

SERVICE SCANIA

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SMÖRJOLJEREKOMMENDATIONER

Bakgrund

Multigradeoljor avsedda för dieselmotorer finns nu tillgängliga. Våra motorer får smörjas med antingen single grade eller multigradeoljor som uppfyller nedanstående krav.

Aktuell information

Sugmotorer ska smörjas med en olja som uppfyller kraven för service CC eller CD enligt API.

Överladdade motorer ska smörjas med en olja som uppfyller kraven för service CD enligt API.

Viskositetsrekommendationer

LUBRICATING OIL RECOMMENDATIONS

Background

Multigrade oils for diesel engines are now available. Our engines may be lubricated by either single or multigrade oils, provided that they meet the demands specified below.

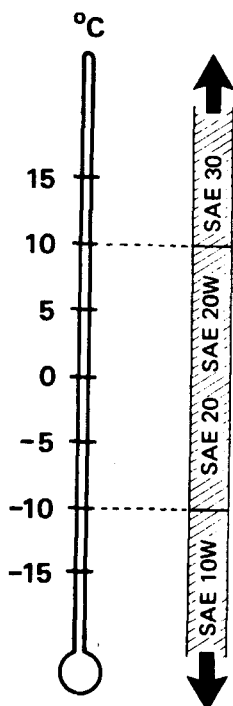
Current information

Naturally aspirated engines should be lubricated by an oil meeting the demands of API service class CC or CD.

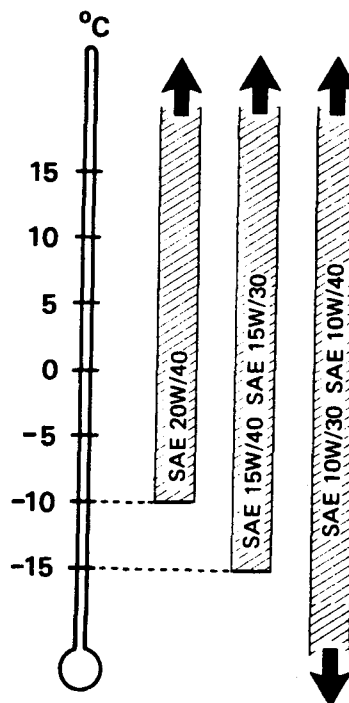
Supercharged engines should be lubricated by an oil meeting the demands of API service class CD.

Viscosity recommendations

Single grade



Multigrade



3200-1197

15

SCHMIERÖLEMPFEHLUNGEN

Anlaß

Mehrbereichsmotorenöle für Dieselmotoren sind jetzt verfügbar. Unsere Motoren dürfen entweder mit Einbereichs- (single grade) oder Mehrbereichsölen (multigrade), welche den nachstehenden Forderungen entsprechen, geschmiert werden.

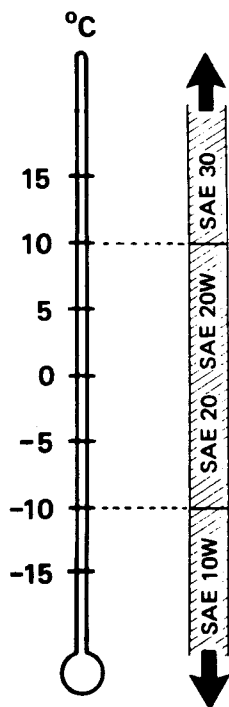
Aktuelle Information

Saugmotoren müssen mit einem Öl geschmiert werden, welches den Forderungen für Service CC oder CD nach API entspricht.

Aufgeladene Motoren müssen mit einem Öl geschmiert werden, welches den Forderungen für Service CD nach API entspricht.

Viskositätsempfehlungen

Single grade



RECOMENDACIONES SOBRE ACEITES LUBRICANTES

Antecedentes

Existen actualmente aceites multigrados para motores diesel. Nuestros motores pueden lubricarse sea con aceites "monogrados" (single grade) sea con aceites multigrados, siempre y cuando cumplan con las siguientes exigencias.

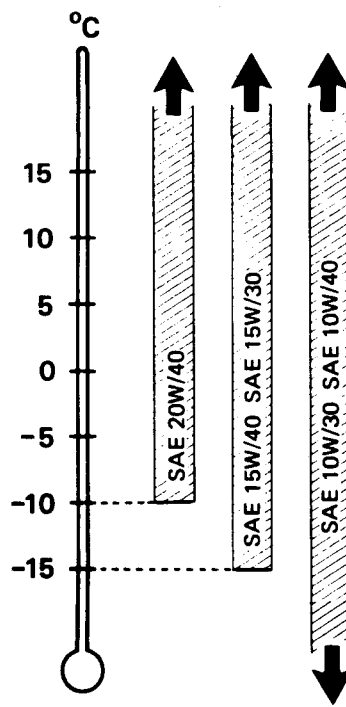
Información actual

Los motores de aspiración natural deberán lubricarse con un aceite que cumpla con las exigencias de servicio CC o CD según API.

Los motores sobrealimentados deberán lubricarse con un aceite que cumpla con las exigencias de servicio CD según API.

Recomendaciones de viscosidad

Multigrade



MODIFIED D/DS8-ENGINE (Starting with S/N 5001415)

General

As from April 1977 the D/DS8-engines for trucks have been modified. In connection with this a new designation system has been introduced. The modified engines are designated D801 and DS801 respectively, for instance DS801 LB15.

A new engine number series was previously begun for D/DS8-engines starting from 5 000 001. The changes described here were introduced beginning from engine No. 5 001 415.

Cylinder Head

In order to reduce fuel consumption and smoke density the cylinder head intake port has been modified. The valve seat ring for the intake port has been changed to the same type as for D/DS11 and D/DS14. The valve seat ring for the exhaust valve remains unchanged.

The new cylinder head and the new valve seat ring for the intake port are interchangeable with the previous design.

