BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/3/2007

Department:	Person responsible:	Telephone:	Use	internal	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 BIN5	C / C2
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21060_10	690	4422	011M FeP(Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS – 154947	568938		03LD/17486
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine trial	Oil dilution + LP full load	18589
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
995 h	12/03/2007	2007-CP4 / 0043	Confidential

1 Subject

CP4 customer return
Oil dilution program + LP full load

2 Conclusion

No significant change of the hydraulic functional values.
The wear of the pump is very low.

The pump has passed the **endurance run**

3 Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No wear detected — OK

3.2 Drivetrain

Slight wear observed on the roller crest and tappet body (Figs. 1 and 2) — uncritical

3.3 High pressure

Sealing point of intake valve to the stationary seal ring is slightly rusted (Fig. 3) — OK

3.4 Bearing

Very slight wear visible — OK

3.5 Shaft seal

Slight recession of the shaft seal (Fig. 4) — uncritical

3.6 Holes

No striking feature — OK

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK

3.8 Other

no — OK

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/3/2007

Department:	Person responsible:	Telephone:	Use		
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For information:

4 Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 11/20/2006	Delivery rate [l/h] after testing 07/26/2007			
KL1-S	3375	500	0.4	67.5	67.8	x		
LG	1000	1800	0.4	17.5	17.6	x		
ST	200	200	0.4	3.9	3.9	x		

No significant change of the hydraulic functional values recognizable.

5 Destiny of the parts

Parts will be scrapped during RB 06/2008

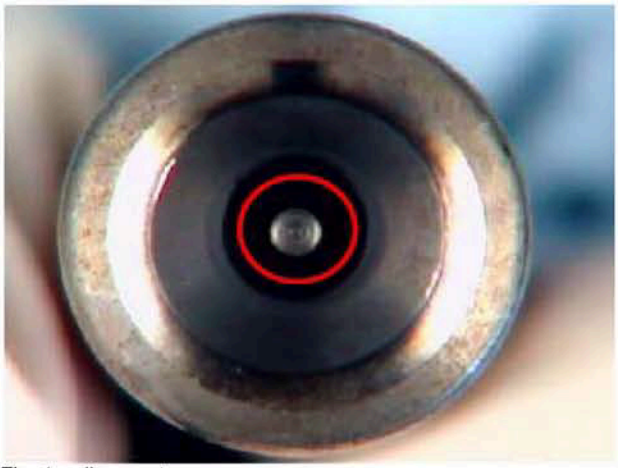

Fig. 1: roller crest

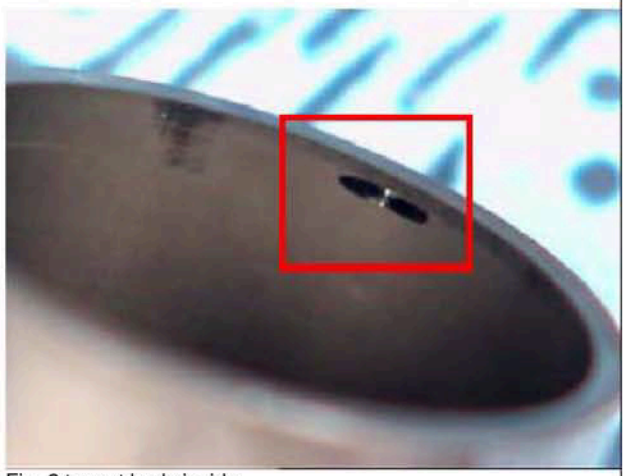

Fig. 2 tappet body inside

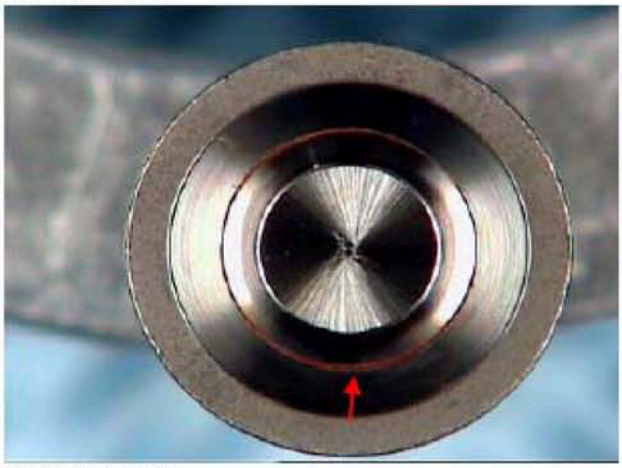

Fig. 3: Intake valve

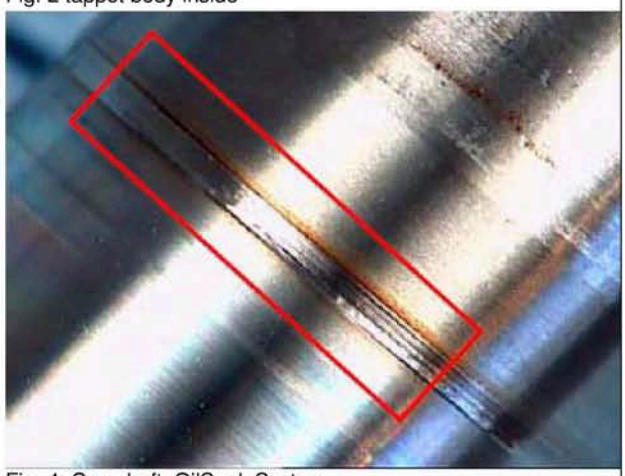

Fig. 4: Camshaft_OilSeal_System

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BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/25/2008

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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D/D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	010207	0042	0110 FeP – 1
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS – 175041	588430		AU 481-8-8007
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	Q verification	20213
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
100000 km / -miles	11/13/2007	2007-CP4_0115	Confidential

1. Subject

CP4 customer returns without complaint
Diagnosis after end of endurance run

2. Conclusion

No hydraulic modification.
No critical wear detected.

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: X

3.2 Drivetrain

Only running marks visible (see roller Fig. 1 and camshaft Fig. 2) — OK: X

3.3 High pressure

Slight fretting wear at the intake valve (Fig. 3) — OK: X

3.4 Bearing

No striking feature — OK: X

3.5 Shaft seal

Slight wearing -in of the shaft seal (depth x width = 9x480 µm) (Figs. 4 and 5) — OK: X

3.6 Holes

Only slight cavitation points visible — OK: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK: X

3.8 Other

No striking feature — OK: X

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/25/2008

Department:	Person responsible:	Telephone:	Use		
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For information:	

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 2/6/2007	Delivery rate [l/h] after testing 10/23/2007			
ST	200	200	0.4	3.8	3.9	x		
LG	1000	1800	0.4	17.8	17.1	x		
KL1-S	3375	500	0.4	64.7	67.9	x		

No striking feature

5. Destiny of the parts

The parts are stored until RB 09/2008

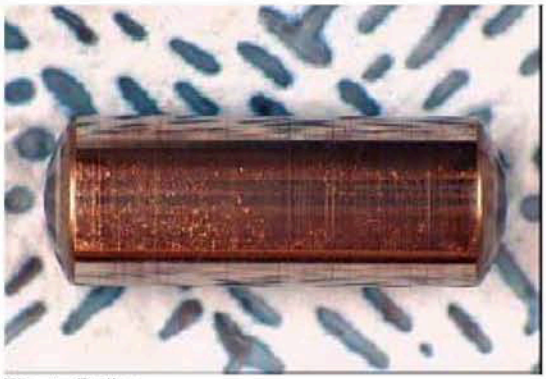

Fig. 1: Roller

Fig. 2 Camshaft

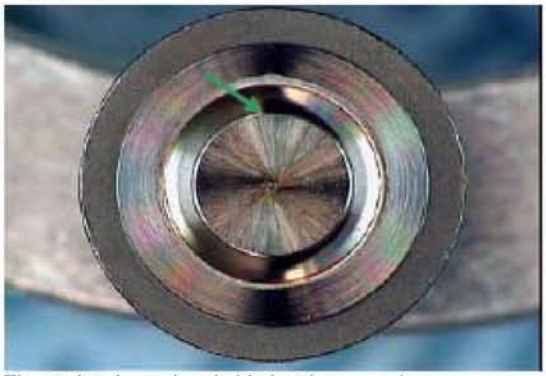

Fig. 3: Intake valve (with fretting wear)

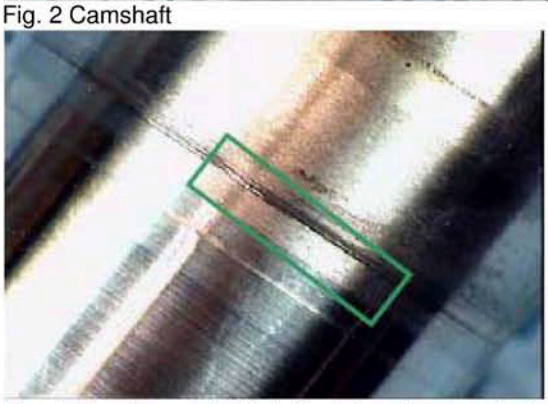

Fig. 4: Running mark of shaft seal on the camshaft

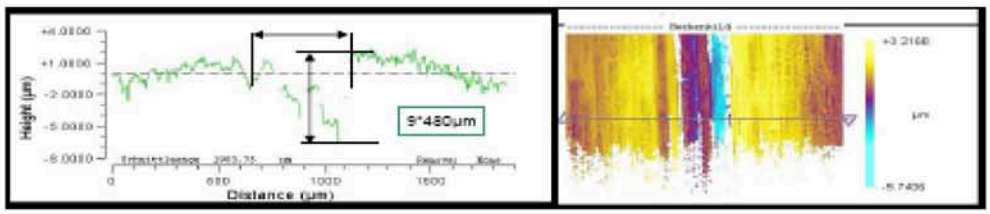

Fig. 5: Wear measurement of the running mark of the shaft seal

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BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/11/2008

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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 BIN5	C / C2
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21060_10	690	4653	011M FeP (Feuerbach plant) – M
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS –164754	0577928		03LD/17477
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	Gear Fatigue Test	19423
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
118338 km	10/17/2007	2007-CP4_0117	Confidential

1.Subject

CP4 customer return
GDV-EWP (Ehra variable track for passenger cars); 03LD/17477
Vehicle endurance run

2. Conclusion

The residual contamination test of the pump was normal.
The pump was seal-tight in the cold test at -25 °C.
Slight cavitation erosion was found between intake valve and the stationary seal ring, but is not in the critical range.
The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive
Slight wear visible — OK: X

3.2 Drivetrain
Slight entrainment of the C coating on the roller crest. Alignment mark of the roller on the cam track visible (Fig. 1) — uncritical: X

3.3 High pressure
Moderate fretting wear on the seal seat of the intake valve, but uncritical (Fig. 2) — uncritical: X

3.4 Bearing
Slight running marks visible — OK: X

3.5 Shaft seal
Slight running marks visible — OK: X

3.6 Holes
Incipient cavitation erosion in the tappet hole of the housing in non-running area (Fig. 3) — uncritical: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No striking feature — OK: X

3.8 Other

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/11/2008

Department:	Person responsible:	Telephone:	Use		
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For information:	

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 10/24/2006	Delivery rate [l/h] after testing 10/24/2007			
ST	200	200	0.4	3.9	3.9	X		
LG	1000	1800	0.4	17.6	17.7	X		
KL1-S	3375	500	0.4	67	67.8	X		

No striking feature

5. Destiny of the parts

Parts will be stored at RB and scrapped in 06/2008

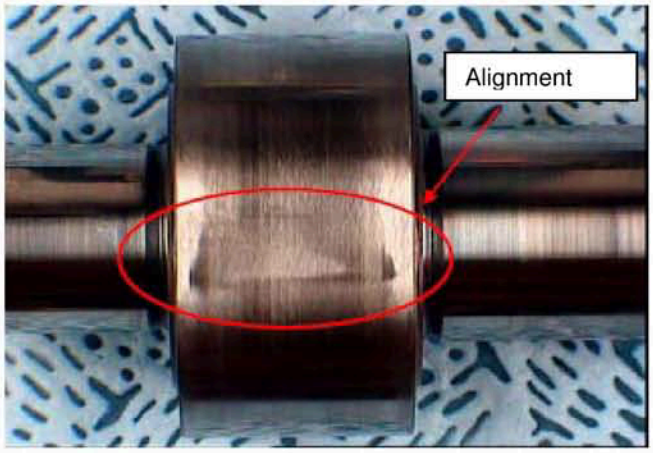

Figure 1 cam track

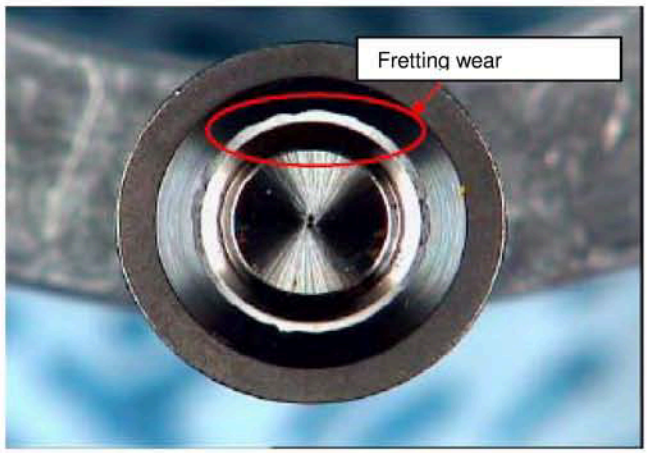

Fig. 2 intake valve

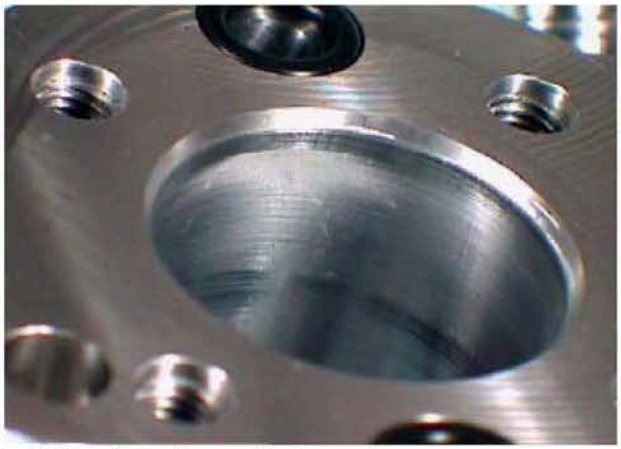

Fig. 3 Housing of tappet hole

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BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/11/2008

Department:	Person responsible:	Telephone:	Use	internal	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1XS_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 BIN5	C / C2
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_06	689	4888	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS -164742	0577909		03LA/17301
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Q verification	Gear Fatigue Test	19426
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
120,000 km/- miles	10/17/2007	2007-CP4_0118	Confidential

Complaint: None.

1. Subject

CP4 customer return
Q verification
Endurance run end

2. Conclusion

Hydraulic testing points within tolerance for new parts.
Only slight wear visible.
The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

Only slight running marks — OK: X

3.2 Drivetrain

Slight wear marks visible — OK: X

3.3 High pressure

The onset of cavitation erosion on the piston base visible (Fig. 1).
Fretting wear on the sealing surface of the intake valve / stationary seal ring visible (Fig. 2) — uncritical: X

3.4 Bearing

Slight wear marks visible — OK: X

3.5 Shaft seal

Shaft seal slipped off the camshaft — OK: X

3.6 Holes

The onset of cavitation erosion in tappet hole recognizable — OK: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

Overflow valve screw plug slightly rusted — OK: X

3.8 Other

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/11/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

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For information: Non-responsive content removed

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 9/12/2006	Delivery rate [l/h] after testing 10/24/2007			
Starting point	200	200	0.4	3.8	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17.2	17.2	x		
n_max_p, 500bar	3375	500	0.4	65.0	66.3	x		

OK

5. Destiny of the parts

Parts will be stored at RB and scrapped in 06/2008

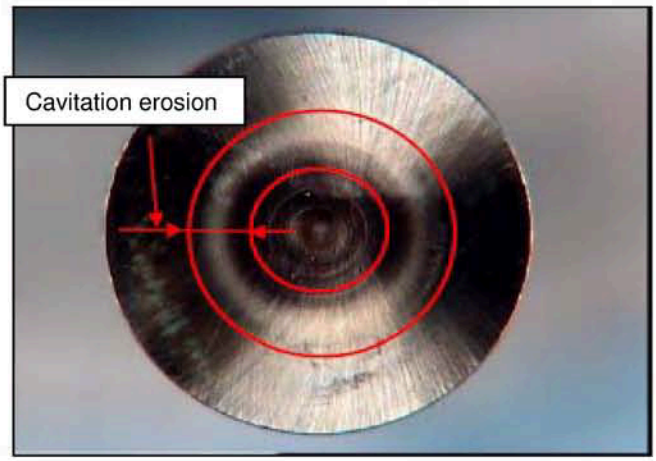

Fig. 1 High-pressure piston base

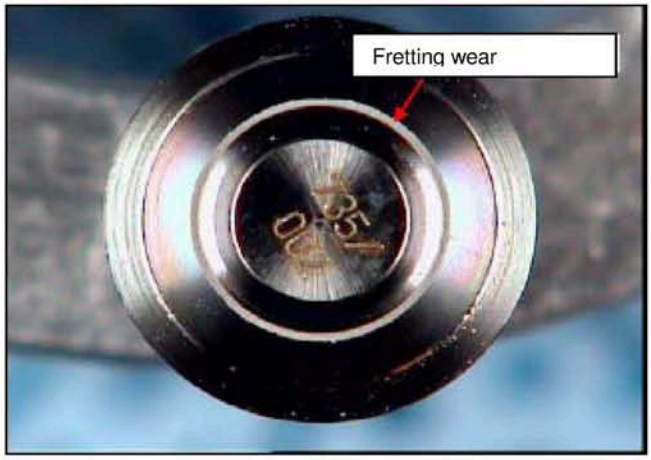

Fig. 2 Intake valve sealing surface

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Department:		Phone		Date:	1/29/2008	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/26/2008

Department:	Person responsible:	Telephone:	Use	internal / external
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1xS_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D/D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	11206	0010	011M FeP (Feuerbach plant) – 1
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS –175042	588432		CAG0000003
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	EW1 KIN	20212
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
95598 km	11/29/2007	2007-CP4_0123	Confidential

1. Subject

CP4 customer return
Diagnosis after end of endurance run

2. Conclusion

Functioning OK
Wear uncritical during the running time.
The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: X

3.2 Drivetrain

Only slight running marks on roller (Fig. 1) and camshaft (Fig. 2) visible — OK: X

3.3 High pressure

Slight fretting wear at the intake valve (Fig. 3) — uncritical: X

3.4 Bearing

No striking feature — OK: X

3.5 Shaft seal

No striking feature — OK: X

3.6 Holes

No striking feature — OK: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK: X

3.8 Other

No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/26/2008

Department:	Person responsible:	Telephone:	Use	
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			external	x

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 10/24/2006	Delivery rate [l/h] after testing 10/24/2007			
ST	200	200	0.4	4.2	3.7	x		
LG	1000	1800	0.4	16.7	17.6	x		
KL1-S	3375	500	0.4	67.7	66.4	x		

No striking feature

5. Destiny of the parts

The parts are stored until 09/2008 at RB

Fig. 1 Roller

Fig. 2: Camshaft

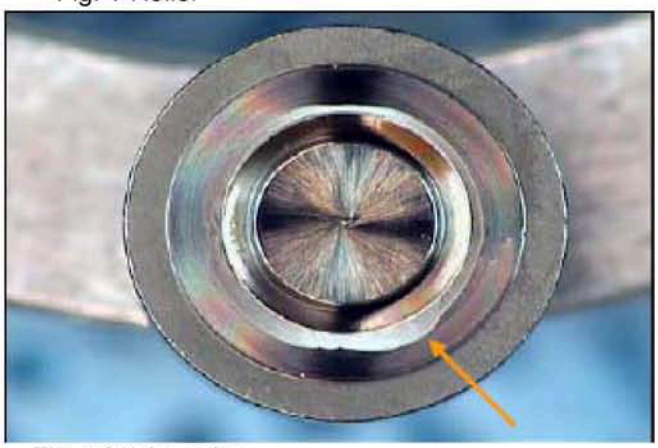

Fig. 3 intake valve

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Department:		Phone		Date:	4/11/2008	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/26/2008

Department:	Person responsible:	Telephone:	Use	internal / external
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1XS_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D/D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	201206	0043	0110 FeP – 1
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS –167929	582051		03LAP270028
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	Polycyclic endurance run	19584
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
718 h	11/29/2007	2007-CP4_0124	Confidential

1. Subject

CP4 customer return
Diagnosis after end of endurance run

2. Conclusion

No change in the hydraulic testing detected.
Wear of all parts minimal.
The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: X

3.2 Drivetrain

In very good condition (see roller Fig. 1 and camshaft Fig. 2) — OK: X

3.3 High pressure

Only running marks on HP piston visible (Fig. 3) — OK: X

3.4 Bearing

No striking feature — OK: X

3.5 Shaft seal

No striking feature — OK: X

3.6 Holes

No striking feature — OK: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK: X

3.8 Other

No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/26/2008

Department:	Person responsible:	Telephone:	Use		
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 12/19/2006	Delivery rate [l/h] after testing 12.07.2007			
ST	200	200	0.4	4	3.9	x		
LG	1000	1800	0.4	16.5	17.6	x		
KL1-S	3375	500	0.4	66.9	67.1	x		

No striking feature

5. Destiny of the parts

The parts will be stored at RB until 09/2008

Fig. 1 Roller

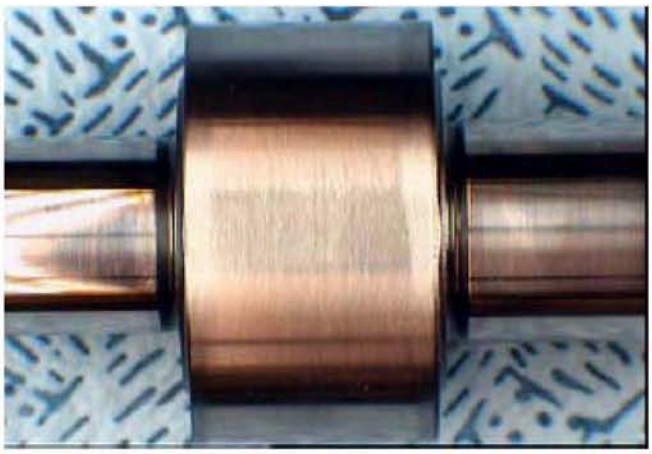

Fig. 2: Camshaft

Fig. 3: HP piston

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Department:		Phone		Date:	4/11/2008	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/25/2008

Department:	Person responsible:	Telephone:	Use	internal	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	071206	0011	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS-154940	568932		CAG 0000 050
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
0	Engine trial	Function	19089
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
826 h	10/18/2007	2007-CP4_0140	Confidential

1. Subject

CP4 customer return
Findings at the end of endurance run

2. Conclusion

The delivery rates after endurance run correspond to the specifications.
The wear of the components is low.
The spring plate edge shows uncritical entrainment of the anti-friction paint.

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK | uncritical | Critical

3.1 Drive
No striking feature — OK: X

3.2 Drivetrain
Spring plate with isolated anti-friction paint spalling (Figs. 1 and 2) — uncritical: X

3.3 High pressure
No striking feature — OK: X

3.4 Bearing
No striking feature — OK: X

3.5 Shaft seal
No striking feature — OK: X

3.6 Holes
No striking feature — OK: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No striking feature — OK: X

3.8 Other
No striking feature

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/25/2008

Department:	Person responsible:	Telephone:	Use	internal / external
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3.9 Images of visual findings

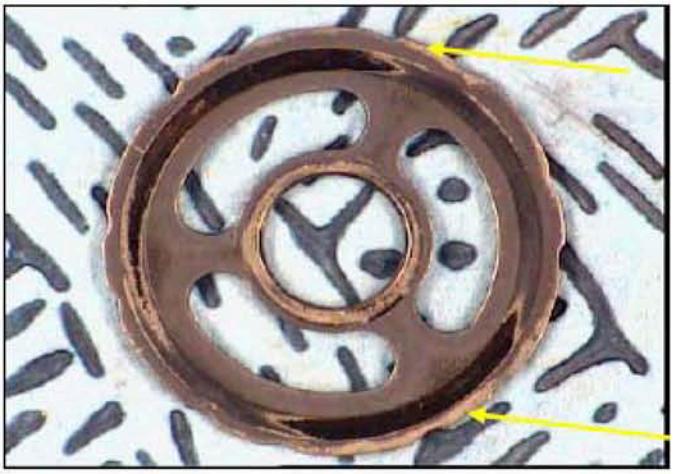

Fig. 1: Spring plate, tappet side

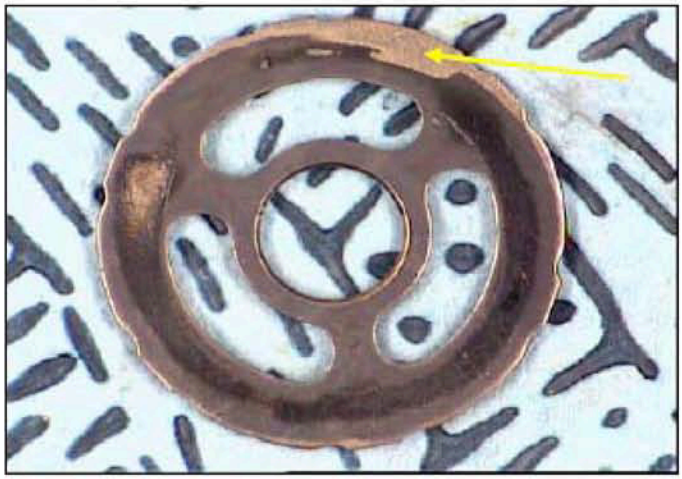

Fig. 2: Spring plate, spring side

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 12/19/2006	Delivery rate [l/h] after testing 7/26/2007			
ST	200	200	0.4	4.0	3.9	X		
LG	1000	1800	0.4	16.6	17.3	X		
KL-1	3375	500	0.4	67.0	67.0	X		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The parts are stored until 06/2008 at RB

6. Attachments

None

Tested:	Non-responsive content removed	**Phone:**	Non-responsive content removed	**Date:**	2/7/2008	**Signature:**	Non-responsive content removed
Department:		**Phone:**		**Date:**	2/7/2008	**Signature:**	
Department:		**Phone:**		**Date:**	2/12/2008	**Signature:**	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	4/14/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_01	683	4396	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS –154931	568684		03LD/16353
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine trial	Cold EGR + POI3	18593
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
1690 h	7/18/2007	2007-CP4_0144	Confidential
VA / ETC no.:	**Endurance run type [RB]:**		

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- There are abnormal grooves on almost all components and the high number of metallic and non-metallic foreign bodies, especially in the areas in front of the screens or on them.
- On the screens of the metering unit and the overflow valve, copper fibers mixed with predominantly organic particles with proportions of copper, calcium, silicon, magnesium, sulfur and oxygen were detected using EDX / EDS analysis.
- The thread of the camshaft shows damage, caused most likely due to the transport.

Result

- The pump has **passed** the test.
- **Massive contamination of the low-pressure system with foreign particles**

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

Thread flanks damaged (see Figure 1) — uncritical

3.2 Drivetrain

Tappet body with grooves (see Figure 2), roller's lateral slip off (see Figures 3 to 4) — uncritical

3.3 High pressure

Narrow grooves on the piston skirt surface (see Figure 5)

Particle marks on the piston crown (see Figure 6) — Critical

3.4 Bearing

Fine grooves in the radial bearing surfaces (see Figure 7 Flange and Fig. 8 Camshaft) — uncritical

3.5 Shaft seal

Slight recession of the shaft seals into the camshaft (see Fig. 9) — Critical

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	4/14/2008

Department:	Person responsible:	Telephone:	Use	internal	external
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3.6 Holes — X

Small metallic particles in the metering unit hole (see Fig. 10)

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) — X

No striking feature

3.8 Other — X

Foreign particles on the screen of the metering unit (see Fig. 11) and the overflow valve (see Fig. 12)
For the result of the EDX / EDS analysis of particles, see Appendix

3.9 Images of visual findings

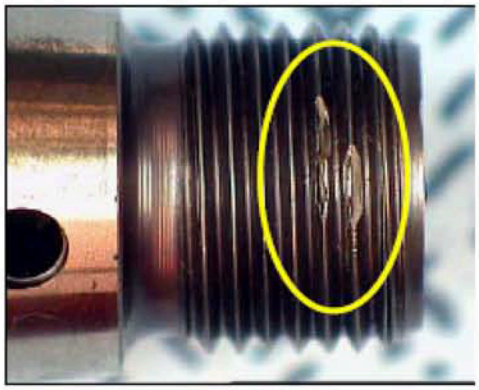

Fig. 1 Camshaft, thread (damage)

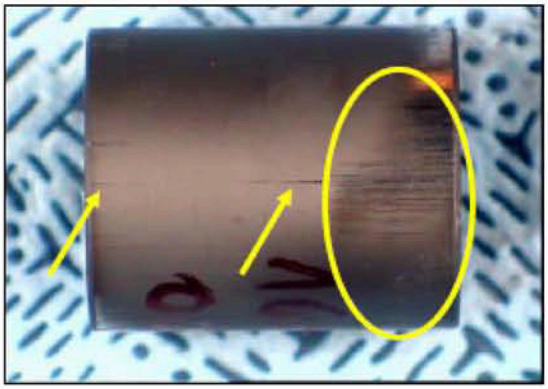

Fig. 2 Tappet body, lateral surface (grooves)

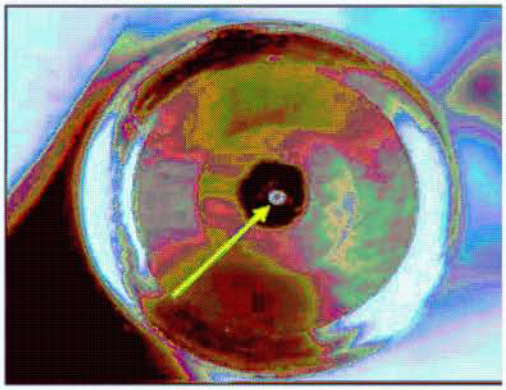

Fig. 3 Roller front surface, housing side

Fig. 4 Tappet body inside, housing side

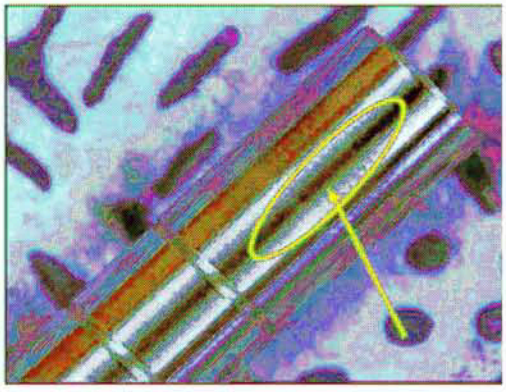

Fig. 5 High-pressure piston, high-pressure range (groove)

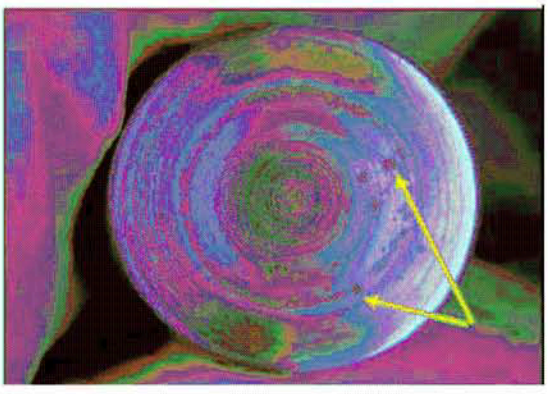

Fig. 6 High-pressure piston, piston crown (particles)

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	4/14/2008

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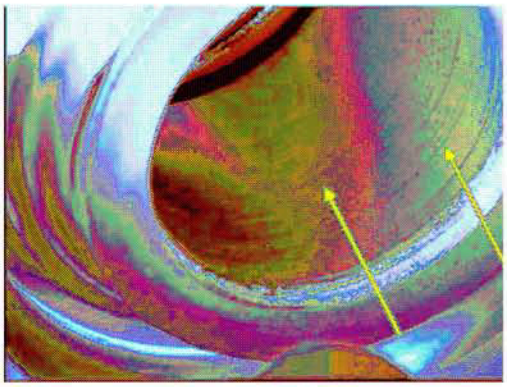

Fig. 7 Flange bearing bushing (grooves)

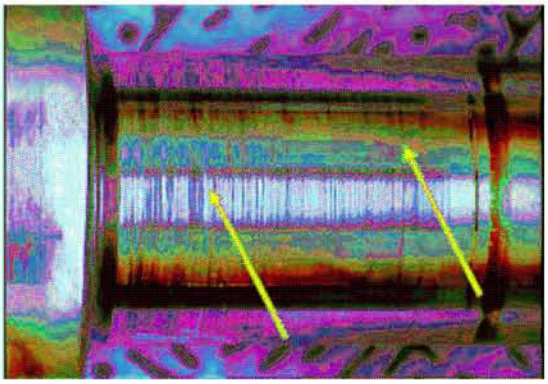

Fig. 8 Camshaft, flange bearing bushing (grooves)

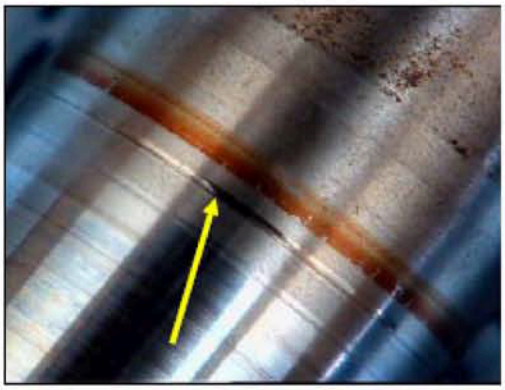

Fig. 9 Camshaft, moving range of shaft seal

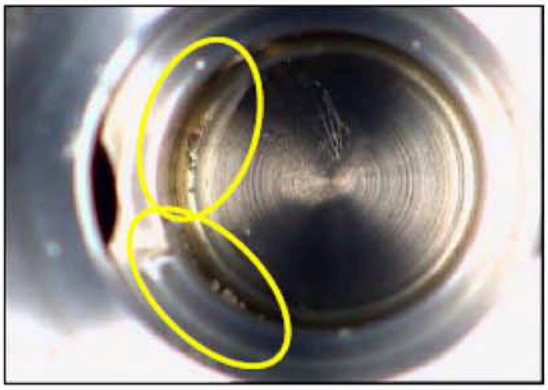

Fig. 10 Housing, metering unit hole (particles)

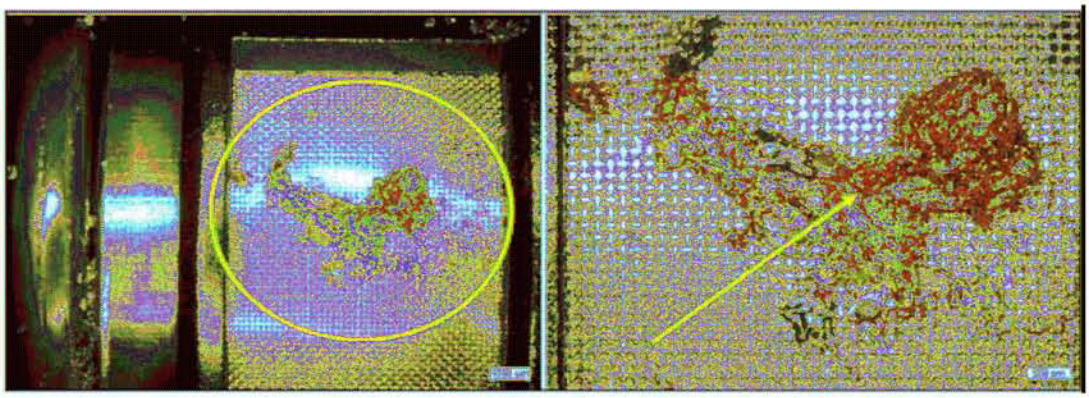

Fig. 11 Metering unit screen top view and magnification (copper fibers)

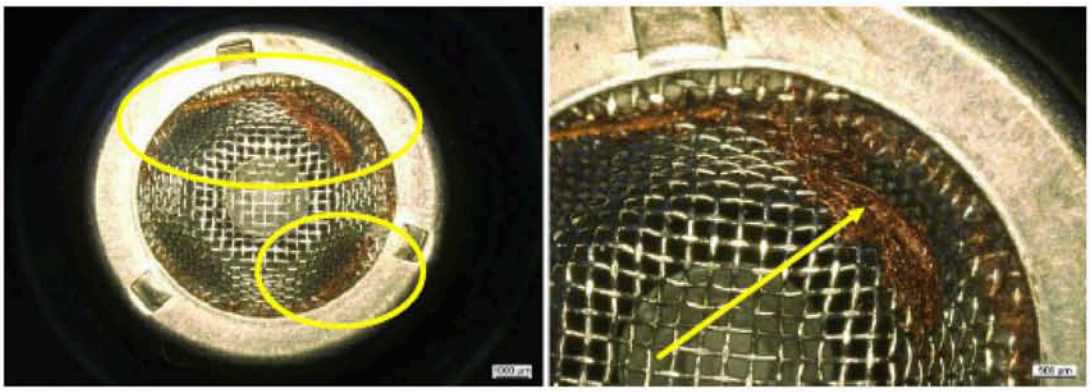

Fig. 12 Overflow valve screen top view and magnification (copper fibers)

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		Date	4/14/2008

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4. Hydraulic function

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 3/27/2006	Delivery rate [l/h] after testing 7/26/2007			
Starting point	200	200	0.4	3.8	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17.1	17.4	x		
N_max_p, 500 bar	3375	500	0.4	67.2	67.2	x		

met.

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

The result of the EDX / EDS analysis of particles (2008-0148)

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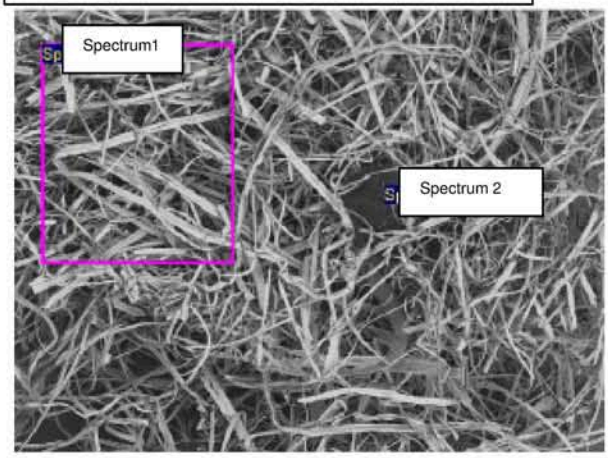
Department:		**Phone**		**Date:**	4/18/2008	**Signature:**	
Department:		**Phone**		**Date:**	4/23/2008	**Signature:**	

EA11003EN-00857[4]

Photo report CR / ARA EDS report | 2.008-0148 | BOSCH

Project: 2008-0148
Owner: camscan
Area: Work area 1

Sample: 2008-0148 metering unit
Type: Specification
ID:



500 µm Electron image 1

Magnification: 117 X
Acceleration voltages (kV): 20.00
Process time: 6

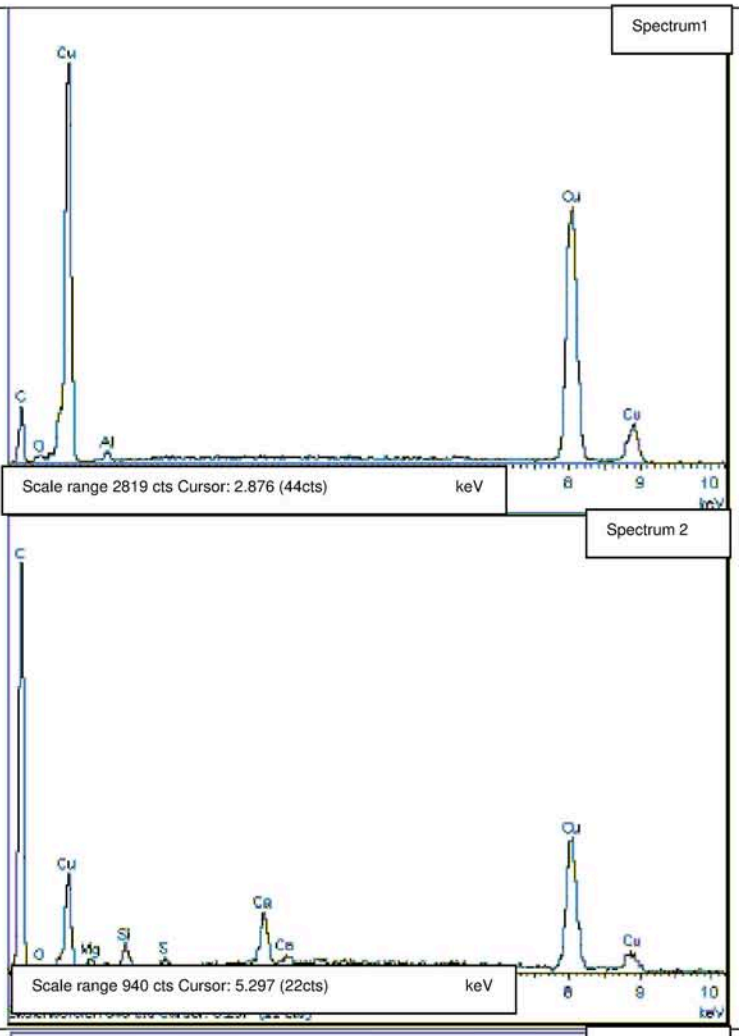
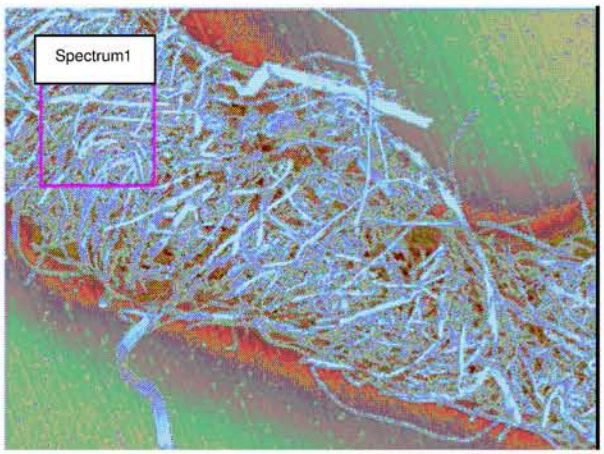


Photo report CR / ARA EDS report | 2.008-0148 | BOSCH

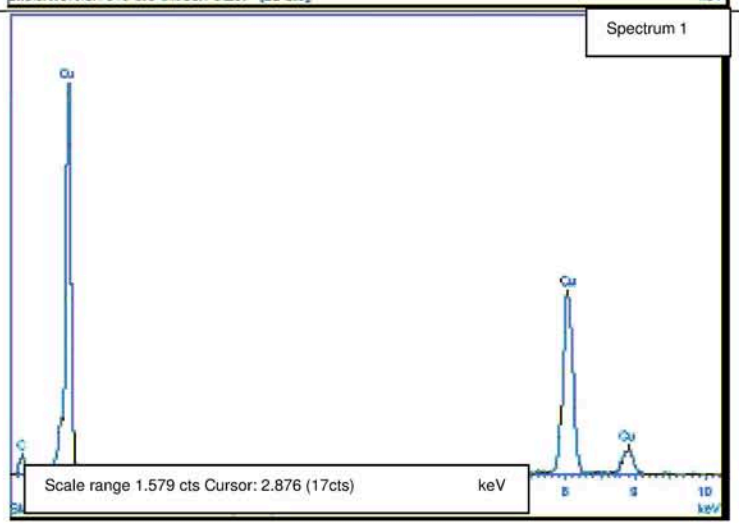
Project: 2008-0148
Owner: camscan
Area: Work area 1

Sample: 2008-0148 ÜV
Type: Specification
ID:



400 µm Electron image 1

Magnification: 144 X
Acceleration voltages (kV): 20.00
Process time: 6



BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/28/2008

Department:	Person responsible:	Telephone:	Use	internal / external
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_X	VW	R4 2.0 EU5	C / C2
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_07	690	4705	011M FeP (Feuerbach plant) – M
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS –154935	568692	03LA/17772	03LA/17772
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
03LA/17772	CR-engine	IFL	18596
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
600 h	7/18/2007	2007-CP4_0145	Confidential

1. Subject

CP4 customer return
Internal release of endurance run (VW entry)

2. Conclusion

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature

OK: X

3.2 Drivetrain

Very slight running marks recognizable (Example: Fig. 1 camshaft and Fig. 2 roller)

OK: X

3.3 High pressure

Very slight running marks recognizable (Fig. 3 HP piston)

OK: X

3.4 Bearing

No striking feature (Fig. 4 Flange bearing)

OK: X

3.5 Shaft seal

No striking feature

OK: X

3.6 Holes

No striking feature

OK: X

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/28/2008

Department:	Person responsible:	Telephone:	Use	internal	
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3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) X

No striking feature

3.8 Other

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 11/29/2006	Delivery rate [l/h] after testing 7/26/2007	
ST	200	200	0.4	3.9	3.9	X
LG	1000	1800	0.4	17.4	17.4	X
KL1-S	3375	500	0.4	66.5	67.4	X

No striking feature

5. Destiny of the parts

The parts will be stored at RB until 08/2008

Fig. 1 Camshaft

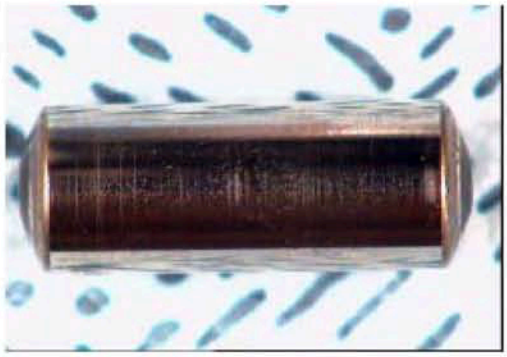

Fig. 2: Roller

Fig. 3: HP piston

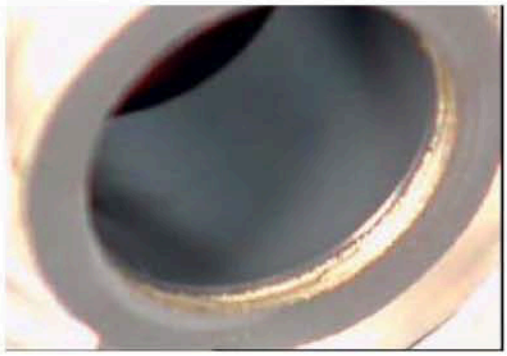

Fig. 4: Flange bearing

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Department:		Phone		Date:	4/11/2008	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_220	VW	R4 2.0 EU5	C / C2
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_06	689	4890	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	578258		03LA/17098
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	VW462-7-02224	19419
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
19940 h	10/22/2007	2007-CP4_0148	Confidential
VA / ETC no.:	**Endurance run type [RB]:**		
DS-164766			

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Lateral roller slip off (no picture available) — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK: x

3.8 Other

OK: x

No striking feature

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	internal	
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 9/12/2006	Delivery rate [l/h] after testing 10/23/2007			
Starting point	200	200	0.4	3.9	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17.1	17	x		
n_max_p, 500bar	3375	500	0.4	65.8	66.6	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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Department:		**Phone:**		**Date:**	4/10/2008	**Signature:**	
Department:		**Phone:**		**Date:**	4/11/2008	**Signature:**	

EA11003EN-00860[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/22/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	081206	0035	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS-164776	578285	CBA0000303	CBA0000 303
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CBA0000303	CR-engine	GDV;CBA 0000 303	19415
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
52008 h	10/22/2007	2007-CP4_0151	Confidential

1. Subject

CP4 customer return

2. Conclusion

No striking features detected.

