

Workshop Manual



4H50 TIC

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- Analog speed adjustment
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Preface

This Workshop Manual corresponds to the technical status as stated on each page (month / year). It has been conceived so that only a trained mechanic (instructed yearly) can perform all repairs trouble-free.

Notes on how to clean parts etc. have been omitted, as it is taken for granted that this is known and will be accomplished.

All work may only be performed with the specified or absolutely equivalent tools. It is a prerequisite that normal "hand tools" are at hand.

With respect to maintenance work, tools, troubleshooting, etc., we refer to the operator's manual.

Only use genuine Hatz original spare parts for repairs!
Only these parts guarantee problem-free dimensional accuracy and quality.

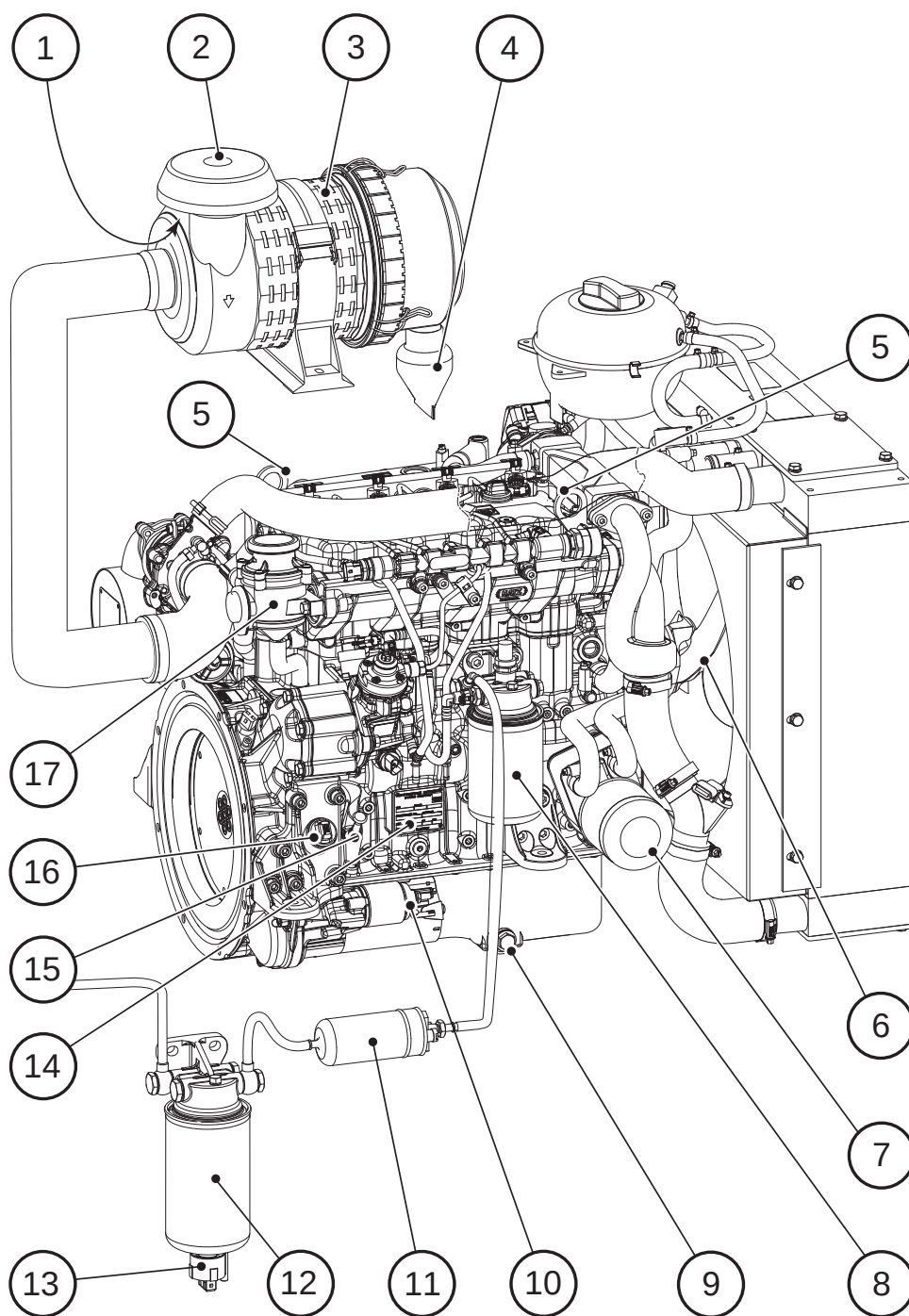
In addition, the general statutory regulations and those of the responsible professional trade associations apply.

Potential discrepancies due to special equipment are possible and can neither be accounted for in the Workshop Manual nor in the Spare Parts list.
In case of any difficulties, please contact the nearest HATZ service office.



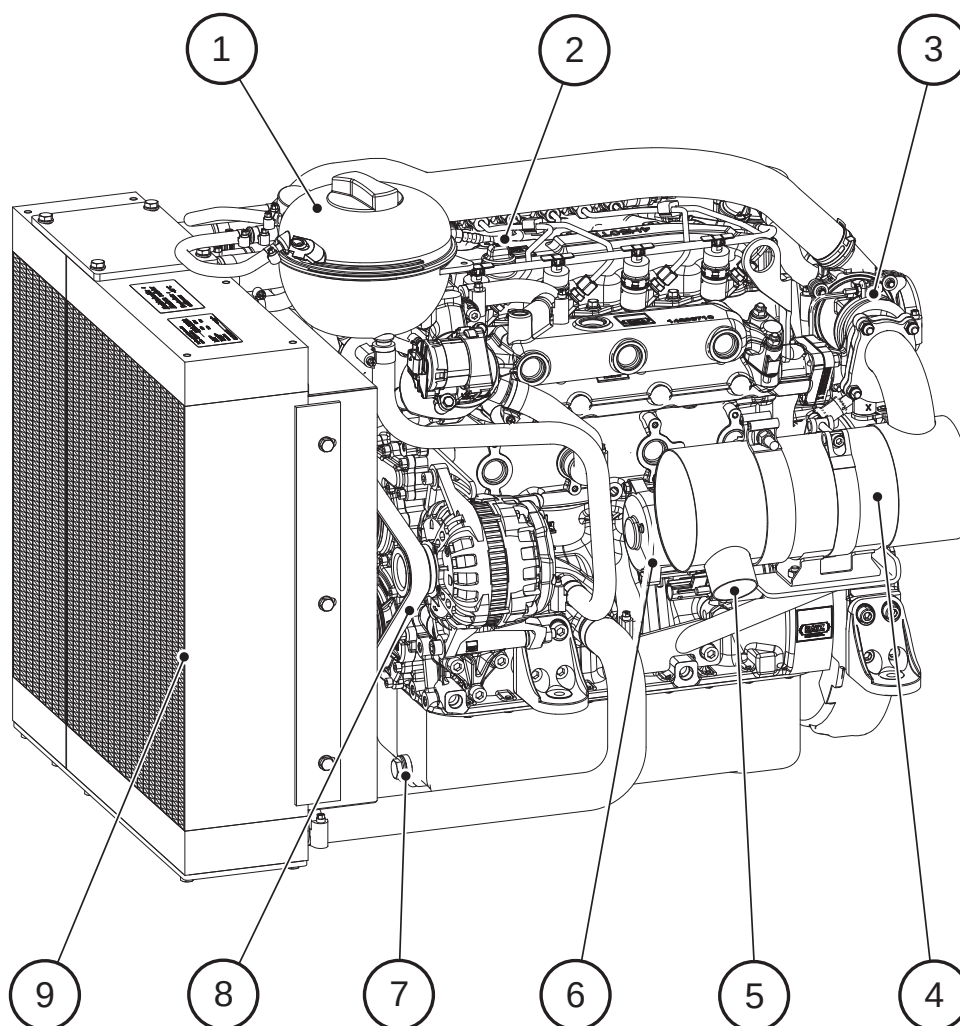
1. General

Engine description



Intake side

- | | |
|-------------------------------------|--|
| 1 Intake opening for combustion air | 10 Starter (low installation position) |
| 2 Rain cap | 11 Electric fuel pump |
| 3 Air filter (option) | 12 Fuel pre-filter |
| 4 Dust discharge valve | 13 Drain screw on the fuel pre-filter |
| 5 Lifting eyes | 14 Engine type plate |
| 6 Fan | 15 Dipstick |
| 7 Oil filter | 16 Oil filler screw bottom |
| 8 Fine fuel filter | 17 Crankcase ventilation |
| 9 Side oil drain screw | |



Exhaust side

- | | |
|---------------------------------------|--|
| 1 Expansion tank for coolant (option) | 6 Starter (high installation position) |
| 2 Oil filler screw top | 7 Oil drain screw front |
| 3 Exhaust gas turbocharger | 8 Poly v belt |
| 4 Oxidation catalytic converter | 9 Radiator (option) |
| 5 Exhaust gas discharge | |

Technical data

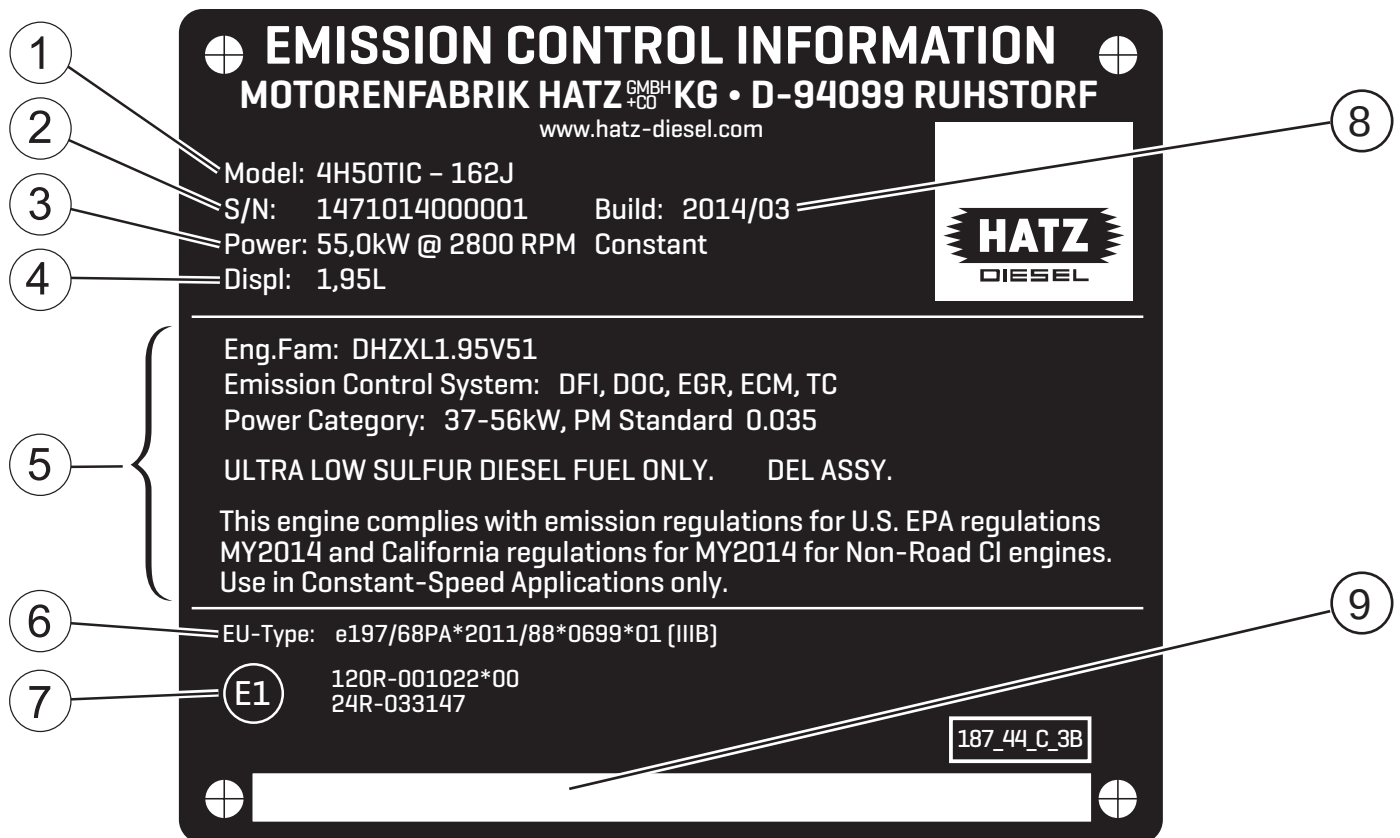
Type		3H50TIC	4H50TIC
Type		Liquid-cooled four stroke diesel engine	
Combustion system		Direct injection, turbocharger with charge air cooling, cooled exhaust-gas recirculation	
Injection system		Bosch common rail	
Number of cylinders		3	4
Bore/stroke	mm	84/88	84/88
Displacement	cm ³	1464	1952
Fill quantity of lubricating oil	Approx. ltr.	5.25? ¹⁾	7.0 ¹⁾
Difference between "max" and "min" marking	Approx. ltr.	? ¹⁾	1.0 ¹⁾
Engine oil consumption (after running-in period)	Max.	1% of fuel consumption, with respect to full load	
Engine oil pressure		2.5 bar to 4.5 bar	
Coolant quantity with HATZ standard radiator and expansion tank	Approx. ltr.	?	12.5
Direction of rotation when looking at flywheel		Left	
Tappet clearance		Automatic tappet clearance compensation	
Max. perm. inclination during continuous operation in every direction:		30° ²⁾	
Weight (incl. radiator and catalytic converter) without operating fluids	approx. kg	?	226
Battery capacity	Max.	12 V – 110 Ah / 450 A according to DIN 24 V – 66 Ah / 300 A according to DIN	

¹⁾ These details must be understood as approx. values.

Relevant is in every case the **max.** marking on the dipstick.

²⁾ Exceeding these values causes engine damage.

Engine type plate

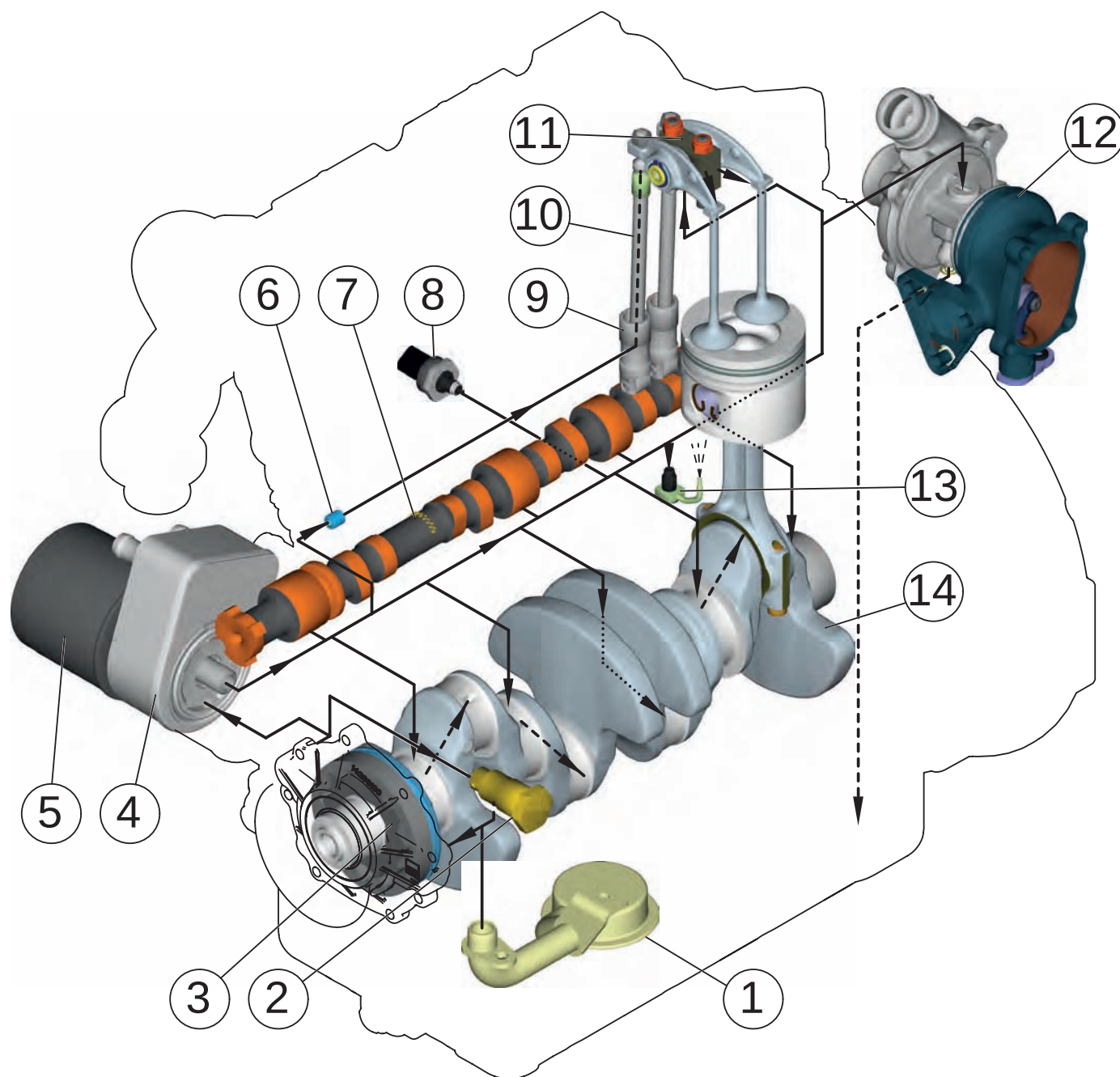


The engine type plate is affixed to the crankcase and includes the following engine information:

- 1 Model designation of the engine
- 2 Engine number (serial number of the engine)
- 3 Engine output (kW) at rated speed (min-1)
- 4 Displacement (liters)
- 5 Information for US emissions certification (EPA/CARB)
- 6 EU type approval
- 7 EU country of origin (Germany)
- 8 Year of construction (year/month)
- 9 Bar code (engine number)

The following data must always be specified in case of queries and for spare parts orders:

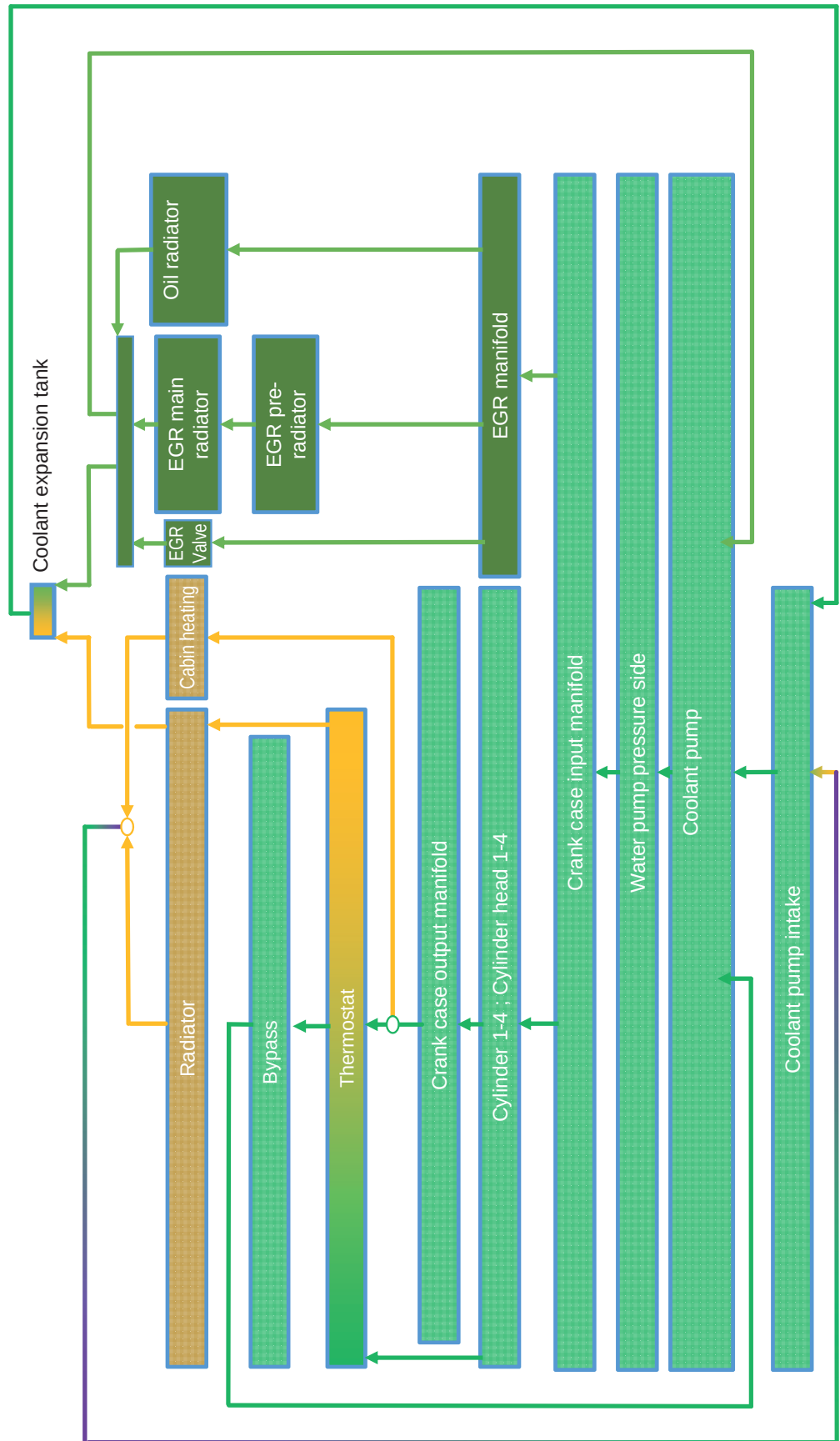
- 1 Model designation
- 2 Engine number



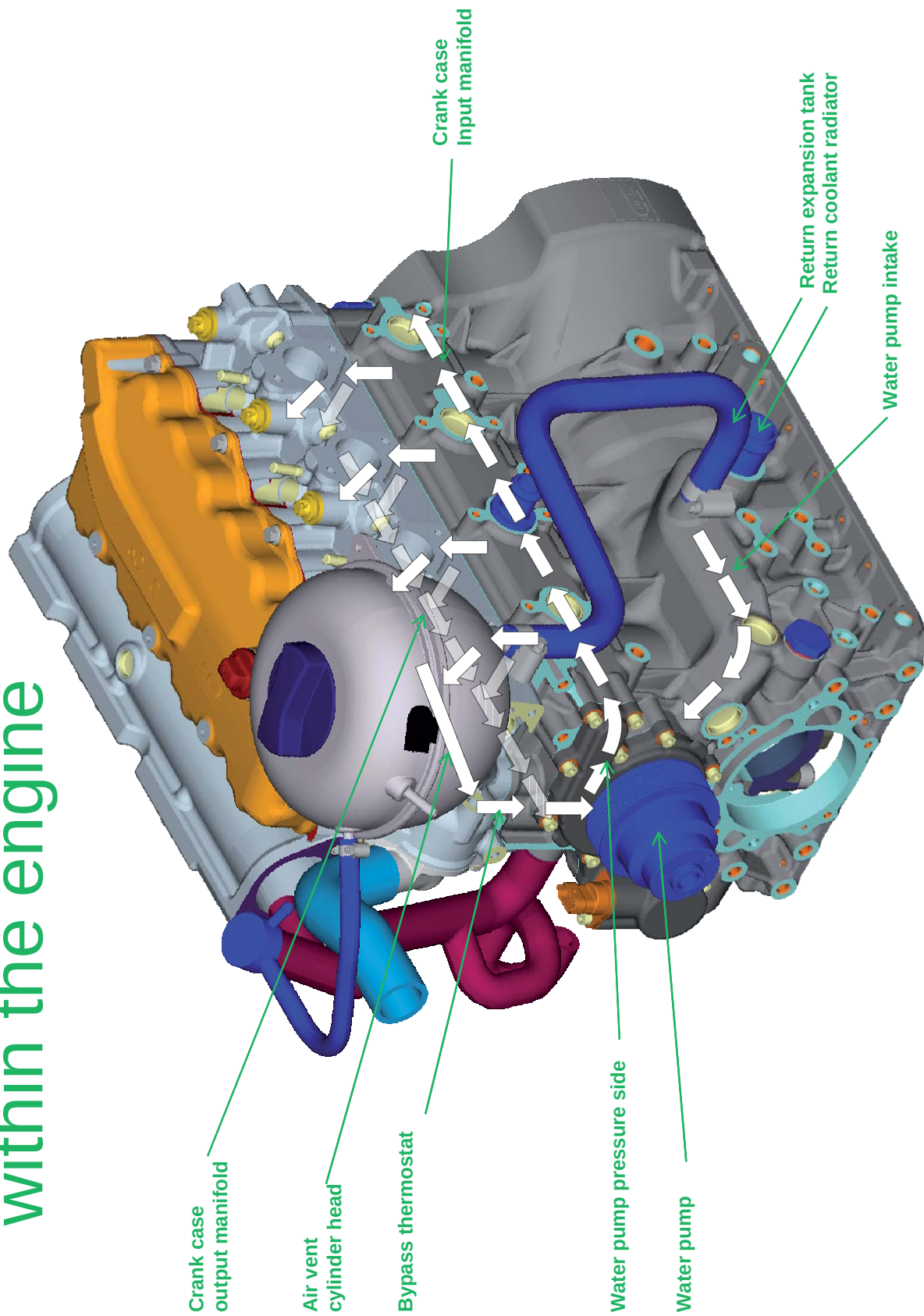
- 1 Oil intake pipe
- 2 Oil pressure relief valve
- 3 Oil pump
- 4 Oil cooler
- 5 Oil filter
- 6 Check valve
- 7 Camshaft

- 8 Oil pressure sensor
- 9 Roller tappet with HVA element
- 10 Push rod
- 11 Rocker arm bearing block with injection nozzles
- 12 Turbocharger
- 13 Piston cooling
- 14 Crankshaft

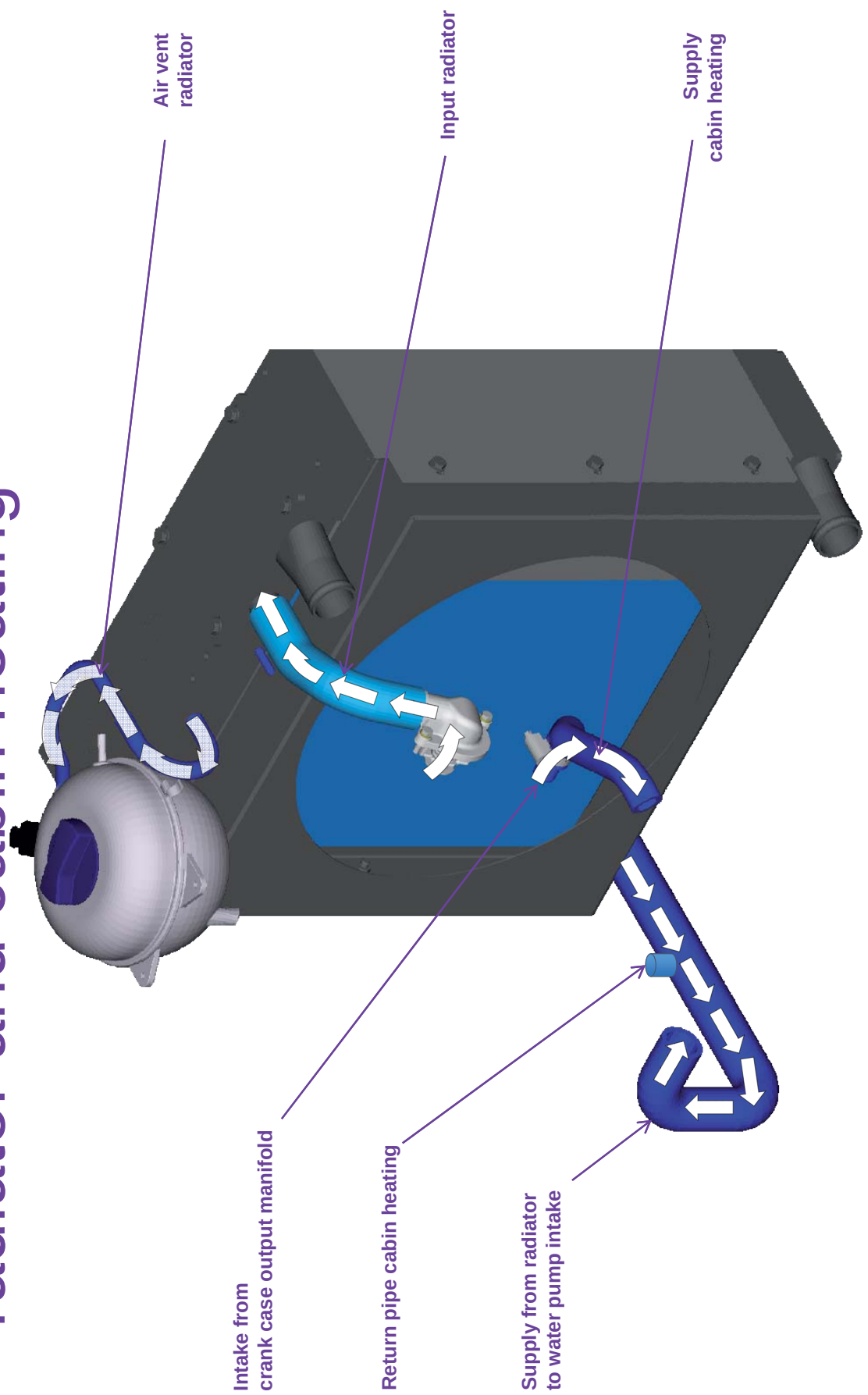
Cooling circuit diagram 4H50



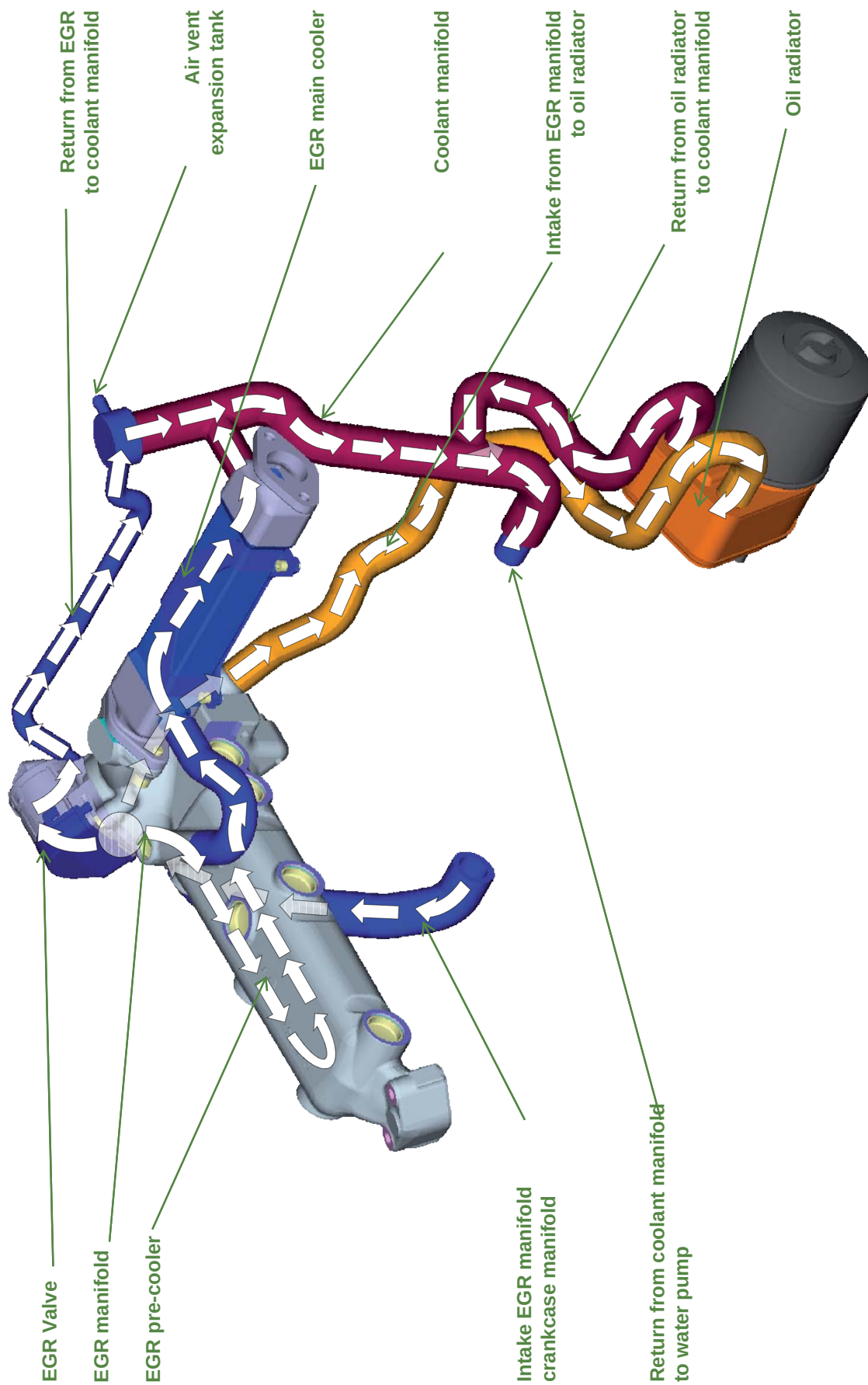
Cooling circuit diagram 4H50 – within the engine



Cooling circuit diagram 4H50 – radiator and cabin heating



Cooling circuit diagram 4H50 – exhaust gas recirculation and oil radiator



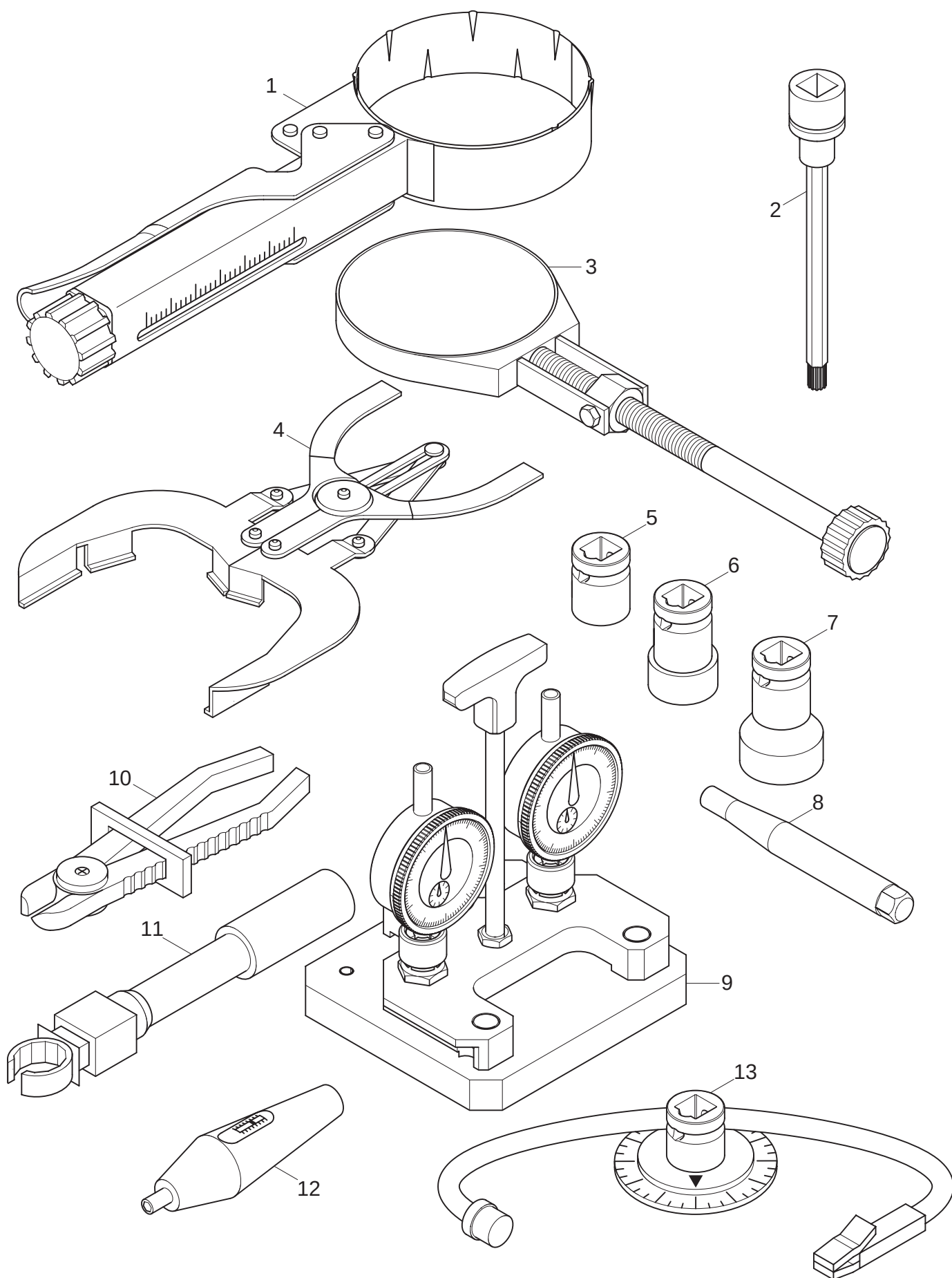
Application of sealant and adhesive material:

502 230 01	Loctite Activator	500 ml
700 189 18	Loctite 243	50 ml
502 234 00	Loctite 648	10 ml
502 825 01	Silicon	30 ml
700 218 15	Silicon	300 ml
502 830 02	high-temperature paste	1000 g



Assembly/disassembly cylinder head + exterior area

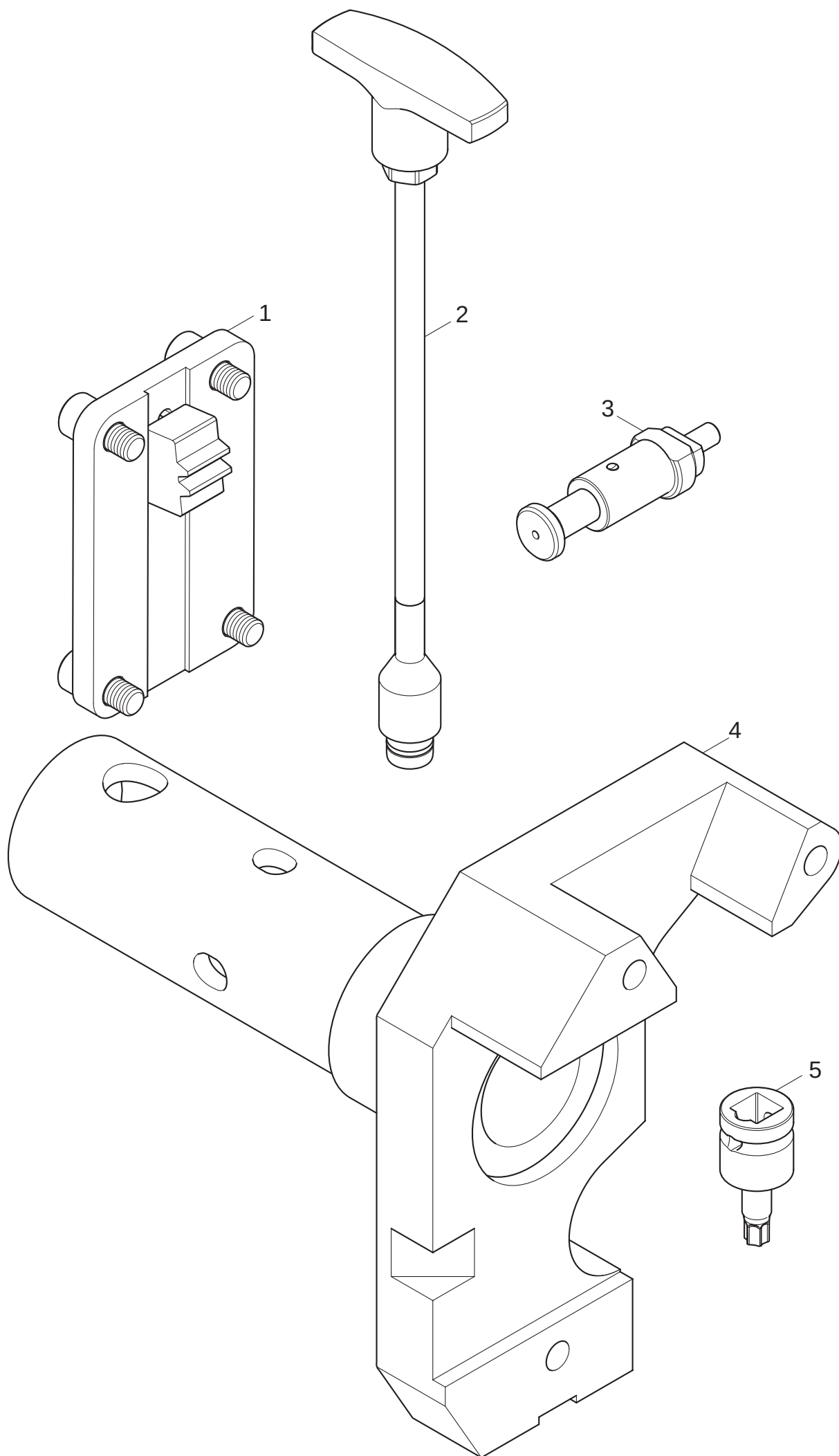
No.	Ident no.	Designation
1	626 383 00	Piston ring collet chuck $\varnothing$ 70 - 100mm
2	612 099 00	Multi-tooth wrench socket M8
3	620 307 01	Strap wrench
4	612 090 01	Piston ring expander
5	700 217 64	Socket wrench for cyl.K E14 1/2"
6	700 106 34	Socket wrench SW 27 for oil pressure sensor
7	700 106 76	Socket wrench SW 36 for oil filter adapter
8	653 368 00	Centering bolts for engine mount
9	653 474 00	Measurement device for gap
10	700 113 94	Hose clamping tongs
11	702 534 99	Kink torque wrench
12	702 534 97	Screwdriver torque
13	702 534 98	Rotation angle measurement device (Gedore)





