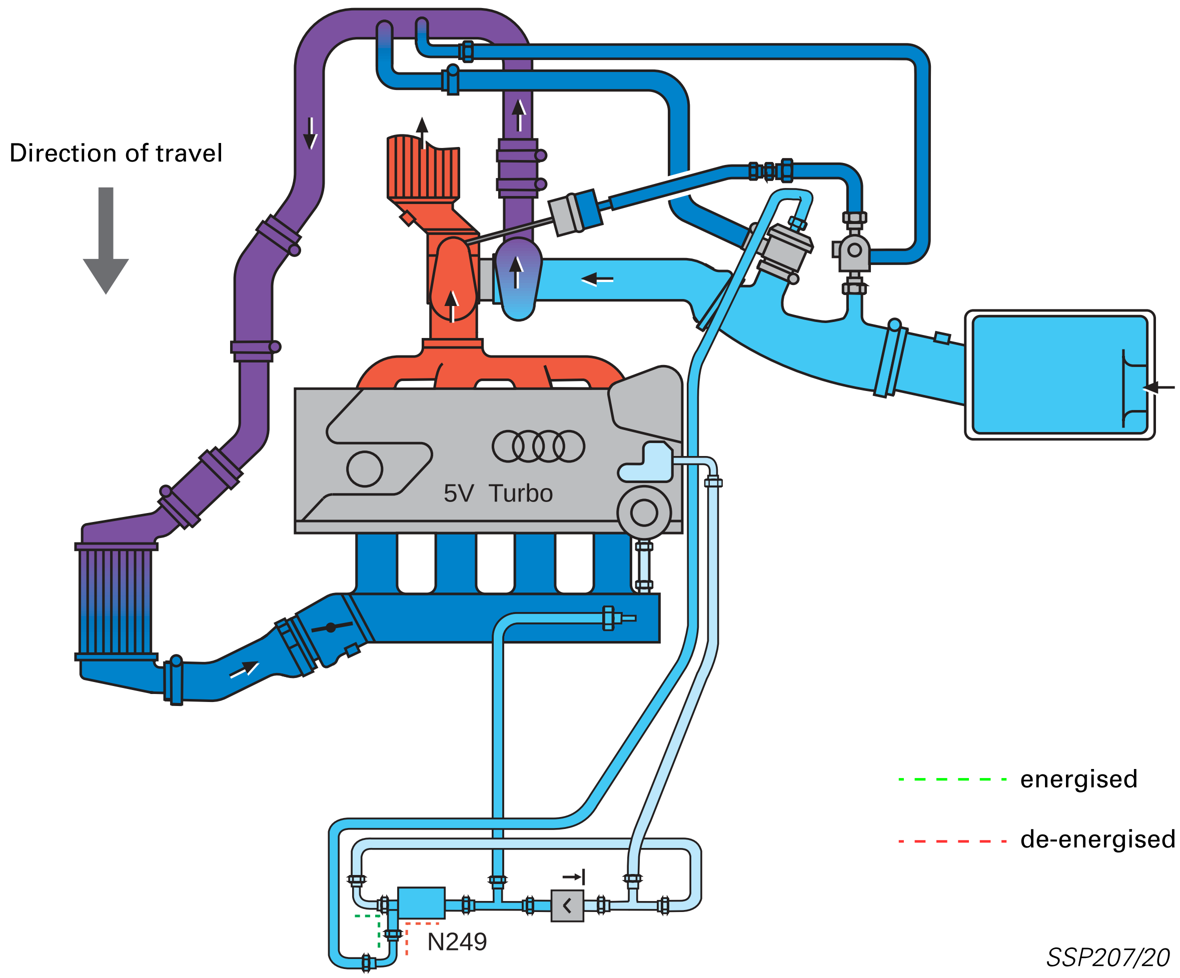
Drive units

Charging



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The turbocharging system comprises the following components:

- Exhaust emission turbocharger
- Charge air cooler
- Charge pressure control
- Air divert control in overrun

The flow energy of the exhaust emissions is transferred to the fresh air entering the exhaust gas turbocharger. In the process, the air required for combustion is compressed and the volume of air entering the cylinders per working cycle is thus increased.

The air temperature, increased by compression, is again reduced in the charge air cooler. Since the density of the cooled air is higher, the amount of fuel-air mixture entering the engine is greater, too.