3. Results of diagnosis (visual findings)

Legend rating stages	OK	uncritical	Critical
	X		
		X	
			X

3.1 Drive

No striking feature — X

3.2 Drivetrain

Very slight running marks visible — X

3.3 High pressure

Slight wear marks visible — X

3.4 Bearing

No striking feature — X

3.5 Shaft seal

No striking feature — X

3.6 Holes

No striking feature — X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — X

4. Destiny of the parts

The parts are stored until 07/2008 at RB

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Department:		**Phone:**		**Date:**	1/23/2008	**Signature:**	
Department:		**Phone:**		**Date:**	1/26/2008	**Signature:**	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/24/2008

Department:	Person responsible:	Telephone:	Use	internal	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_02	685	4747	011M FeP (Feuerbach plant) – M
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS –164778	0578290		03LD/16369
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine trial	Function	19414
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
2056 h	10/22/2007	2007-CP4_0152	Confidential

1. Subject

CP4 customer return
Endurance run end

2. Conclusion

The parts have an incipient wear (2,056 h running time). Anti-friction paint fragments were found in the pump. The pump was mounted before end 06/2006. Between 05/2006 and 06/2006, problem of adhesion occurred during the application of the anti-friction paint on the spring plate. Since then, the process has been improved. Copper particles which do not come from CP4 were also found on overflow valve and the metering unit screen. Risk of nozzle clogging! The origin of the copper should be clarified by the customer, since it is not the first case.

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages	OK	uncritical	Critical
	X		
		X	
			X

3.1 Drive

No striking feature

X

3.2 Drivetrain

X

Incipient cavitation on the piston base at the roller support (Fig. 1). Anti-friction paint on the spring plate peeled-off (Fig. 2).

3.3 High pressure

X

Incipient fretting wear at the seal seat of the intake valve (Fig. 3)

3.4 Bearing

X

No striking feature

3.5 Shaft seal

X

Incipient wear of the shaft seal on the camshaft (Figure 4)

3.6 Holes

X

Anti-friction paint of the spring plate in the metering unit hole of the housing (Fig. 5)

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

X

Anti-friction paint of the spring plate on the metering unit sieve. Copper on overflow valve and metering unit screen

3.8 Other

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/24/2008

Department:	Person responsible:	Telephone:	Use	internal	
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 5/10/2006	Delivery rate [l/h] after testing 10/23/2007			
ST	200	200	0.4	3.9	3.9	X		
LG-1	1000	1800	0.4	17.4	17.1	X		
KL-1S	3375	500	0.4	67.4	67.5	X		

No striking feature

5. Destiny of the parts

The parts will be stored at RB until 08/2008

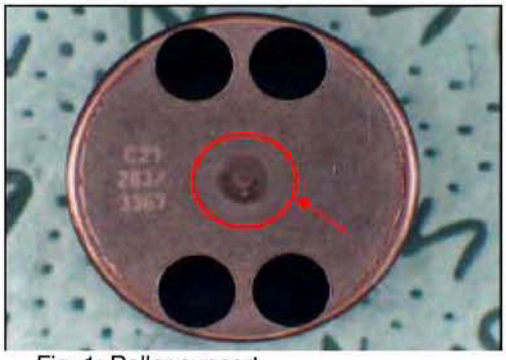

Fig. 1: Roller support

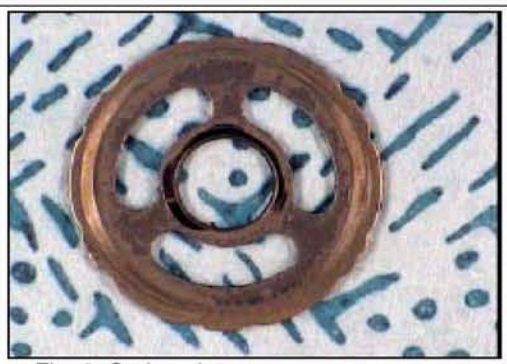

Fig. 2: Spring plate

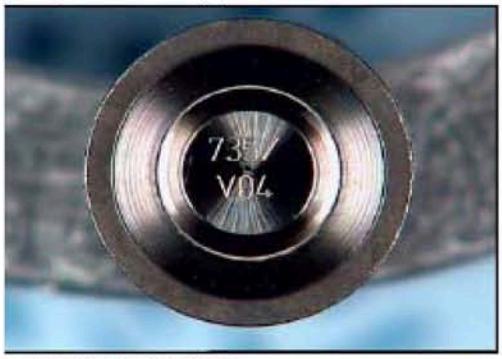

Fig. 3: Intake valve

Fig. 4: Camshaft

Fig. 5: Metering unit screen

Figure 6: Overflow valve screen

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EA11003EN-00862[0]

BOSCH

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	internal		
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	010207	0080	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	578254		CAG 0000 082
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	Reso-run	19421
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
209 h	10.22.2007	2007-CP4_0153	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-164759			

Complaint:

1.Subject

CP4 customer return

Findings at the end of endurance run

2. Conclusion

No back measurement of the function, because a fuel-quantity drift due to the running time is not expected and there is no complaint.

Wear of the components is low and without significant striking features.

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: X

3.2 Drivetrain

No striking feature — OK: X

3.3 High pressure

No striking feature — OK: X

3.4 Bearing

No striking feature — OK: X

3.5 Shaft seal

No striking feature — OK: X

3.6 Holes

No striking feature — OK: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK: X

3.8 Other

No striking feature

EA11003EN-00862[1]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	internal	
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part	Delivery rate [l/h] after testing

No functional testing due to the short running time and classification in the third diagnosis category.

5. Destiny of the parts

The parts are stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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EA11003EN-00863[0]

BOSCH

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	270407	0008	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	577765		CBDP170811
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	ÖVL+PZD	19444
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
227 h	10/17/2007	2007-CP4_0154	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-164722			

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature

3.2 Drivetrain

Lateral roller slip off (no picture available)

3.3 High pressure

No striking feature

3.4 Bearing

No striking feature

3.5 Shaft seal

No striking feature

3.6 Holes

No striking feature

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature

3.8 Other

No striking feature

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	internal	
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 4/27/2007	Delivery rate [l/h] after testing 10/25/2007			
Starting point	200	200	0.4	3.9	4.1	x		
1000 rpm, p_rated	1000	1800	0.4	17.7	17.8	x		
n_max_p, 500bar	3375	500	0.4	67.3	65.9	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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Department:		**Telephone:**		**Date:**	4/10/2008	**Signature:**	
Department:		**Telephone:**		**Date:**	4/11/2008	**Signature:**	

BOSCH

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	020207	0028	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	577772		3LAP270109
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	70h ÖVL+70h PZD	19438
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
340 h	10/17/2007	2007-CP4_0156	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-164727			

Complaint:

1. Subject

CP4 customer return
Findings at the end of endurance run

2. Conclusion

Delivery rates after endurance run or test in accordance with the specifications.
Wear of the components is low and without significant striking features.

The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK | uncritical | Critical

3.1 Drive
No striking feature — OK: X

3.2 Drivetrain
Lateral roller slip off (no picture available) — OK: X

3.3 High pressure
No striking feature — OK: X

3.4 Bearing
No striking feature — OK: X

3.5 Shaft seal
No striking feature — OK: X

3.6 Holes
No striking feature — OK: X

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No striking feature — OK: X

3.8 Other
No striking feature — OK: X

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 2/2/2007	Delivery rate [l/h] after testing 10/25/2007			
Starting point	200	200	0.4	3.9	4.1	x		
1000 rpm, p_rated	1000	1800	0.4	17.6	17.7	x		
n_max_p, 500bar	3375	500	0.4	65.6	66.1	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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Department:		**Telephone:**		**Date:**	3/6/2008	**Signature:**	

EA11003EN-00865[0]

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/27/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95	VW	R4 2.0 EU5	C / C1
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_02	685	4742	011M FeP (Feuerbach plant) – M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS-164746	577913		03LA/16870
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
		CR-engine	19425
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
70440 h	10/17/2007	2007-CP4_0160	Confidential

1.Subject

CP4 customer returns without complaint
Diagnosis after endurance run end
Engine testing conditions unknown.

2. Conclusion

Function

Functioning OK

Particle accumulation on metering unit screen: Contamination residues of plastic and aluminum alloy. The particles could originate from the pump housing, but this could not be proven through a fault. The origin of the plastic particles could not be determined.

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK | uncritical | Critical

	OK	uncritical	Critical
3.1 Drive			
No striking feature	X		
3.2 Drivetrain	X		
Only running marks visible			
3.3 High pressure	X		
Slight fretting wear at the seal seat of the intake valve (Fig. 1)			
3.4 Bearing	X		
No striking feature			
3.5 Shaft seal		X	
Slight recession of shaft seals < 10 µm (Fig. 2)			
3.6 Holes	X		
No striking feature			
3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)		X	
Particle collection of contamination residues (origin unknown) and aluminum (possibly from CP4 housing) on the metering unit screen (Fig. 3)			
3.8 Other		X	
Pump outside slightly rusted (Fig. 2)			

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	27.032008

Department:	Person responsible:	Telephone:	Use	internal	
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	New part 5/10/2006	After testing 10/23/2007			
Starting point	200	200	0.4	3.9	3.9	X		
1000 rpm, p_rated	1000	1800	0.4	16.9	17.1	X		
n_max_p, 500bar	3375	500	0.4	67.0	66.9	X		

No striking feature

5. Destiny of the parts

The parts are stored until 09/2008 at RB

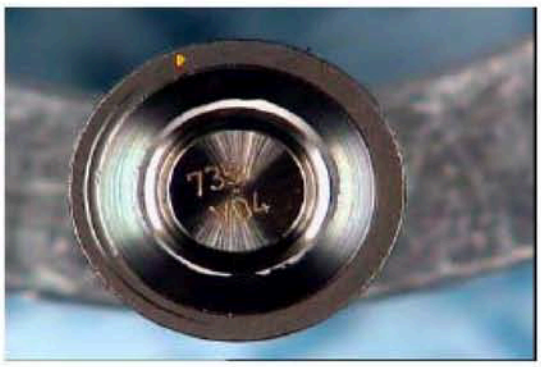

Fig. 1: Intake valve

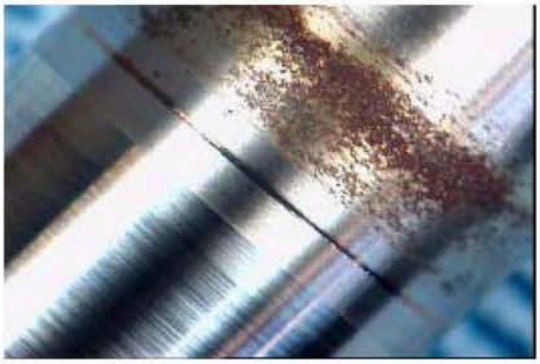

Fig. 2: Camshaft running surface of shaft seal

Fig. 3: Metering Unit

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Department:		**Phone:**		**Date:**	4/11/2008	**Signature:**	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	1/23/2008

Department:	Person responsible:	Telephone:	Use	internal	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_X	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_01	684	4555	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS-164756	577931		03LC/18145
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	CR-engine	ÖVL+endurance run 1	19422
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
495 h	10/17/2007	2007-CP4_0161	Confidential
VA / ETC no.:	**Durability test type [RB]:**		

Complaint:

1. Subject

CP4 customer return
Endurance run end
ÖVL+endurance run 1

2. Conclusion

The pump does not show any kind of striking feature.
The pump has passed the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking features — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking features — OK: x

3.8 Other

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	5/23/2008

Department:	Person responsible:	Telephone:	Use	internal	
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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	New part 4/12/2006	After testing 10/23/2007			
Starting point	200	200	0.4	3.9	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17.4	17.4	x		
n_max_p, 500bar	3375	500	0.4	67.2	67.2	x		

No striking feature

5. Destiny of the parts

The parts are stored until 07/2008 at RB

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Department:		**Phone**		**Date:**	1/29/2008	**Signature:**	

BOSCH

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C2 / D1
Part number (TTNo.): 0445B21058	**Date of manufacture:** 010207	**Serial number:** 0117	**Manufacturing plant - line** 011M FeP (Feuerbach plant)- M -
SAP-No.: 30-101005-07	**Samos no.:** 588442	**Customer order no.:**	**Engine/Vehicle number** 03LC/18158
Customer part number	**Endurance run type [customer]:** Engine endurance run	**Endurance run conditions:** ÖVL+PZD	**DSBFD no.:** 20211
Mileage 594 h	**Parts receipt at dept. DS-PC/EDI:** 11/29/2007	**Process no.** 2007-CP4_0163	**Confidentiality note** Confidential
VA / ETC no.: DS-175045	**Durability test type [RB]:**		
Complaint:			

1. Subject

CP4 customer return
Findings at the end of durability test

2. Conclusion

Delivery rates after endurance run or test in accordance with the specifications.
Wear of the components is low and without significant striking features.
On the flange front surface, two marks with a diameter of 6 mm can be seen, probably from a puller.
The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Lateral roller slip-off slightly increased (see Figs. 1 and 2) — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking features — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking features — OK: x

3.8 Other

Marks on flange front surface with 6 mm diameter (see Fig. 3) — OK: x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/27/2008

Department:	Person responsible:	Telephone:	Use	internal	
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3.9 Images of visual findings

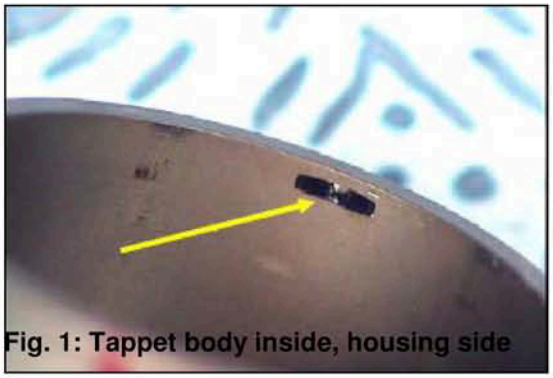

Fig. 1: Tappet body inside, housing side

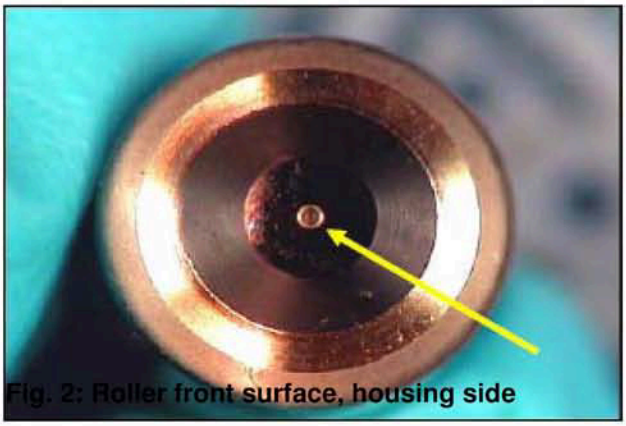

Fig. 2: Roller front surface, housing side

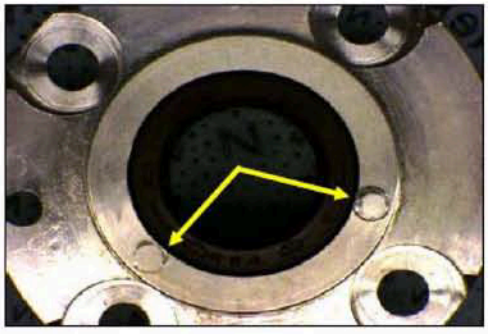

Fig. 3: Flange front surface

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] New part 1/31/2007	Delivery rate [l/h] after testing 12/5/2007			
Starting point	200	200	0.4	3.9	3.9	X		
1000 rpm, p_rated	1000	1800	0.4	17.6	17.6	X		
n_max_p, 500bar	3375	500	0.4	66.8	66.6	X		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.
No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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Department:		**Phone**		**Date:**	3/6/2008	**Signature:**	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C2 / D1
Part number (TTNo.): 0445B21058	**Date of manufacture:** 081206	**Serial number:** 0068	**Manufacturing plant - line** 011M FeP (Feuerbach plant)- M -
SAP-No.: 30-101005-07	**Samos no.:** 588456	**Customer order no.:**	**Engine/Vehicle number** 3LAP270051
Customer part number	**Endurance run type [customer]:** Engine endurance run	**Endurance run conditions:** Function	**DSBFD no.:** 20210
Mileage 836 h	**Parts receipt at dept. DS-PC/EDI:** 11/29/2007	**Process no.** 2007-CP4_0164	**Confidentiality note** Confidential
VA / ETC no.:	**Durability test type [RB]:**		

Complaint:

1. Subject

CP4 customer return

Findings at the end of endurance run

2. Conclusion

Delivery rates after endurance run or test in accordance with the specifications.
The wear of the components is low.
striking features that are uncritical:
- metering unit O-ring was slightly cut by slanted mounting or screw-fitting (typical marks).
- On the flange front surface, two marks with a diameter of 6 mm can be seen, probably from a puller.

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking features — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

Metering unit O-ring slightly cut, marks of slanted assembly (see Fig. 2) — uncritical: x

3.8 Other

OK: x

Marks on flange front surface with 6 mm diameter (see Fig. 3)

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	internal	
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3.9 Images of visual findings

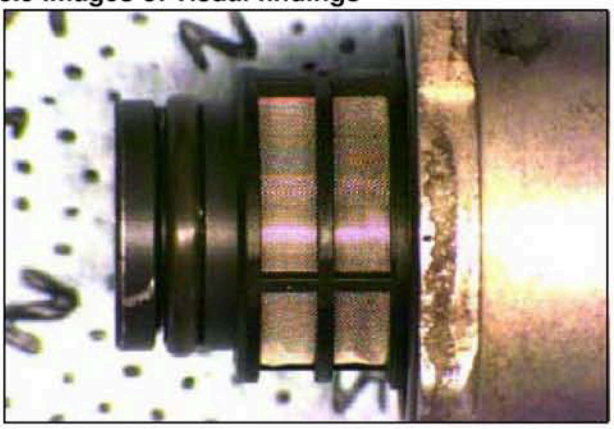

Fig. 1 Metering unit

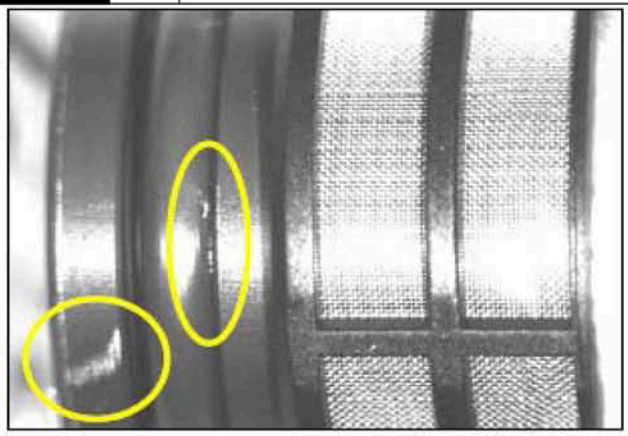

Fig. 2 Metering unit, detail view O-ring

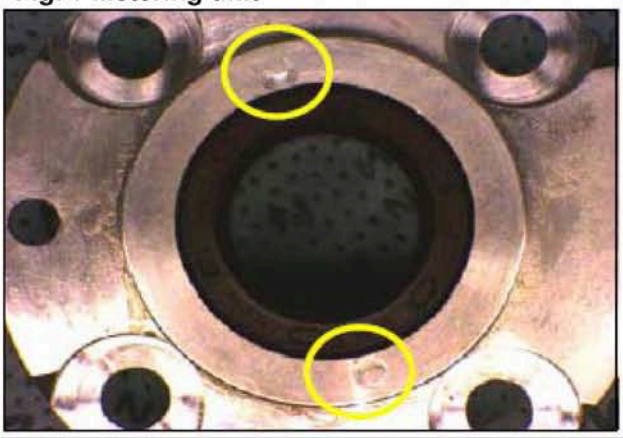

Fig. 3 Flange front surface

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	2/1/2007	12/5/2007			
Starting point	200	200	0.4	3.9	3.7	X		
1000 rpm, p_rated	1000	1800	0.4	17.8	17.7	X		
n_max_p, 500bar	3375	500	0.4	64.8	66.6	X		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met. No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C / C1
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_02	686	4007	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	588456		03LD/16702
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	PZD+ÖVL	20204
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
485 h	11/29/2007	2007-CP4_0165	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-175058			
Complaint:			

1. Subject

CP4 customer return

Findings at the end of endurance run

2. Conclusion

Delivery rates after endurance run or test in accordance with the specifications.
The wear of the components is low.
The screen of the metering unit is contaminated with foreign particles.
The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

	OK	uncritical	Critical
3.1 Drive	x		
No striking feature			
3.2 Drivetrain	x		
No striking feature			
3.3 High pressure	x		
No striking feature			
3.4 Bearing	x		
No striking feature			
3.5 Shaft seal	x		
No striking feature			
3.6 Holes	x		
No striking features			
3.7 Attached components (metering unit, overflow valve, counting point)	x		
No striking feature			

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	internal	
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3.8 Other

Foreign particles on the metering unit screen (see Fig. 1) — X

3.9 Images of visual findings

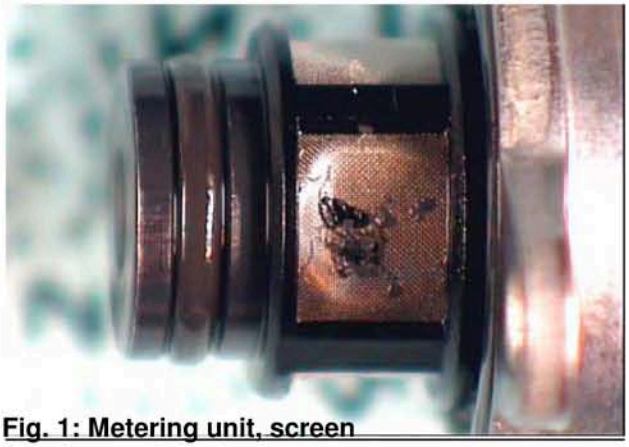

Fig. 1: Metering unit, screen (foreign particles)

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/8/2006	Delivery rate [l/h] after testing 12/4/2007	
Starting point	200	200	0.4	3.9	3.9	X
1000 rpm, p_rated	1000	1800	0.4	17	17.2	X
n_max_p, 500bar	3375	500	0.4	66.8	66.6	X

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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Department:		**Phone**		**Date:**	3/6/2008	**Signature:**	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_01	685	4734	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	588479		03LA/16587
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	endurance run 1+ÖVL	20203
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
450 h	11/29/2007	2007-CP4_0166	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-175060			
Complaint:			

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Striking features

- The pump was disassembled by the customer for self analysis and then reassembled (specification on the pump). The chip along the flange press-in diameter is due to this reassembly. The contamination by foreign particles is also probably due to this or the entry via the low-pressure system upstream to the pump.
- The severe corrosion on the cam and the roller outside the running range is due to the presence of free water.
- The taper of the camshaft shows significant corrosion.
- The existing cavitation erosion suggests insufficient internal pump chamber pressure during operation.

Components

- The wear of the components is low.

Result

- The pump has passed the **endurance run**

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical }

	OK	uncritical	Critical
3.1 Drive		x	
3.2 Drivetrain		x	
3.3 High pressure		x	

3.1 Drive

Severe corrosion on the taper (see Fig. 1)

3.2 Drivetrain

Corrosion of the camshaft (see Fig. 2), roller's lateral slip off (see Figures 3 to 4)

3.3 High pressure

Small cavitation erosion area in the HP range (see Fig. 5)z

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

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3.4 Bearing — x

No striking feature

3.5 Shaft seal — x

Slight recession of the shaft seal into the camshaft

3.6 Holes — x

Cavitation erosion in the tappet hole outside the moving range of the tappet (see Fig. 6); foreign particles in the metering unit hole (see Fig. 7) and in the overflow valve hole (see Fig. 8)

3.7 Attached components (metering unit, overflow valve, counting point) — x

Foreign particles on the screen of the metering unit (see Fig. 9) and the screen of the overflow valve (see Fig. 10)

3.8 Other — x

Chip on the press-in diameter due to flange assembly (see Figures 11 and 12)

3.9 Images of visual findings

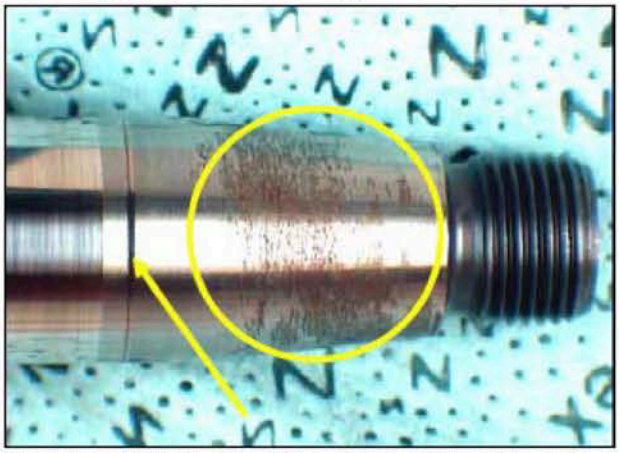

Fig. 1 Camshaft, running range of shaft seal and

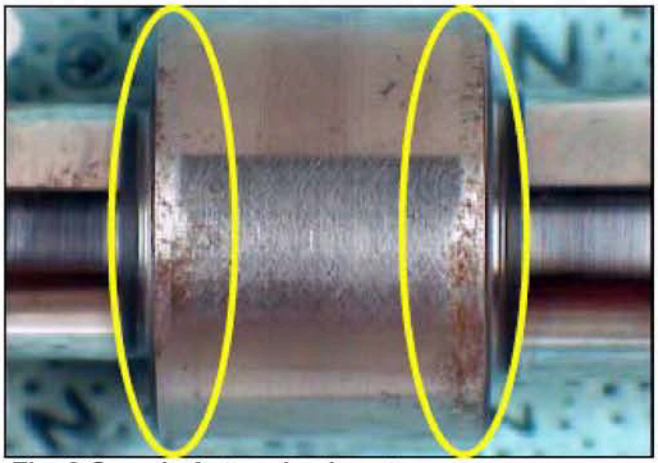

Fig. 2 Camshaft, top dead center

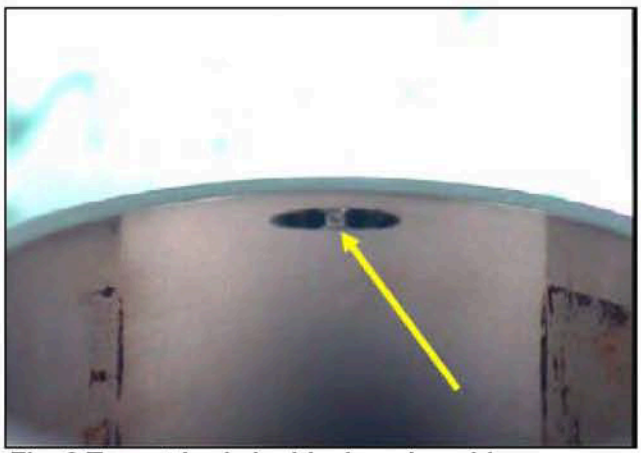

Fig. 3 Tappet body inside, housing side

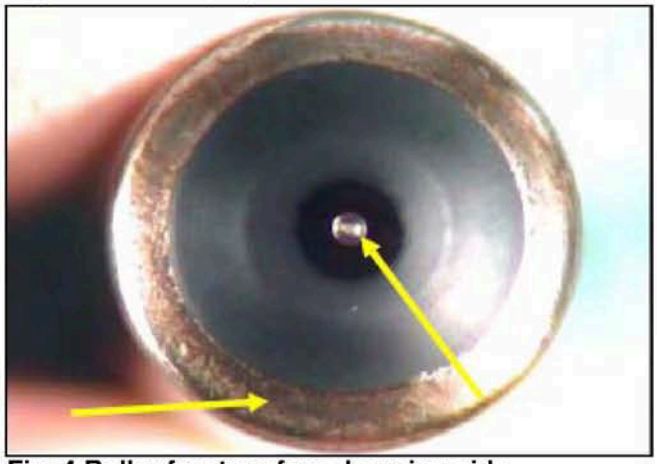

Fig. 4 Roller front surface, housing side

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	
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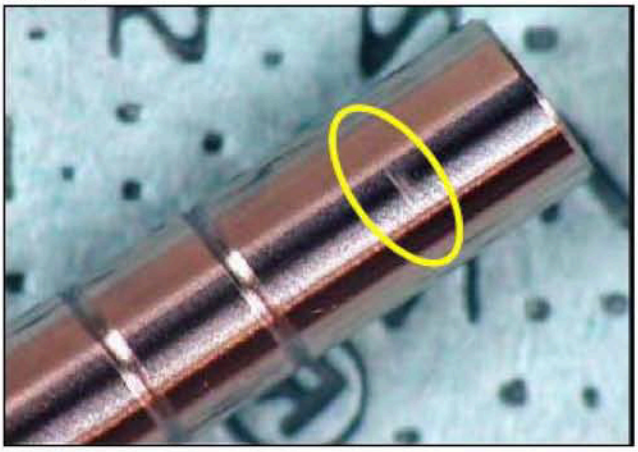

Fig. 5 High-pressure piston, high-pressure

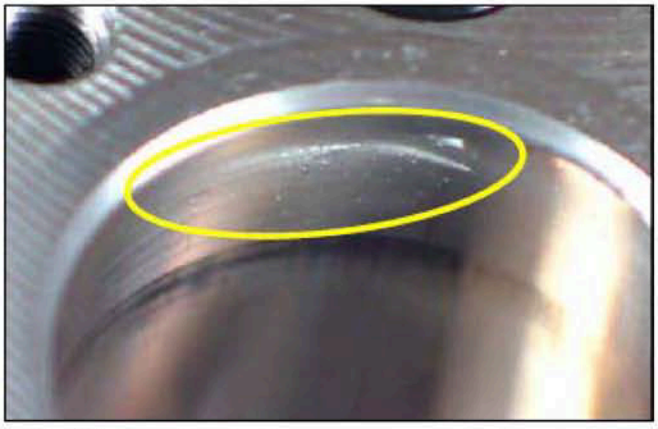

Fig. 6 Tappet hole, top

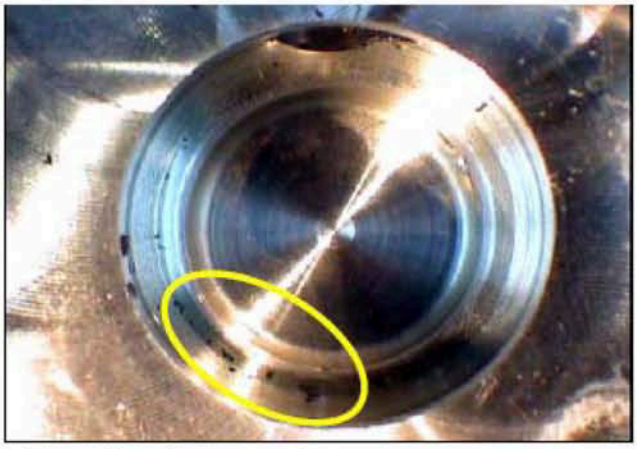

Fig. 7 Housing, metering unit

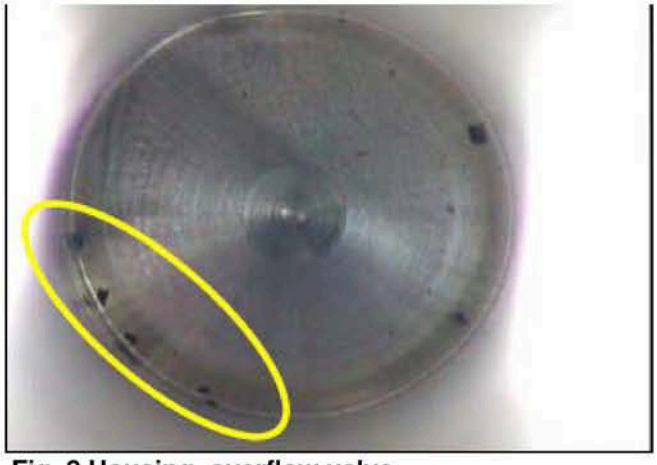

Fig. 8 Housing, overflow valve

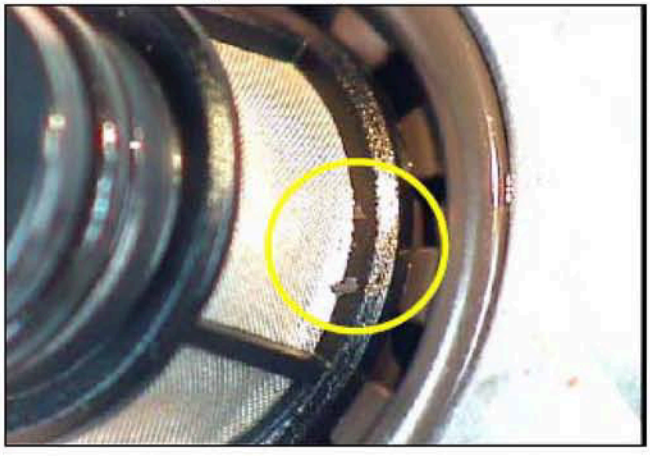

Fig. 9 metering

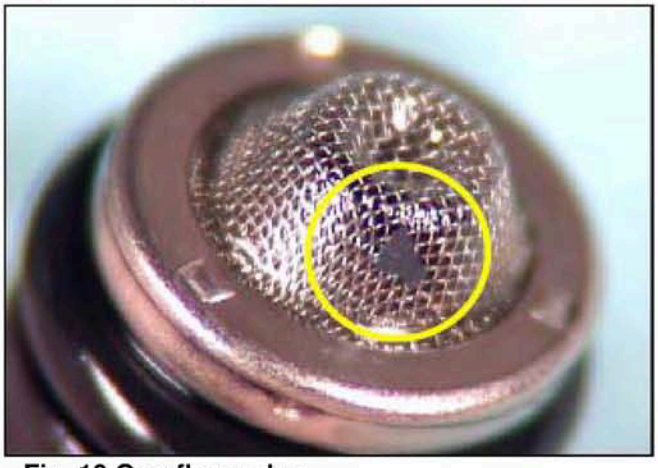

Fig. 10 Overflow valve, screen

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

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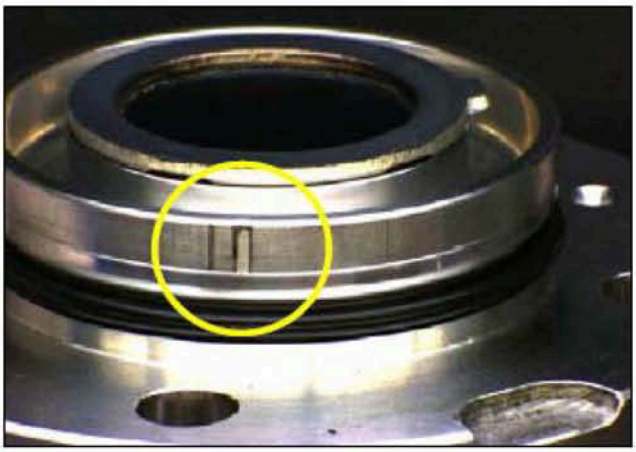

Fig. 11 Flange, press-in composite

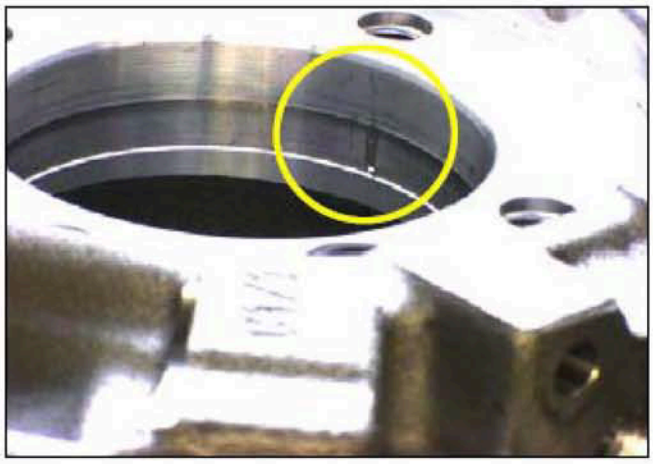

Fig. 13 Housing, press-in diameter

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		Date	2/28/2008

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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 5/8/2006	Delivery rate [l/h] after testing 12/4/2007			
Starting point	200	200	0.4	3.9	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17.1	17.1	x		
n_max_p, 500bar	3375	500	0.4	67.5	66.8	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	
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			external	x

To:	[redacted]
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 BIN5	B / B
Part number (TTNo.): 0445B21058_06	**Date of manufacture:** 689	**Serial number:** 4141	**Manufacturing plant - line** 011M FeP (Feuerbach plant)-M -
SAP-No.: 30-101005-07	**Samos no.:** 588471	**Customer order no.:**	**Engine/Vehicle number** 03LD/17236; VW 351-780123
Customer part number	**Endurance run type [customer]:** Vehicle endurance run	**Endurance run conditions:** WL1	**DSBFD no.:** 20216
Mileage 19825 km	**Parts receipt at dept. DS-PC/EDI:** 11/29/2007	**Process no.** 2007-CP4_0169	**Confidentiality note** Confidential
VA / ETC no.: DS-175052	**Durability test type [RB]:**		
Complaint:			

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without any striking features.

Result

- The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

Item	OK	uncritical	Critical
3.1 Drive	x		
3.2 Drivetrain		x	
3.3 High pressure	x		
3.4 Bearing	x		
3.5 Shaft seal		x	
3.6 Holes	x		

3.1 Drive

No striking feature

3.2 Drivetrain

Lateral roller slip-off slightly increased (see Figs. 1 and 2) slight cavitation erosion on the roller support back (see Figs. 3 and 4)

3.3 High pressure

No striking feature

3.4 Bearing

No striking feature

3.5 Shaft seal

Slight recession of the shaft seals into the camshaft (see Fig. 5)

3.6 Holes

No striking features

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	internal	
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3.7 Attached components (metering unit, overflow valve, counting point) X

No striking feature

3.8 Other X

No striking feature

3.9 Images of visual findings

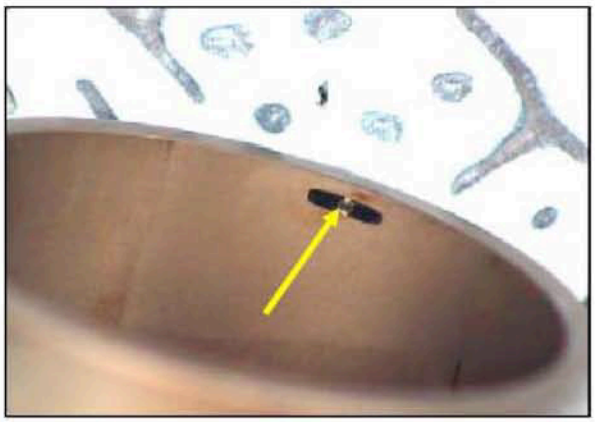

Fig. 1 Tappet body inside, flange side

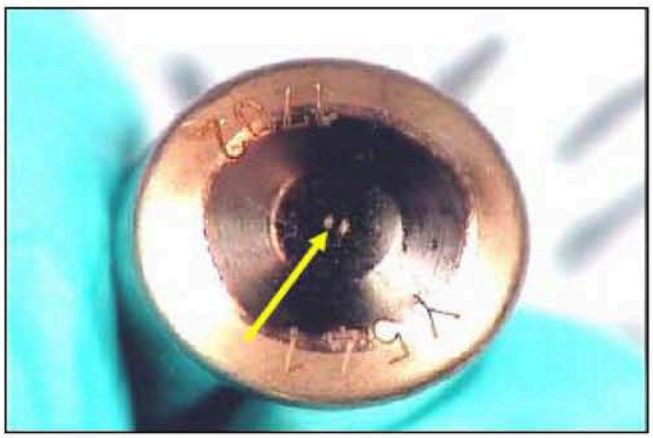

Fig. 2 Roller front surface, flange side

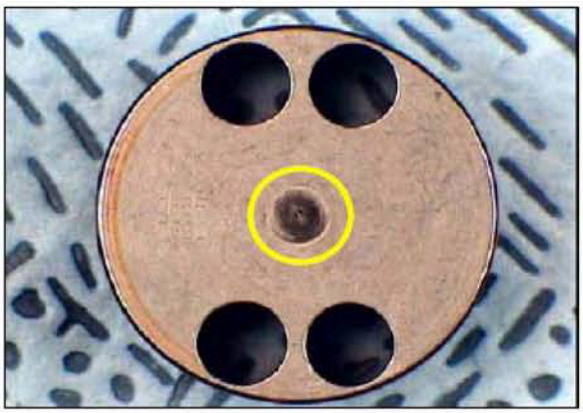

Fig. 3 Roller support, piston base support

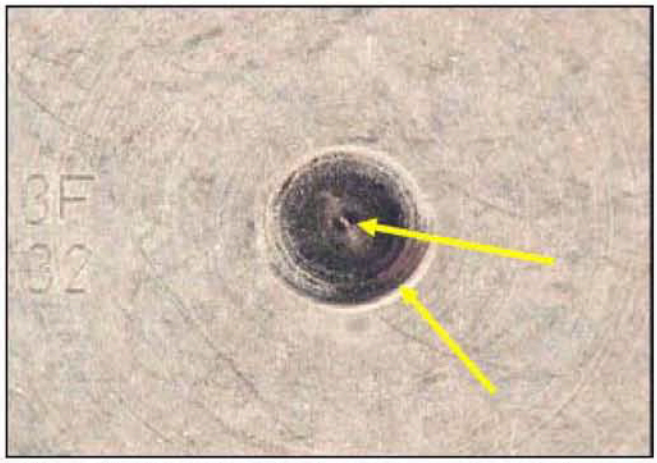

Fig. 4 Roller support, piston base support in

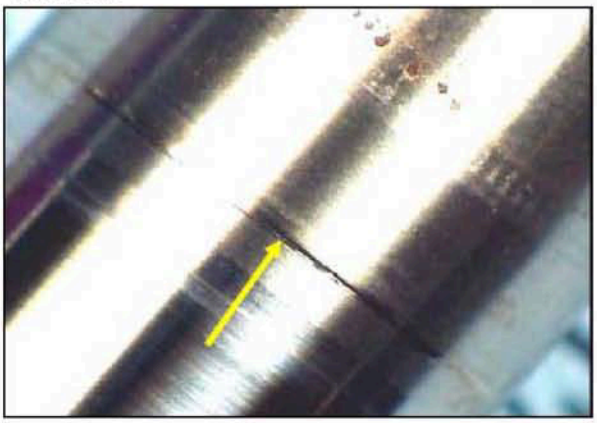

Fig. 5 Camshaft, moving range of shaft seal

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	internal	
[redacted]				external	x

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 9/25/2006	Delivery rate [l/h] after testing 12/4/2007			
Starting point	200	200	0.4	3.7	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17	17.7	x		
n_max_p, 500bar	3375	500	0.4	67.3	67.2	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

Tested:	[redacted]	**Phone**	[redacted]	**Date:**	3/31/2008	**Signature:**	[redacted]
Department:		**Phone**		**Date:**	4/10/2008	**Signature:**	
Department:		**Phone**		**Date:**	4/11/2008	**Signature:**	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	1/30/2008

Department:	Person responsible:	Telephone:	Use	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C / C2
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058_07	690	4364	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-1015814-07	588476		03LB/17818
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	Ehra variable track for passenger cars	20205
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
99850 km	11/29/2007	2007-CP4_0172	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-175056			
Complaint:			

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- The pump was dismantled without back measurement for the visual findings.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — x

3.2 Drivetrain

Slight lateral roller slip-off (see Figs. 1 and 2) — x

3.3 High pressure

No striking feature — x

3.4 Bearing

No striking feature — x

3.5 Shaft seal

No striking feature — x

3.6 Holes

No striking feature — x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — x

3.8 Other

No striking feature — x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/30/2008

Department:	Person responsible:	Telephone:	Use	internal / external
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3.9 Images of visual findings

Fig. 1 Tappet body inside, housing side

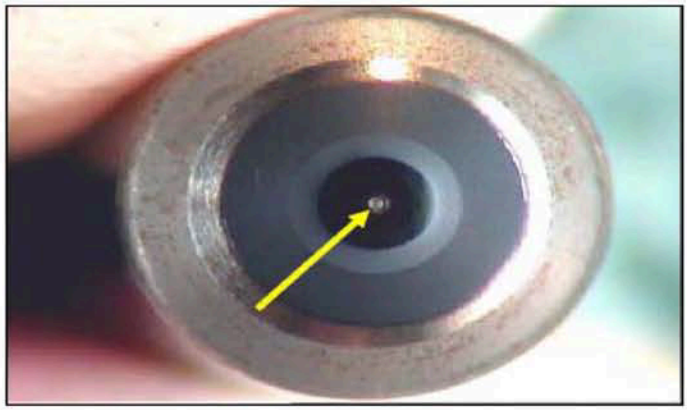

Fig. 2 Roller front surface, housing side

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 10/12/2006	Delivery rate [l/h] after testing
Starting point	200	200	0.4	3.9	
1000 rpm, p_rated	1000	1800	0.4	17.1	
n_max_p, 500bar	3375	500	0.4	67.4	

The pump was dismantled without back measurement for the visual findings.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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Department:		**Phone**		**Date:**	4/23/2008	**Signature:**	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	4/14/2008

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			external	x

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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C2 / D1
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	081206	0007	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-1015814-07	584309		CAG0000011
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	Ehra variable track for passenger cars	19791
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
89000 km	12/20/2007	2007-CP4_0173	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-170284			
Complaint:			

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.
- Cold seal-tightness confirmed up to -25 °C after endurance run

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Lateral roller slip-off (see Fig. 1) in the tappet (see Fig. 2) — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking features — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

OK: x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	4/14/2008

Department:	Person responsible:	Telephone:	Use	
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No striking feature

3.8 Other

x

No striking feature

3.9 Images of visual findings

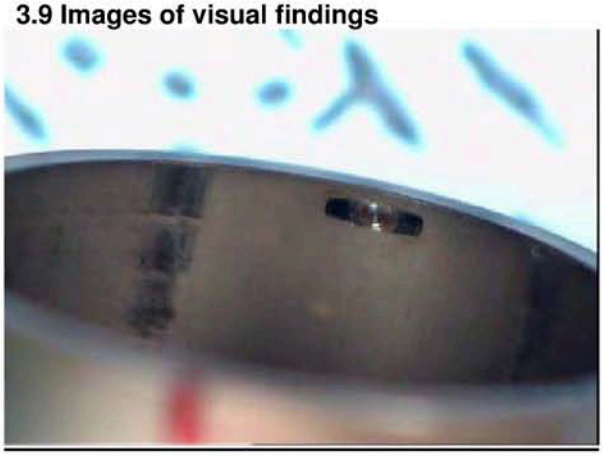

Fig. 1 Tappet body inside, housing side

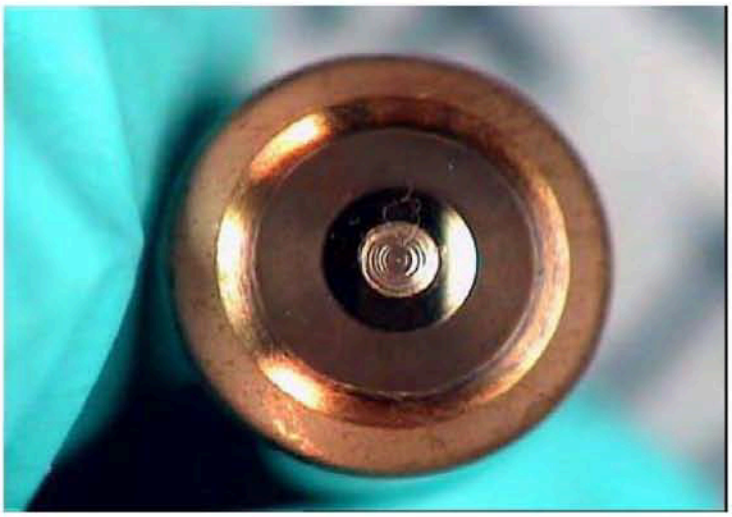

Fig. 2 Roller front surface, housing side

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 12/7/2006	Delivery rate [l/h] after testing 12/20/2007	
Starting point	200	200	0.4	3.9	3.7	x
1000 rpm, p_rated	1000	1800	0.4	16.7	17.7	x
n_max_p, 500bar	3375	500	0.4	67.1	67.2	x

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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Department:		**Phone**		**Date:**	5/6/2008	**Signature:**	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	
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For information:	[redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.): 445010507	**Date of manufacture:** 290607	**Serial number:** 0007	**Manufacturing plant - line** 011M FeP (Feuerbach plant)- M -
SAP-No.: 30-101005-07	**Samos no.:** 584310,001	**Customer order no.:**	**Engine/Vehicle number** 03LA/270202
Customer part number	**Endurance run type [customer]:** Engine endurance run	**Endurance run conditions:** not known	**DSBFD no.:** 20042
Mileage 840 h	**Parts receipt at dept. DS-PC/EDI:** 12/21/2007	**Process no.** 2007-CP4_0174	**Confidentiality note** Confidential
VA / ETC no.: DS-172513	**Durability test type [RB]:**		
Complaint:			

1. Subject

CP4 customer return
Findings at the end of endurance run

2. Conclusion

Delivery rates after endurance run or test in accordance with the specifications.
Wear of the components is low and without significant striking features.
The feed/return connection shows slight damage due to handling errors.
The pump has passed the **endurance run**

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive
No striking feature — OK: x

3.2 Drivetrain
No striking feature — OK: x

3.3 High pressure
No striking feature — OK: x

3.4 Bearing
No striking feature — OK: x

3.5 Shaft seal
No striking feature — OK: x

3.6 Holes
No striking features — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)
No striking feature — OK: x

3.8 Other
Feed/return connection faulty (see Figs. 1 and 2) — uncritical: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/28/2008

Department:	Person responsible:	Telephone:	Use	internal	external
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3.9 Images of visual findings

Fig. 1 Feed connection

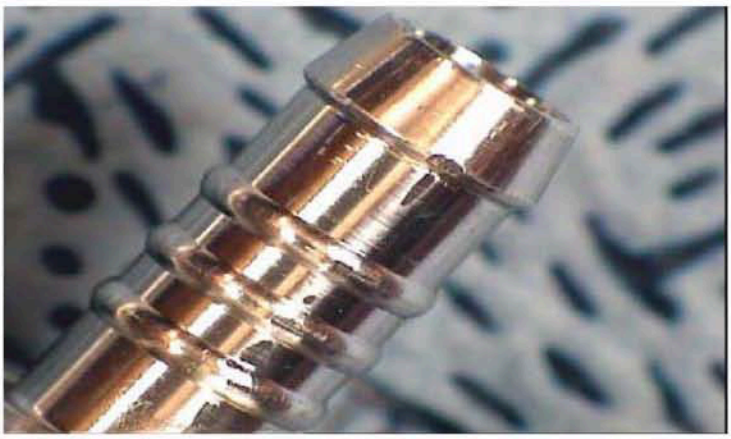

Fig. 2 Return connection

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/28/2007	Delivery rate [l/h] after testing 12/21/2007			
Starting point	200	200	0.4	3.9	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17.9	17.7	x		
n_max_p, 500bar	3375	500	0.4	66.1	67.2	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	4/4/2008

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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	110407	0019	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS-172525	054647	3LAP270157	3LAP270157
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
3LAP270157		GDV-Ehra variable track for passenger cars	20044
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
95210 km	12/21/2007	2007-CP4_0176	Confidential

1. Subject

CP4 customer return
Diagnosis after end of endurance run
Testing conditions: 95.210km GDV Ehra variable track for passenger cars

2. Conclusion

Cold cell result: leak-tight down to -30 °C.
Function: OK
The wear of power transmission elements is part of the values that are usual for this service life category.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Moderate wear of the C coating on the roller crest (Fig. 1). Slight recession of the roller in the tappet body (Fig. 2). — uncritical: x

3.3 High pressure

Very low fretting wear of the intake valve, otherwise smooth marks recognizable. — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — OK: x

3.8 Other

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	4/4/2008

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4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 4/11/2007	Delivery rate [l/h] after testing 12/21/2007			
Starting point	200	200	0.4	3.9	3.9	x		
1000 rpm, p_rated	1000	1800	0.4	17.6	17.7	x		
n_max_p, 500bar	3375	500	0.4	65.4	66.6	x		

No striking feature.

