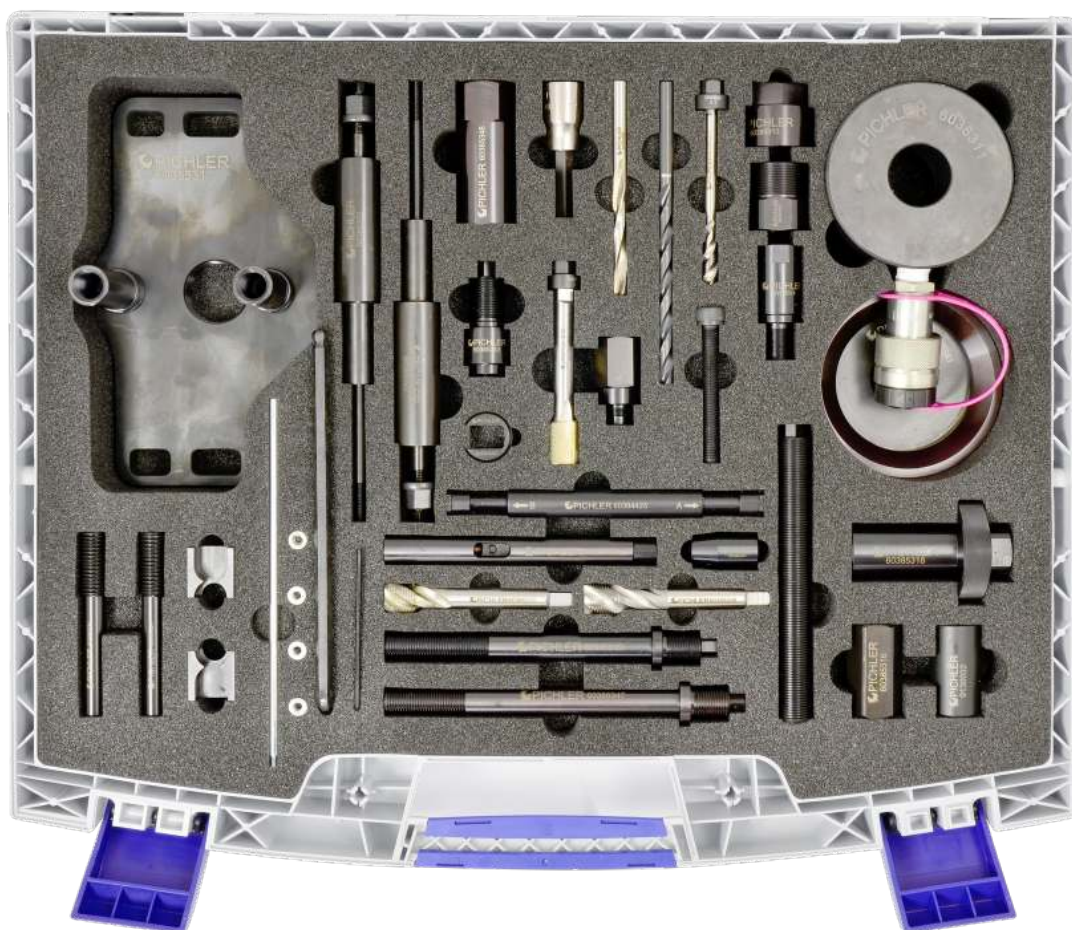




INJECTOR REMOVAL SET MOD. SOFIM FOR F1AE-2,3 L AND F1CE-3,0 L

Manual

60385340 / 60385345



PICHLER
tools since 1978.

SAFETY NOTICE

To understand the functioning of the tools, is it necessary to read the manual first!

- > Read these instructions before assembling, during installation and throughout use and in the proper sequence
- > Always refer to the OEM manufacturer's instructions and service manuals for the latest data and to maintain the correct sequence
- > These work instructions and the recommended tools are meant to serve as aides only and are by no means a guarantee for certain results.
- > This tool kit is a special collection and it has been tested and used successfully on several occasions. It is of the utmost importance to maintain the correct procedure as per the instructions
- > The use of the tools should only be carried out by qualified personnel!



ATTENTION

Special caution



CORRECT



LIGHT BULB

Hint or recommendation



WRONG



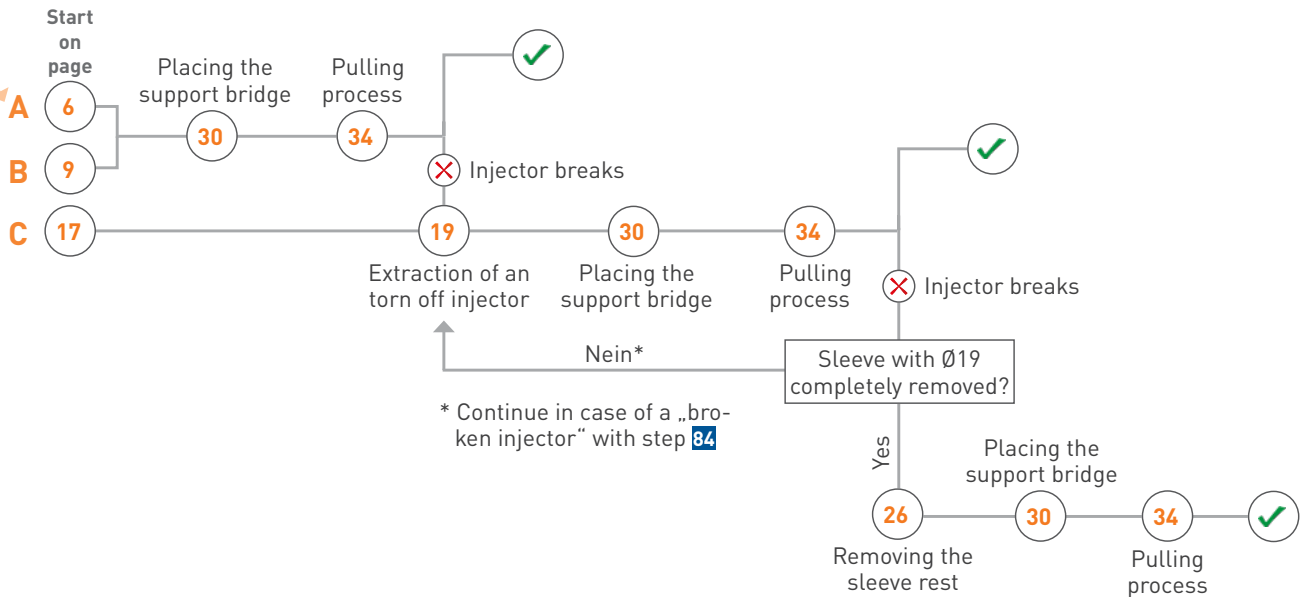
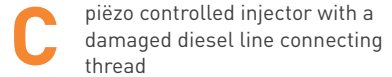
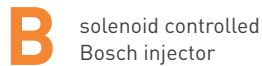
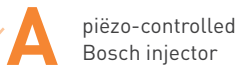
SAFETY GOGGLES