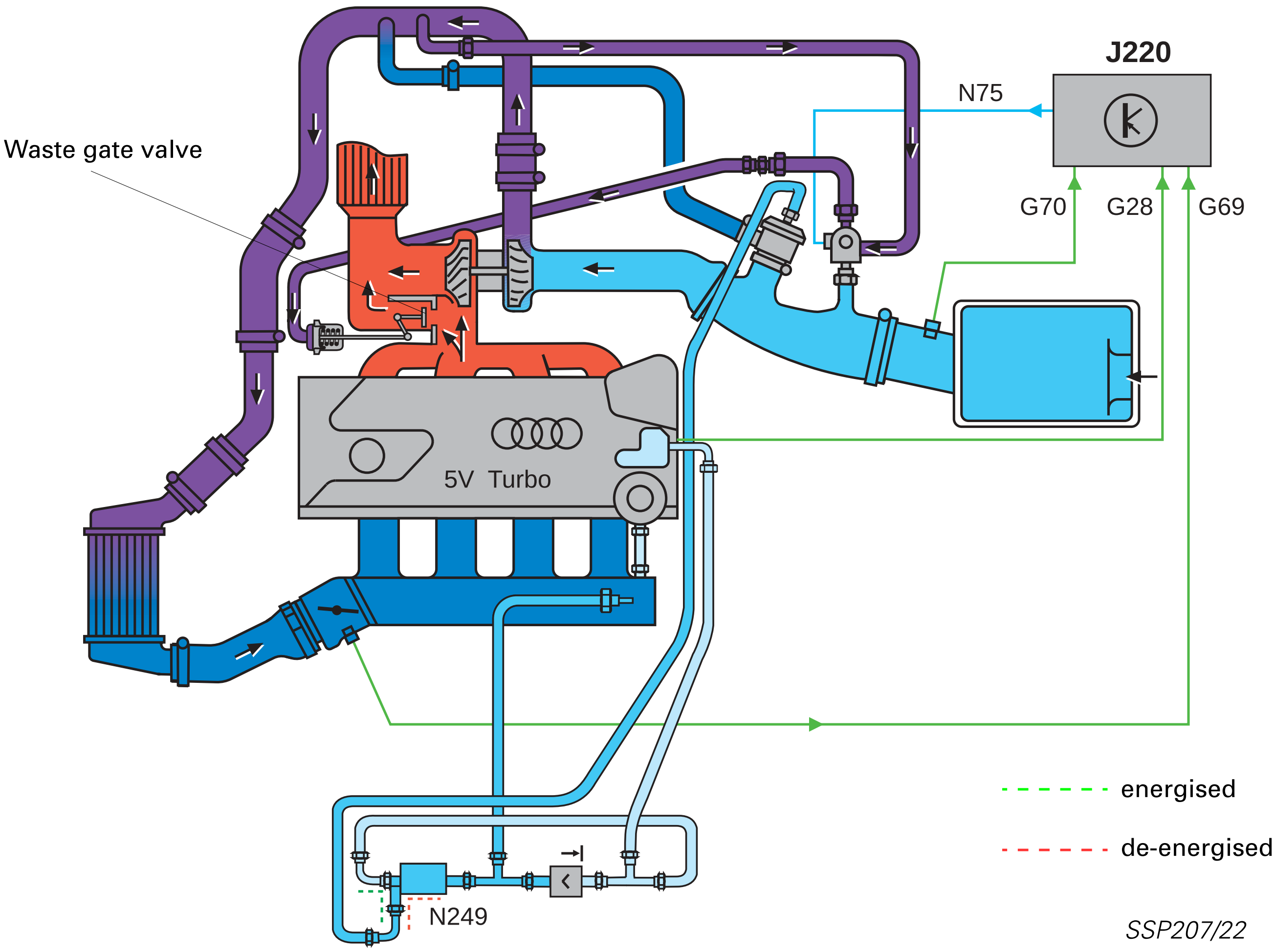
The result is an increase in power output for the same displacement and engine speed.

In the case of the 1.8-ltr. 5V turbocharged engine, turbocharging is also used to provide high torque from the bottom end to the top end of the rev band.

Charge pressure increases in proportion to the turbocharger speed. The charge pressure is limited to prolong the life of the engine. The charge pressure control performs this task.

The air divert control prevents the turbocharger slowing down unnecessarily if the throttle valve closes suddenly.

Charge pressure control



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The engine control unit calculates the charge pressure setpoint from the engine torque request.

The engine control unit regulates the charge pressure as a function of the opening time of the solenoid valves for charge pressure limitation N75. For this purpose, a control pressure is generated from the charge pressure in the compressor housing and the atmospheric pressure.

This control pressure counteracts the spring pressure in the charge pressure control valve (vacuum box) and opens or closes the waste gate valve in the turbocharger.

In the de-energised state, the solenoid valve N75 is closed and the charge pressure acts directly on the vacuum box. The charge pressure control valve opens at low charge pressure.

If the control fails, the maximum charge pressure is limited to a basic charge pressure (mechanical charge pressure).