5. Destiny of the parts

The parts will be stored at RB until 10/2008.

Fig. 1: roller crest

Fig. 2: Tappet body

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Department:		Phone		Date:	4/11/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	4/17/2008

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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.): 445010507	**Date of manufacture:** 050607	**Serial number:** 0404	**Manufacturing plant - line** 011M FeP (Feuerbach plant)- M -
SAP-No.: 30-101005-07	**Samos no.:** 584308	**Customer order no.:**	**Engine/Vehicle number** CAH0000111
Customer part number	**Endurance run type [customer]:** Engine trial	**Endurance run conditions:** Reso-run	**DSBFD no.:** 20041
Mileage 111 h	**Parts receipt at dept. DS-PC/EDI:** 12/20/2007	**Process no.** 2007-CP4_0187	**Confidentiality note** Confidential
VA / ETC no.: DS-172511	**Endurance run type (RB):**	**Fuel:** EN590	

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.
- Cold seal-tightness confirmed up to -25 °C after endurance run

Components

- Smoothening area with grooves in the tappet hole and on the tappet body uncritical.
- Wear of the remaining components is low and without significant striking features.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

	OK	uncritical	Critical
3.1 Drive No striking feature	x		
3.2 Drivetrain Smoothening area with grooves on the tappet body (see Fig. 1)		x	
3.3 High pressure No striking feature	x		
3.4 Bearing No striking feature	x		
3.5 Shaft seal No striking feature	x		
3.6 Holes Smoothening area with grooves in the tappet hole (see Fig. 2)		x	
3.7 Attached components (metering unit, overflow valve, counting point) No striking feature	x		
	x		

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
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3.8 Other

No striking feature

3.9 Images of visual findings

Fig. 1 Tappet body, lateral surface

Fig. 2 Housing, tappet hole

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/5/2007	Delivery rate [l/h] after testing 12/20/2007			
Starting point	200	200	0.4	3.9	3.8	x		
1000 rpm, p_rated	1000	1800	0.4	17.8	17.7	x		
n_max_p, 500bar	3375	500	0.4	66.1	66.2	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

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BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	3/28/2008

Department:	Person responsible:	Telephone:	Use	
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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C2
Part number (TTNo.): 0445B21058_05	**Date of manufacture:** 689	**Serial number:** 4926	**Manufacturing plant - line** 011M FeP (Feuerbach plant)- M -
SAP-No.: 30-101005-07	**Samos no.:** 577901	**Customer order no.:**	**Engine/Vehicle number** 03LA/17115 / AU 481-8-110
Customer part number	**Endurance run type [customer]:** Vehicle endurance run	**Endurance run conditions:** Ehra variable track for passenger cars	**DSBFD no.:** 19435
Mileage 100000 km	**Parts receipt at dept. DS-PC/EDI:** 1/11/2008	**Process no.** 2007-CP4_0248	**Confidentiality note** Confidential
VA / ETC no.: DS-164732			

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state (deviation during the first back measurement after reassembly could not be confirmed).
- Cold seal-tightness after endurance run or test confirmed up to -30 °C (Leakage during the first measurement on the shaft seal due to contamination in the form of a hair and particles verified through cleaning and retest, camshaft wear measurement normal).

Components

- Wear of the remaining components is low and without significant striking features.
- Damage to the camshaft with respect to its functioning uncritical and probably due to inadequate packaging during return.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

Camshaft damaged on the first thread pitch (fault and breakage of the flank, see Figs. 1 and 2)

3.2 Drivetrain

No striking feature

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	3/28/2008

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3.3 High pressure — X

No striking feature

3.4 Bearing — X

No striking feature

3.5 Shaft seal — X

Contamination (for hair and particles, see Fig. 3) resulted in a leak in the cold test at -25 °C; pump is seal-tight in bubble test at room temperature (after back measurement and reassembly); wear measurement of shaft seal running range on the camshaft normal (see Figs. 4 and 5)

3.6 Holes — X

No striking feature

3.7 Attached components (metering unit, overflow valve, counting point) — X

No striking feature

3.8 Other — X

No striking feature

3.9 Images of visual findings

Fig. 1 Camshaft, thread

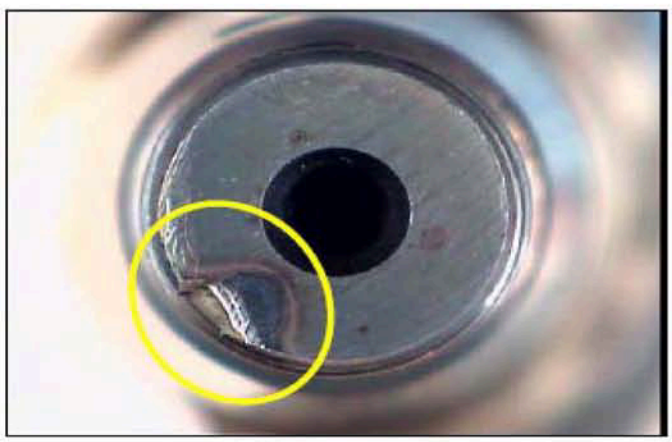

Fig. 2 Camshaft, front surface

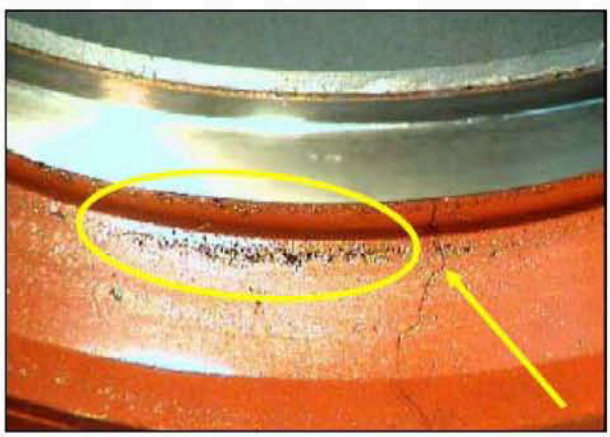

Fig. 1 Flange, shaft seal sealing lip

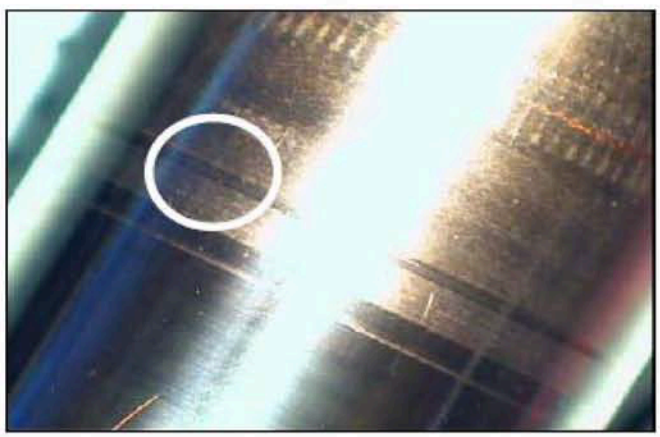

Fig. 4: Camshaft, shaft seal running range

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/28/2008

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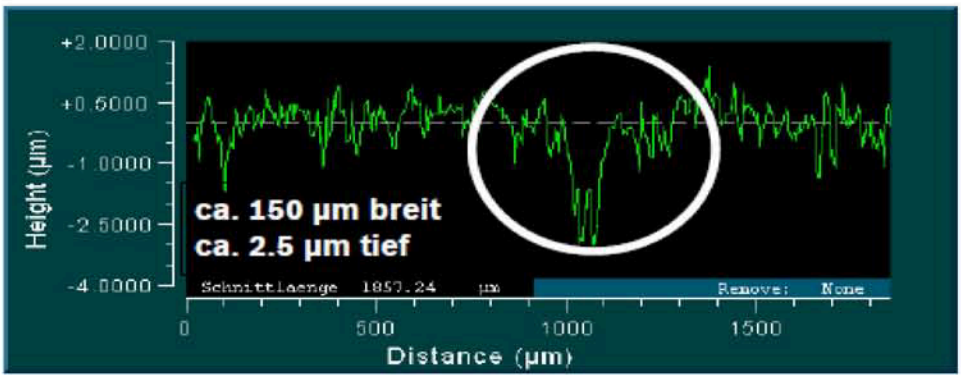

about 150 µm wide
about 2.5 µm deep
Cutting length

Fig. 5: WLI (white-light interferometry) measurement result, camshaft

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 9/15/2006	Delivery rate [l/h] after testing 10/22/2007			
Starting point	200	200	0.4	3.9	3.8	x		
1000 rpm, p_rated	1000	1800	0.4	17	16.8	x		
n_max_p, 500bar	3375	500	0.4	65.4	58.8		x	

TCD testing point LG (1,000 rpm, p_rated) within tolerance (nominal ≥ 15.5 or 15.2 l/h after running time).
Testing point 3,375 rpm / 500 bar / 0.4 A abnormal, that is, outside the known scattering range.

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] after reassembly 2/22/2008				
Starting point	200	200	0.4	3.9		x		
1000 rpm, p_rated	1000	1800	0.4	17		x		
n_max_p, 500bar	3375	500	0.4	66.6		x		

Delivery rate deviation in the testing point 3,375 rpm / 500 bar / 0.4 A no longer available after reassembly.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/28/2008

Department:	Person responsible:	Telephone:	Use	
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Department:		**Phone**		**Date:**	4/10/2008	**Signature:**	
Department:		**Phone**		**Date:**	4/11/2008	**Signature:**	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/15/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

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For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C2 / D1
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	081206	0073	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS-164773	0578260		3LAP270056
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	GDV-Ehra variable track for passenger cars	19417
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
98221 km	1/11/2008	2007-CP4_0249	Confidential

Complaint:

1. Subject

CP4 customer return
Endurance run end after gear endurance test

2. Conclusion

No critical wear detected.

The pump has passed the test.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

	OK	uncritical	Critical
3.1 Drive	X		
3.2 Drivetrain		X	
3.3 High pressure		X	
3.4 Bearing	X		
3.5 Shaft seal	X		
3.6 Holes		X	
3.7 Attached components (metering unit, overflow valve, counting point)	X		
3.8 Other			

3.1 Drive

No striking feature

3.2 Drivetrain

Slight recession of the spring plate (Fig. 1)

3.3 High pressure

fretting wear at the sealing surface of the intake valve / stationary seal ring (Fig. 2)

3.4 Bearing

No striking feature

3.5 Shaft seal

No striking feature

3.6 Holes

Slight cavitation erosion in the upper region of the tappet hole (Fig. 3)

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature

3.8 Other

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	1/15/2008

Department:	Person responsible:	Telephone:	Use		
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4. Destiny of the parts

The parts will be stored at RB until 07/2008

Fig. 1: Spring plate

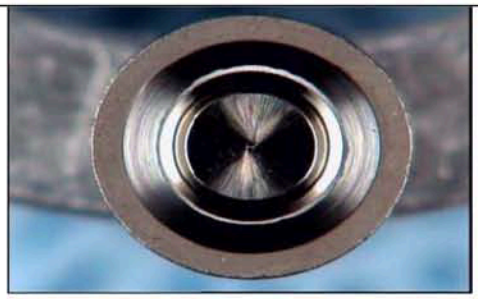

Fig. 2: Intake valve

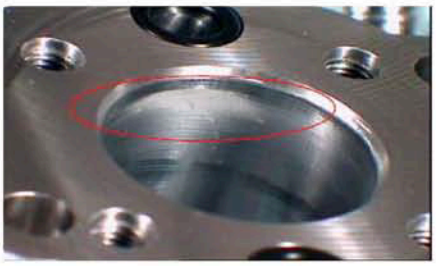

Fig. 3: Tappet hole

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Department:		Phone		Date:	1/28/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/5/2008

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For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,8_MT4,2	VW	R4 2.0 EU5	C2 / D1
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21058	081206	0066	011M FeP (Feuerbach plant)-M - 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	584304		3LAP270027
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	Polycyclic endurance run (PCR)	19788
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
914 h	1/11/2008	2007-CP4_0253	Confidential
VA / ETC no.:	**Durability test type [RB]:**		

Complaint:

1.Subject

CP4 customer return
Findings at the end of endurance run

2. Conclusion

The delivery rates after endurance run correspond to the specifications.
Wear of the components is good and does not show any striking features.

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — OK: x

3.8 Other

No striking feature — OK: x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/5/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	2/1/2007	12/11/2007			
Starting point	200	200	0.4	3.9	3.8	x		
1000 rpm, p_rated	1000	1800	0.4	17.6	17.6	x		
n_max_p, 500bar	3375	500	0.4	66.2	66.9	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 06/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	2/7/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	2/7/2008	Signature:	
Department:		Phone		Date:	2/12/2008	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	5/28/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.2S_644_2x4,85_REC_3,3_1,2	Audi	W19 EU5	C2
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B20162_05	250706	0008	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
DS-169128	582246		059 D V6N 025
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	CR-engine	Engine map operation	19695
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
202 h	11/15/2007	2007-CP4_0203	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-169128		EN590	

1. Subject

CP4 customer returns **without complaint**
Diagnosis after endurance run end
202 h engine map operation
Engine 059 D V6N 025

2. Conclusion

Function

- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has passed the **endurance run**

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — x | | |

3.2 Drivetrain

	x	

The tappet body has turned around the roller support in the two tappet combinations. Thus, there are 2 or 3 slip-off points of the roller in the tappet body (see 3.10, Figures 1 and 2).

Wear due to lateral roller slip-off is normal.

3.3 High pressure

No striking feature — x | | |

3.4 Bearing

No striking feature — x | | |

3.5 Shaft seal

No striking feature — x | | |

3.6 Holes

No striking features — x | | |

3.7 Attached components (metering unit, overflow valve, counting point)

x | | |

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	5/28/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

No striking feature

3.8 O-rings

x

No striking feature

3.9 Other

x

No striking feature

3.10 Images

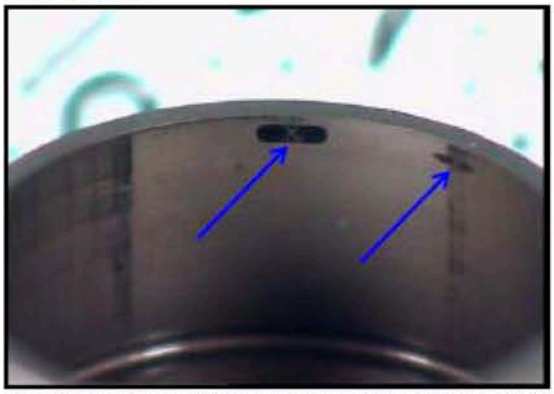

Fig. 1: Tappet body to the left: Two slip-off points of the roller

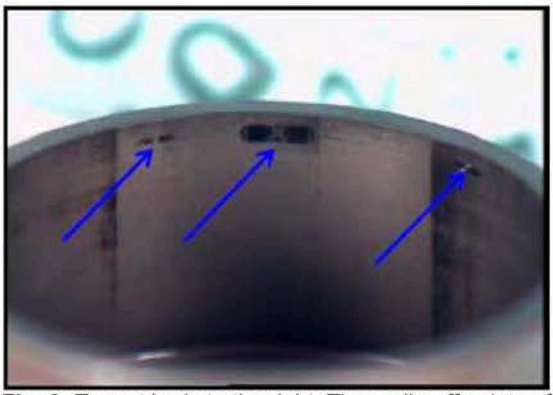

Fig. 2: Tappet body to the right: Three slip-off points of the roller

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 7/28/2006	Delivery rate [l/h] after testing 11/29/2007
LG	1000	1800	0.4	30.7	31.3

x

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD for new parts.

5. Destiny of the parts

The pump will be scrapped at the request of Audi.

6. Attachments

None

Tested:	Non-responsive content removed	**Phone:**	Non-responsive content removed	**Date:**	6/27/2008	**Signature:**	Non-responsive content removed
Department:		**Phone:**		**Date:**	6/30/2008	**Signature:**	
Department:		**Phone:**		**Date:**	7/9/2008	**Signature:**	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/24/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.2S_644_2x4,85_REC_3,3_1,2	Audi	W19 EU5	D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010611	200906	0016	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-100481-06	582527	CP4.2_064	059.D EU5 114
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CP4.2_064		BOSCH BAT in KST	19803
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
1670 h	11/23/2007	2007-CP4_0216	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-170340		EN590	

1. Subject

CP4 customer returns **without complaint**
Diagnosis after endurance run end
1,670 h Federal Highway Test (BOSCH at KST)
Engine 059.D EU5 114

2. Conclusion

Function
- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.
- The cold seal-tightness after endurance run or test has been proven up to -25 °C (KACO shaft seal).

Components
- The wear due to cavitation erosion is increased on the roller support (HP piston contact), but uncritical.
- The wear due to cavitation erosion is increased on the high-pressure piston (piston base), but uncritical.
- The wear due to cavitation erosion is increased in the housing (right tappet hole), but uncritical.
- Wear of the remaining components is low and without significant striking features.

Result
- The pump has **passed the endurance run**.

3. Results of diagnosis (visual findings)

Legend rating stages

	OK	uncritical	Critical
	X		
		X	
			X

3.1 Drive
No striking feature — X

3.2 Drivetrain — X
Roller support: Cavitation erosion around the center of the HP piston contact area (see 3.10 Figures 1 and 2)

3.3 High pressure — X
HP piston, piston base: Cavitation erosion at the contact area (see 3.10 Figures 3 and 4)

3.4 Bearing
No striking feature — X

3.5 Shaft seal
No striking feature — X

3.6 Holes — X
Housing, tappet hole to the right: Cavitation erosion (see 3.10, Figure 5)

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No striking feature — X

3.8 O-rings
No striking feature — X

3.9 Other
No striking feature — X

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/24/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

3.10 Images

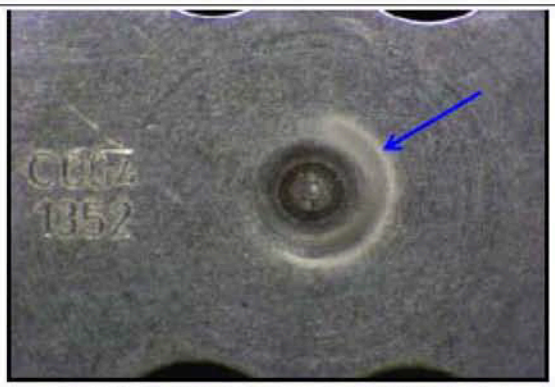

Fig. 1: Roller support to the left: Cavitation erosion

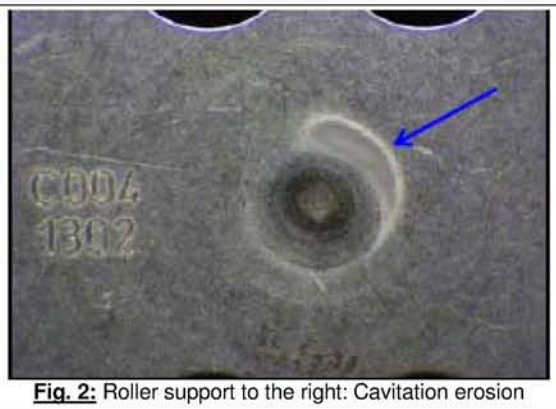

Fig. 2: Roller support to the right: Cavitation erosion

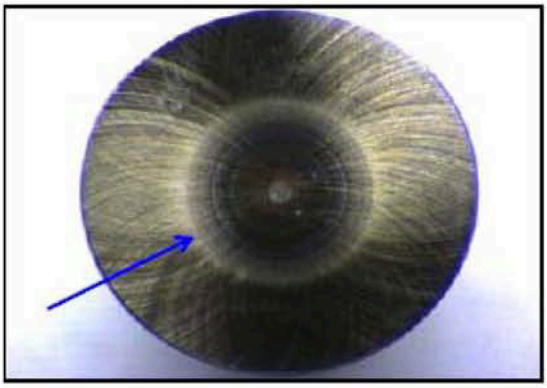

Fig. 3: High-pressure piston to the left:
Cavitation erosion at the piston base

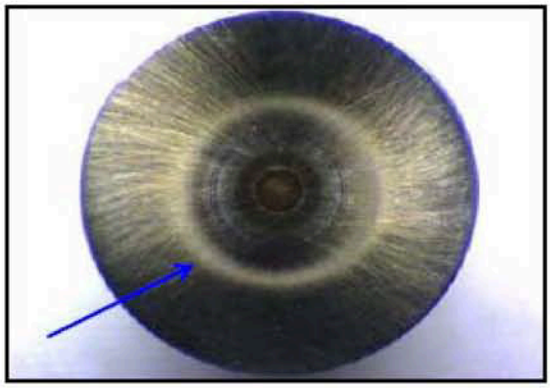

Fig. 4: High-pressure piston to the right:
Cavitation erosion at the piston base

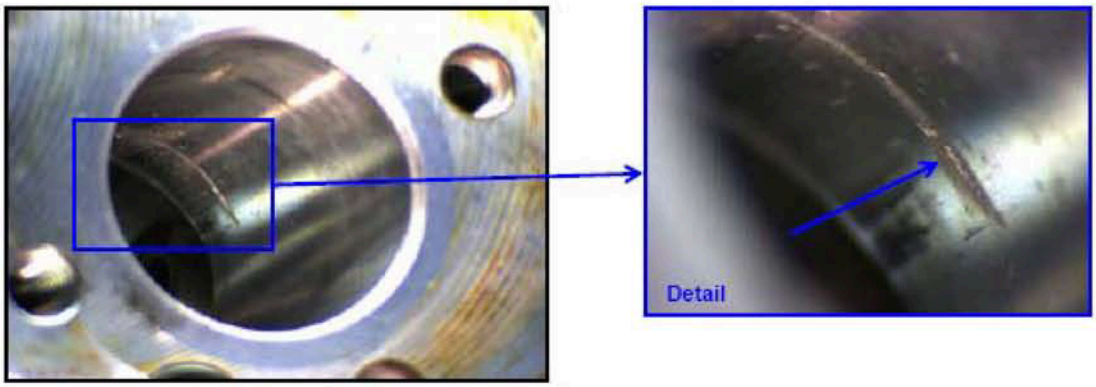

Fig. 5: Tappet hole to the right: Cavitation erosion

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 9/18/2006	Delivery rate [l/h] after testing 12/7/2007
LG	1000	1800	0.4	30.9	31.6

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD for new parts.

x

5. Destiny of the parts

The pump will be scrapped at the request of Audi.

6. Attachments

None

Tested:	Non-responsive content removed	**Phone**	Non-responsive content removed	**Date:**	6/27/2008	**Signature:**	Non-responsive content removed
Department:		**Phone**		**Date:**	6/30/2008	**Signature:**	
Department:		**Phone**		**Date:**	7/9/2008	**Signature:**	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	5/13/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	290607	0008	0110 FeP (Feuerbach plant)
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	587811		03LA270201
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	not known	20178
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
449 h	1/31/2008	2008-CP4_0054	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
Ds-174522			

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- The lateral roller slip-off in the tappet is slightly increased, but still uncritical.
- Wear of the remaining components is low and without significant striking features.
- On the flange front surface, two marks with a diameter of 6 mm can be seen, probably from a puller.

Result

- The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Lateral roller slip-off (see Fig. 1) in the tappet (see Fig. 2) — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — OK: x

3.8 Other

Marks on flange front surface with 6 mm diameter (see Fig. 3) — uncritical: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	5/13/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

3.9 Images of visual findings

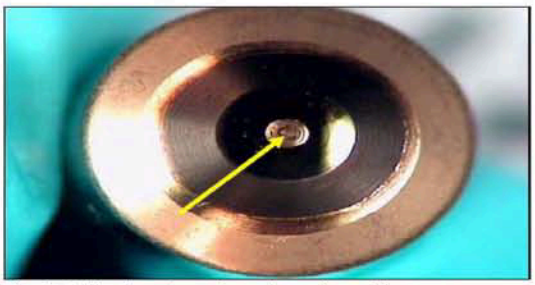

Fig. 1 Roller front surface, housing side

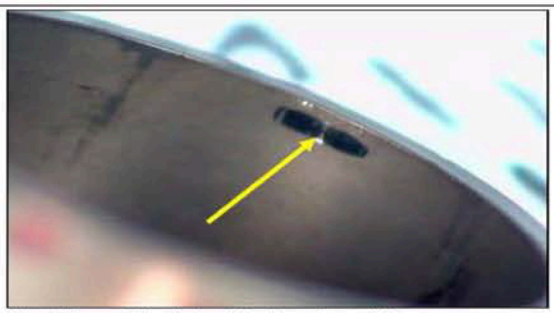

Fig. 2 Tappet body inside, housing side

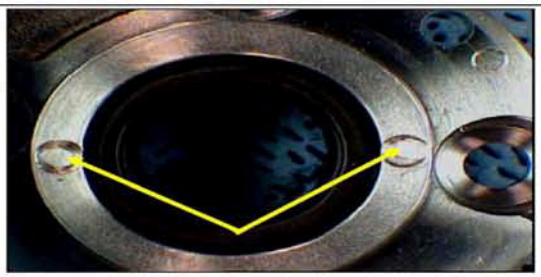

Fig. 3 Flange front surface (damage)

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	6/28/2007	2/11/2008			
Starting point	200	200	0.4	3.9	3.8	x		
1000 rpm, p_rated	1000	1800	0.4	17.9	17.9	x		
n_max_p, 500bar	3375	500	0.4	66.2	67.5	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	5/14/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	5/20/2008	Signature:	
Department:		Phone		Date:	5/26/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	6/9/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	190707	0498	0110 FeP (Feuerbach plant)
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	587836		CAG0000171
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	Ehra variable track for passenger cars	20170
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
70994 km	2/1/2008	2008-CP4_0062	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-174532			

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.
- Cold leakage (formation of drops) on the cylinder head screw plug above -30 °C (not tested at -25 °C). Cold seal-tightness proven up to -40 °C at shaft seal, metering unit and housing.

Components

- O-ring of the screw plug shows an interior notch in the sealing area towards the screw. The width of the notch of about 190 µm is outside the tolerance of 150 µm.
- Wear of the components is low and without significant striking features.

Result

- The cold leakage at the screw plug in the cylinder head is due to an unacceptably wide notch of the O-ring. Further analyses and measures carried out through quality assurance of purchased parts.
- The pump has **conditionally passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK | uncritical | Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

BOSCH CP4 **CR pump CP4 - Diagnosis report** | Report no. [redacted] | Date 6/9/2008

Department:	Person responsible:	Telephone:	Use	
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			external	x

To: Non-responsive content removed

For information:

3.6 Holes

No striking feature

3.7 Attached components (metering unit, overflow valve, counting point)

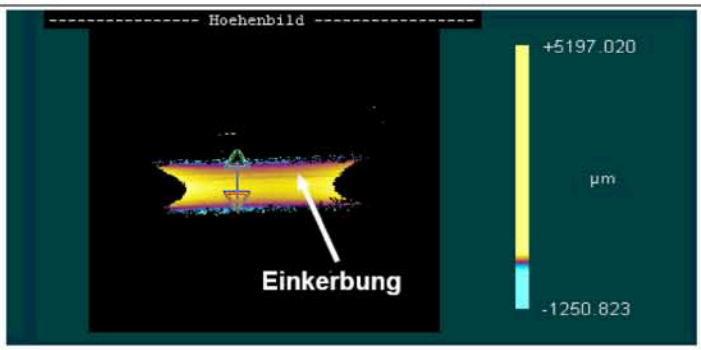
No striking feature

3.8 Other

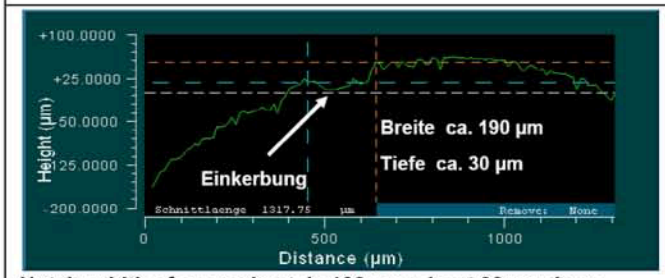
O-ring screw plug cylinder head slightly twisted and with an inside notch (see Figure 1)
WLI measurement of O-ring screw cap cylinder head notch (see Figs. 2 and 3)

3.9 Images of visual findings

Fig. 1 O-ring screw cap cylinder head inside



Notch, elevated image
Fig. 2 WLI (white-light interferometry) measurement of O-ring notch (profile interface)



Notch, width of approximately 190 µm, about 30 µm deep, cutting length
Fig. 3 WLI (white-light interferometry) measurement of O-ring notch, profile interface

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing
	n[rpm]	p_rail [bar]	I_MU [A]	7/19/2007	2/11/2008
Starting point	200	200	0.4	3.8	3.8
1000 rpm, p_rated	1000	1800	0.4	17.9	17.9
n_max_p, 500bar	3375	500	0.4	65.9	66.5

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.
No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/9/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

To:	Non-responsive content removed
For information:	

6. Attachments

None

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Department:		Phone		Date:	6/30/2008	Signature:	
Department:		Phone		Date:	7/3/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	6/17/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.2S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	050607	0328	011M FeP (Feuerbach plant)-M - 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-01	590401.001		
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Engine endurance run	endurance run 1+ÖVL	20454
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
279 h	2/26/2008	2008-CP4_0175	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-176930		EN590	

Complaint:

1.Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — OK: x

3.8 Other

No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/9/2008

Department:	Person responsible:	Telephone:	Use		
Non-responsive content removed				internal	
				external	x

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	6/5/2007	3/7/2008			
Starting point	200	200	0.4	3.9	4.2	x		
1000 rpm, p_rated	1000	1800	0.4	17.5	17.1	x		
n_max_p, 500bar	3375	500	0.4	66.1	65.8	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	6/23/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	6/23/2008	Signature:	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/17/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	020507	0272	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-01	590270.001	CAH0000074	CAH0000074
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CAH0000074	Vehicle endurance run	GDV-EWP	20469
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
101956 km	2/26/2008	2008-CP4_0181	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-176922		EN590	

Complaint:

1.Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.
- Cold seal-tightness confirmed up to -30°C after endurance run

Components

- The slightly asymmetric wear of the intake valve plate and stationary seal ring is still uncritical.
- metering unit O-ring slightly cut by oblique assembly (marks in the housing and at the metering unit). The error is known through 0-km complaints at VW and recorded on 8D.
- Wear of the remaining components is low and without significant striking features.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

Fretting wear between intake valve sealing surface (see Fig. 1) and stationary seal ring (see fig. 2) — uncritical: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

Metering unit hole with scrape marks through metering unit assembly (see Figure 3) — uncritical: x

3.7 Attached components (metering unit, overflow valve, counting point)

Metering unit magnetic drum with scrape marks (see Fig. 4) and metering unit O-ring cut (see Fig. 5) — uncritical: x

BOSCH CP4 | **CR pump CP4 - Diagnosis report** | Report no. [redacted] | Date 6/17/2008

Department:	Person responsible:	Telephone:	Use	internal	external
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3.8 Other

No striking feature

x

3.9 Images of visual findings

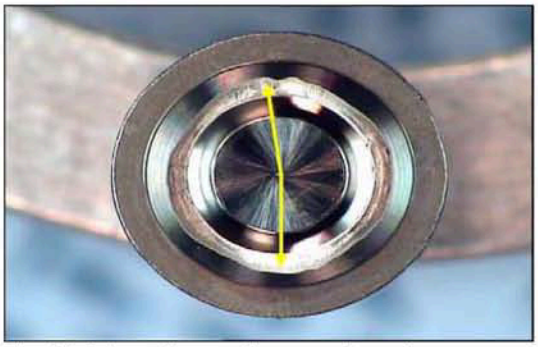

Fig. 1 Intake valve, sealing area (wear)

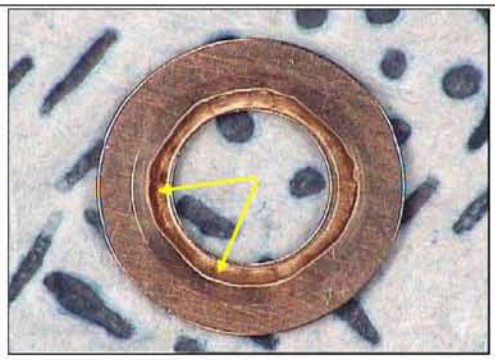

Fig. 2 Intake valve stationary seal ring, sealing area (wear)

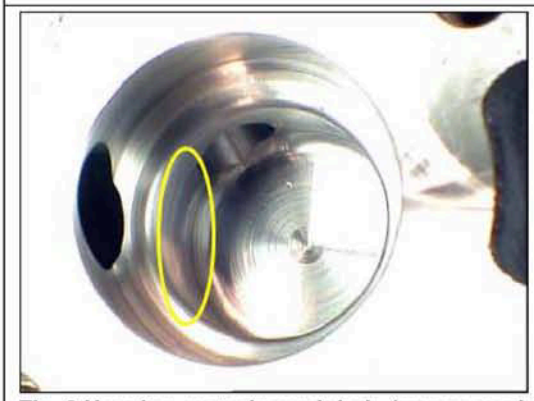

Fig. 3 Housing, metering unit hole (scrape marks)

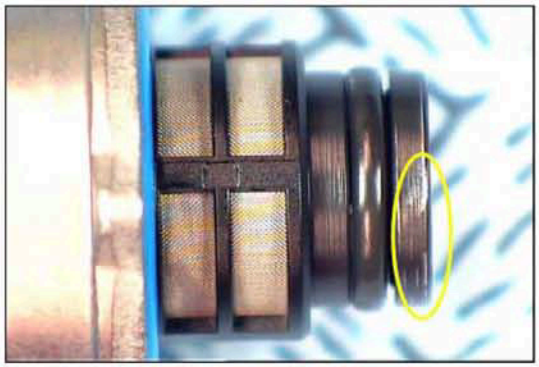

Fig. 4 Metering unit, magnetic drum (scrape marks)

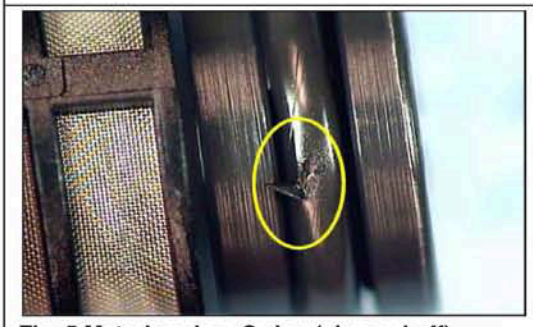

Fig. 5 Metering ring, O-ring (sheared off)

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	5/2/2007	3/7/2008			
Starting point	200	200	0.4	3.8	4.3	x		
1000 rpm, p_rated	1000	1800	0.4	17.8	17.4	x		
n_max_p, 500bar	3375	500	0.4	67.2	65.6	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/17/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

6. Attachments

None

Tested:	Non-respon sive conte nt removed	Phone	Non-responsiv e content rem oved	Date:	6/23/2008	Signature:	Non-respons ive content removed
Department:		Phone		Date:	6/23/2008	Signature:	
Department:		Phone		Date:	6/27/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	6/18/2008

Department:	Person responsible:	Telephone:	Use	internal / external
Non-responsive content removed				x

To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	100407	0277	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-01	590405.001	CBA0000545	CBA0000545
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CBA0000545	Engine endurance run	Vehicle air-conditioning technology - reclaimed refrigerant. DPF	20453
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
1225 h	2/26/2008	2008-CP4_0182	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-176931		EN590	

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.
- Cold seal-tightness confirmed up to -30°C after endurance run

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has **passed** the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — OK: x

3.8 Other

No striking feature — OK: x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/18/2008

Department:	Person responsible:	Telephone:	Use		
Non-responsive content removed				internal	
				external	x

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	4/10/2007	3/7/2008			
Starting point	200	200	0.4	3.8	4.3	x		
1000 rpm, p_rated	1000	1800	0.4	17.5	17.2	x		
n_max_p, 500bar	3375	500	0.4	67	65.5	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	6/23/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	6/23/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	6/18/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	050607	0325	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-01	590283.001	CAH0000136	CAH0000136
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CAH0000136	Engine endurance run	ÖVL+endurance run 1+ÖVL	20468
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
440 h	2/26/2008	2008-CP4_0187	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-176925		EN590	

Complaint:

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

-The pump has passed the durability test.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — OK: x

3.8 Other

No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/18/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	6/5/2007	3/7/2008			
Starting point	200	200	0.4	3.9	4.2	x		
1000 rpm, p_rated	1000	1800	0.4	17.9	17.6	x		
n_max_p, 500bar	3375	500	0.4	66.6	65.9	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.
No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	6/23/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	6/23/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	6/18/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	230707	0222	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-01	590276.001	CBA0002352	CBA0002352
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CBA0002352	Vehicle endurance run	GDV-EWP	20467
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
44950 km	2/26/2008	2008-CP4_0188	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-176924		EN590	

Complaint:

1.Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has **passed** the durability test.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical }

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — OK: x

3.8 Other

No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/18/2008

Department:	Person responsible:	Telephone:	Use		
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				external	x

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	7/19/2007	3/7/2008			
Starting point	200	200	0.4	3.8	4.3	x		
1000 rpm, p_rated	1000	1800	0.4	17.7	17.4	x		
n_max_p, 500bar	3375	500	0.4	66.8	66.3	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.
No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	6/23/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	6/23/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	7/15/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.2S_644_2x4,85_REC_3,3_1,3_R2,0	AUDI	W19 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B20197	070227	0081	011M FeP (Feuerbach plant)-M -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-100481-06	593398		059 D CO2 012
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CP4.2_081	Engine endurance run	Diesel 5	20661
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
530 h	3/19/2008	2008-CP4_0255	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-179387		EN590	

1. Subject

CP4 customer returns without complaint.

Diagnosis of pump after endurance run end.

Testing conditions: Engine endurance run "diesel 5", engine 059 D CO2 012

2. Conclusion

Function

- The volumetric efficiency of the back measurement is OK. There is no significant drift when compared to the new part measurement (for more details, see 4).
- The seal-tightness of the non-return valves (RSV) was analyzed separately and is OK

Visual findings

- All components have normal running marks only during the running time (green rating).

The test was passed.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

3.1 Drive

No striking feature — x

3.2 Drivetrain

No striking feature — x

3.3 High pressure

No striking feature — x

3.4 Bearing

No striking feature — x

3.5 Shaft seal

No striking feature — x

3.6 Holes

No striking feature — x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — x

3.8 Other

No striking feature — x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/15/2008

Department:	Person responsible:	Telephone:	Use		
Non-responsive content removed				internal	
				external	x

3.9 Other

No striking feature

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing	
	n[rpm]	p_rail [bar]	I_MU [A]	2/26/2007	4/7/2008	
LG	1000	1800	0.4	31.3	31.8	x

The volumetric efficiency of the back measurement is OK (within TCD nominal value).
There is no significant drift when compared to the new part measurement.

5. Destiny of the parts

The pump will be scrapped at the request of Audi.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	7/21/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	7/23/2008	Signature:	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/18/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.2S_644_2x4,85_REC_3,3_1,2_MT2,0	AUDI	W19 EU5	Series / D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010611	171106	0001	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-100481-06	593551		CAS 508
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
CP4.2_078	Vehicle endurance run	Q-AL in Q7	20678
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
65000 km	3/19/2008	2008-CP4_0258	Confidential
VA / ETC no.:		**Fuel:**	
DS-179498		EN590	

1. Subject

CP4 customer returns without complaint
Diagnosis of pump after endurance run end.
Testing conditions: Vehicle endurance run Q-AL in Audi Q7, engine CAS 000 508

2. Conclusion

Function
- The volumetric efficiency of the back measurement is OK. There is no significant drift when compared to the new part measurement (for more details, see 4).
- The metering unit was diagnosed separately for GS-CP/EEC1. Functional and visual findings are OK (see Appendix 6 ZVM 614)

Visual findings
- All components have normal running marks only during the running time (green rating).

The test was passed.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive
No striking feature — OK: X

3.2 Drivetrain
No striking feature — OK: X

3.3 High pressure
No striking feature — OK: X

3.4 Bearing
No striking feature — OK: X

3.5 Shaft seal
No striking feature — OK: X

3.6 Holes
No striking feature — OK: X

3.7 Attached components (metering unit, overflow valve, counting point)
No striking features with respect to metering unit see Appendix — OK: X

3.8 O-rings
No striking feature — OK: X

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/18/2008

Department:	Person responsible:	Telephone:	Use		
Non-responsive content removed				internal	
				external	x

3.9 Other

No striking feature

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	11/17/2006	4/4/2008			
LG	1000	1800	0.4	31.4	32	x		

The volumetric efficiency of the back measurement is OK (within TCD nominal value).
There is no significant drift when compared to the new part measurement.

5. Destiny of the parts

The pump will be scrapped at the request of Audi.

6. Attachments

Metering unit diagnosis ZVM614

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	7/23/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	7/23/2008	Signature:	

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Cc

Pump 0445010611 **serial no**. 0001 **date of manufacture** 171106
Endurance run diagnosis no. DNA 2282; ASMUS / SAMOS 0593551; diagnosis no. 20678; DS-179498
SAP 30-100481-01

1. Description

Metering unit complaint: No
System design Vehicle
Endurance run type Q-AL in Q7
Running time 65000 km

Remark:
Customer return no. 2008-CP4_0258.
Project: W19EU5.
The development no. 0928 B01 481 is also printed on the metering unit.
Fuel: EN590.

2. Diagnosis

- **Visual findings (external):**
Metering unit housing is contaminated and / or rusted and a piece of plastic injection molding is broken off, both without any impairment of function, see photos. Otherwise, no complaints are externally visible.
- **Function:**
The characteristic curve of the displacement / current measurement looks good.
During the delivery rate / current measurement, all values are within the tolerances.
- **Wear:**
There are no or only slight running marks on the components.
- **Other:**

None.

3. Result

[X] Passed ***[ ] Conditionally passed*** ***[ ] Failed***

The metering unit is functionally OK, delivery rate and displacement measurements yielded positive results. Wear of the components is low.

4. Corrective actions

No error.