Wearing safety goggles
necessary

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SEQUENCE OF OPERATING





Nr.	PART.-NR.	Pcs.	Description	60385345	60385340
1	6038311	1x	Hydraulic Hollow Plunger Cylinder 20ton	✓	✗
2	60385342	1x	Swivel Cup Collar	✓	✓
3	60385639	1x	Swivel Cup	✓	✓
4	60385318	1x	Extraction Adapter	✓	✓
5	60385313	1x	Box Nut Adaptor	✓	✓
6	60384417	1x	Screw-On Sleeve	✓	✓
7	60385314	1x	External Thread M17x1/ Internal Thread M20x1.5	✓	✓
8	60385321	1x	Extraction Spindle M20x1.5x160mm	✓	✓
9	9130032	1x	Twist Socket 19mm	✓	✓
10	58506020	1x	Tap Holder Adapter Inner Square 5.7 mm / Hex 13	✓	✓
11	60385301	1x	Tap M10	✓	✓
12	60385317	1x	Hexagon Socket Screw M10x75 with Full Thread / Class 12.9	✓	✓
13	60385334	1x	Spiral Drill Ø8.5x165mm with Mark	✓	✓
14	60385308	1x	Drill Bit Ø8.5x117mm	✓	✓
15	60385312	1x	Drill Guide M17x1	✓	✓
16	60383425	1x	Double Pin Wrench	✓	✓
17	60385331	1x	Centering Guide	✓	✓
18	60385339	1x	Tap M16x1.5	✓	✓
19	60385316	1x	Extension Nut M20x1.5	✓	✓
20	60384172	1x	Allen Socket 10 with Hole	✓	✓
21	58506050	1x	Tap Holder Adapter Inner Square 9.2mm to / Hex 13	✓	✓
22	60383317	1x	Tap M17x1	✓	✓
23	60385348	1x	Box Nut Adaptor	✓	✓
24	60385343	1x	Internal Thread M14x1.5 / External Thread M20x1.5	✓	✓
25	60385346	1x	Open Screw	✓	✓
26	60385333	1x	Tap Holder	✓	✓
27	60385338	1x	Tap M18x1.5	✓	✓
28	60385349	1x	Extraction Spindle M18x1.5 / M20x1.5	✓	✓
29	60385347	1x	Extraction Spindle M16x1.5 / M20x1.5	✓	✓
30	6038316	2x	Collar Nut M10	✓	✓
31	60385322	2x	Outer Support Leg	✓	✓
32	151.20425	1x	Hex Key 2.5	✓	✓
33	9610200	1x	Hex Key 8 / L=200mm	✓	✓
34	60385323	2x	Support Leg Adapter for Inner Support Legs	✓	✓
35	60390102	4x	Sealing Plug Ø7.2mm with Collar Ø10mm	✓	✓
36	60390081	1x	Sealing Plug Setting Tool	✓	✓
37	60385311	1x	Support Plate	✓	✓
38	60385327	2x	Support Block	✓	✓
39	60385324	2x	Inner Support Leg	✓	✓

A EXTRACTION OF A PIËZO-CONTROLLED BOSCH INJECTOR – 3.0L EURO5

Remove, in preparation, all parts which are in the way such as: plastic engine cover, wiring harness at the valve cover, fuel injection lines and the injector clamp of the concerning injector.



ATTENTION

Close all resulting openings with either plugs, a piece of cloth or something similar.



TIP

By using the optional traction limiter **60382320** the injector can be removed from the injector shaft **WITHOUT** damaging or tearing it off.



Remove the plastic connector from the injector with a chisel or impact resistant screwdriver and a pair of pliers.



Slide the Open Screw **60385346** on the flat spots of the injector.



Screw Adapter **60385343** on the inlet connector of the injector and tighten it.  **hex 10 / approx. 70Nm**



Screw the Box Nut Adaptor **60385348** on the Open Screw **60385346**.  **hex 32 / approx. 110Nm**



Screw the Extension Nut **60385316** on to the Extraction Adapter **60385343** and tighten it lightly.  **hex 27**



Screw the Extraction Spindle **60385321** in the Extension Nut **60385316** and tighten it..

⊙ hex 10



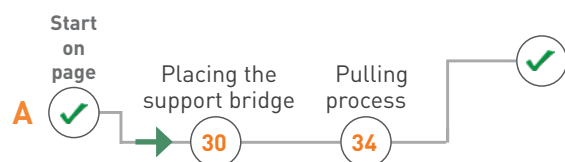
13



14

Continue with:

- Placing the support bridge
- Pulling process



B EXTRACTION OF A SOLENOID CONTROLLED BOSCH INJECTOR - 2.3L EURO 4 AND 5 / 3.0L EURO

Remove, in preparation, all parts which are in the way such as: plastic engine cover, wiring harness at the valve cover, fuel injection lines and the injector clamp of the concerning injector.



ATTENTION

Close all resulting openings with either plugs, a piece of cloth or something similar.

Remove the solenoid with a slotted socket 29mm **6038422** (not included in the set) or multigrip pliers.