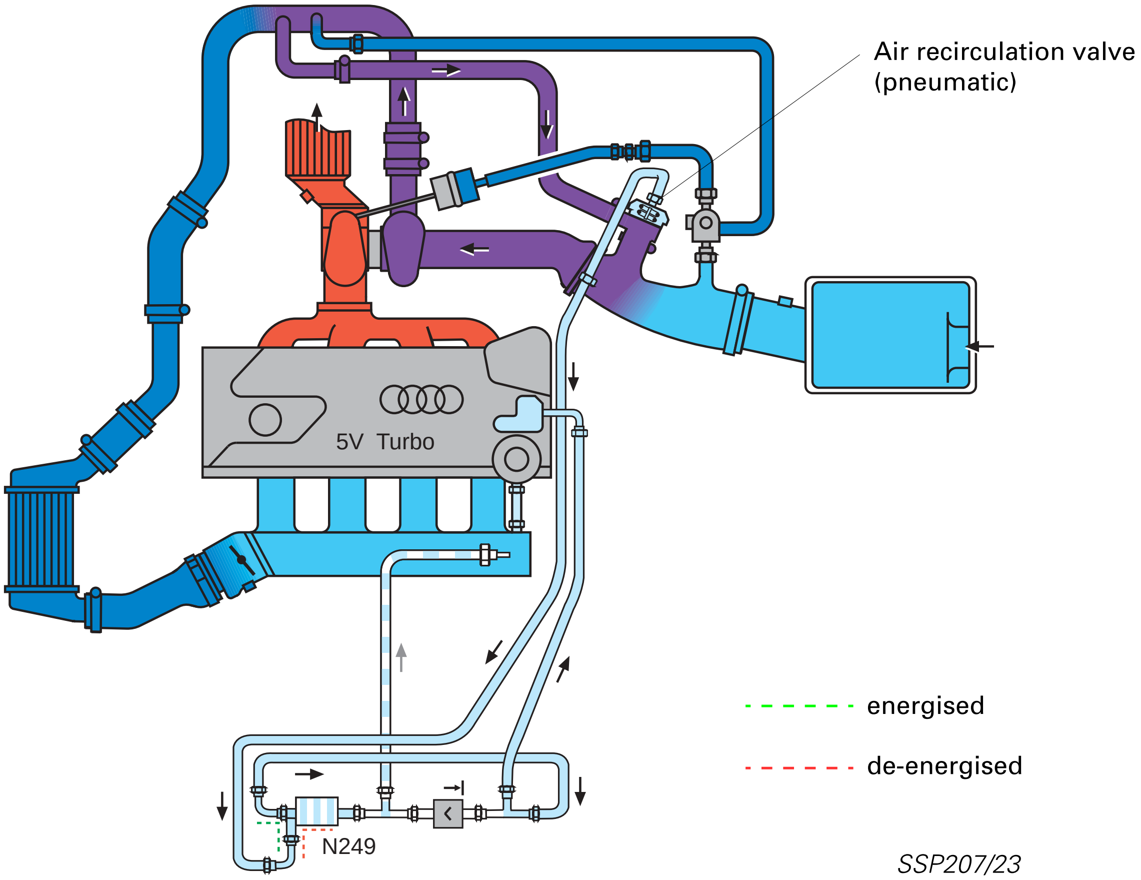
If the bypass is closed, the charge pressure rises. In the lower engine speed range, the turbocharger supplies the charge pressure required to develop high torque or the required volume of air.

As soon as the charge pressure has reached the calculated charge pressure, the bypass opens and a certain quantity of exhaust gas is ducted past the turbine. The turbocharger motor speed decreases, and so too does the charge pressure.

For more detailed information regarding charge pressure control, please refer to SSP 198.

Drive units

Air divert control in overrun



SSP207/23

When the throttle valve is closed, it produces a backpressure in the compressor circuit due to the charge pressure still present. This causes the compressor wheel to decelerate rapidly. When the throttle valve is opened, the speed of the turbocharger must again be increased. The air divert control in overrun prevents turbo lag, which would otherwise occur.

The air recirculation valve is a mechanically activated and pneumatically controlled spring diaphragm valve. It is also activated via an electrically activated air recirculation valve for turbocharger N249. This, in connection with the vacuum reservoir, enables the air recirculation valve N249 to operate independently of the intake manifold pressure. If the air recirculation valve fails, control takes place as a result of the engine vacuum downstream of the throttle valve.

As soon as the throttle valve is closed, the air recirculation valve briefly closes the compressor circuit.

The vacuum counteracts the spring in the valve. The valve opens, and the compressor and intake sides of the compressor circuit close for a short period of time. There is no deceleration of the compressor wheel.

When the throttle valve re-opens, the intake manifold vacuum drops. The air recirculation valve is closed by the spring force. The compressor circuit no longer closes briefly. Full charger speed is available immediately.

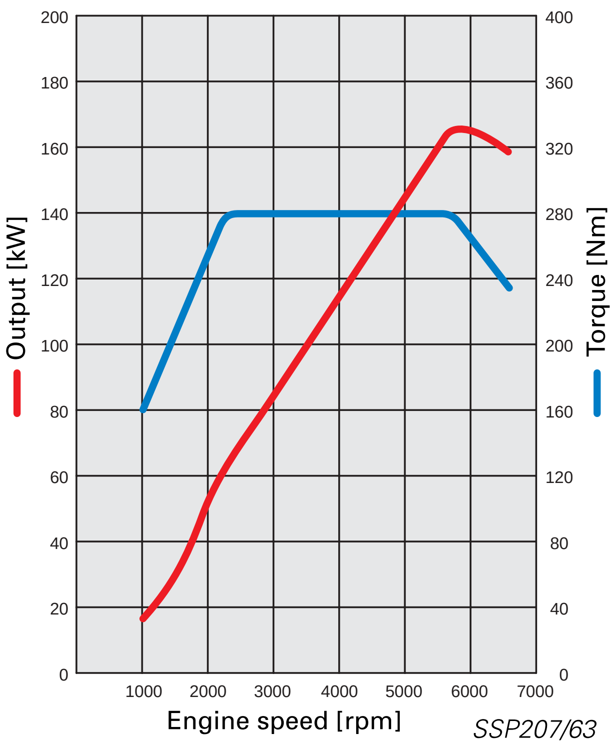
For more detailed information regarding the air divert control in overrun, please refer to SSP 198.