5. Other tests (e.g. material analysis. process analysis)

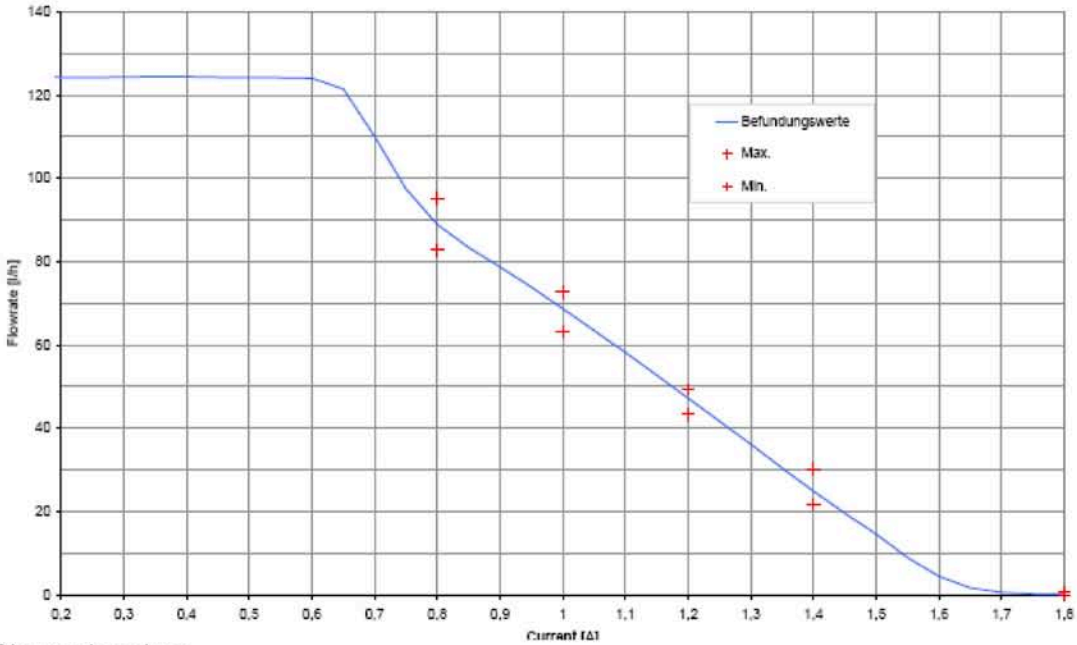
No further tests are performed.

6. Destiny of the parts

Metering unit is returned to the client.

Person responsible:	Non-responsive content removed	
Approval:	Non-responsive content removed	

Function:

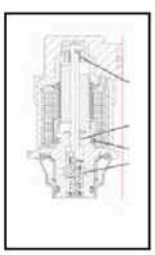


Diagnosis values
Delivery rate [l/h]
Current [A]

Testing point [A]	0.8	1.0	1.2	1.4	1.80
Diagnosis values [l/h]	88.93	68.72	47.17	24.86	0.15

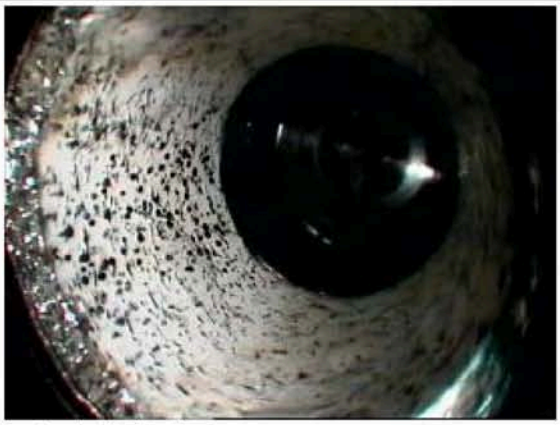
Wear:

External	1	**2**	3	4	**5**	6	7	**8**	9	**10**
contamination:					X					
Damage:					X					
Filter contamination		X								
Filter damage		X								
O-ring outside		X								
Seal		X								

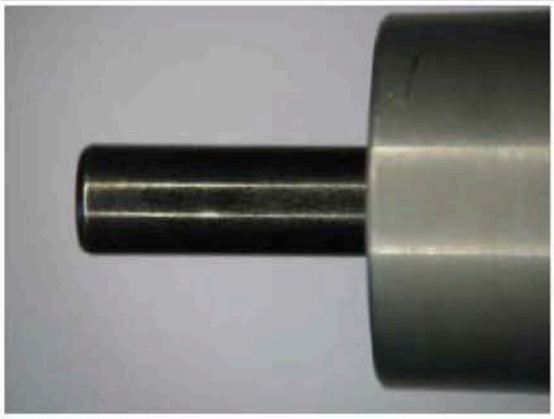


internal	1	**2**	3	4	**5**	6	7	**8**	9	**10**
Tappet housing:		X								
Bearing housing:		X								
Tappet magnetic core:		X								
Bearing magnetic core:		X								
O-ring inside:		X								
Valve piston:		X								

Metering unit 0928400708 serial no. 53 date of manufacture 69006



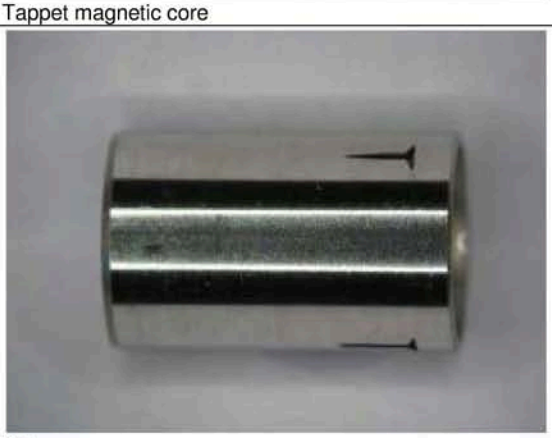
Bearing in the housing



Tappet housing

Tappet magnetic core

Bearing in the magnetic core



Piston

Metering unit housing

Piece of housing broken without impairment of function

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EA11003EN-00891[0]

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/10/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	[redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	190508	0741	5150 JhP (Jihlava plant) - 03
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	715206.002	731223	3VWC781K39M258026
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
731223	Vehicle endurance run	Summer trip Mexico	22769
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
13539 km	10/2/2008	2008-CP4_0776	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-200437		US Field	

Complaint: Restart after vehicle stop not possible due to error indication in the instrument cluster, but no entry in the control unit. Metering unit dismantled to check drivetrain damage and reassembled.

1. Subject

CP4 customer returns diagnosis before endurance run end **with** complaint

Testing conditions: Summer trip Mexico

2. Conclusion

Function

- No function test due to possible drivetrain damage.

Components

- Drivetrain damage of category I (surfaces almost completely worn).
- Particle marks and impressions on almost all of the components due to drivetrain damage.
- Metering unit O-ring sheared over half the circumference of disassembly and reassembly of the metering unit on the vehicle.
- Unusual deposits at the edge of the flange bearing bushing and in the two low-pressure-sided lubrication grooves of the high pressure piston.
- Analysis of the deposit on the flange bearing bushing residues resulting from aging and reaction products of the fuel (see Appendix Report CR / ARA 2008-1206).

Result

- The analysis results of the reddish sticky deposits reveal the presence of proportions from aging fuel and components from reaction products of fuel components and thus an indication of changes to the fuel properties, which may have a worsening effect on the coefficients of friction of the drivetrain parts.
- The damage pattern of the roller support with wear on the C coating in the main load areas (pressure profile) and the indications from the analysis of deposits support the failure hypothesis of an increased mixed friction of the roller in the roller support and as a result of slippage between the roller and cam (stiff roller). This led to the abrasive wear of drivetrain parts and thus failure of the pump.

- The pump **has failed** the durability test.

3. Results of diagnosis (visual findings)

Legend rating stages

OK	X		
uncritical		X	
Critical			X

3.1 Drive

No striking feature

X		

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To:	DS/CSP2-Fernandes DS-PC/EHC2-Kö, DS/SVW-Bucher, -/-Niethammer
For information:	DS-PC/EHC1-Mr, DS-PC/EDI1-PB, DS-PC/EHC2-Gr, DS-PC/EHC1, -/EHC2, -Ak, -/EHP1, -/EHP2, -/EHP-Va, -/ECW W1 -Spr, /- W3-Ls, FeP/COS, -/-2, CVIT/ECP21-Stasi, DS-PC/ENJ, -/ENP, -/EHP

3.2 Drivetrain

[ ] [ ] [x]

Cam with abrasion over the entire running surface and a 90° rotation mark (see Figure 1 and Figure 2); roller with circumferential abrasion and a small and a large 90° wear mark (see Figure 3); US field roller support with C coating wear in the form of pressure profile (see Figure 4); roller support at the contact point of the high-pressure piston with many particle impressions (see Figure 5)

3.3 High pressure

[ ] [x] [ ]

High-pressure piston base with many particle impressions (see Figure 6)

High-pressure piston skirt with many fine grooves or particle marks (see Figure 7)

Deposits in the low-pressure-sided lubrication grooves of the high-pressure piston (see Figure 8)

3.4 Bearing

[ ] [x] [ ]

Radial bearing of the flange (see Figure 9) and housing (see Figure 10) with particle impressions

Bearing area of the camshaft flange-side (see Figure 11) and housing-side (see Figure 12) with particle impressions

3.5 Shaft seal

[x] [ ] [ ]

No striking feature

3.6 Holes

[ ] [x] [ ]

Tappet hole with many particle impressions and drafts (see Figure 13)

3.7 Attached components (metering unit, overflow valve, counting point)

[x] [ ] [ ]

No striking feature

3.8 O-rings

[ ] [ ] [x]

Metering unit O-ring sheared to an extent of about 180° (see Figure 14)

3.9 Other

[ ] [x] [ ]

Deposits on the front surface of the flange bearing bushing along the shaft seal (see Figure 15)

3.10 Images of visual findings

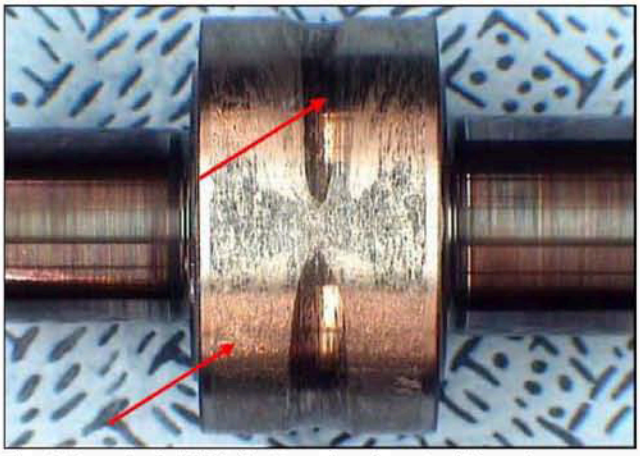

Fig. 1 Camshaft, BDC (bottom dead center) (wear)

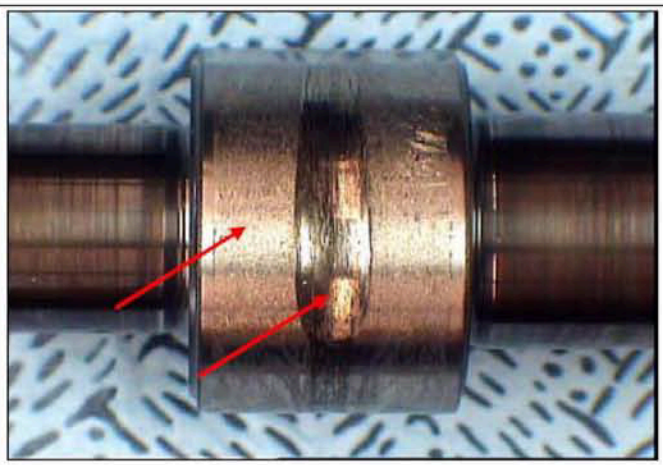

Fig. 2 Camshaft, TDC (top dead center) (wear)

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/10/2008

Department:	Person responsible:	Telephone:	Use	internal	
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For information:	DS-PC/EHC1-Mr, DS-PC/EDI1-PB, DS-PC/EHC2-Gr, DS-PC/EHC1, -/EHC2, -Ak, -/EHP1, -/EHP2, -/EHP-Va, -/ECW W1 -Spr, /- W3-Ls, FeP/COS, -/-2, CVIT/ECP21-Stasi, DS-PC/ENJ, -/ENP, -/EHP

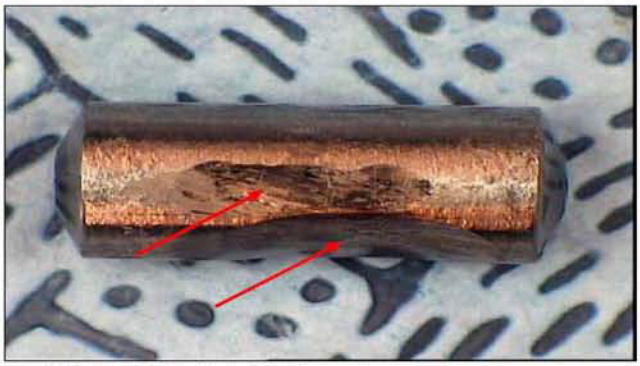

Fig. 3 Roller, lateral surface (wear)

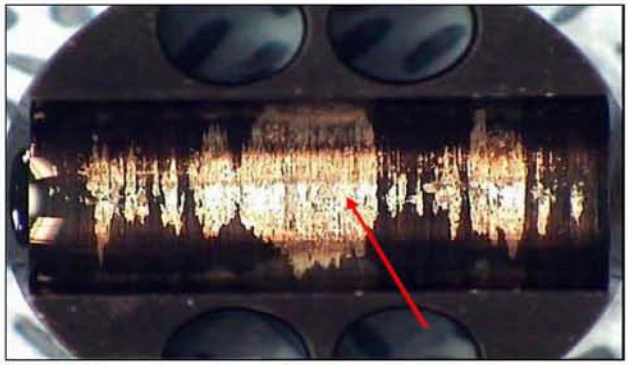

Fig. 4 Roller support, running range (wear)

Fig. 5 Roller support, contact point of high-pressure piston

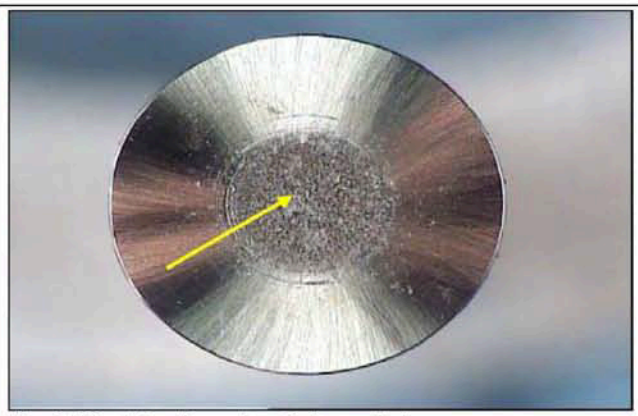

Fig. 6 HP piston base (particle marks)

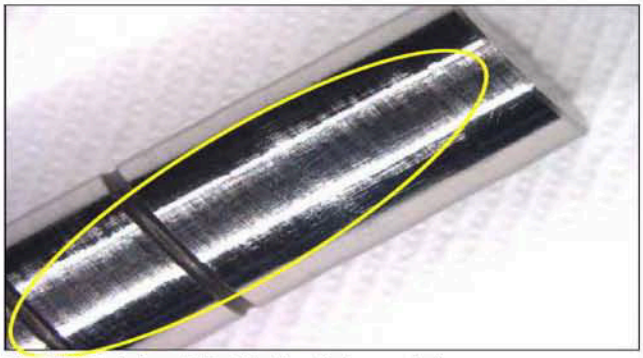

Fig. 7 HP piston, HP-side (particle marks)

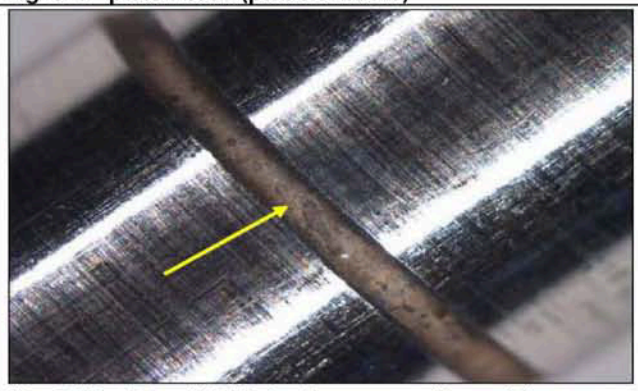

Fig. 8 HP piston, LP lubrication groove (deposits)

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		Date	12/10/2008

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To:	DS/CSP2-Fernandes DS-PC/EHC2-Kö, DS/SVW-Bucher, -/-Niethammer
For information:	DS-PC/EHC1-Mr, DS-PC/EDI1-PB, DS-PC/EHC2-Gr, DS-PC/EHC1, -/EHC2, -Ak, -/EHP1, -/EHP2, -/EHP-Va, -/ECW W1 -Spr, /- W3-Ls, FeP/COS, -/-2, CVIT/ECP21-Stasi, DS-PC/ENJ, -/ENP, -/EHP

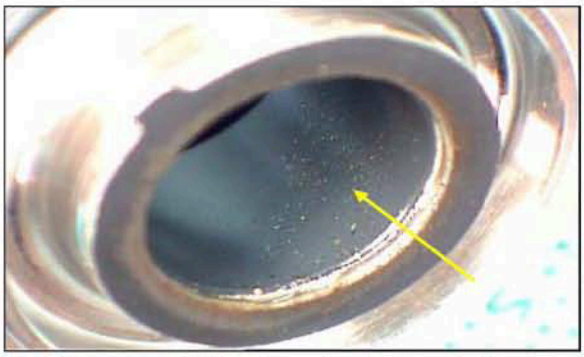

Fig. 9 Flange, radial bearings (particle marks)

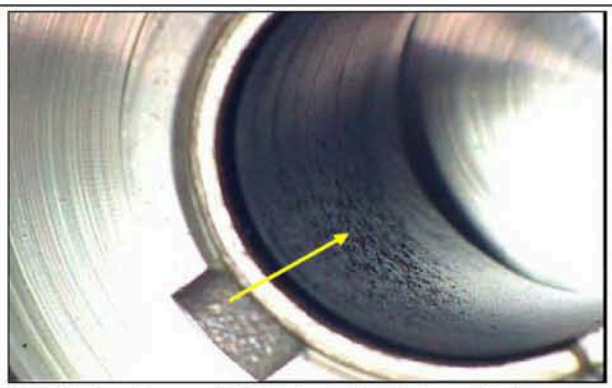

Fig. 10 Housing, radial bearings (particle marks)

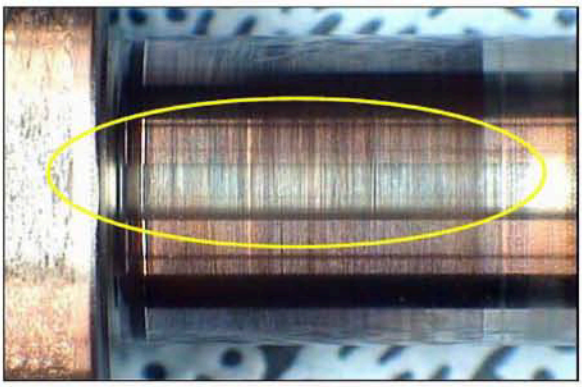

Fig. 11 Camshaft, flange bearing range (particle marks)

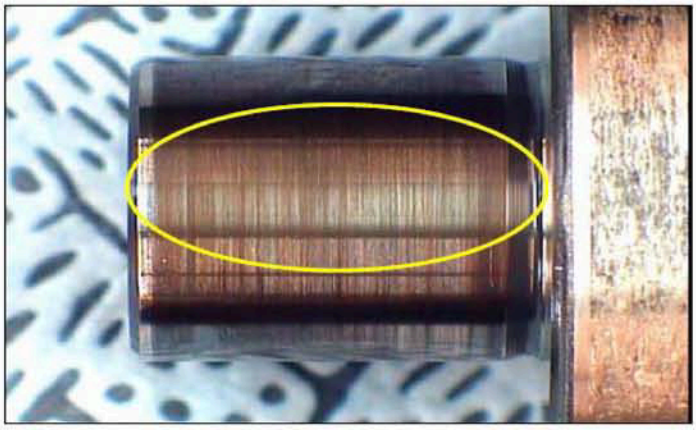

Fig. 12 Camshaft, housing bearing range (particle marks)

Fig. 13 Housing, tappet hole (particle marks)

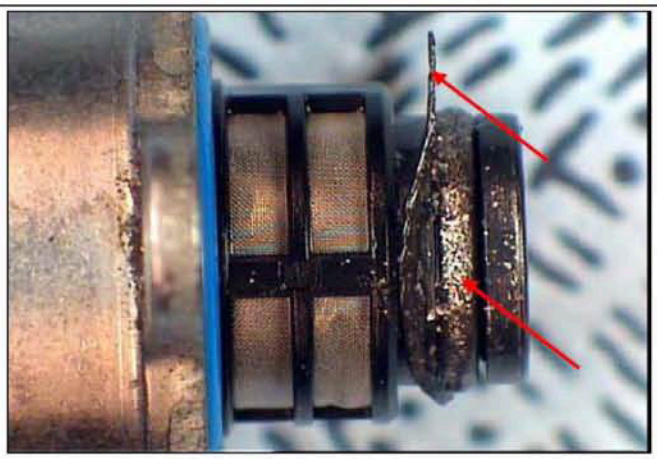

Fig. 14 Metering unit, O-ring (sheared off)

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/10/2008

Department:	Person responsible:	Telephone:	Use	
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To:	DS/CSP2-Fernandes DS-PC/EHC2-Kö, DS/SVW-Bucher, -/-Niethammer
For information:	DS-PC/EHC1-Mr, DS-PC/EDI1-PB, DS-PC/EHC2-Gr, DS-PC/EHC1, -/EHC2, -Ak, -/EHP1, -/EHP2, -/EHP-Va, -/ECW W1 -Spr, /- W3-Ls, FeP/COS, -/-2, CVIT/ECP21-Stasi, DS-PC/ENJ, -/ENP, -/EHP

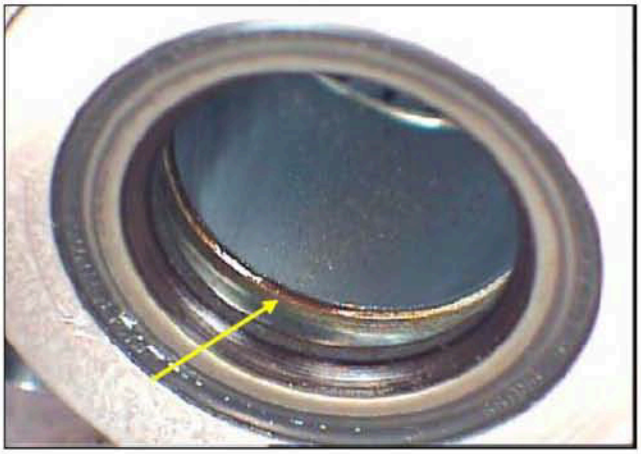

Fig. 15 Flange, the edge of the bearing bush (deposits)

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part	Delivery rate [l/h] after testing

No functional testing due to the complaint.

5. Destiny of the parts

The pump is stored at RB until 03/2009 and then scrapped.

6. Attachments

CR/ARA 2008-1206

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	12/16/2008	Signature:	Non-responsive content removed
Department:		Phone		Date:	12/17/2008	Signature:	
Department:		Phone		Date:	12/17/2008	Signature:	

DIN EN ISO 9001: 2000
Version December 2000
This certificate is valid until 2008-12-06
Certificate registration no. 004778 QM
Frankfurt am Main 2005-12-07

BOSCH

CR/ARA Corporate Sector Research and Advance Engineering Applied Research 1 - Analytics

CR / ARA analysis report, analysis number: 2008-1206

dated 11.27.2008 Version 1

Order: 2008-CP4-0776 Deposit analysis of flange bearing bushing / VW R4 2.0l EU5 / failure vehicle testing [redacted] / pump #190508-0741

Client: [redacted]
Receipt of samples: 11/3/2008

Analysis coordinator: [redacted]

	Analysis no. 2008-1206	Author [redacted]	Date 11/27/2008

Client: Non-responsive content removed
Site / dept.:
Case / carton:
PSP element: 30-101005-07
c.c.: [redacted]

Telephone: Non-responsive content removed
Fax:
Receipt: 11/3/2008

Order: **2008-CP4-0776 Deposit analysis of flange bearing bushing / VW R4 2.0l EU5 / failure vehicle testing Mexico / pump #190508-0741**

Procedure: **IR / UV / VIS (infrared/ultraviolet/visible) spectrometry, electron microscopy (scanning electron microscope-SEM), EDS / WDS**
Employee: Non-responsive content removed

Question:
Identification and origin of the deposit on the front surface of the flange bearing bushing of a CP4.

Result:
The deposit is mainly composed of defined soaps and small amounts of carbonyl compounds (possibly fuel aging products). The observed metal particles were probably entrained by the damage process.
The tin particles found in the deposit may have originated from the detachment of the residue from the bushing (galvanization of the wide band).

Conclusion:
The residues are reaction and aging products of the fuel used.

Person in charge: [redacted]
Tel.: [redacted]

Date: 11/27/2008
Signature: Signed by [redacted]

2211RB14

	Analysis no. 2008-1206	Author [redacted]	Date 11/27/2008

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BOSCH	Analysis report	Version / supplement 1	[redacted]
CR/ARA	Analysis no. 2008-1206	Author [redacted]	Date 11/27/2008

1. Samples and further information on the order

Common rail pump 2008-CP4-0776 with a reddish deposit on the front surface of the flange bearing bushing to the shaft seal.

VW R4 2.0l EU5, pump # 190508-0741. VW EU5 pump for diesel fuel EN590 validated.

Drivetrain failure of the pump (roller / cam due to wear) in summer trials in Mexico after 13,539 km.
Fuel used and the exact running times in Mexico and Germany are not known.

BOSCH	Analysis report	Version / supplement 1	[redacted]
CR/ARA	Analysis no. 2008-1206	Author [redacted]	Date 11/27/2008

2. Detailed results of the methods used

2.1. Fourier Transform Infrared Spectrometry (FTIR)

Objective:
Identification of the deposit composition on the flange bearing bushing of CP4.

Sample preparation:
The deposit was applied on a sample carrier (potassium bromide disk) and measured, then rinsed with methylene chloride on the sample holder and measured again.

Measurement procedure:
The measurements of the deposit was made on the IR (infrared) microscope Equinox-55-1 spectrometer (device SOP OA-G-08-001) from Bruker in transmission mode.

Analysis of the measurements:
The obtained IR (infrared) spectra were evaluated using computerized databases, own and commercially available spectral collections.

Measuring results:
Hydrocarbons with / and low content of esters and weaker acids adhere to the deposit; they could be isolated by treatment with dichloromethane.
According to the IR spectra, the dichloromethane-insoluble deposit is mainly composed of defined soaps as well as small amounts of carbonyl compounds (esters, weaker acids). The IR (infrared) spectra revealed no evidence of significant entrainment of inorganic components.

Assessment:
The deposit is mainly composed of defined soaps and small amounts of carbonyl compounds (possibly fuel aging products).

The fuel used is not known, therefore we cannot accurately classify the carbonyl compounds.

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BOSCH	Analysis report	Version / supplement 1	[redacted]
CR/ARA	Analysis no. 2008-1206	Author [redacted]	Date 11/27/2008

2.2. Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS)

Objective:
Analysis of the composition (elements) of the residue on the front surface of the flange bearing bushing.

Sample preparation:
The residue was removed with a preparation needle and rinsed with petroleum ether.

Measurement points:
The residue was analyzed directly on the preparation needle.

Measurement procedure:
The analysis was carried out using SEM (Scanning Electron Microscopy) (1450 VP, Zeiss) and the coupled EDS (Energy Dispersive Spectroscopy) system (INCA Energy, Oxford Instruments Co.). An accelerating voltage of 20.0 KV was used.

Measuring results:
The preparation needle is made of nickel-plated steel. The first spectrum shows the needle material.

The particles next to the residue consist of iron (Fe), with minor amounts of chromium (Cr), molybdenum (Mo), tungsten (W) and manganese (Mn). In addition, particles of tin (Sn) occur. The residue itself consists mainly of carbon (C) with small amounts of nitrogen (N) and oxygen (O). Within the residue there are tiny particles of iron (Fe) and oxygen (O).

Assessment:
Besides containing various metal particles, the residue is an organic residue (fuel conversion?) with fine iron particles. These very fine iron particles which rapidly oxidize (rust) would be responsible for the (reddish-brown) color.

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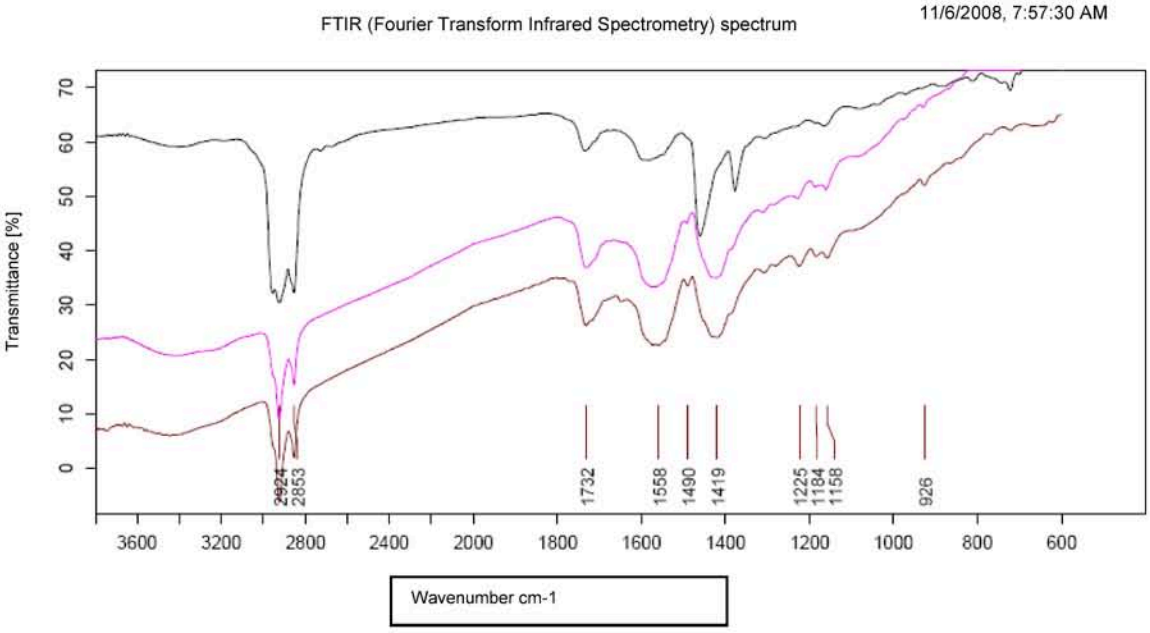
BOSCH	Analysis report	Version / supplement 1	[redacted]
CR/ARA	Analysis no. 2008-1206	Author [redacted]	Date 11/27/2008

3. Appendix

3.1. Appendix for the Fourier Transform Infrared Spectrometry (FTIR)

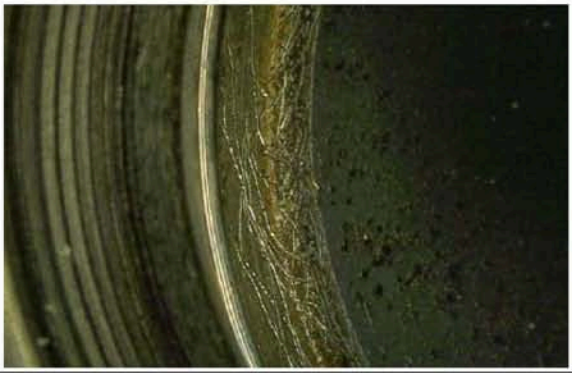


CR CP4 with reddish-brown, CH2Cl2-insoluble deposit on the front surface of the flange bushing to the shaft seal 2008-1206-1.0
CR CP4 with reddish-brown, CH2Cl2-insoluble deposit on the front surface of the flange bushing to the shaft seal 2008-1206-1.3
CR CP4 with reddish-brown, CH2Cl2-insoluble deposit on the front surface of the flange bushing to the shaft seal 2008-1206-1.4
Measuring method: Equinox-I-Mikroskop-Transmission-MCT.XPM Person responsible: [redacted]
ARA no.: 2008-1206-1.0

3.2. Appendix to SEM-EDS

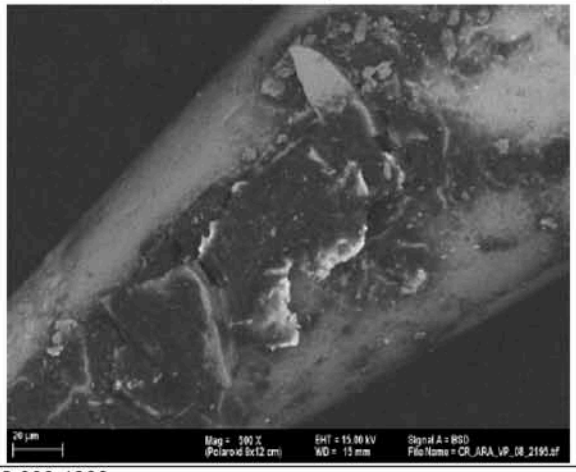
A photo report (Bilder_2008-1206.pdf) and an EDS report (EDS_2008-1206.pdf) were created. These will be added to the analysis report separately.

Photo report CR / ARA **11.10.2008**



2.008-1206
CR_ARA_M_08_1759
Overview of flange bearing bushing with detached residues

2.008-1206
CR_ARA_M_08_1760
Residue on preparation needle for analysis



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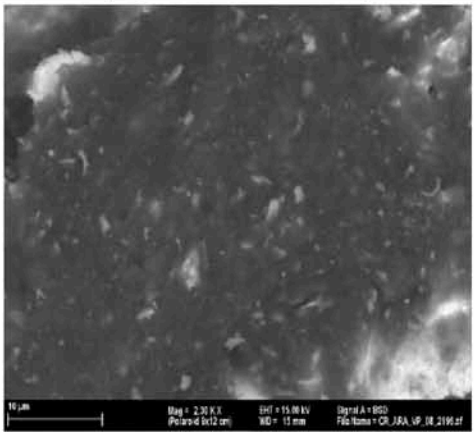

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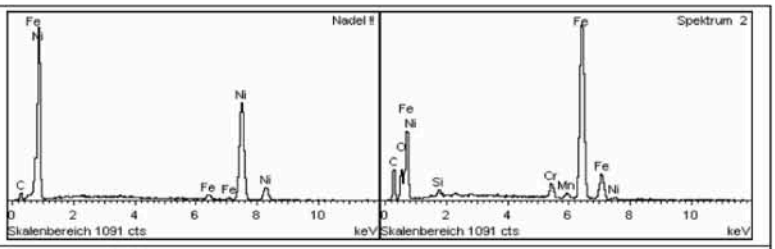
Residue on preparation needle for analysis

Photo report CR / ARA EDS report	2.008-1206	BOSCH	
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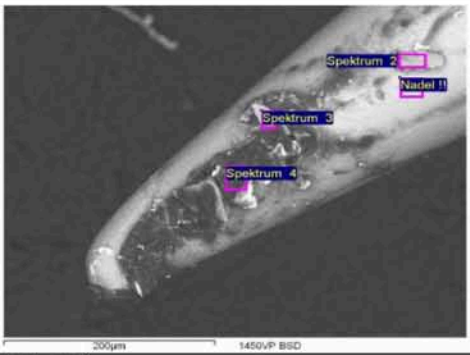
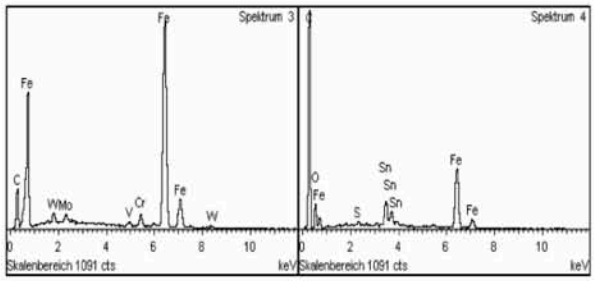
Sample: Residue on preparation needle Type: Specification ID:			

	
Spectrum 2 Spectrum 3 Spectrum 4 Needle !!	Scale range 1091 cts Spectrum 3 Spectrum 4
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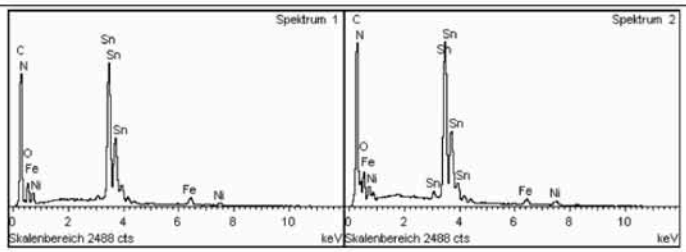
EA11003EN-00891[14]

Photo documentation / SEM / EDS report 2.008-1206	BOSCH	
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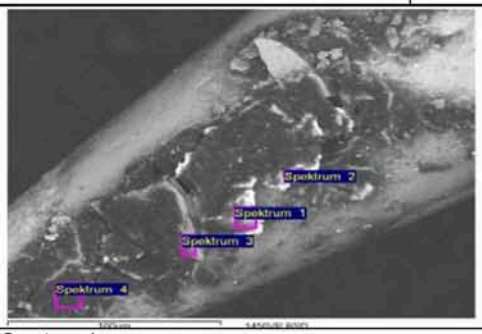
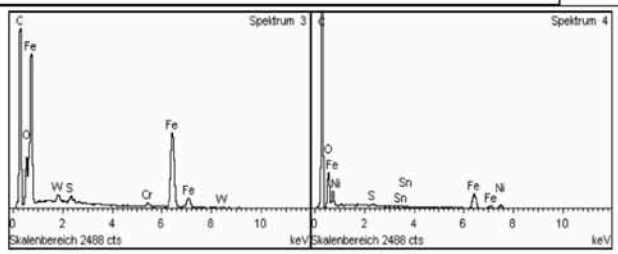
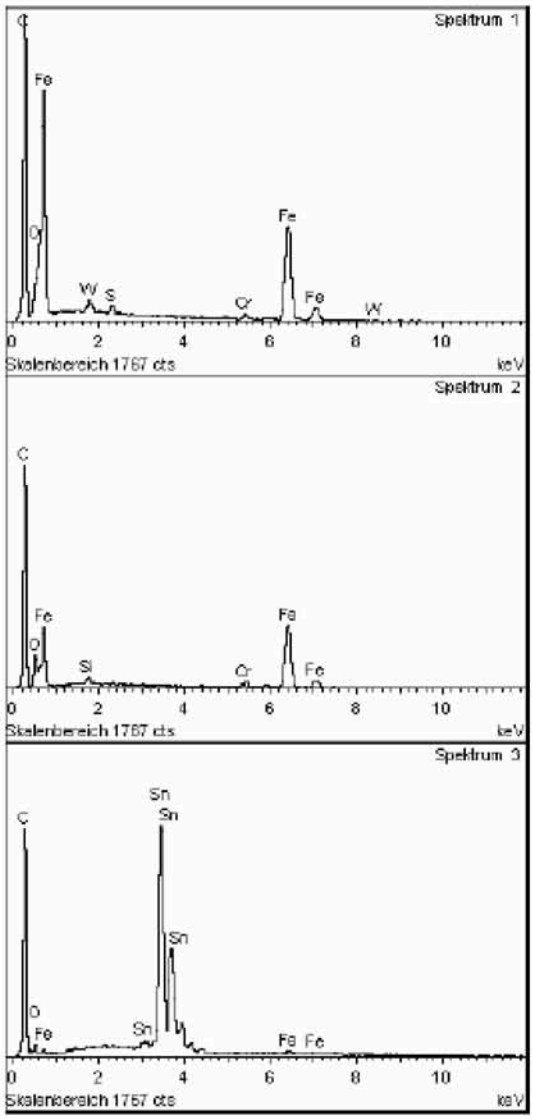
		
Spectrum 1 Spectrum 2 Spectrum 3 Spectrum 4	Scale range 2488 cts Spectrum 3 Spectrum 4	
Magnification: 500 X Acceleration voltages (kV): 15.00 Process time: 6		

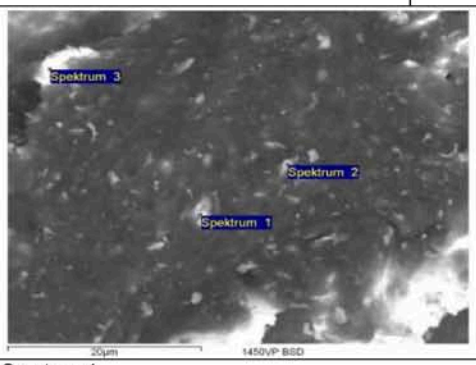
EA11003EN-00891[15]

Photo report CR / ARA EDS report	2.008-1206

BOSCH



Project: 2.008-1206 Owner: [redacted] Area: Work area 3	Scale range 1767 cts Spectrum 1 Spectrum 2
Sample: Residue on preparation needle Type: Specification ID:	Spectrum 3



Spectrum 1
Spectrum 2
Spectrum 3

Magnification: 2299 X
Acceleration voltages (kV): 15.00
Process time: 6

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		Date	12/15/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21070	150408	0681	0110 FeP – 04
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-02	718361.002	731223	CBA 655 000260
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
731223	Vehicle endurance run	VW-Passat PQ46	23034
VA / ETC no.:	**Actual mileage**	**Fuel:**	**Confidentiality note**
DS-202949	100000 km	EN590	Confidential

1. Subject

CP4 customer return
Verification modification package 3 (design package)
Diagnosis after endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear due to cavitation erosion in the contact area of the high-pressure piston to the roller support occurs only on the roller support back and slightly more pronounced than that of comparable endurance runs.
- The groove in the C coating of the roller support was probably caused by a particle
- Wear of the remaining components is low and without significant striking features.

Change package 3

Roller support with C2.1 coating

- Features C2.1 coating is not visible over the TTNR of the roller support (6007 = series) and was detected by EDX

Roller: C2 tip coating, a second supplier, short design

- Front surface without the characteristic groove (see Figure 4 and Figure 5 in Appendix 1).
- Length of roller 24.58 mm

Camshaft: Omission of shot blasting

- Missing shot blasting impressions visible (see Figure 6 and Figure 7 in Appendix 1).

spring seat: Omission of anti-friction coating

- Front surface of the spring plate without anti-friction paint (see Figure 8 and Figure 9 in Appendix 1).

Cylinder head: Non-return valve hemispherical head with red. Play

- Hemispherical head with characteristic groove on the surface (see Figure 10 in Appendix 1).

Opening pressure lowering non-return valve:

- Spring seat with characteristic groove on the surface (see Figure 11 in Appendix 1), opening pressure after the endurance run 1.18 bar.

Bearing bushing: Second supplier

- Identification recognizable via tappet latching (see Figure 14 in Appendix 1).

Metering unit: NC bearing

- see metering unit report ZVM 689 (picture on page 3 "bearing in the housing")

Result

- The components with modification package 3 have a wear rating green.
- The pump has passed the endurance run.

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/15/2008

Department:	Person responsible:	Telephone:	Use	internal / external
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3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Cavitation erosion on the roller support back on the piston contact point (see Figure 1), but only very low cavitation erosion on the high-pressure piston base (see Figure 2) — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK: x

3.8 O-rings

No striking feature — OK: x

3.9 Other

No striking feature — OK: x

3.10 Images of visual findings

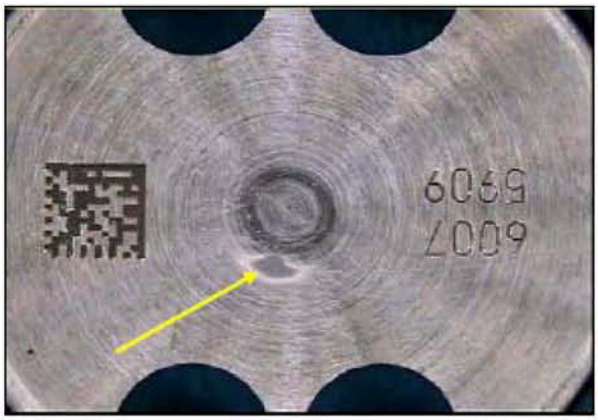


Fig. 1 Roller support, HP piston contact (cavitation)

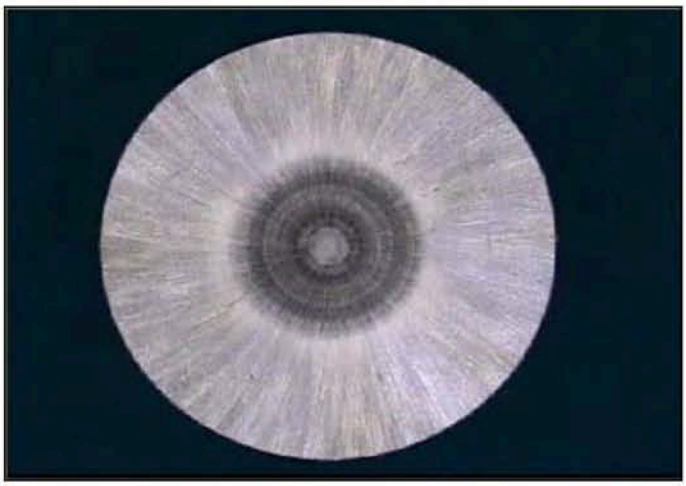


Fig. 2 HP piston, piston base *(very low* cavitation)

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/15/2008

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 4/16/2008	Delivery rate [l/h] after testing 11/10/2008			
Starting point	200	200	0.4	4	4.2	x		
1000 rpm, p_rated	1000	1800	0.4	17.1	17.4	x		
n_max_p, 500bar	3375	500	0.4	64.3	66.3	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 12/2010 and then scrapped.