○ **slotted socket 29mm**

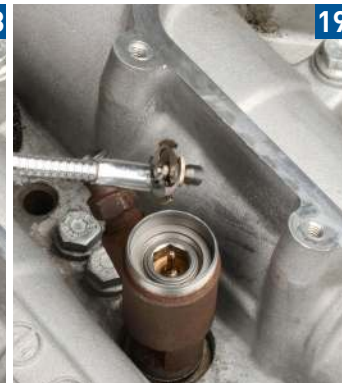
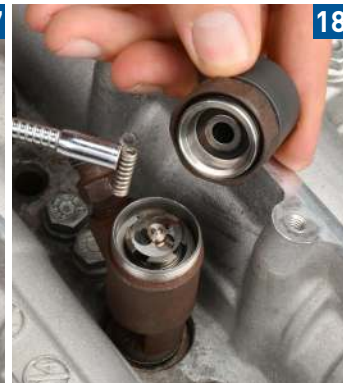
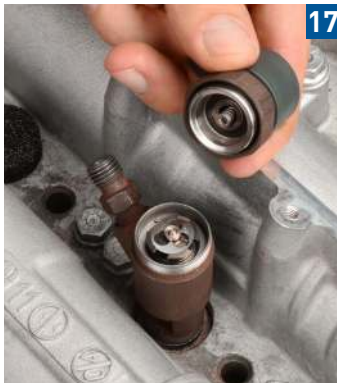


TIPP

Durch die Verwendung des optionalen Zugkraftbegrenzers **60382320** kann der Injektor, OHNE diesen zu beschädigen bzw. abzureissen, aus dem Injektorschacht entfernt werden.



When removing the solenoid, loose parts such as springs, washers and others may fall out. Remove the loose small parts e.g. with magnet **52601020** Ø8mm (not included in the set).



Unscrew the open screw with the Hex Socket **60384172** and a suitable tool with a 1/2" square.



23



25



27

Cut internal thread with the Tap M17x1 **60383317** and Tap Adapter **58506050** as deep as possible into the injector.  **hex 13**

This way is also thread M17x1 cut on the small step (see picture **30**)

Lubricate the Tap and repeatedly break the chips.



28



29



30



31

Remove the swarf e.g. with the magnet **52601020** Ø8mm (not included in the set) or suction device **80636500** (not included in the set).



32

Screw the Drill Guide **60385312** in the injector and tighten it lightly.  hex 24



Clamp the Spiral Drill $\varnothing 8.5\text{mm}$ **60385308** in a drill, wet it and insert it in the Drill Guide **60385312**. Drill carefully, and with repeatedly lifting, so deep into the injector until a noticeable resistance is felt, or the chuck of the drill touches the Drill Guide **60385312**.



Remove the swarf e.g. with the magnet **52601020** $\varnothing 8\text{mm}$ (not included in the set) or suction device **80636500** (not included in the set).



Replace the Spiral Drill **60385308** by the longer Spiral Drill with Mark **60385334**. Carefully continue to drill into the injector until the mark on the Spiral Drill is flush with the top of the Drill Guide.



TIP

Pull the drill at regular intervals far enough out of the drill guide to remove the swarf from the hole.



38



38.1



ATTENTION

If the spiral drill was reground, the correct drilling depth is no longer consistent with the marking. The hole is deep enough when there was drilled at least 110 mm deep, measured from the top of the drill guide. (see picture **39**)



39

Unscrew the Drill Guide **60385312** from the injector and remove the swarf e.g. with the magnet **52601020** Ø8mm from the injector and remove the swarf e.g. with the magnet **80636500** (not included in the set).



40



41

Clamp the Tap M10 **60385301** in the adapter **58506020** wet the tap with cutting oil and cut, as deep as possible, thread in the injector.



ATTENTION

Don't forget to lubricate and to break the chips.



TIP

It is recommended to interrupt again and again the cutting to prevent a swarf build-up. Unscrew the Tap completely from the hole and remove the swarf e.g. with the magnet **52601020** Ø8mm (not included in the set) and continue the tapping until the maximum depth is reached.



To check whether the M10 thread has been cut deep enough, screw the Hexagon Socket Screw M10x75 **60385317** all the way in the thread. If the distance between the areas marked in red is less than 21mm is the thread cut deep enough. (see the picture **46**)
Should the distance exceed 21mm, repeat the procedure from step **42**.

Remove the Hexagon Socket Screw M10x75 **60385317**.



Screw the Extraction Adapter **60385314** in the injector and tighten it.  hex 24 / approx. 70Nm



Screw the Hexagon Socket Screw M10x75 **60385317** through the Extraction Adapter **60385314** in the previously cut thread and tighten it with Hex Key **9610200** or hex socket **7902080** (not included in the set).

⊖ inner hex 8 / approx. 80 Nm



Screw the Screw-On Sleeve **60384417** all the way on the thread for the solenoid valve and tighten it lightly.

⊖ hex 32



Screw the Box Nut Adaptor **60384313** on the Screw-On Sleeve **60384417** and tighten it.

⊖ hex 32 / approx. 90Nm



Screw the Extraction Spindle M20x1.5 **60385321** in the Extraction Adapter **60385314** and tighten it lightly
 hex 10



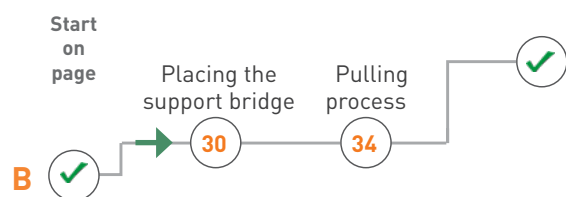
56



57

Continue with:

- **Placing the support bridge**
- **Pulling process**



C EXTRACTION OF A PIËZO CONTROLLED INJECTOR WITH A DAMAGED OR TORN OFF DIESEL LINE CONNECTING THREAD

Example 1



58

Example 2



59



Hammer the Twist Socket **9130032** firmly on the protruding part of the injector.



60



61



Try to unscrew the injector counter clockwise using a socket wrench with square-drive 1/2" (e.g. **9411000** not included in the set). **Attention:** First read the remarks on page 18.



62



63

Remove the unscrewed part of the injector from the shaft.



If during unscrewing the injector very much effort is needed can this lead to twisting or breaking of the injector. To avoid this continue on page 8 with point A, picture **5**



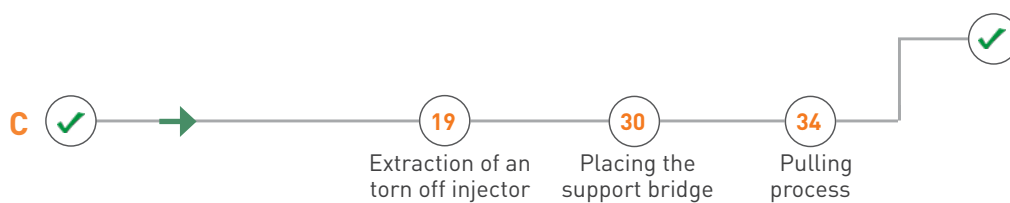
In this case (page 7-picture **7** must adapter **60385343** be welded to the injector. (wear safety goggles)



Continue with:

- Extraction of an torn off injector
- Placing the support bridge
- Pulling process

Start
on
page



D PIËZO OR SOLENOID-CONTROLLED INJECTOR BROKEN OR UNSCREWED DOWN IN CYLINDER HEAD

Remove the broken upper part of the injector and support bridge.

