Service Information

Caterpillar Motoren GmbH & Co. KG product support information for medium-speed engines

Engine platform: all current
Engine section: driving gear
Engine type: all current
Validity: until further notice
No. 0018com • Issue 1; June 25, 2020

Information for all recipients of Service Information

Special attention to engine operators / maintenance crew

Action: for immediate attention

IMPORTANT NOTICE: PISTON PIN SAFETY CHECKS

This Service Information contains an important notice on safety checks applying to all piston pins installed in M20, M25, M32, M34, M43 and M46 engine platforms.

Based on information gathered in the field, we would like to alert you to the fact that a small number of piston pins installed in our engines have developed cracks over time. In most cases, the cracks were discovered during scheduled maintenance of the pistons and damage to the engine could be avoided. However, where a crack remains undetected the piston pin may ultimately fail, cause irreparable damage to the engine and threaten the safety of any personnel in the surrounding area.

Therefore, we would like to remind you to inspect the piston pins for cracks and damage during every scheduled maintenance of pistons as stated in the delivered engine manual. In this context, we recommend that you perform the following safety checks:

Piston pin (job card A5.05. 02.08.01.10 / en / 07.05.2017)

- Check for damage and abnormal wear behavior
- Check for cracks (preferred: Metallic Particle Test / Ultra Sonic Test / Dye Penetrant Testing)
- Measure pin outer diameter

Small-end bush (job card A5.05. 02.09.01.10 / en / 06.10.2016)

- Check for damage and abnormal wear behavior
- Measure small-end bush inner diameter

Circlip

- Check for damage
- Check for correct positioning at groove after reinstalling

Note: If the pistons recently underwent scheduled maintenance without such safety checks, please complete them at the next suitable opportunity. Please also consider drawing additional samples as operating hours increase where sample inspections of the pistons are to be performed according to the engine manual.

For your convenience, please find the referenced job cards attached. Please keep the job cards with your engine manuals on board and in your office at all times. If necessary, please update your maintenance schedule system.

In this context, we would like to reiterate that, as a general precaution, the personnel should avoid staying directly next to rotating equipment unless required.

In case of any questions in this regard please contact your authorized service representative.

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See also: *A5.05.01.06.01.nn, A5.05.02.06.01.nn, A5.05.02.09.01.nn, A5.05.01.11.01.nn*

Spare parts sheets:

Personnel requirement: *2 pers.*

Personnel qualification: *Skilled engine hand*

Operating medium: *Every fuel*

Activities:

1. Remove and check the piston pin
2. Install the piston pin

Engine type	Tools and auxiliary materials	Index	Tool No.	
M 20 C / M 25 C	Piston mounting/removal device	W1	259223 A	
M 32 C	Traverse	W1	9.9223 A	
M 32 E	Piston lifting device	W1	9.2254 A	
M 34 DF	Piston mounting/removal device	W1	1.1067-016	
GCM34	Piston mounting/removal device	W1	349223 A	
VM 32 C	Piston removal device (lower shank division)	W1	9.9223 B	
VM 32 C	Piston mounting/removal device (upper shank division)	W1	9.2180 A	
M 43 C	Piston mounting/removal device	W1	439223 A	
M 46 DF	Piston mounting/removal device	W1	462226 A	
VM 43 C	Traverse	W1	432146 A 432089 A	
VM 46 DF	Piston mounting/removal device	W1	462212 A	
M 43 C / M 46 DF / VM 43 C / VM 46 DF	Piston pin removal device	W2	439220 C	
	Circlip pliers	W3	431019 A	*
M 32 C / M 32 E / M 34 DF / VM 32 C	Circlip pliers	W3	1.9067-525	*
GCM34	Circlip pliers	W3	349227 A	*

* no picture

** or equivalent product

*** not included in the standard tool kit

Engine type	Tools and auxiliary materials	Index	Tool No.	
M 20 C / M25 C / M 32 C / M 32 E / M 34 DF / M 43 C / M 46 DF / VM 32 C / GCM 34 / VM 43 C / VM 46DF	Textile round sling (2x) (VM 32 C/M 32 E/M 34 DF only 1x)	W4		* / ***
	Machine oil			*
* no picture				
** or equivalent product				
*** not included in the standard tool kit				

NOTE

In the following, tool W1 will be referred to as “piston mounting/removal device” for all engine types.