Assembly/disassembly - engine

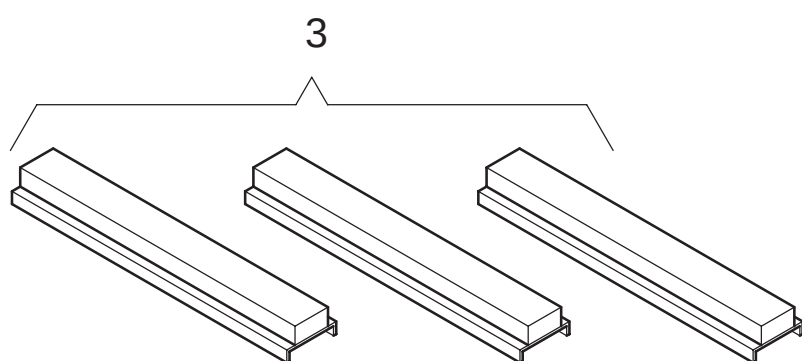
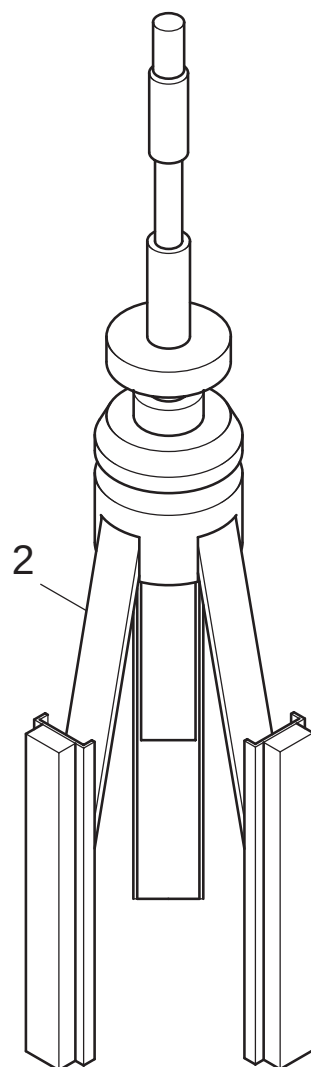
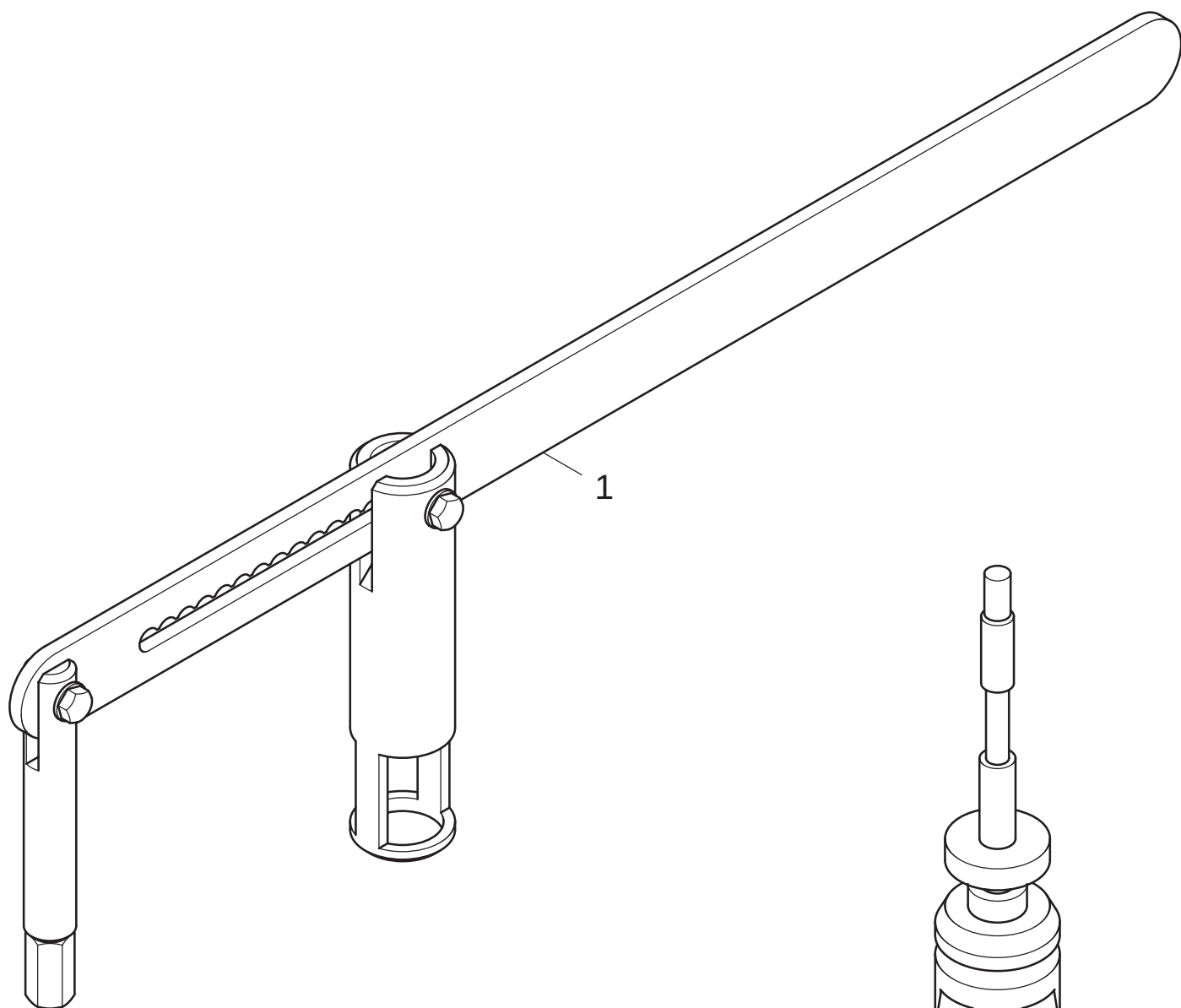
No.	Ident no.	Designation
1	653 480 00	Counterholder for flywheel
2	653 466 00	Assembly pin for roller tappet
3	653 464 00	Magnet holder for roller tappet guide
4	653 517 00	Turning device for engine benches
5	702 517 89	Socket wrench for conrod T50 1/2"





Component servicing

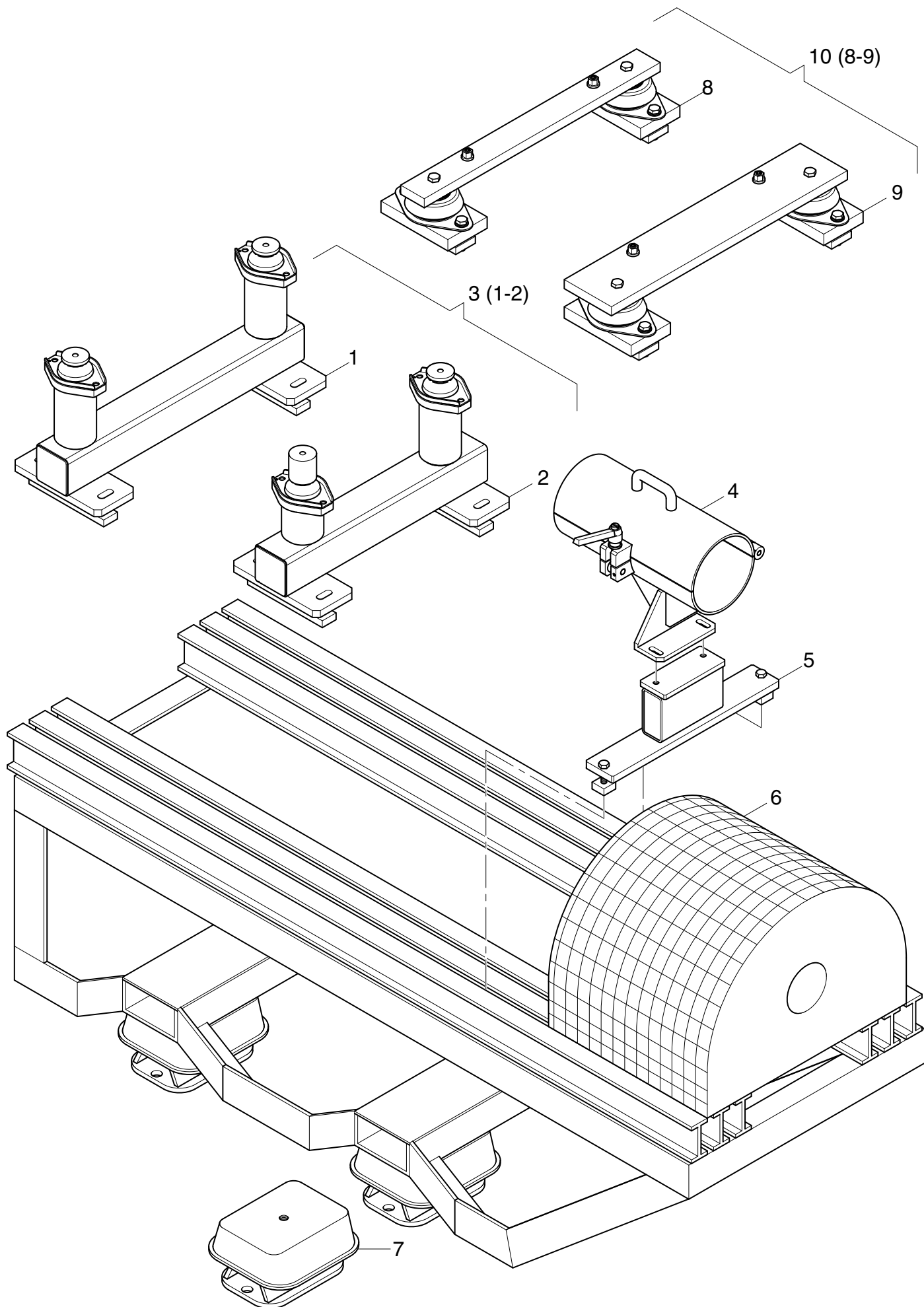
No.	Ident no.	Designation
1	629 223 01	Valve lifting tool
2	634 142 00	Honing tools 50-175
3	634 143 00	Replacement stones for honing tools





Test bench set-up

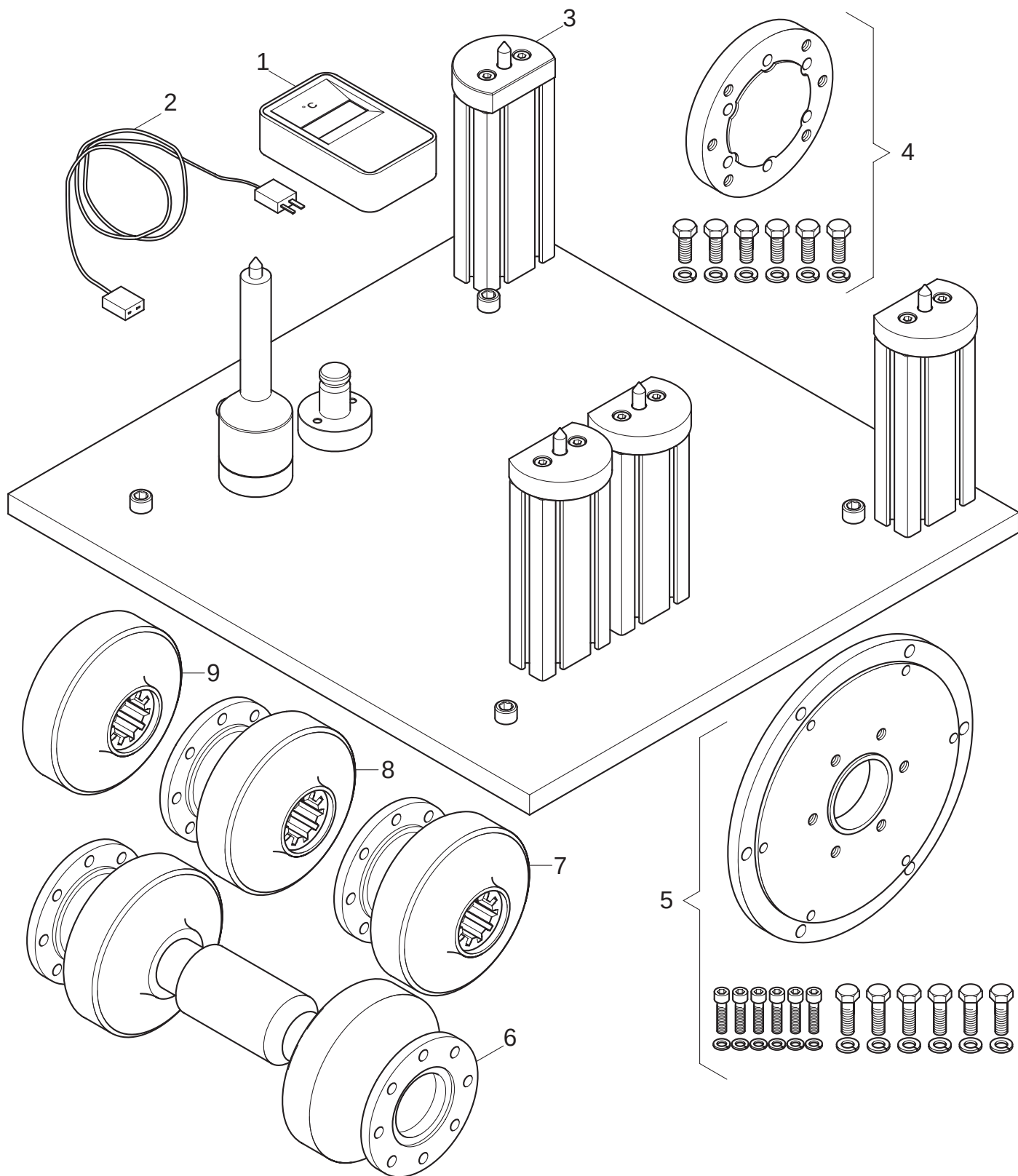
No.	Ident no.	Designation
1	- - - - -	Part cannot be ordered individually, please order group
2	- - - - -	Part cannot be ordered individually, please order group
3	652 948 00	Engine mountings F2F
4	647 639 00	Guard tube
5	629 242 00	Adapter for guard device
6	612 963 01	Base frame "large"
7	618 996 00	Machine bearing "replacement"
8	- - - - -	Part cannot be ordered individually, please order group
9	- - - - -	Part cannot be ordered individually, please order group
10	654 197 00	Engine mountings OPU





Test bench set-up

No.	Ident no.	Designation
1	624 851 01	Temperature measurement device
2	624 861 01	Sensor extension cable
3	653 290 00	Assembly table
4	635 303 90	Adapter flange 6-8-hole
5	631 147 90	Driven flange
6	630 705 00	Drive shaft 8-hole
7	630 706 00	Rod end 8-hole "new"
8	634 287 00	Rod end 8-hole "replacement"
9	634 286 00	Joint insert 8-hole



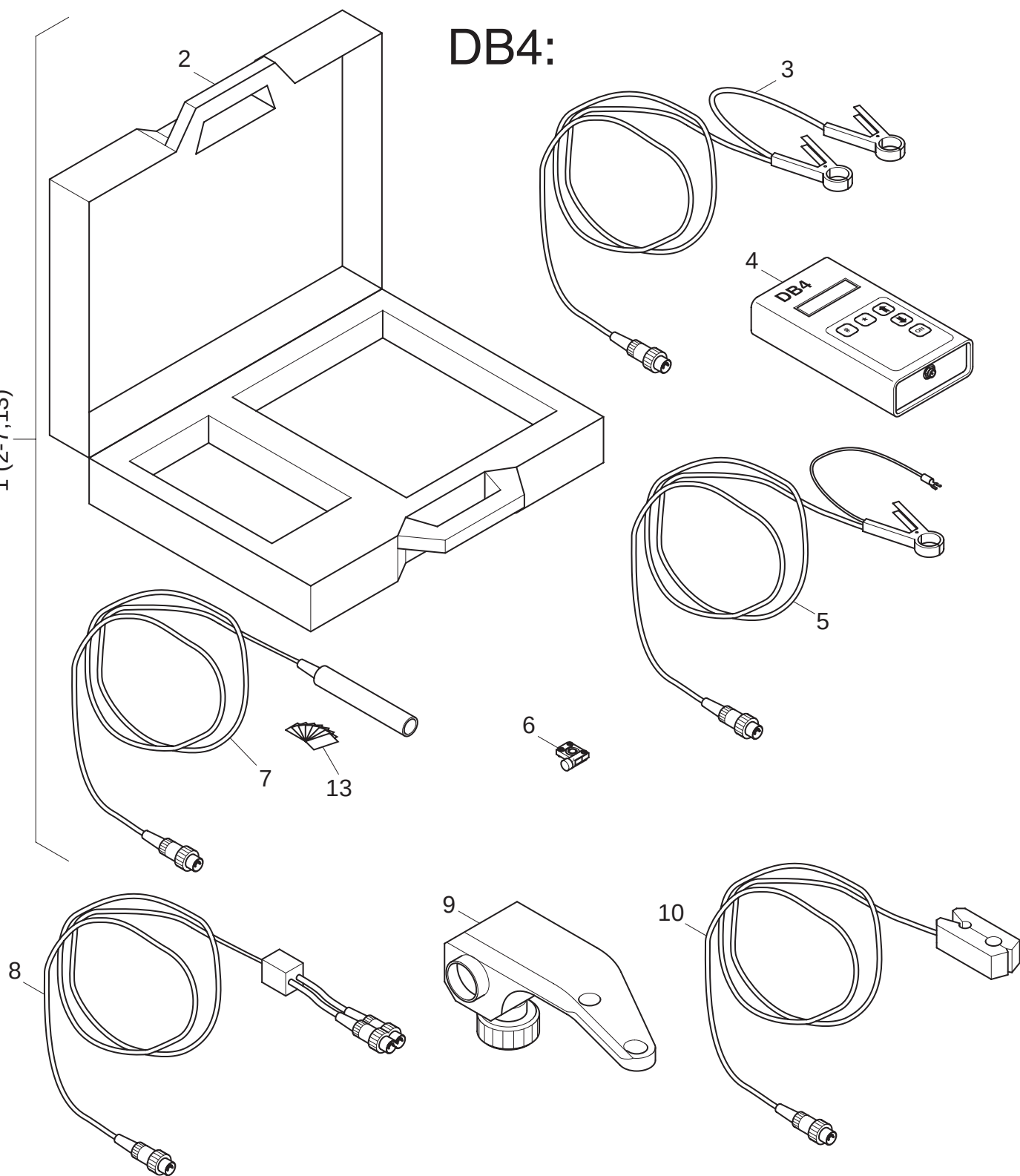


Adjustment and diagnostic equipment

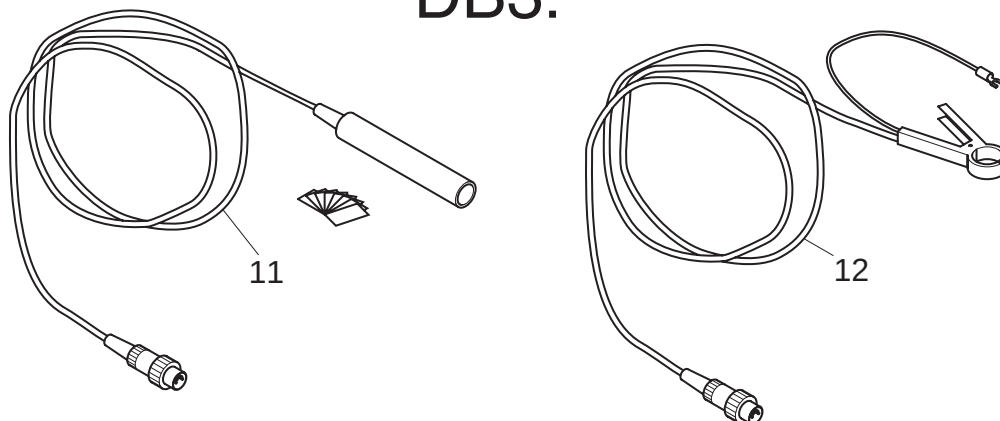
No.	Ident no.	Designation
1	624 838 92	Revolution counter for fuel pressure pipe
2	-----	Part cannot be ordered individually, please order group
3	638 342 00	Charging cable with 12V pole clamps
4	-----	Part cannot be ordered individually, please order group
5	638 340 00	Cable for Piezo sensor
6	631 965 00	Piezo sensor 6mm
7	638 341 00	Photo sensor with cable
8	641 236 00	Speed differential adapter
9	639 123 00	Holder for photo sensor 1B
10	638 343 00	Speed sensor for ignition cable
11	635 776 00	Photo sensor with cable
12	634 268 00	Cable for Piezo sensor
13	702 503 97	Reflex marks (1 sheet = 35 pieces)

1 (2-7,13)

DB4:



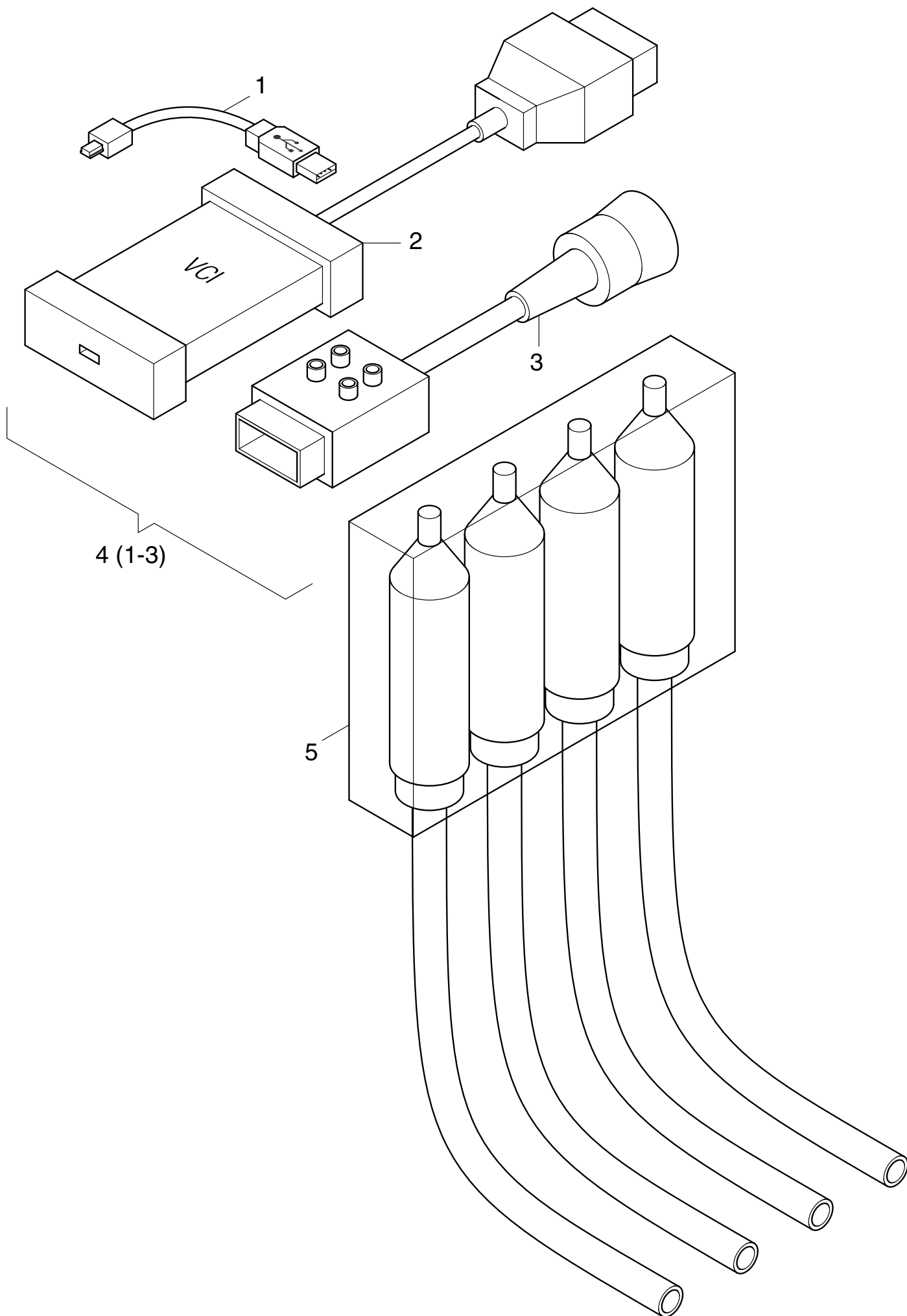
DB3:





Adjustment and diagnostic equipment

No.	Ident no.	Designation
1	-----	Part cannot be ordered individually, please order group
2	-----	Part cannot be ordered individually, please order group
3	-----	Diagnostic tool (Bosch) VCI
4	653 772 00	BG diagnostic tool VCI
5	702 536 30	Return flow quantities measurement device

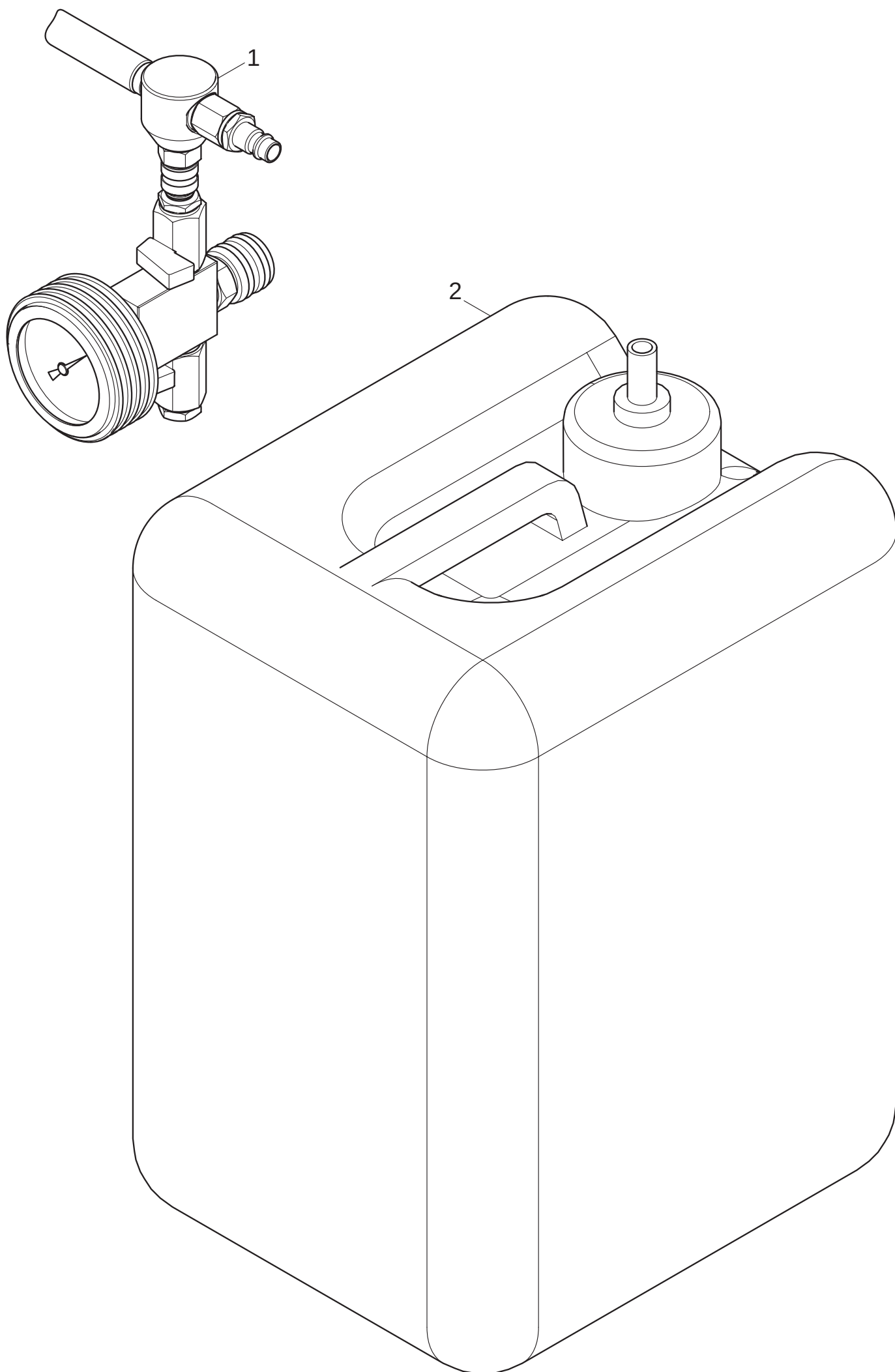




Cooling system

No.	Ident no.	Designation
-----	-----------	-------------

- | | | |
|---|------------|--------------------------------|
| 1 | 702 530 56 | Radiator vacuum filling device |
| 2 | 702 530 57 | Tank for filling device |

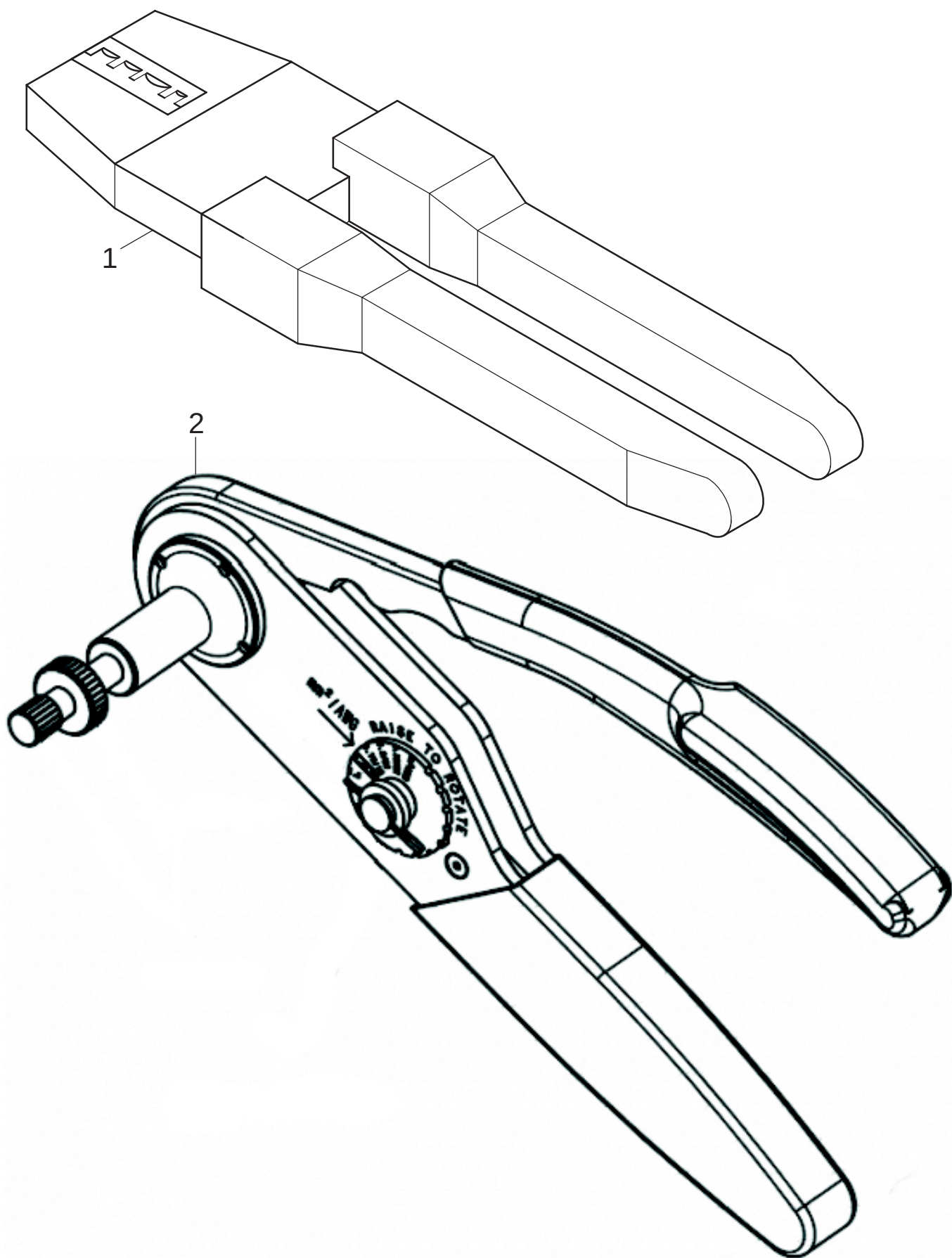




Electrical equipment

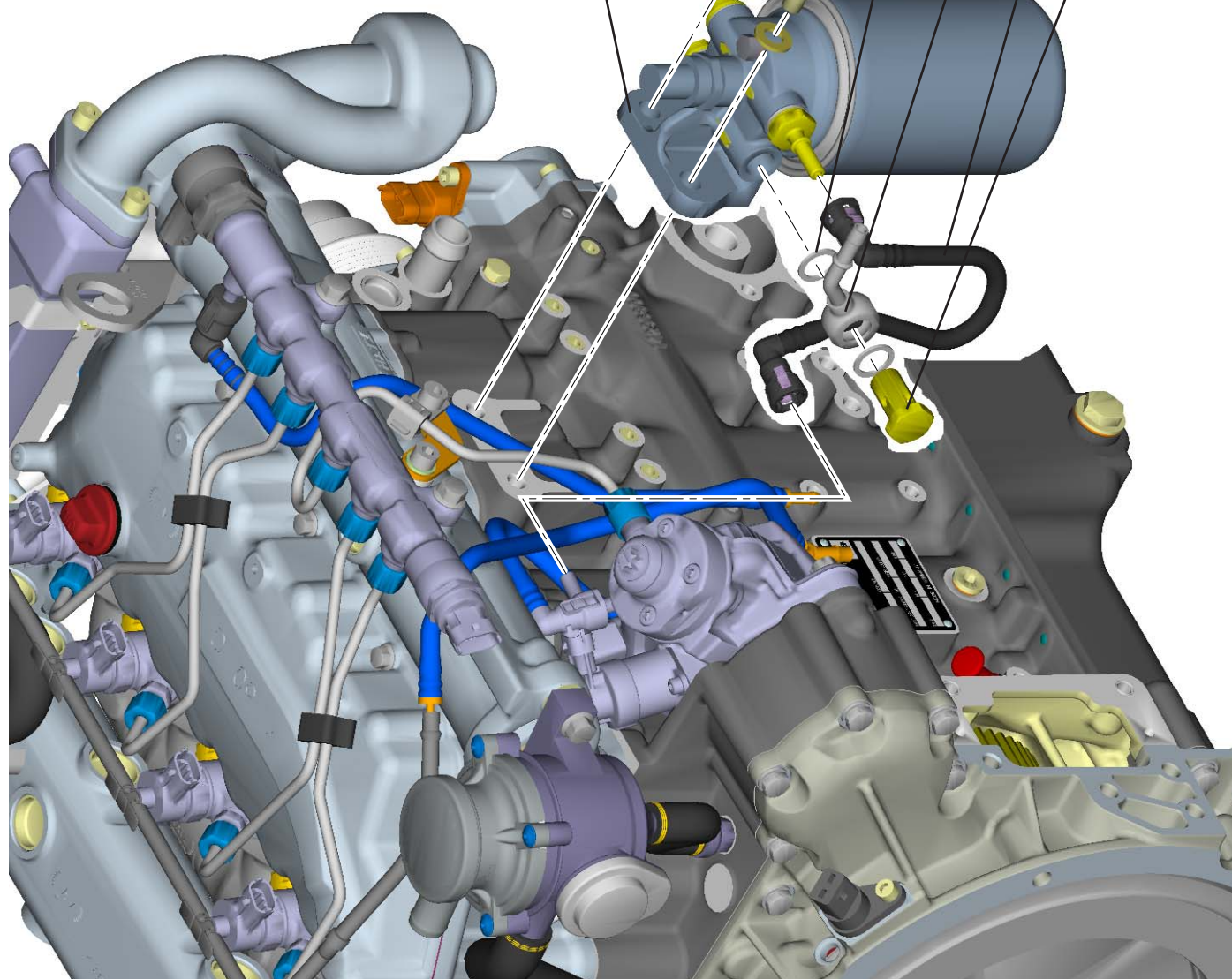
No.	Ident no.	Designation
-----	-----------	-------------

- | | | |
|---|------------|-------------------------------------|
| 1 | 700 318 32 | Crimping pliers "Garant F28/95" |
| 2 | 700 348 26 | Mounting pliers "Deutsch HDT 48-00" |



2. Additional equipment

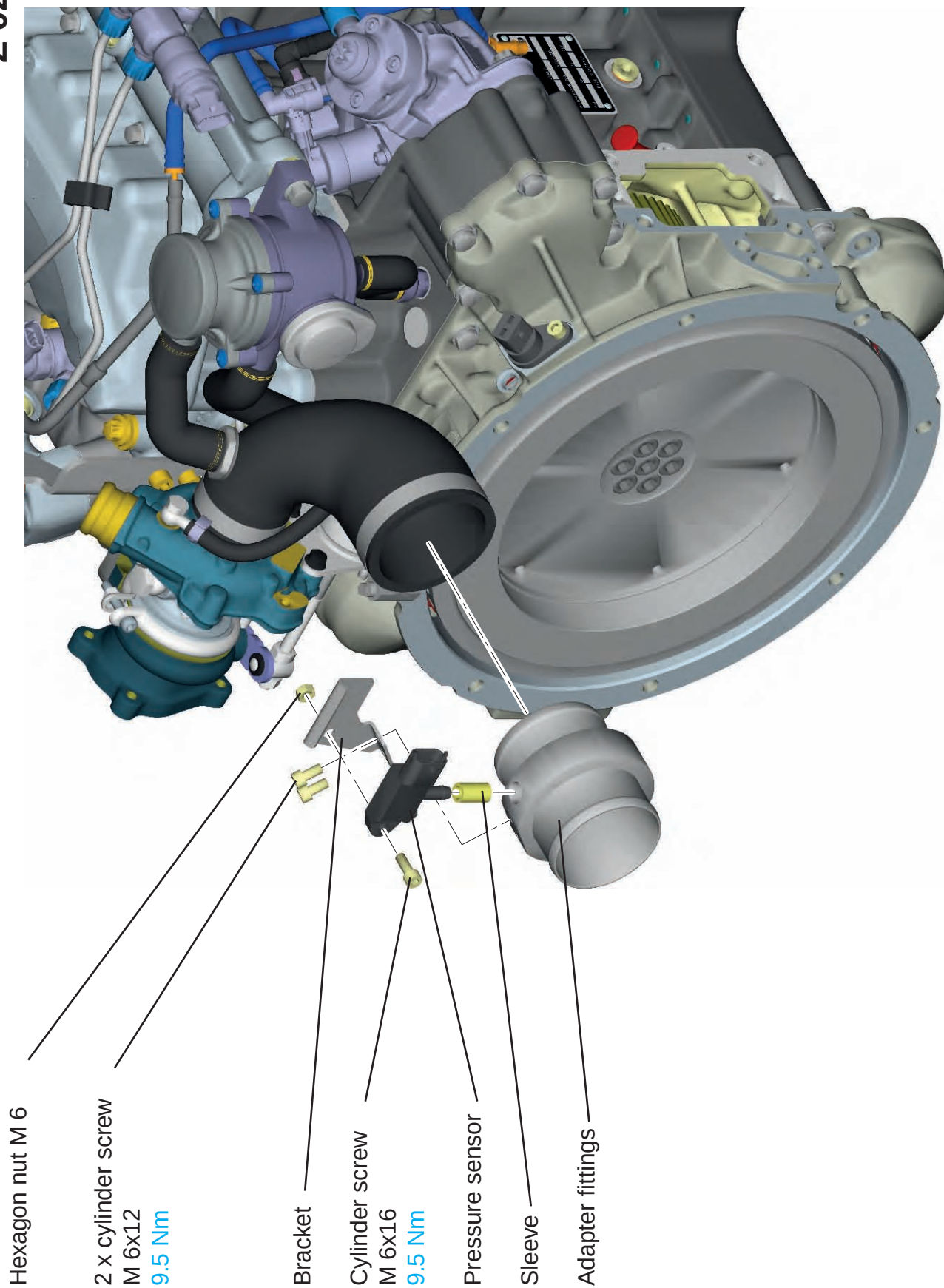
Z 01 Main fuel filter



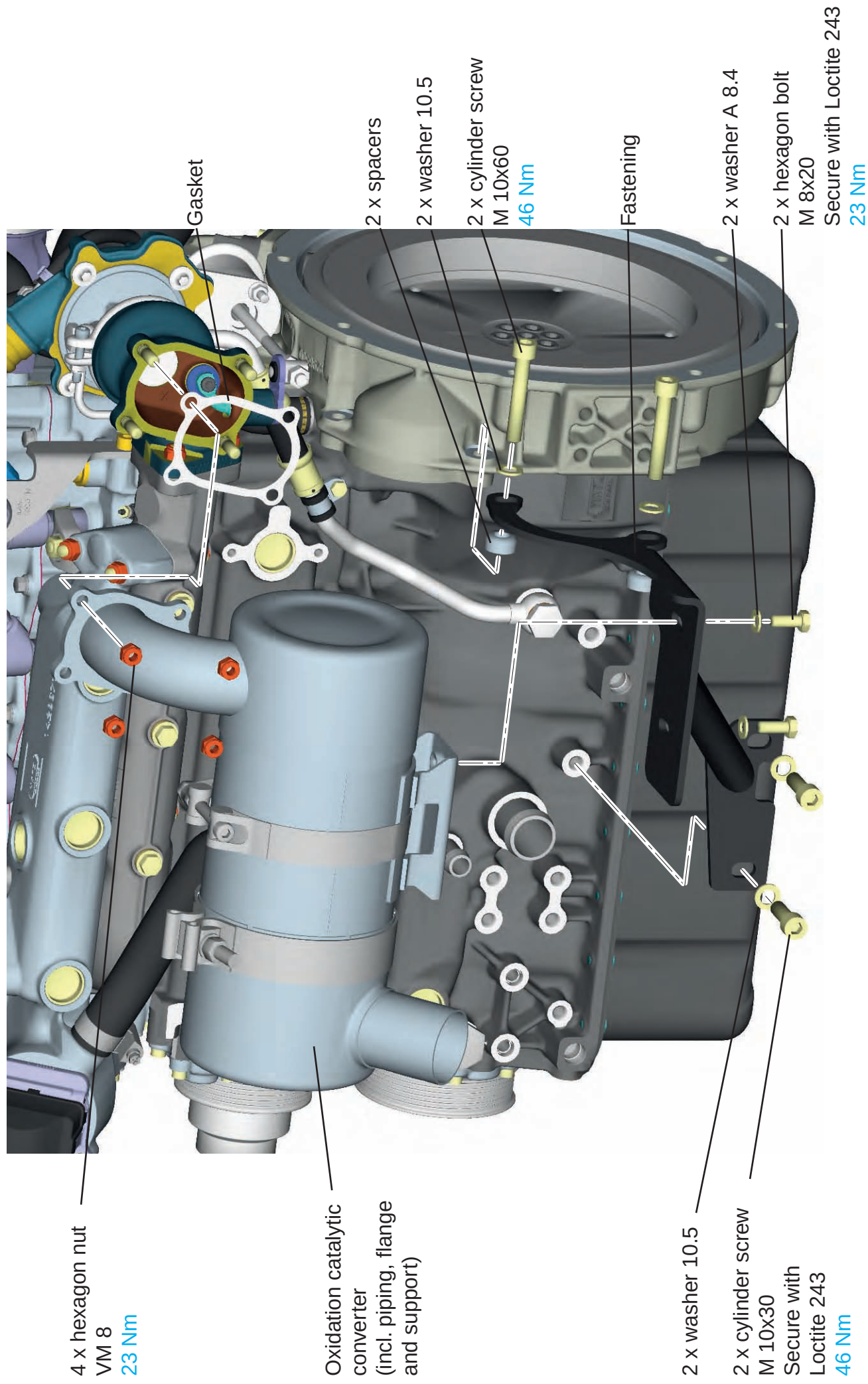
Absolute cleanliness!