1.8-ltr. 5V 165 kW APX turbocharged engine

SSP207/14

Specifications

Engine code:	APX
Type:	4-cylinder 5-valve four-stroke-petrol engine with exhaust gas turbocharger
Valve timing:	Double overhead camshaft (DOHC)
Displacement:	1781 cm^3
Bore:	81 mm
Stroke:	86.4 mm
Compression ratio:	9 : 1
Rated output:	165 kW at 5900 rpm
max. torque:	280 Nm at 2200 to 5500 rpm
Engine management:	ME 7.5
Fuel:	Premium unleaded 98 RON
Exhaust gas treatment:	Twin-flow catalytic converter, one heated lambda probe upstream and downstream of the catalytic converter



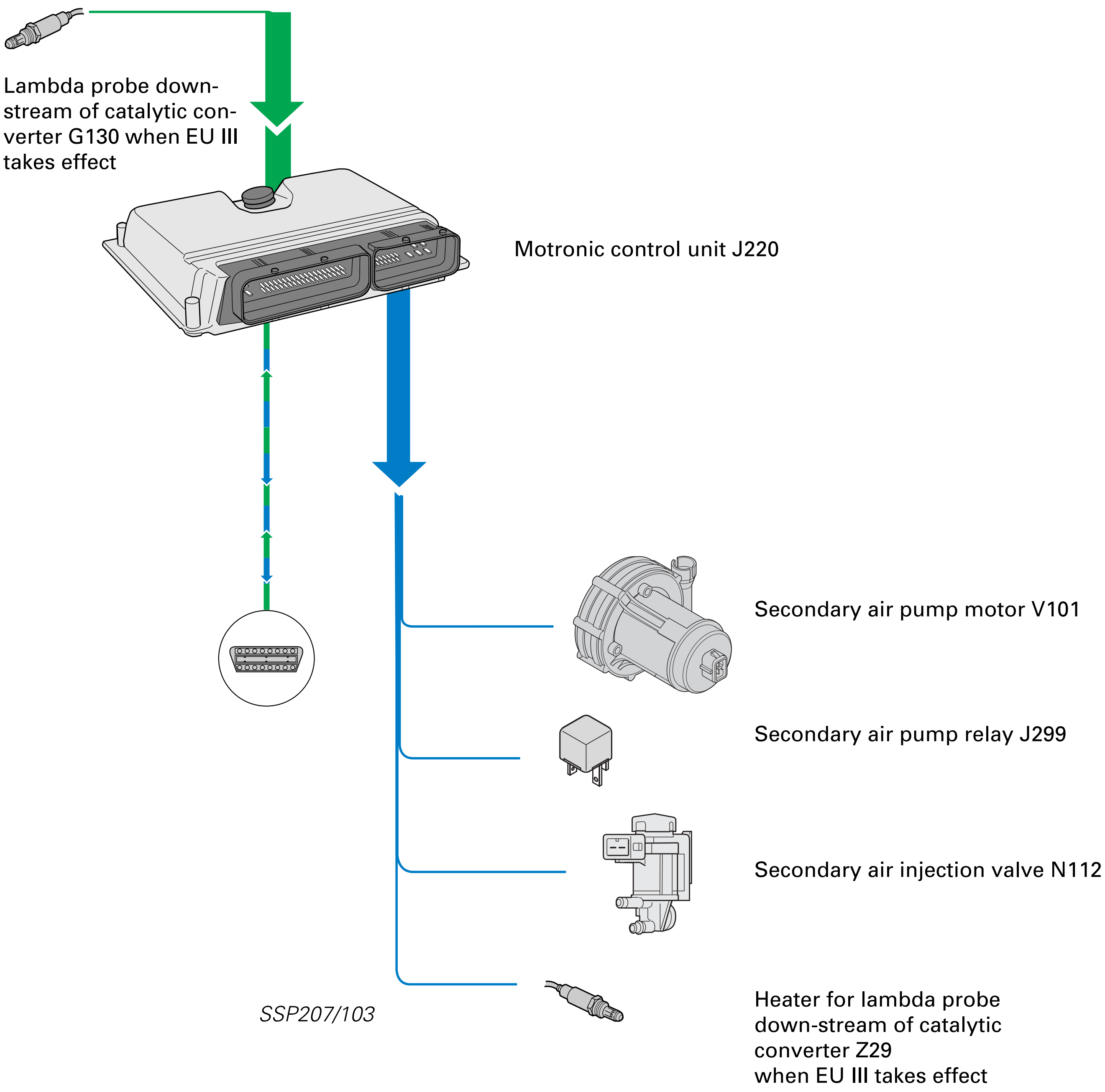
SSP207/63

Technical modifications:
Basic 132 kW (180 bhp)

- Cooling water afterrun pump (approx. 10 min)
- Secondary air system
- Piston (modified), thus changing the compression ratio to 9.0 : 1 from 9.5 : 1
- Manifold (new exhaust and flange)
- When EU III takes effect, there will be a 2nd lambda probe downstream of catalytic converter for catalyst monitoring
- 2 in-line charge air coolers
- Injection valves (higher flow)
- Quick-start sender wheel
- Piston cooling by oil injectors (volumetric flow adaptation)
- Hot-film air mass meter with reverse flow detector HFM5 integrated in the intake air filter upper section
- Single-flow throttle valve unit integrated in the electronic throttle control positioner