Are the Outer Support Legs **60385322** already screwed in in the cylinder head, they need not be removed, unless they hamper further work.

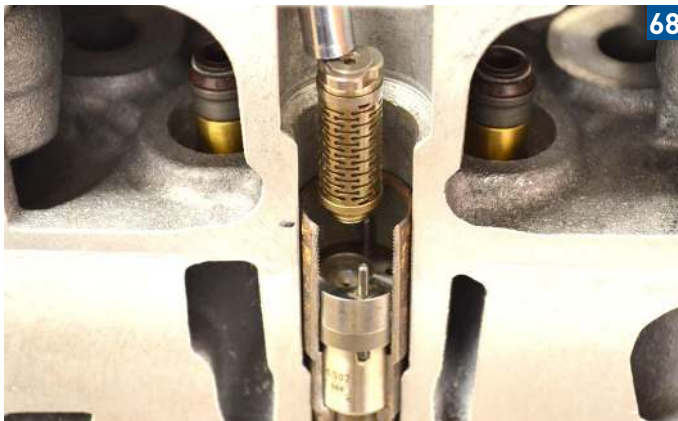


Cross section of the cylinder head with broken injector



Cross section of the cylinder head with unscrewed injector

Remove the remaining parts e.g. with the magnet **52601020** Ø8mm (not included in the set) from the shaft.

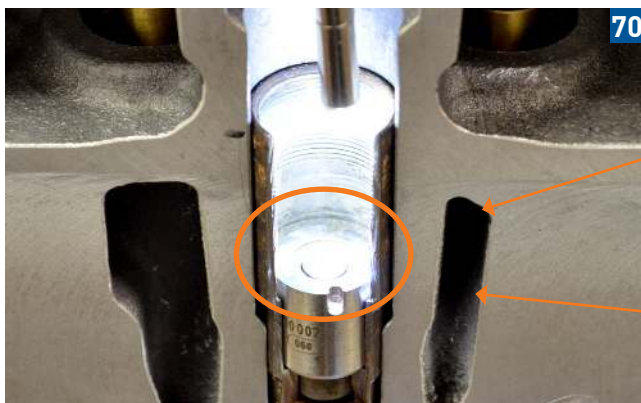


Cross section of the cylinder head and injector



Cross section of the cylinder head and injector

Then determine which nozzle needle body is installed in the injector.



Cross section of the cylinder head and injector

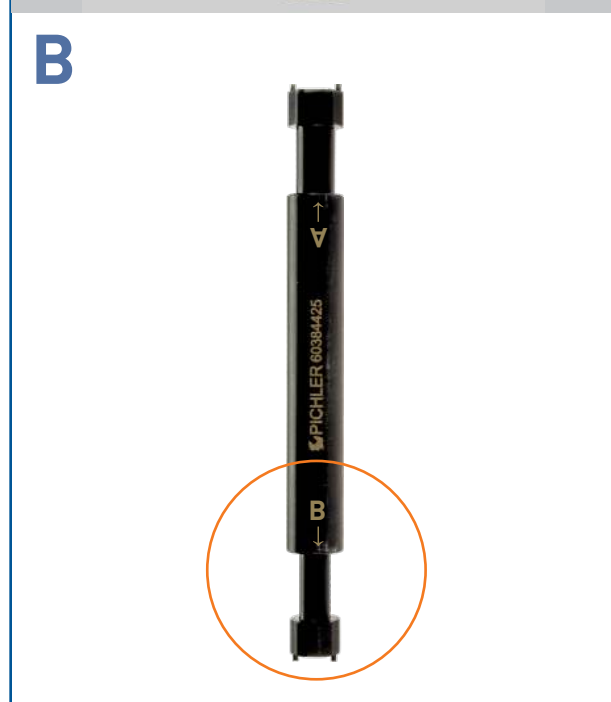


A

B

If the needle body matches **Type A**:
Use **A-end** of the pin wrench **60383425**.

If the needle body matches **Type B**:
Use **B-end** of the pin wrench **60383425**.



Spray a little rust dissolver e.g. rust remover **9990020** (not included in the set) in the injector shaft and let it soak for a while.



Slide the Centering Guide **60385331** over the Double Pin Wrench **60383425** and insert them with the right side down into the injector shaft.



Stick the pins of the Double Pin Wrench **60383425** in the holes of the nozzle body and with an tool wit **hex 14 (Type A)** or **hex 15 (Type B)**, release the nozzle body by gently turning left & right, with **max. 20Nm**.

If the nozzle body can't be released with the Double Pin Wrench at **max. 20Nm** it must be done in a other way using a suitable tool (Vibrohammer, hammer and chisel or by heating, etc.).



! Attention: Max. torque 20 Nm!

Cross section of the cylinder head and injector

Remove the released needle body from the shaft with a strong magnet e.g. **52601030** Ø12 (not included in the set).

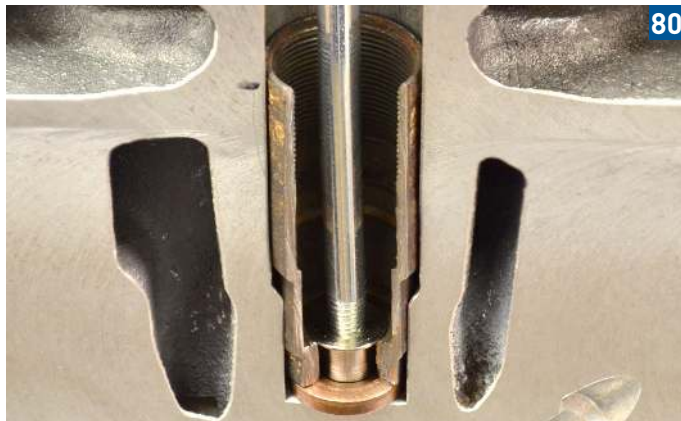


! Remove the released needle body complete from the cylinder head.