Protective caps may only be removed from the parts directly before mounting!

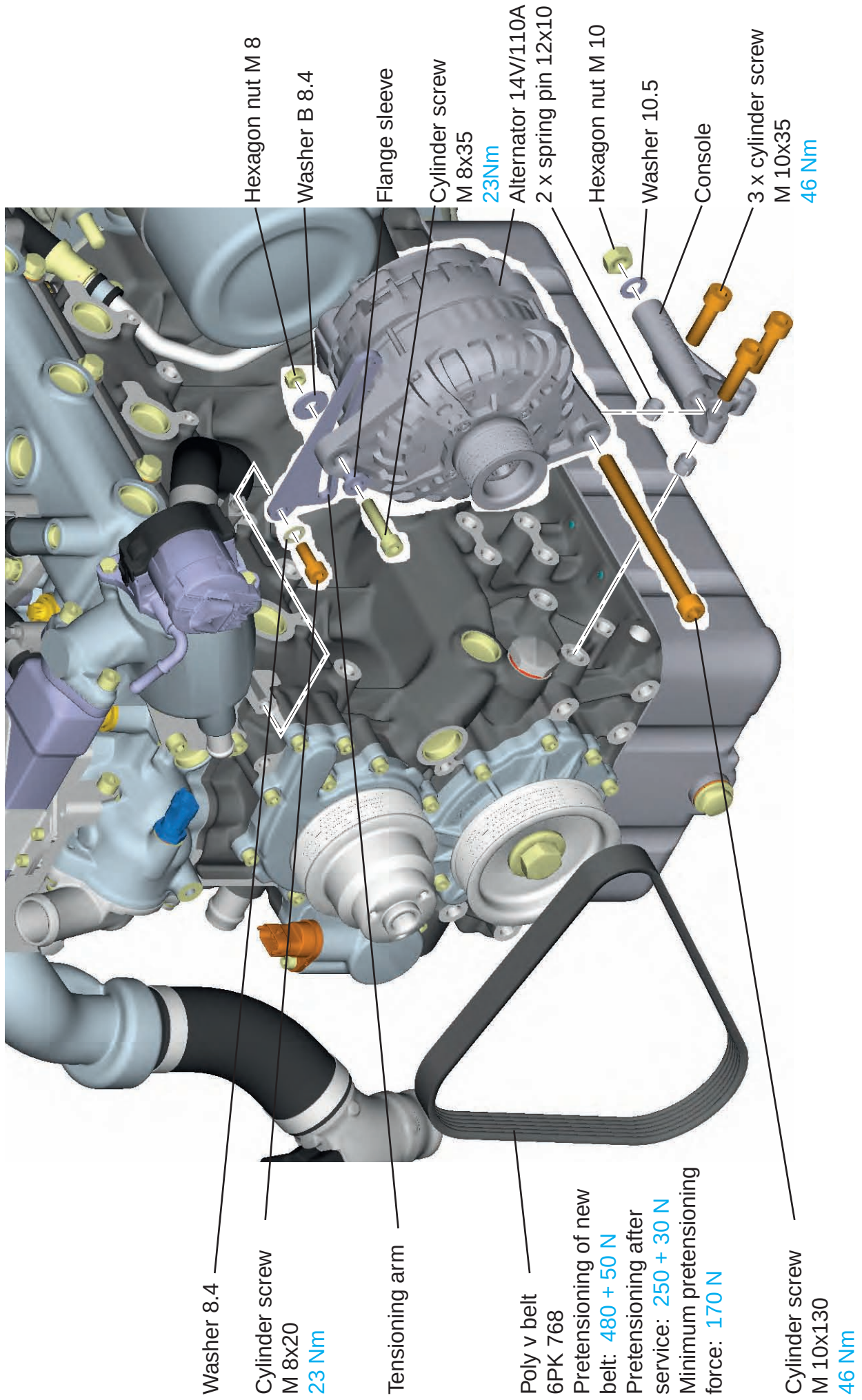
Z 02 Suction hose

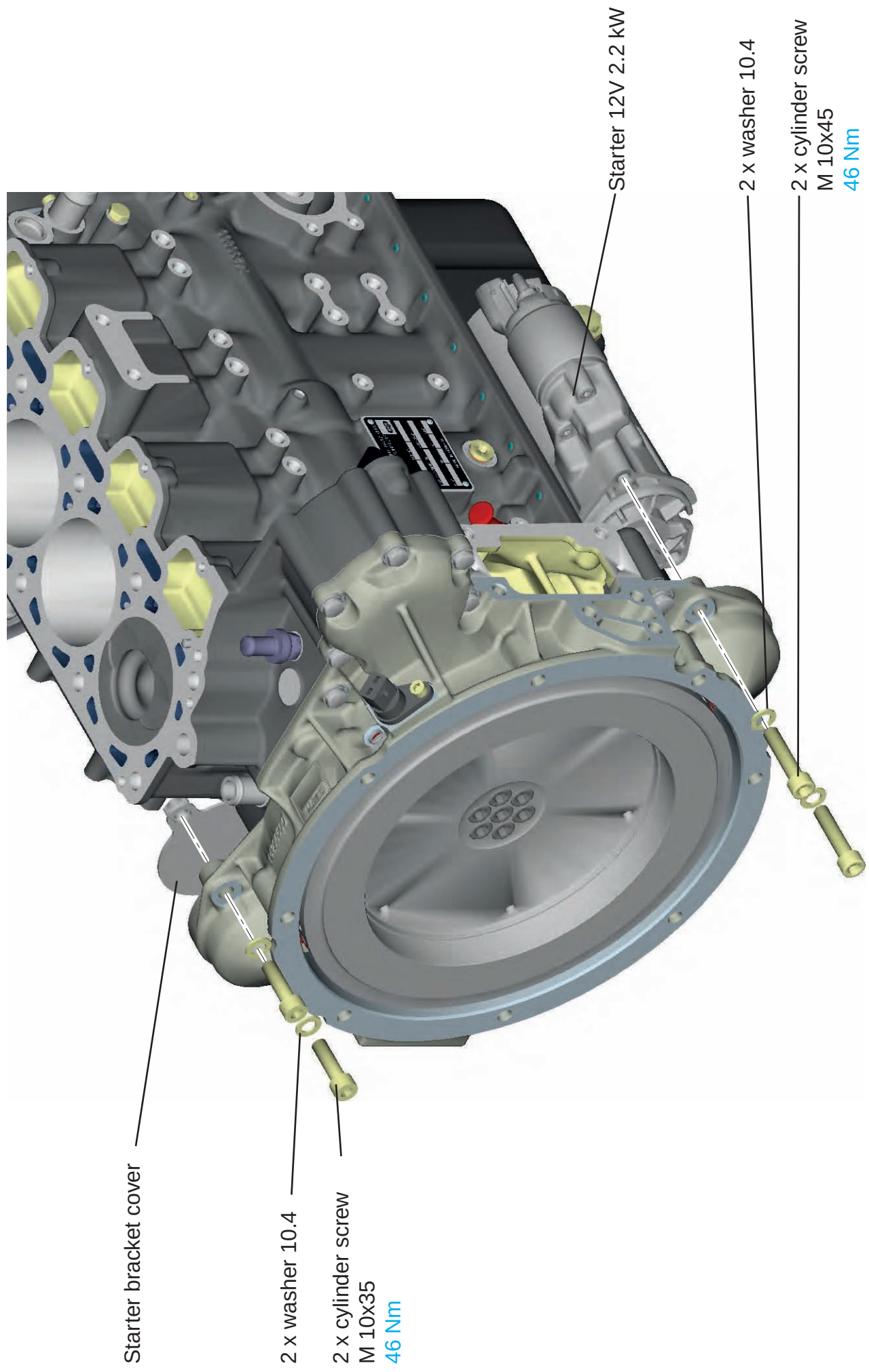


Z 03 Oxidation catalytic converter



Z 05 Alternator





Starter bracket cover

2 x washer 10.4

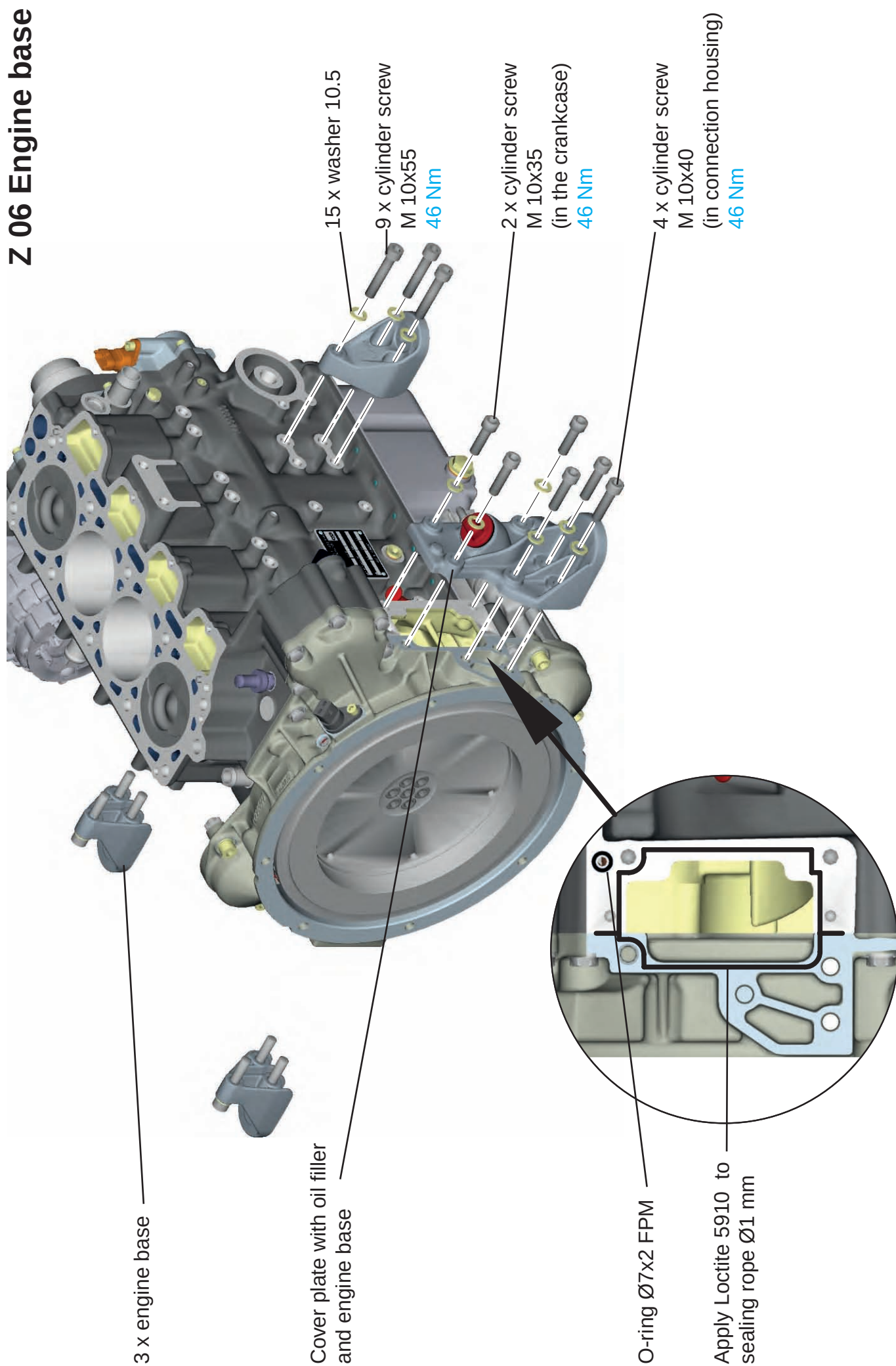
2 x cylinder screw
M 10x35
46 Nm

Starter 12V 2.2 kW

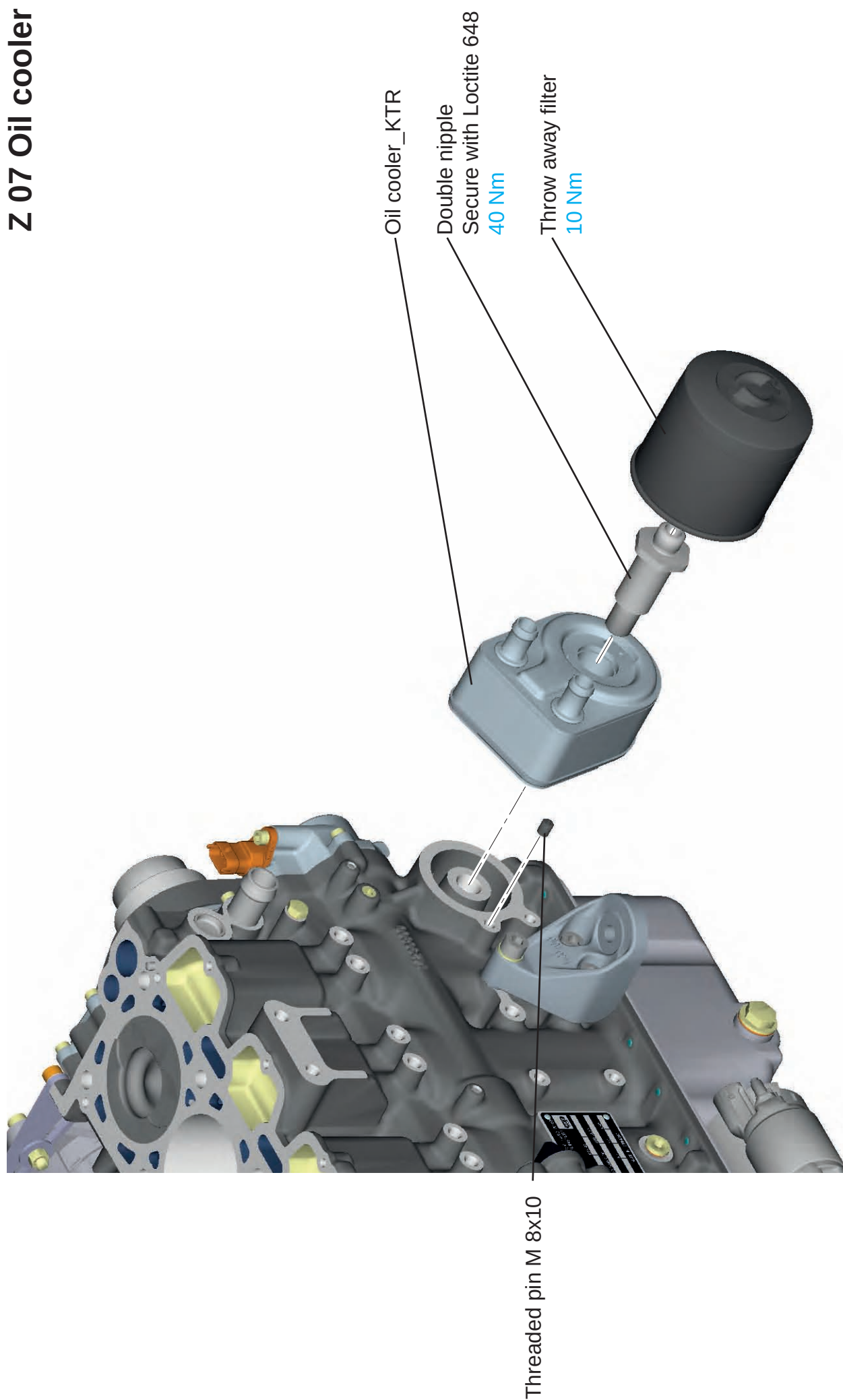
2 x washer 10.4

2 x cylinder screw
M 10x45
46 Nm

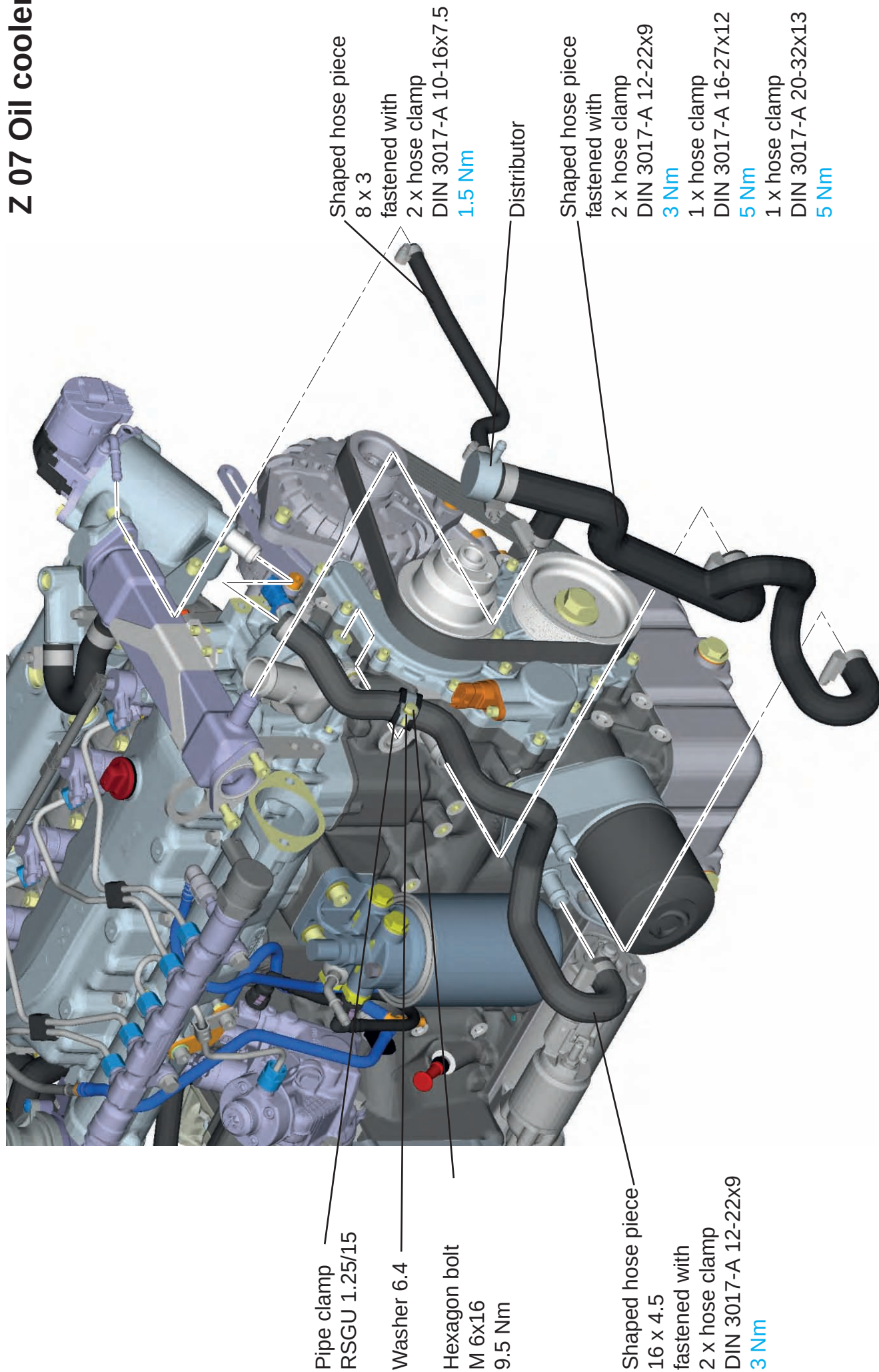
Z 06 Engine base

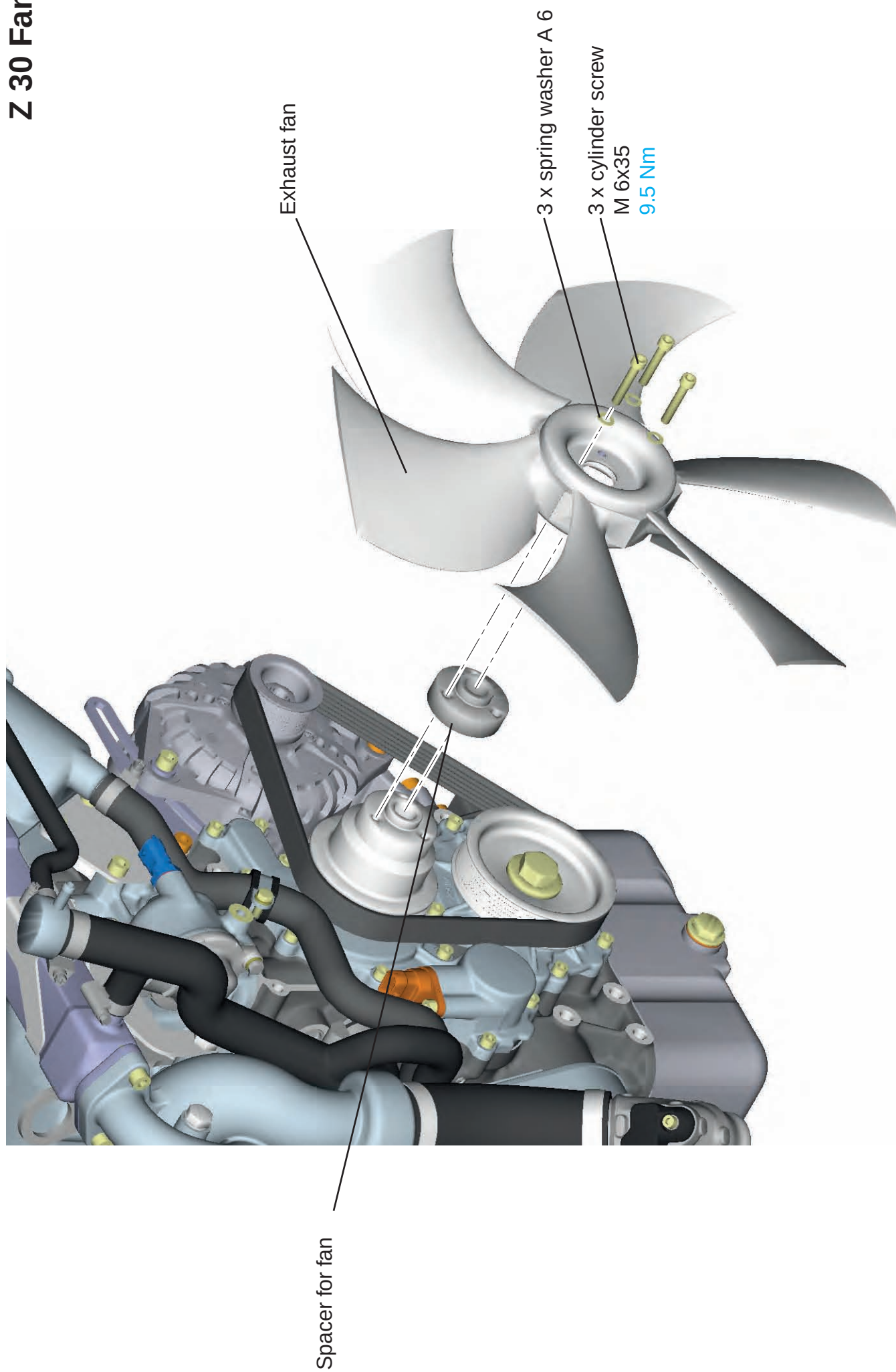


Z 07 Oil cooler

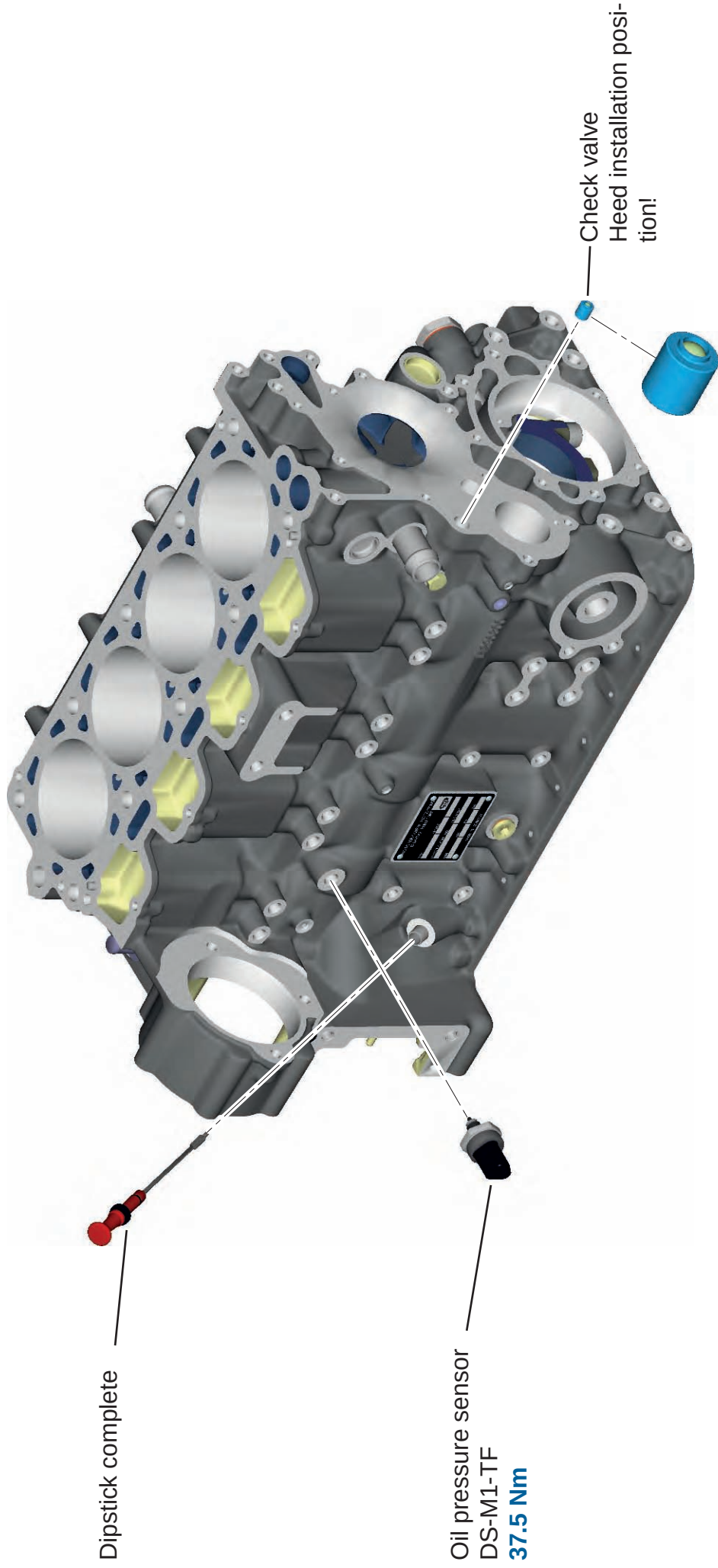


Z 07 Oil cooler



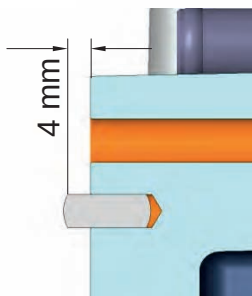


3. Basic engine equipment



M 01 Cylinder crankcase

2 x cylinder pin 6 m6x12
press in to specified dimension



Secure tube connectors
with Loctite 648 and
press into cylinder block
up to the stop

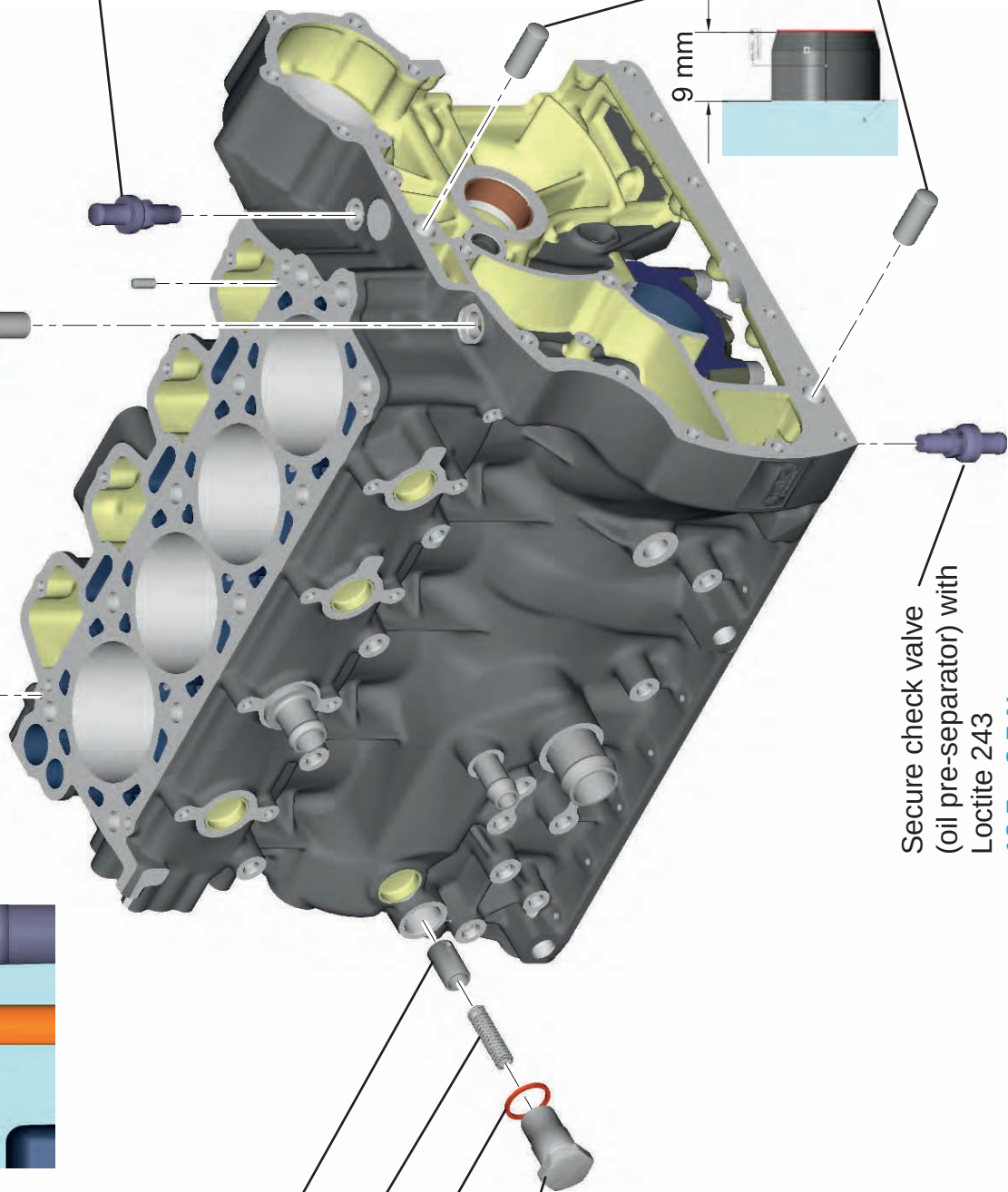
Secure check valve
(Provent) with
Loctite 243
12.5 ± 2.5 Nm

Oil overpressure valve:
Piston for oil overpres-
sure valve

Pressure spring

Sealing ring A 24x29

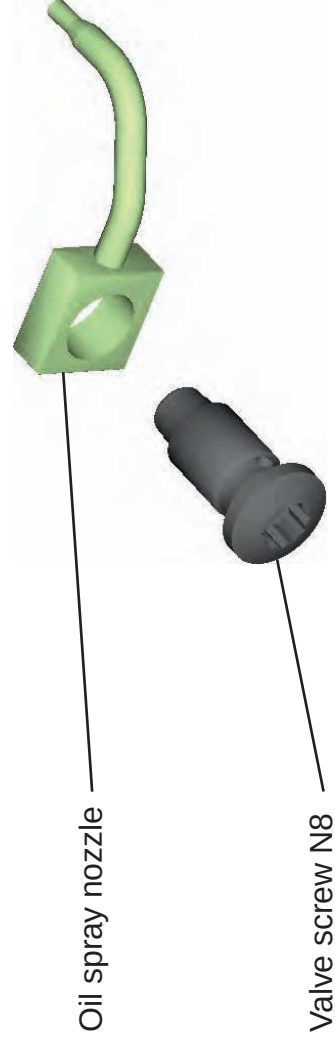
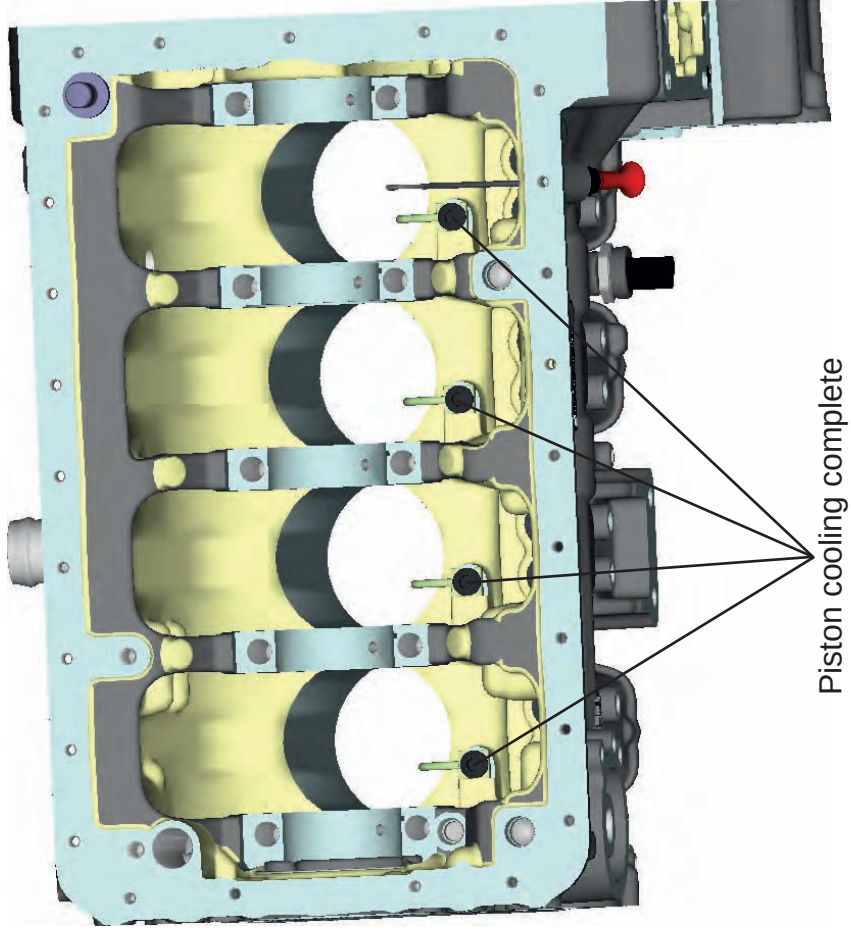
Screw plug
M 24x1.5
100 ± 10 Nm



9 mm

2 x cylinder pin
14 m6x28
press in to specified
dimension

Secure check valve
(oil pre-separator) with
Loctite 243
12.5 ± 2.5 Nm



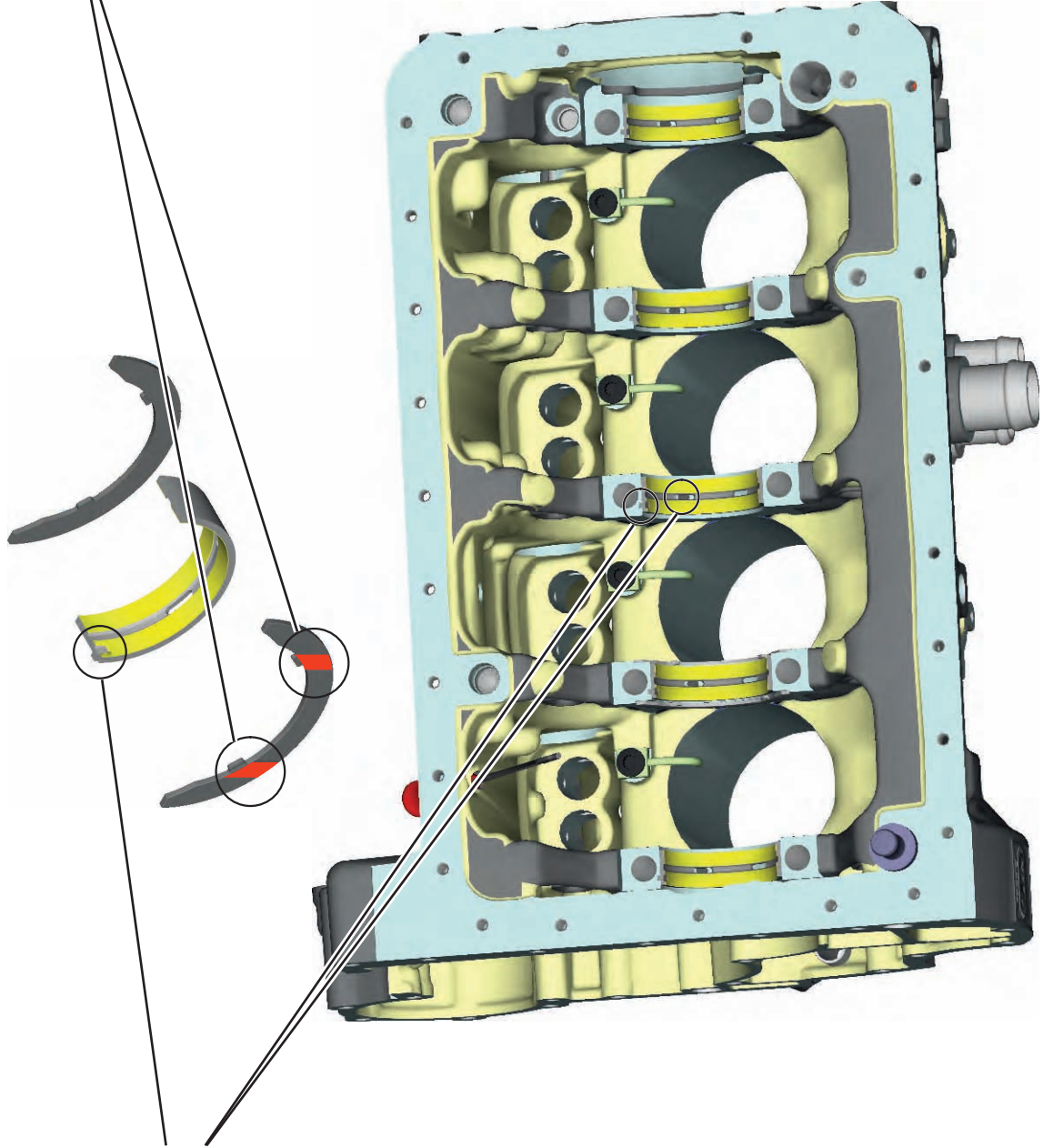
27 ± 2 Nm

M 02 Crankshaft

Insert main bearing halves into cylinder block main bearing bracket and moisten with engine oil.

Heed the correct position of the oil holes and the position groove.

Insert thrust washer with grease.
Oil pockets point to the crankshaft sliding surfaces!

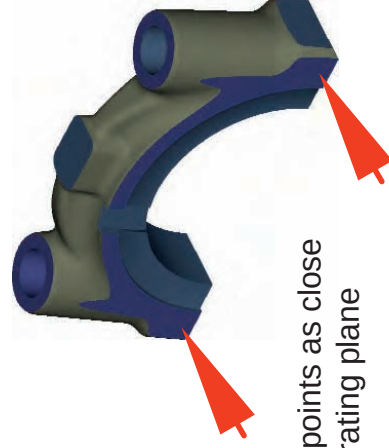
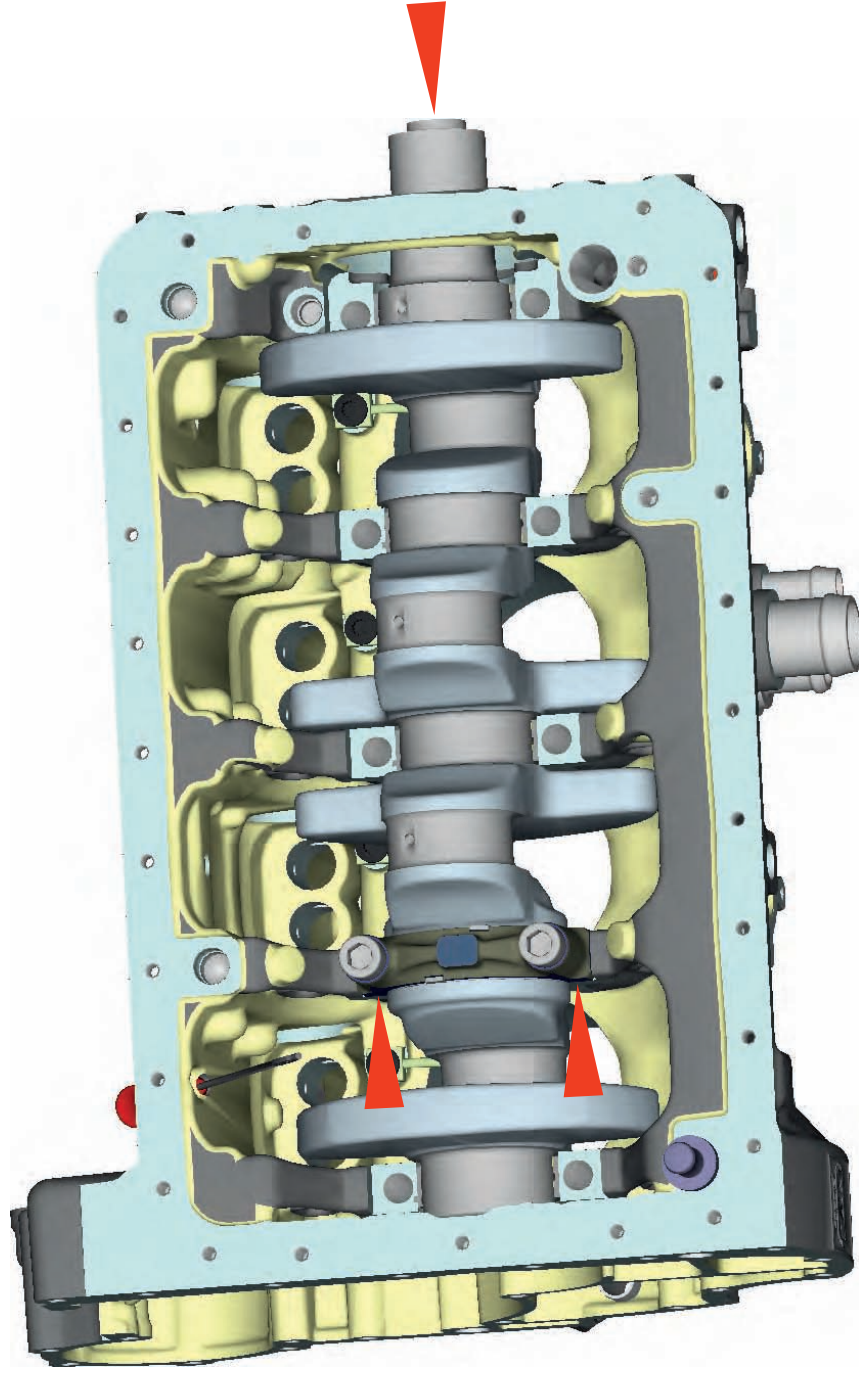


M 02 Crankshaft

Thread crankshaft into cylinder block.