1. Remove and check the piston pin

1.1 Make sure that the measures for securing the engine to prevent unintentional starting have been taken.

Conventional diesel engine:
- Interrupt the starting air supply.
- Switch off and block the fuel supply to the engine.
- Throw and secure the emergency stop lever.
- Set the selector switch at the control stand to “Repair” (depending on equipment).

Dual fuel engine:
- Interrupt the starting air supply.
- Switch off and block the fuel supply to the engine.
- Set the selector switch at the control stand to “Repair” (depending on equipment).

Gas engine:
- Interrupt the starting air supply.
- Mechanically block the main shut-off valve of the gas valve unit.
- Set the key switch at the “Local Data Board“ to “OFF”.
- Remove the key.

1.2 Remove cylinder head and piston (**A5.05.01.06.01.nn** and **A5.05.02.06.01.nn**).

1.3 Make sure that the piston mounting/removal device (**1**/W1) has been installed.

1.4 Attach the eye bolt (**1**/1) with the first textile round sling (W4) to the crane and lift the piston (**1**/3).

	NOTE
	For turning the piston with **two** textile round slings a distinction between different engine types will be made in the next two steps (1.5 and 1.6); these are marked accordingly. For connecting rods with lower shank division (**M 32 E, M 34 DF** and **VM 32 E**) only **one** textile round sling is used; furthermore, the unit consisting of piston (**1**/3) and connecting rod (**1**/7) must be put onto a clean and level base to prevent the connecting rod from buckling and subsequently hitting the piston skirt.

1.5 Prepare the piston for turning:

M 20 C / M 25 C / M 25 E:
Fasten the second textile round sling (W4) with a loop to the connecting rod (**1**/7) and attach it to the second crane.
Make sure that the connecting rod **1**/7) does not hit and thus damage the piston skirt.

M 32 E / M 34 DF / VM 32 E:
Carefully put the entire unit consisting of connecting rod (**1**/7) and piston (**1**/3) onto a clean and level base. In doing so, make sure that the connecting rod (**1**/7) does not buckle or hit and thus damage the piston skirt.

VM 32 C / GCM34:
Install the second piston removal device (**1**/W1.1) with eye bolt (**1**/2) at the small-end connection flange (**1**/4) and attach the eye bolt (**1**/2) with the second textile round sling to a second crane.
In doing so, make sure that the small end does not hit and thus damage the piston skirt.

M 43 C / M 46 DF / VM 43 C / VM 46 DF:
Fasten the second textile round sling (W4) with a loop to the small-end connection flange (**1**/4) and attach it to the second crane.
In doing so, make sure that the small end does not hit and thus damage the piston skirt.

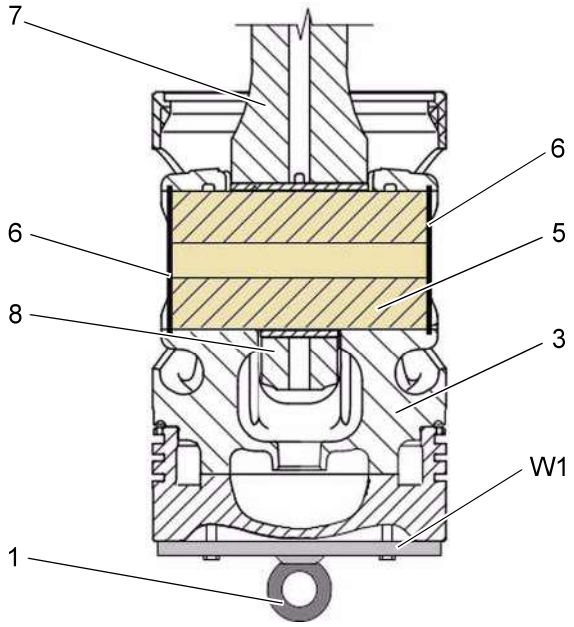
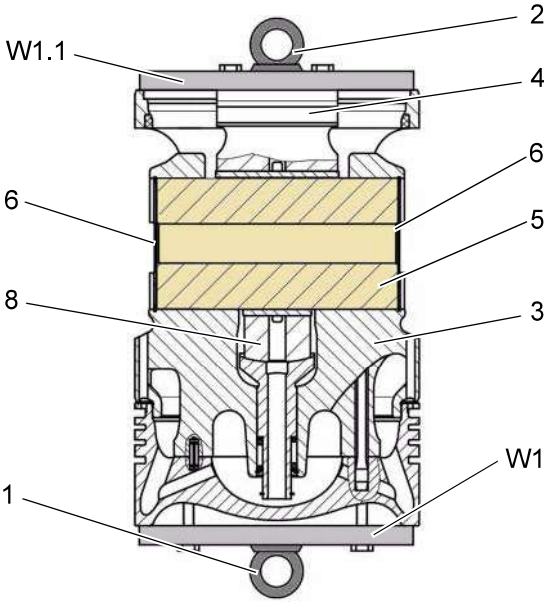
1.6 Turn the piston:

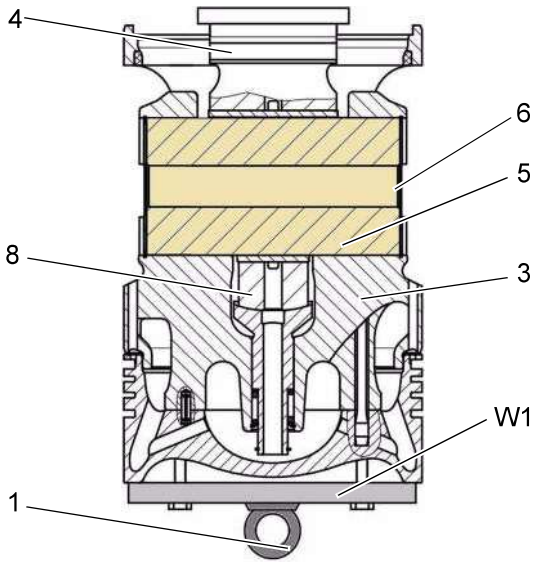
All engines except M 32 E / M 34 DF / VM 32 C [upper shank division]:
By evenly lowering and raising the two cranes slowly turn the piston (**1**/3) into the position shown in **Fig. 1**.
In doing so, make sure that the connecting rod (**1**/7) does not hit the piston (**1**/3).

M 32 E / M 34 DF / VM 32 C [lower shank division]:
Fasten the textile round sling (W4) with a loop to the connecting rod (**1**/7), attach it to the crane and slowly turn the entire unit consisting of connecting rod (**1**/7) and piston (**1**/3) into the position shown in **Fig. 1**.

1.7 **All engines:**
Separate the connection between piston mounting/removal device (**1**/W1) and crane and remove the pistong mounting/removal device (**1**/W1).

1.8 Put the piston (**1**/3) with piston crown pointing downward onto a suitable base and secure it against tilting.

Engine type	1 Schematic diagram
M 20 C / M 25 C / M 25 E / M 32 E / M 34 DF / VM 32 C [lower shank division]	
M 32 C / VM 32 C / [upper shank division] GCM34	

Engine type	1 Schematic diagram
M 43 C / M 46 DF / VM 43 C / VM 46 DF	

1.9 Mark the connecting rod (**1**/7) / small-end connection flange (**1**/4), piston (**1**/3), and piston pin (**1**/5) for correctly positioned reinstallation.

1.10 Slightly lift the connecting rod (**1**/7) or the small-end connection flange (**1**/4) with the crane in order to relieve the piston pin (**1**/5).

1.11 Remove both circlips (**1**/6). For this purpose, use the circlip pliers (W3).

1.12 If necessary, provide a suitable base at the side of the piston (**1**/3) to support the weight of the piston pin (**1**/5) (see Table 1, **Weight of the piston pin**).