6. Attachments

Appendix 1: Images of visual findings

Appendix 2: Metering unit diagnosis report ZMV 688

Tested:	Non-responsive content removed	**Phone:**	Non-responsive content removed	**Date:**	12/16/2008	**Signature:**	Non-responsive content removed
Department:		**Phone:**		**Date:**	2/17/2008	**Signature:**	
Department:		**Phone:**		**Date:**	2/17/2008	**Signature:**	

2008-CP4_0824 Appendix 1: Images of visual findings of modification package 3

Fig. 1 Type plate

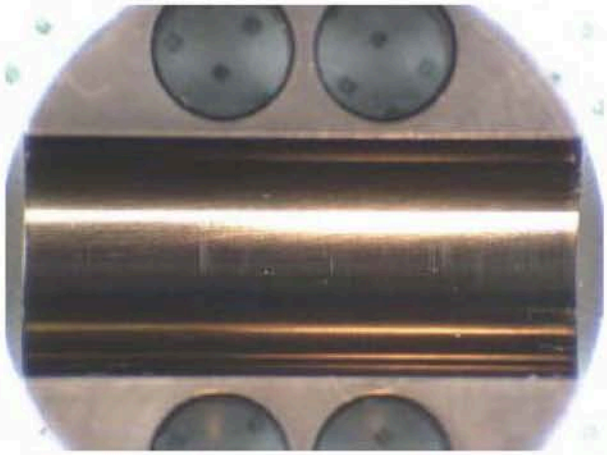


Fig. 2 Roller support running surface

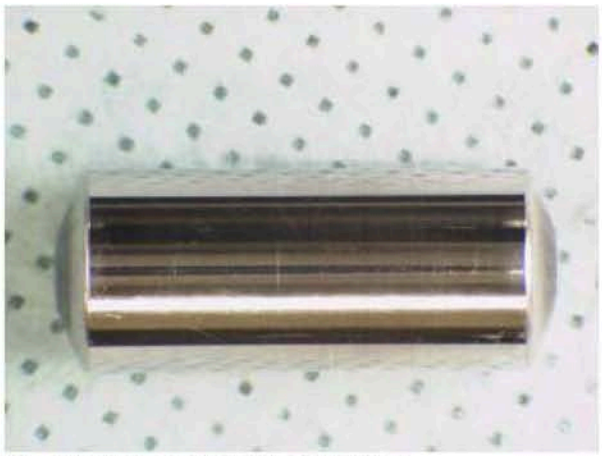


Fig. 3 Roller support lateral surface

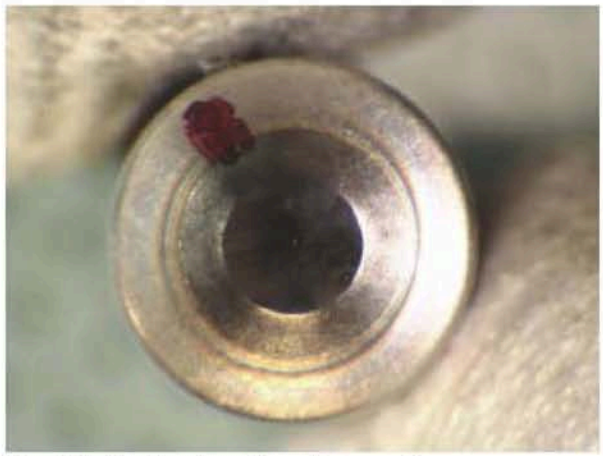


Fig. 4 Roller front surface, flange-side

Fig. 5 Roller front surface, housing-side

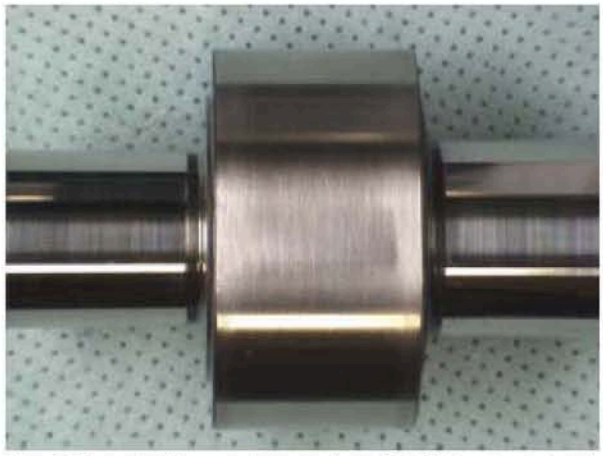


Fig. 6 Camshaft running surface BDC (bottom dead center)

2008-CP4_0824 Appendix 1: Images of visual findings of modification package 3

Fig. 7 Camshaft running surface TDC (top dead center)

Fig. 8 Spring plate, spring-sided

Fig. 9 Spring plate, tappet-sided

Fig. 10 Non-return valve lateral surface (guidance)

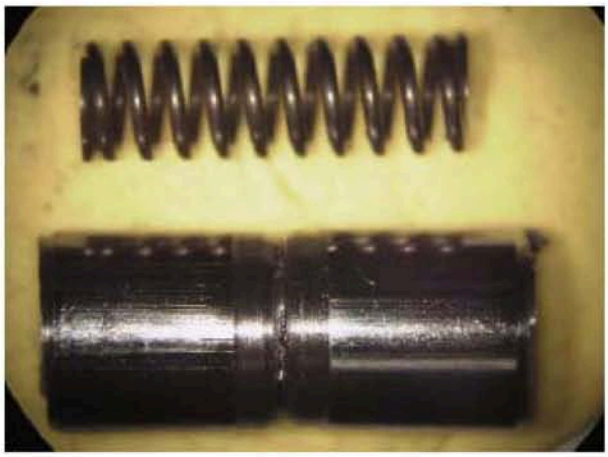


Fig. 11 Non-return valve spring and non-return valve spring seat

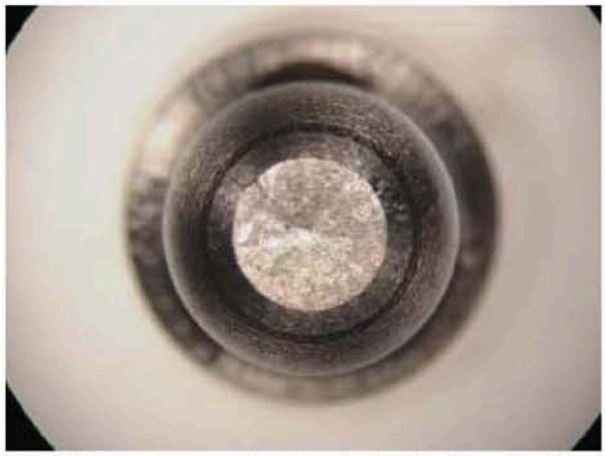


Fig. 12 Non-return valve hemispherical head sealing surface

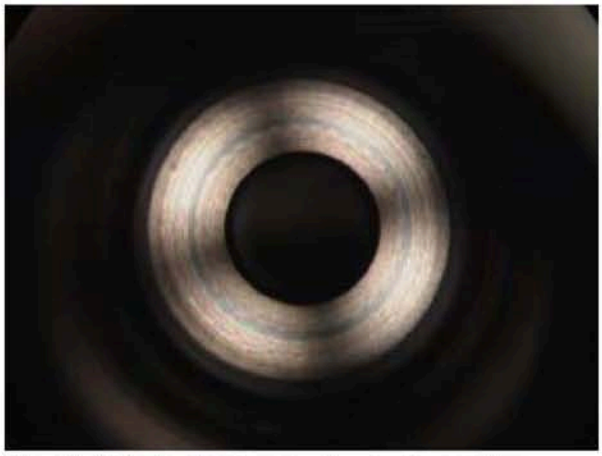


Fig. 13 Cylinder head non-return valve sealing surface

Fig. 14 Flange bearing bushing

Fig. 15 Housing bearing bushing

BOSCH CP4	Diagnosis ZVM 688	Waiblingen, 12.01.2008
Metering unit 0928400706 serial no. 10469 date of manufacture 88404		

Customer VW
To Non-responsive content removed
Cc

Pump **Serial No. Date of manufacture**
Endurance run diagnosis no. 2008_CP4-0824
SAP

1. Description

Metering unit complaint: Testing release
System design
Endurance run type
Running time

Remark:
Fuel:

2. Diagnosis

- **Visual findings (external):**
Visual findings externally good. Housing undamaged. Hydraulics and filter clean, undamaged.
- **Function:**
The characteristic curve of the displacement / current measurement is OK.
During the delivery rate / current measurement, all values are within the tolerances.
- **Wear:**
There are no or only slight running marks on the components.
- **Other:**

3. Result

[X] Passed ***[ ] Conditionally passed*** ***[ ] Failed***

The metering unit is functionally OK, delivery rate and displacement measurements yielded positive results. Wear of the components is low.

4. Corrective actions

No error.

5. Other tests (e.g. material analysis. process analysis)

No further tests are performed.

6. Destiny of the parts

Metering unit remains with Non-responsive content removed

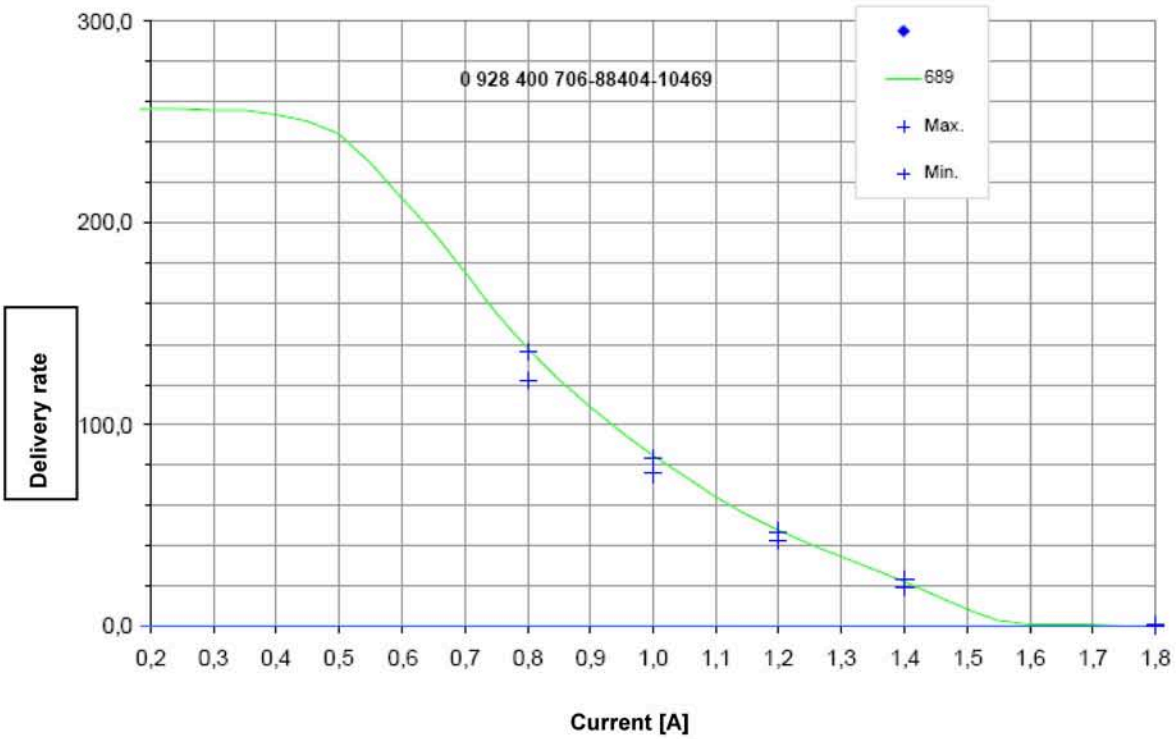
Person responsible:	Non-responsive content removed	
Approval:	Non-responsive content removed	

Date/Signature

BOSCH CP4	Diagnosis ZVM 688	Waiblingen, 11.27.2008

Metering unit 0928400706 serial no. 10469 date of manufacture 88404

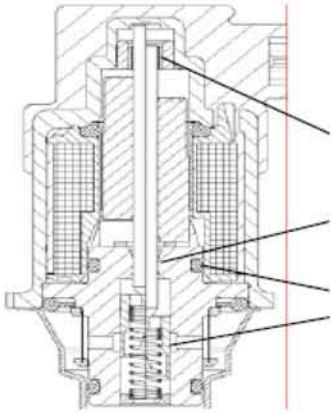
Function:



Testing point [A]	0.80	1.00	1.20	1.40	1.80
Diagnosis values [l/h]	136.37	82.95	46.04	20.44	0.33

Wear:

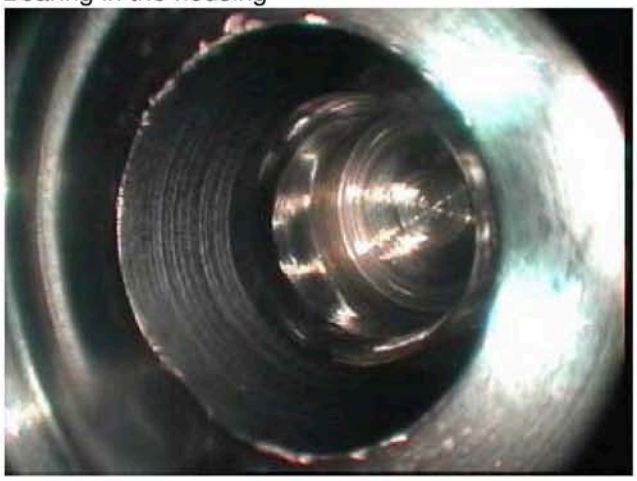
External	1	2	3	4	5	6	7	8	9	10
contamination:		x								
Damage:		x								
Filter contamination		x								
Filter damage		x								
O-ring outside		x								
Seal		x								



internal	1	2	3	4	5	6	7	8	9	10
Tappet housing:		x								
Bearing housing:		x								
Tappet magnetic core:		x								
Bearing magnetic core:		x								
O-ring inside:		x								
Valve piston:		x								

BOSCH CP4	Diagnosis ZVM 688	Waiblingen, 11.27.2008
Metering unit 0928400706 serial no. 10469 date of manufacture 88404		

Bearing in the housing



Tappet housing

Tappet magnetic core

Bearing in the magnetic core

Piston

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/15/2008

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C1 / C1
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21070	150408	0679	0110 FeP – 04
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-02	718361.001	731223	CBA 655 000268
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
731223	Vehicle endurance run	VW-Passat PQ46	23033
VA / ETC no.:	**Actual mileage**	**Fuel:**	**Confidentiality note**
DS-202948	10/17/2007	EN590	Confidential

1. Subject

CP4 customer return
Verification modification package 3 (design package)
Diagnosis after endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear due to cavitation erosion in the contact area of the high-pressure piston to the roller support occurs only on the roller support back and slightly more pronounced than that of comparable endurance runs.
- The groove in the C coating of the roller support was probably caused by a particle
- The metering unit diagnosis did not show any significant striking features (see Appendix CVM 689).
- Wear of the remaining components is low and without significant striking features.

Change package 3

Roller support with C2.1 coating

- Features C2.1 coating is not visible over the TTNR of the roller support (6007 = series) and was detected by EDX

Roller: C2 tip coating, a second supplier, short design

- Front surface without the characteristic groove (see Figure 4 and Figure 5 in Appendix 1).
- Length of roller 24.59 mm

Camshaft: Omission of shot blasting

- Missing shot blasting impressions visible (see Figure 6 and Figure 7 in Appendix 1).

spring seat: Omission of anti-friction coating

- Front surface of the spring plate without anti-friction paint (see Figure 8 and Figure 9 in Appendix 1).

Cylinder head: Non-return valve hemispherical head with red. Play

- Hemispherical head with characteristic groove on the surface (see Figure 10 in Appendix 1).

Opening pressure lowering non-return valve:

- Spring seat with characteristic groove on the surface (see Figure 11 in Appendix 1), opening pressure after the endurance run 1.19 bar.

Bearing bushing: Second supplier

- Identification recognizable via tappet latching (see Figure 14 in Appendix 1).

Metering unit: NC bearing

- see metering unit report ZVM 689 (picture on page 3 "bearing in the housing")

Result

- The components with modification package 3 have a wear rating green.
- The pump has passed the endurance run.

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/15/2008

Department:	Person responsible:	Telephone:	Use	internal / external
Non-responsive content removed				x

3. Results of diagnosis (visual findings)

Legend rating stages: OK | uncritical | Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

uncritical: x

Cavitation erosion on the roller support back on the piston contact point (see Figure 1), but only very low cavitation erosion on the high-pressure piston base (see Figure 2)

Groove in the C coating on the roller support, roller hole (see Figure 3)

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature — OK: x

3.8 O-rings

No striking feature — OK: x

3.9 Other

No striking feature — OK: x

3.10 Images of visual findings

Fig. 1 Roller support, HP piston contact (cavitation)

Fig. 2 HP piston, piston base (very low cavitation)

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	03.272008

Department:	Person responsible:	Telephone:	Use	internal	
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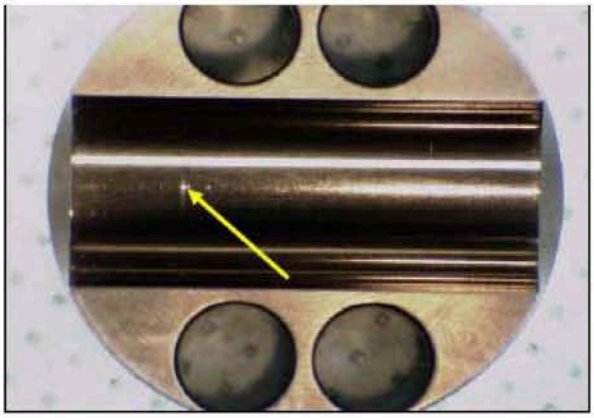


Fig. 3 Roller support, roller hole (particle mark)

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 4/16/2008	Delivery rate [l/h] after testing 11/10/2008			
Starting point	200	200	0.4	3.9	4.2	x		
1000 rpm, p_rated	1000	1800	0.4	16.8	17	x		
n_max_p, 500bar	3375	500	0.4	65.9	65.6	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 12/2010 and then scrapped.

6. Attachments

Appendix 1: Images of visual findings

Appendix 2: Metering unit diagnosis report ZMV 689

Tested:	Non-responsive content removed	**Phone:**	Non-responsive content removed	**Date:**	12/16/2008	**Signature:**	Non-responsive content removed
Department:		**Phone:**		**Date:**	2/17/2008	**Signature:**	
Department:		**Phone:**		**Date:**	2/17/2008	**Signature:**	

2008-CP4_0823 Appendix 1: Images of visual findings of modification package 3

Fig. 1 Type plate

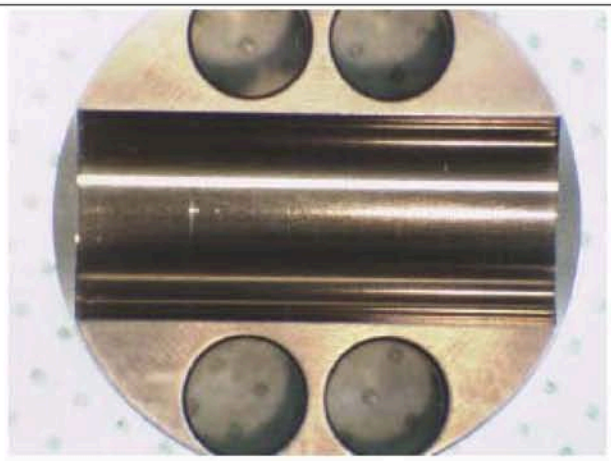


Fig. 2 Roller support running surface

Fig. 3 Roller support lateral surface

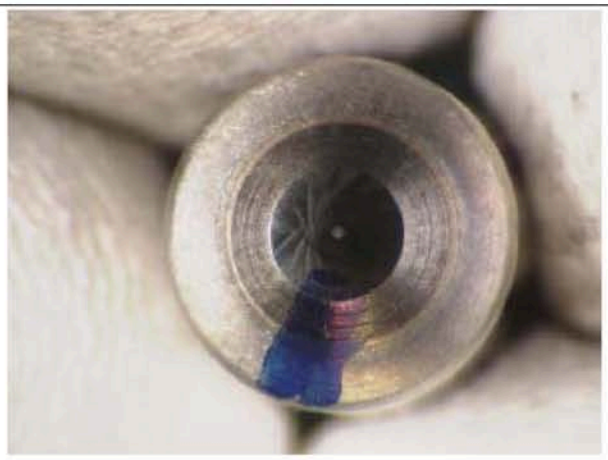


Fig. 4 Roller front surface, flange-side

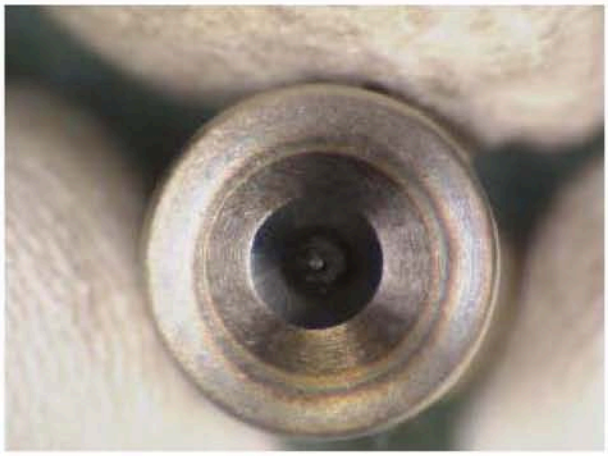


Fig. 5 Roller front surface, housing-side

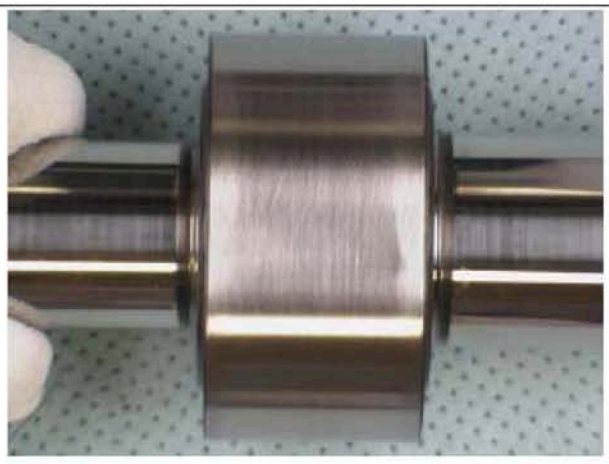


Fig. 6 Camshaft running surface BDC (bottom dead center)

2008-CP4_0823 Appendix 1: Images of visual findings of modification package 3

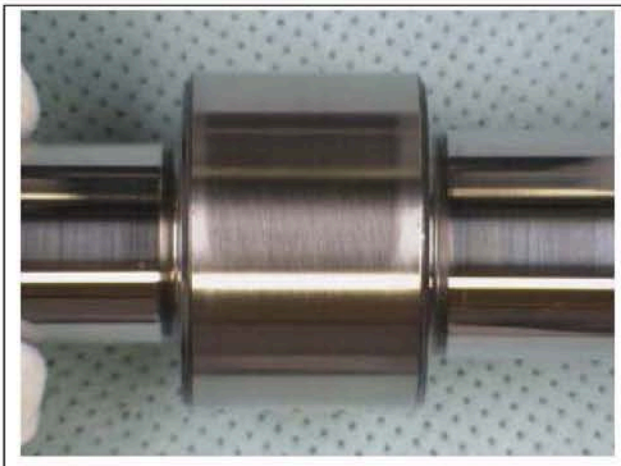


Fig. 7 Camshaft running surface TDC (top dead center)

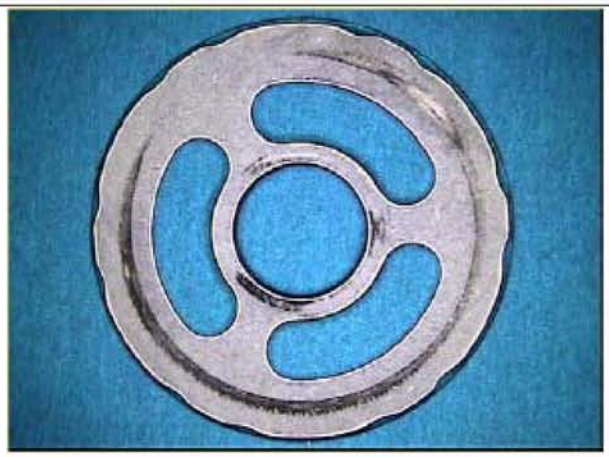


Fig. 8 Spring plate, tappet-sided

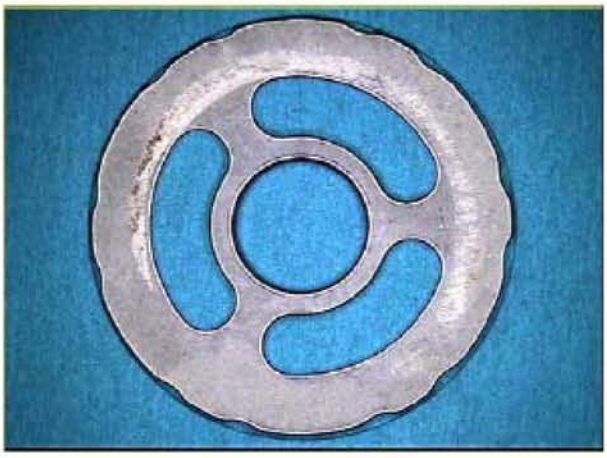


Fig. 9 Spring plate, spring-sided

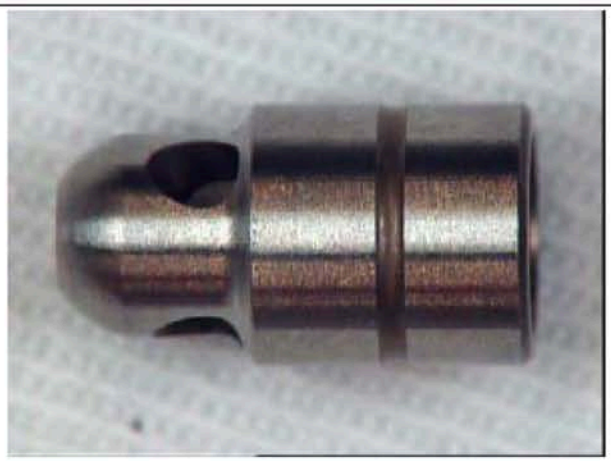


Fig. 10 Non-return valve lateral surface (guidance)

Fig. 11 Non-return valve spring and non-return valve spring seat

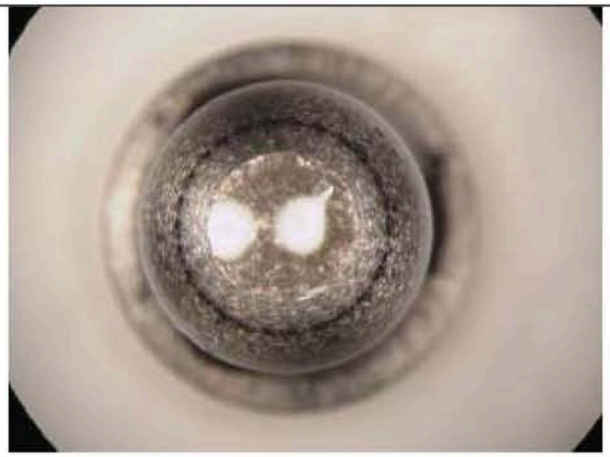


Fig. 12 Non-return valve hemispherical head sealing surface

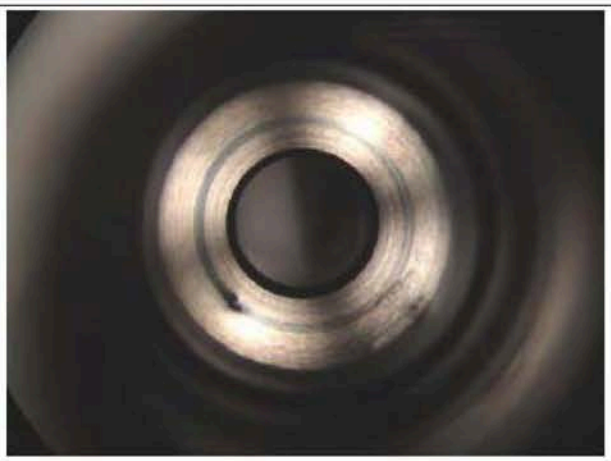


Fig. 13 Cylinder head non-return valve sealing surface

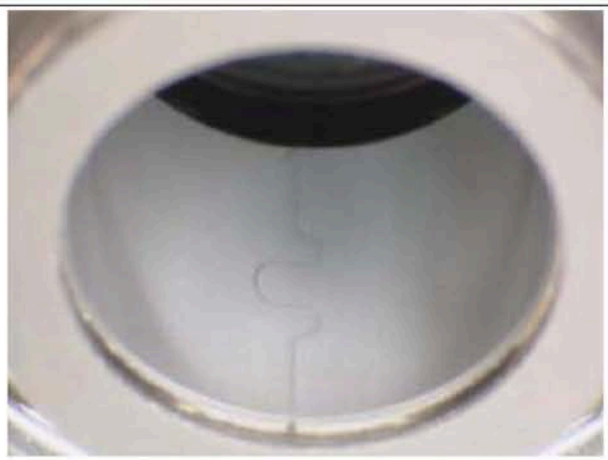


Fig. 14 Flange bearing bushing

Fig. 15 Housing bearing bushing

BOSCH CP4	Diagnosis ZVM 689	[redacted] 12.01.2008
Metering unit 0928400706 serial no. 10469 date of manufacture 88404		

Customer VW
To Non-responsive content removed
Cc

Pump **Serial No. Date of manufacture**
Endurance run diagnosis no. 2008_CP4-0823
SAP

1. Description

Metering unit complaint: Testing release
System design
Endurance run type
Running time

Remark:
Fuel:

2. Diagnosis

- **Visual findings (external):**
Visual findings externally good. Housing undamaged. Hydraulics and filter clean, undamaged.
- **Function:**
The characteristic curve of the displacement / current measurement is OK.
Characteristic curve in the upper delivery rate range slightly above the upper tolerance limit
- **Wear:**
There are no or only slight running marks on the components.
- **Other:**

3. Result

[X] Passed ***[ ] Conditionally passed*** ***[ ] Failed***

The metering unit is functionally OK, delivery rate and displacement measurements yielded positive results. Wear of the components is low.

4. Corrective actions

No error.

5. Other tests (e.g. material analysis. process analysis)

No further tests are performed.

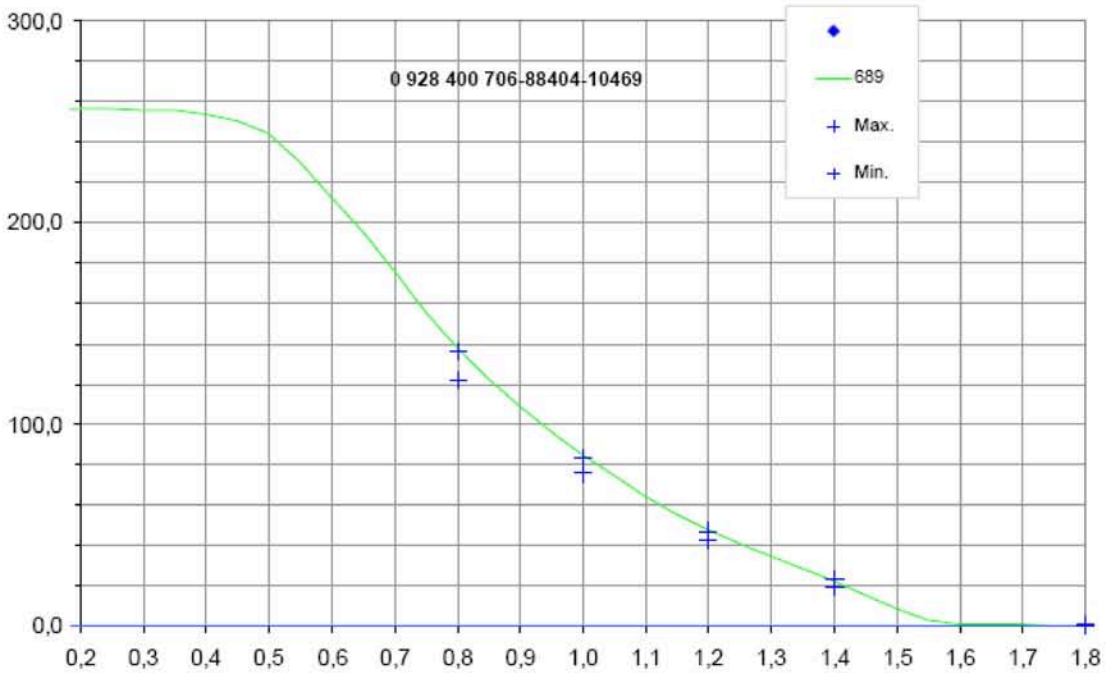
6. Destiny of the parts

Metering unit remains with [redacted]

Person responsible: [redacted]	
Approval: 2764 Non-responsive content removed	Date/Signature

BOSCH CP4	Diagnosis ZVM 689	[redacted] 11.27.2008
Metering unit 0928400706 serial no. 10469 date of manufacture 88404		

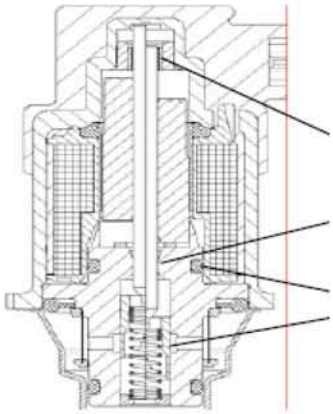
Function:



Testing point [A]	0.80	1.00	1.20	1.40	1.80
Diagnosis values [l/h]	137.56	84.91	47.49	21.93	0.23

Wear:

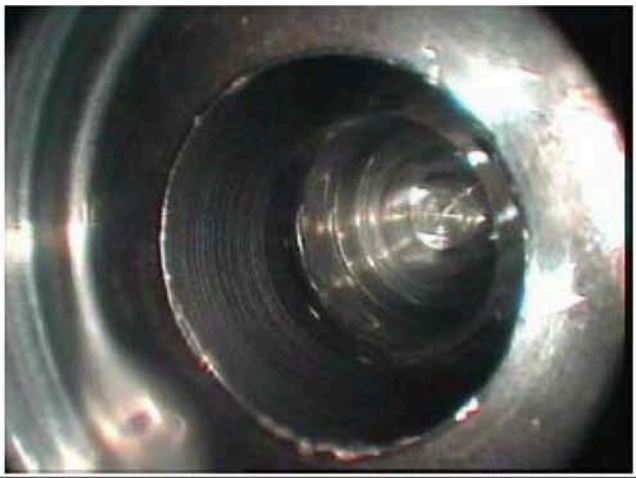
External	1	2	3	4	5	6	7	8	9	10
contamination:		x								
Damage:		x								
Filter contamination		x								
Filter damage		x								
Filter damage		x								
Seal		x								



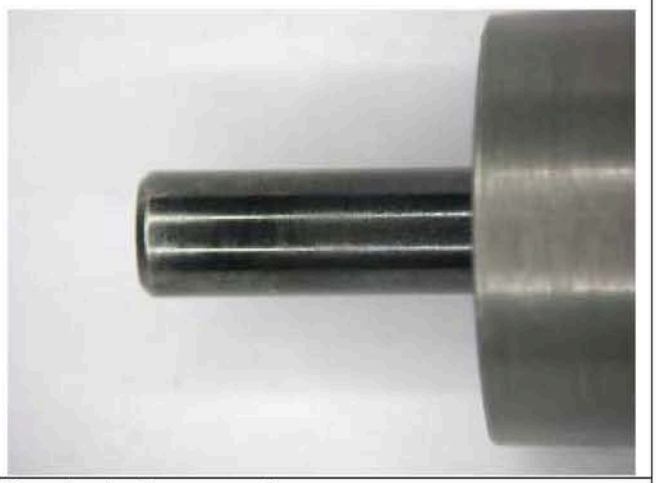
internal	1	2	3	4	5	6	7	8	9	10
Tappet housing:		x								
Bearing housing:		x								
Tappet magnetic core:		x								
Bearing magnetic core:		x								
O-ring inside:		x								
Valve piston:		x								

BOSCH CP4	Diagnosis ZVM 689	[redacted] 11.27.2008
Metering unit 0928400706 serial no. 10469 date of manufacture 88404		

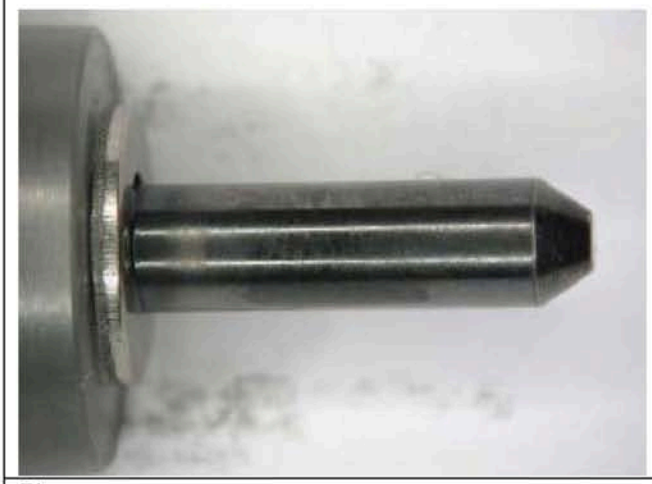
Bearing in the housing



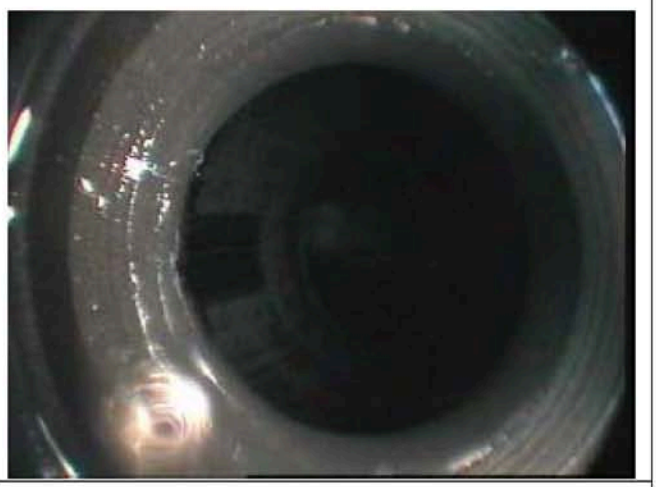
Tappet housing



Tappet magnetic core



Bearing in the magnetic core



Piston

EA11003EN-00894[0]

BOSCH

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	6/23/2008

Department:	Person responsible:	Telephone:	Use	
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			external	x

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21057	050607	0355	0110 FeP (Feuerbach plant)
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101008-01	594599,001	03L 130 755	CAH0000092
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
03L 130 755	Vehicle endurance run	not known	20851
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
27655 km	4/3/2008	2008-CP4_0289	Confidential
VA / ETC no.:	**Durability test type [RB]:**		
DS-180763			

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

The pump has **passed** the test.

3. Results of diagnosis (visual findings)

Legend rating stages	OK	uncritical	Critical
	X		
		X	
			X

3.1 Drive

No striking feature

OK	uncritical	Critical
X		

3.2 Drivetrain

No striking feature

OK	uncritical	Critical
X		

3.3 High pressure

No striking feature

OK	uncritical	Critical
X		

3.4 Bearing

No striking feature

OK	uncritical	Critical
X		

3.5 Shaft seal

No striking feature

OK	uncritical	Critical
X		

3.6 Holes

No striking feature

OK	uncritical	Critical
X		

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature

OK	uncritical	Critical
X		

3.8 O-rings

No striking feature

OK	uncritical	Critical
x		

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/23/2008

Department:	Person responsible:	Telephone:	Use	internal		
Non-responsive content removed				external	x	

3.9 Other x

No striking feature

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/5/2007	Delivery rate [l/h] after testing 4/16/2008	
Starting point	200	200	0.4	66.7	66.6	x
1000 rpm, p_rated	1000	1800	0.4	17.7	17.6	x
n_max_p, 500bar	3375	500	0.4	3.8	4.3	x

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	**Telephone:**	Non-responsive content removed	**Date:**	6/27/2008	**Signature:**	Non-responsive content removed
Department		**Telephone:**		**Date:**	6/30/2008	**Signature:**	

EA11003EN-00895[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/23/2008

Department:	Person responsible:	Telephone:	Use	
Non-responsive content removed			internal	
			external	X

To: Cylinder head: Non-responsive content removed

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.): 445010507	**Date of manufacture:** 190707	**Serial number:** 0499	**Manufacturing plant - line** 0110 FeP (Feuerbach plant)
SAP-No.: 30-101008-01	**Samos no.:** 594603,001	**Customer order no.:** 03L 130 755	**Engine/Vehicle number** CAH0000109
Customer part number 03L 130 755	**Endurance run type [customer]:** Engine endurance run	**Endurance run conditions:** not known	**DSBFD no.:** 20845
Mileage 183 h	**Parts receipt at dept. DS-PC/EDI:** 4/3/2008	**Process no.** 2008-CP4_0291	**Confidentiality note** Confidential
VA / ETC no.: DS-180766	**Durability test type [RB]:**	**Fuel:** EN590	

1. Subject

CP4 customer returns with complaint
Diagnosis of endurance run end without complaint
Special feature: Omission of anti-friction coating on spring plate

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- No effect due to the omission of the anti-friction paint on the spring plate visible,
  The pump has passed the **endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK | Uncritical | Critical

	OK	Uncritical	Critical
3.1 Drive – No striking feature	X		
3.2 Drivetrain – No striking feature	X		
3.3 High pressure – No striking feature	X		
3.4 Bearing – No striking feature	X		
3.5 Shaft seal – No striking feature	X		
3.6 Holes – No striking feature	X		
3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) – No striking feature	X		

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	6/23/2008

Department:	Person responsible:	Telephone:	Use			
Non-responsive content removed				internal		
				external	X	

3.8 O-rings No striking feature	X		
3.9 Other No striking feature	X		

3.10 Images of visual findings

Fig. 1 Spring plate, tappet side

Fig. 1 Spring plate, spring side

Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing			
	n[rpm]	p_rail [bar]	I_MU [A]	5/9/2007	6/3/2008			
Starting point	200	200	0.4	65.8	65.6	x		
1000 rpm, p_rated	1000	1800	0.4	18.1	17.4	x		
n_max_p, 500bar	3375	500	0.4	3.7	4.1	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.
No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Appendix

None

Tested:	Non-responsive content removed	**Phone**	Non-responsive content removed	**Date:**	6/27/2008	**Signature:**	Non-responsive content removed
Department:		**Phone**		**Date:**	6/30/2008	**Signature:**	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/9/2008

Department:	Person responsible:	Telephone:	Use	
Non-responsive content removed			internal	
			external	X

To: Cylinder head: Non-responsive content removed

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	190707	0497	0110 FeP (Feuerbach plant)
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101008-01	594605,001	03L 130 755	CAH0000170
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
03L 130 755	Vehicle endurance run	Ehra variable track for passenger cars	20843
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
74380 km	4/3/2008	2008-CP4_0292	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-180772		EN590	

1. Subject

CP4 customer return
Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.
- Cold seal-tightness confirmed up to -30°C after endurance run

Components

- At the metering unit and metering unit hole, marks of an oblique assembly can be recognized. The risk of O-ring damage is confirmed by complaints in the 0-km range and is being pursued using 8D.
- The cavitation erosion in the tappet hole outside the tappet guide is an indication of excessively low pump interior pressure.
- Wear of the remaining components is low and without significant striking features.

Result

- The pump has passed the **endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK | Uncritical | Critical

	OK	Uncritical	Critical
3.1 Drive No striking feature	x		
3.2 Drivetrain No striking feature	x		
3.3 High pressure No striking feature	x		
3.4 Bearing No striking feature	x		
3.5 Shaft seal No striking feature	x		
3.6 Holes Metering unit hole with scrape marks through metering unit assembly (see Figure 1)		x	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/9/2008
Department:	Person responsible:	Telephone:	Use: internal / external: X
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3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) Metering unit magnetic core with external scrape marks through assembly (see Figure 2)	X
3.8 O-rings No striking feature	X
3.9 Other Cavitation erosion in the tappet hole outside the running range of the tappet (see Figure 3)	X

3.10 Images of visual findings

Fig. 1 Housing, metering unit hole (scrape marks)

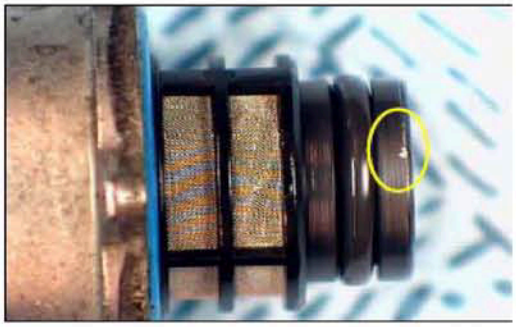

Fig. 2 Metering unit, external magnetic core (scrape marks)

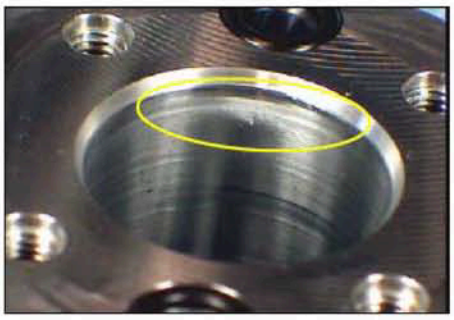

Fig. 3 Housing, tappet hole (cavitation)

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing	
	n[rpm]	p_rail [bar]	I_MU [A]	7/19/2007	4/14/2008	
Starting point	200	200	0.4	67	64.7	X
1000 rpm, p_rated	1000	1800	0.4	17.4	17.4	X
n_max_p, 500bar	3375	500	0.4	3.9	4.2	X

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.
No significant fuel-quantity drift compared to delivery measurement.