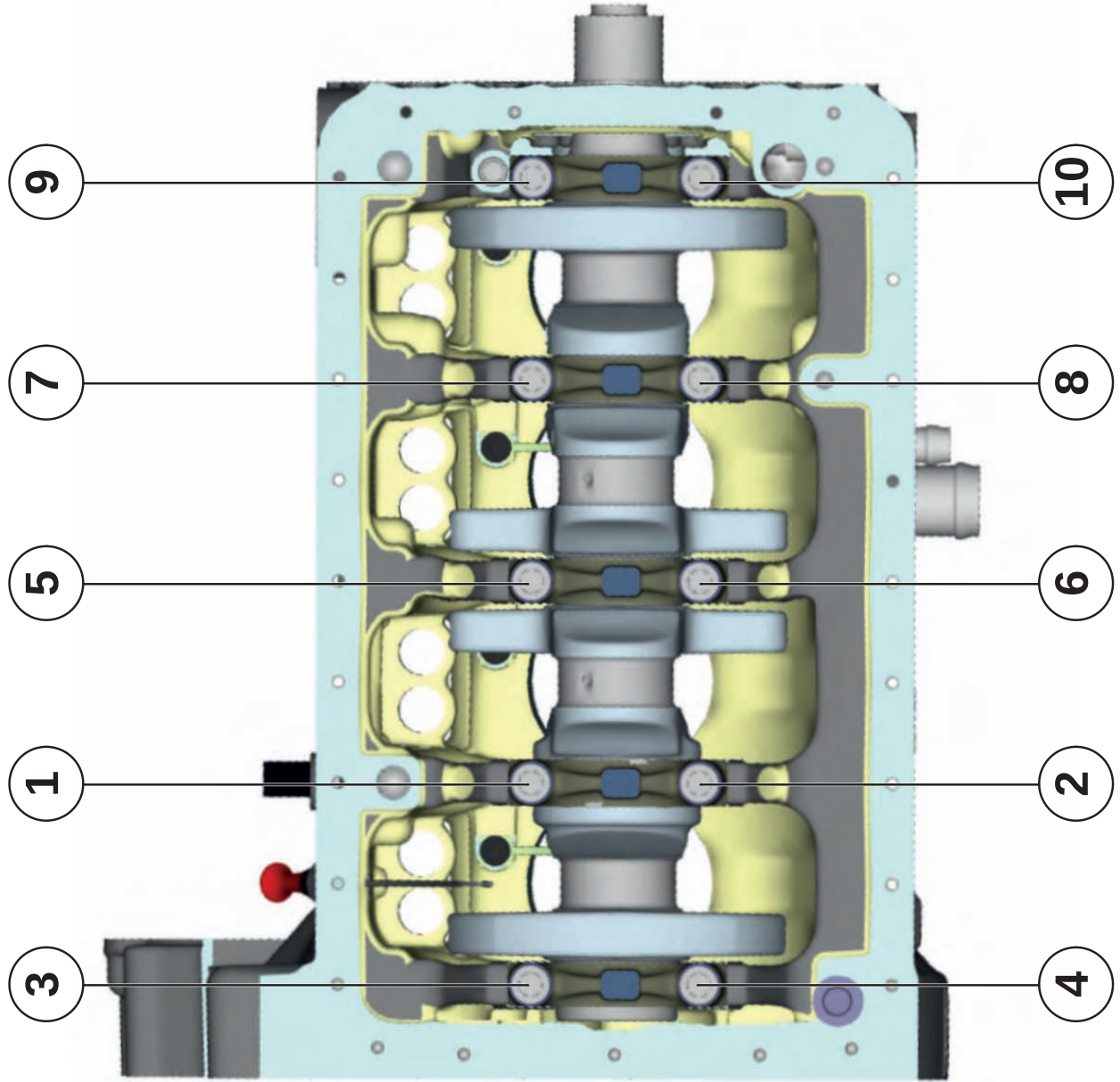
Ensure axial play of the crankshaft through correct mounting of the main bearing bracket with thrust washers.

Before tightening the screws on the main bearing bracket, put the crankshaft and the main bearing bracket in the specified direction to the system.



Force transmission points as close as possible to separating plane

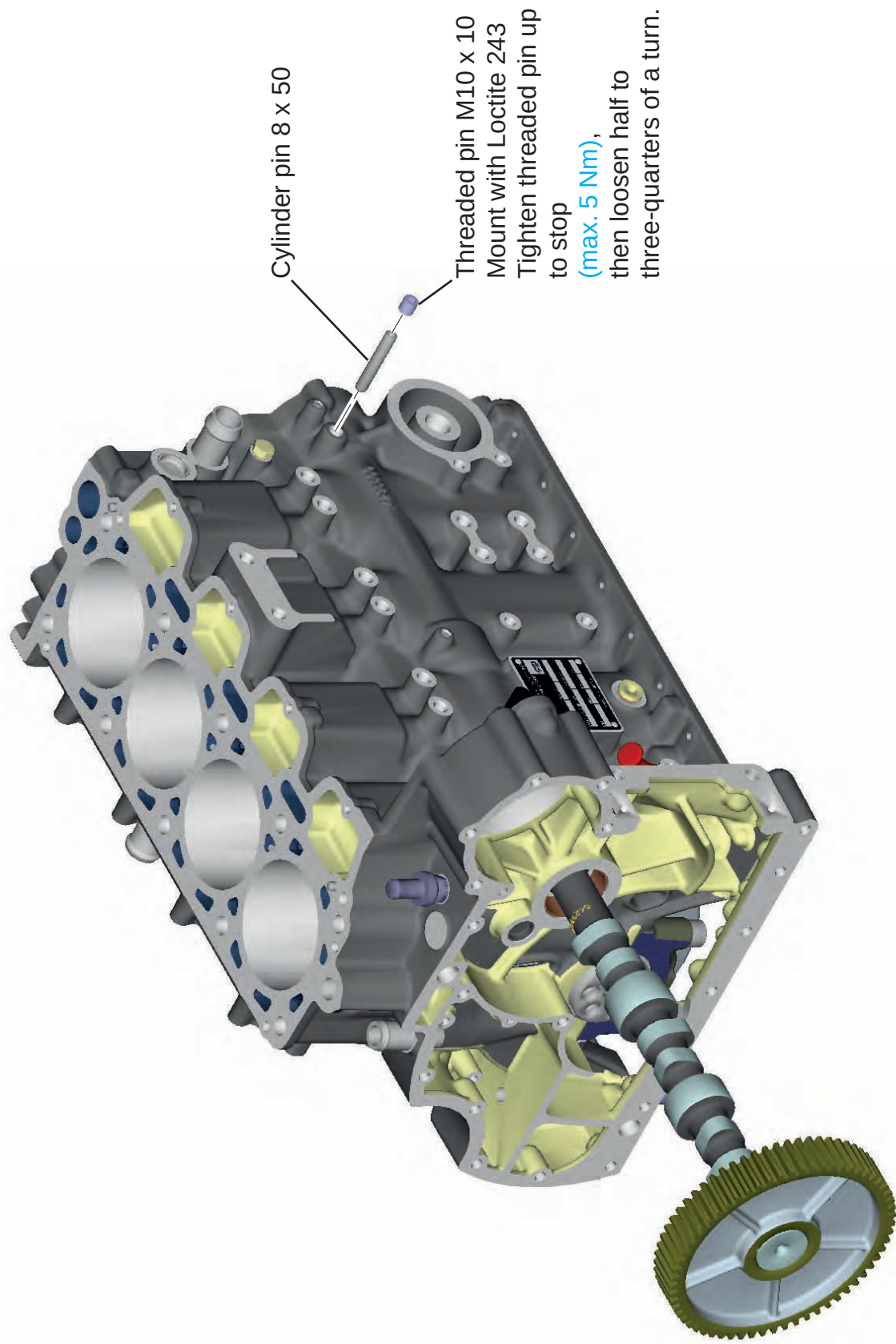
M 02 Crankshaft



Tighten main bearing bracket in the specified sequence.

Tightening torque:

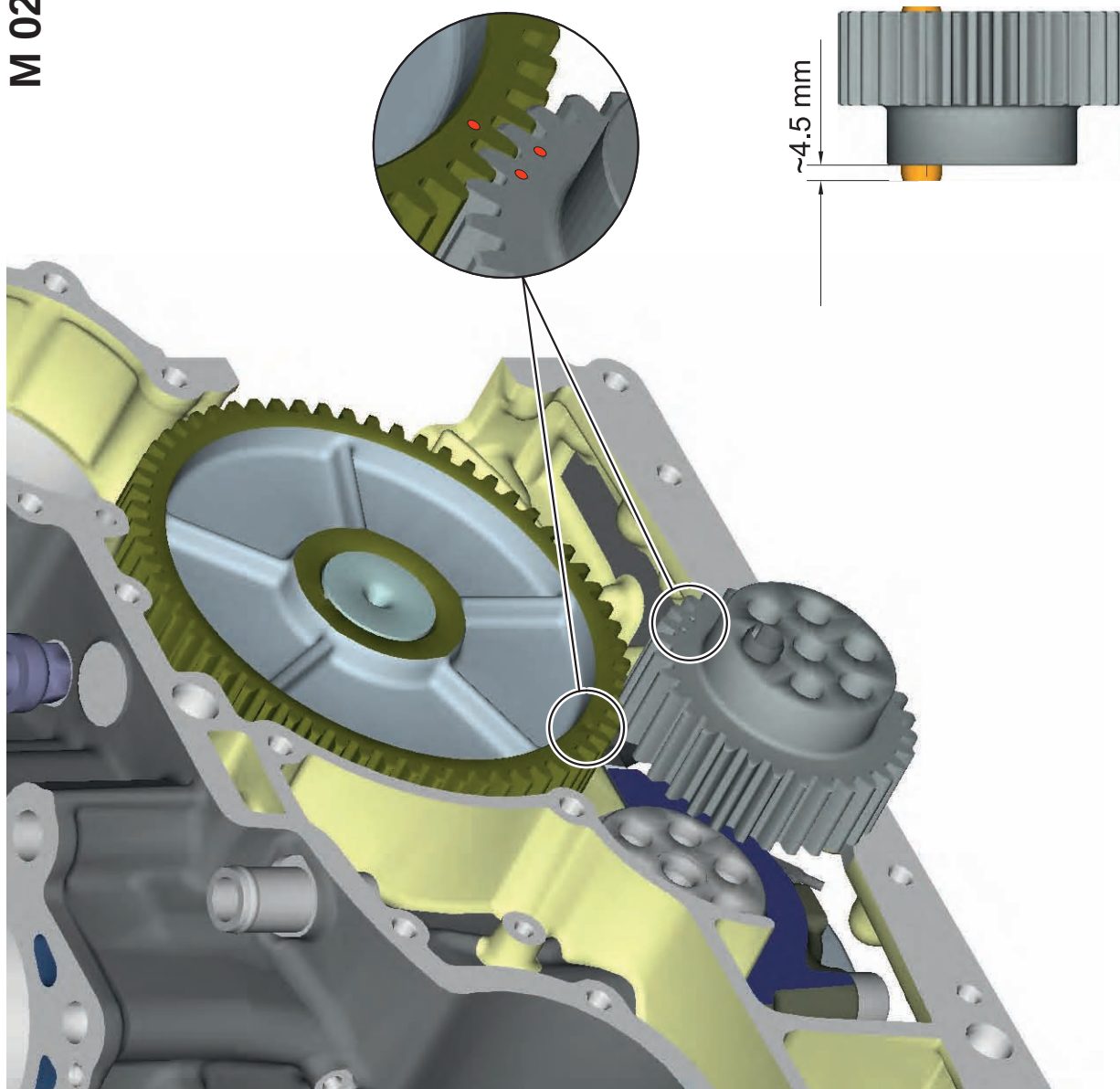
1st level: 10 Nm
2nd level: 45 Nm
3rd level: 90 Nm



Grease camshaft bearing points with engine oil and insert camshaft into cylinder block.

M 02 Crankshaft gear wheel

Place crankshaft gear wheel on crankshaft, heeding the correct positioning of the markings!



Press spring pin into crankshaft gear wheel to specified dimension.

M 01 Connector housing



Apply sealing agent
Loctite 5910
according to the black
curve.

WDRI 55x70x8
Oil slightly and press in
until flush with flange
surface

M 01 Connector housing

Place connector housing on cylinder block and tighten slightly by hand with the three screws **1**.

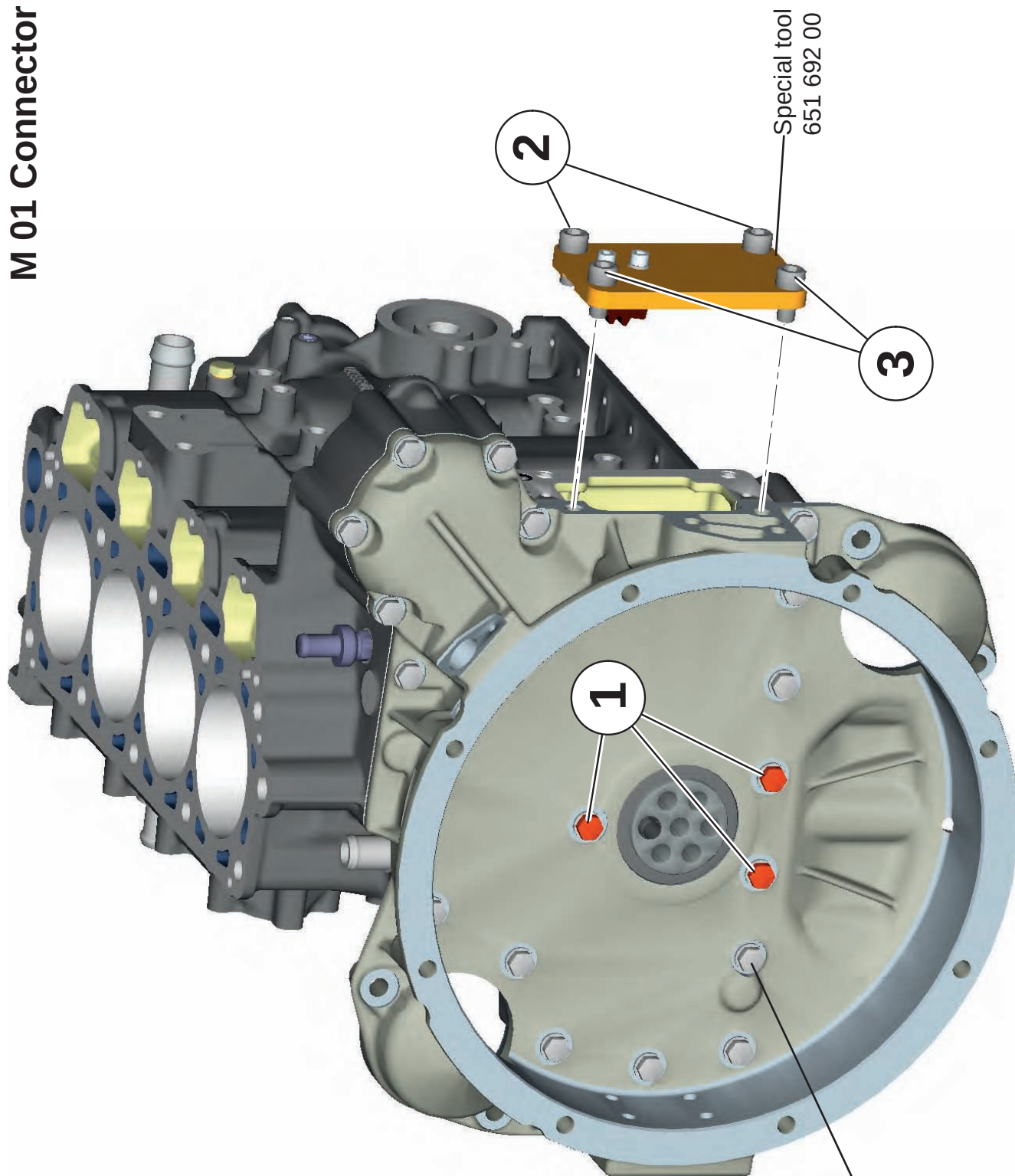
Screw special tool onto cylinder block **2** (**23 Nm**)

Screw special tool onto connector housing **3** (**23 Nm**); this aligns the flange surface.

Tighten only the three screws **1** with **10-12 Nm**. Loosen screws **3** in order to avoid distortion, tighten all 19 combi screws (**23 Nm**).

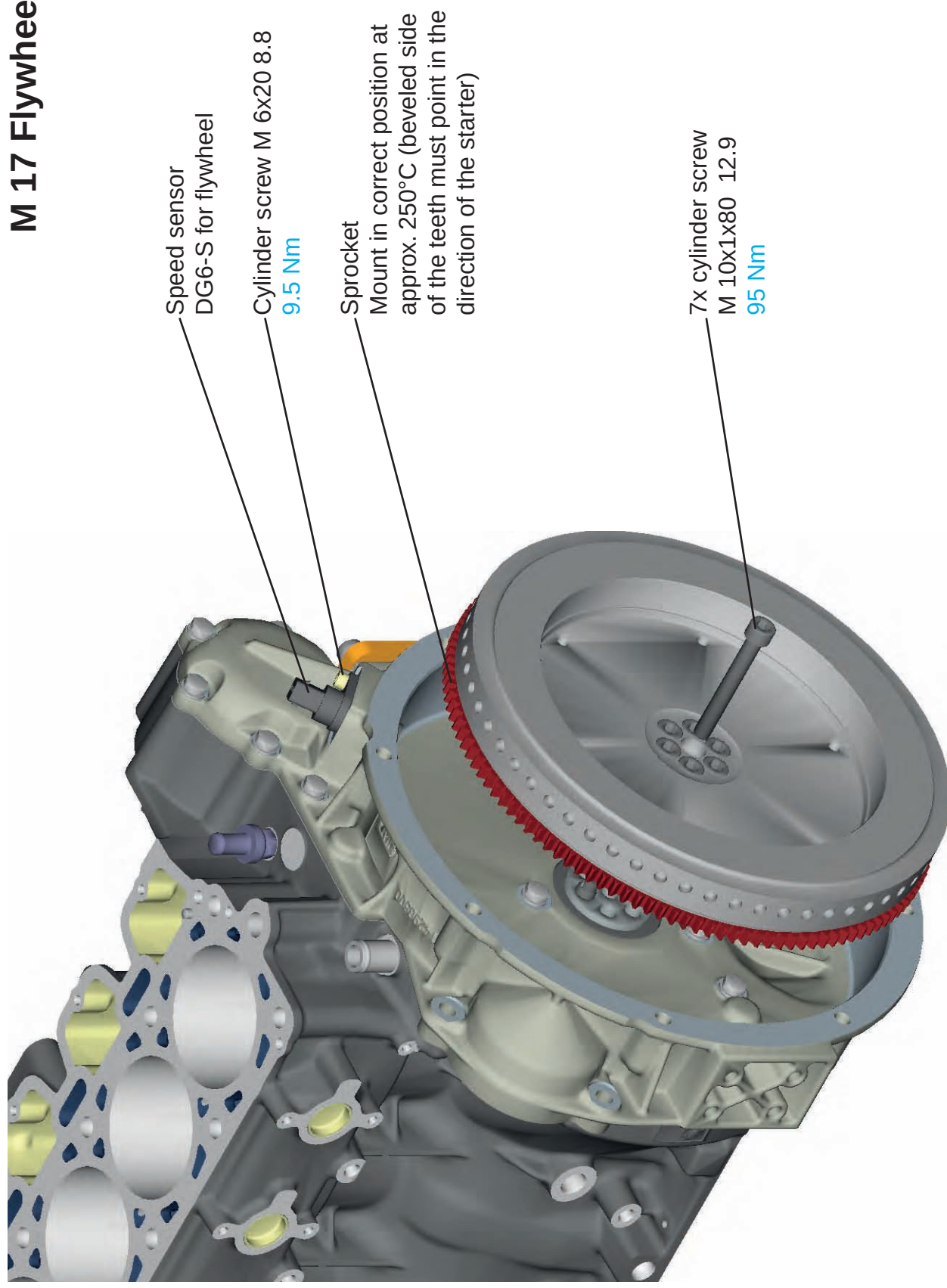
Tighten special tool with screws **3** again (camshaft / crankshaft is blocked).

19x combi screw
ISO 10644 (ISO 4017
+ 10673 N)
M 8x25 - 8.8 - A3B
23 Nm

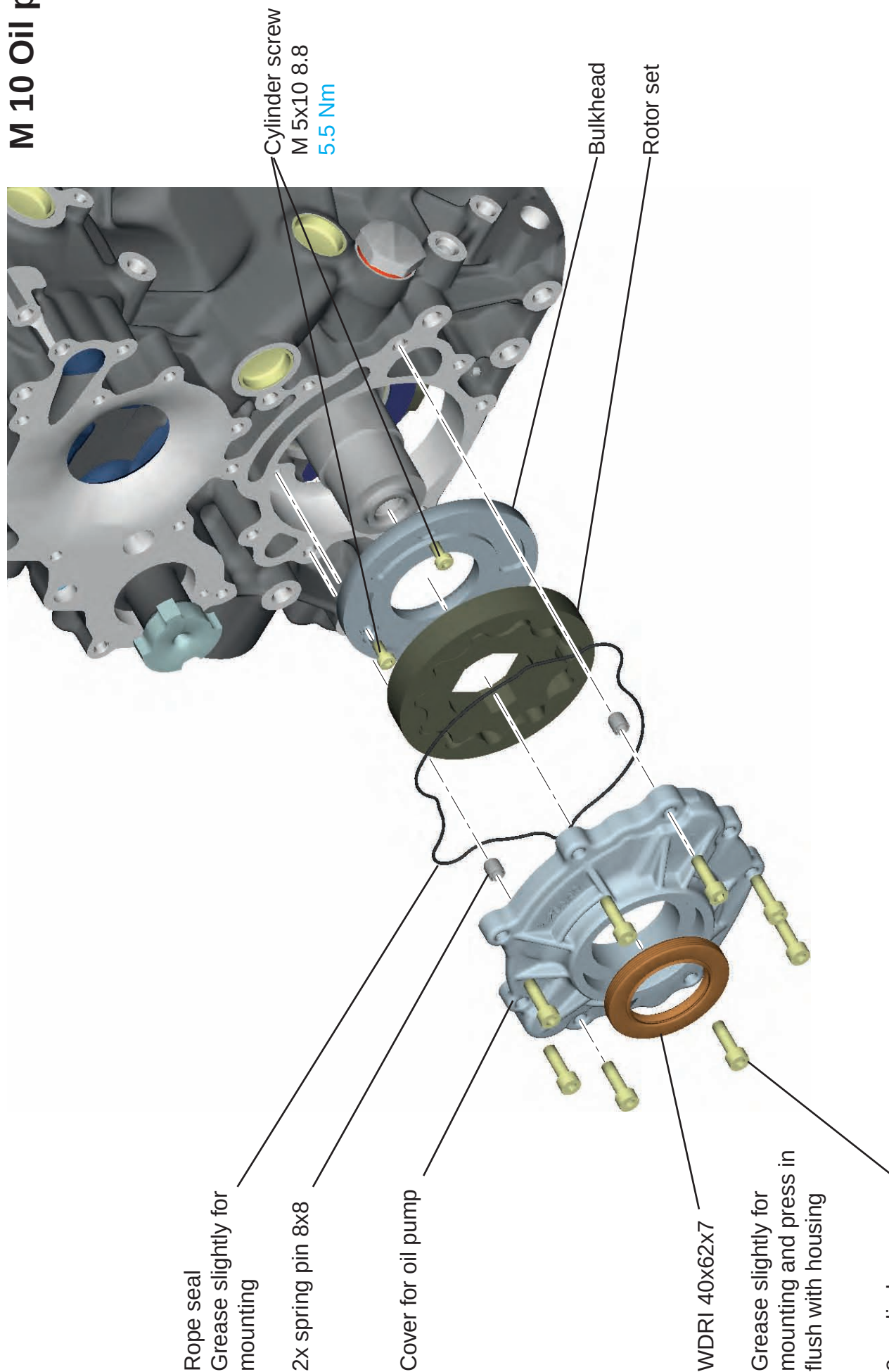


M 17 Flywheel

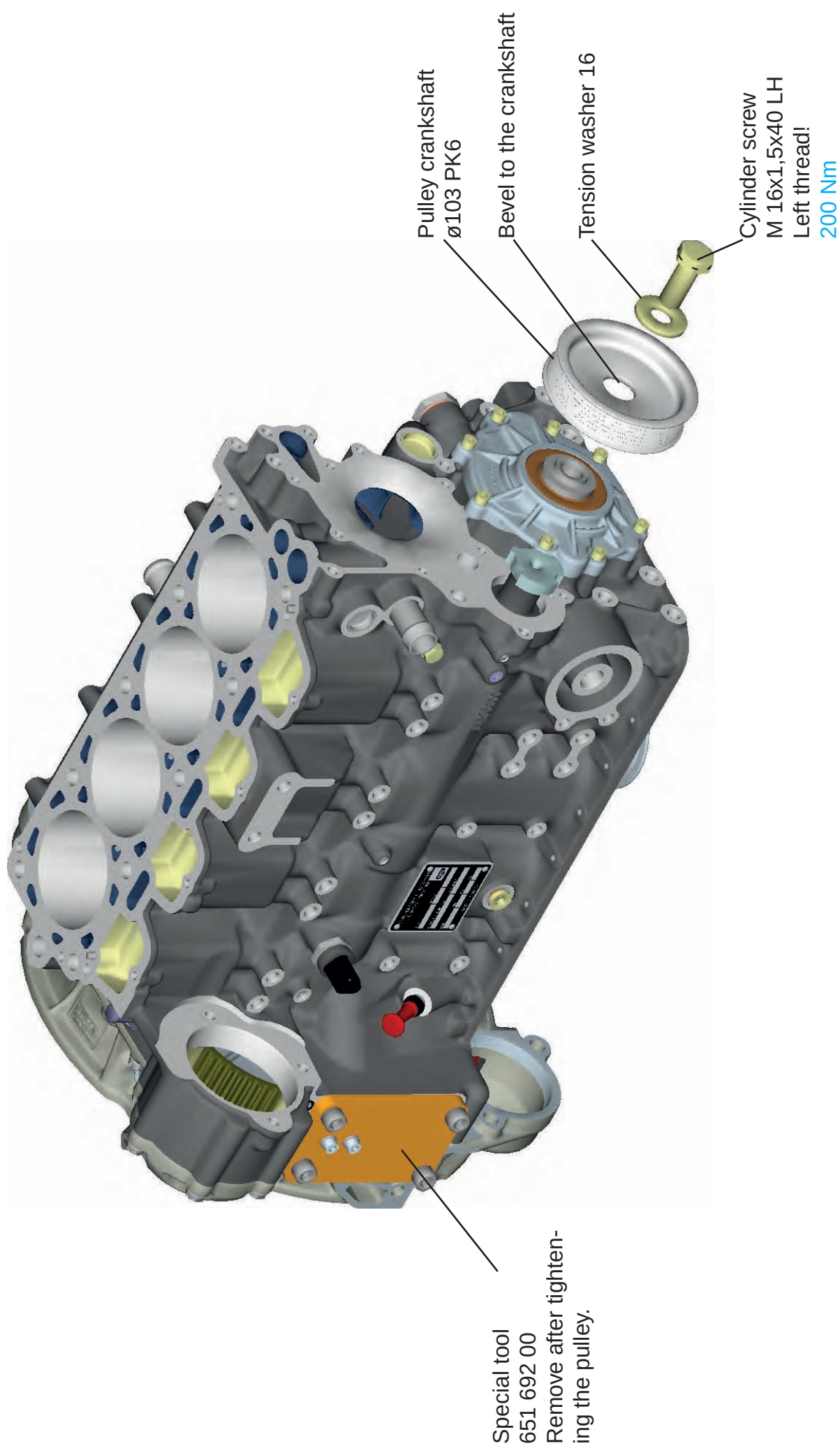
Caution!
Remove speed sensor before dismounting the flywheel and only install after mounting the flywheel; otherwise it can be damaged by the sprocket.
Keep soiling to a minimum!
Front side is magnetic!
Avoid contact with iron particles!