Drive units

Extended system overview - 1.8-ltr. 165 kW 5V engine

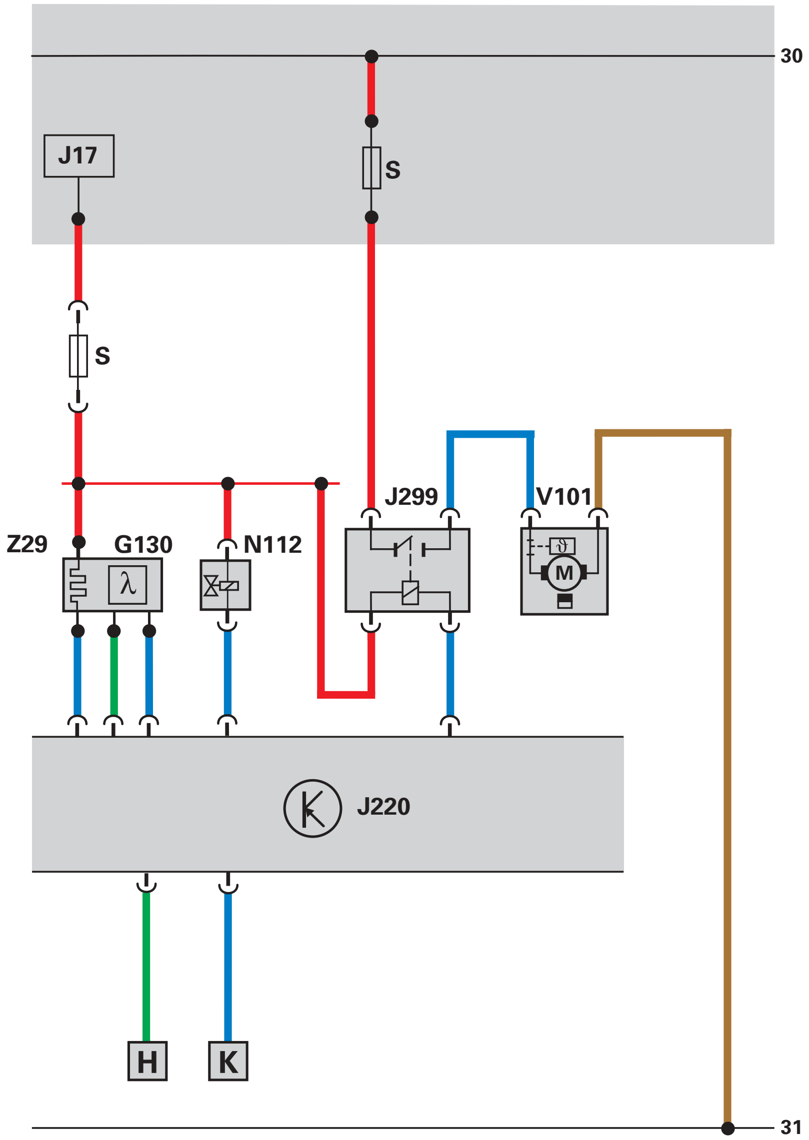


SSP207/103

The secondary air system in the 1.8-ltr. 5V engine developing 165 kW ensures that the exhaust emissions comply with the EU III+D3 standard.

A probe will be installed downstream of the catalytic converter to meet the requirements stipulated in EU III.

Extended function diagram - 1.8-ltr. 165 kW 5V engine



SSP207/27

As of series production launch, the 1.8-ltr. 165 kW engine will be equipped with extended system components to ensure it complies with European exhaust emission standard EU II + D3.

The basic version is equivalent to the engine management system used in the 1.8-ltr. engine developing 132 kW (refer to function diagram).

Legend

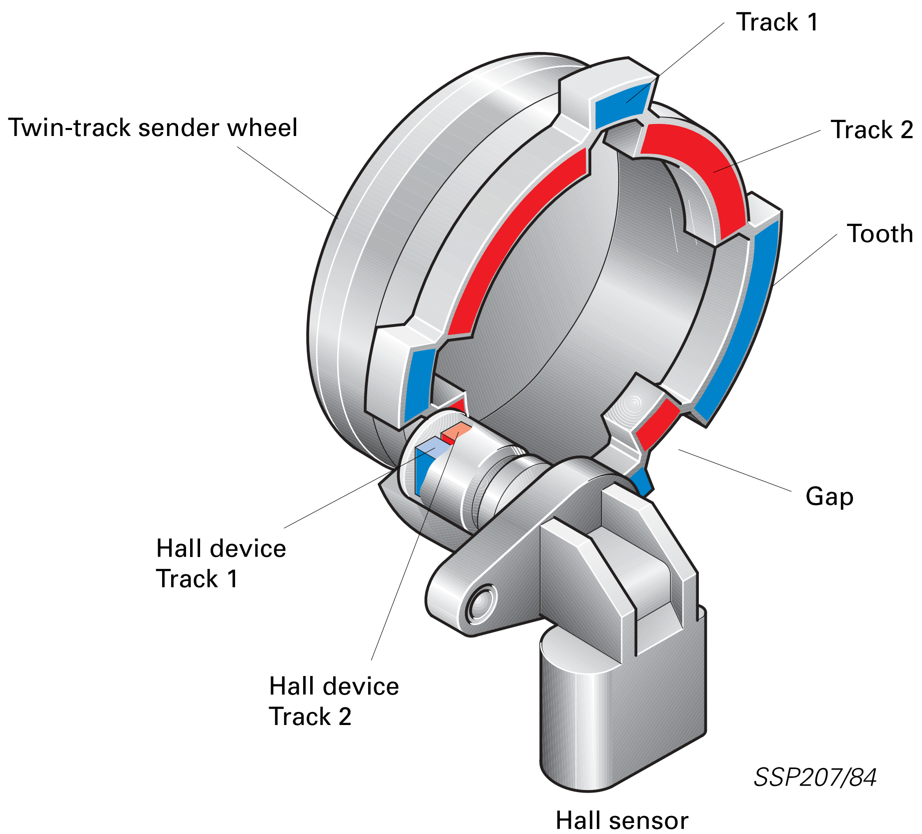
G130	Lambda probe downstream of catalytic converter when EU III comes into effect
J17	Fuel pump relay
J299	Secondary air pump relay
N112	Secondary air injection valve
V101	Secondary air pump motor
Z29	Heater for lambda probe downstream of catalytic converter when EU III comes into effect
H	Air conditioning PWM signal
K	Fault lamp