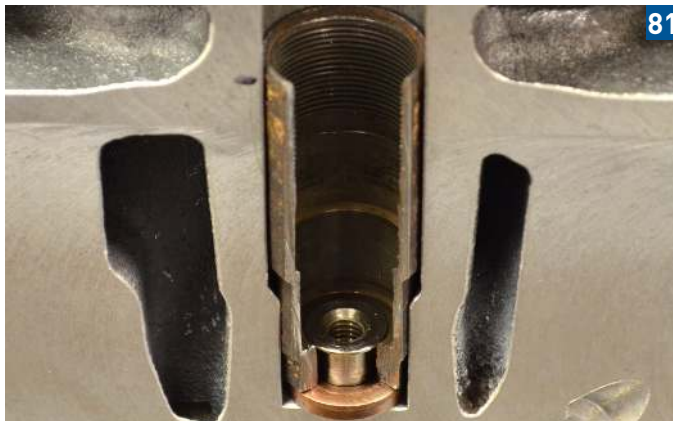
Cross section of the cylinder head and injector

REMOVING THE INJECTOR SLEEVE

Screw a Sealing Plug **60390102** on the Setting Tool **60390081** and close the hole to the combustion chamber.



Cross section of the cylinder head and injector



Cross section of the cylinder head and injector

Clamp the Tap M18x1.5 **60385338** in the Tap Holder **60385333** using Hex Key **151.20425**.  hex 2.5



Slide the Centering Guide **60385331** on to the Tap Holder **60385333** wet the Tap **60385338** with grease or cutting oil and insert it in the injector shaft.



Cut with a suitable tool M18x1.5 thread in the still stuck sleeve.  **hex 13**



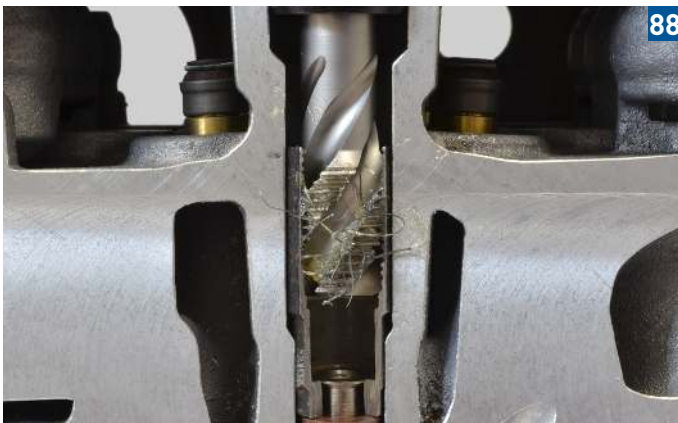
86



87

Cross section of the cylinder head and injector

Cut the thread over the full length of the injector sleeve and repeatedly break the chips.



88

Cross section of the cylinder head and injector



TIP

It is recommended after cutting thread in the sleeve, to remove the chips and to repeat the cutting.

Remove the swarf e.g. with the magnet **52601020** Ø8mm(not included in the set) or suction device **80636500** (not included in the set).



ATTENTION

The Sealing Plug must not be removed along.



89



90

Cross section of the cylinder head and injector

Screw the Extraction Spindle **60385349** in the previously cut thread and tighten it.  hex 10



Cross section of the cylinder head and injector

Screw the Extension Nut **60385316** on the Extraction Spindle and tighten it lightly.  hex 27

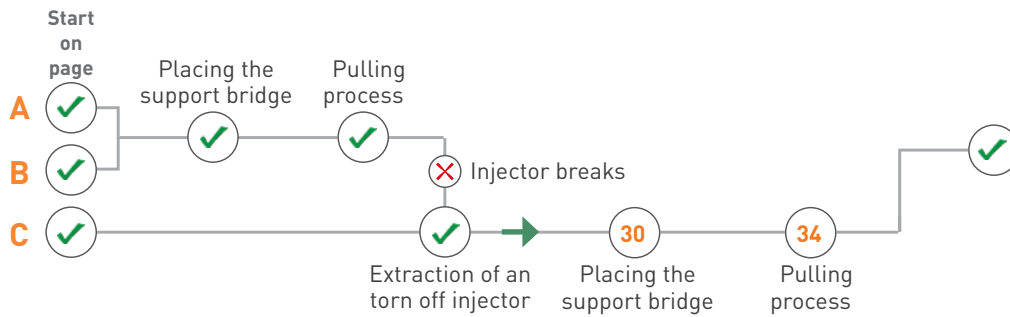


Screw the Extraction Spindle M20x1.5 **60385321** in the Extension Nut **60385316** and tighten it lightly.  hex 10



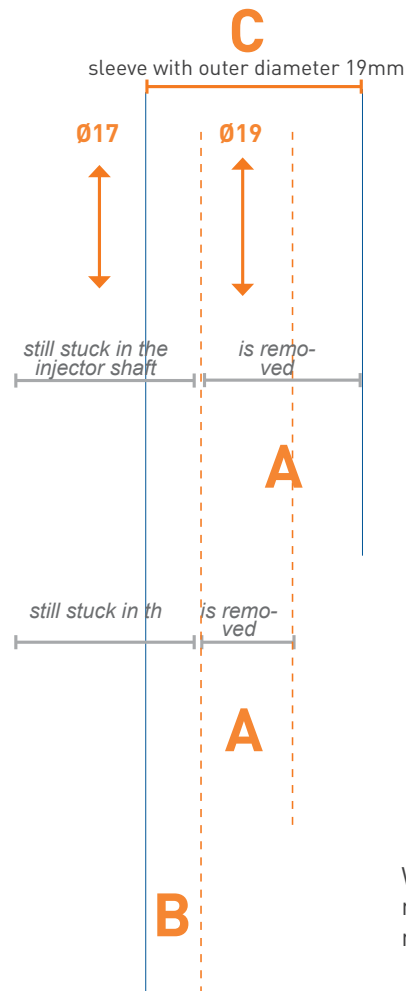
Continue with:

- **Placing the support bridge**
- **Pulling process**





First must be determined, how much of the lower threaded sleeve is still stuck in the injector shaft. This can be found out by comparing the removed part with a new injector. If a rest of the larger diameter (19mm) is still stuck in the injector shaft, repeat the steps from „broken injector“ from step 84 on page 24.



Threaded part of the new injector



Example: The injector was unscrewed in the lower part



Example: The injector is broken flush beneath the thread

Was only a part (A) removed from the shaft, the remaining part of the sleeve (B) must still be removed. Repeat the steps from 84 on page 24.