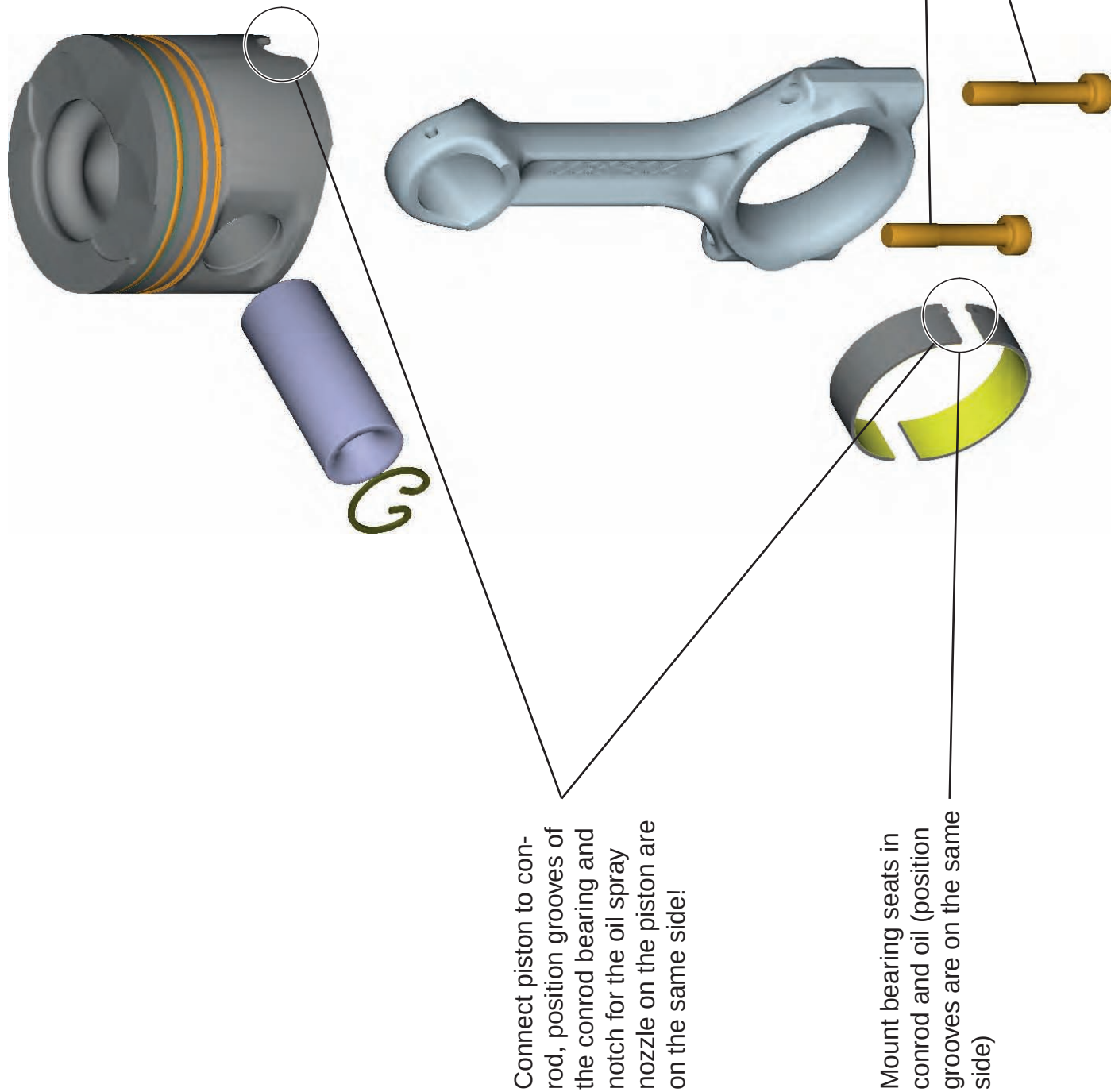
M 10 Oil pump



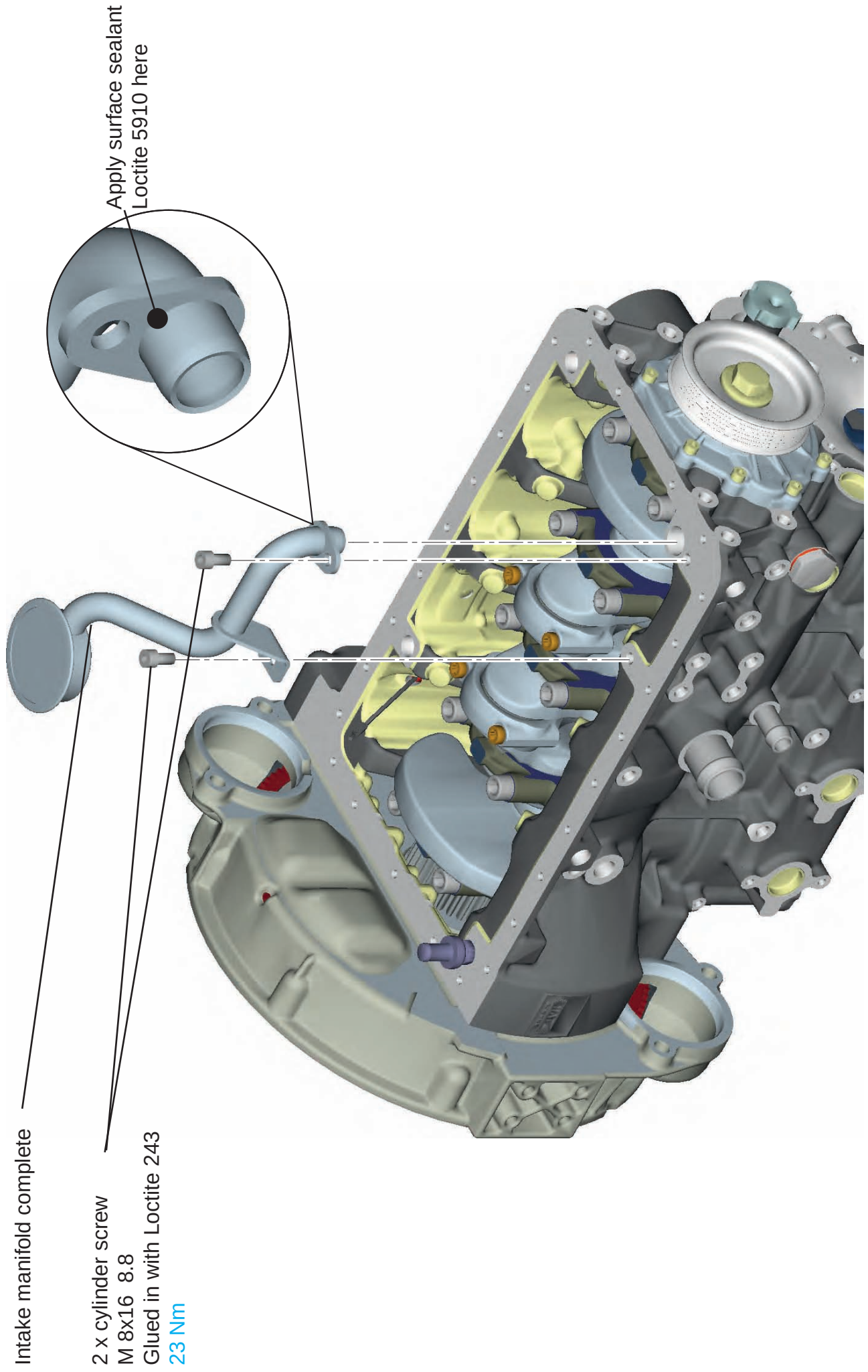
Z 30 Pulley



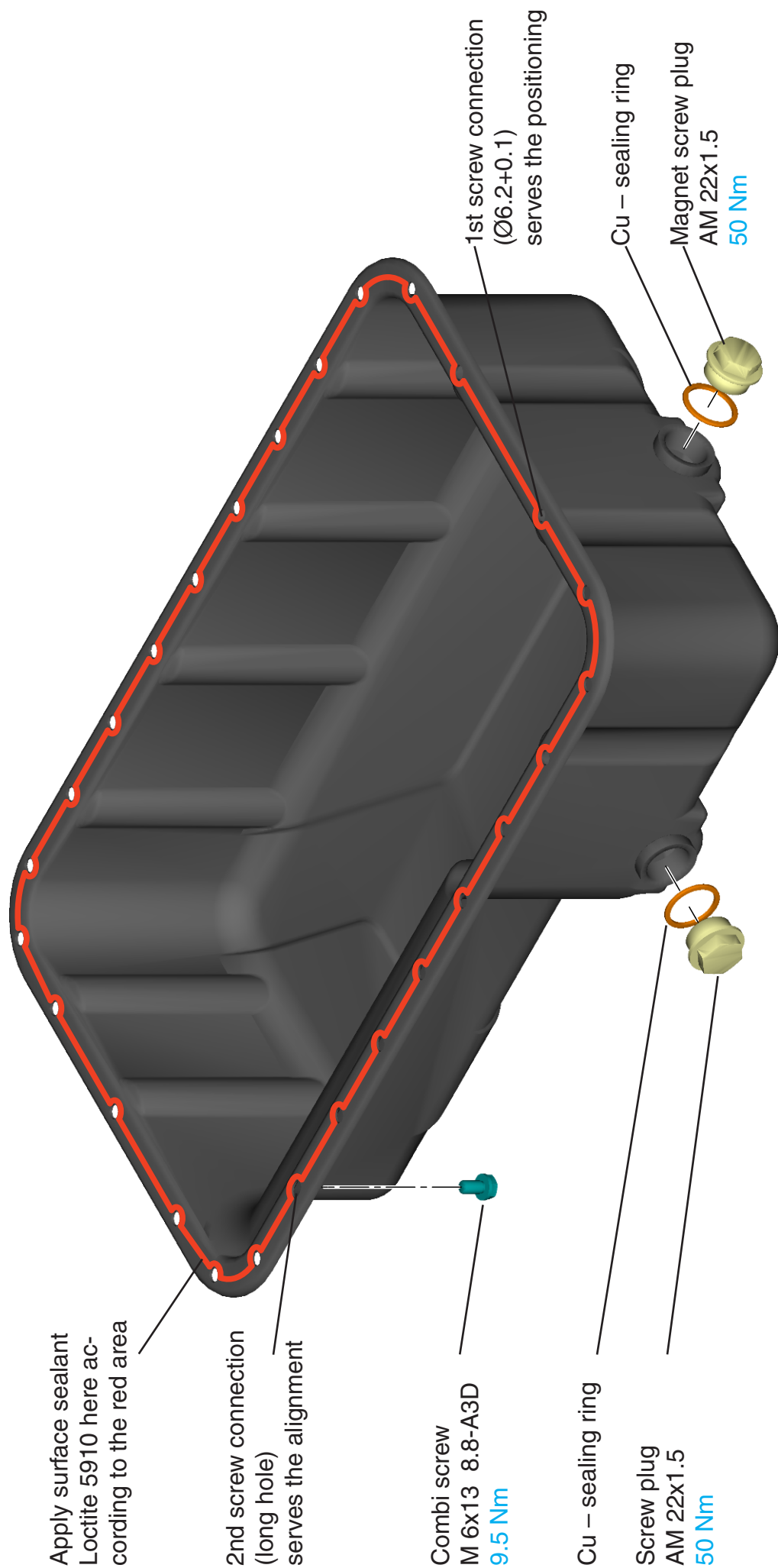
M 05 Piston and conrod



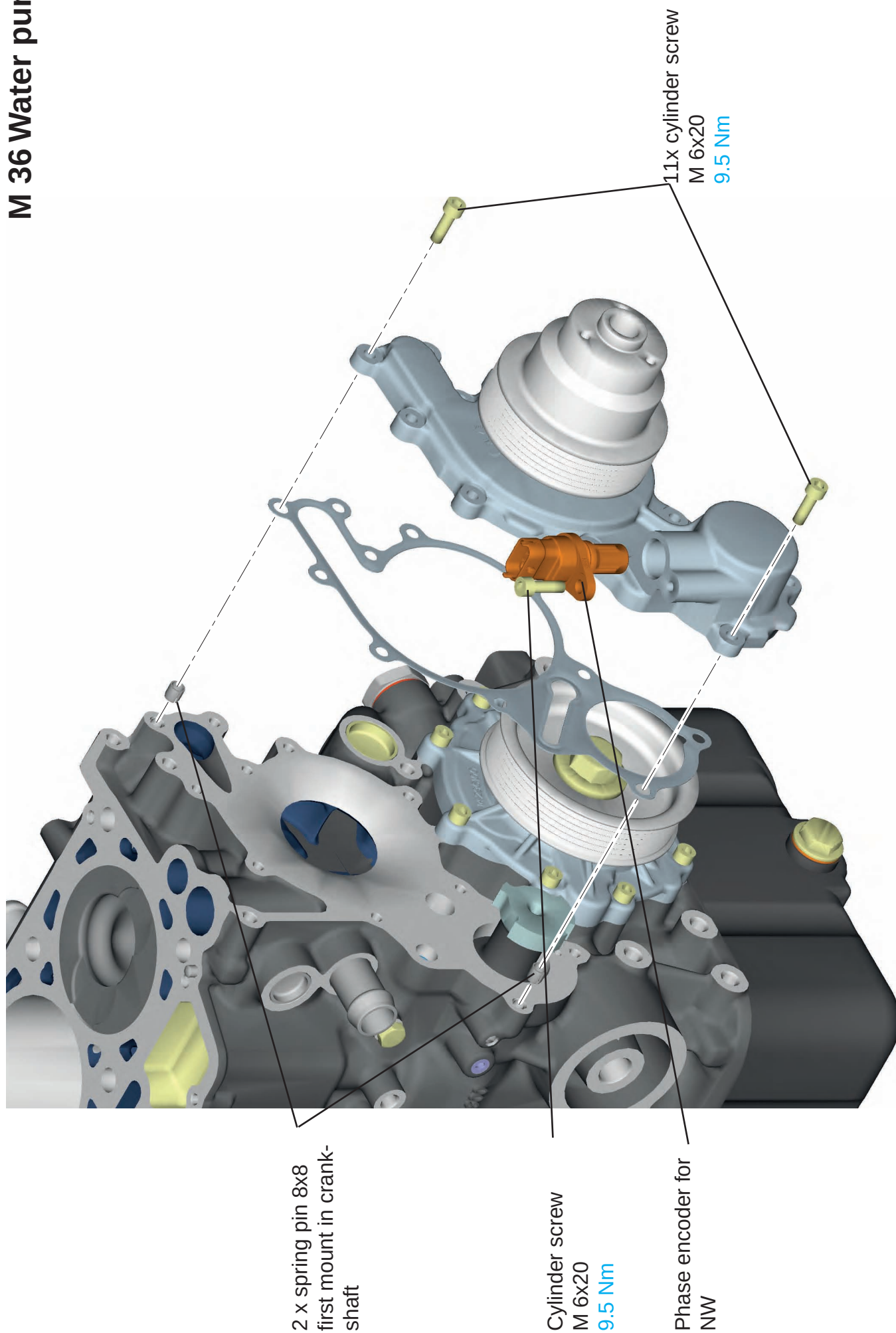
M 10 Intake manifold



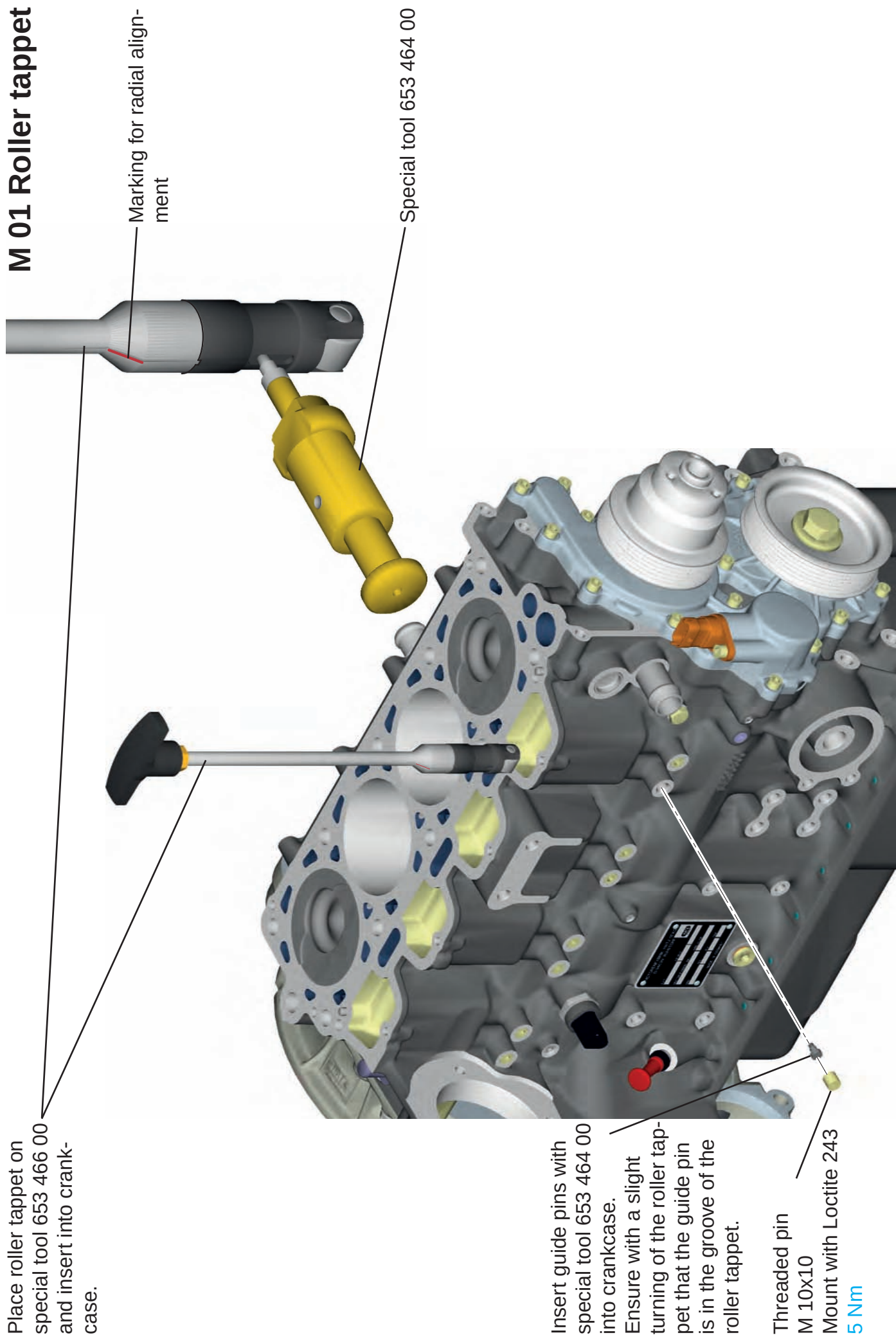
M 01 Oil sump



M 36 Water pump



M 01 Roller tappet



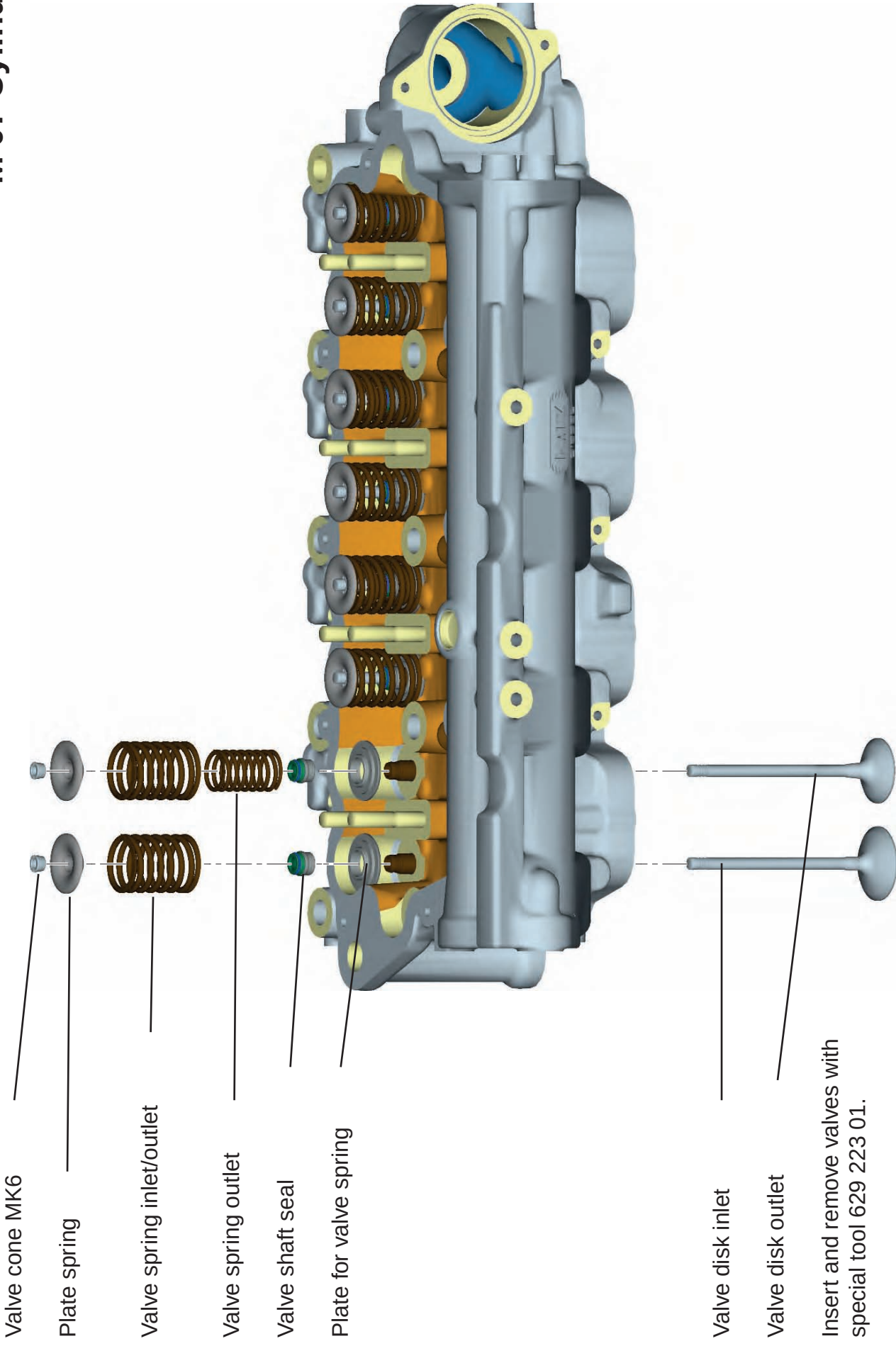
Place roller tappet on special tool 653 466 00 and insert into crankcase.

Insert guide pins with special tool 653 464 00 into crankcase.

Ensure with a slight turning of the roller tappet that the guide pin is in the groove of the roller tappet.

Threaded pin
M 10x10
Mount with Loctite 243
5 Nm

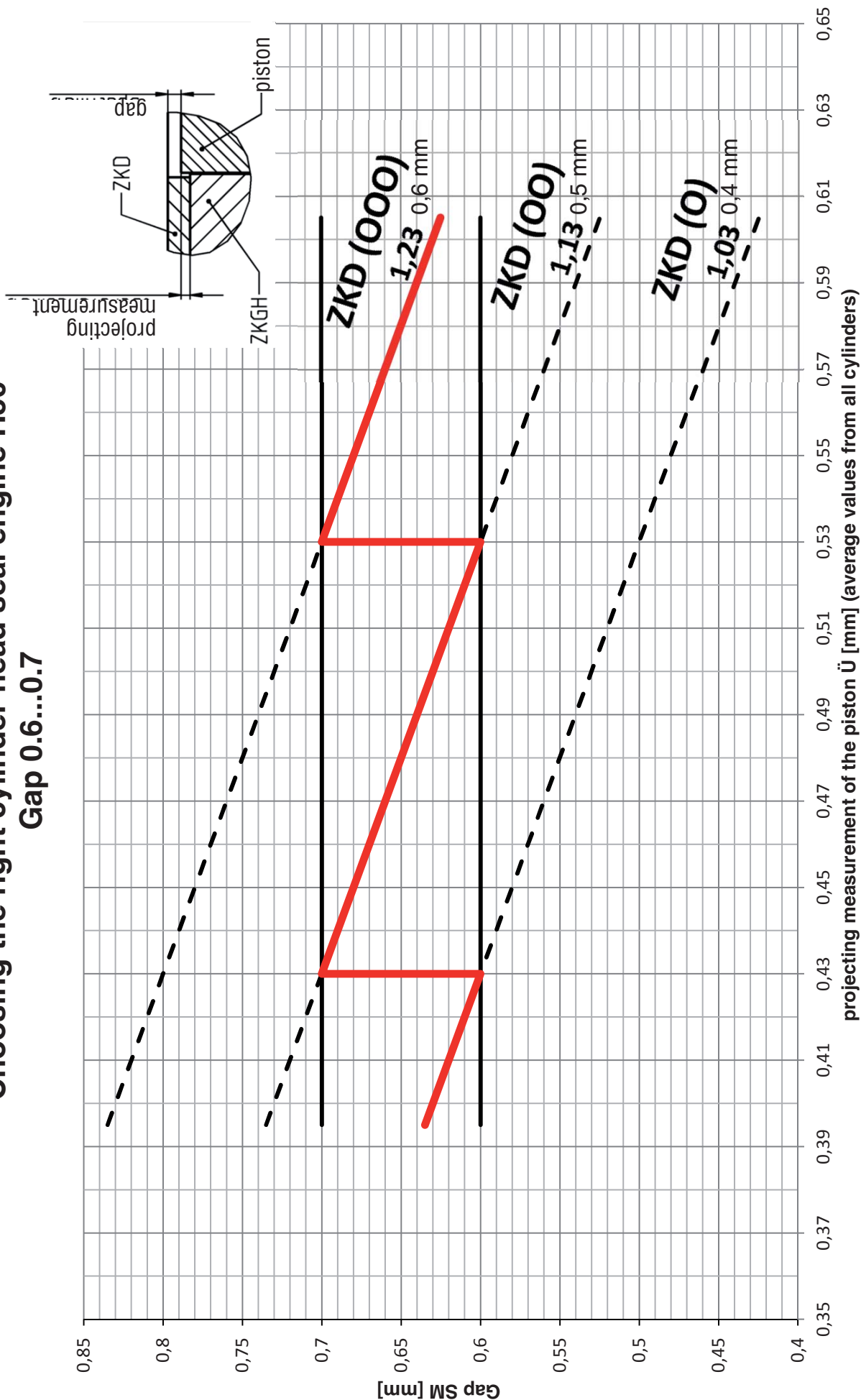
M 07 Cylinder head



M 07 Cylinder head

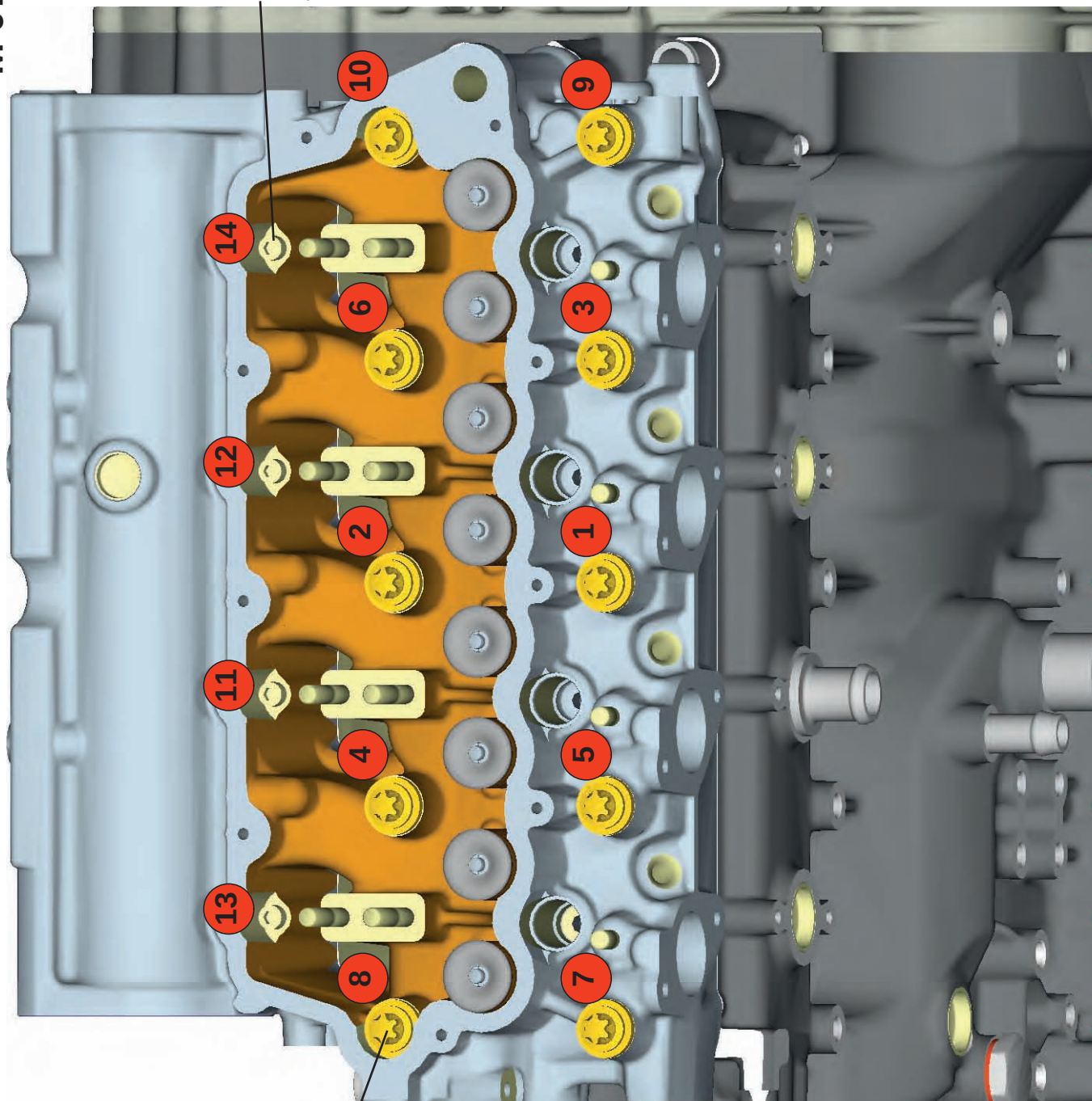
Choosing the right cylinder head seal engine H50

Gap 0.6...0.7



Determine piston protrusion with special tool 653 474 00 and select cylinder head seal according to table.

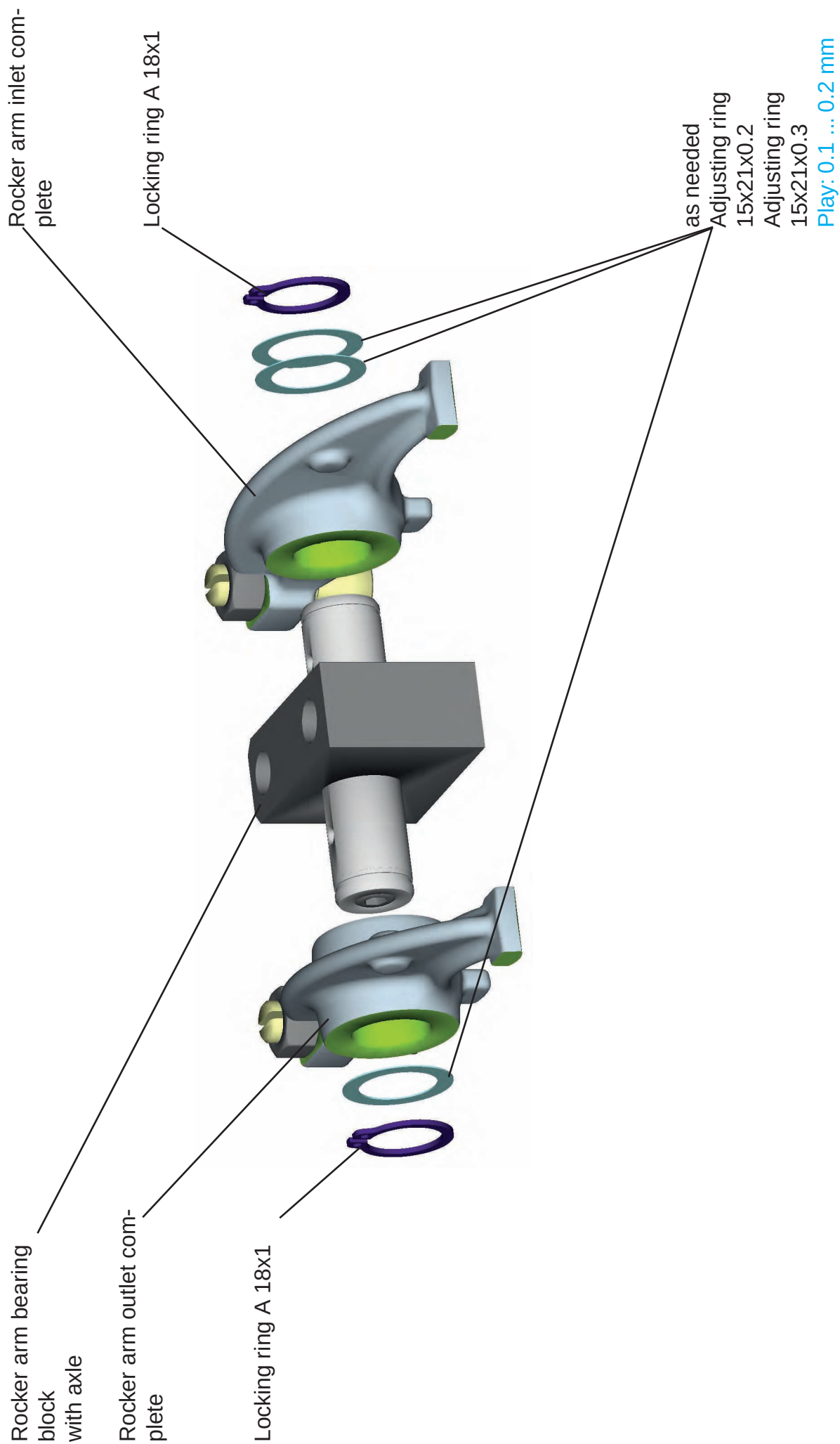
M 07 Cylinder head



Combi screw
M 12x130
Tightening process
1 - 10
1st stage: 20+2 Nm
2ndstage: 75°+5°
3rdstage: 75°+5°
greased with TA White!

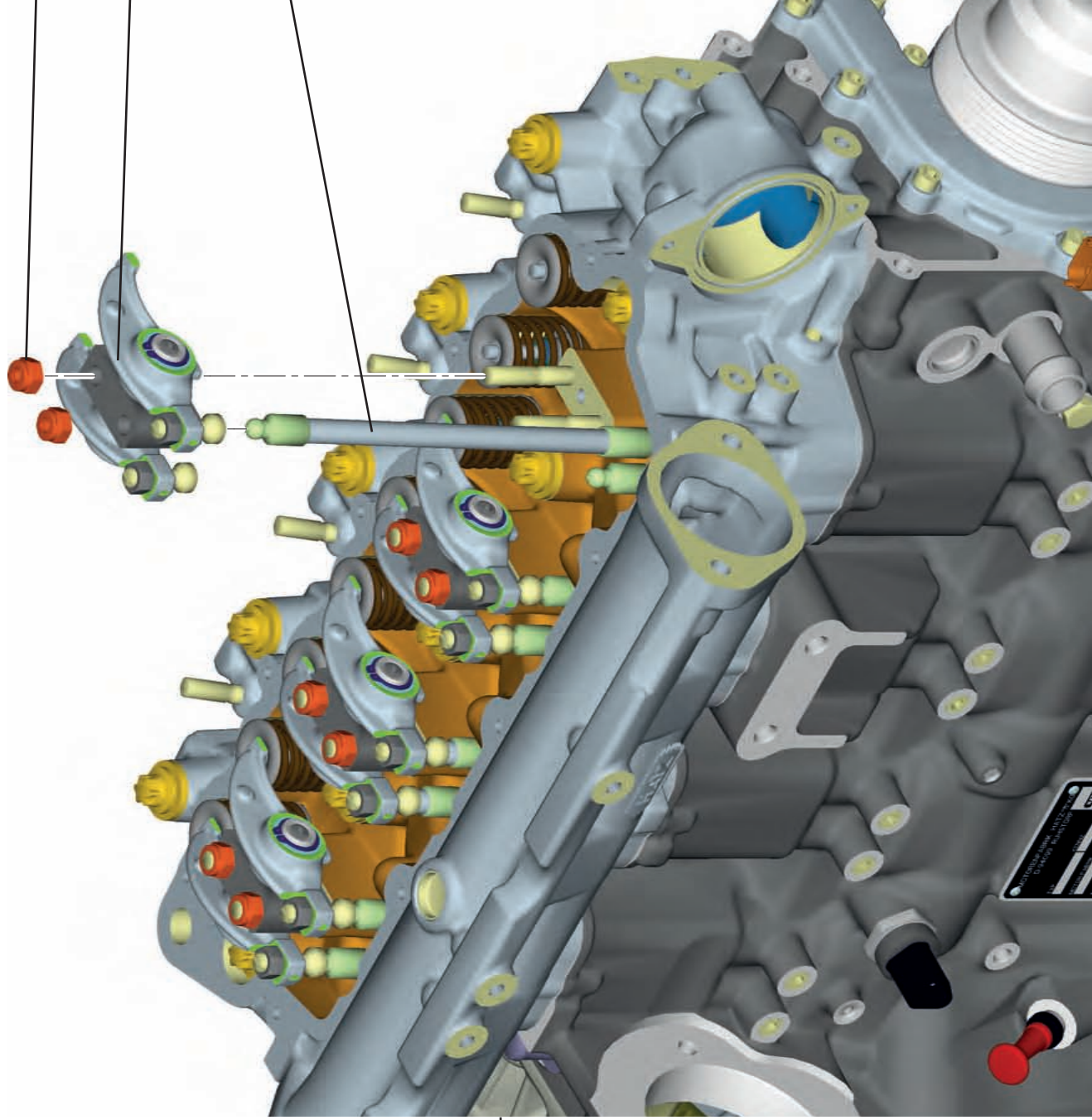
Cylinder screw
M 6x80
Tightening process
11 - 14
9.5 Nm

M 07 Rocker arm



M 07 Rocker arm

- Hexagon nut VM 8
23 Nm
- Rocker arm bearing
block complete
with levers
- Push rod



Basic setting tappet clearance:

Turn the cylinder to be adjusted in the working cycle.

Loosen the lock nut and turn adjusting screw in until the calotte of the adjusting screw lies against the spherical head of the push rod.

From this position, turn the adjusting screw 1 1/4 turns in and secure with lock nut.

M 08 Cylinder head cover

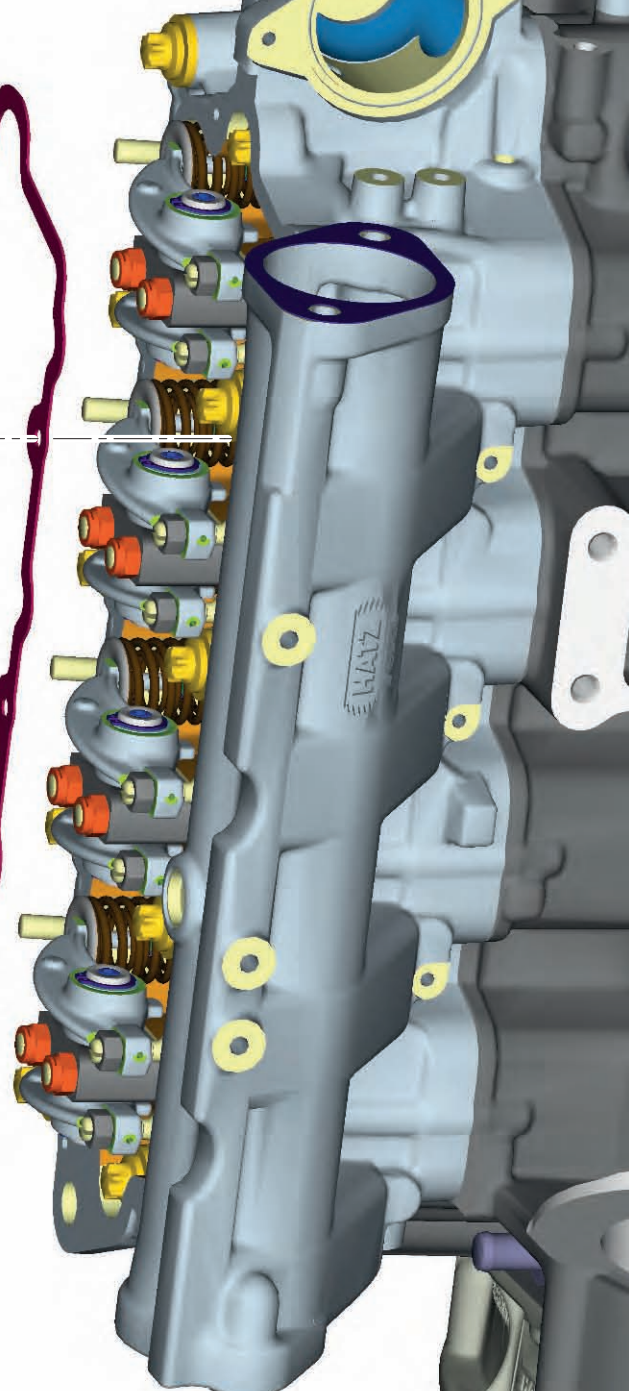
Hexagon bolt
M 6x20 -F- A3B
9.5 Nm



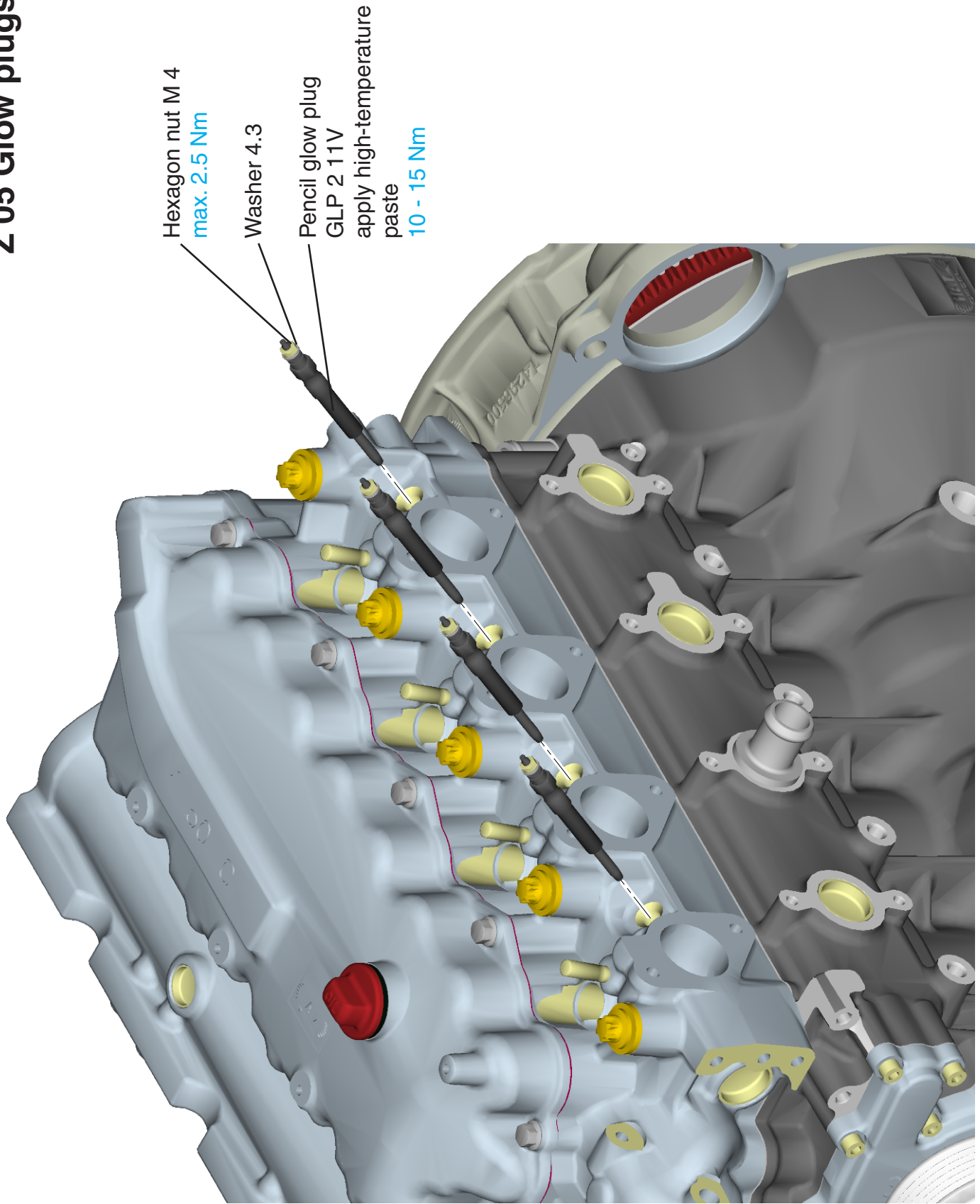
Screw plug for oil filler
with RK ring 26x35x3
tighten hand-tight