Drive units

Quick-start sender wheel

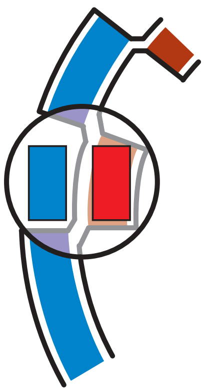
The quick-start sender wheel is attached to the camshaft. It supplies a signal which enables the engine control unit to determine the position of the camshaft relative to the crankshaft more quickly and, in combination with the signal which the engine speed sender supplies, to start the engine more quickly.

On previous systems, it was not possible to initiate the first combustion cycle until a crank angle of approx. 600° - 900° was reached. The quick-start sender wheel enables the engine control unit to recognise the position of the crankshaft relative to the camshaft after a crank angle of 400° - 480°.
This allows the first combustion cycle to be initiated sooner and the engine to start more quickly.



SSP207/84

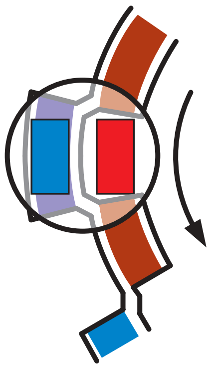
The quick-start sender wheel comprises a twin-track sender wheel and a Hall sensor. The sender wheel is designed so that two tracks are located side by side. In the position where there is a gap in one track, there is a tooth in the other track.



SSP207/85

The control unit compares the phase sensor signal with the reference mark signal and thus ascertains the working cycle currently taking place in the cylinder.

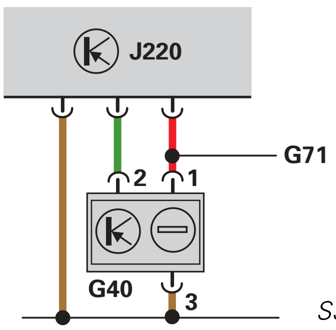
Low phase signal	=	Compression cycle
High phase signal	=	Exhaust cycle



SSP207/86

The signal which the engine speed sender G28 supplies enables the injection cycle to be initiated after a crank angle of approx. 440°.

Electrical circuit



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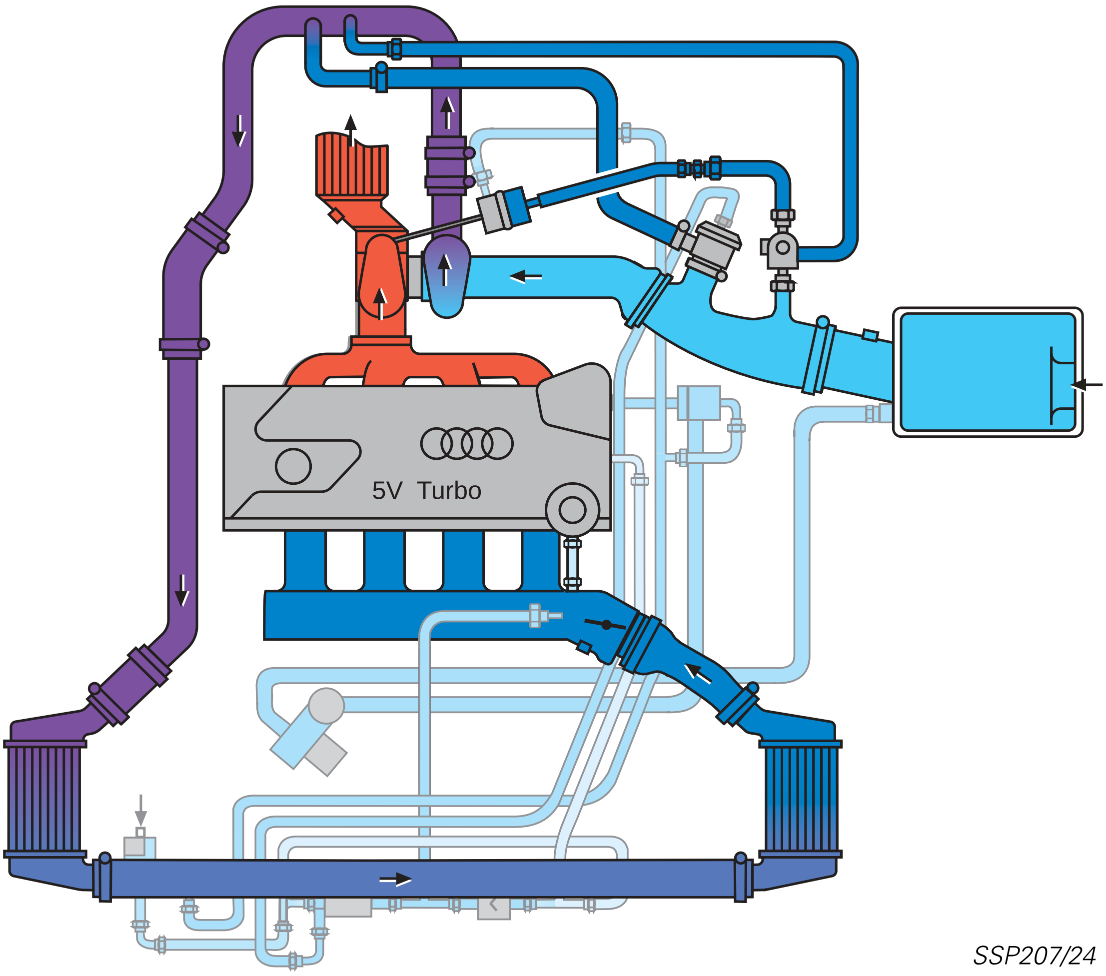
The Hall sender G40 is connected to the sensor earth terminal of the engine control unit.