The removed pieces should be compared with a new injector. Only after the entire sleeve with outer diameter 19mm is removed completely can be continued with the next step, because the M16x1.5 thread in the thinner sleeve with outer diameter 17mm is not strong enough for also removing even the smallest part with outer diameter 19mm.

97

Parts (A) and (B) are together the total length of the sleeve with outer diameter 19mm (C)



Threaded part of the new injector

Example: The injector was unscrewed in the lower part

Example: The injector is broken flush beneath the thread

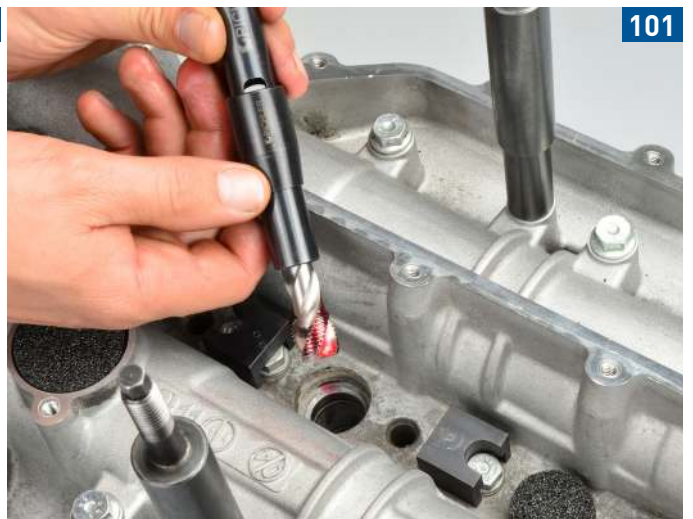


REMOVING THE SLEEVE REST WITH OUTER DIAMETER 17MM

Clamp the Tap M16x1.5 **60385339** in the Tap Holder **60385333** with Hex Key **151.20425**.  hex 2.5



Slide the Centering Guide **60385331** on to the Tap Holder **60385333** wet the Tap **60385339** with grease or cutting oil.



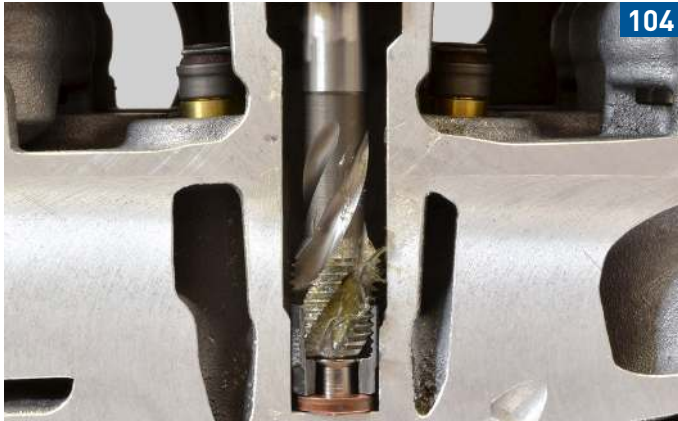
Cut with a suitable tool M16x1.5 thread in the stuck sleeve.

 hex 13



Cross section of the cylinder head and injector

Cut thread over the full depth of the injector sleeve and repeatedly break the chips.

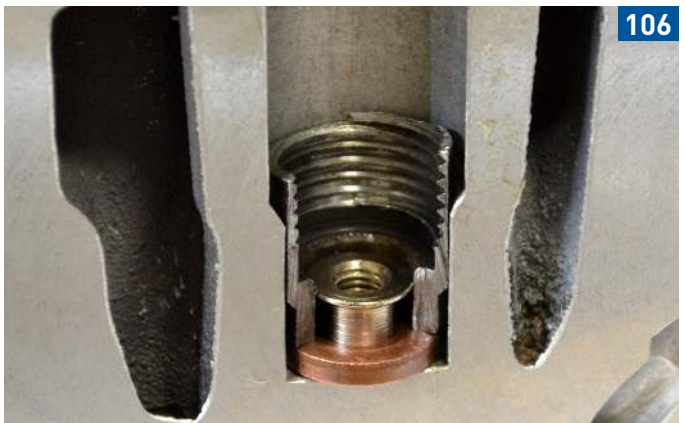


Cross section of the cylinder head and injector



It is recommended after cutting thread in the sleeve, to remove the chips and to repeat the cutting.

Remove the swarf using a magnet or suction device.



Cross section of the cylinder head and injector

Insert the Extraction Spindle **60385347** in the injector shaft and screw it as far as it goes into the previously cut thread and tighten it.  hex 10



Cross section of the cylinder head and injector

Screw the Extension Nut **60385316** on the Extraction Spindle **60385347** and tighten it lightly.

⊙ hex 27



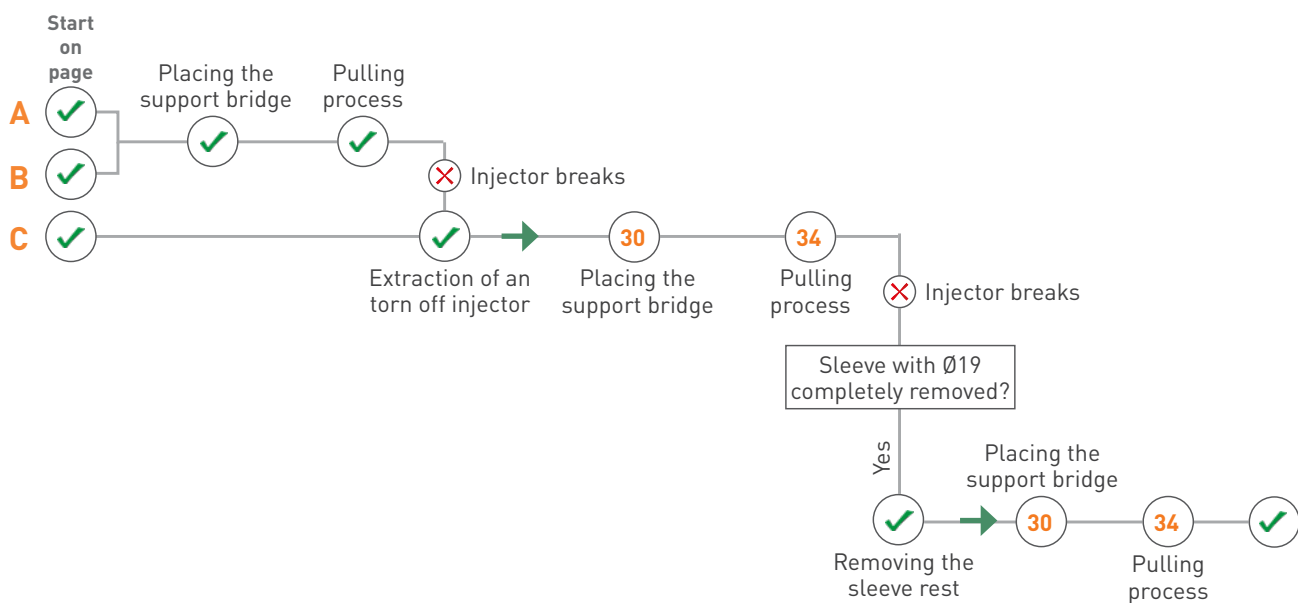
Screw the Extraction Spindle **60385321** into the Extension Nut M20x1.5 **60385316** and tighten it lightly.