Cylinder head cover

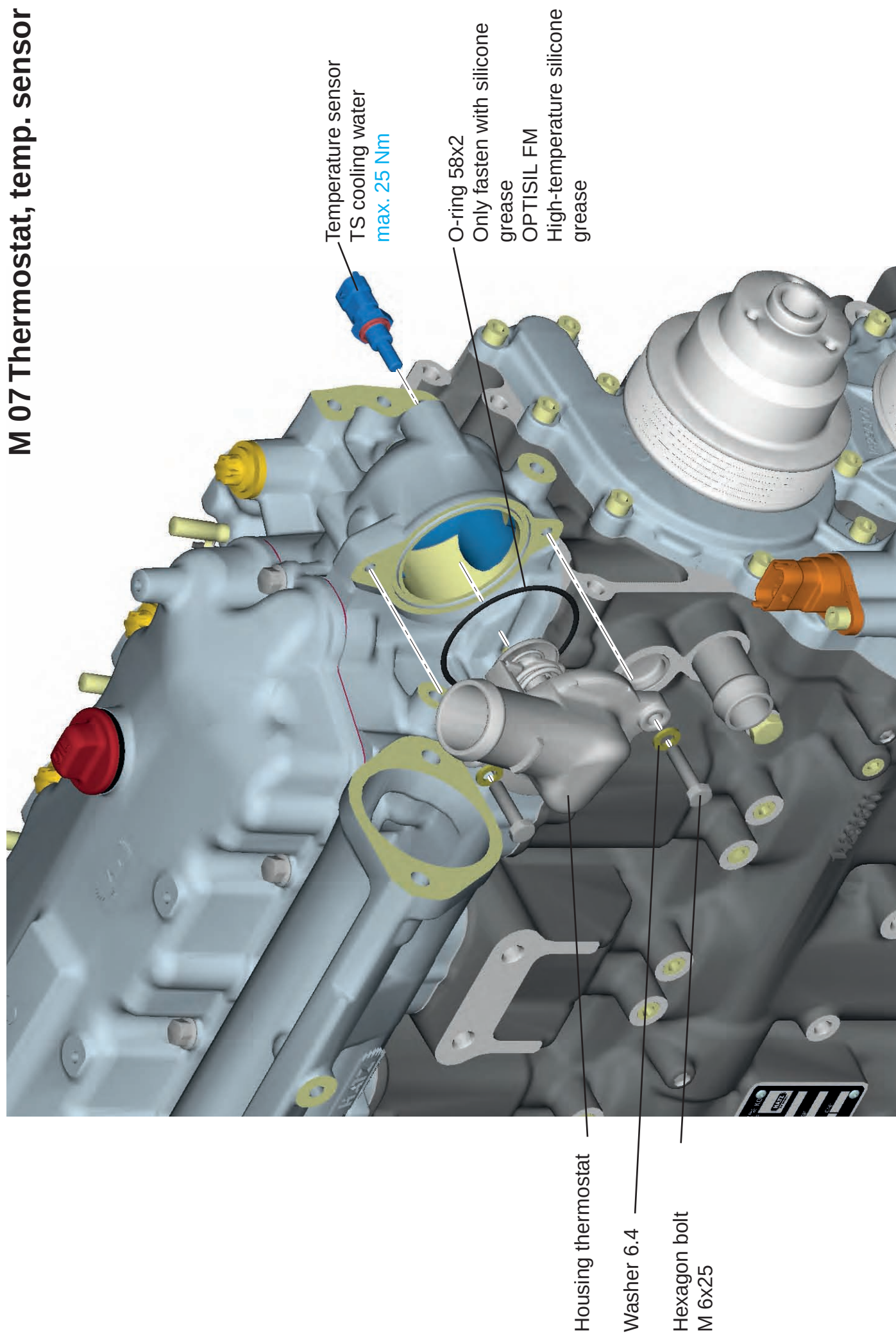
Paper seal for the
cylinder head cover

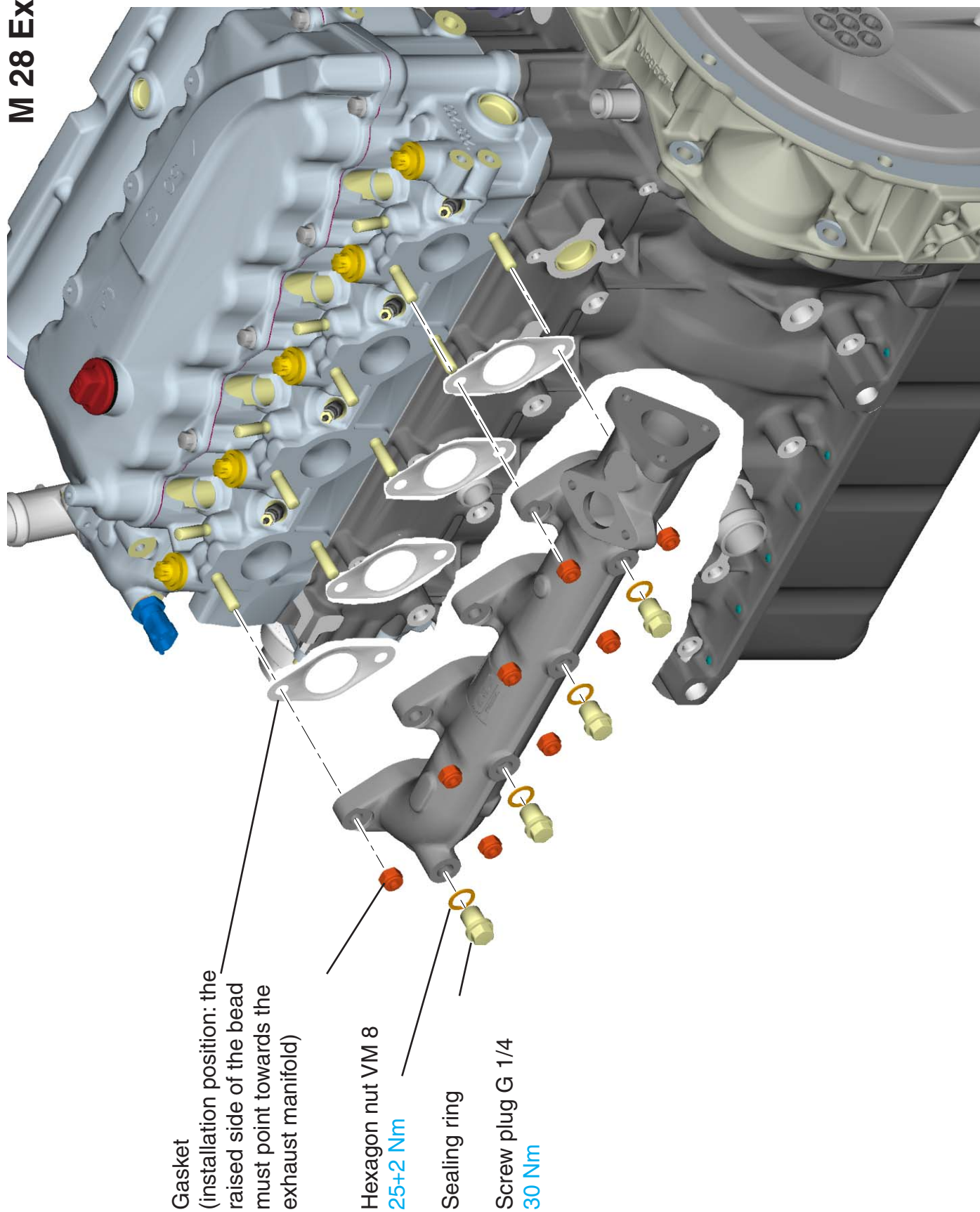


Z 05 Glow plugs

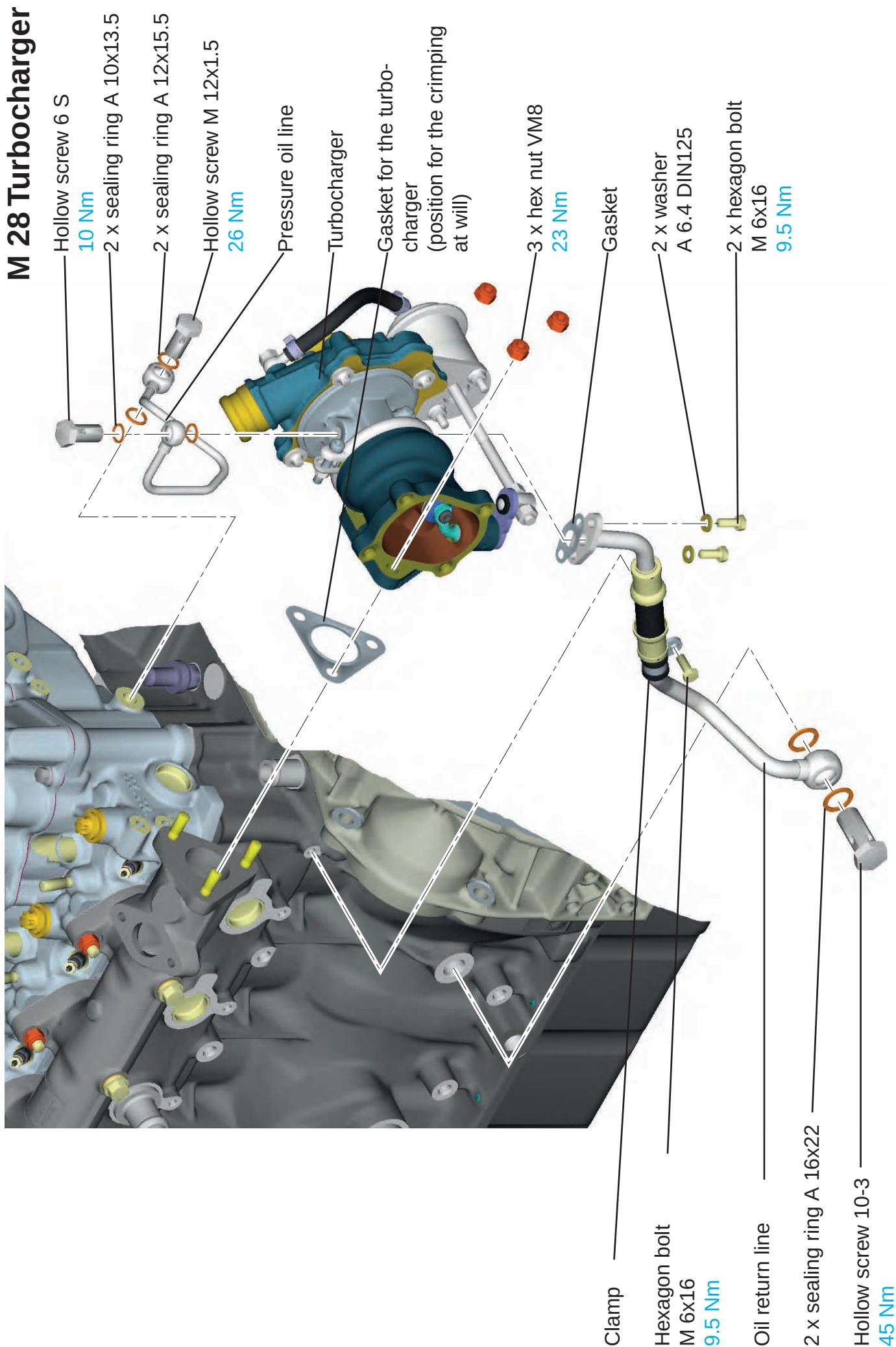


M 07 Thermostat, temp. sensor

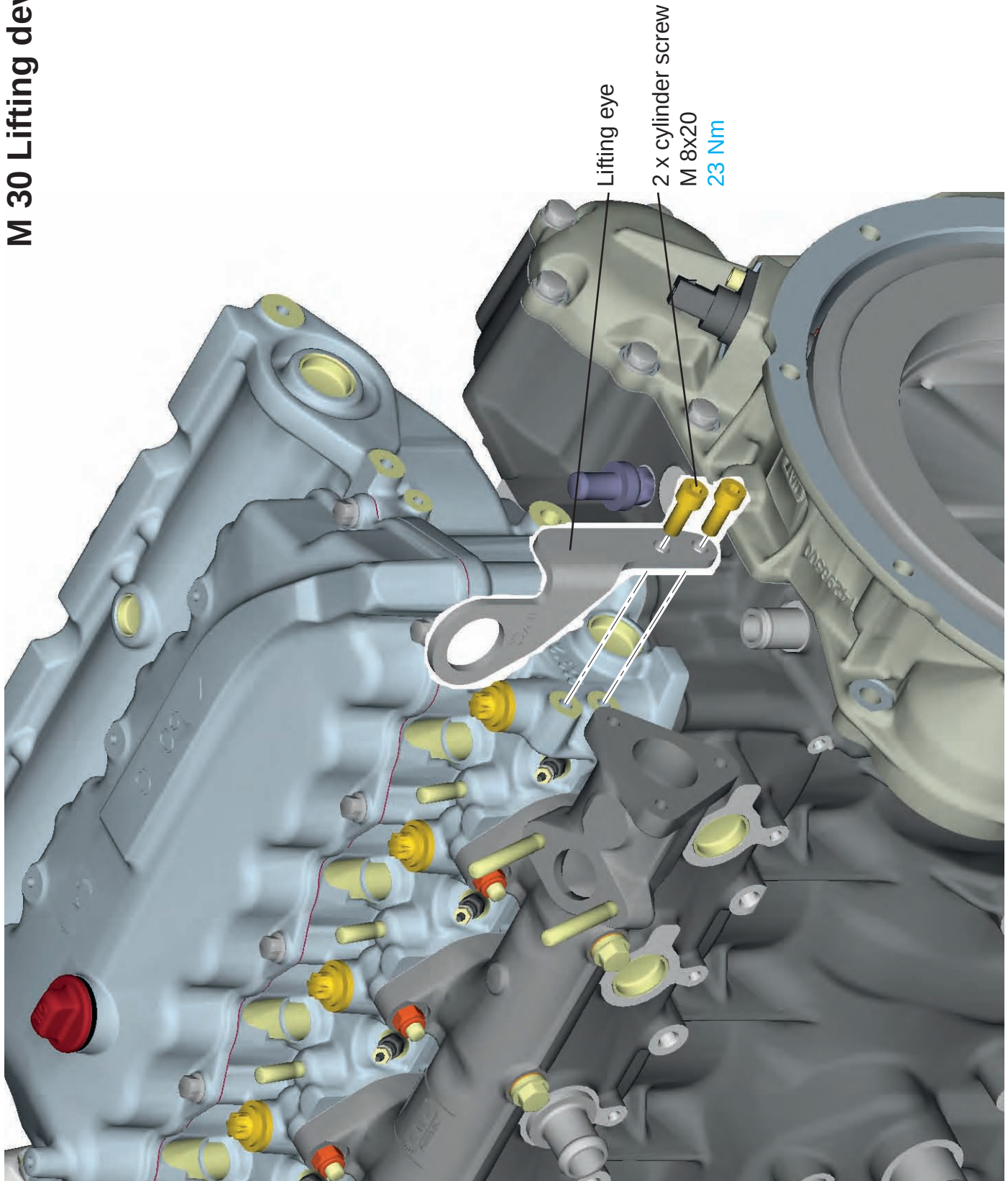




M 28 Turbocharger



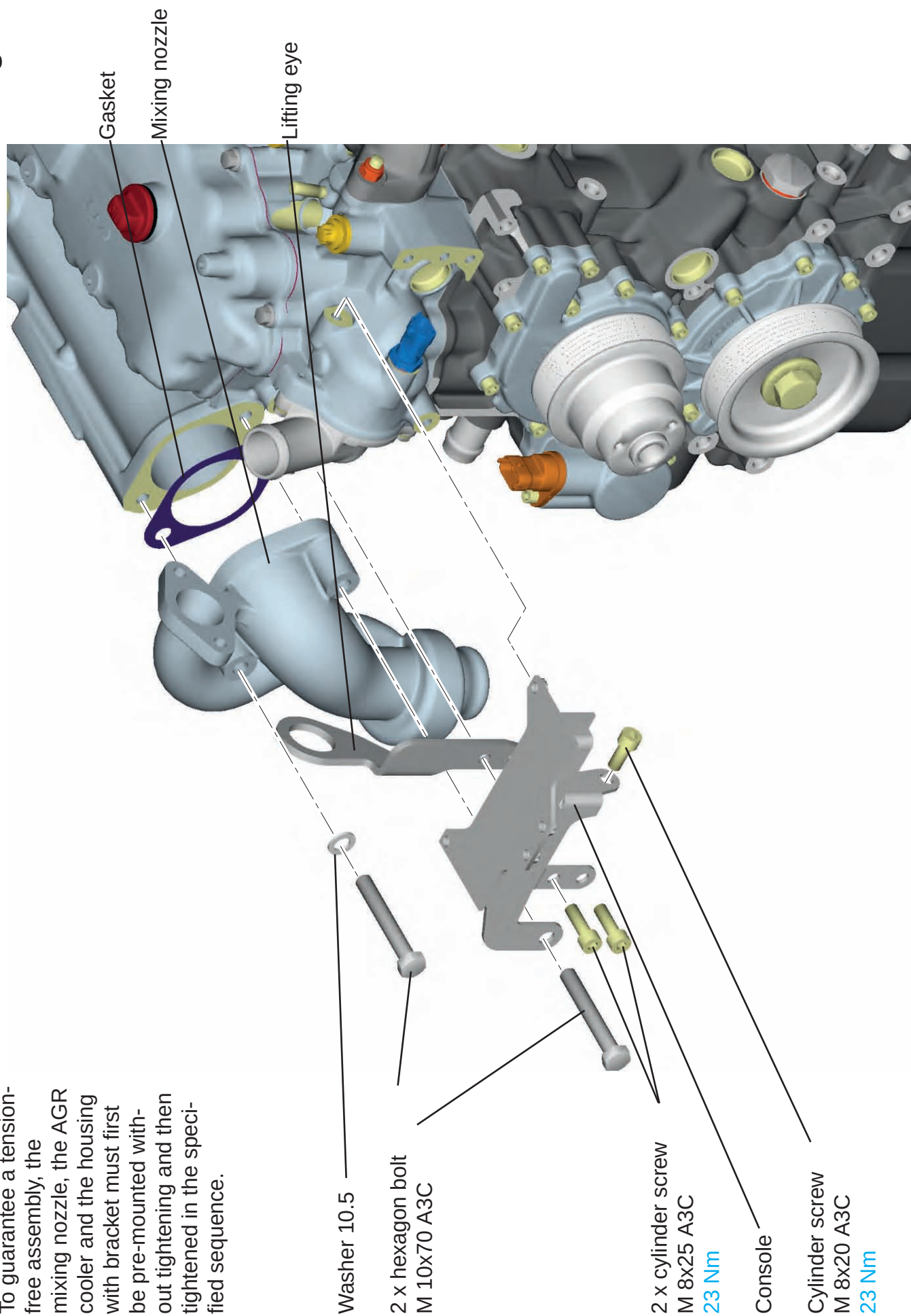
M 30 Lifting device



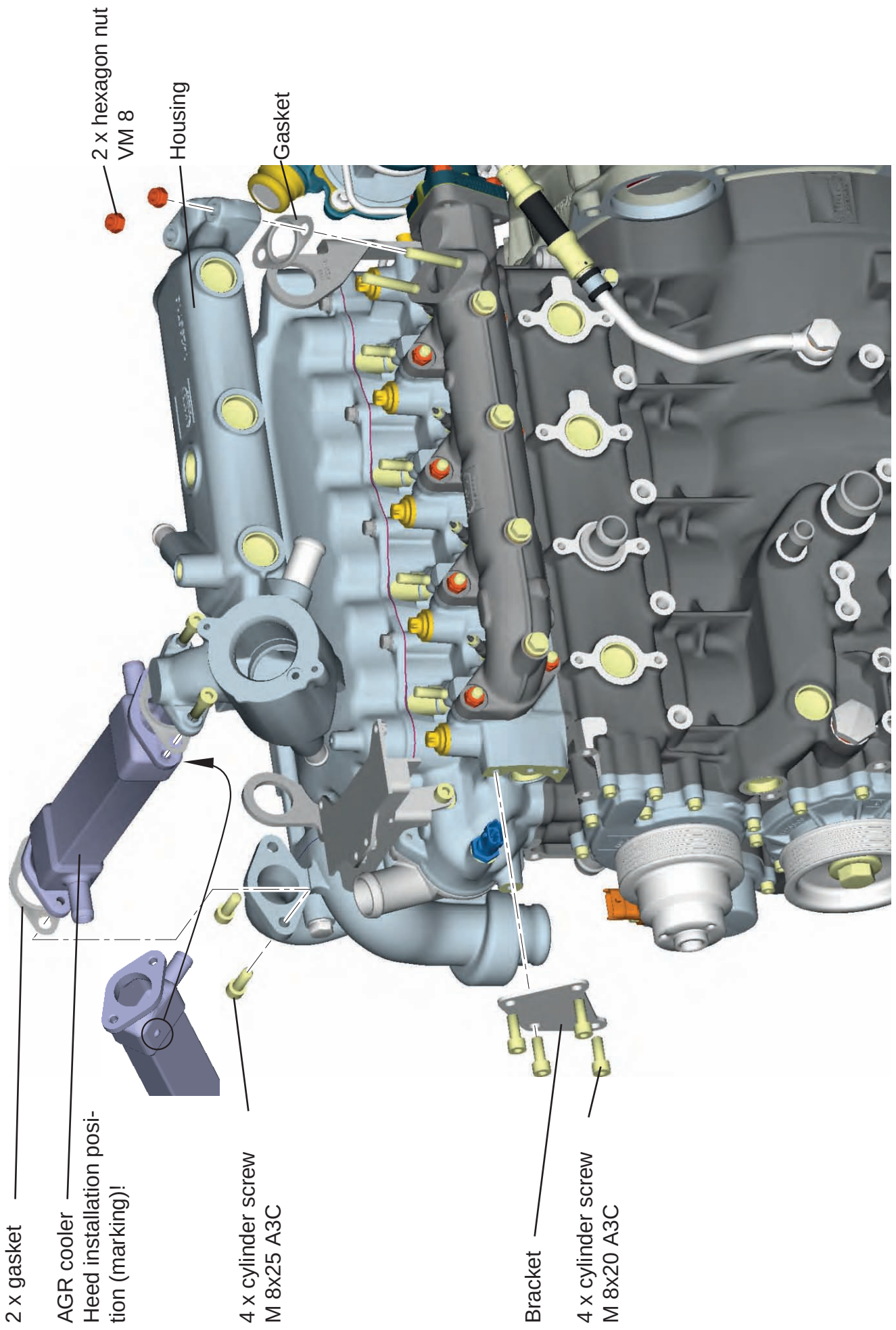
M 37 Exhaust gas return

Note:

To guarantee a tension-free assembly, the mixing nozzle, the AGR cooler and the housing with bracket must first be pre-mounted without tightening and then tightened in the specified sequence.



M 37 Exhaust gas return



M 37 Exhaust gas return

Tightening sequence:

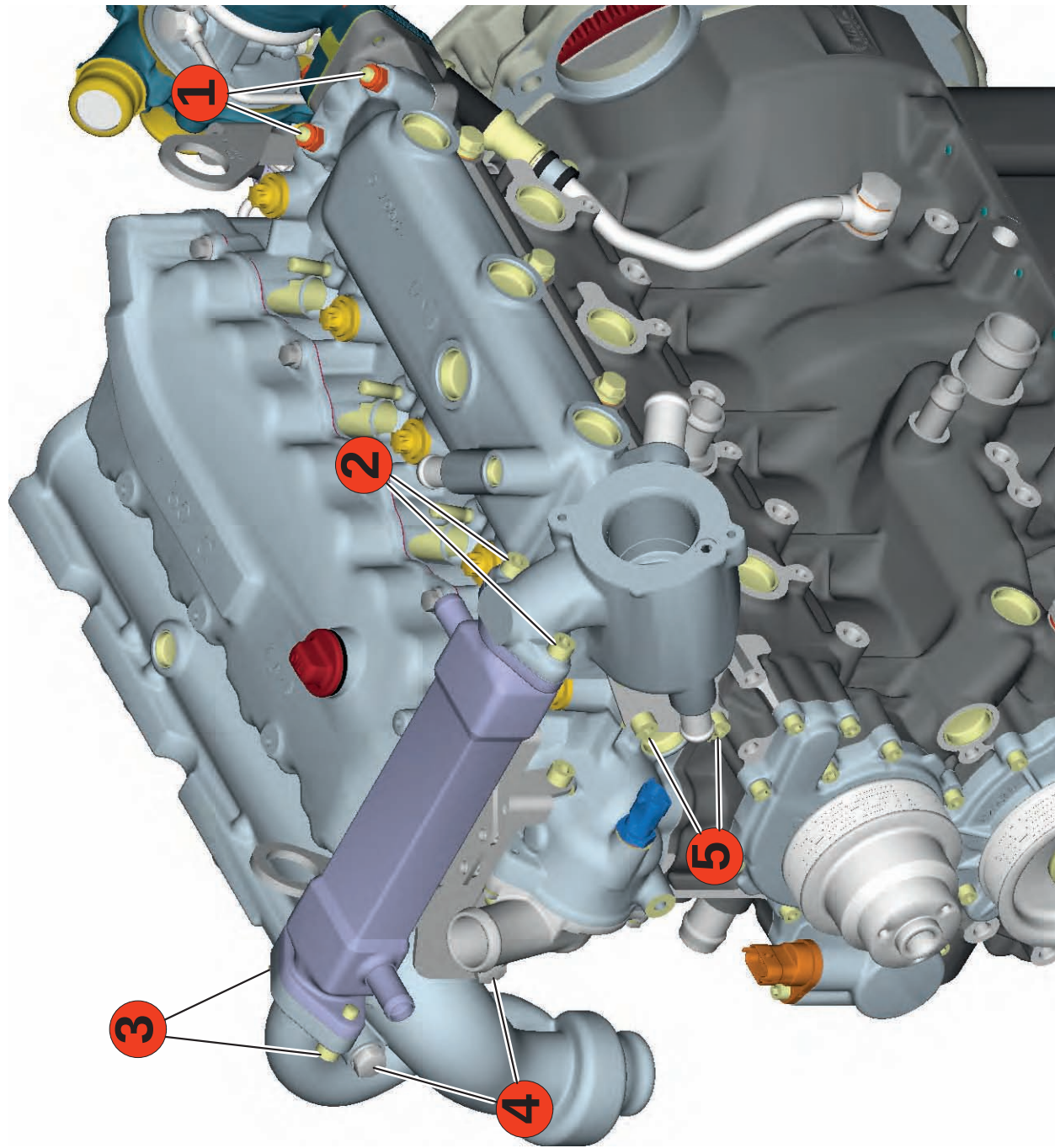
Position 1:
2 x hexagon nut
VM 8
23 Nm

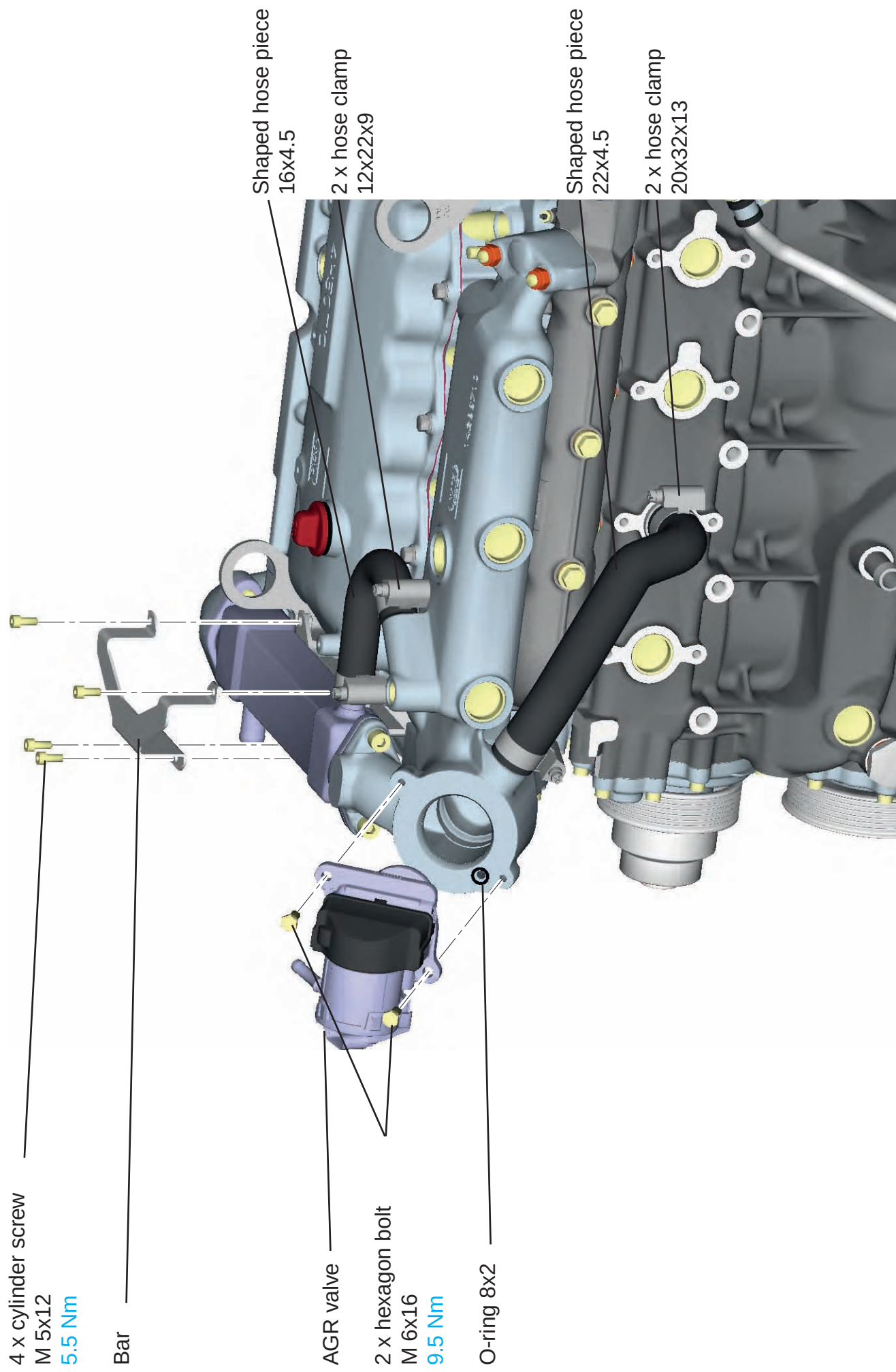
Position 2:
2 x cylinder screw
M 8x25
23 Nm

Position 3:
2 x cylinder screw
M 8x25
23 Nm

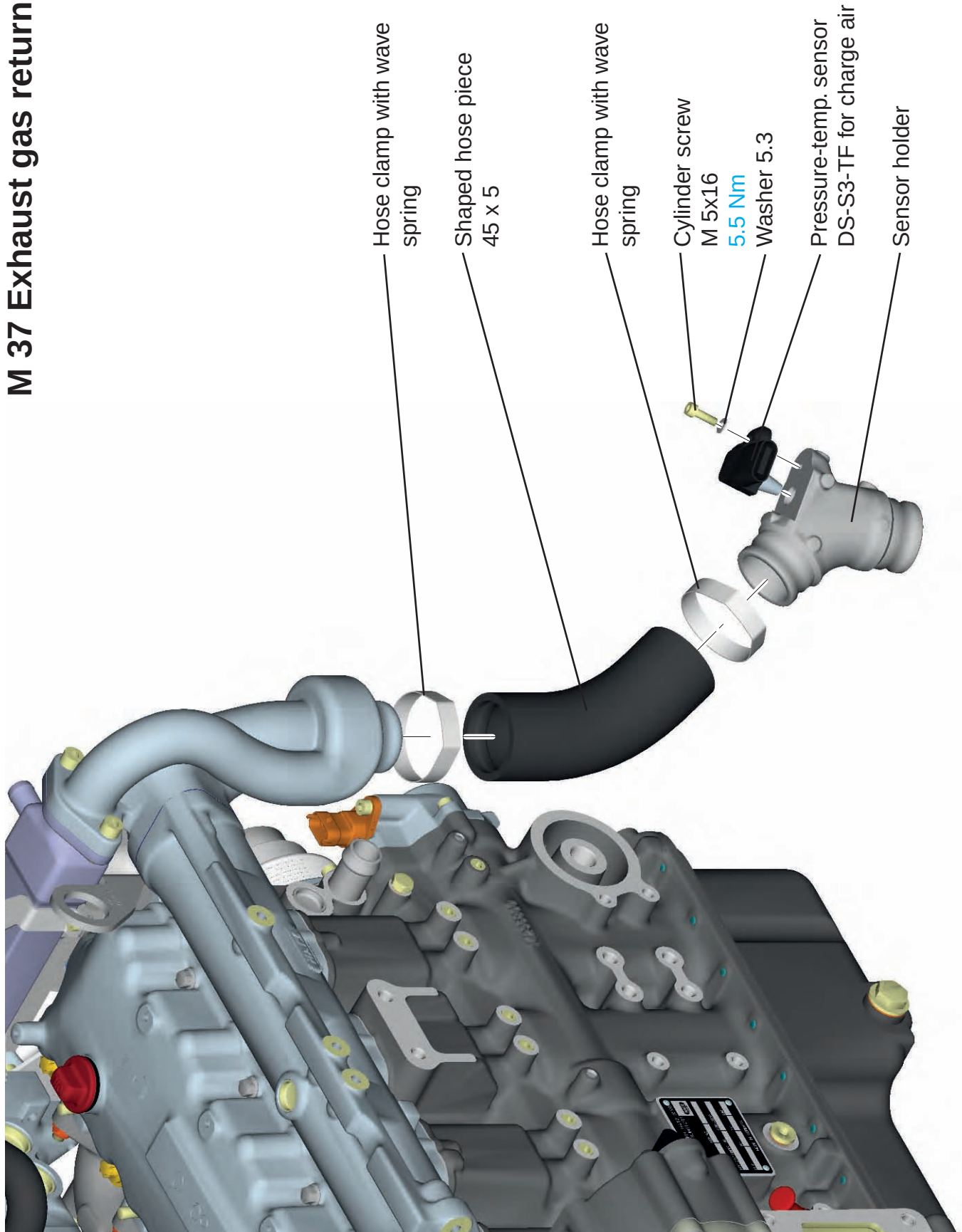
Position 4:
2 x hexagon bolt
M 10x70
46 Nm

Position 5:
4 x cylinder screw
M 8x20
23 Nm





M 37 Exhaust gas return



General instructions:

All work on the injection system may only be done in the voltage and pressure-free state (disconnect battery). During all work on the injection system, cleanliness must be heeded in order to avoid the entry of particles into the injection system or the engine. After every loosening of a pressure tube, it must be replaced!

Mounting of injectors on the engine

Remove the protective caps only right before mounting. Make sure that the nozzle cap and thus the injection holes are not damaged. Moisten exterior gaskets (O-rings) with installation oil, engine oil or diesel. Lubricants and glide agents that contain water are not permissible.

Before mounting, it may be necessary to check the correct position of the copper sealing disk on the nozzle clamping nut.

Attention must be paid that the injector is inserted into the cylinder head bore without damage. A transmission of force to the return connection or the plastic overmold must be avoided.

All plug connectors must be snapped in securely and locked during mounting.

The cap nut of the high-pressure line must be fastened properly before start-up.

If necessary, injector-specific data such as the IMA code must be transferred to the control unit. These serve the correct activation of the injectors and thus the intended operation.

The injector does not have to be ventilated before initial start-up.

Dismounting of injectors on the engine

The dismounting of the injectors must be done analogously to the mounting. Open connections must be sealed with protective caps.

To loosen the high-pressure screw connection, hold the hexagon of the inlet connector tight. With a loosened inlet connector, the high-pressure seal of the injector is no longer guaranteed.

Remounting of injectors on the engine

After each loosening of an injector, the old copper sealing ring must be removed and a new one used.

In order to get cylinder-specific correction data for the engine controller, the injectors should be inserted on the original cylinder when re-using. In principle, the installation on other cylinders is also possible, however only if the IMA correction values are read into the control unit again.

Injectors can be cleaned before re-installation below the high-pressure connection in vertical position in the ultrasound bath.

Mechanical cleaning of the nozzle shaft with brushes is impermissible in order to prevent damage to the injection holes.

M 14 Injection system

Fuel return line:

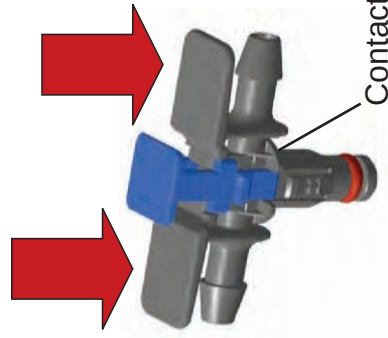
max. number of plug assembly/removal (plugging in; locking; unlocking; removing the plug from the counter piece): **10x**. If during the removal of the plug connectors the O-ring on them is damaged, then the entire return line must be replaced. Before re-mounting of the plug connectors, it must be ensured that the counter pieces are not soiled or corroded. Hose-nozzle connections may not be loosened. The mounting of the fuel return line on the vehicle low-pressure circuit and on the injector must be done dry (without mounting aids). The mounting of the return line on the engine is done by hand.

Mounting:

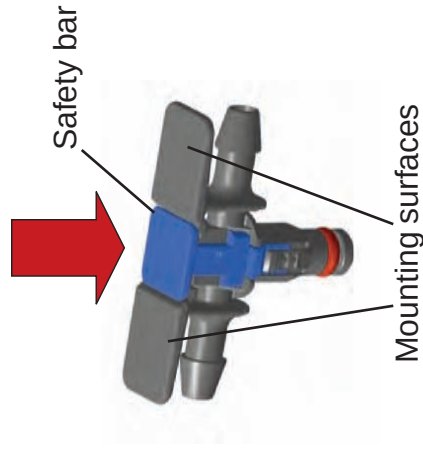
Plug return plug on injector return connection (until contact of the contact surface is on the injector (picture 1). Then close the locking bar (bar must snap into the closed position and be even with mounting surfaces)(picture 2). In order to guarantee the function, the return plugs must be mounted according to the mounting instructions above. Otherwise fuel can escape!

Dismounting:

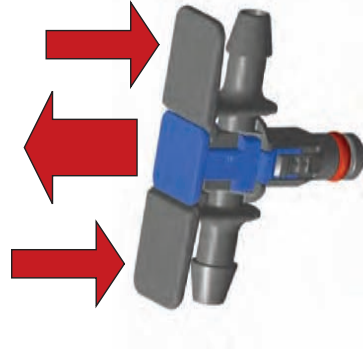
Dismounting must be done by hand. Open safety bar. Meanwhile, press on mounting surface in plug direction (safety bar must snap into open position (picture 3). Then remove return plug from injector return connection (picture 4).



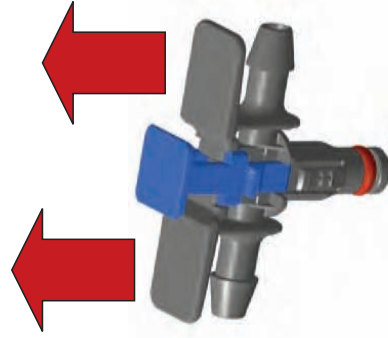
Picture 1



picture 2



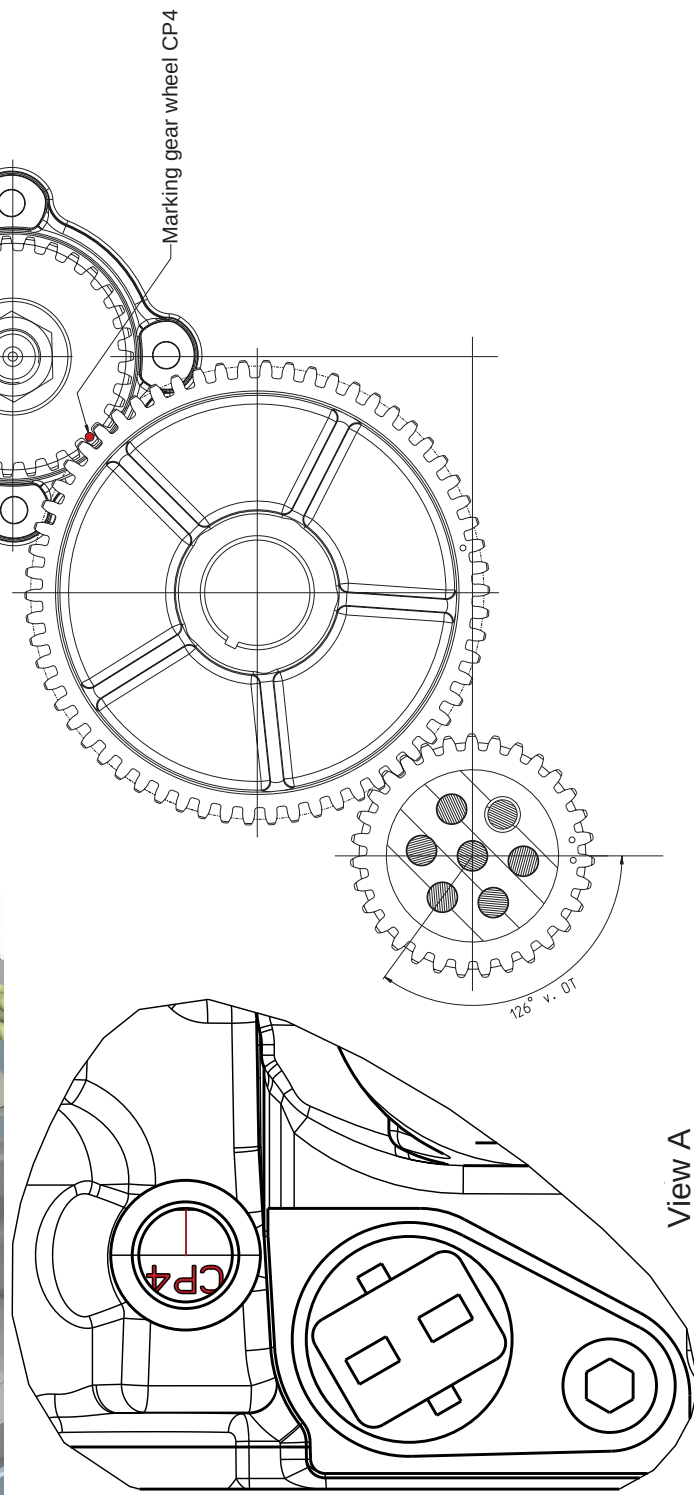
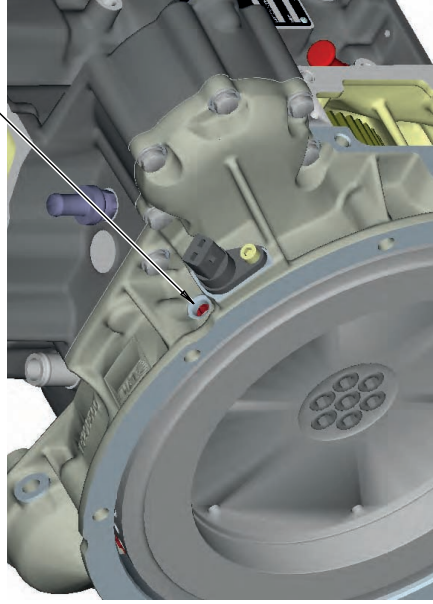
picture 3



picture 4

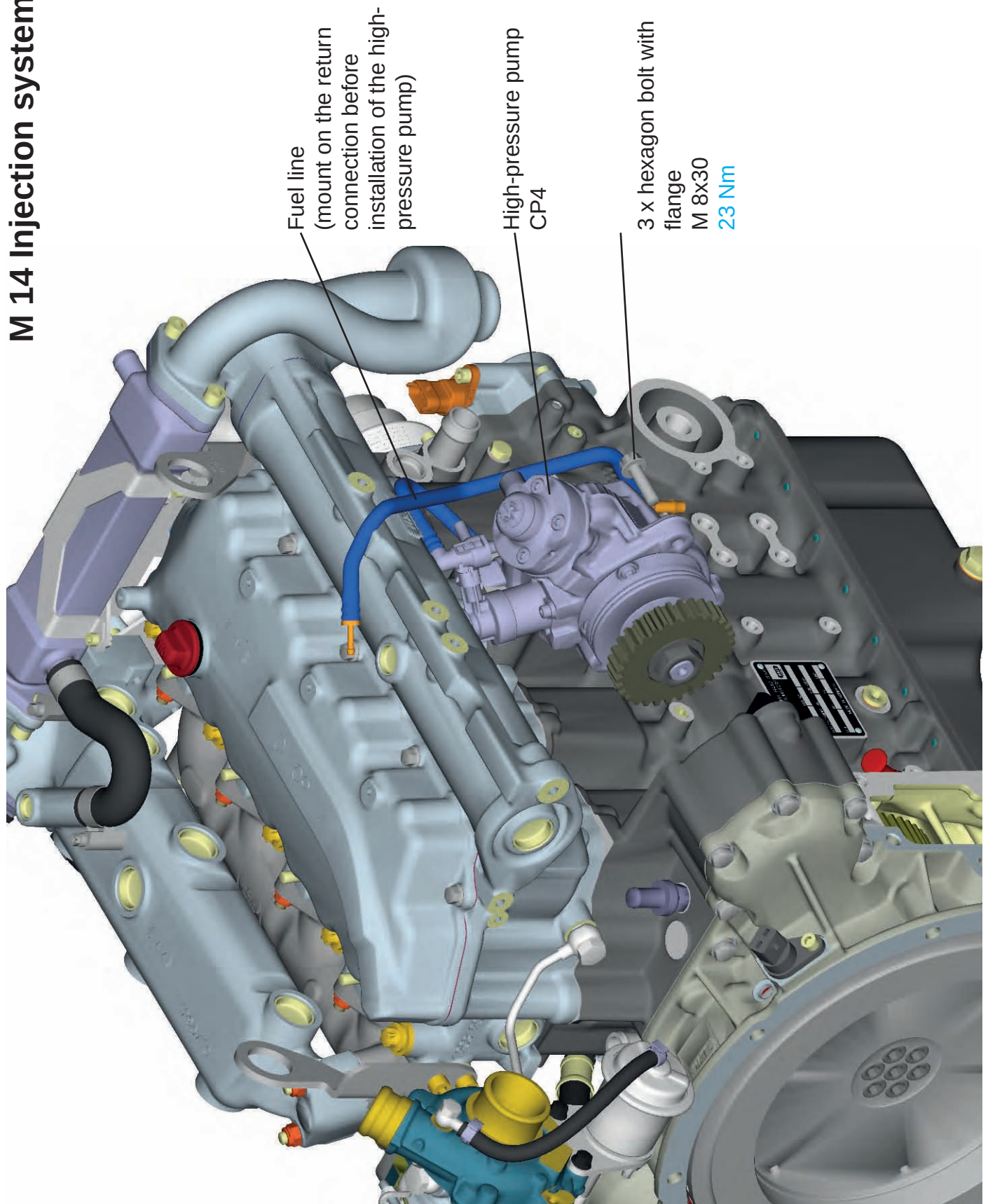
Before the installation or removal of the high-pressure pump, the crankshaft must be turned into the position "CP4" (marking visible through inspection hole in the connection housing). The marking on the high-pressure pump is now in the position shown. This is the basic position for the mounting of the high-pressure pump. Mounting precision: ± 1 tooth. For mounting, grease the O-ring slightly (silicone grease)