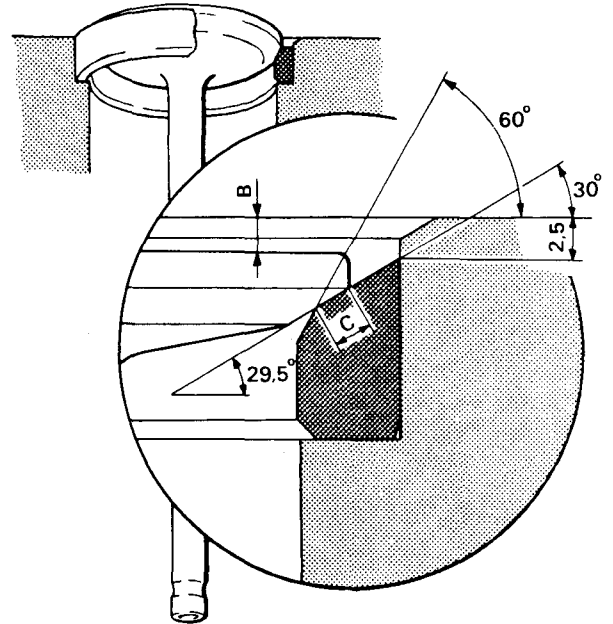


Fig. 2 Brand-new intake valve and maximum machined valve seat ring

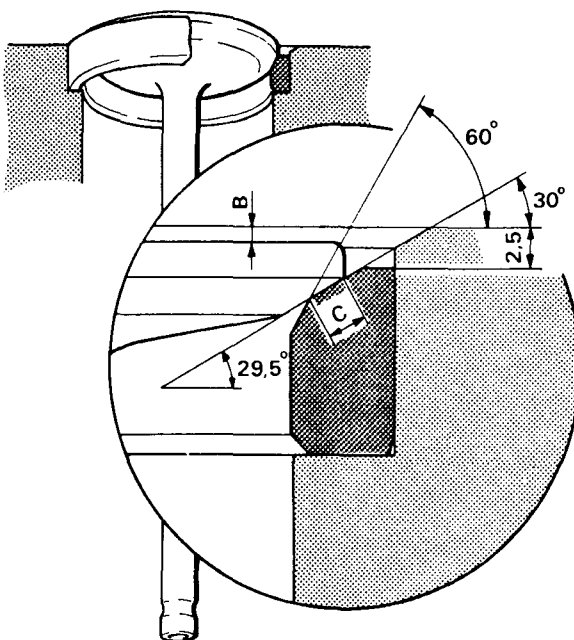


Fig. 1 Brand-new intake valve and valve seat ring

Crankshaft and Reciprocating Components

For D8-engines the compression ratio has been raised from 16.5 to 17 to improve the cold starting characteristics. In consequence new pistons with a new design of combustion chamber are introduced.

The new D8-pistons are **not** interchangeable with the previous design.

Lubricating System

A new suction pipe and strainer have been introduced. The new strainer is welded to the suction pipe (suspended strainer).

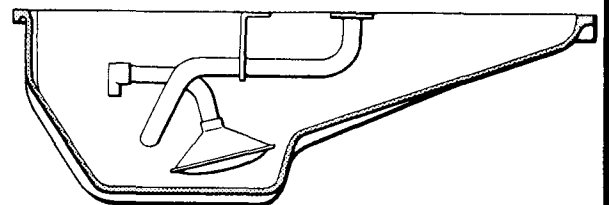


Fig. 3 Suspended strainer

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In connection with this a die-cast oil sump is introduced. A new oil return line and baffle plate have been introduced, which are adapted to the new oil sump.

The holes for attaching the oil filler housing and for fixing the baffle plate are not threaded on this sump at first assembly. Instead screws of a thread pressing type are used. Consequently, this means that the threads in the holes for these screws are formed by the special screw at first assembly. The threads formed in this manner are of a normal type, and permit refitting of both thread pressing screw and normal screw.

The new oil sump gives increased oil capacity from 11.5–16.5 dm³ (l) to 12–18 dm³ (l).

New oil dipsticks have been introduced on account of the change in oil capacity.

The new strainer and oil return line can only be fitted together with the new die-cast oil sump.

A new oil filler housing has been introduced for LB-trucks. This housing has two holes, one for filling with oil and one for the oil dipstick.

L-trucks now have the same oil filler housing as LB-trucks, but the hole for filling with oil is plugged. On L-trucks oil is filled in the valve covers.

The present oil pressure sensor and oil pressure monitor are replaced by a two-pole sensor which is a combined oil pressure sensor and oil pressure monitor. The new combined pressure sensor with monitor is fitted on the same location as the previous oil pressure transmitter (at the oil sump attachment plane against the block).

In connection with this, the machining of the intermediate piece for the oil pressure monitor will be discontinued. The earlier intermediary piece will still be available as a spare part.

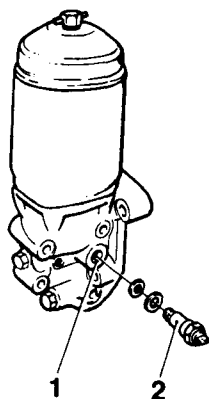


Fig. 4 Intermediate piece and oil cleaner

1. Machining of the hole for the oil pressure monitor is discontinued
2. The oil pressure monitor is discontinued

Fuel System

DS8

Modified injection pump with pressure valves having two idling holes are introduced for the DS8-engine.

The previous injection pump had pressure valves with only one idling hole.

The modified injection pump is interchangeable with the previous design.

D8

In connection with the introduction of a new piston for the D8-engine a new nozzle with five holes (previously four holes) has been introduced. Further new pressure pipes have been introduced which have an inside diameter of 2 mm, the same pipes as the present pressure pipes for the DS8-engine.

Cooling System

A new bracket for the fan ring has been introduced. The bracket is fitted to the new die-cast oil sump with screws of thread pressing type. The tightening torque for the screws is 30 Nm (3.0 kpm).