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/9/2008
Department:	Person responsible:	Telephone:	Use: internal / external: X
[redacted]			

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	**Telephone:**	Non-responsive content removed	**Date:**	7/14/2008	**Signature:**	Non-responsive content removed
Department:		**Telephone:**		**Date:**	7/14/2008	**Signature:**	
Department:		**Telephone:**		**Date:**	7/15/2008	**Signature:**	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	8/21/2008

Department:	Person responsible:	Telephone:	Use	
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			external	x

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.): 445010507	**Date of manufacture:** 040607	**Serial number:** 0279	**Manufacturing plant - line** 0110 FeP (Feuerbach plant) – 01
SAP-No.: 30-101005-07	**Samos no.:** 597416	**Customer order no.:**	**Engine/Vehicle number** CAH0000148
Customer part number	**Endurance run type [customer]:** Vehicle endurance run	**Endurance run conditions:** Ehra variable track for passenger cars	**DSBFD no.:** 19435
Mileage 47023 km	**Parts receipt at dept. DS-PC/EDI:** 4/28/2008	**Process no.** 2008-CP4_0387	**Confidentiality note** Confidential
VA / ETC no.: DS-183934			

1.Subjec

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / Uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	8/21/2008

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

3.5 Shaft seal — x

No striking feature

3.6 Holes — x

No striking feature

3.7 Attached components (metering unit, overflow valve, counting point) — x

No striking feature

3.8 Other — x

No striking feature

3.9 Images of visual findings — x

No striking feature

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/4/2007	Delivery rate [l/h] after testing 6/2/2008	
Starting point	200	200	0.4	3.9	4.2	x
1000 rpm, p_rated	1000	1800	0.4	17.9	17.3	x
n_max_p, 500bar	3375	500	0.4	66.6	66.2	x

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 12/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone:	Non-responsive content removed	Date:	8/21/2008	Signature:	Non-responsive content removed
Department:		Phone:		Date:	8/21/2008	Signature:	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	8/21/2008

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	251007	0012	5150 JhP (Jihlava plant) - 03
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	597419		CBE0000383
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	not known	21136
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
920 h	4/28/2008	2008-CP4_0389	Confidential
VA / ETC no.:			
DS-183936			

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	8/21/2008

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

3.6 Holes [x]

No striking feature

3.7 Attached components (metering unit, overflow valve, counting point) [x]

No striking feature

3.8 O-rings [x]

No striking feature

3.9 Other [x]

No striking feature

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 10/25/2007	Delivery rate [l/h] after testing 6/3/2008	
Starting point	200	200	0.4	3.6	4.3	x
1000 rpm, p_rated	1000	1800	0.4	17.8	17.5	x
n_max_p, 500bar	3375	500	0.4	66.3	65.8	x

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 12/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone:	Non-responsive content removed	Date:	8/21/2008	Signature:	Non-responsive content removed
Department:		Phone:		Date:	8/21/2008	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	8/21/2008

Department:	Person responsible:	Telephone:	Use	
Non-responsive content removed			internal	
			external	x

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	261007	0784	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-07	597421		CBE0000388
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	ÖVL + PZD + ÖVL	21137
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
913 h	4/28/2008	2008-CP4_0390	Confidential
VA / ETC no.:			
DS-183937			

1. Subject

CP4 customer return

Diagnosis of endurance run end without complaint

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without significant striking features.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — [x] OK

3.2 Drivetrain

No striking feature — [x] OK

3.3 High pressure

No striking feature — [x] OK

3.4 Bearing

No striking feature — [x] OK

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	8/21/2008

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

3.5 Shaft seal

No striking feature

x | | |

3.6 Holes

No striking feature

x | | |

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature

x | | |

3.8 O-rings

No striking feature

x | | |

3.9 Other

No striking feature

x | | |

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 11/26/2007	Delivery rate [l/h] after testing 6/3/2008			
Starting point	200	200	0.4	3.7	4.2	x		
1000 rpm, p_rated	1000	1800	0.4	17.6	17.5	x		
n_max_p, 500bar	3375	500	0.4	67.1	66.1	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 12/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	Phone:	Non-responsive content removed	Date:	8/21/2008	Signature:	Non-responsive content removed
Department:		Phone:		Date:	8/21/2008	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	7/9/2008

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
445010507	011107	0013	5150 JhP (Jihlava plant) - 03
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-000335-03	704745		CBA 655 000653
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
	Vehicle endurance run	not known	21830
Mileage	**Parts receipt at dept. DS-PC/EDI:**	**Process no.**	**Confidentiality note**
50000 km	5/27/2008	2008-CP4_0443	Confidential
VA / ETC no.:	**Durability test type [RB]:**	**Fuel:**	
DS-191579			

1. Subject

CP4 customer return

Verification of modification package B (omission of the anti-friction paint on the spring plate)

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the spring plate without anti-friction paint is low, as is the wear of the directly adjacent components. An influence of the omission of the anti-friction paint is not visible.
- The small traces of corrosion on the wear surfaces (low wear) of e.g. intake valve and spring plate are abnormal, but not critical.
- The discoloration in the radial flange bearings are due to smoothness and incidental fuel deposits. The individual grooves are not critical in their form.
- Wear of the remaining components is low and without significant striking features.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

3.1 Drive

No striking feature — [x] OK

3.2 Drivetrain

Wear of spring plate without anti-friction paint is low (see Figure 1 and Figure 2), but traces of corrosion — [x] uncritical

3.3 High pressure

Signs of corrosion in the wear area of intake valve (see Figure 3) sealing point to the stationery seal ring

Signs of corrosion in the wear area of stationery seal ring (see Figure 4) to the intake valve plate — [x] uncritical

3.4 Bearing

Radial flange bearing with grooved structure and discoloration in the center of the bearing (see Figure 5) — [x] uncritical

3.5 Shaft seal

No striking feature — [x] OK

3.6 Holes

No striking feature — [x] OK

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/9/2008

Department:	Person responsible:	Telephone:	Use	internal	external
[redacted]					x

3.7 Attached components (metering unit, overflow valve, counting point) — x

No striking feature

3.8 O-rings — x

No striking feature

3.9 Other — x

No striking feature

3.10 Images of visual findings

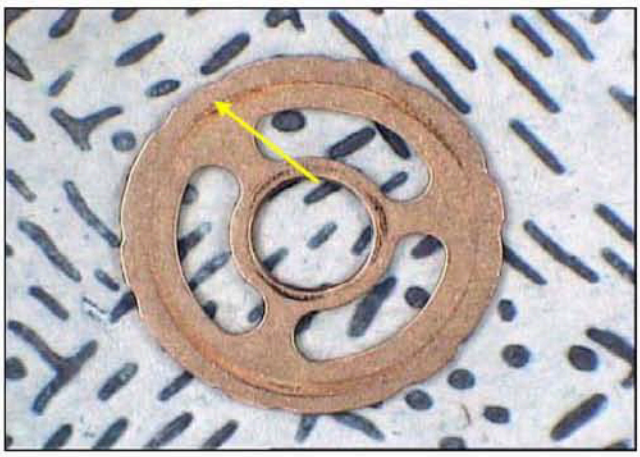

Fig. 1 Spring plate, tappet-side (traces of corrosion)

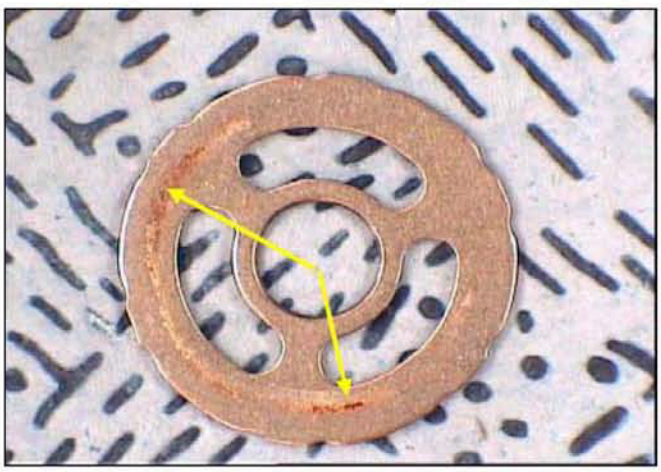

Fig. 2 Spring plate, spring-side (traces of corrosion)

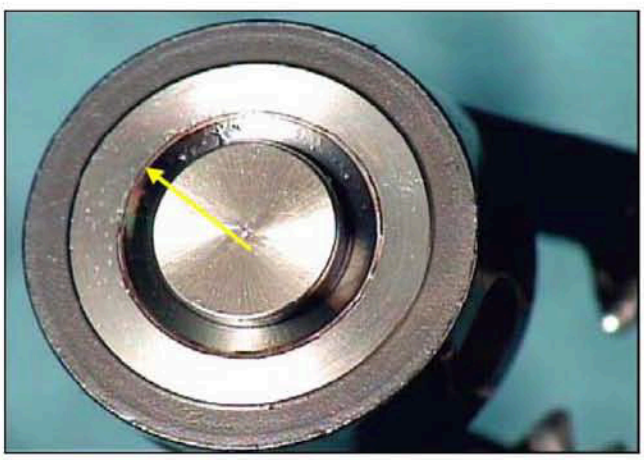

Fig. 3 Intake valve, sealing area (wear)

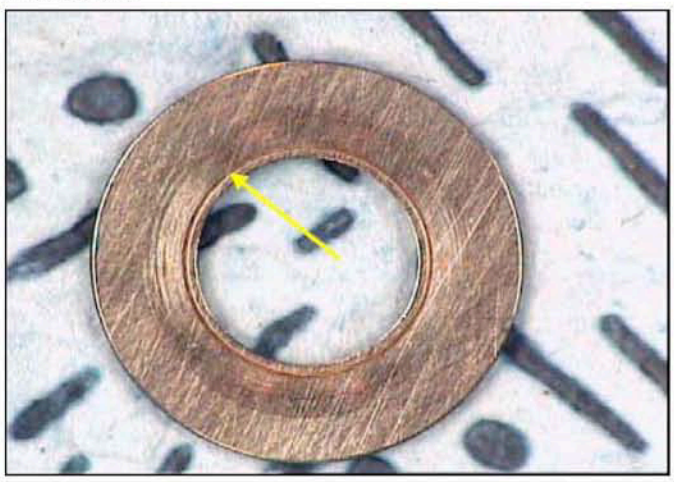

Fig. 4 Stationery seal ring, SV direction (traces of corrosion)

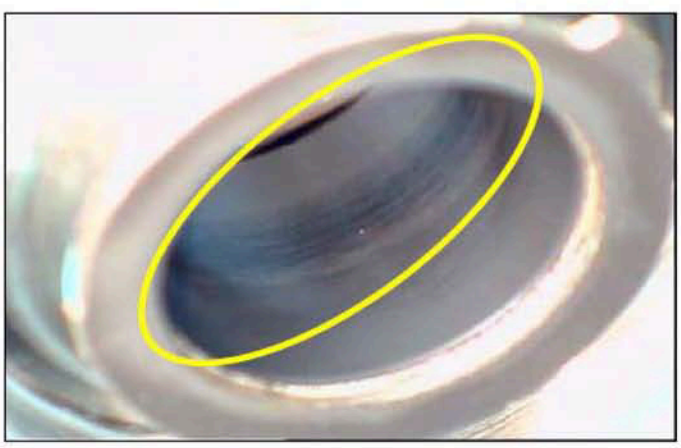

Fig. 4 Flange bearing, radial (grooves, discoloration)

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/9/2008

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 11/1/2007	Delivery rate [l/h] after testing 5/27/2008			
Starting point	200	200	0.4	67.5	66	x		
1000 rpm, p_rated	1000	1800	0.4	17.8	17.6	x		
n_max_p, 500bar	3375	500	0.4	3.7	4.1	x		

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

No significant fuel-quantity drift compared to delivery measurement.

5. Destiny of the parts

The pump is stored at RB until 09/2008 and then scrapped.

6. Attachments

None

Tested:	Non-responsive content removed	**Phone:**	Non-responsive content removed	**Date:**	7/10/2008	**Signature:**	Non-responsive content removed
Department:		**Phone:**		**Date:**	7/14/2008	**Signature:**	
Department:		**Phone:**		**Date:**	7/15/2008	**Signature:**	

EA11003EN-00901[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/20/2009

Department:	Person responsible:	Telephone:	Use	
Non-responsive content removed			internal	
			external	X

To: Cylinder head: Non-responsive content removed

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010507	110308	0491	0110 FeP (Feuerbach plant) – 01
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101005-01	718616	731223	not known
Customer part number	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
731223	Engine trial	Measurement program (see below)	23076
VA / ETC no.:	**Actual mileage**	**Fuel:**	**Confidentiality note**
DS-203337	8 h	Reference diesel CEC RF-06-03	Confidential

Complaint: Pump does not build up high pressure any longer

1. Subject

CP4 customer returns with complaint
Pump has been disassembled by the customer and the bearings in the flange and housing were pressed out.
The HP piston seized in the top dead center (TDC) position was dismantled by the customer.

Testing conditions: Measuring program A, B, E, 0.4 x F
Reference diesel CEC RF-06-03

Description of the measuring program
A: 1 h start-up program
B: Program for reproducibility (5 x 12 points)
C: Long program high pressure fuel pump (HPFP) compression (1 x 1240 points) at Tclosed = 20 °C
D: Long program high pressure fuel pump (HPFP) compression (1 x 1240 points) at Tclosed = 70 °C
E: Shortened program High pressure fuel pump (HPFP) compression (1 x 261 points) at Tclosed = 20°C
F: Shortened program High pressure fuel pump (HPFP) compression (1 x 261 points) at Tclosed = 70 °C

2. Conclusion

Function
- No functional test possible due to complaint reason and irreversible bearing disassembly.

Components
- The high-pressure piston has seized in the piston bore on the low-pressure side between the first and second lubrication groove.
  Traces of abrasion from the adhesion region towards the drivetrain are probably caused by the knocking out of the HP piston during disassembly by the customer.
  This is also suggested by the fact that there are no traces of abrasion visible along the high-pressure side from the main wear area and the HP piston has only traces of abrasion towards the high-pressure range.
  Traces of abrasion in the piston bore opposite the main wear area do not extend to the respective ends of the piston bore.
- The rupture of the spring plate on the inner ring is probably a result of the HP piston seizure.
  This damage is not forced (see also report CP4_0835 2008).
  In the documentation accompanying this
  complaint, there is no indication of a broken spring plate, so that damage is also possible during transport in a disassembled state.

Result
- Cause for the seizure of the high-pressure piston in the low pressure area could not be found.
  The different particle traces cannot be evaluated sufficiently securely with regard to cause and effect due to the forcible disassembly.
  The operating conditions and the reference fuel do not come under consideration as the cause in terms of specification.
- Similar cases of damage with this series pump are known as 0-km complaint with about 3 months older date of manufacture and are documented on the 8D no. 230002262459 (previously 2 failures).
  Even in these cases, no cause could be determined. Regarding the possible causes and conducted analyses and improvement measures, please refer to these ongoing 8D.
- - The pump has failed the **endurance run.**

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/20/2009

Department:	Person responsible:	Telephone:	Use		
Non-responsive content removed				internal	
				external	X

3. Results of diagnosis (visual findings)

Legend rating stages { OK | Uncritical | critical }

	OK	Uncritical	critical
3.1 Drive No striking feature	X		
3.2 Drivetrain Broken spring plate on the inner ring (entrainment HP piston) at two bars (see Figure 1 and Figure 2)			X
3.3 High pressure Cylinder head / piston bore with traces of adhesion and abrasion in the LP range (see Figure 3 and Figure 4) Cylinder head / piston bore opposite side without increased traces of wear (see Figure 5) HP piston with adhesive wear between the 1st and 2nd lubrication groove on the LP side (see Figure 6) SEM (scanning electron microscopy) image of HP piston in the material contrast mode does not show any foreign materials (see Figure 7)			X
3.4 Bearing No striking features, the bearings were delivered in the pressed-out state	x		
3.5 Shaft seal No striking feature	x		
3.6 Holes No striking feature	x		
3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) No striking feature	x		
3.8 O-rings No striking feature	x		
3.9 Other No striking feature	x		

3.10 Images of visual findings

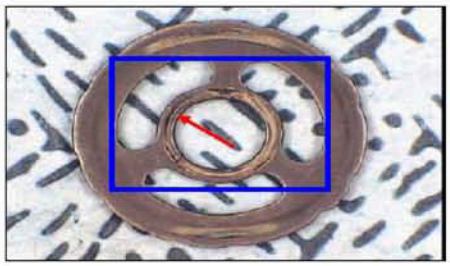

Fig. 1 Spring plate, tappet-side

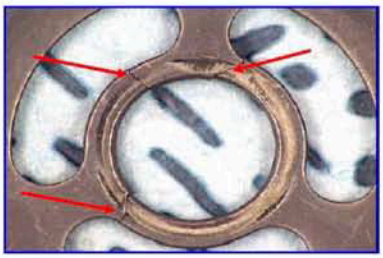

Fig. 2 Detail of Figure 1, the

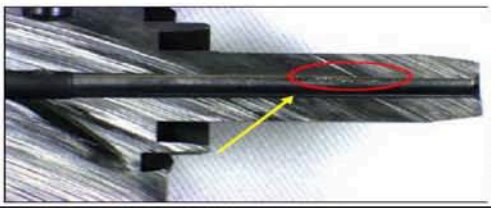

Fig. 3 Cylinder head, piston hole (wear)

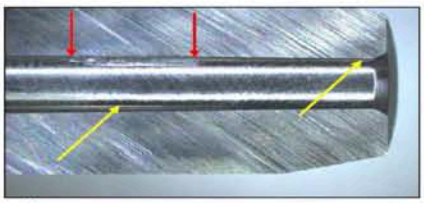

Fig. 4 Detail of Figure 3 (wear)

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/20/2009

Department:	Person responsible:	Telephone:	Use		
Non-responsive content removed		[redacted]		internal	
				external	X

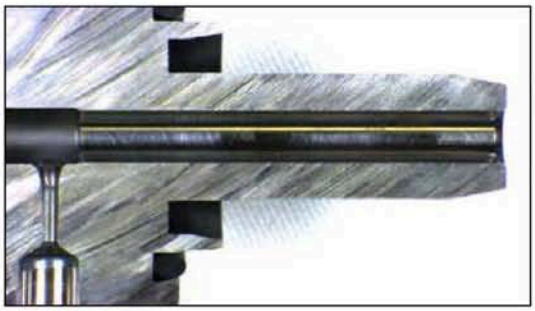

Fig. 5 Cylinder head, piston hole opposite side

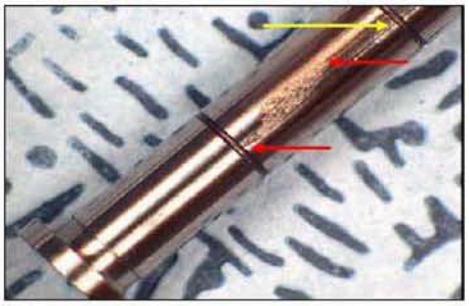

Fig. 6 HP piston, LP-side (wear)

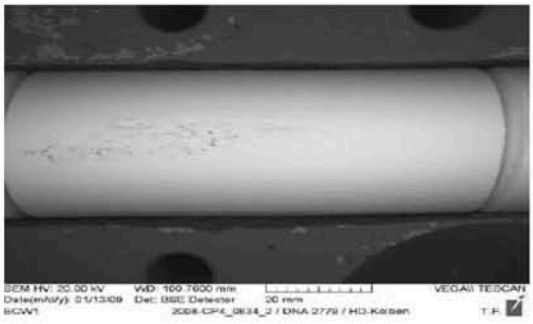

Fig. 7 HP piston, SEM (scanning electron microscopy material contrast

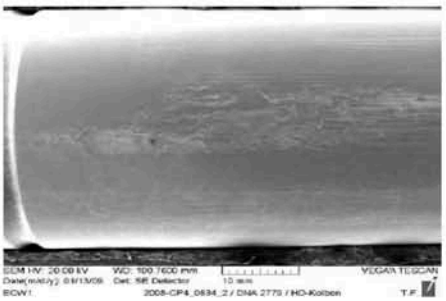

Fig. 8 HP piston, SEM (scanning electron microscopy) image (wear)

Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing
	n[rpm]	p_rail [bar]	I_MU [A]		

No functional test possible due to complaint reason and irreversible bearing disassembly.

6. Destiny of the parts

The pump is stored at RB until 06/2009 and then scrapped.

7. Appendix

8D no. 230002262459 in the version dated October 10 2008

Tested:	Non-responsive content removed	**Telephone:**	Non-responsive content removed	**Date:**	2/27/2009	**Signature:**	Non-responsive content removed
Department:		**Telephone:**		**Date:**	2/27/2009	**Signature:**	
Department:		**Telephone:**		**Date:**	3/3/2009	**Signature:**	

BOSCH

8D report

Reference no.	BSA000001280-001	Reissue:	19-Sep-08
QC no.:	230002245964	Interim report:	
Q8 No..:	230002262459	Final report:	10-Oct-08

Appendix no.

Header data

Complaint date:	**19-Sep-08**	Product:	RADIAL-PISTON PUMP
8D title:	Q8: piston pump seized	Bosch material no.	0445010507
Defectiveness:	**Bosch responsibility**	Bosch manufacturing plant:	Jihlava plant - DS (5150)
Claim Customer	VOLKSWAGEN AG	Application:	
Delivery customer:	VW	Customer service material no.	**03L130755**
Complaint type:	0-km, obstructed	Serial number:	BPT 0958
Failure location:	From finished vehicle or fleet action	ID no.	**IKB 732262**
Goods used	Dispatch: for analysis to RB		
Goods used	**For scrapping at RB**	Problem number	**4814268**
After analysis			
Issued by	Non-responsive content removed	Initiated by:	Non-responsive content removed
c.c.:			

Customer's clerk:		Telephone:	
Business address:		Fax:	

D1 problem-solving team Sponsor: [redacted]

Team leader:	Non-responsive content removed	Telephone:	[redacted]
E-mail:	Non-responsive content removed	Fax:	[redacted]
Business address:			
Team members:	Non-responsive content removed		

D2 Description of problem — Date of manufacture: 12-Jun-08

Customer complaint:	No rail pressure; (malfunction)
Bosch description:	(For checking at U-point)
Self-diagnosis of customer:	
Bosch self-diagnosis:	

Vehicle type:		Mounting location in the vehicle:	
Engine designation:		Vehicle identification no:	
Number of faulty items:	1	Returned qty. to the customer:	
Mileage:		Customer code:	
Date of purchase:		Failure date:	19-Sep-08
Code no. of co-inspector Subsupplier			
Geographic location of the complaint:	Germany, Lower Saxony, VW vehicle plant Emden		
Fault location in the product / module:	Cylinder head (L) piston	U plant:	Plant Jihlava - DS
Fault type:	seized	Final analysis:	10-Oct-08

D3 immediate measure (s)
JhP (Jihlava plant)/QMM2.13
Due to the fact that the error message of the customer was a functional failure, we have tested the results of the assembly functional test. Result was OK, pump was only once with an OK without interruption result

tested.
Implementation of the possible actions is possible only after the pump analysis.

Responsible person	Non-responsive content removed	Implemented on:	19-Sep-08	Effective from:	19-Sep-08
Consent of customer in process or product-changing immediate measure on:				Responsible person	

Should customer-specific 8D requirements be met? Which ones?	No
D4 root cause analysis **Title:** Pump piston seized	
Causing process: Exact cause cannot be determined	Others -> cause cannot be determined

Main cause (s) with proof: How could the fault occur?
Bosch Jihlava plant/QMM31 analysis
01 / visual inspection not OK, the black cap is missing on the cylinder head
02 / Check of CL and RL connection OK
03 / Non-return valve nominal depth: 3.6 ± 0.05 mm actual: 3.63 mm OK
04 / Fuel removal OK
05 / Bubble test OK
06 / metering unit test OK, metering unit screen without particles
07/ Axial clearance OK should be: from 0.15 - to 0.30 mm: 0.21mm
08 / Cylinder head disassembly not OK
- After the cylinder head disassembly, it was found that pump piston in the cylinder has seized.
Further action:
Analysis of piston seizure at Bosch Jihlava plant/QMM1.4
Fuel analysis at Bosch Jihlava plant/ HSE

Proof furnished by: Non-responsive content removed Proof furnished on: 04-Sep-08

Analysis of the wear
In the area of seizure, both pump pistons and cylinder heads were so badly damaged that the exact cause of the seizure cannot be clarified. Close to the seizure area, grooves with the residues of aluminum particles, which could have been caused by machining (corundum) or from adjacent parts (flange, housing), were found. A more accurate chemical analysis with respect to the size of the particles is not possible. In the area of seizure, corroded areas were also found.
The occurrence of corrosion indicates a high chlorine and oxygen content. There are no burrs in the groove region. Micro-structure and hardness in accordance with the specifications.
Proof furnished by: Bosch Jihlava plant/QMM1.4 Proof furnished on: 26-Sep-08

Analysis of the fuel sample enclosed
Fuel analysis:
- Percentage of methyl esters:
should be: up to 5 vol. % is:0.5 ± 0.3 vol. OK
- Measurement of water content:
up to 200 ppm actual: 60±20 ppm OK
- Measurement of flash point:
Nominal flashpoint: Greater than 55 °C: 58.0 ± 1.4 °C OK
- Elementary analysis:
Chlorine content: 0 ppm
Proof furnished by Non-responsive content removed Proof furnished on: 26-Sep-08

JhP (Jihlava plant)/MFH4 Analysis
Analysis of the piston seizure was performed with Ishikawa systematics.
Five aspects were assessed:
1 - Human
2 - Method
3 - Plant
5 - Material
For results of the analysis, please see the end of 8D in the .ppt slides
Proof furnished by Non-responsive content removed Proof furnished on: 05-Nov-08

Main cause (s) with proof: Why was the fault not discovered?
JhP (Jihlava plant)/MFH4 Analysis, QMM2.13,
Based on the analysis, three failure hypotheses were defined:
1. Hypothesis: Seizure due to metal chips after shot blasting of the piston lubrication groove at the piston sub-supplier
2. Hypothesis: Seizure due to particles at the piston (grinding residue after piston grinding in the piston lubrication groove)
3. Hypothesis: Mounting of the piston in the cylinder head not OK
Proof furnished by: [redacted] Proof furnished on: 05-Nov-08

EA11003EN-00901[5]

Reproduction of the error: The error could be reproduced on: The error could not be reproduced.		By:		.

D5 Possible corrective action (s) and proof of effectiveness (testing)

Rotating groove machining	Action against: [redacted]

Detachment of doublings within the leakage oil groove surface as a consequence of its seizure.
Corrective actions:
Change of the machining of the piston ring groove (new parts)
Current status: Piston grooves are rotated
Scheduled status: Piston grooves are cut.
Detachable doublings or spots occurring in shot blasted grooves (through shot blasting).
Proof furnished by: [redacted] Proof furnished on: 16-Jun-08

Cleanliness	Action against: [redacted]

Seizure due to particles at the piston (grinding residue after piston grinding in the piston lubrication groove)
1. Increase in the frequency of cleanliness analysis in piston manufacturing
2. Increase in the frequency of cleanliness analysis of the cylinder head
3. 100% visual inspection of the pump pistons after washing, during piston manufacturing
4. Introduction of visual inspection of the piston at DNA (random sample)
5. Change in the working processes for piston manufacturing after grinding the piston
6. Increase in the check of cylinder head blisters in Feuerbach plant and Jihlava plant
Proof furnished by: [redacted] Proof furnished on: 04-Nov-08

Cylinder head and piston assembly	Action against: [redacted]

Mounting of the piston in the cylinder head:
1. Introduction of the optical sensor for monitoring the correct position of the piston while installing the piston in the cylinder head
Proof furnished by: [redacted] Proof furnished on: 04-Nov-08

D6 Implementation of corrective action (s)

Customer approval on:	by:	
Implementation of corrective action (s)		
Rotating groove machining	Action against:	Non-responsive content removed

Detachment of doublings within the leakage oil groove surface as a consequence of its seizure.
Corrective actions:
Change of the machining of the piston ring groove (new parts)
Current status: Piston grooves are rotated
Scheduled status: Piston grooves are cut.
Detachable doublings or spots occurring in shot blasted grooves (through shot blasting).

Responsible person	Non-responsive content removed	Implementation scheduled on:	29-Nov-08	Implemented on:	Effective from:

Cleanliness Corrective action: 1. Increase in the frequency of cleanliness analysis in piston manufacturing Previous status: 1 x per week New status: 1 x per day D: 10.10.2008 Status: Completed 2. Increase in the frequency of cleanliness analysis of the cylinder head Previous status: 1 x per week New status: 3 x per week (Mon, Wed, Fri) D: 06.10.2008 Status: Completed 3. 100% visual inspection of the pump pistons after washing, during piston manufacturing D: 10.10.2008 Status: Completed 4. Introduction of visual inspection of the piston at DNA (random sample 10 units per small load carrier) 12/2008 Status: Completed 5. Change in the working processes for piston manufacturing after grinding the piston D: 10.10.2008 Status: Completed 6. Increase in the check of cylinder head blisters in Feuerbach plant and Jihlava plant D: 22.10.2008 Status: Completed	Action against: [redacted] D:

Responsible person	JHP (Jihlava plant)/MFH4	Implementation	22-Oct-08	Implemented on:	22-Oct-08	Effective from:	22-Oct-08

		scheduled on:					
Cylinder head and piston assembly			Action against:JhP/MFH4 Analyse				
Mounting of the piston in the cylinder head: 1. Introduction of the optical sensor for monitoring the correct position of the piston while installing the piston in the cylinder head T: QC-NR: 230002245964 7..1..008 3 (4)							
Responsible person	JHP (Jihlava plant)/MFH4	Implementation scheduled on:	19-Dec-08	Implemented on:		Effective from:	

Proof of effectiveness for the implemented corrective action (s):

Rotating groove machining	Action against:	JhP (Jihlava plant)/MFH4 Analysis
Proof furnished by:	FEP (Feuerbach plant)/PUQ1	Proof furnished on:
Cleanliness	Action against:	JhP (Jihlava plant)/MFH4 Analysis
Proof furnished by:	JHP (Jihlava plant)/MFH4	Proof furnished on: Oct 22 2008
Cylinder head and piston assembly	Action against:	JhP (Jihlava plant)/MFH4 Analysis
Proof furnished by:	JHP (Jihlava plant)/MFH4	Proof furnished on:

Cancellation of immediate measure (s)
Cancellation of immediate measures not implemented.

by:	JhP (Jihlava plant)/QMM2.13	on: Nov 04 2008

D7 preventive measure (s) against recurring errors
Improvement of the Quality Management system (FMEA (Failure Mode and Effects Analysis), procedural instructions, PQP, etc.) Measure
In Jihlava plant implementation of measures also in assembly module 5, Feuerbach plant management was informed of implemented measures

Responsible person	Non-responsive content removed	Implementation scheduled on:	06-Nov-08	Implementation completed on:	06-Nov-08

Acceptance of potential solutions for other processes, products, sites:
Is this error likely to occur in other processes, products or sites? Yes
If yes: What other processes, products or sites may be affected?
If yes, what sites will you inform (e.g. FMEA, Lessons Learned Coordinators)?

Non-responsive content removed

If not: Why don't you expect the error to occur in other processes, products or sites?

D8 final consultation (appreciation, suggestions for improvement)

Participants:
Implemented on:
Results:
Completion of the report confirmed by:

Sponsor:	Name:		Date:	Signature:
P/QMM:	Name:		Date:	Signature:

Non-responsive content removed

Jihlava plant/MFH4 pump CP4 - pistons seized

First influence - human

1.1 Visual inspection: Regular monitoring of cleanliness in piston manufacturing
D: 10.10.2008 Completed
Status: Cleanliness analysis 1x per week - result OK

1.2. Visual inspection: Increasing frequency of cleanliness check of pistons from once in two weeks to
daily
D: 10.10.2008 Completed
Result: Measurements in progress - all measurements OK

1.3. Piston fitted incorrectly: Sensor for piston insertion
D: 10.10.2008 in progress
Status: Sensor ordered, delivery date 12/2008

Jihlava plant/MFH4 pump CP4 - pistons seized

First influence - human

1.4. Temperature control too short: Procedural instruction + training for optimal temperature control

D: 10.24.2008 finished

Integrated temperature sensor on pairing the cylinder head system. Pairing process with the parts that are not temperature-controlled is not possible. It is only an infrastructure facility. Procedural instruction and training for optimal temperature control implemented.

1.5. Insertion of piston is not correct: Pattern with piston clamping / piston friction

Preparation T:

End 12/2008 in progress

Status: No grinding or clamping pistons available, task in progress

1.6. Incorrect piston class: Test delivery rate - 5 pumps with each piston class

D: 10.10.2008 completed

A cylinder head of class 3 / pistons with classes 1,2,3,4, no seizure detected after functional testing, piston class 5 - fine smoothening visible

Jihlava plant/MFH4 pump CP4 - pistons seized

Second influence - method

2.1. Cleanliness: Frequency increase cleanliness check of cylinder head - check capacity and possibilities: 10.06.2008 completed

Analysis of the cleanliness of cylinder head 3x per week (Mon, Wed, Fri)

2.2. Washing, storage, manipulation: Comparison Jihlava plant- Feuerbach plant D: 10.10.2008 completed

Washing	Feuerbach plant: High pressure washing system	Jihlava plant: water washing system
Storage	Feuerbach plant: Supermarket / washing frame	Jihlava plant: washing frame in small load carrier, VCI/ (*)
Manipulation	Feuerbach plant: Milkrun	JhP: Milkrun

(*) Reason: Piston manufacturing in another hall

Jihlava plant/MFH4 pump CP4 - pistons seized

Second influence - method

2.3. Washing, storage, manipulation: Limit class pistons - exotic types

D: 10.10.2008 completed

Washing	Feuerbach plant: High pressure washing system	Jihlava plant: water washing system
Storage	Feuerbach plant: Supermarket / washing frame	Jihlava plant: washing frame in small load carrier, VCI/ (*)
Manipulation	Feuerbach plant: Milkrun	JhP: Milkrun

(*) Reason: Piston manufacturing in another hall

2.4. Pairs of pistons: Comparison Jihlava plant- Feuerbach plant

D: 10.10.2008
completed

No deviations observed between Feuerbach plant and Jihlava plant. Processes are identical

Jihlava plant/MFH4 pump CP4 - pistons seized

Second influence - method

2.5. Rinsing: Check method and medium cleanliness

D: 10.10.2008 completed

Check is done 1x per week according to the specification, result OK

2.6. Incorrect piston class: Readings 4 weeks before the complaints Check D: 10.10.2008 completed

Number of pairs about 40,000 pcs., thereof 17 times not OK.

Jihlava plant/MFH4 pump CP4 - pistons seized

Third influence - plant

3.1. Grinding, measurement, washing: Check for 300 pistons for grinding residues in piston slot D: 10.10.2008 completed

Result: 300 pieces of piston pump checked. No particles or grinding residues found in the piston slot

3.2. Grinding, measurement, washing: Piston hardness - check D: 10.10.2008 completed

Check 6 pcs. - result OK

3.3. Grinding, measurement, washing: 100% visual inspection of the pump piston after washing, during piston manufacturing + DNA random inspection D: 10.10.2008 completed

100% check during piston manufacturing and random inspection (10 pcs. for each small load carrier) performed on DNA

Jihlava plant/MFH4 pump CP4 - pistons seized

Fourth influence environment

4.1. Temperature control: Check space for optimal inspection of piston cleanliness (Air - blower, etc.) D: 10.10.2008 Completed

Place for the inspection spot during piston manufacturing has been changed and adapted.

4.2. Shifting - transport: Check in Feuerbach plant and Jihlava plant

D: 10.10.2008
Completed

Transport of the piston in small load carrier, milk run. Feuerbach plant and Jihlava plant identical

4.3. Wash medium: Regularity and results check

D: 10.10.2008
completed

Check 5 times a week, result OK

Jihlava plant/MFH4 pump CP4 - pistons seized

5. Influence - material

5.1. Geometry, roughness, hardness, temperature: Activities are defined

D: 10.24.2008 finished

Roundness, straightness, roughness has been dimensioned for 25 pcs. of pistons.
Result OK

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	3/31/2009

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

Department:	Person responsible:	Telephone:	Confidentiality note
			Confidential

To:	Non-responsive content removed
Cylinder head:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010507	140508	0400	0110 FeP(Feuerbach plant) – 04
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine / vehicle number**
30-101005-01	726712	731223	CBB000706 / 3C59E102-PQ46
Customer part number	**Durability test type [customer]:**	**Durability test conditions:**	**DSBFD no.:**
731223	Vehicle durability test	EWP(Ehra variable track for passenger cars)	23775
VA / ETC no.:	**Actual mileage**	**Fuel:**	**Nominal pressure [bar]:**
DS-209813	79622 km	EN590	1800

1 Subject

CP4 customer return
Diagnosis after durability test end Local wear of the inlet coating on the running surface in the roller support, verification of modification package 4 (second source supplier)
Testing conditions: EWP(Ehra variable track for passenger cars)

2. Conclusion

Function
- Delivery rates after durability test without significant fuel-quantity drift in comparison with the new state.

Components
- The wear of the components is low in general. Only on the running surface of the roller support is low wear to be seen at the run-in layer of the C coating (wear depth 0.29 to 0.43 µm, see Fig. 3.1 and Appendix 1).

Content of modification package 4-second source supplier
- Precast camshaft
- Precast tappet body
- Roller support soft part
- High-pressure piston pump precursor
- Precast non-return valve hemispherical head
- Precast non-return valve spring seat
- Precast intake valve plate
- Precast overflow valve carrier
- Blank flange
- Bearing bushing flange and housing

Result
- The components of the modification package 4 (second source supplier) have the wear rating green. A correlation between the wear of the roller support C coating and the roller support soft part of the second source supplier is unlikely.
- The pump has passed the durability test.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature

3.2 Drivetrain

Local wear of the inlet coating on the running surface in the roller support (0.3 to 0.4 µm wear depth)

BOSCH CP4 | **CR pump CP4 - Diagnosis report** | Report no. [redacted] | Date 3/31/2009

Department:	Person responsible:	Telephone:	Use	internal	
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Department:	Person responsible:	Telephone:	Confidentiality note
			Confidential

3.3 High pressure
No striking feature — x

3.4 Bearing
No striking feature — x

3.5 Shaft seal
No striking feature — x

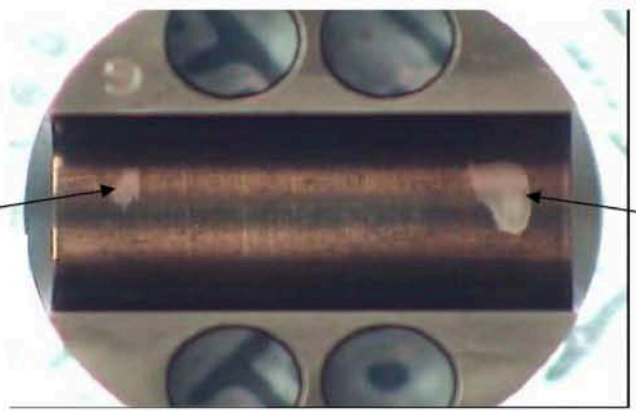
3.6 Holes
No striking feature — x

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No striking feature — x

3.8 O-rings
No striking feature — x

3.9 Other
No striking feature — x

3.10 Images



Appendix 1, measurement 1

Appendix 1, measurement 2

4. Hydraulic function

	n [rpm]	p_rail [bar]	I_ZME [A]	Delivery rate [l/h] of new part 05.14.2008	Delivery rate [l/h] after testing 02.02.2009	
Starting point	200	200	0.4	4.1	4.1	x
1.000 rpm, p_rated	1000	1800	0.4	16.8	16.9	x
n_max_p, 500bar	3375	500	0.4	65	65.6	x

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ⩾ 15.5 or 15.2 l/h after running time) is met.

6. Destiny of parts
The pump is stored at RB until 12/2010 and then scrapped.

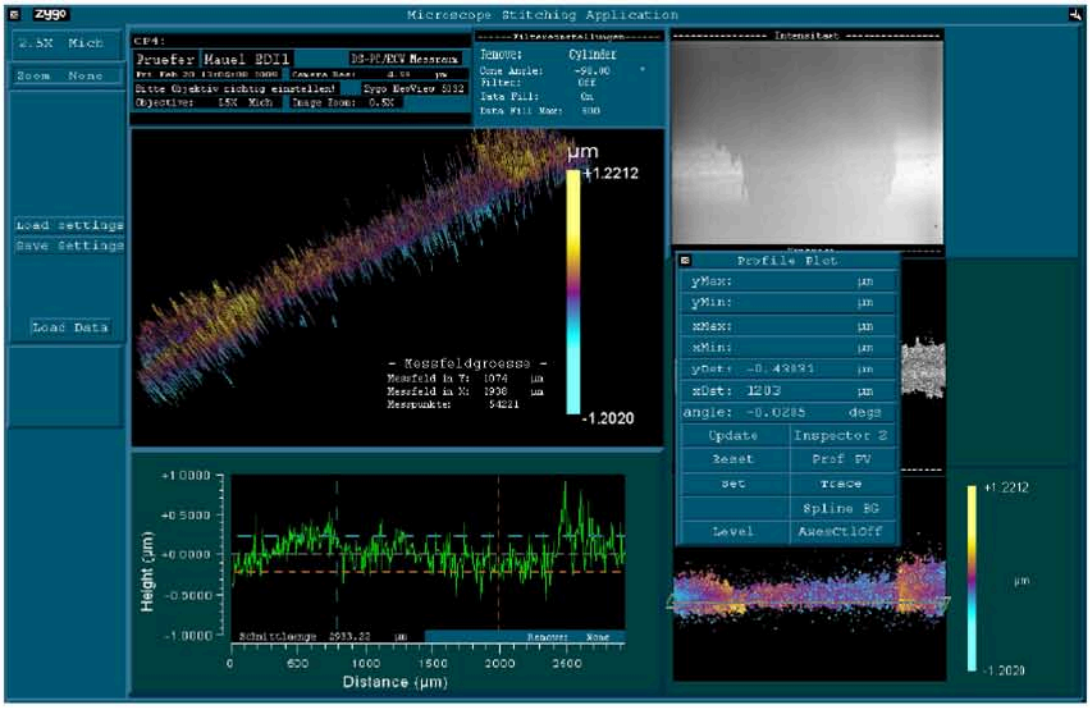
7. Attachments
Appendix 1: WLI (white-light interferometry) measurement of the roller support running surface

tested:	Non-responsive content removed	Telephone	Non-responsive content removed	Date:	04.09.2009	Signature:	Non-responsive content removed
Department:		Telephone		Date:	04.21.2009	Signature:	

Appendix 1

Measurement 1

Measurement 2



BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	7/16/2009

Department:	Person responsible:	Telephone:	internal / external
Non-responsive content removed			external x

To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21116_06	00890	4631	011M FeP (Feuerbach plant)-M
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	742724		03LL000116
VA / ETC no.:	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
DS-222364	Engine endurance run	Profile PZD	25335
Mileage	**Actual mileage is [h]**	**Fuel:**	**Confidentiality note**
	697 h		Confidential

1. Subject

CP4 customer returns **without complaint**

Engine number: 03LL000116, 125 kW, EU5

Mileage: 697 h, Profile PZD

2. Conclusion

Function

- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components

- Wear through lateral roller slip-off in the right tappet assembly is increased, but not critical.
- C coating slightly worn on the running surface for roller in the roller support. Not critical.
- Spring plate shows slight indentations at the tappet side, but not critical.
- Wear of the remaining components is low and without significant striking features.

Result

- The pump has **passed the endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Tappet assembly: Slightly increased lateral roller start-up (see Appendix 1, Figure 1 and 2). Roller support running surface for roller: C coating slightly worn - 0.5 µm depth (see Appendix 1, Figure 3 and 4). Spring plate - indentations in the base material (see Appendix 1, Figure 5). — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	7/16/2009

Department:	Person responsible:	Telephone:		internal	
Non-responsive content removed				external	x

3.6 Holes

No striking feature

x

3.7 Attached components (metering unit, overflow valve, counting point)

No striking features, see metering unit report

x

3.8 Other

No striking feature

x

3.9 Other

No striking feature

x

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part	Delivery rate [l/h] after testing
LG	1000	1800	0.4	10/22/2008	7/14/2009
				19.91	20.58

x

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD (technical customer documentation) for new parts.

5. Destiny of the parts

The pump will be kept at Jihlava plant after consultation with [redacted] and scrapped after six months.

6. Attachments

Appendix 1 - Photos
Appendix 2 - metering unit report UB VW DS-222 364 DNA ZVM20015

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:		Signature:	
Department:		Phone		Date:		Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	7/14/2009

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21116_06	00890	4616	011M FeP (Feuerbach plant)-M
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	742718		03LL000125
VA / ETC no.:	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
DS-222365	Vehicle endurance run	Profile GDV-EWP (Ehra variable track for passenger cars)	25339
Mileage	**Actual mileage is [h]**	**Fuel:**	**Confidentiality note**
	103504 km		Confidential

1. Subject

CP4 customer returns **without complaint**
Engine number: 03LL000125, 125 kW, EU5
Mileage: 103,504 km; Profile GDV EWP

2. Conclusion

Function
- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components
- Wear through lateral roller slip-off in the tappet assembly is increased, but not critical.
- Wear of the remaining components is low and without significant striking features.

Result
- The pump has **passed the endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive
No striking feature — OK: x

3.2 Drivetrain
Tappet assembly: Slightly increased lateral roller slip-off (see 3.10 Figures 1 and 2) — uncritical: x

3.3 High pressure
No striking feature — OK: x

3.4 Bearing
No striking feature — OK: x

3.5 Shaft seal
No striking feature — OK: x

3.6 Holes
No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)
No striking features, see metering unit report — OK: x

3.8 O-rings
No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/14/2009

Department:	Person responsible:	Telephone:	Use	internal / external
Non-responsive content removed				x

3.9 Other

No striking feature

3.10 Images

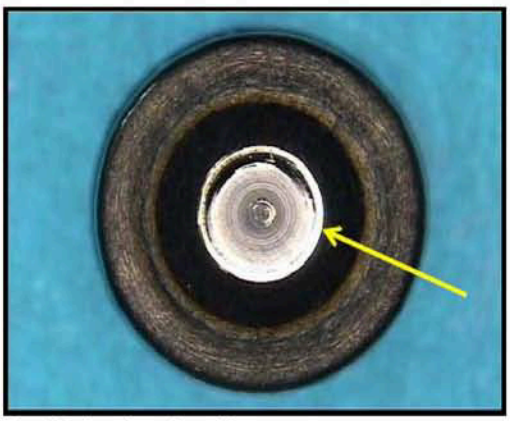


Fig. 1: Roller - housing-side

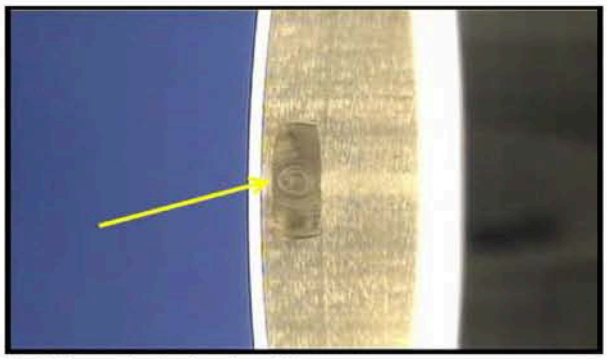


Fig. 2: Tappet body - housing-side

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing
	n[rpm]	p_rail [bar]	I_MU [A]	10/22/2008	7/13/2009
LG	1000	1800	0.4	19.99	19.81

x

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD (technical customer documentation) for new parts.

5. Destiny of the parts

The pump remains after consultation with Non-responsive content removed plant and will be scrapped after 6 months.

6. Attachments

Metering unit report UB VW DS-222365 DNA ZVM20016

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	8/27/2009	Signature:	Non-responsive content removed
Department:		Phone		Date:	8/27/2009	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	7/16/2009

Department:	Person responsible:	Telephone:	Use	internal	
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To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D/D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21116_07	141108	0477	5150 JhP (Jihlava plant) -
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	742720		03LL000264
VA / ETC no.:	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
DS-222366	Engine endurance run	Profile endurance run 2+ÖVL	25336
Mileage	**Actual mileage is [h]**	**Fuel:**	**Confidentiality note**
	545 h		Confidential

1. Subject

CP4 customer returns **without complaint**
Engine no.: 03LL000264, 125 kW, EU5
Mileage: 545h, Profile endurance run 2+ÖVL

2. Conclusion

Function
- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components

- Wear through lateral roller slip-off in the tappet assembly is increased, but not critical.
- Wear of the remaining components is low and without significant striking features.

Result
- The pump has **passed the endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive
No striking feature — OK: x

3.2 Drivetrain
Tappet assembly: Slightly increased lateral roller slip-off (see 3.10 Figures 1 and 2) — uncritical: x

3.3 High pressure
No striking feature — OK: x

3.4 Bearing
No striking feature — OK: x

3.5 Shaft seal
No striking feature — OK: x

3.6 Holes
No striking feature — OK: x

3.7 Attached components (metering unit, overflow valve, counting point)
No striking features, see metering unit report — OK: x

3.8 O-rings
No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/14/2009

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

3.9 Other

No striking feature

3.10 Images

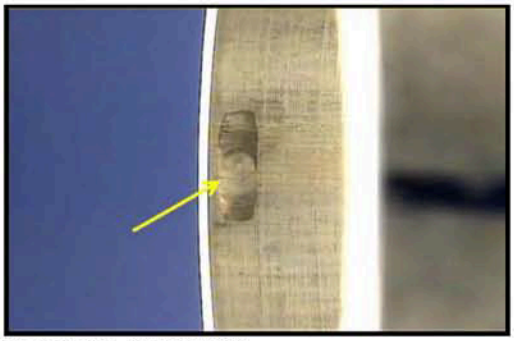

Fig. 1: Roller - housing-side

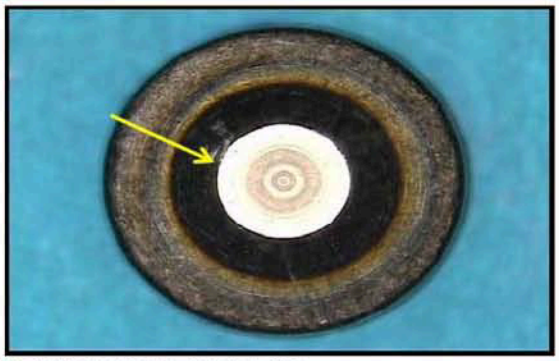

Fig. 2: Tappet body - housing-side

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing
	n[rpm]	p_rail [bar]	I_MU [A]	11/14/2008	7/14/2009
LG	1000	1800	0.4	20.25	20.82

x

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD (technical customer documentation) for new parts.

5. Destiny of the parts

The pump remains after consultation with Mr. [redacted] plant and will be scrapped after 6 months.

6. Attachments

Metering unit report UB VW DS-222366 DNA ZVM20017.

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:		Signature:	
Department:		Phone		Date:		Signature:	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/15/2010

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_448_2x6,75_REC_3,3_1,95_MT4,6	VW	R4 2,0L EA189_2 EU5	B / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21088	883	4536	011M FeP (Feuerbach plant)-M
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	750778		03LP000051
MAP-No.	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
DS-227335	Vehicle endurance run	Profile EWP (Ehra variable track for passenger cars)	26013
Desired mileage [km]	**Actual mileage is [h]**	**Fuel:**	**Confidentiality note**
	100000 km		Confidential

1.Subject

CP4 customer returns **without complaint**
Engine number: 03LP000051 SE250-0-0085, emission standard EU5
Running time: 100,000 km, Profile of Ehra variable track for passenger cars

2. Conclusion

Function
- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components
- Wear of the components is low and without any striking features.