View A

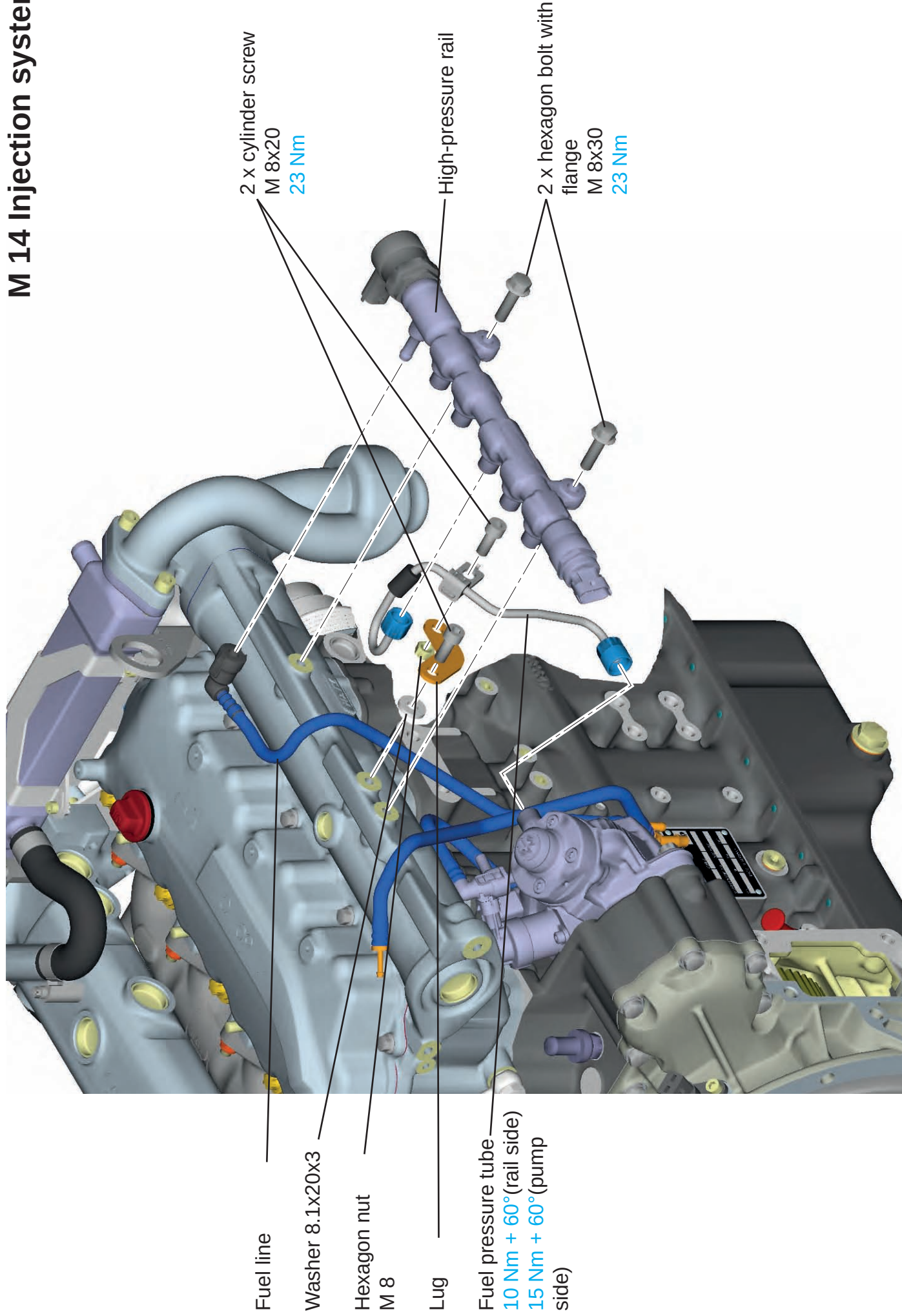


View A

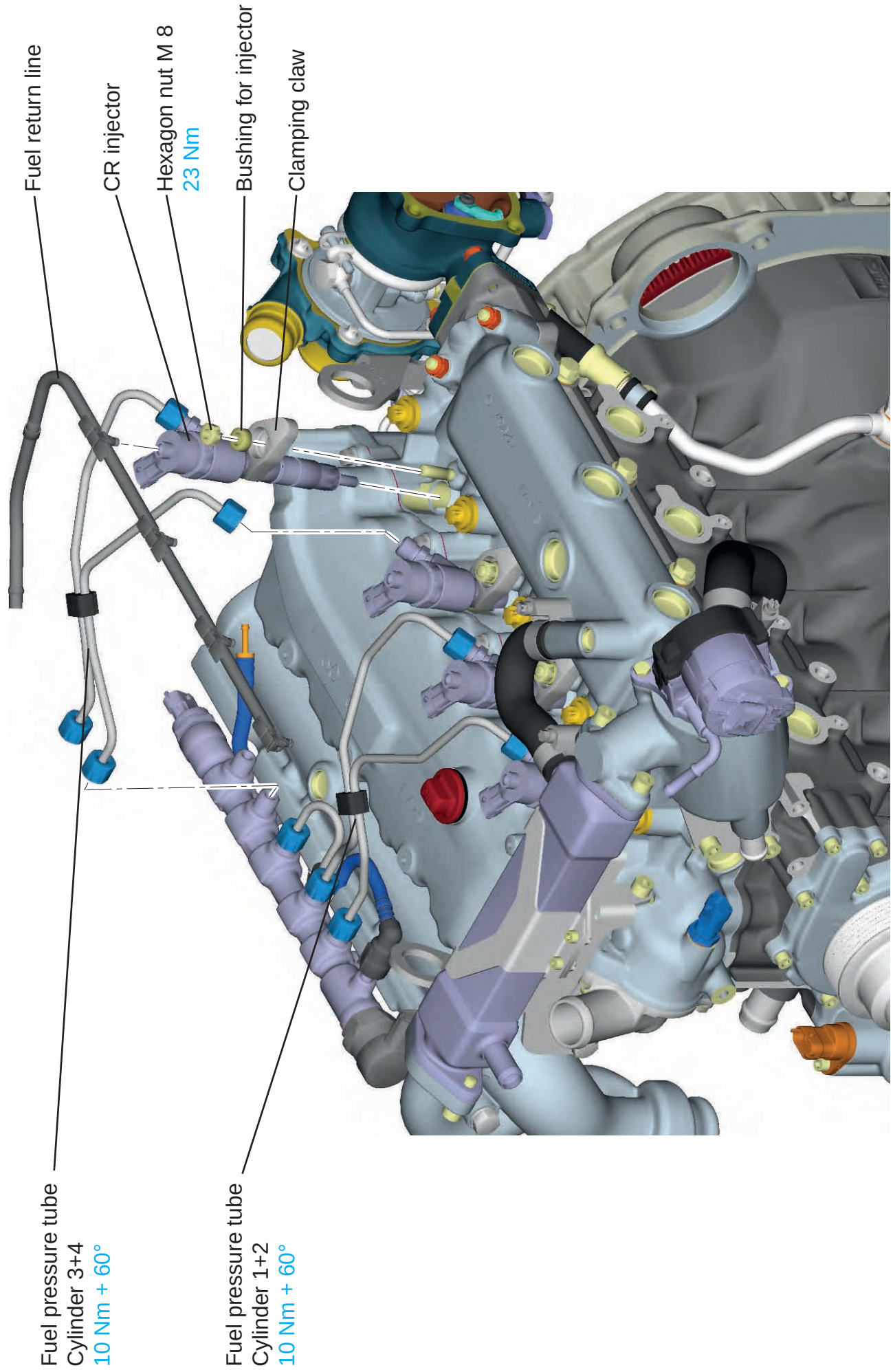
M 14 Injection system

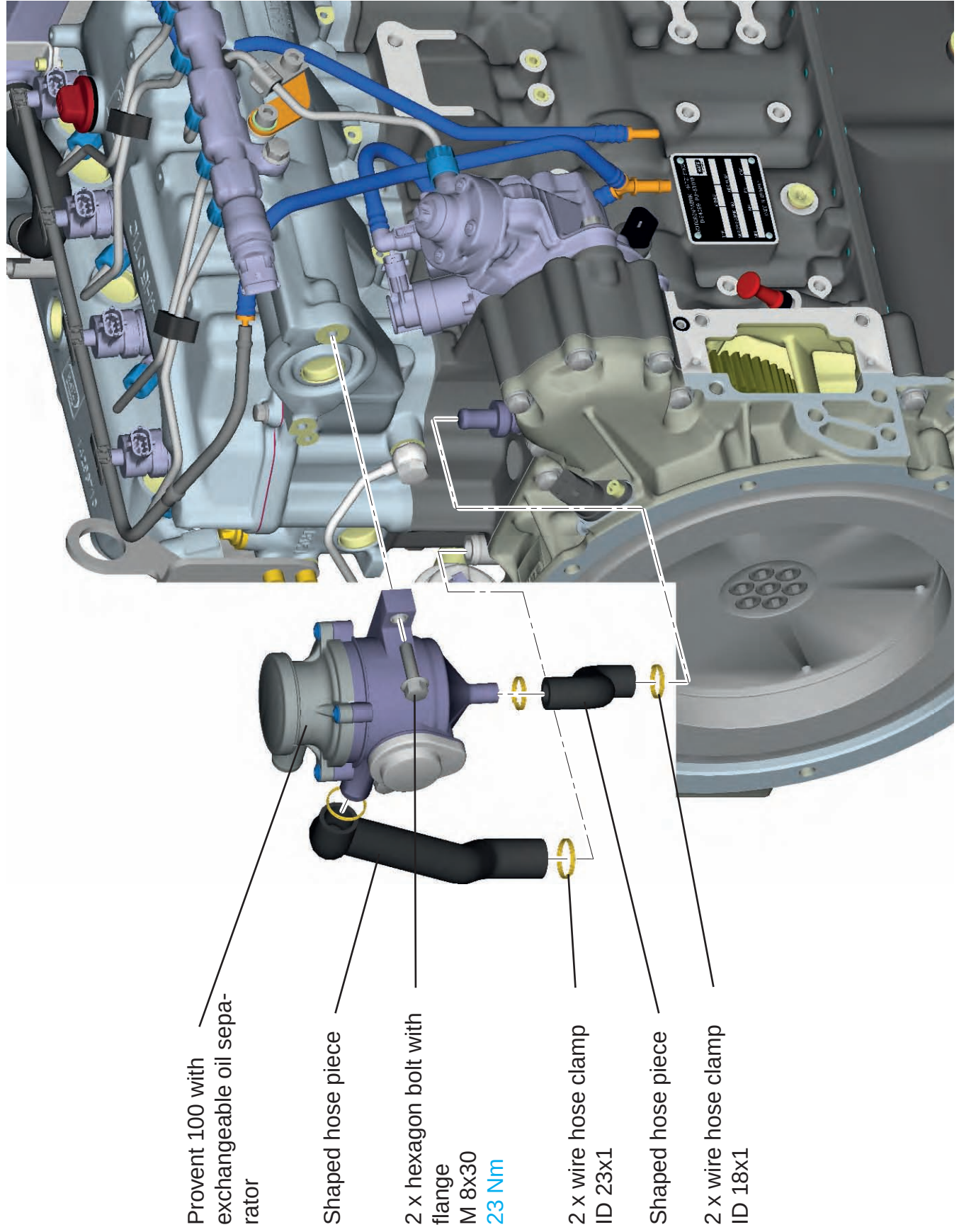


M 14 Injection system



M 14 Injection system





4. Tables

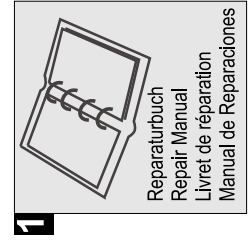
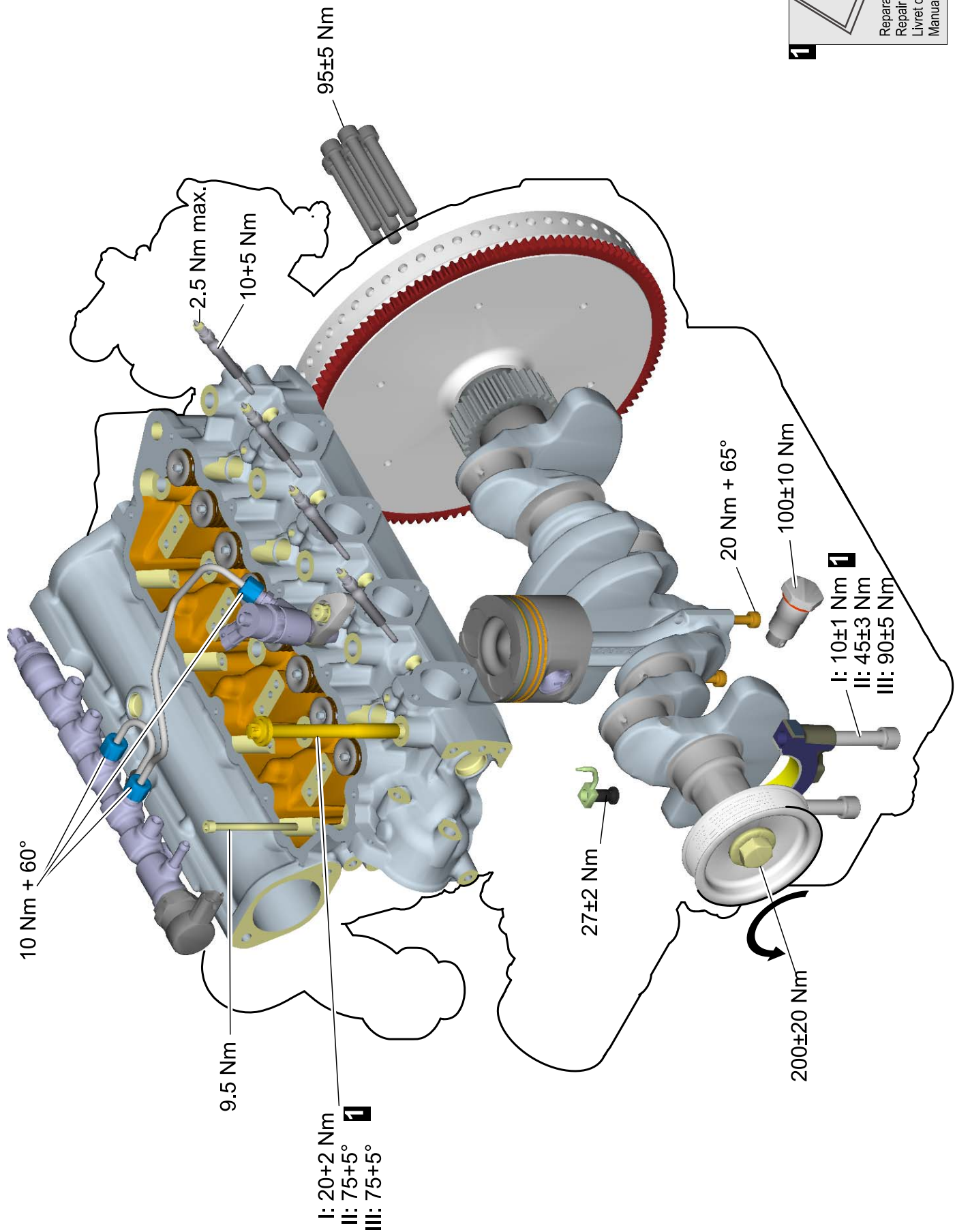
Screw tightening torque

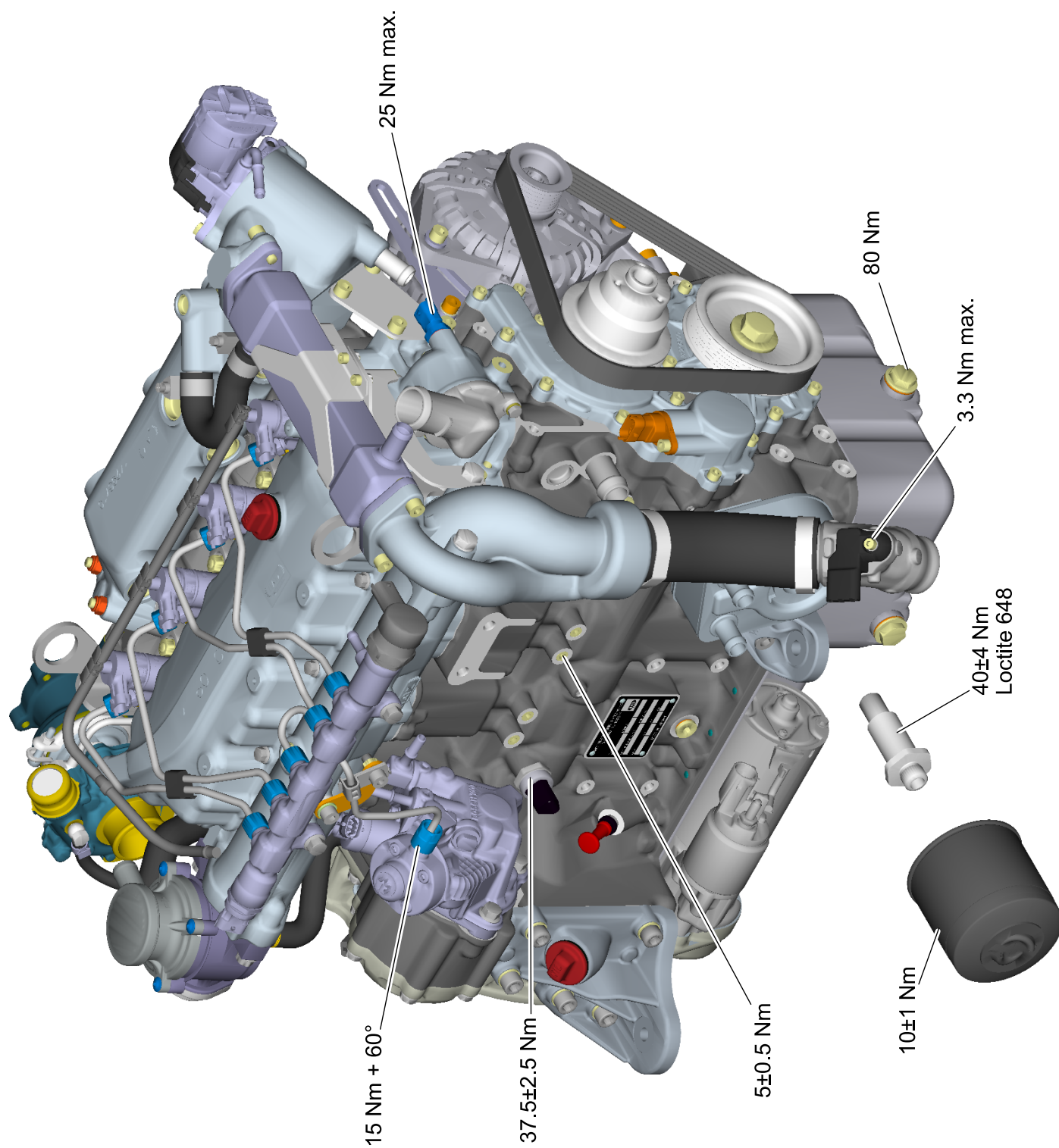
General [Nm]:

$\text{Nm} \div 9.81(10) = \text{kpm}$

$\text{Nm} \div 1.3558 = \text{Lbs ft}$

Thread	Screw quality			
	5.8	8.8	10.9	12.9
M 4	1.7	2.8	3.9	4.7
M 5	3.4	5.5	7.8	9.3
M 6	6.0	9.5	13	16
M 8	14	23	33	39
M10	29	46	65	78
M12	50	80	110	140
M14	80	130	180	220
M16	120	190	270	330
M18	170	270	380	450
M20	240	380	530	640
M22	320	510	720	860





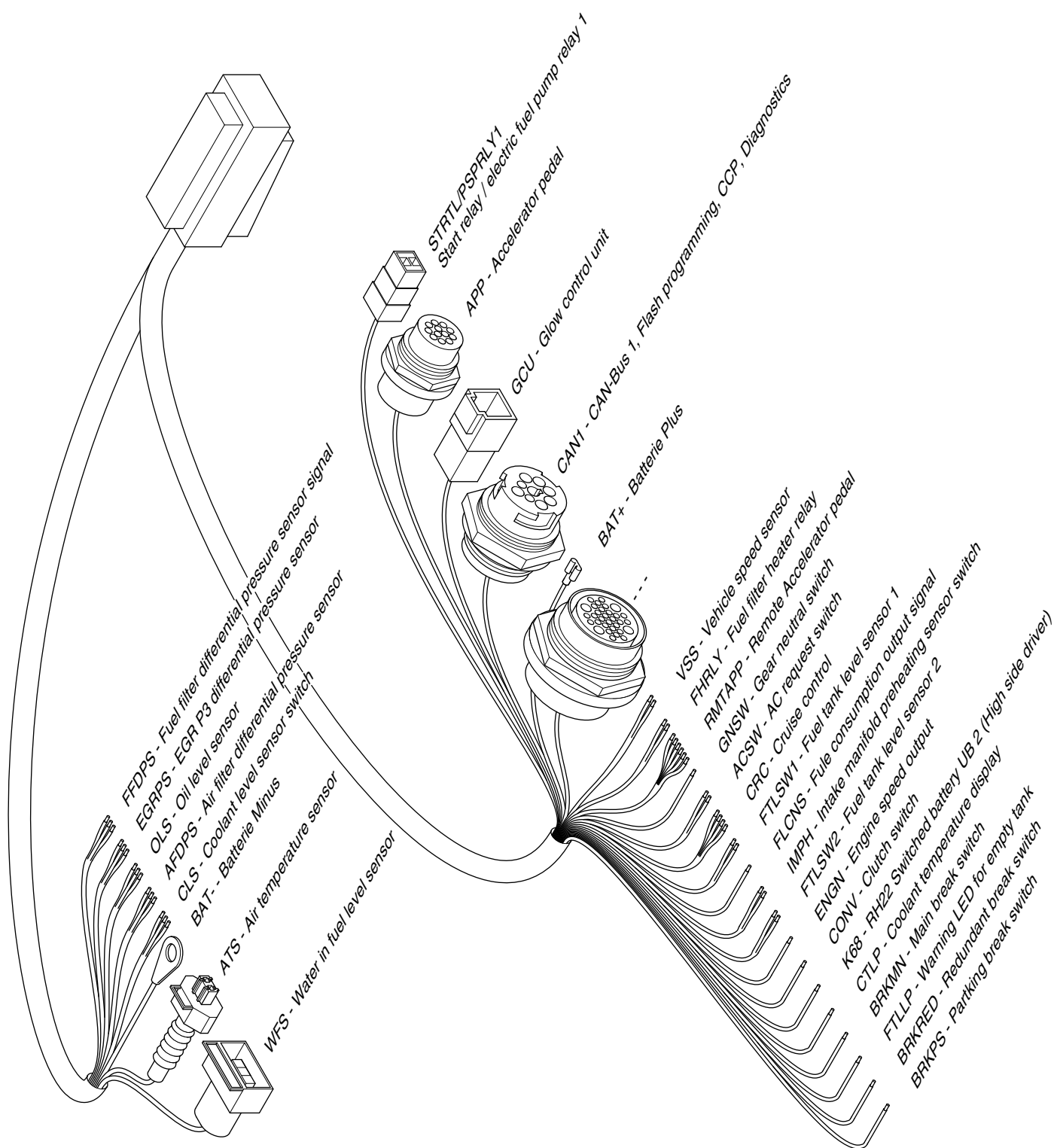
Identifier	Designation of the electrical components
A 1	Instrument box
A 2	Instrument plate
A 3	Start stop automatic
A 4	Starter protection module
B 1	Temperature sensor
B 2	Speed encoder
B 3	Oil pressure sensor
B 4	Signal horn
C1	Condenser
E1	Heater for fuel filter
F1	Fuse
G1	Battery
G2	Three phase alternator
G3	Flywheel alternator
H 1	Indicator light for alternator control
H 2	Indicator light for oil pressure
H 3	Indicator light for engine temperature
H 4	Indicator light for air filter (maintenance switch)
H 5	Indicator light for belt break
H 6	Indicator glow monitoring
H 7	Indicator light fan monitoring
H 8	Remote display: engine on
K 1	Control relay 1 for start / restart block
K 2	Control relay 2 for pre-glow
K 3	Control relay 3 for speed adjustment
K 4	Engine protection relay
K 5	Delay relay
K 6	Start block relay
K 7	Time relay (impulse relay)
K 8	Power relay
M1	Starter motor
MG	Starter alternator
N 1	Controller for starter alternator
N 2	Controller for flywheel alternator
N 3	Controller for three phase alternator (if not integrated)
N 4	Impulse encoder (additional for synchro)controller

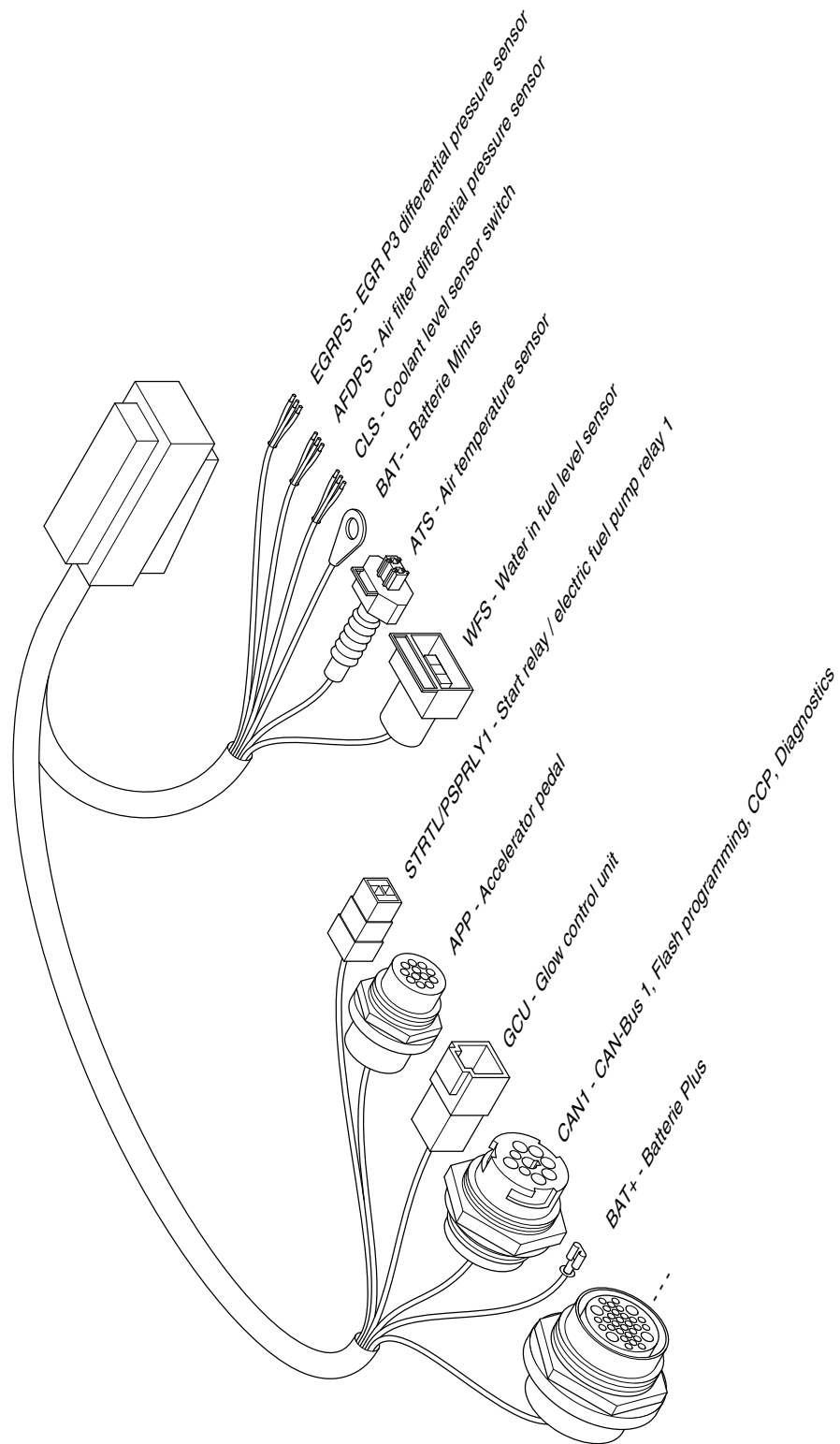
Identifier	Designation of the electrical components
P 1	Operating hours counter
P 2	Tachometer
P 3	Pressure indicator
R 1	Glow plug
R 2	Heating flange
R 3	Series resistor for glow system
R 4	Resistor
R 5	Series resistor with thermo time switch
S 1	Glow start switch (5 - digit)
S 2	Main switch
S 3	Glow plug starter switch (3 - digit)
S 4	Start stop switch
S 5	Switch for speed adjustment
S 6	Temperature switch for engine temperature
S 7	Oil pressure switch
S 8	Pressure switch for air filter
S 9	Fan monitoring switch
S 10	Temperature switch for pre-glowing
S 11	Remote start switch
S 12	Remote stop switch
T 1	Transmitter for speed measurement
V 1	Uncoupling diode
V 2	Free-wheel diode
V 3	Zener diode
V 4	Suppressor diode
W 1	Mass, minus return line
W 2	Screened line on the alternator
X 1	Terminal block on the instrument box
X 2	Flat power strip
X 3	Plug on emergency stop switch
X 4	Outlet on emergency stop switch
X 5	Terminal block in the operator box / terminal box
Y 1	Lift magnet for speed adjustment
Y 2	Lift magnet for engine switch-off
Y 3	Servo magnet (=valve magnet) for engine switch-off
Y 4	Fuel shut-off valve
Y 5	High pressure reset valve
Z 1	Suppression choke
Z 2	Suppressor capacitor

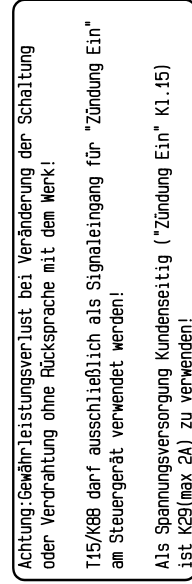
Terminal	Designation
0	Ground
1	Alternator B+
2	For three phase alternator: D+ for flywheel alternator: terminal L on the controller
3	Starter terminal 50
4	Oil pressure switch
5	Temperature switch on the cylinder head
6	Glow plug I
7	Electromagnet for engine switch-off
8	Glow plug II
9	Start stop input
10	Plus terminal for direct current motor speed fine adjustment
11	Minus terminal for direct current motor speed fine adjustment
12	Oil pressure sensor
13	* * * Reserved for special application * * *
14	Speed adjustment magnet - excitation circuit
15	* * * Reserved for special application * * *
16	Lift magnet for decompression
17	Maintenance switch for air filter
18	Electromagnet for engine switch-off (pick-up winding)
19	Temperature sensor on the cylinder head
20	Oil temperature switch
21	Fan monitoring switch
22	Terminal W for speed measurement
23	Starter 30 (for ammeter connection)
24	Terminal C for controller on flywheel alternator
25	Oil temperature sensor
26	Terminal 50f on the starter protection module
27	* * * Reserved * * *
28	Speed adjustment magnet (pick-up winding)
29	* * * Reserved * * *

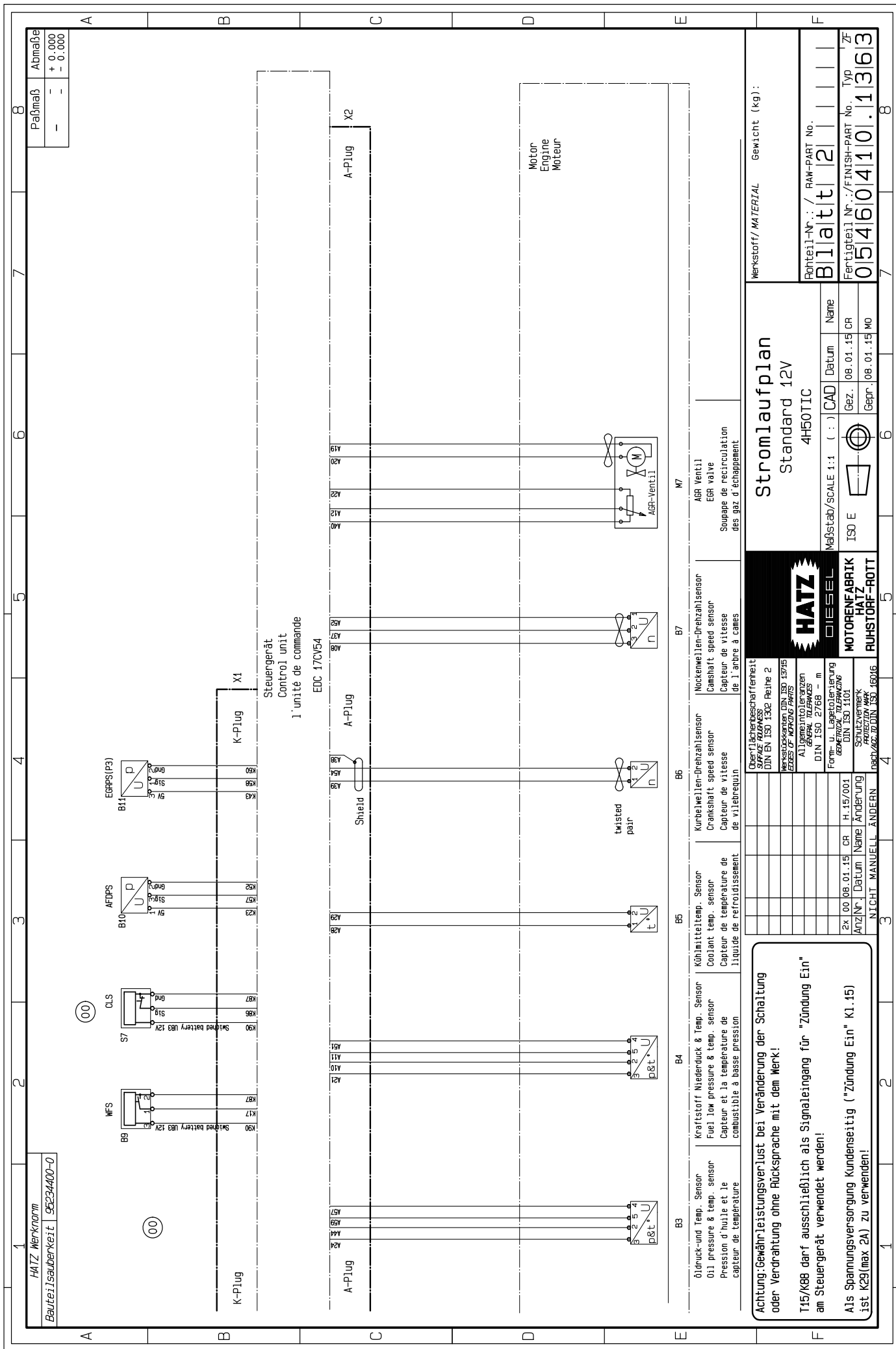
Bosch designation for cable marking

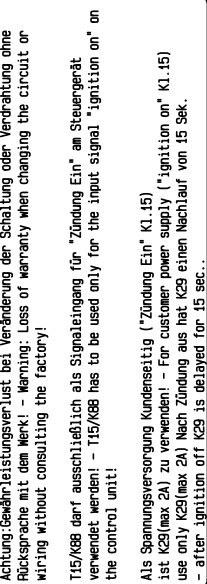
Bosch	Hatz	German designation	English designation
INJ11	M1	IN Jektor Bank 1 - Zylinder 1 (1. Zylinder)	IN Jector bench 1 - cylinder 1 (1. cylinder)
INJ12	M2	IN Jektor Bank 1 - Zylinder 2 (4. Zylinder)	IN Jector bench 1 - cylinder 2 (4. cylinder)
INJ21	M3	IN Jektor Bank 2 - Zylinder 1 (3. Zylinder)	IN Jector bench 2 - cylinder 1 (3. cylinder)
INJ22	M4	IN Jektor Bank 2 - Zylinder 2 (2. Zylinder)	IN Jector bench 2 - cylinder 2 (2. cylinder)
FLPS1	B4	Kraftstoff Niederdruck u. Temp. Sensor	F uel L ow P ressure and temp. S ensor
OPS	B3	Öldruck/Temperatur Sensor	O il P ressure/ Temperature S ensor
MEU	K2	Hochdruckpumpe mit Zumesseinheit	High Pressure Pump with ME tering U nit
RDS	B1	R ail- D ruck S ensor	Rail-Pressure-Sensor
DRV	K1	D ruck- R egel- V entil	Pressure Control Valve
CAS	B7	Nockenwellen-Drehzahl Sensor	CA mshaft Speed S ensor
BPS	B2	Ladedruck-/Temperatur Sensor	B oost P ressure-/ Temperature S ensor
CTS	B5	Kühlmittel-Temperatur Sensor	C oolant- T emperature S ensor
CRS	B6	Kurbelwellen-Drehzahl Sensor	CR ankshaft Speed S ensor
ATS	B8	Ansaugluft-Temperatur Sensor	A ir T emperature S ensor
WFS	B9	Wasser im Kraftstoff Sensor	W ater in F uel S ensor
CLS	S7	Kühlmittel-Niveau Sensor	C oolant- L evel S ensor
AFDPS	B10	Luftfilter-Wartungs Sensor	A ir F ilter D ifference P ressure S ensor
EGRPS	B11	AGR-Druck Sensor	EGR - P ressure S ensor
EGR	M7	Abgas-Rückführ Ventil	E xhaust- G as- R ecirculation Valve
EDC		Elektronische Dieselregelung	E lectronic D iesel C ontrol
EKP		E lektro- K raftstoff- P umpe	Elektric-Fuel-Pump
EMV		E lektro M agnetische V erträglichkeit	Electromagnetic Compatibility
EPW		E lektro- P neumatischer W andler	Electro Pneumatic Converter
HFM		Heißfilm-Luftmassenmesser	H ot F ilm Air M ass Sensor
HS			H igh- S ide
LS			L ow- S ide
LDF		L ade D ruck F ühler	Boost Pressure Sensor
NTC		Negativer Temperaturkoeffizient	N egative T emperature C oefficient
OBD		O n B oard- D iagnose	O n B oard D iagnostic
OL			O pen L oad
PTC		Positiver Temperaturkoeffizient	P ositive T emperature C oefficient
PWG		P edal W ert G eber	Accelerator Pedal Sensor
APP		Pedalposition	A ccelerator P edal P osition
SG		S teuer G erät	Control Unit
ECU		SteuerGerät	E lectronic C ontrol U nit
VTG		Lader mit variabler Turbinengeometrie	V ariable T urbine G eometry
ZME		Z u- M ess- E inheit	Metering Unit

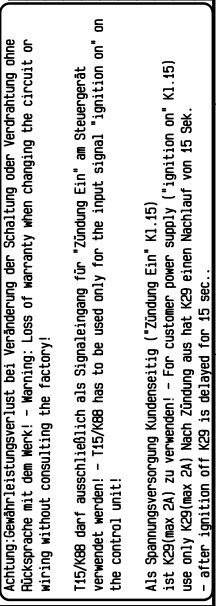


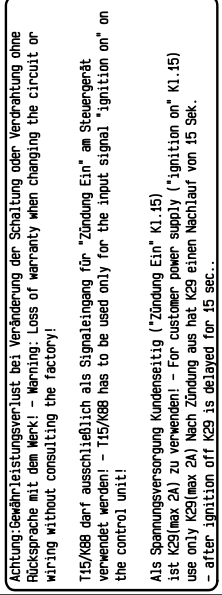












[illegible]

T15/K98 darf ausschließlich als Signaleingang für "Zündung Ein" am Steuergerät verwendet werden!
T15/K98 has to be used only for the input signal "ignition on" on the control unit!
T15 / K98 doit être utilisé uniquement pour le signal d'entrée « Contact allumer » sur l'unité de commande!

Als Spannungsversorgung Kundensseitig ("Zündung Ein" K1.15) ist K29(max 2A) zu verwenden!
For customer power supply ("ignition on" K1.15) use only K29(max 2A)
Pour l'alimentation électrique du client (« Contact allumer » borne 15) utiliser uniquement K29 (max 2A).

Nach Zündung aus hat K29 einen Nachlauf von 15 Sek..
After ignition off K29 is delayed for 15 sec..
Après coupure du contact, K29 est retardée pendant 15 secondes.

5X

7X

Sicherungen - Fuses - Fusibles

[illegible]

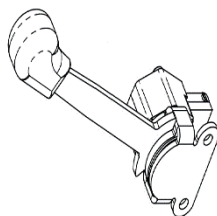
	Stromlaufplan Standard 12V 4H50TIC V710				
	Maßstab/SCALE 1:1	(:)	CAD	Datum	Name
			Gez.	17.05.16	CR
			Gepr.	17.05.16	MO
	TSO E				
MOTORENFABRIK HATZ RUHSTOß-ROTT					

Werkstoff/MATERIAL	Gewicht (kg):
Rohteil-Nr.: / RAW-PART No.	
B1	5
a	
t	
t	
Fertigteil Nr.: / FINISH-PART No.	
0	1
5	3
4	6
6	0
0	4
3	0
1	3
3	6
6	3

CAN speed adjustment H50



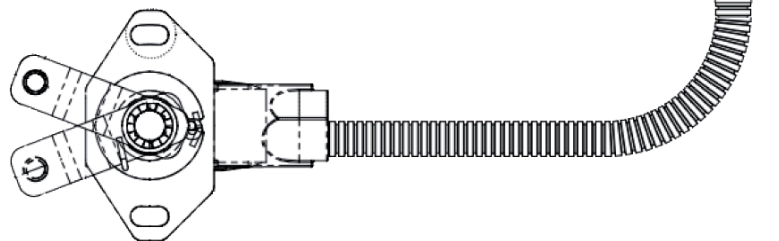
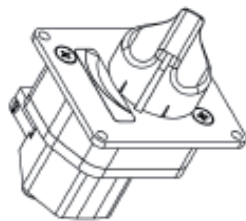
Hand lever



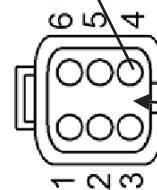
Gas pedal



Gas rotary knob

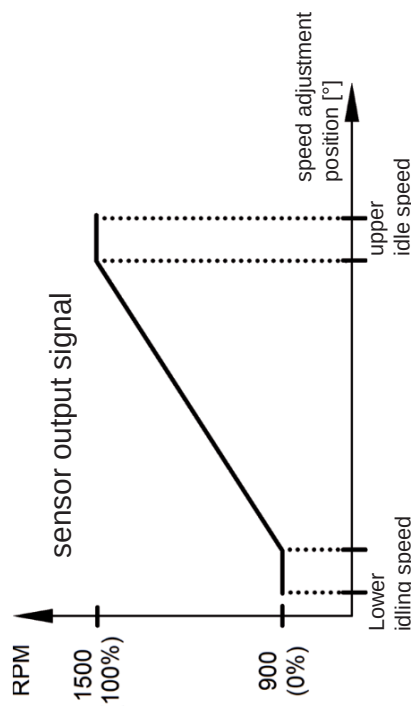
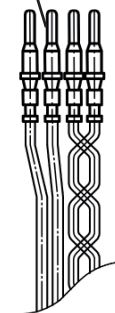
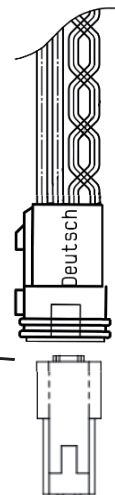