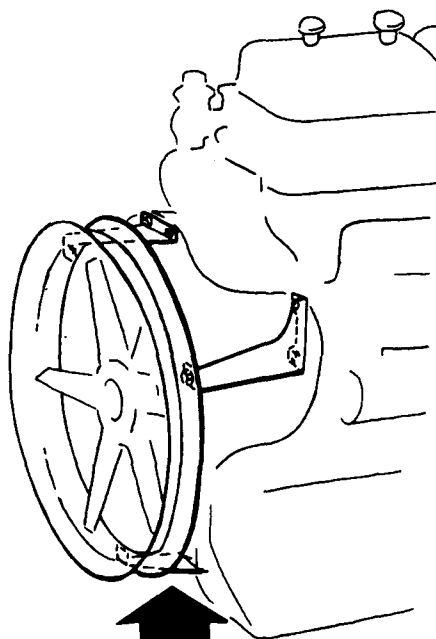


Fig. 5 New bracket for the fan ring

SPECIFICATIONS, SETTING VALUES, TOOLS

Cylinder Head

Min. height of cylinder head after planing	114.4 mm
Distance "B" between plane of cylinder head and valve head (intake and exhaust valve)	min. 0.75 mm
Lock fluid for injector sleeve No.	561019

Intake Valve

Clearance (cold engine)	0.35 mm
Head angle	29.4°—29.6°
Overall length	169 mm
Head diameter	50 mm
Spindle diameter	10.937—10.950 mm
Valve timing D8	opens 11° B.T.D.C.
	closes 41° A.B.D.C.
DS8	opens 28° B.T.D.C.
	closes 26° A.B.D.C.
Lifting height without valve clearance D8 and DS8	12.6 mm

Exhaust Valve

Clearance (cold engine)	0.70 mm
Head angle	44.4°—44.5°
Overall length	169 mm
Head diameter	42 mm
Spindle diameter	10.927—10.940 mm
Valve timing D8	opens 43° B.B.D.C.
	closes 7° A.T.D.C.
DS8	opens 56° B.B.D.C.
	closes 26° A.T.D.C.
Lifting height without valve clearance D8	12.8 mm
DS8	13.0 mm

Intake Valve Seat

	Interchangeable
Seat angle	30.0°—30.5°
Width of contact surface (C)	1.5—2.0 mm
Height	9.0 mm
Outside diameter	54.977—54.990 mm
Valve seat position, diameter	54.880—54.900 mm
Valve seat position, depth	11.45—11.55 mm
Valve seat, oversize:	
Outside diameter	55.177—55.190 mm
Valve seat position diameter	54.880—54.900 mm

Exhaust Valve Seat

	Interchangeable
Seat angle	45°—45.5°
Width of contact surface (C)	1.7—2.5 mm
Height	8.8 mm
Outside diameter	46.964—46.975 mm
Valve seat position	46.880—46.900 mm
Valve seat position, depth	11.45—11.55 mm
Valve seat, oversize:	
Outside diameter	47.164—47.175 mm
Valve seat position	47.080—47.100 mm

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Valve Guides

Length intake	86 mm
exhaust	73 mm
Inside diameter (fitted)	10.98-11.00 mm
Max. clearance for valve spindle	0.17 mm
Height above plane for valve spring	24.0±0.25 mm

Valve Springs

Outer spring	
Free length	67.5 mm
Compressed to 660 N (67 kp)	37.0 mm
Inner spring	
Free length	60.5 mm
Compressed to 340 N (34 kp)	34.0 mm

Lubricating System

Tightening torque for	
Oil filler housing	30 Nm (3.0 kpm)
Baffle plate	20 Nm (2.0 kpm)
Oil capacity	min. 12 dm ³ (l)
	max. 18 dm ³ (l)

Fuel System

Injection pump setting (D8)	22° B.T.D.C.
(DS8)	18° B.T.D.C.

Cooling System

Tightening torque for bolt	30 Nm (3.0 kpm)
Bracket for fan ring — oil sump	

Tools for machining of valve seat rings and tools for milling of grooves in cylinder head: Mira, Baumgartner AB, Switzerland.

Engine Type Designations

Truck	Old	New
L81, L/LS86	D8L04	D801 L05
LB81 V	D8LB09	D801 LB11
LB81 H	D8LB10	D801 LB12
L81, L/LS86	DS8L08	DS801 L09
LB81/86-series	DS8LB13	DS801 LB15
LB81/86-series		
with GA651/652	DS8LB14	DS801 LB16

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CYLINDERHUVUDPACKNING FÖR D/DS8 (t.o.m. motornr 761784)

Bakgrund

För D/DS8 i 56, 66, 80 och 85 seriens lastbilar och bussar samt motsvarande separatmotorer (samtliga med nio cylinderhuvudskruvar) finns som reservdel en cylinderhuvudpackning, som täcker alla sex cylindrarna. Denna typ av packning ger en förbättrad gastätning jämfört med tidigare packningstyp.

Aktuell information

Packningen kan beställas från vår reservdelsavdelning. Den ingår även i en "packningssats, cylinderhuvud" och i en "helrenoveringssats". Tidigare packningssatser med den äldre typen av cylinderhuvudpackning finns tillgängliga även i fortsättningen.

Att iakttaga

Tidigare meddelade värden för cylinderfoderhöjd, krav på tätningssyornas beskaffenhet etc är oförändrade. Cylinderhuvudpackningen skall, i likhet med andra cylinderhuvudpackningar, monteras torr d v s utan tätningsmassa.

CYLINDER HEAD GASKET FOR D/DS8 (up to engine no. 761784)

Background

For D/DS8 in the 56, 66, 80 and 85 series trucks and buses and corresponding separate engines (all with nine cylinder head bolts) there is, as spare part, a cylinder head gasket, which covers all the six cylinders. This type of gasket gives improved gas sealing compared with the previous type of gasket.

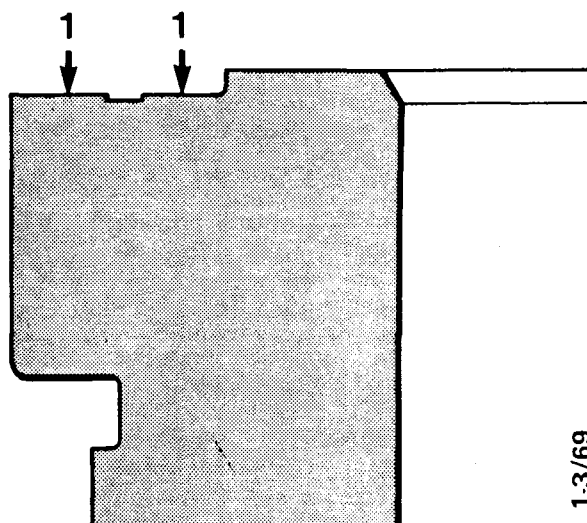
Current Information

The gasket can be ordered from our Spare Parts Department. It is also included in a "gasket set, cylinder head" and in a "general overhaul set". The previous gasket sets with the old type cylinder head gasket will still be available in the future.