Result
- The pump has **passed the endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical }

	OK	uncritical	Critical
3.1 Drive	x		
3.2 Drivetrain	x		
3.3 High pressure	x		
3.4 Bearing	x		
3.5 Shaft seal	x		
3.6 Holes	x		
3.7 Attached components (metering unit, overflow valve, counting point)	x		
3.8 O-rings	x		

3.1 Drive
No striking feature

3.2 Drivetrain
No striking feature

3.3 High pressure
No striking feature

3.4 Bearing
No striking feature

3.5 Shaft seal
No striking feature

3.6 Holes
No striking feature

3.7 Attached components (metering unit, overflow valve, counting point)
No striking feature

3.8 O-rings
No striking feature

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/15/2010

Department:	Person responsible:	Telephone:	Use	internal / external
Non-responsive content removed				x

3.9 Other
No striking feature

X

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing
	n[rpm]	p_rail [bar]	I_MU [A]	4/11/2008	10/8/2009
LG	1000	1800	0.4	19.38	19.93

X

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD (technical customer documentation) for new parts.

5. Destiny of the parts
The pump will be scrapped at the request of VW.

6. Attachments
None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	3/16/2010	Signature:	Non-responsive content removed
Department:		Phone		Date:	3/22/2010	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	3/15/2010

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x

To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2,0L EA189_2 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21116_03	890	4560	011M FeP (Feuerbach plant)-M
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	750778		03LP000051
MAP-No.	**Endurance run type [customer]:**	**Endurance run conditions:**	**DSBFD no.:**
DS-227336	Vehicle endurance run	Profile EWP (Ehra variable track for passenger cars)	26012
Mileage	**Actual mileage is [h]**	**Fuel:**	**Confidentiality note**
	100000 km		Confidential

1.Subject

CP4 customer returns **without complaint**

Engine-No.:03LL0000069 103kW, VW 416-0-0075

EU5 emission standard, running time: 100,000 km, Profile of Ehra variable track for passenger cars

2. Conclusion

Function

- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components

- Wear of the components is low and without any striking features.

Result

- The pump has **passed the endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive

No striking feature — x (OK)

3.2 Drivetrain

No striking feature — x (OK)

3.3 High pressure

No striking feature — x (OK)

3.4 Bearing

No striking feature — x (OK)

3.5 Shaft seal

No striking feature — x (OK)

3.6 Holes

No striking feature — x (OK)

3.7 Attached components (metering unit, overflow valve, counting point)

No striking feature — x (OK)

3.8 O-rings

No striking feature — x (OK)

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/15/2010

Department:	Person responsible:	Telephone:	Use	internal / external
Non-responsive content removed				x

3.9 Other

No striking feature

x

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing
	n[rpm]	p_rail [bar]	I_MU [A]	10/13/2008	10/8/2009
G	1000	1800	0.4	19.73	19.74

x

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD (technical customer documentation) for new parts.

5. Destiny of the parts

The pump will be scrapped at the request of Audi.

6. Attachments

None

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	3/16/2010	Signature:	Non-responsive content removed
Department:		Phone		Date:	3/22/2010	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/3/2010

Department:	Person responsible:	Telephone:	Use	internal	
[redacted]				external	x

Confidentiality note
Confidential

To:	Non-responsive content removed
For information:	[redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 EU5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010507	140508	1158	5150 JhP (Jihlava plant) - 03
Actual mileage is [h]	**Fuel:**		
30000 km	no information		
SAP-No.:			**Engine/Vehicle number**
30-052021-04			CBBB 01001 / TRUZZZ8J891003028
Customer part number			**Endurance run conditions:**
03L 130 755			Field

Complaint: Drivetrain damage

1. Subject

CP4 customer returns with complaint from France. (Breakdown) engine no. CBBB 2.0l TDI / 125 kW. (Volkswagen engine installed in an Audi TT Coupe.) Vehicle identification no.: TRUZZZ8J891003028

Pump was disassembled in RB-Jihlava and delivered to the product development.

2. Conclusion

Function
- Due to the drivetrain damage, no functional test was performed.

Components
- Drivetrain damage category I (global, abrasive wear)
- As a result, particle marks and grooves through particles on most components (bearings, tappet holes, contact area of HP piston and roller support, etc.)
- Due to the progression of damage, detailed analysis on the cam track, the roller support and roller is no longer possible.
- The anti-friction paint on the spring plate is partly entrained or ruptured.

Result
- Possible damage hypothesis:

Material fatigue and rupture of the roller led probably to the increased slip between roller and cam track (stiff roller) on the tappet assembly in this failure case. Consequently, there was abrasive wear of drivetrain parts and a final turned tappet by 90°. Possible cause for the development of flat spots and stiff rollers for CP4 pumps is the value falling below the minimum viscosity limit:
- Which may have been initiated by wrong fueling, such as kerosene or diesel fuel.
- By overheating of the diesel fuel.

Furthermore, flat spots and stiff rollers are also created through:
- Commissioning with air in the drivetrain compartment.
- C coating defect, fusing in the roller support hole or metal chips on the lateral surface of roller.

- Omission of the anti-friction paint of the spring plate (no suggestions) in the series.
- The pump is to be assessed as on-field failure.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / uncritical / Critical

X		
	X	
		X

3.1 Drive

- No significant wear

X		

3.2 Drivetrain

		X

- Camshaft, cam track Abrasive wear in the center of the cam track along the entire circumference of the cam due to the turned tappet (see Appendix 1, Figure 11 to 14)
- Tappet assembly:
- Roller support, running surface of the roller: C coating is locally entrained (see Appendix 1, Fig. 16)
- Roller support, HP piston contact surface: Particle indentations (see Appendix 1, Fig. 15)
- Tappet body / roller support: Tappet body has rotated relative to the roller support (see Appendix 1, Figures 19 and 20).

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/3/2010

Department:	Person responsible:	Telephone:	Use	internal / external
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For information:	

- Tappet body lateral surface: Grooves through particle drafts (consequential errors; see Appendix 1, Fig. 18)
- Roller, roller surface: Abrasive wear around the entire circumference (see Appendix 1, Figures 9 and 10).

3.3 High pressure — x
- Running surface of piston high-pressure side (upper 50% of the piston length): Grooves through particles (see Appendix 1, Figure 8)
- Piston base: Impressions through particles (see Appendix 1, Figure 7)
- Anti-friction paint on the spring plate of the tappet spring is partially entrained, chipped (see Appendix 1, Figures 1 and 2)

3.4 Bearing — x
- Bearing bush: radially melted (see Appendix 1, Fig. 4)

3.5 Shaft seal — x
- No significant wear

3.6 Holes — x
- Tappet hole top and bottom, grooves and particle indentations (see Appendix 1, Figures 5 and 6)

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) — x
- No significant wear

3.8 O-rings — x
- No significant wear

3.9 Other — x
- Metering unit, particle deposition in the O-ring space (see Appendix 1, Figure 17)

4. Hydraulic function
Assessment no longer possible

5. Destiny of the parts
The parts are returned to the Quality Assurance.

6. Attachments
Appendix 1 - Photos

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	11/16/2010	Signature:	Non-responsive content removed
Department:		Phone		Date:	12/21/2010	Signature:	

EA11003EN-00910[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/24/2010
Department: Non-responsive content removed	Person responsible: [redacted]	Telephone:	Use: internal / external X
			Confidentiality note: Confidential

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Cylinder head:

Pump type: CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	Customer: VW	Project: VW R4 2.0L EU5 CRS3.2 RPU	Project / design pattern type: Series / Series
Part number (TTNo.): 445010507	Date of manufacture: 161108	Serial number:	Manufacturing plant - line: 5150 JhP (Jihlava plant)
Actual mileage is [h]: 50000 km	Fuel: Others		MAP-No.: DS-241774
SAP-No.: 30-101745-50	Samos no.:	Customer order no.:	Engine: CDC000534
Customer part number: CR/CP4S1/R35/20	DSBFD no.: 27321	Endurance run type [customer]: Vehicle endurance run	Endurance run conditions: Argentina endurance run

1. Subject

CP4 customer returns **without complaint**
Engine no.: CDC000534 (Amarok), emission standard: EU5
Testing conditions: Argentina endurance run
Mileage: 50,000km

2. Conclusion

Function
Delivery ratesafter durability test without any significant striking features

Components
Wear of the components is low. There are no significant striking features seen at the pump.

Result
The pump has **passed the durability test.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK | Uncritical | Critical

	OK	Uncritical	Critical
3.1 Drive: No significant wear	X		
3.2 Drivetrain: No significant wear	X		
3.3 High pressure: No significant wear	X		
3.4 Bearing: No significant wear	X		
3.5 Shaft seal: No significant wear	X		
3.6 Holes: No significant wear	X		

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/9/2008

Department:	Person responsible:	Telephone:	Use	internal	
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3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) — X
No significant wear

3.8 O-rings — x
No significant wear

3.9 Other — x
No significant wear

Hydraulic function

The pump function is within specification limits. There is no significant drift in comparison to the delivery measurement

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing	
	n[rpm]	p_rail [bar]	I_MU [A]	11/16/2008	09.03.2010	
ST	200	200	0.4	4.1	4.1	X
LG	1000	1800	0.4	17.3	17.3	X

5 Destiny of the parts

The pump will be scrapped at the request of the client.

Tested:	Non-responsive content removed	Telephone:	Non-responsive content removed	Date:	3/24/2010	Signature:	Non-responsive content removed
Department:		Telephone:		Date:	3/25/2010	Signature:	

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	3/24/2010

Department:	Person responsible:	Telephone:	Use	internal / external
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Confidentiality note
Confidential

To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	VW R4 2.0L EU5 CRS3.2 RPU	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010507	161108		5150 JhP (Jihlava plant)
Actual mileage is [h]	**Fuel:**		**MAP-No.**
50000 km	Others		DS-241774
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101745-50	768619		CDC000534
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
CR/CP4S1/R35/20	27321	Vehicle endurance run	Argentina endurance run

1. Subject

CP4 customer returns **without complaint**
Engine no.: CDC000534 (Amarok), emission standard: EU5
Testing conditions: Argentina endurance run
Mileage: 50,000km

2. Conclusion

Function
Delivery rates after endurance run without any significant striking features.
Components
Wear of the components is low. There are no significant striking features seen at the pump.
Result
- The pump has **passed the endurance run.**

3. Results of diagnosis (visual findings)

Legend rating stages: OK | uncritical | Critical

3.1 Drive

No significant wear

OK	uncritical	Critical
x		

3.2 Drivetrain

No significant wear

OK	uncritical	Critical
x		

3.3 High pressure

No significant wear

OK	uncritical	Critical
x		

3.4 Bearing

No significant wear

OK	uncritical	Critical
x		

3.5 Shaft seal

No significant wear

OK	uncritical	Critical
x		

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/24/2010

Department:	Person responsible:	Telephone:	Use	internal	
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			Confidentiality note: Confidential		

3.6 Holes — x

No significant wear

3.7 Attached components (metering unit, overflow valve, counting point) — x

No significant wear

3.8 O-rings — x

No significant wear

3.9 Other — x

No significant wear

4. Hydraulic function

The pump function is within specification limits.
There is no significant drift in comparison to the delivery measurement

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 11/16/2008	Delivery rate [l/h] after testing 3/9/2010	
ST	200	200	0.4	4.1	4.1	x
LG	1000	1800	0.4	17.3	17.3	x

5. Destiny of the parts

The pump will be scrapped at the request of the client.

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	3/24/2010	Signature:	Non-responsive content removed
Department:		Phone		Date:	3/25/2010	Signature:	

[redacted]	Report no.	**CR pump CP4 diagnosis report**	BOSCH CP4
7/14/2010	Date		

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Confidentiality note Confidential					

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To:
For information:

Project / design pattern type	**Project:**	**Customer:**	**Pump type:**
Series / Series	VW R4 2.0L EU5 CRS3.2 RPU	VW	CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2
Manufacturing plant - line	**Serial number:**	**Date of manufacture:**	**Part number (TTNo.):**
5150 JhP (Jihlava plant) - 03	1383	260109	0445010507
MAP-No.		**Fuel:**	**Actual mileage is [h]**
DS-241775		Others	100000 km
Engine / vehicle number	**Customer order no.:**	**Samos no.:**	**SAP-No.:**
	CR/CP4S1/R35/20	768619	30-101745-50
Endurance run conditions:	**Endurance run type [customer]:**	**DSBFD no.:**	**Customer part number**
Argentina returns	Vehicle endurance run	27322	CR/CP4S1/R35/20

1. Subject

CP4 customer returns **without complaint**
Engine no.: CDC000018 (Amarok)
Testing conditions: Vehicle endurance testing in Argentina
Mileage: 100,000 km, emission standard: EU5

2. Conclusion

Function
Delivery rates after endurance run without any significant striking features

Components
C coating ruptures on the roller support in allowable size. The C coating ruptures are not due to the endurance run conditions and have no effect on function and service life.
The wear of the components is low. There are no significant striking features seen at the pump.

Result
The pump has **passed** the endurance run.

3. Diagnosis Results (visual findings)

Legend rating stages: OK / uncritical / critical

3.1 Drive
No significant striking features

3.2 Drivetrain
C coating ruptures on the roller support in allowable size.

3.3 High pressure
No significant striking features

3.4 Bearing
No significant striking features

3.5 Shaft seal

No significant striking features ×

[redacted]	Report no.	CR pump CP4 diagnosis report	BOSCH CP4
7/14/2010	Date		

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Use				
Confidentiality note Confidential				

3.6 Holes
No significant wear ×

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No significant wear ×

3.8 O-rings
No significant wear ×

3.9 Other
No significant wear ×

3.10 Images

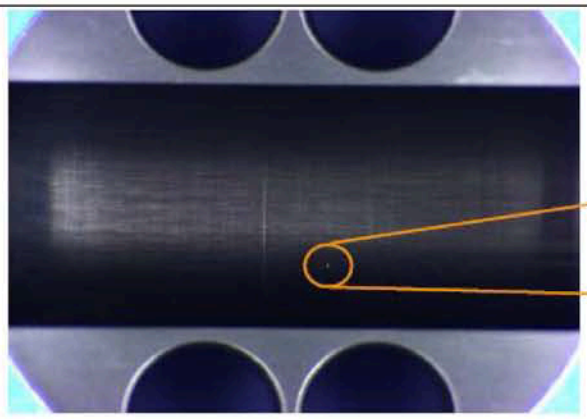

Fig. 1: Roller support to the right C coating ruptures ruptures

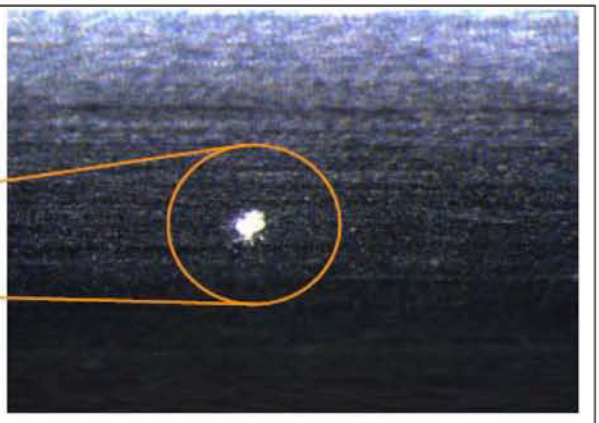

Image 2: Roller support to the right C coating

4. Hydraulic function

- The pump function is within specification limits. There is no significant drift in comparison to the delivery measurement

Delivery rate [l/h] After testing	Delivery rate [l/h] New part	I_MU [A]	p_rail [bar]	n[rpm]				
3/9/2010	1/26/2009							
17.7	17.6	0.4	200	200	ST			x
4.3	4.2	0.4	1800	1000	LG			x

5. Destiny of the parts

The pump will be scrapped at the request of the client.

6. Attachments

None

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[redacted]	Report no.	CR pump CP4 diagnosis report	BOSCH CP4
7/14/2010	Date		

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Confidentiality note: Confidential				

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To:
For information:

Project / design pattern type	Project:	Customer:	Pump type:
Series / Series	R4 2.0L EU5 RPU	VW	CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2
Manufacturing plant - line	**Serial number:**	**Date of manufacture:**	**Part number (TTNo.):**
5150 JhP (Jihlava plant) - 03	1383	260109	0445010507
MAP-No.		**Fuel:**	**Actual mileage is [h]**
DS-241775		Others	100000 km
Engine / vehicle number	**Customer order no.:**	**Samos no.:**	**SAP-No.:**
	CR/CP4S1/R35/20	768619	30-101745-50
Endurance run conditions:	**Endurance run type [customer]:**	**DSBFD no.:**	**Customer part number**
Argentina returns	Engine endurance run	27322	CR/CP4S1/R35/20

1. Subject

CP4 customer returns **without complaint**
Engine no.: CDC000018 (Amarok)
Testing conditions: Vehicle endurance run in Argentina
Mileage: 100,000 km, emission standard: EU5

2. Conclusion

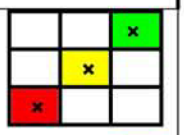
Function
Delivery rates after endurance run without any significant striking features

Components
C coating ruptures on the roller support in allowable size. The C coating ruptures are not due to the endurance run conditions and have no effect on function and durability and service life.
The wear of the components is low. There are no significant striking features seen at the pump.

Result
The pump has **passed** the endurance run.

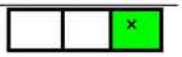
3. Diagnosis Results (visual findings)

Legend rating stages { OK / uncritical / Critical

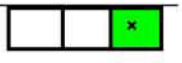


3.1 Drive
No significant wear

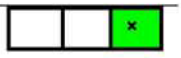
3.2 Drivetrain
C coating ruptures on the roller support in allowable size.



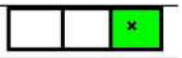
3.3 High pressure
No significant wear



3.4 Bearing
No significant wear



3.5 Shaft seal
No significant wear



[redacted]	Report no.	CR pump CP4 diagnosis report	BOSCH CP4
7/14/2010	Date		

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Confidentiality note: Confidential				

3.6 Holes
No significant wear

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No significant wear

3.8 O-rings
No significant wear

3.9 Other
No significant wear

3.10 Images

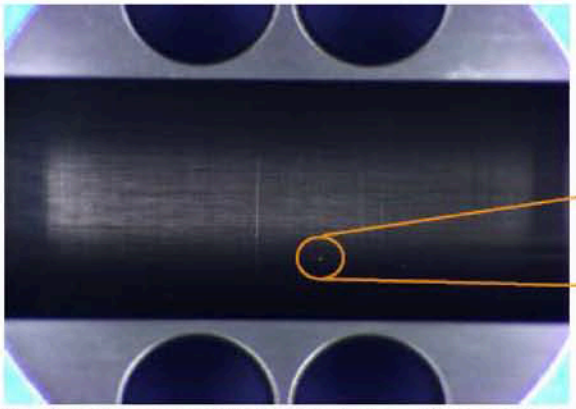

Fig. 1: Roller support to the right C coating ruptures

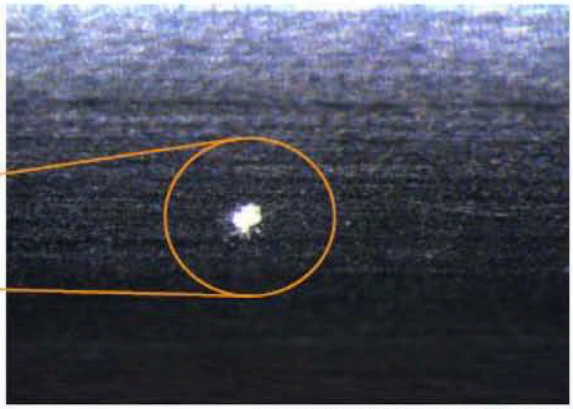

Image 2: Roller support to the right C coating ruptures

4. Hydraulic function

The pump function is within specification limits. There is no significant drift in comparison to the delivery measurement

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 1/26/2009	Delivery rate [l/h] after testing 3/9/2010
ST	200	200	0.4	17.6	17.7
LG	1000	1800	0.4	4.2	4.3

5. Destiny of the parts

The pump will be scrapped at the request of the client.

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6. Attachments
None

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[redacted]	Report no.	CR pump CP4 diagnosis report	BOSCH CP4
6/29/2010	Date		

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Confidentiality note Confidential				

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To:

For information:

Project / design pattern type Series / Series	Project: R4 2.0 EU5	Customer: VW	Pump type: CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2
Manufacturing plant - line 5150 JhP (Jihlava plant) - 03	Serial number: 1419	Date of manufacture: 260109	Part number (TTNo.): 0445010507
MAP-No. DS-243105	Diagnosis no. 3706	Fuel: EN590	Actual mileage is [h] 56551 km
Engine / vehicle number CDC000047 120 kW BiT (Amarok)	Customer order no.:	Samos no.: 770357	SAP-No.: 30-101745-50
Endurance run conditions: Emission standard: EU5	Endurance run type [customer]: Vehicle endurance run	DSBFD no.: 27479	Customer part number

1. Subject

CP4 customer return
Diagnosis after endurance run without complaint

2. Conclusion

Function
- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components
- Wear corresponds to the service life and the testing conditions.

Result
The pump has **passed** the endurance run.

3. Diagnosis Results (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive
No significant wear

3.2 Drivetrain
No significant wear

3.3 High pressure
No significant wear

3.4 Bearing
No significant wear

3.5 Shaft seal
No significant wear

3.6 Holes
No significant wear

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No significant wear

[redacted]	Report no.	CR pump CP4 diagnosis report	BOSCH CP4
6/29/2010	Date		

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Confidentiality note Confidential				

3.8 O-rings
No significant wear ×

3.9 Other
No significant wear ×

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_ZME [A]	Delivery rate [l/h] of new part 1/26/2009	Delivery rate [l/h] after testing 3/24/2010	
Starting point	200	200	0.4	4.1	4.2	×
1000 rpm, p_rated	1000	1800	0.4	17.4	17.6	×
N_max, p_500bar	3375	500	0.4	64.5	65.7	×

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

5. Destiny of the parts

The pump is stored at RB until 12.2010 and then scrapped.

6. Attachments

No appendix

Tested:	Non-responsive content removed	**Telephone:**	Non-responsive content removed	**Date:**	7/5/2010	**Signature:**	Non-responsive content removed
Department:		**Telephone:**		**Date:**	7/5/2010	**Signature:**	

[redacted]	Report no.	CR pump CP4 diagnosis report	BOSCH CP4
6/29/2010	Date		

		Telephone:	Person responsible:	Department:
	internal			
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Confidentiality note: Confidential				

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To:
For information:

Project / design pattern type: Series / Series	Project: R4 2.0 EU5	Customer: VW	Pump type: CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2
Manufacturing plant - line: 5150 JhP (Jihlava plant) - 03	Serial number: 1419	Date of manufacture: 260109	Part number (TTNo.): 0445010507
MAP-No.: DS-243105	Diagnosis no.: 3706	Fuel: EN590	Actual mileage is [h]: 56551 km
Engine / vehicle number: CDC000047 120 kW BiT (Amarok)	Customer order no.:	Samos no.: 770357	SAP-No.: 30-101745-50
Endurance run conditions: Emission standard: EU5	Endurance run type [customer]: Vehicle endurance run	DSBFD no.: 27479	Customer part number

1. Subject

CP4 customer return
Diagnosis after endurance run without complaint

2. Conclusion

Function
- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components
- Wear corresponds to the service life and the testing conditions.

Result
- The pump has **passed** the endurance run.

3. Diagnosis Results (visual findings)

Legend rating stages: OK / uncritical / Critical

3.1 Drive
No significant wear

3.2 Drivetrain
No significant wear

3.3 High pressure
No significant wear

3.4 Bearing
No significant wear

3.5 Shaft seal
No significant wear

3.6 Holes
No significant wear

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)
No significant wear

[redacted]	Report no.	CR pump CP4 - Diagnosis report	BOSCH CP4
6/29/2010	Date		

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Confidentiality note: Confidential				

3.8 O-rings
No significant wear

3.9 Other
No significant wear

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 1/26/2009	Delivery rate [l/h] after testing 3/24/2010
Starting point	200	200	0.4	4.1	4.2
1000 rpm, p_rated	1000	1800	0.4	17.4	17.6
N_max, p_500bar	3375	500	0.4	64.5	65.7

TCD (technical customer documentation) testing point LG (1,000 rpm, p_rated ≥ 15.5 or 15.2 l/h after running time) is met.

5. Destiny of the parts

The pump is stored at RB until 12.2010 and then scrapped.

6. Attachments

No appendix

Tested:	Non-responsive content removed	Telephone:	Non-responsive content removed	Date:	7/5/2010	Signature:	Non-responsive content removed
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BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	12/2/2010

Department:	Person responsible:	Telephone:	Use	internal	
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			Confidentiality note: Confidential		

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Cylinder head:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D
Part number (TTNo.): 0445B21116_13	**Date of manufacture:** 081	**Serial number:** 4673	**Manufacturing plant - line** 0110 FeP (Feuerbach plant)
Mileage 104887 km	**Fuel:** EN590		**MAP-No.** DS-251677
SAP-No.: 30-101008-07	**Samos no.:** 780995	**Customer order no.:**	**Engine/Vehicle number** CFH0126169
Customer part number **03L 130 755 D**	**DSBFD no.:** 28374	**Endurance run type [customer]:** Vehicle endurance run	**Endurance run conditions:** GDV - EWP (Ehra variable track for passenger cars)

1. Subject

CP4 customer returns **without complaint**
GDV Ehra variable track for passenger cars, vehicle endurance run, service life 104,887 km, testing details are not known.
Diagnosis after diagnosis following completion of running time.

Pump with special features (see 6. Appendix 1)

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.
  The non-return valve (version supplier 2 for spring, supplier 3 for hemispherical head) is thus without any functional striking features.

Components (Special features of modification package):

- The roller support (version supplier 2 with material supplier 2) does not show any non-critical run-in traces of the C coating.
- No striking features visible on the cylinder head (version supplier 2 for soft stage).
- No striking features visible on the spring and the spring plate (both are version supplier 2) of the intake valve.
- On the robust flange, uncritical 8 µm deep smoothening of the running surface (see 6. Appendix 2) is visible - axial wear depth up to 100 µm is uncritical.
- The O-rings (version supplier 2) does not show any striking features.
- Wear of the remaining components is low and without significant striking features.

Result

- The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages			
OK	X		
Uncritical		X	
Critical			X

3.1 Drive No striking feature	X		
3.2 Drivetrain C coating of roller support with slight, non-critical run-in traces (Fig. 1); no striking features on other drivetrain components	X		

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		Date	12/2/2010

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3.3 High pressure Cylinder and/or the piston running path do not show any striking features Tappet spring base on the cylinder head light smoothening (Fig. 2) Intake valve base on the cylinder head does not show any striking feature (Fig. 3) Spring and spring plate of the intake valve does not show any striking features, other high-pressure components do not show any striking features	X		

3.4 Bearing Robust flange with non-critical run-in traces on the axial bearing (Fig. 4); no striking features on other bearing components	X		
3.5 Shaft seal No striking feature	X		
3.6 Holes No striking feature	X		
3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) No striking feature	X		
3.8 O-rings No striking feature	X		
3.9 Other No striking feature	X		

3.10 Images

Fig. 1: Roller support to the right, running surface

Fig. 2: Cylinder head to the right, tappet spring suspension system

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			Date	12/2/2010	
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			Confidentiality note: Confidential		

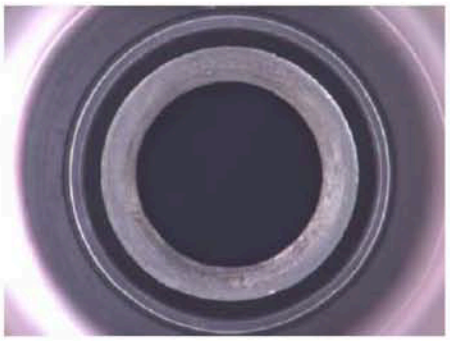

Figure 3 cylinder head to the right, SV system

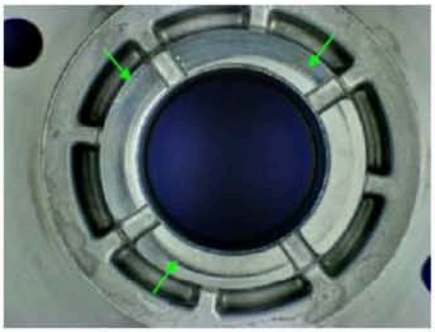

Figure 4: robust flange, axial running surface

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] New part 1/28/2010	Delivery rate [l/h] After testing 7/7/2010	
ST	200	200	0.4	4.5	4.6	X
LG	1000	1800	0.4	20.0	20.2	X

No significant volumetric efficiency change compared to delivery measurement.
Back measurement is within the TCD for new parts.

5. Destiny of the parts

The pump is stored at RB until 06/2011 and then scrapped.

6. Attachments

Appendix 1: Sample configuration for special components
Appendix 2: Set of slides for diagnosis of robust flange

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BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	12/14/2010

Department:	Person responsible:	Telephone:	Use	internal	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	D/D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21116_05	0891	4839	011M FeP (Feuerbach plant)-M -
Actual mileage is [h]	**Fuel:**		**MAP-No.**
100000 km	EN590		DS-256645
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101581-07	786990	PT4839, 000891; engine 03LL000173 or Fa	03LL000173/ VW41600073
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
03L 130 755 D	28794	Vehicle trial	EES

1. Subject

CP4 customer returns **without complaint.**
EES (Ehra Start-stop) vehicle endurance run, running time 100000km, **110k Start-stops**
Diagnosis after running time expiry

2. Conclusion

Function

- Delivery rates after endurance run without significant fuel-quantity drift in comparison with the new state.

Components

- The roller support shows a local rupture of the C3 coating. Because of the maximum wear depth of 0.5 µm in combination with the smaller surface (see 6. Appendix 1), rupture is uncritical. The most likely cause is inhomogeneity in the structure of C3 coating (see also report CP4_0320 2010 in this regard).
- Wear of the other components is low and does not show any significant striking features.

Result

- The pump has **passed the endurance run**.
- It is switched to the optimized C3.1 coating as a corrective action for inhomogeneities in C3 coating.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Local rupture of C3 coating (Fig. 1, detailed image Figure 2) — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

3.5 Shaft seal

No striking feature — OK: x

3.6 Holes

No striking feature — OK: x

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		Date	12/14/2010

Department:	Person responsible:	Telephone:	Use	internal	
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3.7 Attached components (metering unit, overflow valve, counting point)

x

No striking feature

3.8 O-rings

x

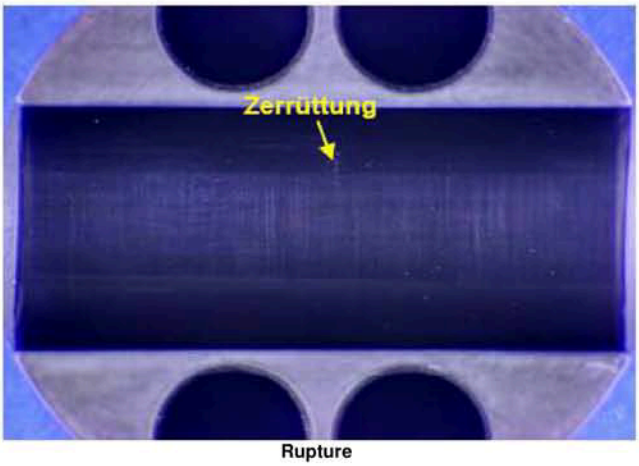
No striking feature

3.9 Other

x

No striking feature

3.10 Images



Rupture

Fig. 1: Roller support

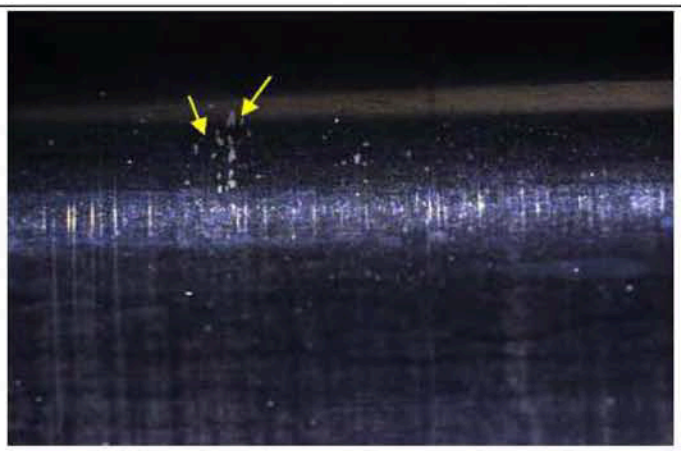


Fig. 2: Roller support, detailed rupture

4. Hydraulic function

				Delivery rate [l/h] of new part	Delivery rate [l/h] after testing	
	n[rpm]	p_rail [bar]	I_MU [A]	11/18/2008	9/23/2010	
ST	200	200	0.4	4.4	4.5	x
LG	1000	1800	0.4	19.9	20.4	x

No significant volumetric efficiency change compared to delivery measurement.
Back measurement is within the TCD for new parts.

5. Destiny of the parts

The pump is stored at RB until 06/2011 and then scrapped.

6. Attachments

Appendix 1: WLI (white-light interferometry) measurement of roller support

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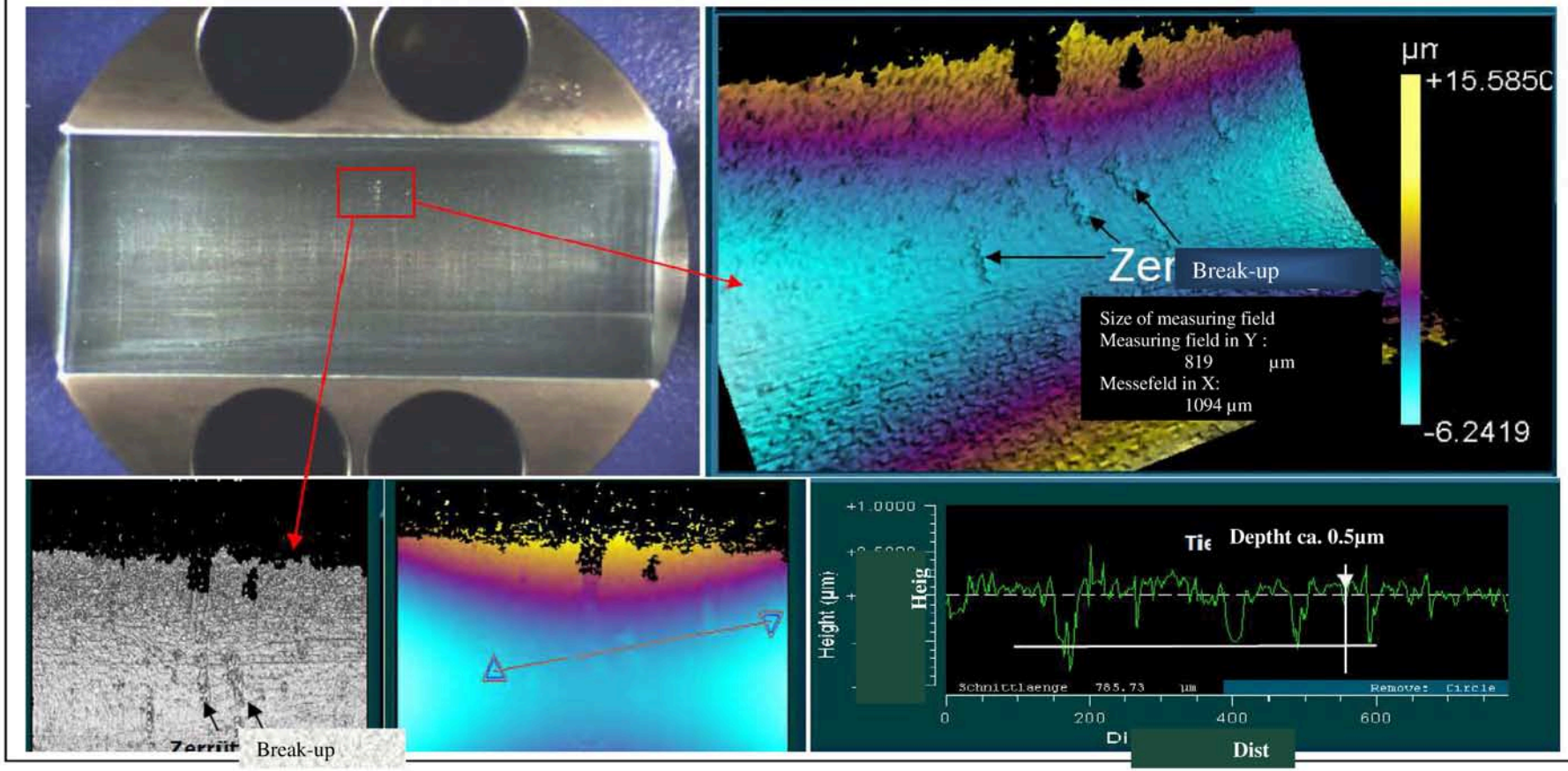
EA11003EN-00917[2]

CP4 - Investigation R4 2,0 EU5/ #891-4839

→ **Pump:** D-sample, CP4.1S_398_2x6_REC_3,3_1,95_MT4,2, #891-4839

→ **Operating conditions:** Vehicle-Endurance testing, Run time 100000km, Endurance testing-end

→ **Investigation:** Roller shoe – start, C-layer, centric



Diesel Systems

BOSCH

EA11003EN-00918[0]

BOSCH CP4

CR pump CP4 - Diagnosis report

Report no.	[redacted]
Date	2/3/2011

Department:	Person responsible:	Telephone:
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Use	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010514	260309	0736	736 - 04
Actual mileage is [h]	**Fuel:**		**MAP-No.**
100023 km	EN590		DS-258419
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-102202-15	789477	731523	CGL0000027 / AU416 -1 1138
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
03L 130 755 D	28992	Vehicle endurance run	Ehra variable track for passenger cars

1.Subject

CP4 Customer returns **without** complaint
Engine no. CGL00000, 125 kW, Euro 5
Vehicle no.: AU416 -1 1138
Testing conditions: Ehra variable track for passenger cars

2. Conclusion

Function:
The pump function is within the specification limits. There is no significant drift in comparison to the delivery measurement.

Components
Wear of the components is low and without significant striking features.

Result
The pump has passed the **endurance run**

3. Results of diagnosis (visual findings)

Legend rating stages	OK	uncritical	Critical
	X		
		X	
			X

3.1 Drive
No striking feature — X

3.2 Drivetrain
No striking feature — X

3.3 High pressure
No striking feature — X

3.4 Bearing
No striking feature — X

3.5 Shaft seal
No striking feature — X

3.6 Holes
No striking feature — X

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/3/2011

Department:	Person responsible:	Telephone:	Use	internal	
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Confidentiality note
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3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) x
No striking feature

3.8 O-rings x
No striking feature

3.9 Other x
No striking feature

3.10 Images
None

4. Hydraulic function

The pump function is within the specification limits. There is no significant drift in comparison to the delivery measurement.

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 3/26/2009	Delivery rate [l/h] after testing 10/1/2009	
ST	200	200	0.4	4.6	4.9	x
LG	1000	1800	0.4	20.1	20.6	x

5. Destiny of the parts

The pump parts remain with Robert Bosch GmbH at the request of the customer

6. Attachments

None

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Department		Telephone:		Date:	2/14/2011	Signature:	

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/3/2011

Department:	Person responsible:	Telephone:	Use	
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To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010514	260309	0736	736 - 04
Actual mileage is [h]	**Fuel:**		**MAP-No.**
100023 km	EN590		DS-258419
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-102202-15	789477	731523	CGL0000027 / AU416 -1 1138
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
03L 130 755 D	28992	Vehicle endurance run	Ehra variable track for passenger cars

1. Subject

CP4 Customer returns **without** complaint
Engine no. CGL00000, 125 kW, Euro 5
Vehicle no.: AU416 -1 1138
Testing conditions: Ehra variable track for passenger cars

2. Conclusion

Function:
The pump function is within the specification limits. There is no significant drift in comparison to the delivery measurement.

Components
Wear of the components is low and without significant striking features.

Result
The pump has passed the **endurance run**

3. Results of diagnosis (visual findings)

Legend rating stages				
	OK	X		
	uncritical		X	
	Critical			X

3.1 Drive
No striking feature — X

3.2 Drivetrain
No striking feature — X

3.3 High pressure
No striking feature — X

3.4 Bearing
No striking feature — X

3.5 Shaft seal
No striking feature — X

3.6 Holes
No striking feature — X

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/3/2011

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3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) x
No striking feature

3.8 O-rings x
No striking feature

3.9 Other x
No striking feature

3.10 Images
None

4. Hydraulic function

The pump function is within the specification limits. There is no significant drift in comparison to the delivery measurement.

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 3/26/2009	Delivery rate [l/h] after testing 10/1/2010	
ST	200	200	0.4	4.6	4.9	x
LG	1000	1800	0.4	20.1	20.6	x

5. Destiny of the parts

The pump parts remain with Robert Bosch GmbH at the request of the customer

6. Attachments

None

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Department		Telephone:		Date:	2/14/2011	Signature:	

EA11003EN-00920[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/23/2011

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To:	Non-responsive content removed
For information:	[redacted]

Pump type:	Customer:	Project:	Project / design pattern type
C P4.1 S_348_2x 5,2 5_R E C_3,3_I, 95_ M T4,2	VW	R4 2.0 EU5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010507	150609	0365	5150 JhP (Jihlava plant) - 03
Actual mileage is [h]	**Fuel:**		**MAP-No.**
22400 km	Others		DS-259908
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101745-50	791254	VN817-8-0164 (RPU) EU5	
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
	29202	Vehicle endurance run	Profile Argentina diesel

1.Subject

CP4 Customer returns without complaint
BD 0 445 010 507 HP pump CP4.1,
Design status, date of manufacture: 06.15.2009, SN: BPT0356,
Engine no. VN817-8-0164 (RPU), CDC0000616
EU5 emission standard with Argentina diesel, mileage 22,400 km

2. Conclusion

Function:

Pumps were already opened by the customer. Therefore, hydraulic back measurement no longer possible.

Components:

Drivetrain damage category 1 (global, abrasive wear of roller support and cam track in addition to material fatigue and rupture of the roller), see Figures 1 to 4

As a result, particle marks and grooves through particles on most components (bearings, tappet holes, contact area of HP piston and roller support, etc.), see Figs. 11 to 14

Due to the progression of damage, no detailed analysis on the cam track, roller support and the roller

is possible any longer. Argentina-diesel cannot be ruled out as a possible cause of this damage.

Brown discoloration due to fuel on the housing and flange bearing of the camshaft, see Figures 7 and 8; bearing damage as a result of drivetrain damage and overload, see Figures 5 and 6

The high-pressure piston shows waviness and discoloration that can occur during grinding under certain circumstances, see Figures 9 and 10

Result:

- The pump has failed the endurance run.

The pump is released for EN590 according to TCD (technical customer documentation). The endurance run conditions with Argentina diesel were carried out outside this release.

One possible reason for the deposit formation is air, water in fuel, foam or Argentina diesel fuel.

3. Results of diagnosis (visual findings)

Legend rating stages				
	OK	X		
	uncritical		X	
	Critical			X

3.1 Drive

No striking feature

X		

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		Date	2/23/2011

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3.2 Drivetrain — x
Drivetrain damage category I (global, abrasive wear)

3.3 High pressure — x
Piston base up to 4 mm diameter damaged by particles indentations. High-pressure piston, waviness over the entire piston guidance.

3.4 Bearing — x
Bearing damage due to drivetrain damage and overload

3.5 Shaft seal — x
No striking feature

3.6 Holes — x
As a result of drivetrain damage, particle marks and particles are in the metering hole.

3.7 Attached components (metering unit, overflow valve, counting point) — x
As a result of drivetrain damage, there are particles on the MU (metering unit).