⊙ hex 10



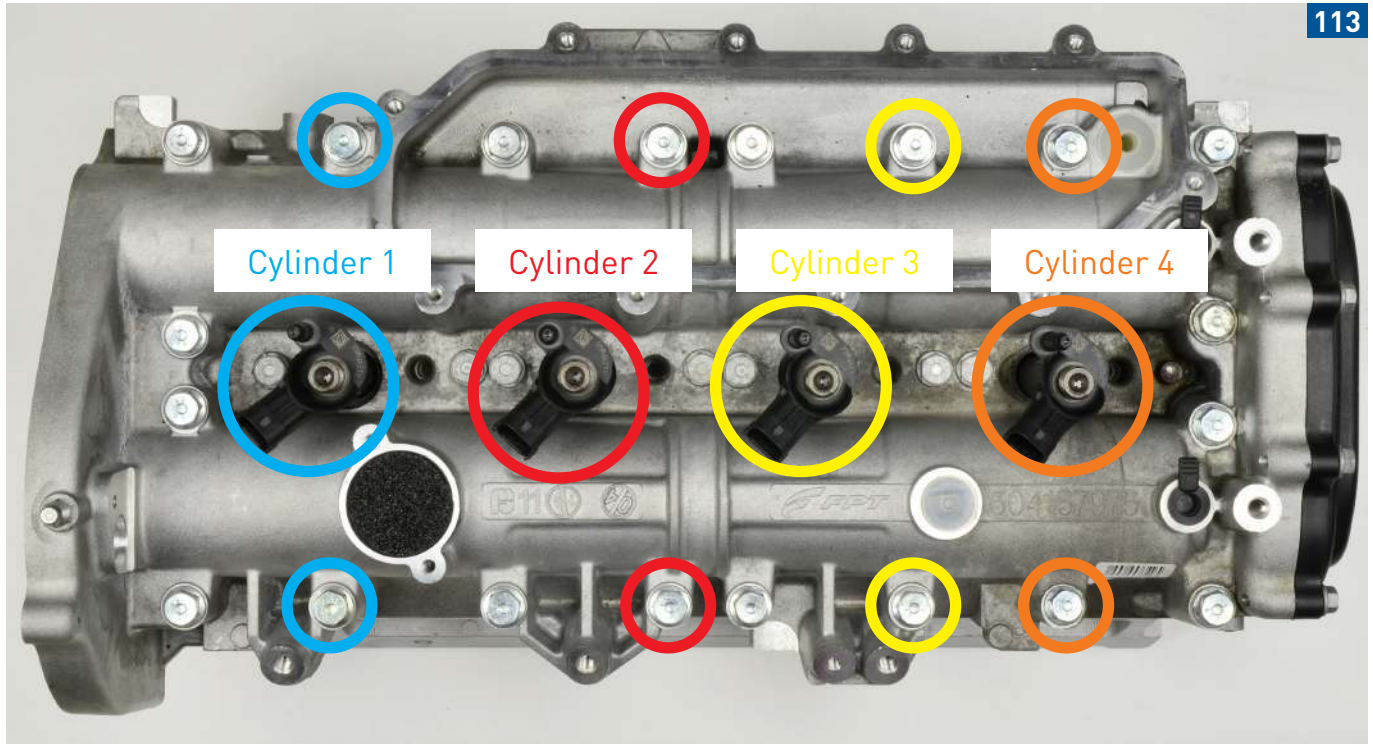
Continue with:

- Placing the support bridge
- Pulling process



E PLACING THE SUPPORT BRIDGE OVER THE VARIOUS CYLINDERS

Unscrew the corresponding valve cover bolts of the concerning injector according the picture. **113**.



Screw both Outer Support Legs **60385322** in the holes of the removed valve cover bolts and tighten them.