Attention

The previously given values for cylinder liner height, requirements as regards condition of sealing surfaces etc. remain unchanged. The cylinder head gasket, in common with other cylinder head gaskets, must be fitted in a dry state, i.e. without sealing compound.

Benämning	Antal per motor	Art. nr	Description	Number of Engine	Part No.
Cylinderhuvudpackning	1	250265	Cylinder head gasket	1	250265
Packningssats, cylinderhuvud	1	550153	Gasket set, Cylinder head	1	550153
Helrenoveringssats	1	550029	General overhaul set	1	550029



Cylinderfodrets övre ände
1. Cylinderfoderhöjden mätes
från denna yta

Top of cylinder liner
1. Cylinder liner height is
measured from this surface

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ZYLINDERKOPFDICHTUNG FÜR D/DS8 (bis Motor Nr. 761784)

Anlaß

Für D/DS8 in Lkw und Bussen der Serien 56, 66, 80 und 85 sowie für entsprechende separate Motoren (sämtliche mit neun Zylinderkopfschrauben) gibt es als Ersatzteil eine Zylinderkopfdichtung, die alle sechs Zylinder deckt. Dieser Dichtungstyp gibt eine verbesserte Gasdichtung, verglichen mit dem früheren Dichtungstyp.

Aktuelle Information

Die Dichtung kann von unserer Ersatzteilabteilung bestellt werden. Diese Dichtung ist auch in einem "Dichtungssatz, Zylinderköpfe" und in einem "Satz für komplette Überholung" enthalten. Die bisherigen Dichtungssätze mit dem älteren Typ der Zylinderkopfdichtung ist auch weiter verfügbar.

Zu beachten

Die früher mitgeteilten Werte für Zylinderkopfhöhe, Forderung bezüglich Beschaffenheit der Dichtungsflächen usw. sind unverändert. Die Zylinderkopfdichtung soll in Übereinstimmung mit anderen Zylinderkopfdichtungen trocken montiert werden, d.h. ohne Dichtungsmasse.

Benennung	Anzahl je Motor	Art. Nr.
Zylinderkopfdichtung	1	250265
Dichtungssatz, Zylinderköpfe	1	550153
Satz für komplette Überholung	1	550029

JUNTA DE CULATA PARA D/DS8 (hasta el motor núm. 761784)

Antecedentes

Para los D/DS8 de los camiones y autobuses de las series 56, 66, 80 y 85 y los motores industriales y marinos correspondientes (todos con nueve tornillos de culata) existe como repuesto una junta de culata que cubre los seis cilindros. Este tipo de junta provee mejor estanqueidad que el tipo antiguo.

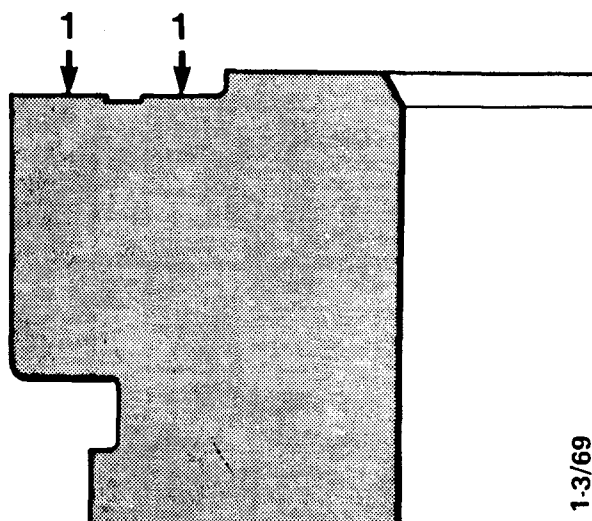
Información actual

La junta es suministrada por nuestro servicio de repuestos. Está igualmente incluida en un "juego de juntas de culata" y un "juego de reacondicionamiento". Los juegos de juntas antiguos con el tipo antiguo de junta de culata siguen almacenados y suministrados.

Se observará

Los valores comunicados anteriormente respecto a la altura de camisa de cilindro, el estado de las superficies de cierre, etc. quedan incambiados. Como las otras juntas de culatas, esta junta se monta en seco, es decir sin producto hermético.

Denominación	Cantidad por motor	Núm. de art
Junta de culata	1	250265
Juego de juntas, culata	1	550153
Juego de reacondicionamiento	1	550029



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Oberes Ende der Zylinderlaufbüchse

1. Zylinderlaufbüchsenhöhe wird von dieser Fläche gemessen

Extremidad superior de la camisa

1. La altura de la camisa se mide desde esta superficie

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CYLINDERHUVUDPACKNING

Bakgrund

Byte av gummikvalitet i gummiringarna ingående i cylinderhuvudpackningen.

Aktuell information

De nya gummiringarna har röd eller orange färg. Ringarna ersätter helt de tidigare svarta ringarna.

Cylinderhuvudpackning komplett med nya gummiringarna har samma artikelnummer som tidigare 271988. Gummiringarna separat har nytt artikelnummer.

	Art. nr. nytt utf.	Art. nr. äldre utf.
Benämning		
Gummiring	271983	288226
Gummiring	271985	288227
Gummiring	271986	288229
Gummiring	271989	288228

Ringar av äldre utförande och det nya utförandet får ej monteras i samma motor.

CYLINDER HEAD GASKET

Background

The type of rubber used for sealing rings in cylinder head gasket has been changed.

Current information

New style rings are red or orange in colour and replace old style black rings.

Part number 271988 for cylinder head gasket with new style rubber sealing rings remains unchanged. Individual new style rubber sealing rings have new part numbers.

	Part no. old style	Part no. new style
Part name		
Sealing ring	271983	288226
Sealing ring	271985	288227
Sealing ring	271986	288229
Sealing ring	271989	288228

Old and new style rings may not be combined in the same engine.