3.8 O-rings — x
No striking feature

3.9 Other — x
No striking feature

3.10 Images

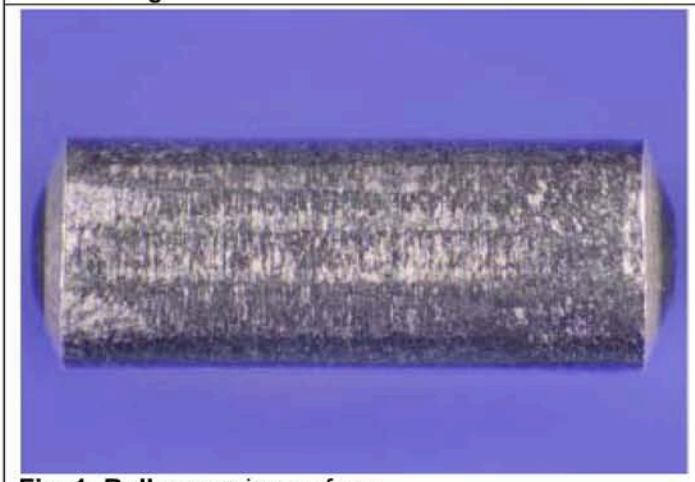

Fig. 1: Roller, running surface

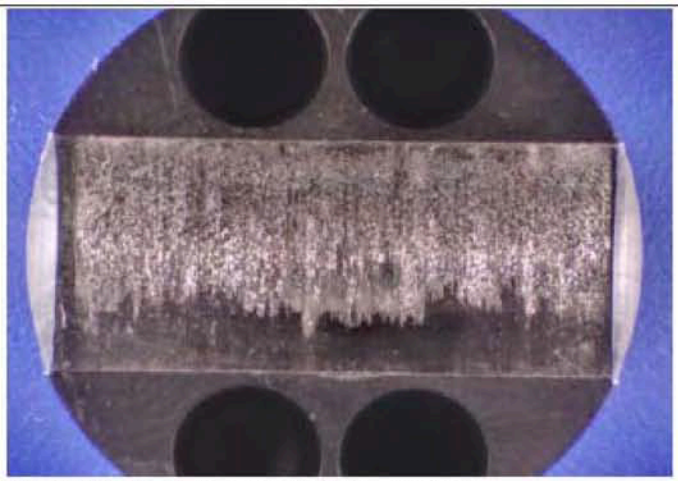

Fig. 2: Roller support, running surface

Fig. 3: Camshaft, cam track running surface TDC (top dead center)

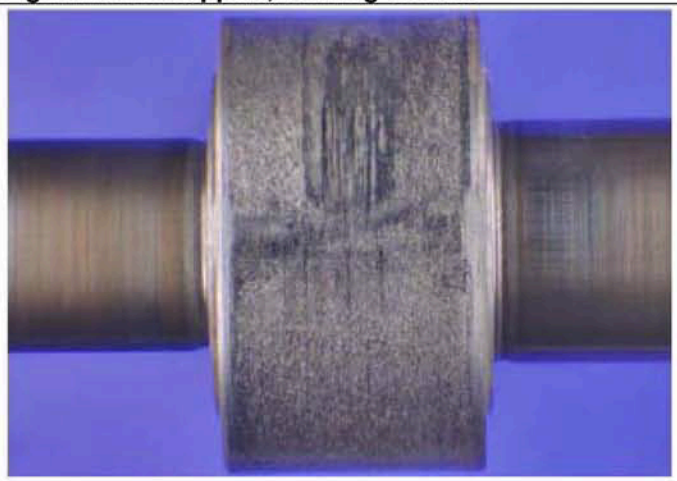

Fig. 4: Camshaft, cam track running surface BDC (bottom dead center)

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		Date	2/23/2011

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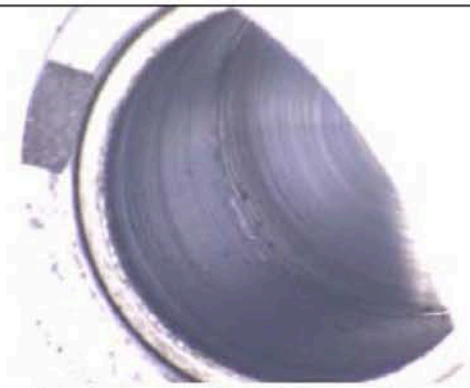

Fig. 5: Housing mount bushing, radial

Fig. 6: Housing mount bushing, radial

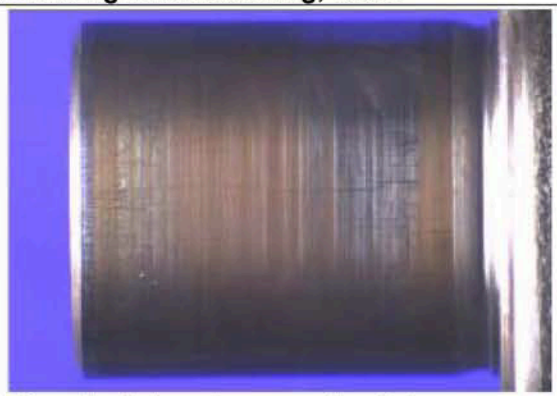

Fig. 7: Camshaft, housing mount radial

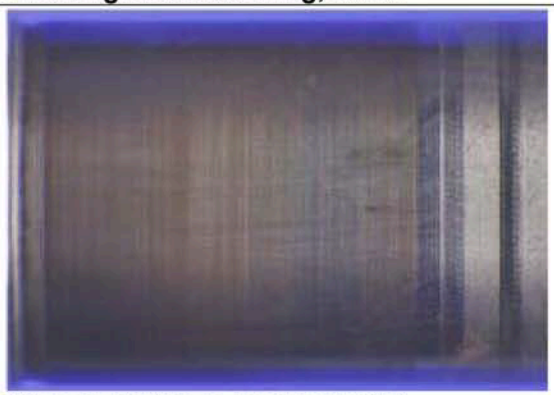

Fig. 8: Camshaft, flange bearing radial

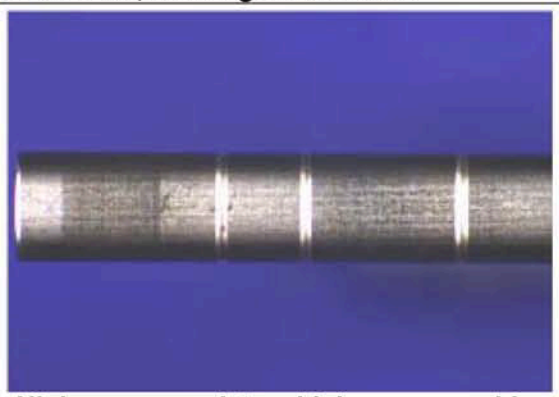

Fig. 9: High-pressure piston, high-pressure side

Fig. 10: High-pressure piston, low-pressure side

Fig. 11: Roller support, piston system

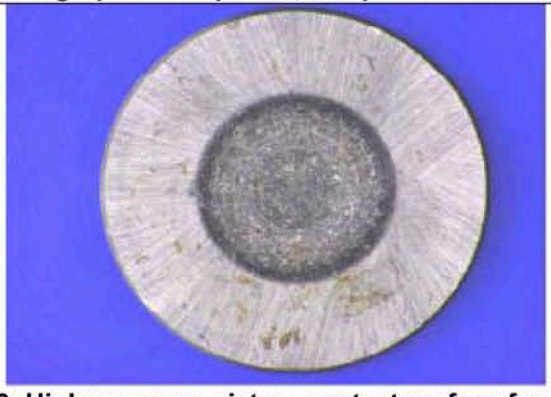

Fig. 12: High-pressure piston, contact surface for roller support

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/23/2011

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Confidentiality note
Confidential

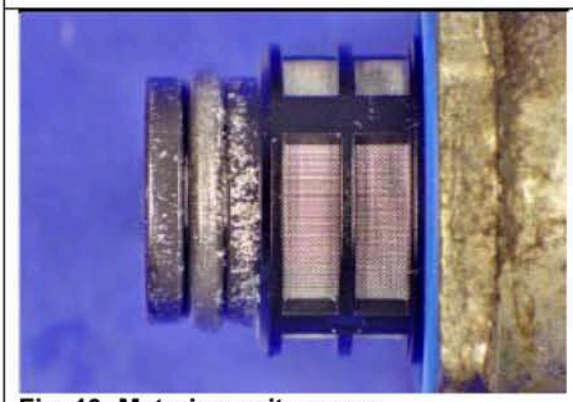

Fig. 13: Metering unit, screen

Fig. 14: Housing, metering unit hole

4. Hydraulic function

The pumps were already opened by the customer. Therefore, hydraulic back measurement no longer possible.

5. Destiny of the parts

The pump parts remain with Robert Bosch GmbH at the request of the customer

6. Appendix

None

Tested:	Non-responsive content removed	**Telephone:**	Non-responsive content removed	**Date:**	2/23/2011	**Signature:**	Non-responsive content removed
Department		**Telephone:**		**Date:**	3/2/2011	**Signature:**	

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BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/23/2011

Department:	Person responsible:	Telephone:	Use	
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			external	x
			Confidentiality note	
			Confidential	

To: [redacted]

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010507	150709	0060	5150 JhP (Jihlava plant) - 03
Actual mileage is [h]	**Fuel:**		**MAP-No.**
62106 km	Others		DS-259910
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101745-50	791254		VN817-9-0359 (RPU) EU5,120kW
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
03L 130 755	29203	Vehicle endurance run	Profile of Ehra variable track for passenger cars with Argentina diesel

1. Subject

CP4 Customer returns without complaint
Engine no. VN817-9-0359 (RPU) 120 kW, CDC ..... 630, emission standard: EU5
Mileage: 62,106 km, profile of Ehra variable track for passenger cars with Argentina diesel

2. Conclusion

Function:
Pumps were already opened by the customer. Therefore, hydraulic back measurement no longer possible.

Components:
The high-pressure piston shows waviness and discoloration that can occur during grinding under certain circumstances in China. (Rating 4), see Figures 1 and 2
Significant deposits on the right side of the roller support due to fuel. (Rating 5), see Figure 3
Brown discoloration due to fuel on the roller. (Rating 5), see Figure 4
Wear of the other components is low and without significant striking features.

Result:
The pump has **passed the endurance run**.
The pump is released for EN590 according to TCD (**T**echnical Customer **D**ocumentation). The endurance run conditions with Argentina
diesel were outside of this release.
One possible reason for the deposit formation is air, water in fuel, foam or Argentina diesel fuel.

3. Results of diagnosis (visual findings)

Legend rating stages

OK	x		
Uncritical		x	
Critical			x

3.1 Drive

No striking feature

x		

3.2 Drivetrain

	x	

Significant deposits on the right side of the roller support due to fuel. (Rating 5), see Figure 3
Brown discoloration due to fuel on the roller. (Rating 5), see Figure 4

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/23/2011

Department:	Person responsible:	Telephone:	Use	
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Confidentiality note

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3.3 High pressure [| x |]

The high-pressure piston shows waviness and discoloration that can occur during grinding under certain circumstances. (Rating 4), see Figures 1 and 2

3.4 Bearing [x | |]

No striking feature

3.5 Shaft seal [x | |]

No striking feature

3.6 Holes [x | |]

No striking feature

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) [x | |]

No striking feature

3.8 O-rings [x | |]

No striking feature

3.9 Other [x | |]

No striking feature

3.10 Images

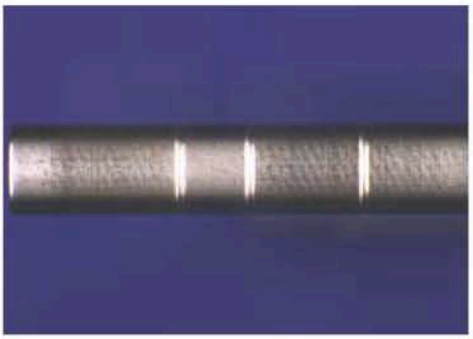

Fig. 1: High-pressure piston, high-pressure side (rating 4)

Fig. 2: High-pressure piston, low-pressure side (rating 4)

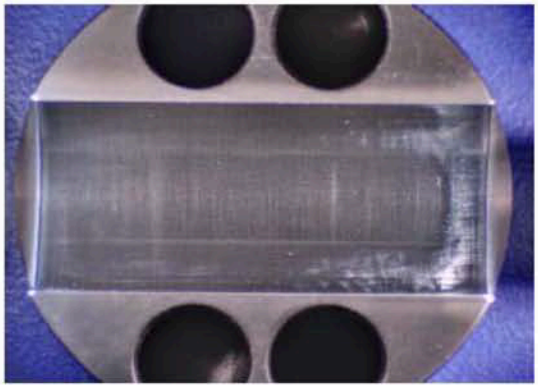

Fig. 3: Roller support, running surface (rating 5)

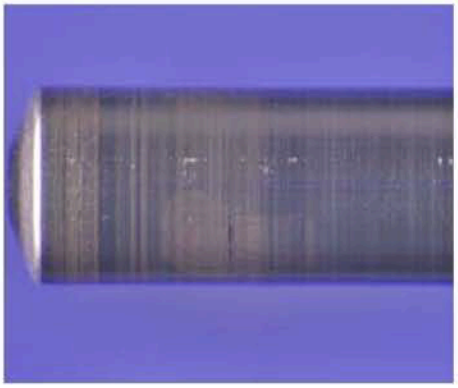

Fig. 4: Roller, running surface (rating 5)

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
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4. Hydraulic function

Pumps were already opened by the customer. Therefore, hydraulic back measurement no longer possible.

5. Destiny of the parts

The pump parts remain with Robert Bosch GmbH at the request of the customer

6. Attachments

None

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Department		Telephone:		Date:	3/1/2011	Signature:	

EA11003EN-00922[0]

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	2/23/2011

Department:	Person responsible:	Telephone:	Use	
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			Confidentiality note: Confidential	

To: Non-responsive content removed

For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_348_2x5,25_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010507	150709	0060	5150 JhP (Jihlava plant) - 03
Actual mileage is [h]	**Fuel:**		**MAP-No.**
62106 km	Others		DS-259910
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101745-50	791254		VN817-9-0359 (RPU) EU5,120kW
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
03L 130 755	29203	Vehicle endurance run	Profile of Ehra variable track for passenger cars with Argentina diesel

1. Subject

CP4 Customer returns without complaint
Engine no. VN817-9-0359 (RPU) 120 kW, CDC ..... 630, emission standard: EU5
Mileage: 62,106 km, profile of Ehra variable track for passenger cars with Argentina diesel

2. Conclusion

Function:
Pumps were already opened by the customer. Therefore, hydraulic back measurement no longer possible.

Components:
The high-pressure piston shows waviness and discoloration that can occur during grinding under certain circumstances in China. (Rating 4), see Figures 1 and 2
Significant deposits on the right side of the roller support due to fuel. (Rating 5), see Figure 3
Brown discoloration due to fuel on the roller. (Rating 5), see Figure 4
Wear of the other components is low and without significant striking features.

Result:
The pump has **passed the endurance run**.
The pump is released for EN590 according to TCD (**T**echnical Customer **D**ocumentation). The endurance run conditions with Argentina
diesel were outside of this release.
One possible reason for the deposit formation is air, water in fuel, foam or Argentina diesel fuel.

Legend rating stages

OK	x		
Uncritical		x	
Critical			x

3. Results of diagnosis (visual findings)

3.1 Drive

No striking feature

x		

3.2 Drivetrain

	x	

Significant deposits on the right side of the roller support due to fuel. (Rating 5), see Figure 3
Brown discoloration due to fuel on the roller. (Rating 5), see Figure 4

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3.3 High pressure x

The high-pressure piston shows waviness and discoloration that can occur during grinding under certain circumstances. (Rating 4), see Figures 1 and 2

3.4 Bearing x

No striking feature

3.5 Shaft seal x

No striking feature

3.6 Holes x

No striking feature

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) x

No striking feature

3.8 O-rings x

No striking feature

3.9 Other x

No striking feature

3.10 Images

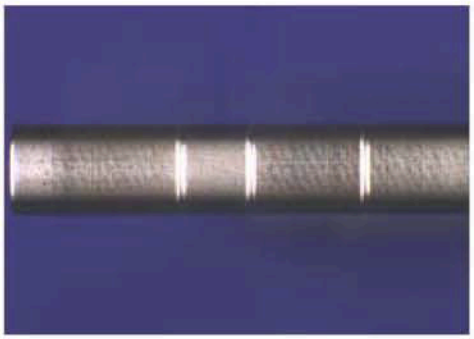

Fig. 1: High-pressure piston, high-pressure side (rating 4)

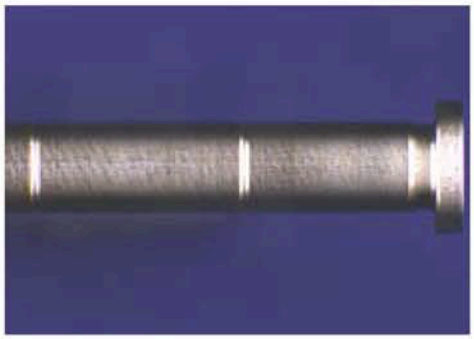

Fig. 2: High-pressure piston, low-pressure side (rating 4)

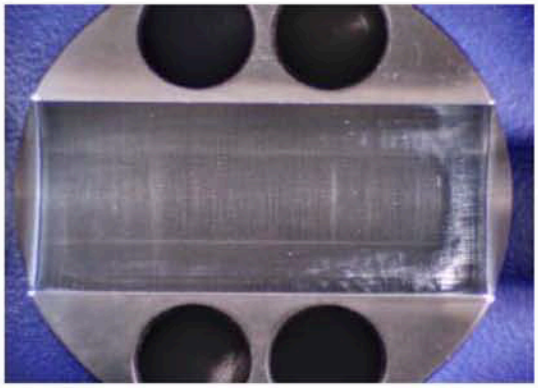

Fig. 3: Roller support, running surface (rating 5)

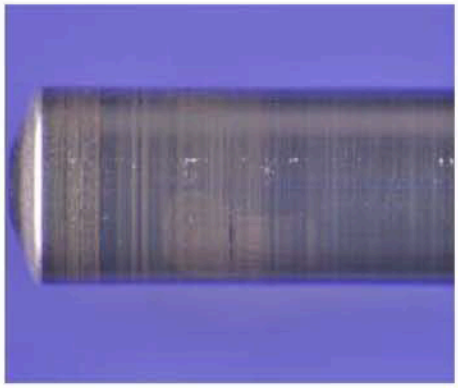

Fig. 4: Roller, running surface (rating 5)

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4. Hydraulic function

Pumps were already opened by the customer. Therefore, hydraulic back measurement no longer possible.

5. Destiny of the parts

The pump parts remain with Robert Bosch GmbH at the request of the customer

6. Attachments

None

Tested:	Non-responsive content removed	**Telephone:**	Non-responsive content removed	**Date:**	2/28/2011	**Signature:**	Non-responsive content removed
Department		**Telephone:**		**Date:**	3/1/2011	**Signature:**	

EA11003EN-00923[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/3/2011

Department:	Person responsible:	Telephone:	Use	
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			external	x
			Confidentiality note: Confidential	

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For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 EU5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21137_05	989	4491	011M FeP (Feuerbach plant)-M -
Actual mileage is [h]	**Fuel:**		**MAP-No.**
950 h	EN590		DS-260833
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-102939-09	791448	03LT/20819, 103 kW	03LT/20819, 103 kW
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
03L 130 755 F	29265	Engine endurance run	Profile of ÖVL + PZD + ÖVL

1. Subject

CP4 customer returns **without complaint**.
Engine no. 03LT/20819, 103 kW, emission standard: EU5

Mileage: 950 h with ÖVL + + PZD + ÖVL

2. Conclusion

Function:
The pump function in the specified testing point meets the requirements. In comparison to the delivery measurement, no significant fuel-quantity drift is detectable.
Components:
Fretting wear on the high-pressure seal of the intake valve and the high-pressure seal in contact with the intake valve. (See 3.10 Figures 1 and 2, rating 4)
Fuel deposits on the outer edges of the sealing surfaces of the intake valve and high-pressure seal. (See 3.10 Figures 1 and 2, rating 3)
Wear of the other components is low and without significant striking features.
Result:
The pump has passed the endurance run.
Deposit formation is due to fuel. Robert Bosch GmbH requires further information from the customer in this regard.

3. Results of diagnosis (visual findings)

Legend rating stages

	OK	Uncritical	Critical
3.1 Drive – No striking feature	x		
3.2 Drivetrain – No striking feature	x		
3.3 High pressure x		x	

3.3 High pressure x
Fretting wear at the high-pressure seal of the intake valve. (Rating 4, Figure 1).
Fretting wear on the high-pressure seal in contact with the intake valve (Rating 4, Figure 2).
Fuel deposits on the outer edge of the high-pressure sealing surfaces of the intake valve. (See 3.10 Figures 1 and 2, rating 3)
Fuel deposits on the outer edge of the high-pressure seal of the intake valve. (See 3.10 Figures 1 and 2, rating 3)

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/3/2011

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3.4 Bearing X
No striking feature

3.5 Shaft seal X
No striking feature

3.6 Holes X
No striking feature

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point) X
No striking feature

3.8 O-rings X
No striking feature

3.9 Other X
No striking feature

3.10 Images

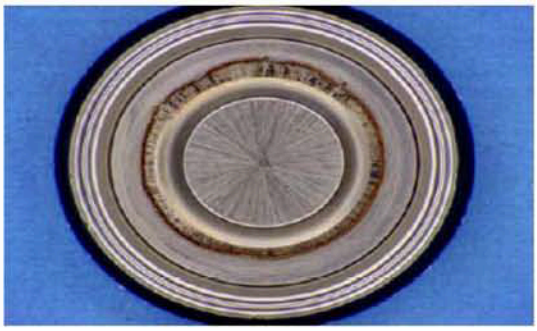

Fig. 1: Intake valve of fretting wear (Rating 4)

Fig. 2: Fretting wear at stationery seal ring (Rating 4)

4. Hydraulic function

The pump function in the specified testing point meets the requirements. In comparison to the delivery measurement, no significant fuel-quantity drift is detectable.

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] New part	Delivery rate [l/h] After testing	
ST	200	200	0.4	4.4	4.5	X
LG	1000	1800	0.4	20.4	20.5	X

5. Destiny of the parts

The pump parts remain with Robert Bosch GmbH at the request of the customer

6. Attachments

None

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EA11003EN-00924[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/10/2011

Department:	Person responsible:	Telephone:	Use	
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			Confidentiality note: Confidential	

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For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2.0 BIN5	Series / Series
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445010514	250310	0449	5150 JhP (Jihlava plant) -
Actual mileage is [h]	**Fuel:**		**MAP-No.**
890 h	EN590		DS-265015
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101933-06	796025		C3LF / 21493
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
03L 130 755 D	29797	Engine endurance run	TTHS/SRT

1.Subject

CP4 customer returns without complaint, pump diagnosed
Engine no. C3LE/21493 120 kW (Crafter 4 cyl.)

Emission standard: EU5, mileage: 890 h, endurance run profile TTHS / SRT

2. Conclusion

Function:
The pump function is within the specification limits. There is no significant drift in comparison to the delivery measurement.

Components:
Wear of the components is low and without significant striking features.

Result:
The pump has passed the endurance run.

3. Results of diagnosis (visual findings)

Legend rating stages

	OK	Uncritical	Critical
	x		
		x	
			x

3.1 Drive
No striking feature — x

3.2 Drivetrain
No striking feature — x

3.3 High pressure
No striking feature — x

3.4 Bearing
No striking feature — x

3.5 Shaft seal
No striking feature — x

3.6 Holes
No striking feature — x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	3/10/2011

Department:	Person responsible:	Telephone:	Use	
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3.7 Attached components (metering unit, overflow valve, counting point)

x

No striking feature

3.8 O-rings

x

No striking feature

3.9 Other

x

No striking feature

3.10 Images

4. Hydraulic function

The pump function is within the specification limits. There is no significant drift in comparison to the delivery measurement.

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] New part 3/25/2010	Delivery rate [l/h] After testing 11/8/2010	
ST	200	200	0.4	4.6	4.7	x
LG	1000	1800	0.4	20.6	20.5	x

5. Destiny of the parts

The pump parts remain with Robert Bosch GmbH at the request of the customer

6. Attachments

None

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EA11003EN-00925[0]

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	9/22/2011

Department:	Person responsible:	Telephone:	Use	
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			external	x
			Confidentiality note: Confidential	

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For information:

Pump type:	Customer:	Project:	Project / design pattern type
CP4.2HS_747_2x5,63_REC_3,3_1,3_MT4,2	AUDI	W36 2000bar (Q7)	D/D
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B20249_08	990	4011	011M FeP (Feuerbach plant)-M
Actual mileage is [h]	**Fuel:**		**MAP-No.**
160565 km	India EU3		DS-276680
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-101921-06	813822		059.H W36 586 / AU641 04046
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
059 130 755 AK	31082	Vehicle endurance run	3-zone endurance run (NK6, cool1, hot)

1.Subject

CP4 Customer returns **without** complaint
Diagnosis after endurance run end
160,565 km vehicle durability test
Engine no. 059.H W36 586 / Vehicle No.: AU641 04046
Anti-wear package: without
Testing country: Germany

2. Conclusion

Function:
- Delivery rates after endurance run or test without significant fuel-quantity drift in comparison with the new state.

Components:
- The shaft seal on pump side (inside) shows increased wear (see Figure 3).
  However, this is classified as uncritical.
- Both spring plates show smoothening with slight noticeable grooves (see Figures 1 and 2).
  The wear of the two components is not critical and does not affect the function.
- Wear of the other components is low and without significant striking features.

Result:
- Wear of the shaft seal is increased most likely due to reduced lubricity of the fuel. This indicates a reduced viscosity of the fuel.
  Maybe, there was a slightly increased proportion of free water or gasoline from the fuel at times.
- The pump has passed the **endurance run**

3. Results of diagnosis (visual findings)

Legend rating stages

OK	x		
Uncritical		x	
Critical			x

3.1 Drive

No striking feature — x

3.2 Drivetrain

Spring plate to the left and right: Smoothening with slight noticeable grooves (see Figures 1 and 2). — x

3.3 High pressure

No striking feature — x

3.4 Bearing

No striking feature — x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	9/22/2011

Department:	Person responsible:	Telephone:	Use	
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			Confidential	

3.5 Shaft seal

Shaft seal pump-side: increased wear (see Figure 3).

3.6 Holes

No striking feature

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature

3.8 O-rings

No striking feature

3.9 Other

No striking feature

3.10 Images

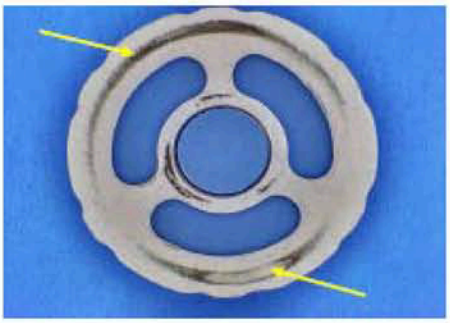

Fig. 1: Spring plate to the left, piston system

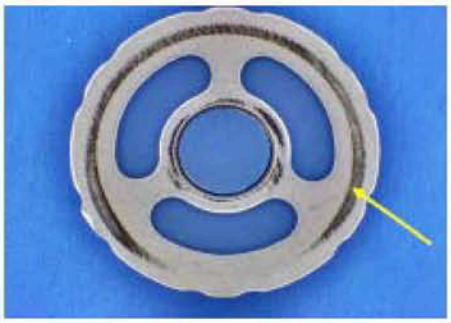

Figure 2: Spring plate to the right, piston system

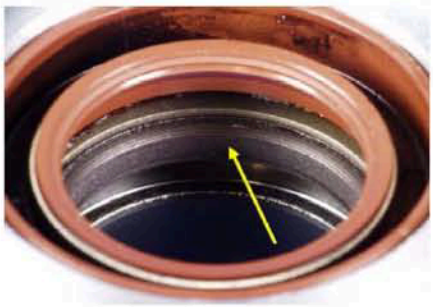

Fig. 3: Shaft seal, pump-side

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 11/17/2009	Delivery rate [l/h] after testing 3/10/2001
ST	200	200	0.4	8.5	8.5
LG	1000	2000	0.4	35.9	36.4

No significant volumetric efficiency change, the volumetric efficiency is within the tolerance specified in the TCD (technical customer documentation) for new parts.

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	9/22/2011

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			Confidentiality note: Confidential		

5. Destiny of the parts

The pump will be scrapped at the request of Audi.

6. Attachments

Appendix 1: Diagnosis images of drivetrain

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Department		Telephone:		Date:		Signature:	

Appendix 1 to process 2011-CP4_0203

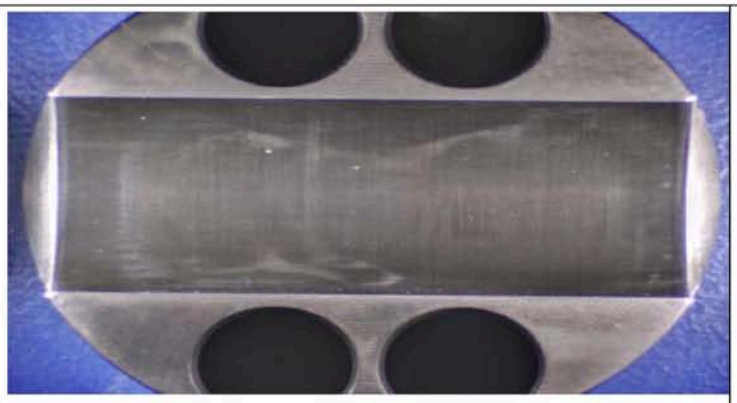

Fig. 1: Roller support to the left
Slight deposit R3

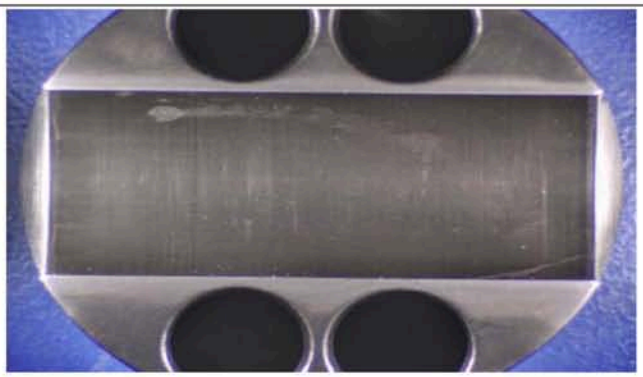

Fig. 2: Roller support to the right

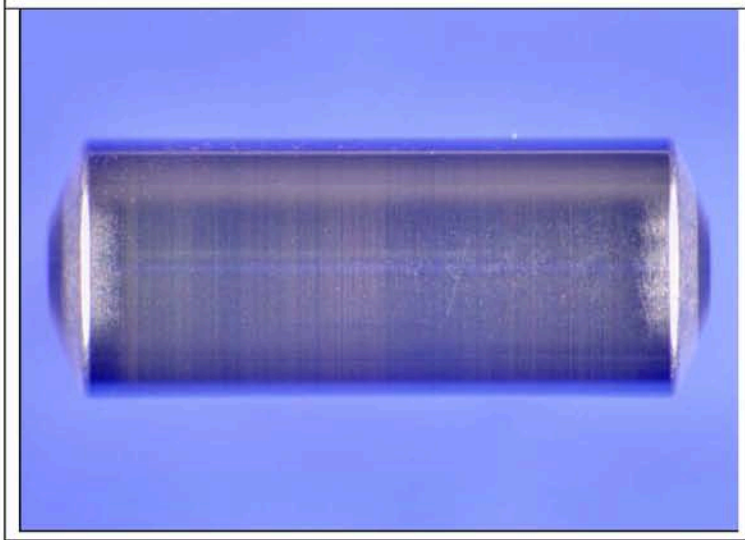

Fig. 3: Roller to the left
Faint brown discoloration R3

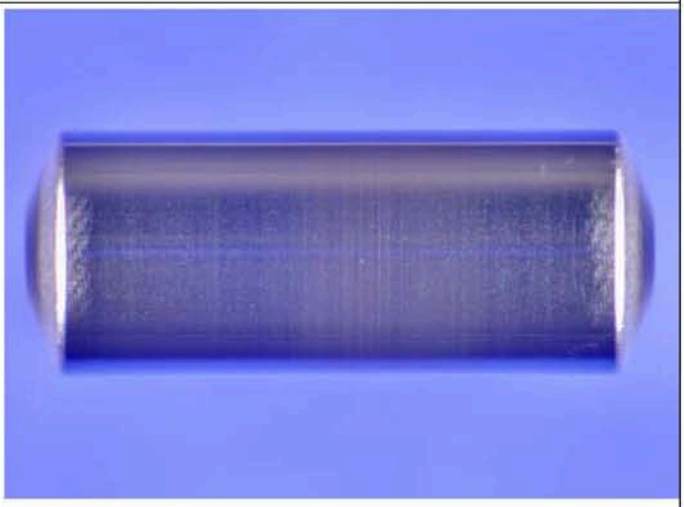

Fig. 4: Roller to the right
Faint brown discoloration R3

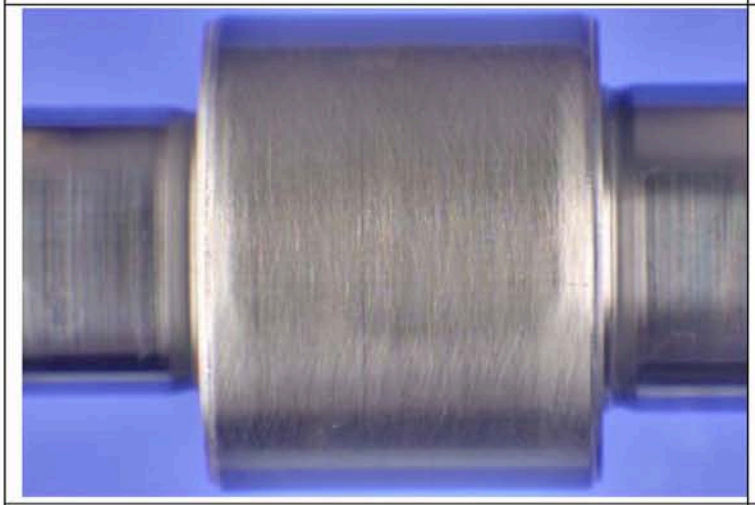

Fig. 5: Camshaft, running surface US1

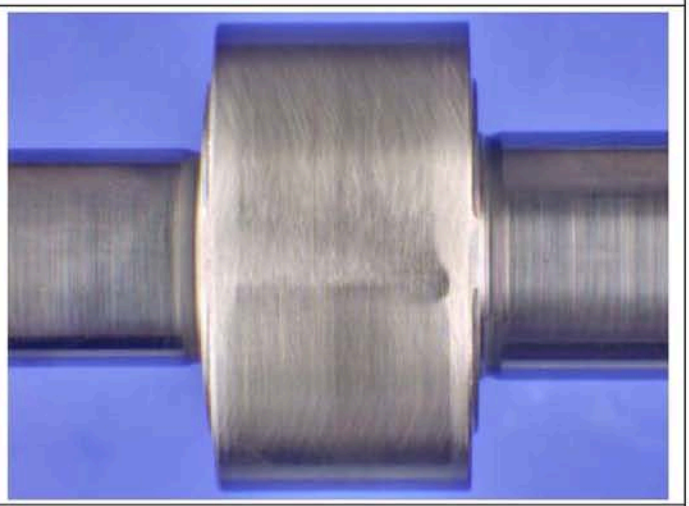

Fig. 6: Camshaft, running surface LS1

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/11/2011

Department:	Person responsible:	Telephone:	Use	
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To: Non-responsive content removed

For information: [redacted]

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2L EA189 Gen2 BIN5	C / C
Part number (TTNo.):	**Date of manufacture:**	**Serial number:**	**Manufacturing plant - line**
0445B21210_01	006	4327	011M FeP (Feuerbach plant)-M -
Actual mileage is [h]	**Fuel:**		**MAP-No.**
101180 km	North China fuel		DS- 280121
SAP-No.:	**Samos no.:**	**Customer order no.:**	**Engine/Vehicle number**
30-104330-20	819666	03L130755 AB	VW316_BW088-0S, 103 kW
Customer part number	**DSBFD no.:**	**Endurance run type [customer]:**	**Endurance run conditions:**
731325	31512	Vehicle endurance run	Profile radial run-out North China

1. Subject

CP4 customer returns **without complaint**
Diagnosis after endurance run end
101180km vehicle durability test
Anti-wear package for the roller support: AWP1
Anti-wear package for the high-pressure piston: AWP0
Engine no. VW316_BW088-0S
Testing country: [redacted]

2. Conclusion

Function:
- The hydraulic delivery rates after endurance run or trial are without significant drift of quantity in comparison with the new state.

Components:
- The roller support shows a groove due to particle draft (see 3.10, Figure 1).
- The spring plate shows noticeable grooves and smoothening over large area (see 3.10, Figure 2).
-The above-mentioned striking feature should be classified as uncritical.
-The remaining components show normal wear pattern.

Result:
The pump has **passed the endurance run**.

3. Results of diagnosis (visual findings)

Legend rating stages: OK / Uncritical / Critical

3.1 Drive
No striking feature — OK

3.2 Drivetrain
Roller support to the right: Particle draft (see 3.10, Figure 1). — Uncritical

3.3 High pressure
No striking feature — OK

3.4 Bearing
No striking feature — OK

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/11/2011

Department:	Person responsible:	Telephone:	Use	internal / external
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3.5 Shaft seal

No striking feature

3.6 Holes

No striking feature

3.7 Attached components (Metering Unit, Overflow Valve, Counting Point)

No striking feature

3.8 O-rings

No striking feature

3.9 Other

No striking feature

3.10 Images

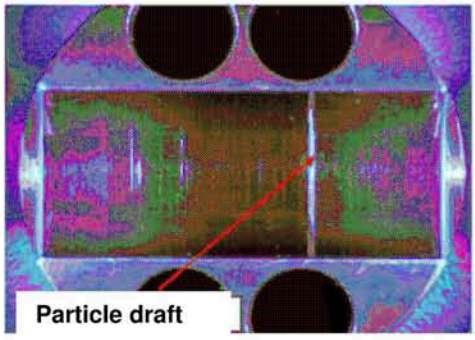

Fig. 1: Roller support to the right, running surface

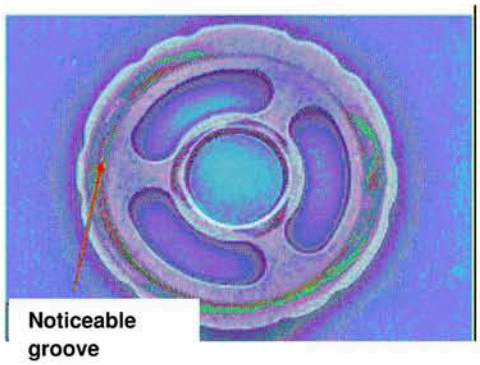

Image 2: Spring plate to the right, piston system

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/29/2010	Delivery rate [l/h] after testing 7/5/2011
LG	1000	1800	0.4	21.0	21.0
ST	200	2	0.4	4.4	4.4

The volumetric efficiency was checked and is within the tolerance specified in the TCD for new parts.

5. Destiny of the parts

The pump will be scrapped at the request of VW.

6. Attachments

No appendices.

Tested:	Non-responsive content removed	Telephone:	Non-responsive content removed	Date:	7/14/2011	Signature:	Non-responsive content removed
Department:		Telephone:		Date:	7/15/2011	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/12/2011

Department:	Person responsible:	Telephone:	Use	
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			external	x
			Confidentiality note: Confidential	

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2L EA189 Gen2 BIN5	C / C
Part number (TTNo.): 0445B21210_01	**Date of manufacture:** 006	**Serial number:** 4331	**Manufacturing plant - line** 011M FeP (Feuerbach plant)-M -
Actual mileage 60000 km	**Fuel:** North China fuel		**MAP-No.** DS-280122
SAP-No.: 30-104330-20	**Samos no.:** 819666	**Customer order no.:** VW316_BW090-0S	**Engine/Vehicle number** VW316_BW090-0S, 103 kW
Customer part number 731325	**DSBFD no.:** 31513	**Endurance run type [customer]:** Vehicle endurance run	**Endurance run conditions:** Profile radial run-out North China

1. Subject

CP4 customer returns **without complaint**
Diagnosis after endurance run end
60,000 km vehicle durability test
Anti-wear package for the roller support: AWP1
Anti-wear package for the high-pressure piston: AWP0
Engine no. VW316_BW090-0S
Testing country: [redacted]

2. Conclusion

Function

- The hydraulic delivery rates after endurance run or trial are without significant drift of quantity in comparison with the new state.

Components

-The spring plate has noticeable grooves and large smoothening (see 3.10, Figure 1).
-The above-mentioned striking feature is yet to be classified as **uncritical**.

Result

- The pump has **passed the endurance run**.

3. Results of diagnosis (visual findings)

Legend rating stages: OK | uncritical | Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

Noticeable grooves and smoothening over a large area (see 3.10, Figure 1) — uncritical: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

BOSCH CP4	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/12/2011

Department:	Person responsible:	Telephone:	Use	internal / external
Non-responsive content removed				x
			Confidentiality note: Confidential	

3.5 Shaft seal — x
No striking feature

3.6 Holes — x
No striking feature

3.7 Attached components (metering unit, overflow valve, counting point) — x
No striking feature

3.8 O-rings — x
No striking feature

3.9 Other — x
No striking feature

3.10 Images

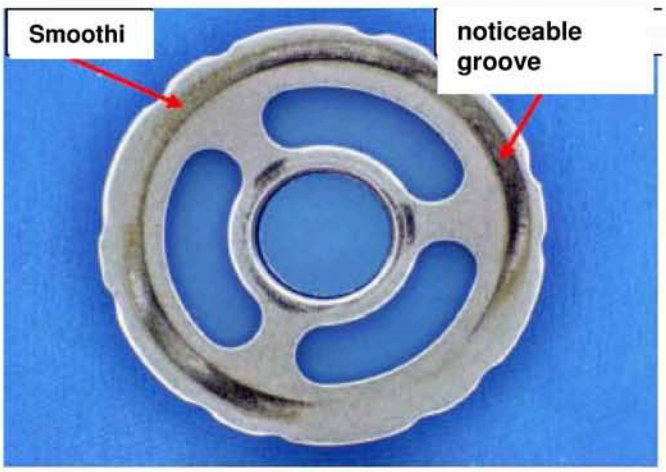

Fig. 1: Spring plate to the right, piston

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/29/2010	Delivery rate [l/h] after testing 7/5/2011	
LG	1000	1800	0.4	21.1	21.2	x
ST	200	200	0.4	4.5	4.4	x

The volumetric efficiency was checked and is within the tolerance specified in the TCD for new parts.

5. Destiny of the parts

The pump will be scrapped at the request of VW.

6. Attachments

No appendices.

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	7/15/2011	Signature:	Non-responsive content removed
Department:		Phone		Date:	7/15/2011	Signature:	

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/12/2011

Department:	Person responsible:	Telephone:	Use	
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				external x
			Confidentiality note: Confidential	

To:	Non-responsive content removed
For information:	

Pump type:	Customer:	Project:	Project / design pattern type
CP4.1S_398_2x6_REC_3,3_1,95_MT4,2	VW	R4 2L EA189 Gen2 BIN5	C / C
Part number (TTNo.): 0445B21210_01	**Date of manufacture:** 006	**Serial number:** 4329	**Manufacturing plant - line** 011M FeP (Feuerbach plant)-M -
Actual mileage 101077 km	**Fuel:** North China fuel		**MAP-No.** DS-280123
SAP-No.: 30-104330-20	**Samos no.:** 819666	**Customer order no.:** VW316_BW077-0S	**Engine/Vehicle number** VW316_BW077-0S, 103 kW
Customer part number 731325	**DSBFD no.:** 31514	**Endurance run type [customer]:** Vehicle endurance run	**Endurance run conditions:** Profile radial run-out North China

1. Subject

CP4 customer returns **without complaint**
Diagnosis after endurance run end
1,01,077km vehicle endurance run
Anti-wear package for the roller support: AWP1
Anti-wear package for the high-pressure piston: AWP0
Engine no. VW316_BW077-0S
Testing country: North China

2. Conclusion

Function

- The hydraulic delivery rates after endurance run or trial are without significant drift of quantity in comparison with the new state.

Components

Wear of the components is low and without significant striking features.

Result

- The pump has **passed the endurance run**.

3. Results of diagnosis (visual findings)

Legend rating stages { OK / uncritical / Critical

3.1 Drive

No striking feature — OK: x

3.2 Drivetrain

No striking feature — OK: x

3.3 High pressure

No striking feature — OK: x

3.4 Bearing

No striking feature — OK: x

BOSCH	CR pump CP4 - Diagnosis report	Report no.	[redacted]
		Date	7/12/2011

Department:	Person responsible:	Telephone:	Use	internal	
Non-responsive content removed				external	x
			Confidentiality note: Confidential		

3.5 Shaft seal — x
No striking feature

3.6 Holes — x
No striking feature

3.7 Attached components (metering unit, overflow valve, counting point) — x
No striking feature

3.8 O-rings — x
No striking feature

3.9 Other — x
No striking feature

3.10 Images

4. Hydraulic function

	n[rpm]	p_rail [bar]	I_MU [A]	Delivery rate [l/h] of new part 6/29/2010	Delivery rate [l/h] after testing 7/5/2011	
LG	1000	1800	0.4	21.1	21.2	x
ST	200	200	0.4	4.4	4.4	x

The volumetric efficiency was checked and is within the tolerance specified in the TCD for new parts.

5. Destiny of the parts

The pump will be scrapped at the request of VW.

6. Attachments

No appendices.

Tested:	Non-responsive content removed	Phone	Non-responsive content removed	Date:	7/15/2011	Signature:	Non-responsive content removed
Department:		Phone		Date:	7/15/2011	Signature:	

CP4 – Diagnosis 17858

BOSCH

From:	Persons responsible	Phone extension	Phone extension	Feuerbach 6/6/2007 Page 1 of 1 Appendix 0 page (s)
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To: Non-responsive content removed

For information:

Customer:	**VW**	**IBAS number:**	105 225 862
Component:	CP4.1S-348-2X5.25-REC	**SaMOS:**	0560399
Project:	R4 2.01 Tdi	**Customer order / MKV no.:**	
Engine / block no.:		**Parts receipt at dept. DS-PC/EDI:**	5/7/2007
TTNo.:	0 445 B21 058_02	**Manufacturing site:**	0110 (Feuerbach plant)
DoM:	685	**Pattern type:**	C
Serial no.:	0044	**Running time:**	605 h
Add-on parts:	Metering Unit	**Complaint:**	Endurance run end
Operating conditions:	KRT (customer information)		

1. Description of problem

The pump should be diagnosed and assessed according to the durability trial.

2. Diagnosis result

Leak-tightness:

The pump was seal-tight in the immersion test (air with 6 bar_rel, 10 min).

Function:

Quantity is within test tolerance for new parts at all testing points. The seal-tightness of the HP valve is OK. No hydraulic defects were found.

Parts visual findings:

The drivetrain parts (camshaft, roller, roller support, HP pistons, bearings) are in very good condition. The machining marks on the cam track are still visible. No striking feature present.

3. Conclusion

The pump does not show any striking feature in the function and wear. The pump has passed the test.

4. Destiny of the parts

The parts are returned to the customer.

Checked by:	Non-responsive content removed	Telephone:	Non-responsive content removed	Date:	6/6/2007	Signature:	Non-responsive content removed
Department		Telephone:		Date:	6/11/2007	Signature:	
E. dept.:		Telephone:		Date:	6/14/2007	Signature:	

Report passed on to the customer: yes

CP4 – Diagnosis 17846

BOSCH

From:	Persons responsible	Phone extension	Phone extension	Feuerbach 6/22/2007 Page 1 of 2 Appendix 0 page (s)
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To: Non-responsive content removed

For information:

Customer:	**VW**	**IBAS number:**	105 225 852
Component:	CP4.1S-348-2X5.25-REC	**Samos:**	0560377
Project:	R4 2.01 Tdi	**Customer order / MKV no.:**	
Engine / block no.:	03LD/16351	**Parts receipt at dept. DS-PC/EDI:**	5/7/2007
TTNo.:	0 445 B21 043_02	**Manufacturing site:**	0110 (Feuerbach plant)
DoM:	681	**Pattern type:**	B3.3
Serial no.:	4768	**Running time:**	950h
Add-on parts:	Metering Unit	**Complaint:**	Endurance run end
Operating conditions:	Application		

1. Description of problem

The pump should be diagnosed and assessed according to the durability trial.

2. Diagnosis result

Leak-tightness:

The pump was seal-tight in the immersion test (air with 6 bar_rel, 10 min).

Function:

Quantity is within test tolerance for new parts at all testing points. The seal-tightness of the HP valve is OK. No hydraulic defects were found (see Table 1)

Parts visual findings:

The drivetrain parts (camshaft, roller, roller support, HP pistons, bearings) are in very good condition. The machining marks on the cam track are still visible. No striking feature present.

3. Conclusion

The pump does not show any striking feature in the function and wear. The pump has passed the test.

4. Destiny of the parts

The parts are returned to the customer.

				Delivery measurement	Back measurement
	n[rpm]	p [bar]	iMetering Unit [A]	1/30/2006	5/9/2007
KL1-S	3375	500	0.40	77.9	78.1
LG	1000	1800	0.40	20.4	20.4
ST	200	200	0.40	4.5	4.5

Table 1: Functional test 681-4768

EA11003EN-00930[1]

CP4 – Diagnosis 17846

BOSCH

From:	Persons responsible	Phone extension	Phone extension	Feuerbach 6/22/2007 Page 2 of 2 Appendix 0 page (s)
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To: Non-responsive content removed

For information: Fischer

Checked by:	Non-responsive content removed	Telephone:	Non-responsive content removed	Date:	6/25/2007	Signature:	Non-responsive content removed
Department		Telephone:		Date:	6/27/2007	Signature:	
E. dept.:		Telephone:		Date:	6/27/2007	Signature:	

Report passed on to the customer: yes

W6 74 5.00

VOLKSWAGEN

HPFP - Assessment

Manufacturer	Bosch	Date	26.01.10
Series	CP4.1	Person in charge	[redacted]
VW - part number	03L130755	Project	RPU
Manufacturer part no.	0445010507	Engine no.	CDC 000002
Serial no. / DoM	BPT 1451 / 260109	Output:	
Drawing no. / pattern		Fuel	
Revision index	0007	Vehicle / test rig	
Plant	515	Running time /	100000 km
Complaints / comments	RPU verification engine		

Component	Assessment		Remark
	OK	Not OK	
housing			
Drive shaft	X		
Roller support	X		
Roller	X		
Tappet hole	X		
HP piston	X		
Spring washer / anti-friction paint coating	X		
Shaft seal / seal-tightness	X		
Corrosion	X		
Bearing	X		
LP ports	X		
HP ports	X		
MU / MU hole	X		
Hydraulic function			
Delivery rate			
Injection pressure			
Drive power			
Seal-tightness under load			
Pressure valves	X		
Overflow valve			
Dirt / chips	X		
Electrical function			
Plug contacts	X		
Metering Unit			

Remarks:

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