⊙ hex 7

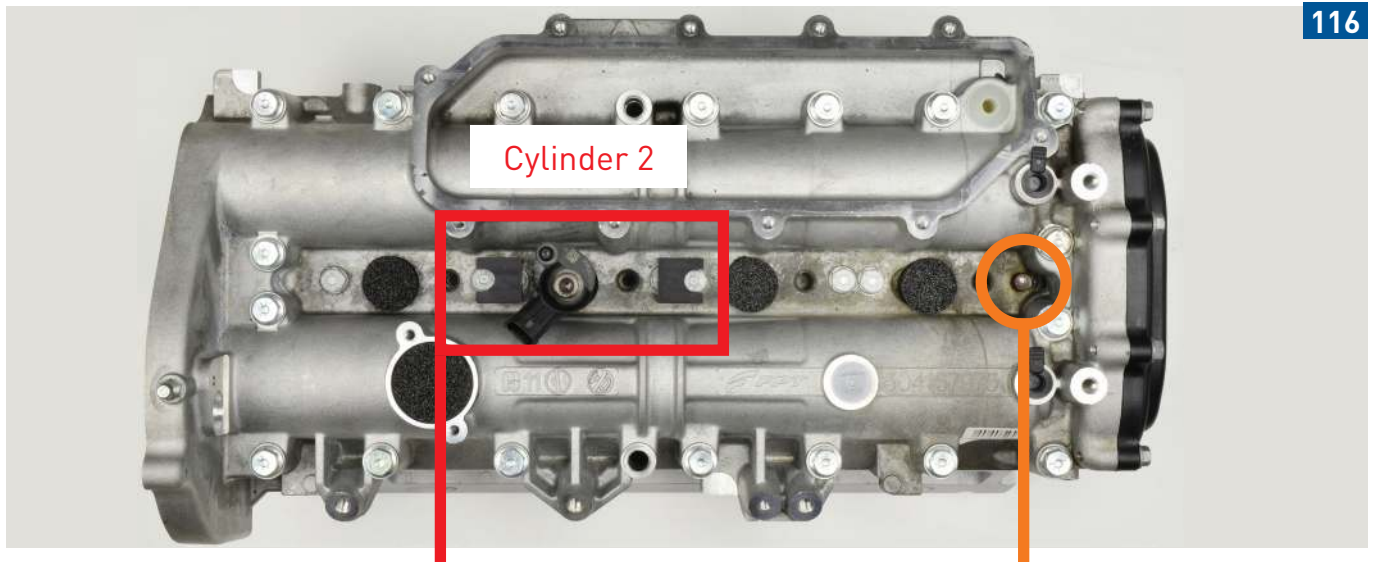


The two Support Blocks [60385327](#) are always placed on the camshaft cover over the screws so that the front side without cut out always points in the direction of the concerning injector. e.g. with cylinder 2 (picture [117](#))



ATTENTION

Only 1 Support Block is used on the 4th cylinder. The pin on the camshaft cover (counter support for the injector clamp) is used as other support. (picture [119](#)).



Screw the two Inner Support Legs [60385324](#) all the way in the Support Leg Adapter [60385323](#).





ATTENTION

The wider flat part of the Support Plate **60385311** must point in the direction of the timing belt or chain, for each of the four cylinders.

breitere Flachstelle

Ventilsteuerung

Place the Support Plate **60385311** on the Outer Support Legs **60385322** and fix it with the two M10 Collar Nuts **60385316** in such a way that the plate can still be positioned.



123



124

Align the Support Plate **60385311** so that the two Inner Support Legs **60385324** are located over the two support blocks. The Extraction Spindle must not touch the Support Plate **60385311**.



125



126



ATTENTION

With cylinder 4 must one Inner Support Leg **60385323**, be positioned over the pin on the camshaft cover as shown in picture **128**.



127



128



Hold the support bridge and tighten the two Collar Nuts M10 **6038316** with a spanner.  hex 16



Screw the Inner Support Legs **60385324** with the Hex Key **9610200** so far out until they make light contact with the support blocks **60385327**.  hex 8



ACHTUNG

With cylinder 4 must one Inner Support Leg **60385324**, rest on the pin on the camshaft cover (counter support for the injector retaining fork). (picture **133**)

Tighten both Inner Support Legs **60385324** alternately till these are well-set on the Support Blocks **60385327**.  hex 8



Place the Swivel Cup Collar **60385342** and Swivel Cupe **60385639** over the Extraction Spindle **60385321**, on the Support Plate **60385311**.



ATTENTION

It is important to ensure that the arrows on the Swivel Cup Collar point down↓ in the direction of the Support Plate or cylinder head!



134



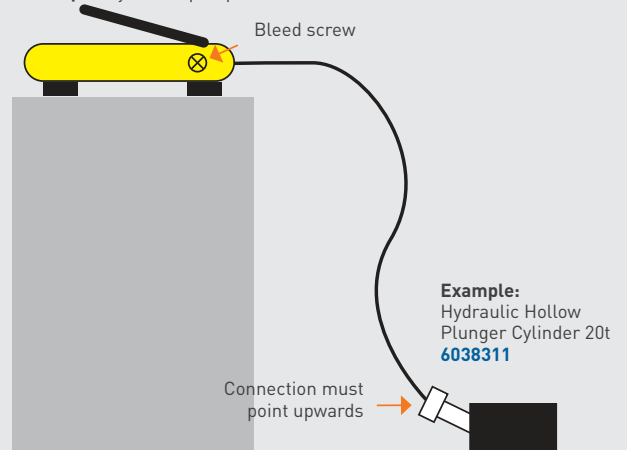
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Bleeding the hydraulic system

Connected hydraulic Hollow Plunger Cylinder 20t **6038311** to the hydraulic pump. Place the Hollow Plunger Cylinder lower than the hydraulic pump so that the air can rise through the hose to the hydraulic pump. Build up pressure till the max. stroke of Hollow Plunger Cylinder is reached. Relieve the pressure by opening the relief valve. Repeat his procedure 4 to 5 times. Top up the oil if necessary.

Example: hydraulic pump with hose **80255500**



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EXTRACTION PROCESS

Place the Hydraulic-Hollow Plunger Cylinder 20t **6038311** over the Extraction Spindle **60385321** on the Swivel Cup. Screw the Extraction Adapter **60385318** on the Extraction Spindle **60385321** and centre the Cylinder with the Swivel Cup Collar **60385342** and Swivel Cup **60385639**.



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Build up only low pressure for 2 to 3 times at the beginning of the extraction procedure, relieve the pressure and tighten the Extraction Adapter. This allows the support bridge with the other components to align and thereby settle somewhat.



Start the extraction procedure, after about 8mm the maximum stroke of the Hydraulic Cylinder is reached. Release the pressure, screw in the Adapter and again build up the pressure.



ATTENTION

Upon reaching 8mm lift height do not continue to pump, but relieve the pressure, screw in the Adapter and re-apply the pressure.



Repeat the procedure until the injector is extracted.



Piëzo-controlled Bosch injector completely removed



Solenoid valve controlled Bosch injector completely removed



When the injector breaks in the lower part during the extraction process then continue on page 21.
When the injector breaks during the extraction process and can the nozzle body and the injector sleeve be removed, continue on Page 26.



Piëzo-controlled Bosch injector broken off



Solenoid valve controlled Bosch injector broken off

RECOMMENDED ACCESSORIES

HYDRAULIC SET 3 PIECES

80255500



AIR HYDRAULIC FOOT PUMP SET, 3-PCS 700 BAR

80255585



RUST LOOSENER AND CONTACT SPRAY 400 ML

9990020



PNEUMATIC HAMMER SET VIBRO-IMPACT WITH 4 ADAPTERS

80257000



FLEXIBLE MAGNET GR. 2 & GR. 3

52601020 / 52601030



INJECTOR SHAFT CLEANING SET COMPLETE

9038100



INJECTOR SOCKET 29 DRIVE 1/2"

6038422



UNIVERSAL RATCHET LEVER DRIVE 1/2" RATCHET HEAD, 670MM LONG

7560010 / 75005160



CUTTING GREASE 300G

60200035



NOTES

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