Weight of the piston pin

Engine type	Weight [kg]
M 20 C	approx. 8
M 25 C / M 25 E	approx. 17
M 32 C / M 32 E / M 34 DF / VM 32 C / GCM34	approx. 33
M 43 C / VM 43 C / M 46 DF / VM 46 DF	approx. 84

NOTE

Step 1.13 (Utilization of the piston pin removal device) is relevant only for the following engine types**: M 43 C / M 46 DF / VM 43 C / VM 46 DF**.

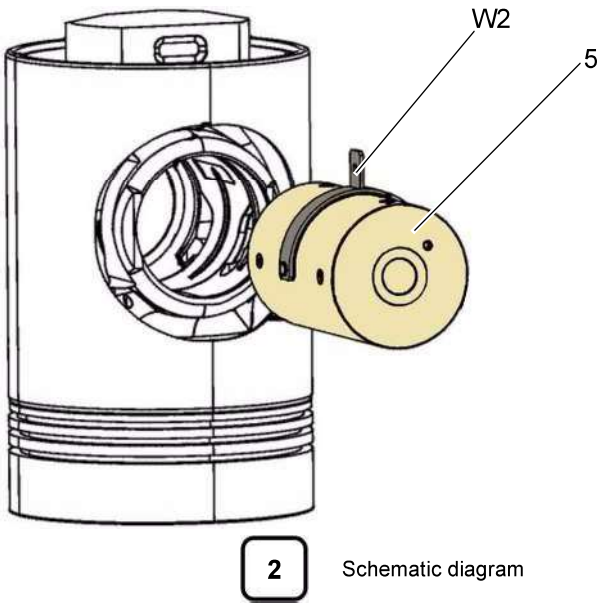
Starting with step 1.14 the instructions apply to **all** engine types again.

1.13 **M 43 C / M 46 DF / VM 43 C / VM 46 DF:**
Push the piston pin (**2**/5) out of the piston bore and small-end bush without applying any force until the second oil hole becomes visible.

1.13.1 Install the piston pin removal device (**2**/W2) on the second oil hole of the piston pin (**2**/5) and attach it to the crane with suitable means.

1.14 **All engine types:**
Push the piston pin (**2**/5) completely out of the piston bore without applying any force, put it onto a suitable base and secure it to prevent sliding.

1.15 If necessary, separate the connection between piston pin removal device (**2**/W2) and crane and remove the piston pin removal device (**2**/W2).



2 Schematic diagram

1.16 Check the surface of the piston pin (**2**/5) for cracks and damage.

1.17 Measure the piston pin (**2**/5), small-end bush, and piston pin bore (**A5.05.02.09.01.nn**).

2. Install the piston pin

	**CAUTION** **Engine damage due to dirt possible!** When installing the piston pin **2**/5) particular attention has to be paid to cleanliness of the components. Even smallest contamination (such as sand, chips, etc.) between piston pin (**2**/5) / small-end bush / piston pin bore or in the oil holes may cause major engine damage after a short operating time

2.1 Carefully clean and lightly oil all removed components.
Check both circlips (**1**/6) and replace them if necessary.

2.2 Install one circlip (**1**/6) in the piston pin bore. For this purpose, use the circlip pliers (W3).

2.3 Check the oil holes in the small end (**Fig. 1**/8) and the small-end bush for cleanliness / free passage and clean them if necessary.

2.4 Introduce the small-end connection flange (**1**/4) or the connecting rod (**1**/7) into the piston (**1**/3) until the small-end bush aligns with the piston pin bore.
In doing so, make sure to prevent the small end (**1**/8) from tilting to avoid creating difficulties for the subsequent installation of the piston pin.

	***NOTE*** Steps 2.5 and 2.6 (Insertion of the piston pin) are different for the individual engine types; starting with step 2.7 the instructions apply to **all** engine types again.

2.5 **M 43 C / M 46 DF / VM 43 C / VM 46 DF:**
Make sure that the piston pin removal device (**2**/W2) is installed on the second oil hole of the piston pin (**2**/5).
Attach the piston pin removal device (**2**/W2) with suitable means to the crane.

2.5.1 Oil the piston pin (**2**/5) and insert it according to the markings applied under step **1.10** up to the central oil hole into the piston and small-end bush without tilting.

2.5.2 Remove the piston pin removal device (**2**/W2) and push the piston pin (**2**/5) without tilting into the final mounting position.