ZYLINDERKOPFDICHTUNG

Anlaß

Austausch der Gummiqualität in Gummiringen für Zylinderkopfdichtungen.

Aktuelle Information

Die neuen Gummiringe haben eine rote oder orange Farbe. Die Ringe ersetzen ganz die bisherigen schwarzen Ringe.

Die Zylinderkopfdichtung, komplett mit neuen Gummiringen, hat dieselbe Artikel Nr. wie bisher: 271988. Separate Gummiringe haben eine neue Artikel Nr. erhalten.

Benennung	Artikel Nr. alte Ausführung	Artikel Nr. neue Ausführung
Gummiring	271983	288226
Gummiring	271985	288227
Gummiring	271986	288229
Gummiring	271989	288228

Ring der älteren Ausführung und der neuen Ausführung dürfen nicht in denselben Motor montiert werden.

JUNTA DE CULATA

Antecedentes

Cambio de la calidad de la goma en los anillos de goma pertenecientes a la junta de culata.

Información actual

Los nuevos anillos de goma son rojos o anaranjados. Estos anillos sustituyen totalmente a los anillos antiguos negros.

La junta de culata completa con nuevos anillos de goma tiene el mismo número de artículo que antes, es decir, 271988. Los anillos de goma por separado tienen nuevos números de artículo.

Denominación	Núm. art. ejec. antigua	Núm. art. nueva ejec.
Anillo de goma	271983	288226
Anillo de goma	271985	288227
Anillo de goma	271986	288229
Anillo de goma	271989	288228

No se montarán anillos de antigua y de nueva ejecución conjuntamente en un motor.

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RENOVERING AV TURBOKOMPRESSORER DS8

Bakgrund

Vi har rekommenderat renovering av turbokompressorenhet efter 180 000 km (2 700 h).

Aktuell information

Livslängden för turbokompressorer har ökat efter hand som nya modeller har införts.

Att iaktta

Vi anser det inte längre vara nödvändigt att byta turbokompressor i förebyggande syfte.

ÜBERHOLUNG VON TURBOLADERN DS8

Anlaß

Wir haben Überholung der Turboladereinheit nach 180 000 km (2 700 h) empfohlen.

Aktuelle Information

Die Lebensdauer der Turbolader hat sich erhöht, nachdem neue Modelle eingeführt worden sind.

Zu beachten

Wir finden es nicht mehr länger notwendig, den Turbolader als vorbeugende Maßnahme auszutauschen.

RECONDITIONING OF TURBOCHARGERS DS8

Background

We have recommended reconditioning of the turbocharger unit after 180 000 km (2 700 h).

Current Information

The service life of turbochargers has been gradually increased as new models have been introduced.

Attention

We no longer consider it necessary to replace the turbocharger as a preventive measure.

REACONDICIONAMIENTO DEL TURBOCOM- PRESOR DEL DS8

Antecedentes

Hasta ahora hemos recomendado reacondicionar la unidad del turbocompresor al cabo de 180 000 km (2 700 horas).

Información actual

La vida útil de los turbocompresores ha sido aumentada a medida que han salido nuevos modelos.

Se observará

Consideramos que en adelante no será necesario cambiar el turbocompresor por medida preventiva.

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VATTENLÄCKAGE FRÅN CYLINDERHUVUD-PACKNINGEN

Bakgrund

Fall av vattenläckage mellan cylinderfodrets övre ända och cylinderblocket har förekommit. Detta har orsakat korrosionsskador på cylinderblocket.

Aktuell information

Cylinderhuvudpackningen består av en massiv stålplåt samt lösa gummiringar. Ytorna mellan gummiringarna har inte någon tätande uppgift. Därför kan korrosionsskador tillåtas på cylinderblockets överplan mellan tätningsringarnas anliggningsytor. Djupet på korrosionsskadorna kan få uppgå till 1 mm.

Att iaktta

Vid reparation av motor på grund av vattenläckage mellan cylinderfoder och cylinderblock ska tätningsmassa 584 002 användas, vilken kan beställas från vår reservdelsavdelning.

Vid reparation av motor med korrosionsskador på cylinderblockets överplan, kontrollera att skadorna inte förekommer på några tätningsytor.

Vid användning av tätningsmassa ska följande punkter följas:

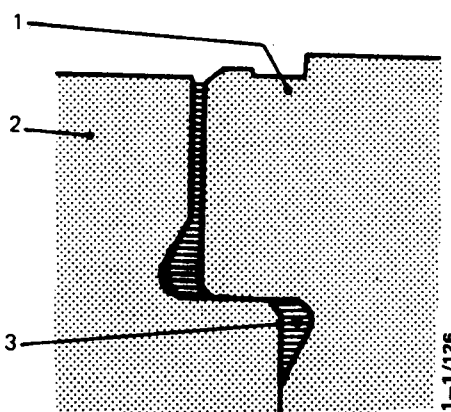
1. Rengör cylinderfodret noggrant.
2. Kontrollera, om nödvändigt justera, foderhöjden genom brotschning. Eventuella korrosionsskador måste brotschas bort innan tätningsmassan anbringas.
3. Sätt i tätningsringarna i blocket och anolja ringar och nedre styrningsytan för cylinderfodret med motorolja.
4. Avfetta med avfettningsmedel, foderkragen och spåret under samt foderläget.
5. För påläggning av tätningsmassan används en sprutpistol i vilken tuben med munstycke placeras. Lägg på tätningsmassa i en obruten sträng (ø 3 mm) i spåret under foderkragen. Se fig. Lägg tätningsmassan på ett cylinderfoder i taget.
6. Montera cylinderfodret på vanlig sätt inom 15 min efter det att tätningsmassan pålagts. **OBS! Iaktta försiktighet så att strängen med tätningsmassa inte skadas.**
7. Tryck ner cylinderfodret med hjälp av två spännklackar, 98515. Åtdragningsmoment: 50 Nm (5,0 kpm). Avlägsna överflödigt tätningsmassa. Låt cylinderfodret vara nedpressat tills nästa cylinderfoder ska monteras.