Even if the Hall sender fails, it is still possible to start the engine.

Charging



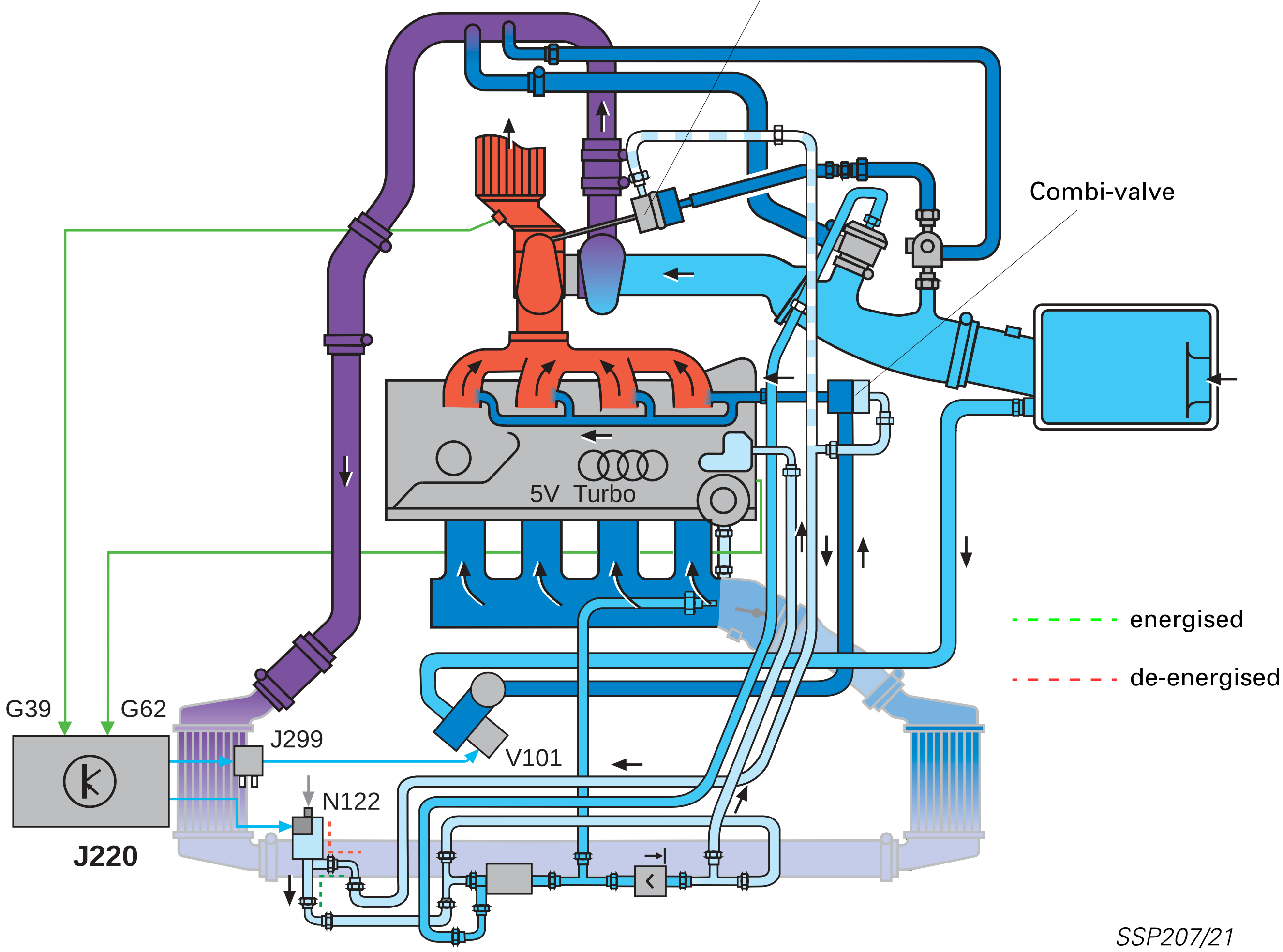
SSP207/24

To increase the power output and torque of the 1.8-ltr. 5V engine to 165 kW, it was necessary to make various design modifications to the basic engine of the Audi TT Coupé developing 132 kW.