2.6 **M 20 C / M 25 C / M 25 E / M 32 C / M 32 E / M 34 DF / VM 32 C / GCM34:**
Oil the piston pin (**1**/5) and insert it according to the markings applied under 1.10 into the small-end bush without tilting until reaching the final mounting position.

2.7 **All engines:**
Install the second circlip (**1**/6). For this purpose, use the circlip pliers (W3).

2.8 Turn the piston (**1**/3) into its original position.For this purpose, fasten the textile round sling to the connecting rod (**1**/7), eye bolt (**1**/2) or the small-end connection flange (**1**/4) depending on engine type and attach it to the crane.

2.8.1 Lift the piston (**1**/3) and install the piston mounting/removal device (**1**/W1).

2.8.2 Attach the eye bolt (**1**/1) with the second textile round sling to the second crane.

2.8.3 By evenly lowering and raising the two cranes slowly turn the piston (**1**/3) until the connecting rod (**1**/7) / small-end connection flange (**1**/4) points downward.
If necessary, make sure that the connecting rod (**1**/7) does not hit the piston (**1**/3).

2.8.4 Separate the connection between the connecting rod (**1**/7), the eye bolt (**1**/2) or the small-end connection flange (**1**/4) and the crane and, if applicable, remove the second piston mounting/ removal device (**1**/W1.1).

2.8.5 Install piston and cylinder head (**A5.05.02.06.01.nn** and **A5.05.01.11.01.nn**).

2.9 Lift the measures for securing the engine to prevent unintentional starting.

Conventional diesel engine:
- Reestablish starting air supply.
- Set the emergency stop lever to operating position.
- Reestablish fuel supply to the engine.
- Set the selector switch on the control stand to “Engine” or “Remote”.

Dual fuel engine:
- Reestablish starting air supply.
- Reestablish fuel supply to the engine.
- Set the selector switch at the control stand to “Engine” or “Remote”.

Gas engine:
- Reestablish starting air supply.
- Open the main shut-off valve of the gas valve unit.
- Insert the key into the key switch at the “Local Data Board“.

See also:

Spare parts sheets:

Personnel requirement: *1 pers.*

Personnel qualification: *Skilled engine hand*

Operating medium: *Every fuel*

Activities:

1. Measure the small-end bush clearance

	***NOTE*** It is not possible to instal a small-end bush accurately with conventional means. This job must be carried out by **Caterpillar** Kiel or an authorized **Caterpillar** workshop. The decisive criteria for assessing the small-end bush are essentially the clearance limits (see corresponding Table Clearance 1, 2 or 3). A small-end bush shall only be replaced if: • A clearance limit has been reached • A clearance limit will probably be exceeded before the next maintenance • There is mechanical damage such as severe score marks, crumbling or deep cavitation pits • The max. number of operating hours has been reached (see maintenance schedule)

1. Measure the small-end bush clearance

1.1 Clean the piston pin (1), small-end bush (2), piston bosses (3a and 3b) and measure and record dimensions A, B, C, D, and X with a suitable measuring tool such as an external micrometer and an inside micrometer.