1. Cylinderfoder
2. Cylinderblock
3. Tätningsmassa

1. Cylinder liner
2. Cylinder block
3. Sealing compound

1. Zylinderlaufbüchse
2. Zylinderblock
3. Dichtungsmasse

1. Camisa de cilindro
2. Bloque de cilindros
3. Pasta de cierre



WATER LEAKAGE FROM CYLINDER HEAD GASKET

Background

Cases have been recorded of water leakage between top end of cylinder liner and cylinder block. This has resulted in corrosion damage to cylinder block.

Current information

The cylinder head gasket consists of a solid steel plate and separate rubber rings. The surfaces between the rubber rings do not perform any sealing function. For this reason corrosion damage to the upper surface of the cylinder block is permitted between the contact surfaces of the rubber rings. Depths of corrosion attack should not exceed 1 mm.

To be observed

When working on engine for repairs to water leakage between cylinder liner and cylinder block, use sealing compound Fel-Pro RTV Clear (Part No. 360) or General Electric RTV108.

When repairing corrosion damage to top surface of cylinder block, check for damage to sealing surfaces.

The sealing compound should be used as follows:

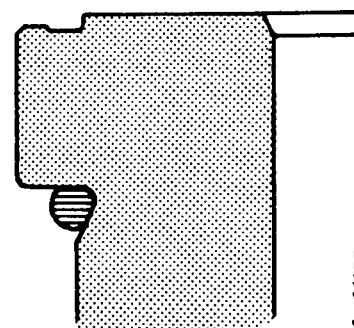
1. Carefully clean cylinder liner seats.
2. Check cylinder liner height and, if necessary, adjust by reaming. Any corrosion damage must be reamed away before sealing compound is applied.
3. Fit sealing rings into block and use engine oil to oil rings and lower guide surface for cylinder liner.
4. Degrease with degreasing agent, liner collar, groove below collar and liner seat. If shims are used, these must also be degreased.
5. To apply sealing compound, use an injector gun, into which the tube with the nozzle is fitted. Apply a continuous bead (3.0 mm dia) into groove below liner collar as shown in figure below. Apply sealing compound to one cylinder liner at a time.
6. Fit the cylinder liner in the usual manner within 15 minutes after applying sealing compound. **Note: Take care not to damage bead of sealing compound.**
7. Press cylinder liner down by means of two clamping pads 98515. Tightening torque: 50 Nm (5.0 kgf./m). Remove surplus sealing compound. Keep liner pressed down until next liner is to be fitted.

- Cylinderfoder
- Cylinder liner

- Tätningsmassa
- Sealing compound

- Zylinderlaufbüchse
- Camisa de cilindro

- Dichtungsmasse
- Pasta de cierre



3200-1305

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1d	SI	3-1	2

WASSERLECKAGE VON ZYLINDERKOPF-DICHTUNGEN

Anlaß

Fälle von Wasserleckage zwischen dem oberen Ende der Zylinderlaufbüchse und dem Zylinderblock sind vorgekommen, welches Korrosionsschäden am Zylinderblock verursacht hat.

Aktuelle Information

Die Zylinderkopfdichtung besteht aus einem massiven Stahlblech und losen Gummiringen. Die Flächen zwischen den Gummiringen haben keine abdichtende Aufgabe. Deshalb können Korrosionsschäden an der oberen Zylinderblockfläche zwischen den Anliegeflächen der Dichtringe zulässig sein. Die Korrosionsschäden können bis zu 1 mm tief sein.

Zu beachten

Bei der Reparatur des Motors aufgrund von Wasserleckage zwischen Zylinderlaufbüchse und Zylinderblock muß die Dichtungsmasse 584 002 benutzt werden, die von unserer Ersatzteilabteilung bestellt werden kann.

Bei Reparatur des Motors mit Korrosionsschäden an der Zylinderblockoberfläche ist zu kontrollieren, daß Schäden nicht bei anderen Dichtflächen vorkommen.

Bei Benutzung der Dichtungsmasse sind folgende Punkte zu beachten:

1. Zylinderlaufbüchse sorgfältig reinigen.
2. Zylinderlaufbüchsenhöhe kontrollieren und wenn notwendig durch Ausreiben justieren. Eventuelle Korrosionsschäden müssen ausgerieben werden, bevor die Dichtungsmasse angebracht wird.
3. Dichtringe in den Block setzen und die Ringe und untere Führungsfläche für die Zylinderlaufbüchse mit Motoröl leicht ölen.
4. Den Zylinderlaufbüchsenflansch, die Nut darunter und den Zylinderlaufbüchsenstift mit Entfettungsmittel entfetten.
5. Für das Auflegen der Dichtungsmasse eine Spritzpistole benutzen, in welcher die Tube mit der Düse placiert wird. Die Dichtungsmasse in einem zusammenhängenden Strang (Durchmesser 3 mm) in die Nut unter dem Büchsenflansch legen. Siehe Fig. Jede Zylinderlaufbüchse einzeln mit Dichtungsmasse belegen.
6. Die Zylinderlaufbüchse wie üblich montieren.
ACHTUNG! Vorsichtig sein, damit der Strang der Dichtungsmasse nicht beschädigt wird.
7. Die Zylinderlaufbüchse mit Hilfe von zwei Spannstücken, 98515, herunterdrücken, Anzugsdrehmoment 50 Nm (5,0 kpm). Überflüssige Dichtungsmasse entfernen. Die Zylinderlaufbüchse heruntergepreßt lassen, bis die nächste Zylinderlaufbüchse montiert wird.

FUGA DE AGUA DE LA JUNTA DE CULATA

Antecedentes

Se han dado casos de fuga de agua entre el extremo superior de la camisa del cilindro y el bloque de cilindros. Esto ha ocasionado daños de corrosión en el bloque de cilindros.

Información actual

La junta de culata consta de una chapa de acero maciza y anillos de goma sueltos. Las superficies entre los anillos de goma no tienen ninguna función de cierre. Por esta razón se pueden permitir daños de corrosión en el plano superior del bloque de cilindros entre las superficies de contacto de los anillos de cierre. La profundidad permitida de los daños de corrosión puede llegar hasta 1 mm.

Se observará

Al reparar un motor debido a fuga de agua entre la camisa del cilindro y el bloque de cilindros se empleará pasta de cierre 584 002, que puede obtenerse de nuestro Departamento de Repuestos.