Connection
CAN speed adjustment

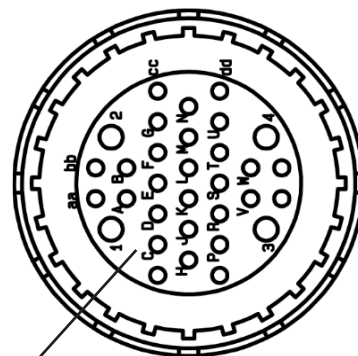


Pin No.	Pin assignment	Pin
1	Supply B -	cc
2	Supply B +	dd
3	CAN high	aa
4	CAN low	bb
5	shield	-
6	not assigned	-

custom cabling



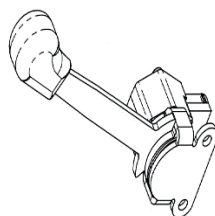
motor connector
Customer control unit



Analog speed adjustment H50



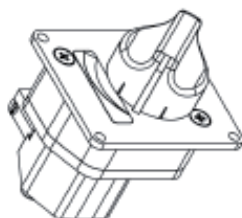
Hand lever



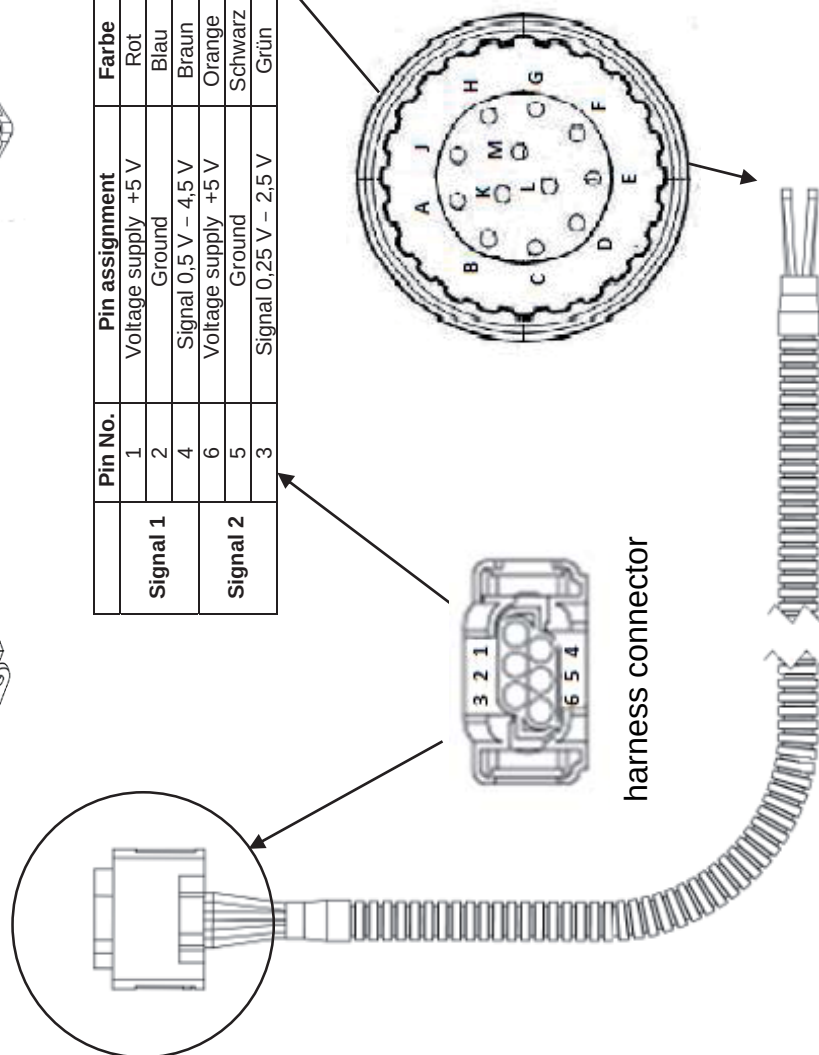
Gas pedal



Gas rotary knob

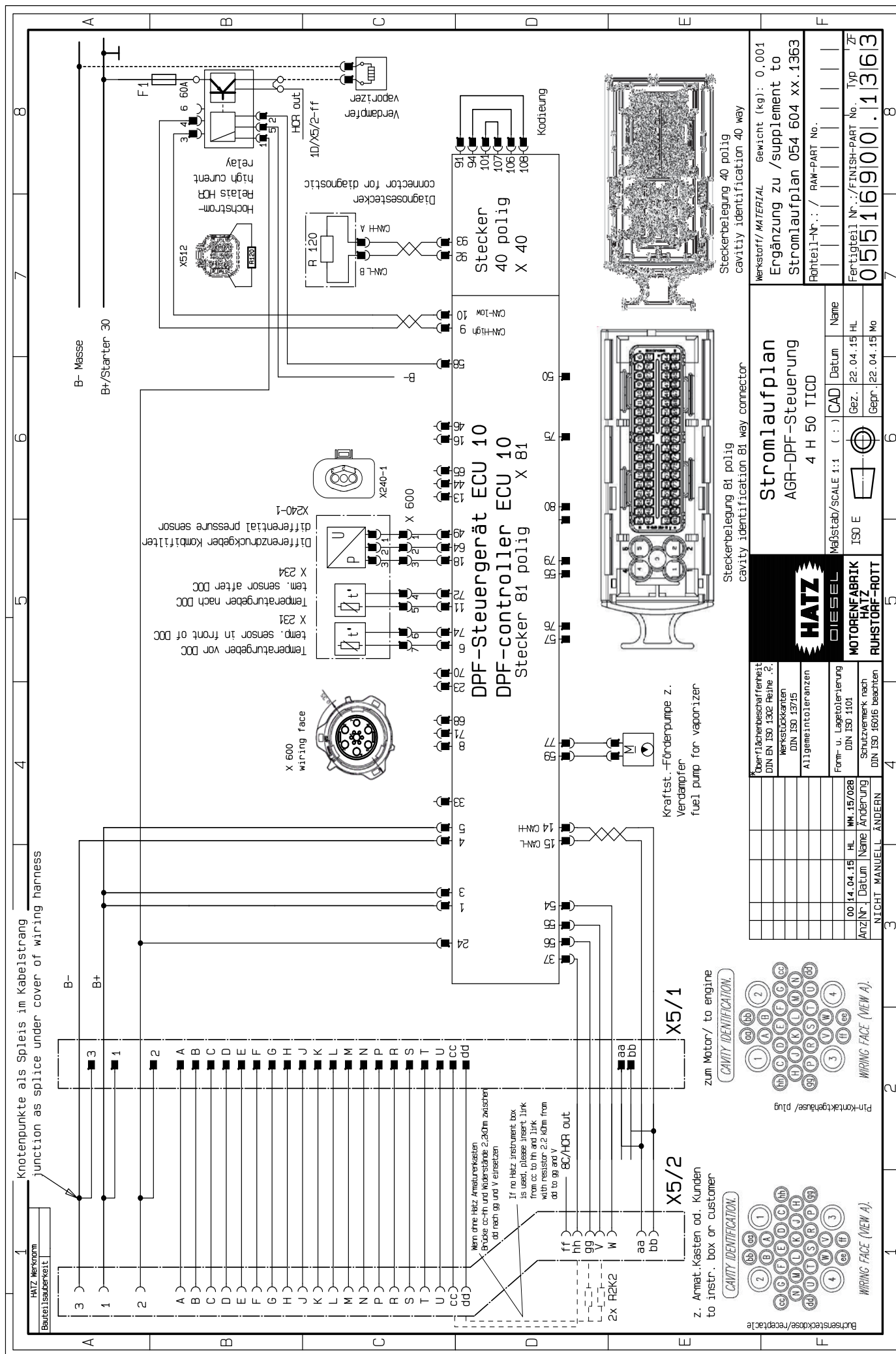


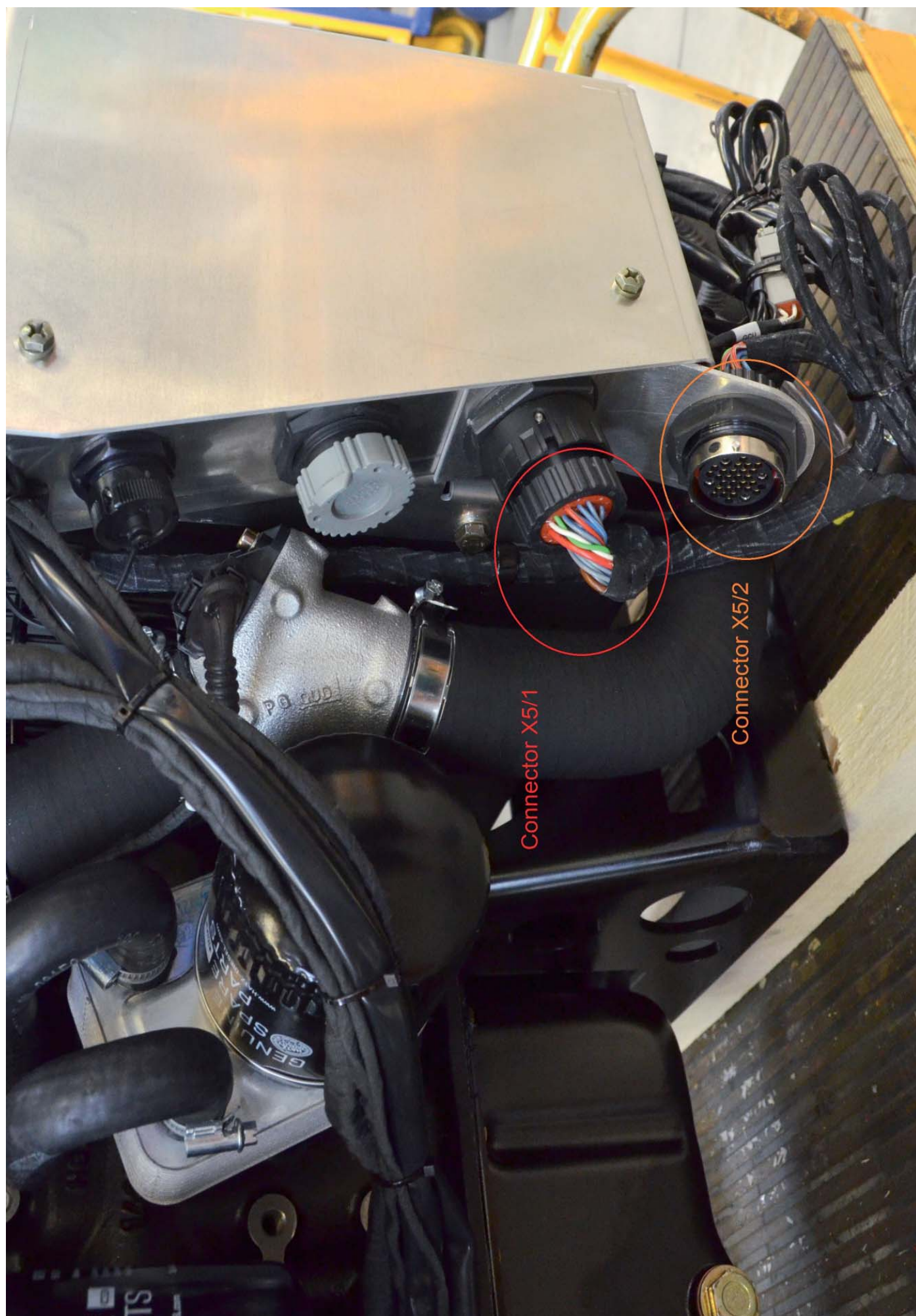
	Pin No.	Pin assignment	Farbe	Pin
Signal 1	1	Voltage supply +5 V	Rot	A
	2	Ground	Blau	C
	4	Signal 0,5 V - 4,5 V	Braun	B
Signal 2	6	Voltage supply +5 V	Orange	D
	5	Ground	Schwarz	F
	3	Signal 0,25 V - 2,5 V	Grün	E

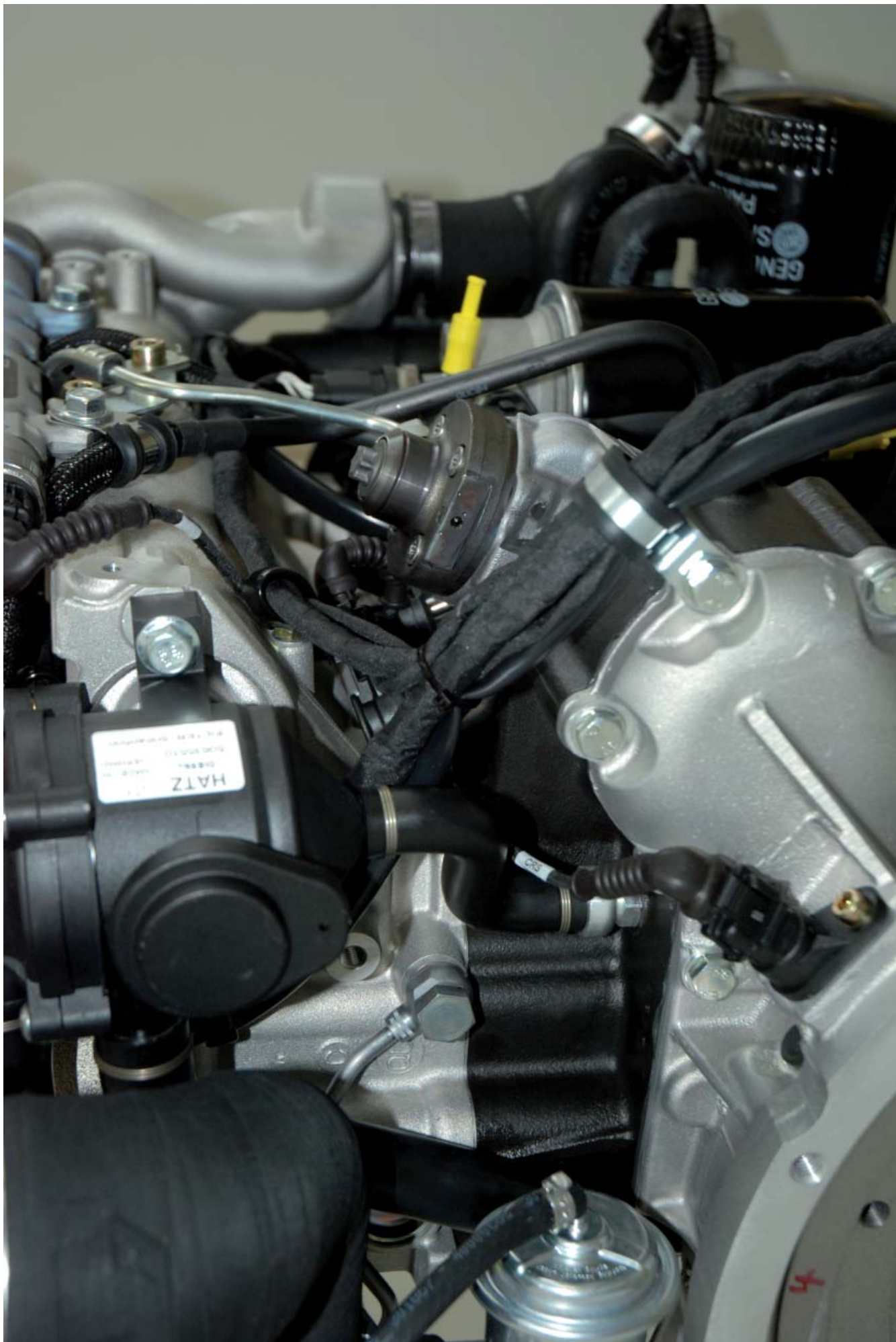


sensor output signal

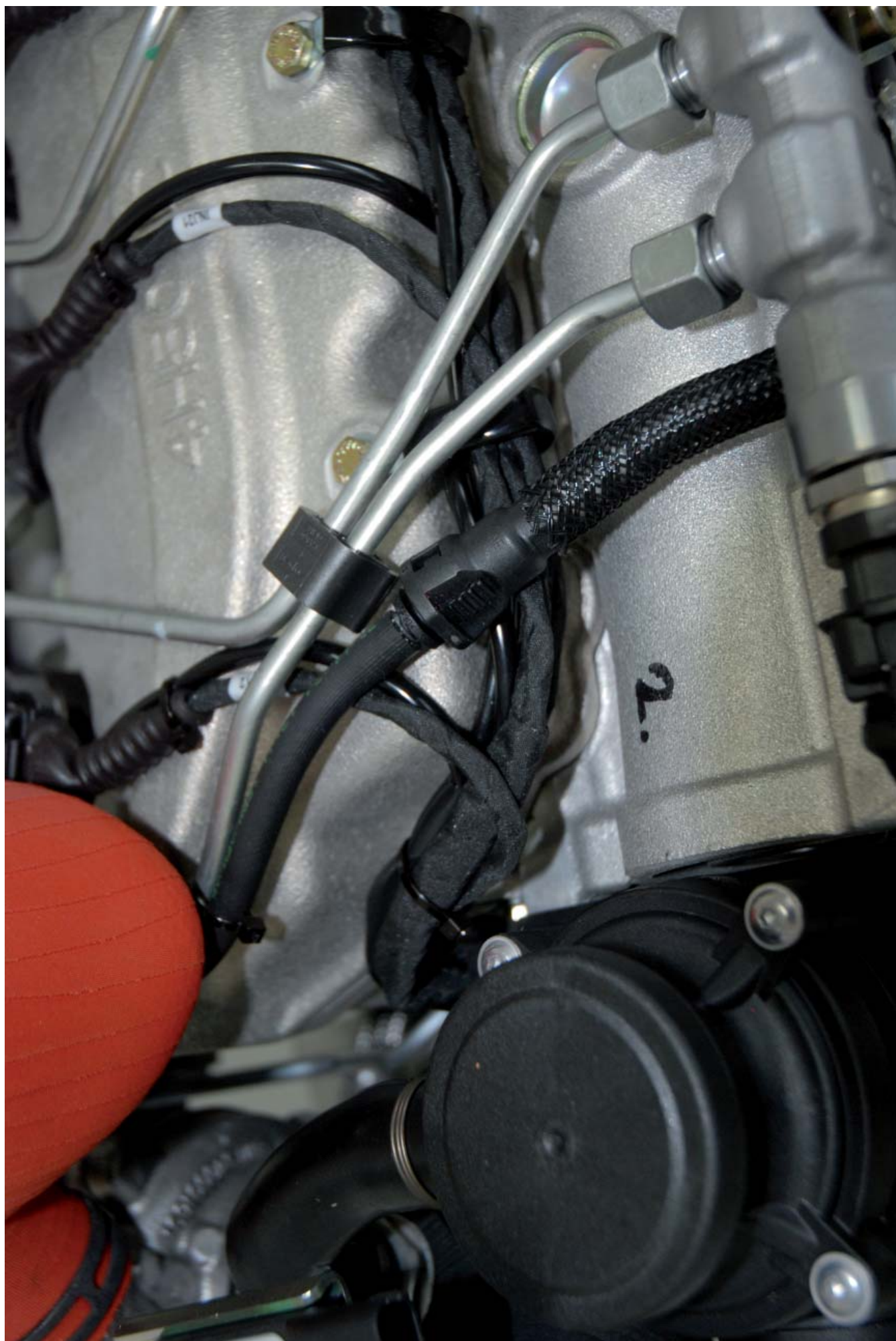




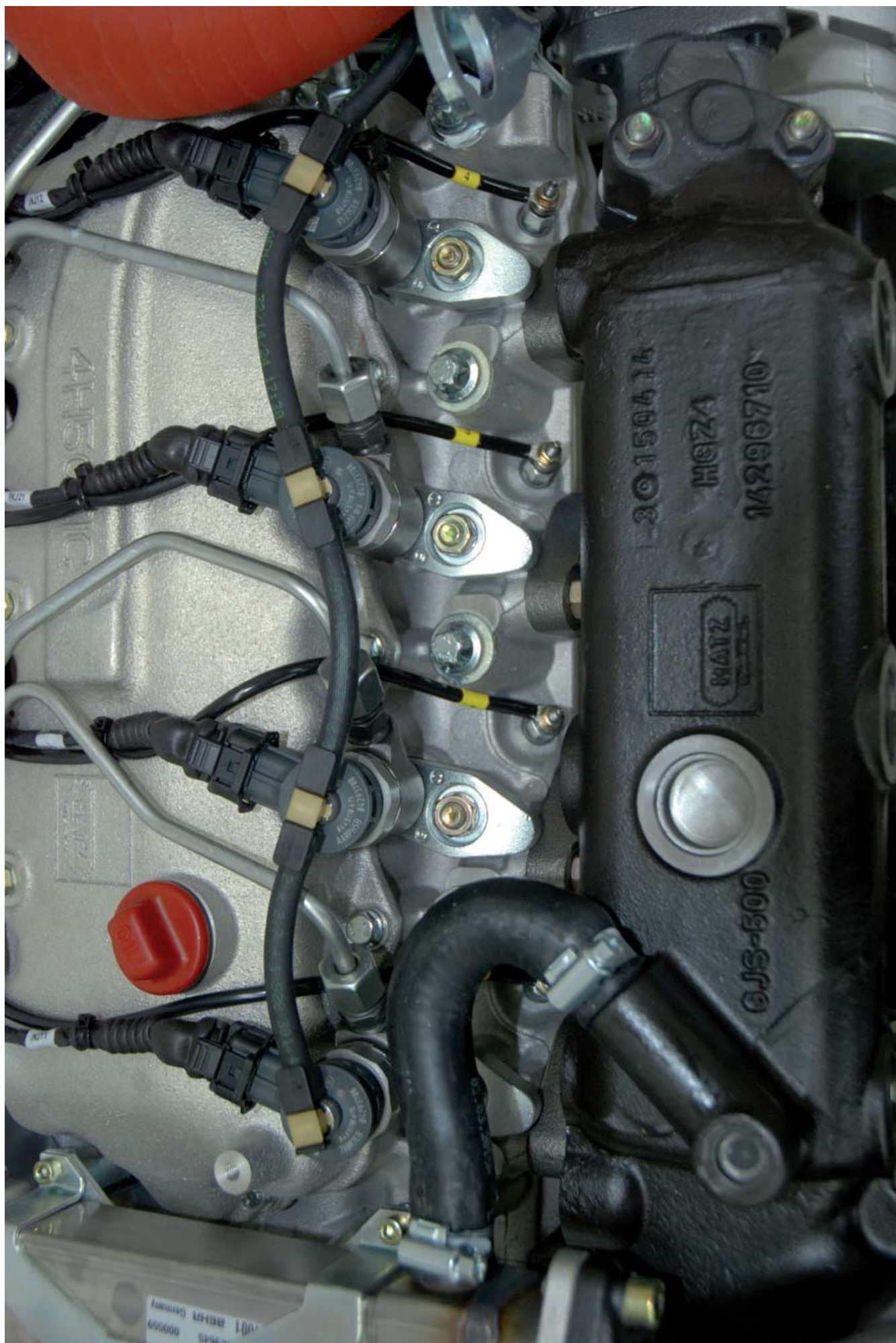


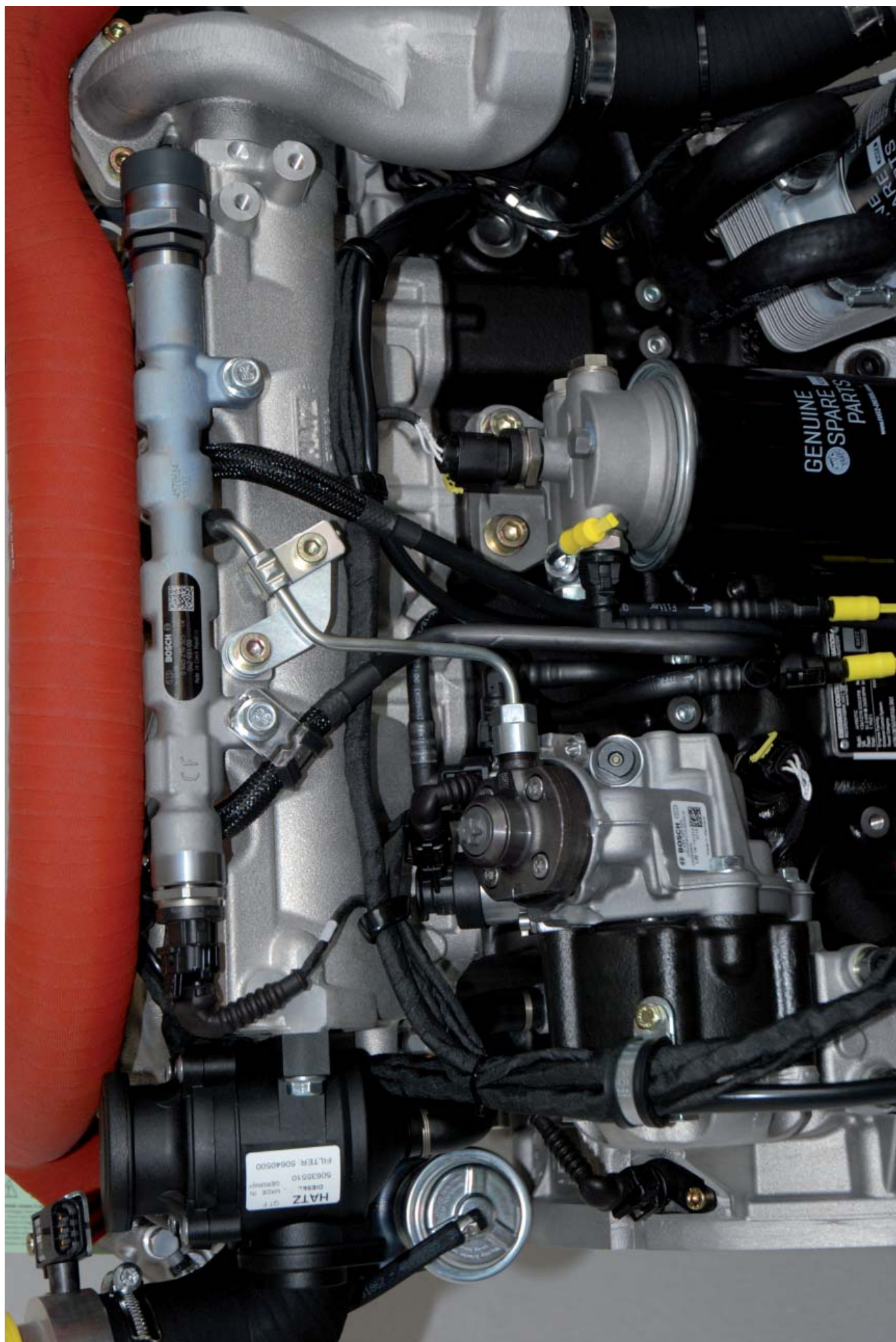


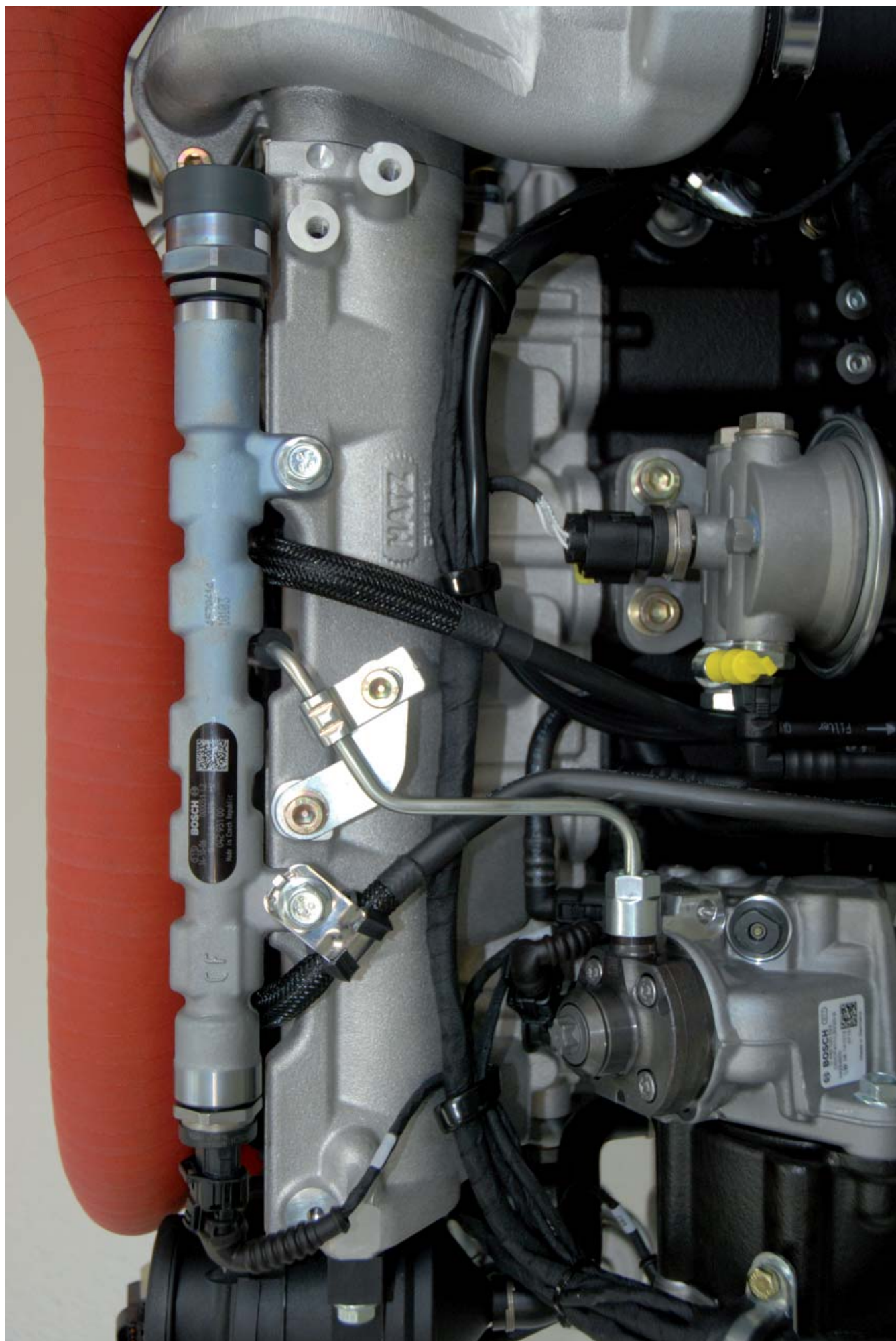


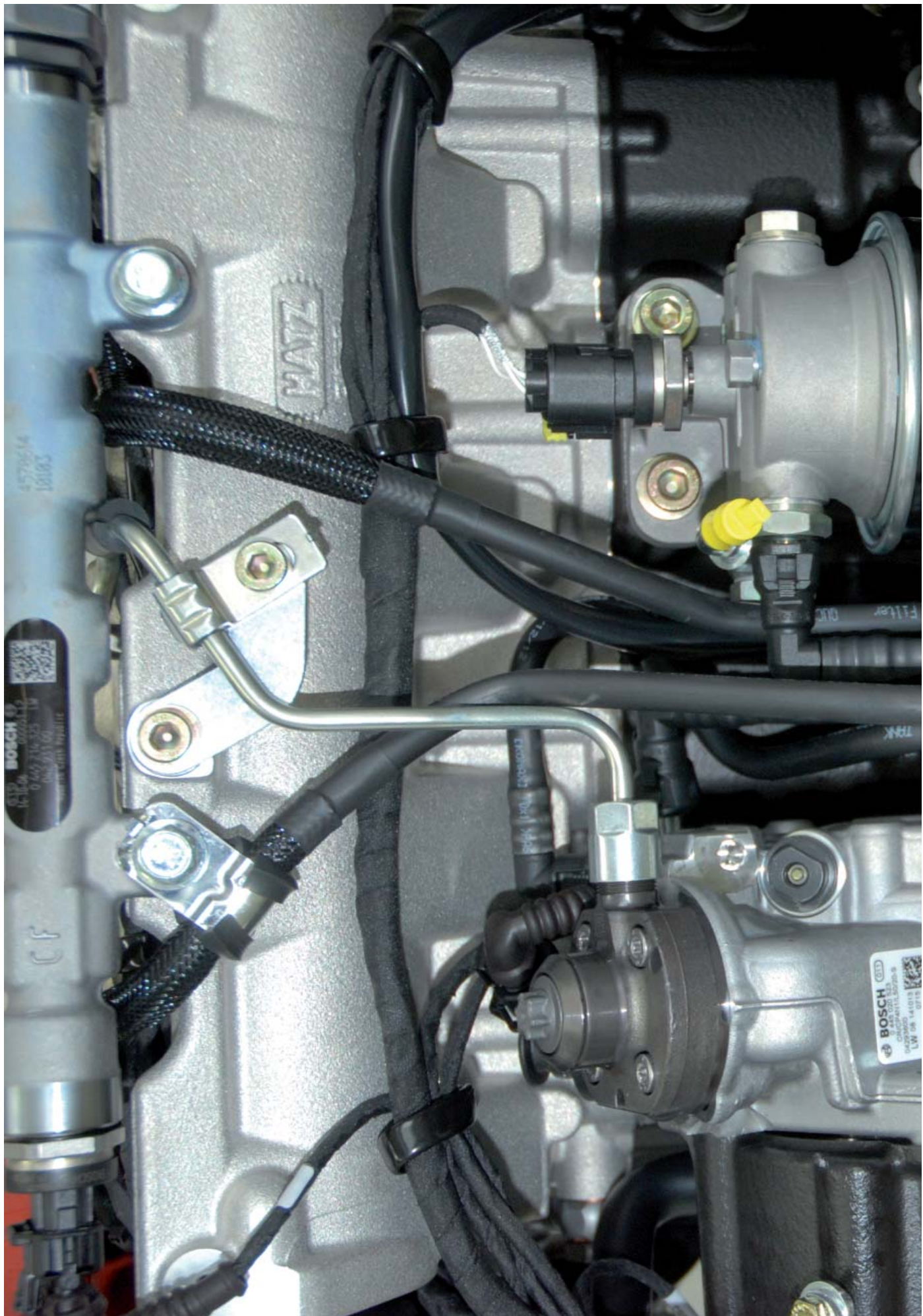




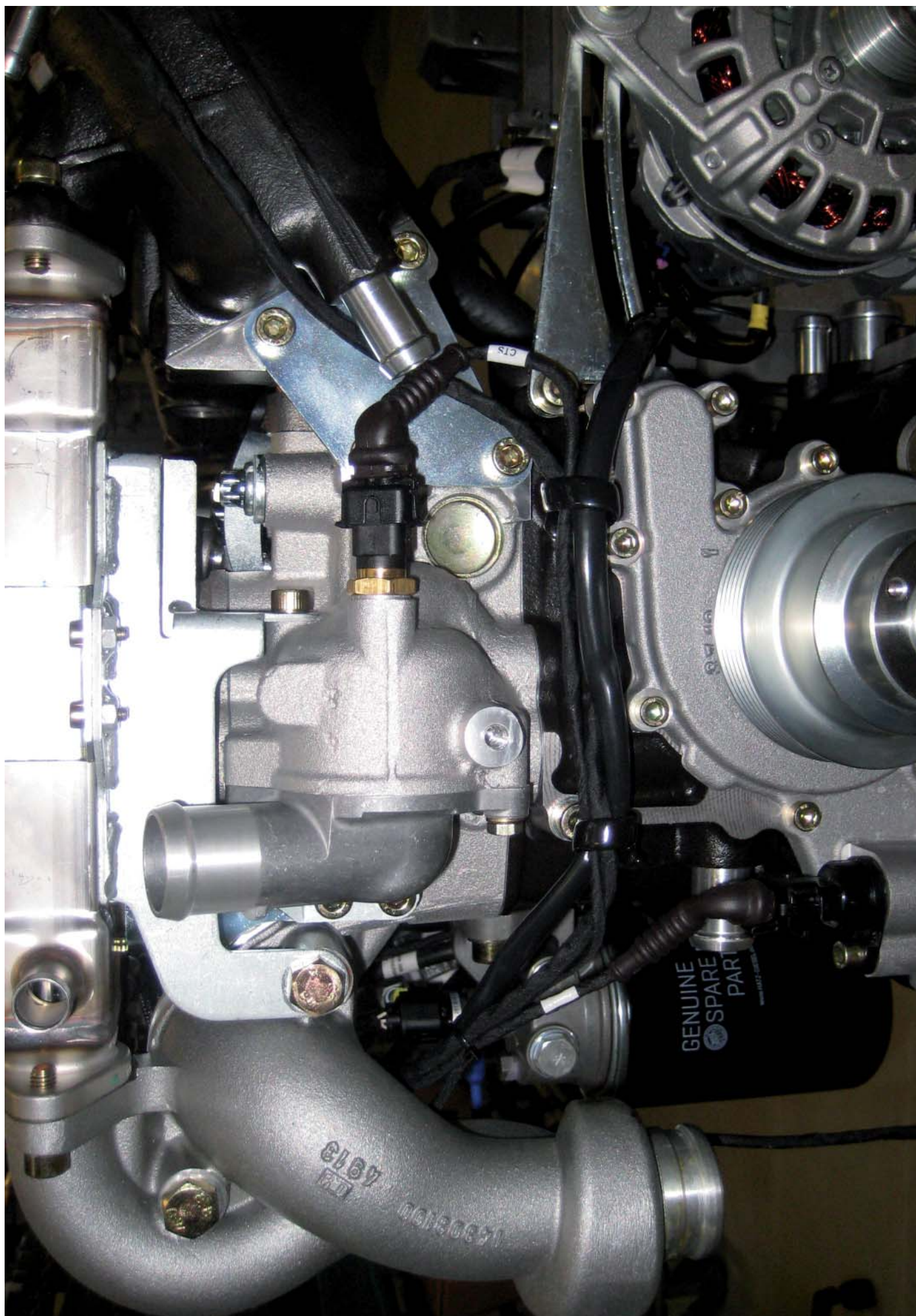




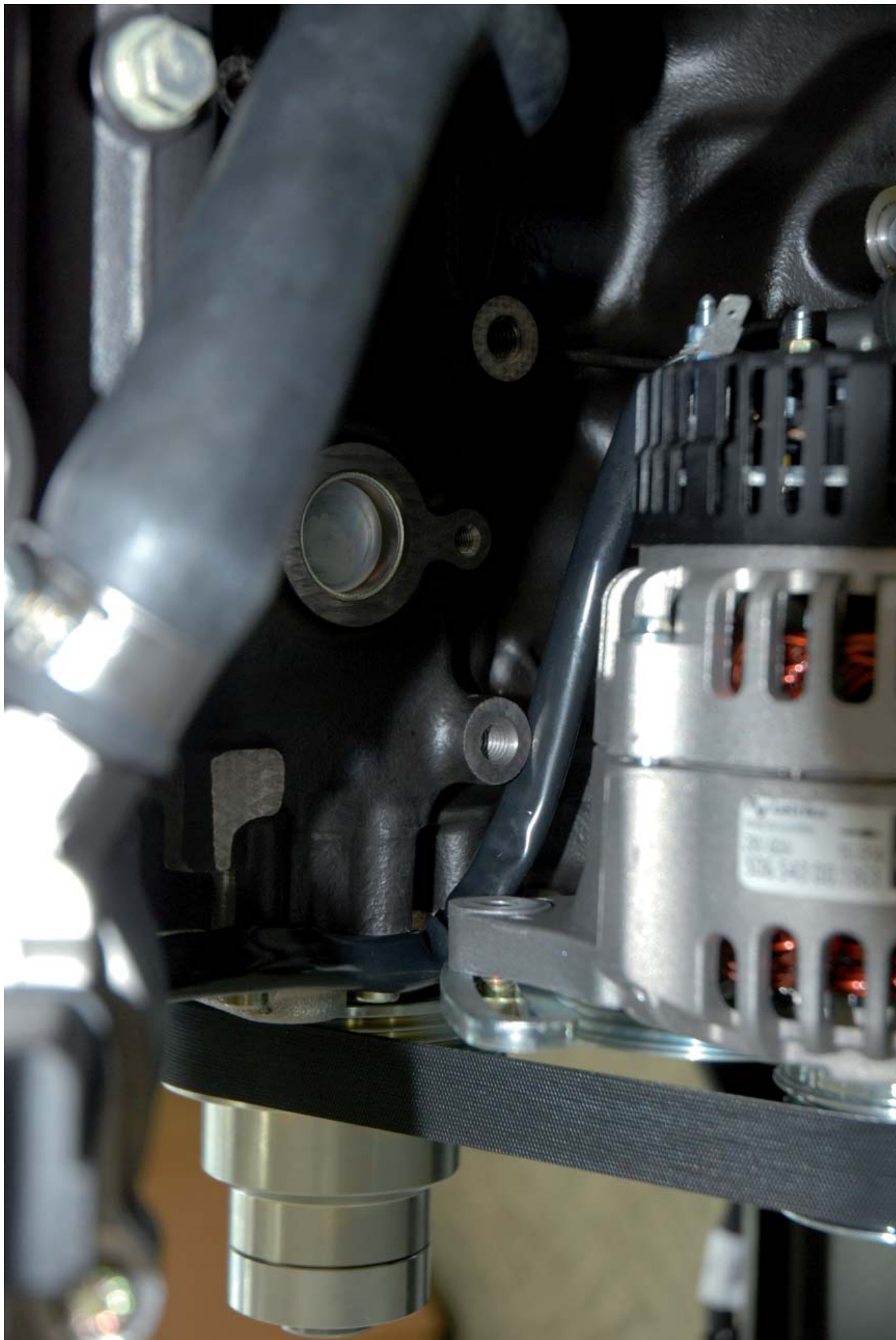






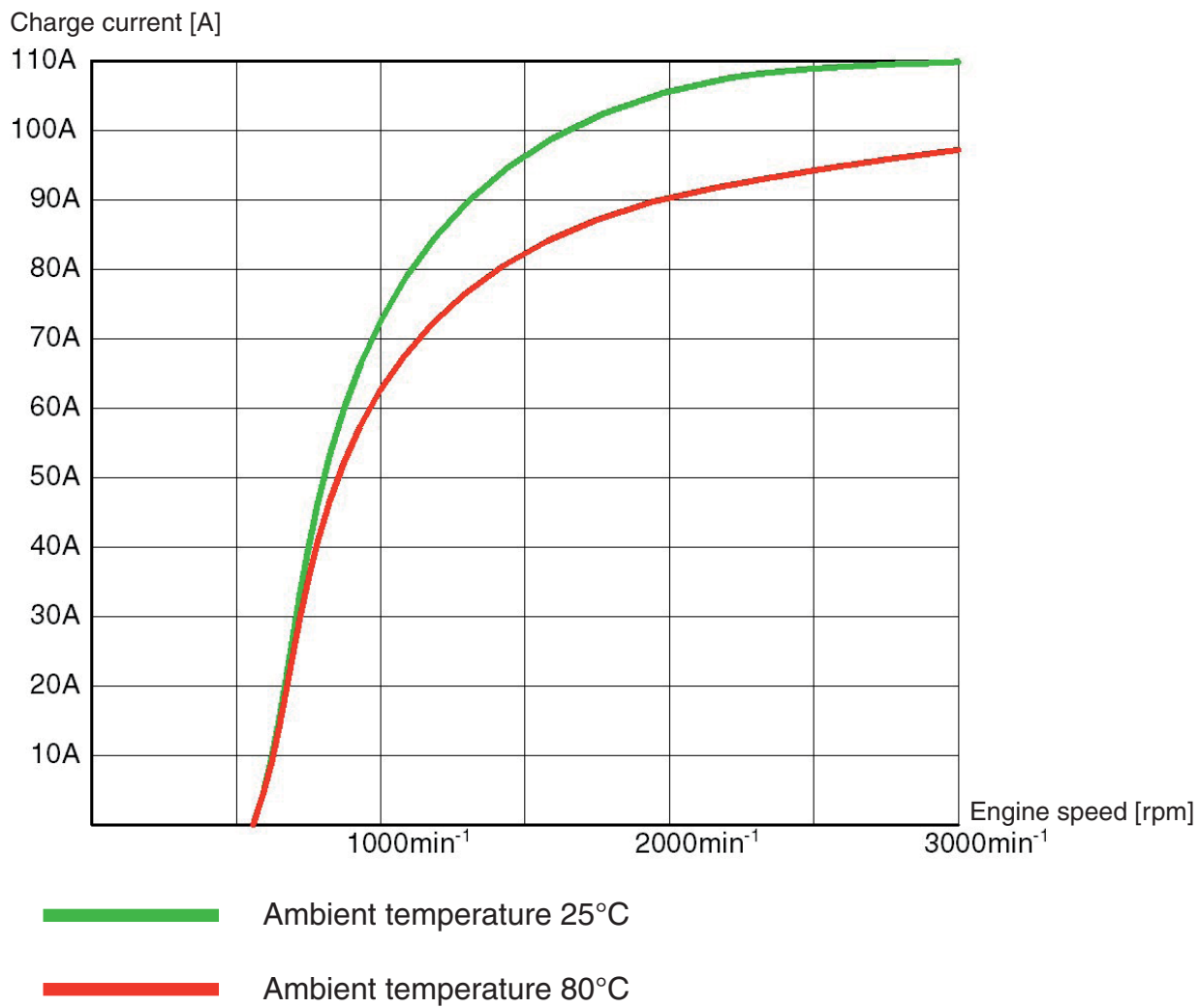






Blink code SHORT - LONG		
1.1	Error source:	Error in the monitoring, display and control elements area
	Possible error:	Indicators or cabling defective; power supply from control unit insufficient other error, not specified in more detail
	Remedies:	Check function and cabling of the indicators; check power supply to the control unit; otherwise HATZ Service must perform troubleshooting
1.2	Error source:	Error in the speed sensor area
	Possible error:	Crankshaft or camshaft sensor cabling faulty
	Remedies:	Check cabling
1.3	Error source:	Error in the air supply area
	Possible error:	Air filter soiled charge air after charge air cooler impermissibly high cabling charge air sensor, intake underpressure sensor faulty
	Remedies:	Service air filter clean charge air cooler check cabling
1.4	Error source:	Error in the exhaust return area
	Possible error:	Cabling AGR sensor faulty AGR cooler/valve clogged with deposits
	Remedies:	Check cabling Clean AGR cooler/valve
2.1	Error source:	Error in the fuel low pressure system area
	Possible error:	Water in fuel; fuel pressure too low fuel temperature too high; cabling conveyor pump or sensor faulty
	Remedies:	Drain water at fuel pre-filter; check tank contents, fill; or replace clogged fuel filter; ensure sufficient cooling of the fuel; check cabling
2.2	Error source:	Error in the fuel high pressure system area
	Possible error:	Cabling of the sensor system (injectors, rail pressure sensor, pressure control valve, high pressure pump) faulty.
	Remedies:	Check cabling
2.3	Error source:	Error in oil temperature pressure area
	Possible error:	Oil pressure too high/low oil temperature impermissibly high sensor cabling faulty
	Remedies:	Check oil level, if necessary refill oil use oil with appropriate viscosity class check water hose oil cooler. (hose kinked) +possibly clean radiator check cabling;
3.1	Error source:	Error in the fluid cooling area
	Possible error:	Coolant level impermissibly low coolant temperature impermissibly high; cabling, coolant temperature sensor faulty; Sensor faulty
	Remedies:	Refill coolant clean radiator; check cabling; replace sensor
3.2	Error source:	Error in the pre glow system area
	Possible error:	Cabling of the glow plugs faulty; one or several glow plugs faulty glow plug control unit "GCU" faulty.
	Remedies:	Check cabling check function of the glow plugs;

Charge current curve 12 V



Charge current curve 24 V