A characteristic feature of the engine is its higher air demand, making it necessary to enlarge the diameter of the intake port and exhaust gas turbocharger.

Since the previous charge air cooler was no longer capable of effectively cooling down the increased air flow through the exhaust gas turbocharger, it was necessary to accommodate a second, parallel charge air cooler on the left-hand side of the vehicle.

Secondary air system



SSP207/21

In the cold start phase, the exhaust gases contain a high proportion of uncombusted hydrocarbons.

To improve the exhaust gas composition, these constituents must be reduced.
The secondary air system is responsible for this task.

The system injects air upstream of the outlet valves during this phase, thus enriching the exhaust gases with oxygen. This causes postcombustion of the uncombusted hydrocarbons contained in the exhaust gases.

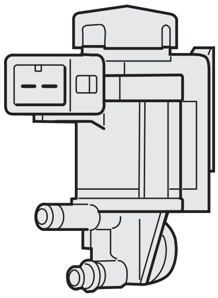
The catalytic converter reaches operating temperature more quickly due to the heat released during postcombustion.

The vacuum box for the charge pressure control valve is controlled in the cold start phase by the electro-pneumatic secondary air control valve N112 while the secondary air system is in operation.

The control pressure acts on the turbocharger waste gate, and the exhaust gas flow is routed past the turbine wheel up to the upper load range.

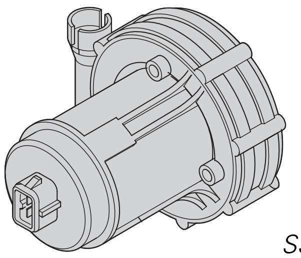
The hot exhaust gases help the secondary air system to quickly heat the catalytic converter up to operating temperature during the cold start phase.

Drive units


SSP207/16

Secondary air injection valve N112

The secondary air injection valve is an electro-pneumatic valve. It is switched by the Motronic control unit and controls the combi-valve.
To open the combi-valve, the secondary air injection valve releases the intake manifold vacuum.
To close the combi-valve, the secondary air injection valve releases atmospheric pressure.


SSP207/17

Secondary air pump V101

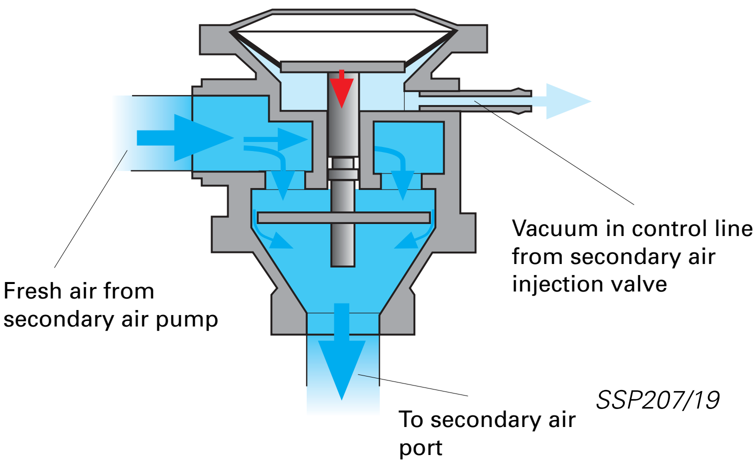
The secondary air pump relay J299 which the Motronic control unit drives switches the electric current for the secondary air pump motor V101. The fresh air which is mixed with the exhaust gases is drawn out of the air filter housing by the secondary air pump and released by the combi-valve.

The combi-valve

The combi-valve is bolted to the secondary air duct of the cylinder head.
The air path from the secondary air pump to the secondary duct of the cylinder head is opened by the vacuum from the secondary air injection valve.

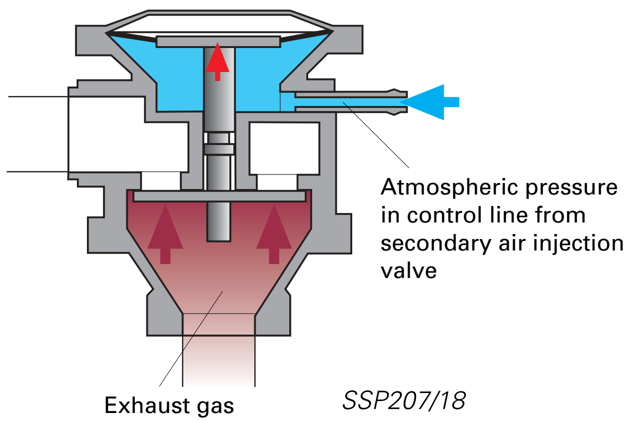
This valve also prevents hot exhaust gases entering and damaging the secondary air pump.

Valve opened



SSP207/19

Valve closed



SSP207/18