Al reparar un motor con daños de corrosión en el plano superior del bloque de cilindros, controlar que no haya daños en las superficies de cierre.

Al emplear pasta de cierre se seguirán los siguientes puntos:

1. Limpiar minuciosamente la camisa del cilindro.
2. Controlar la altura de la camisa, y si fuera necesario, ajustarla escariando. Antes de aplicar la pasta de cierre habrá que quitar escariando eventuales daños de corrosión.
3. Colocar los anillos de cierre en el bloque. Aceitar los anillos y la superficie de guía inferior para la camisa con aceite para motor.
4. Desengrasar el cuello de la camisa, la ranura debajo y el alojamiento de la camisa con un producto desengrasador. Si se emplean arandelas de ajuste habrá también que desengrasarlas.
5. Para la aplicación de la pasta de cierre emplear una pistola de inyección en la cual se coloca el tubo con boquilla. Aplicar la pasta en cordón continuo (de 3 mm de diámetro) en la ranura debajo del cuello de la camisa. Ver la figura. Aplicar la pasta en las camisas, una a una.
6. Montar la camisa como de costumbre.
NOTA: Poner cuidado para no dañar el cordón de pasta de cierre.
7. Meter la camisa presionando hacia abajo con dos talones tensores 98515. Par de apriete 50 Nm (5,0 mkg). Quitar la pasta de cierre superflua. Mantener la camisa apretada hasta montar la siguiente.

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CRANKSHAFT AND MAIN BEARINGS

On all crankshaft and main bearings the part number is punched in. With aid of the table below and the punched in number it is possible to determine the size of the bearings.

CAUTION

This is particularly important when carrying out the first repair on industrial engines which are provided with crankshafts of. undersize 1 as original equipment. This occurs in rare instances only and Waukesha Engine will identify these engines by serial number in the near future.

D/DS5, D/DS8

Description	Quantity/Engine (halves)		Design 1 Punched in Number	Design 2 Punched in Number	(Current Service Part Numbers)	Size	mm
					Design 3 Punched in Number		
Connecting rod bearings	8	12	153590	229638	261117	standard	75.00
			153591	229639	261118	undersize 1	74.75
			153592	229640	261119	undersize 2	74.50
			153593	229641	261120	undersize 3	74.25
			153594	229642	261121	undersize 4	74.00
			153595	229643	261122	undersize 5	73.75
			153596	229644	261123	undersize 6	73.50
			153597	229645	261124	undersize 7	73.25
			153598	229646	261125	undersize 8	73.00
Main bearing	10	14	20908	229648	261093	standard	85.00
			20909	229649	261094	undersize 1	84.75
			20910	229650	261095	undersize 2	84.50
			20911	229651	261096	undersize 3	84.25
			20912	229652	261097	undersize 4	84.00
			20913	229653	261098	undersize 5	83.75
			20914	229654	261099	undersize 6	83.50

3200-1188

All bearing designs of the same size are interchangeable.

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PISTONS AND PISTON RINGS

Scania has introduced design changes to service piston and piston rings, as well as standarization in basic engine generations, used in Waukesha/Scania F475, F476 (D8, DS8), series Engines.

The following tables furnish a consolidated presentation of original part numbers and the cross reference part number for service replacement. The list below explains the headings used in the tables.

Tables are divided into two sections:

- "Originally fitted piston"; and,
- "Spare parts".

Under the "Originally fitted piston" section:

Column 1 lists the engine serial number break.

Column 2 is a design notation.

Column 3 "Naked Piston Punched No." lists the piston number punched into the top of the piston. Before the tabulation, a piston was identified by this number and the corresponding serial number. This was often inaccurate.

Column 4 "Piston complete with chrome ring" refers to the piston number listed on the engine card. This provides a foolproof method for identifying the correct piston to use.

Column 5 "Piston complete with molybdenum ring" refers to the piston number listed on the engine card. This provides a foolproof method for identifying the correct piston number to use.

Under the "Spare Parts" section:

Column 1 "Ring set for originally fitted piston" refers to original piston ring set replacement.

Column 2 "Piston complete" means the piston with rings, pin and retainers.

Column 3 "Piston complete consisting of" with sub-headings "Naked Piston Punched No." and "Piston ring set" refers to the service piston and ring set used for service replacement.

Table "D8 Contents of Current Ring Sets" furnishes the part numbers, dimensions of the rings and position installed on the piston.

D8

CONTENTS OF CURRENT PISTON RING SETS

	Top Ring		Ring No. 2 - 3		Ring No. 4		Ring No. 5	
	Part No.	Height mm	Part No.	Height mm	Part No.	Height mm	Part No.	Height mm
Ø 115 mm								
550068	225330	3,0	149880	3,0	171930	6,0	171930	6,0
550110	225330	3,0	149880	3,0	233938	6,0	—	—
550145	252746	2,4	229995	2,4	233938	6,0	—	—
550146	252746	2,4	229995	2,4	245486	4,7	—	—

All sizes given are approximate. All top rings are molybdenum coated.

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D8 PISTONS AND PISTON RINGS									
Originally fitted piston					Spare parts				
As from engine No.	De-sign No.	Naked Piston Punched No.	Piston complete with chrome ring	Piston complete with molybdenum ring	Ring set for originally fitted piston	Piston complete	Piston complete consisting of		Note
							Naked Piston Punched No.	Piston ring Set	
	1	153526	153578	—	550068	270925	189471	550068	
		162797	162798	—	550068	270925	189471	550068	
		168114	168112	—	550068	270925	189471	550068	
		169745	169743	—	550068	270925	189471	550068	
		173782	173780	—	550068	270925	189471	550068	
		180482	180480	—	550068	270925	189471	550068	
		189471	189469	—	550068	270925	189471	550068	
742269	2	213150	213149	—	550068	235883	235882	550068	
748792	3	223904	223896	225327	550068	235883	235882	550068	1
752438	4	235882	235881	235883	550068	235883	235882	550068	
761785	5	251956	251955	258663	550146	258663	251956	550146	2
5001443	6	275707	275706	276114	550146	276114	275707	550146	2
DS8									
	1	183376	183374	—	550068	235898	550110	235895	
		223906	223898	225329	550068	235898	550110	235895	
746110	2	223906	229118	229268	550110	235898	550110	235895	
784522	4	229119	229471	229473	550110	235898	550110	235895	
	5	235320	235076	235077	550110	235898	550110	235895	
750143	6	235895	235894	235898	550110	235898	550110	235895	
761785	7	251954	251953	258664	550146	258664	251954	550146	3
						271005	249178L	550145	4

Notes 1. Increased engine output.