1.2 Dimension A has to be measured 20 mm behind the circlip groove on both sides.

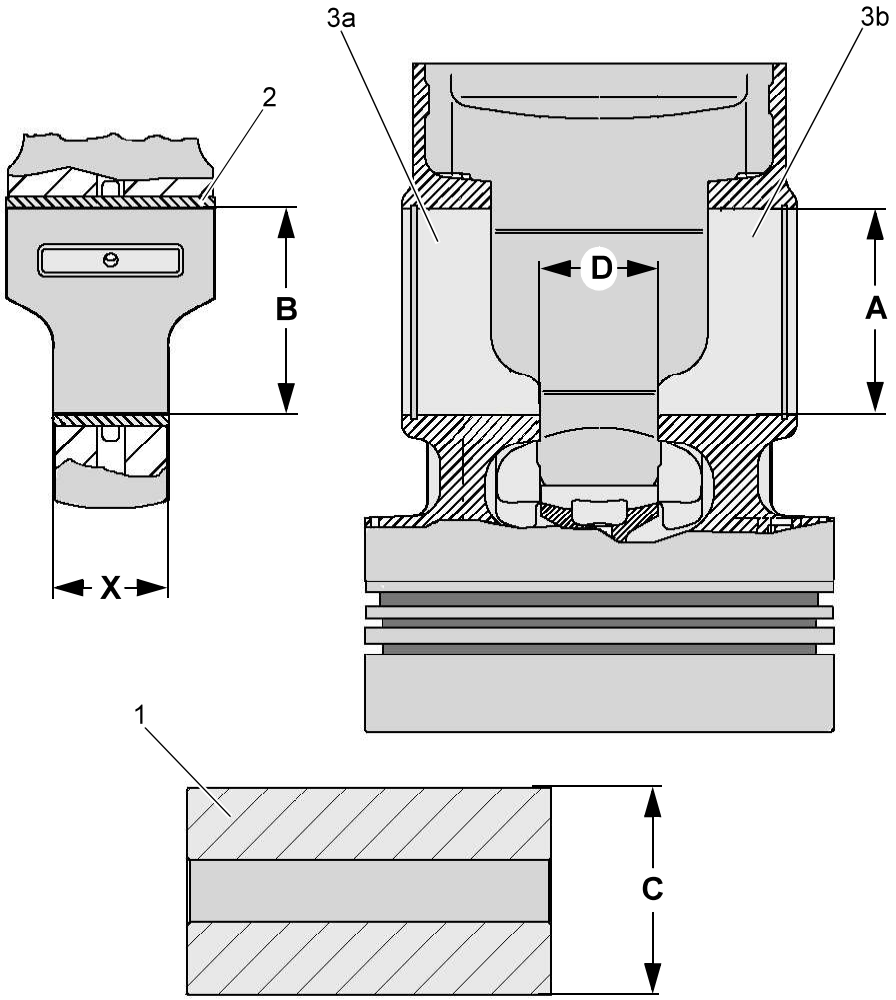
1.3 The respective clearances are to be determined from the difference of the following measuring values:

Dimension A (Ø of piston bosses /3a/3b) **minus Dimension C**
(Ø of piston pin/1) **= Clearance 1**

Dimension B (Ø of small-end bush /2) **minus Dimension C**
(Ø piston pin /1) **= Clearance 2**

Dimension D (distance between piston bosses /3a and 3 b) **minus Dimension X**
(Width of small-end bush /2) **= Clearance 3**

1.4 When reaching the clearance limits (see **Table Clearance 1-3**) or if the clearance limit will probably be exceeded before the next maintenance, the corresponding wear parts must be replaced.



1.5 **Table Clearance 1** (Dimension A minus Dimension C),

Engine series	Min. clearance (mm)	Max. clearance (mm)	Clearance limit (mm)
M 20 C	0.005	0.025	0.05
M 25 C / M 25 E	0.05	0.08	0.10
M 32 C / VM 32 C / M 32 E GCM34 / M 34 DF	0.06	0.09	0.15
M 43 C / M 46 DF VM 43 C / VM 46 DF	0.06	0.09	0.15
M 43 C / VM 43 C (For Mahle pistons only)	0,07	0,13	0,19

1.6 **Table Clearance 2** (Dimension B minus Dimension C)

Engine series	Min. clearance (mm)	Max. clearance (mm)	Clearance limit (mm)
M 20 C	0.09	0.16	0.18
M 25 C / M 25 E	0.11	0.2	0.22
M 32 C / VM 32 C / M 32 E GCM34 / M 34 DF	0.14	0.24	0.26
M 43 C / M 46 DF VM 43 C / VM 46 DF	0.20	0.30	0.34

Table Clearance 3 (Dimension D minus Dimension X)

Engine series	Min. clearance (mm)	Max. clearance (mm)	Clearance limit (mm)
M 20 C	0.2	0.80	1.00
M 25 C / M 25 E	0.50	1.10	1.30
M 32 C / VM 32 C / M 32 E GCM34 / M 34 DF	0.50	1.10	1.30
M 43 C / M 46 DF VM 43 C / VM 46 DF	0.70	1.20	1.50