Notes 2. Connecting rod with wedge shaped small end.

Notes 3. Increased engine output. Connecting rod with wedge shaped small end.

Notes 4. Low piston for fitting in engines with machined upper surface up to engine No. 761784, See 1a SI 3-7 in Service Handbook.

SERVICE SCANIA

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2a	0	1	—	1	General	CONCERNING FUNCTION REFERENCE IS MADE TO SECTION "SPECIAL INFORMATION"
	1	—	—	1	Coolant pump	
		—	2	—	Dismantling	
		—	3	—	Inspection	
		—	3	—	Assembling	
	2	1	—	—	Temperature controlled fan	
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COOLING SYSTEM

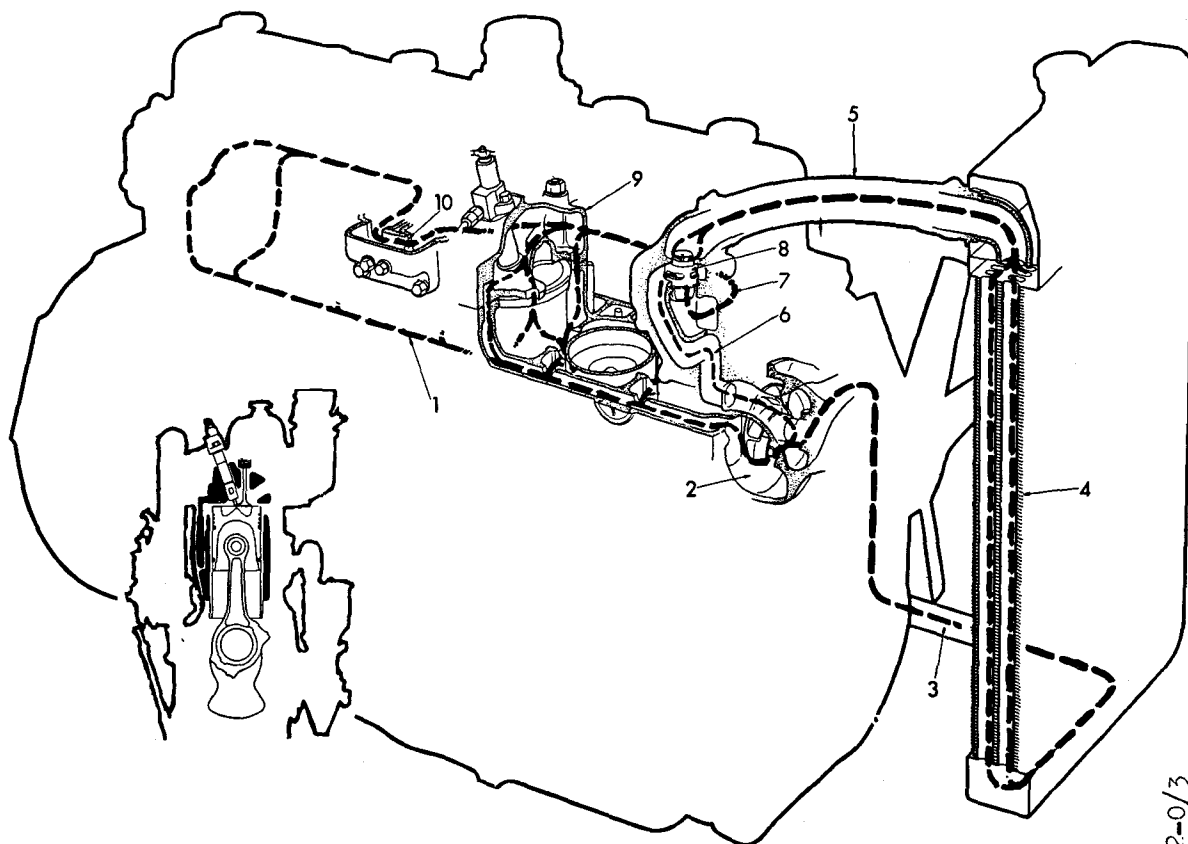
The coolant is **made to circulate** by the coolant pump (2), which pumps the liquid through the engine and radiator. The pump draws the coolant from the lower part of the radiator and forces it into the distribution gallery of the engine block. From the distribution gallery the coolant is forced on into the engine block where it flows round the cylinder liners and then rises up into the cylinder heads (9). From the distribution gallery the coolant is also forced direct up into the cylinder heads through passages which are so directed that the coolant flows round the sleeves of the injectors.

From the rear cylinder head the coolant passes through a communicating passage (10) to the front cylinder head which is in communication with the thermostat housing through a passage (7).

Coolant Pump

The coolant pump is mounted on the front end of the engine and is driven by vee belts from a belt pulley on the crankshaft. It is of centrifugal type with an impeller of phosphor-bronze and a shaft of stainless steel. The shaft runs in ball bearings and the pump is fitted with a resilient seal which bears against a ceramic ring on the impeller.

FU



Cooling system

- | | |
|---------------------------------|---|
| 1. Coolant distribution gallery | 7. Inlet passage from cylinder head to thermostat housing |
| 2. Coolant pump | 8. Thermostat |
| 3. Lower radiator hose | 9. Cylinder head |
| 4. Radiator | 10. Communicating passage |
| 5. Upper radiator hose | |
| 6. Return line | |

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The task of the thermostat is to keep the engine at as constant a working temperature as possible. It consists of a valve for controlling the flow of coolant through the radiator and a bellows which regulates the valve. The thermostat bellows is made of thin corrugated sheet metal, so that it is able to expand and contract. Inside the bellows is a volatile liquid. When the bellows is heated this liquid vaporizes, increasing the pressure and causing the bellows to expand. The controlling action of the thermostat is based on this principle.

As an alternative to this thermostat there are those which in some installations have a wax temperature sensitivity working agent. Thus in the event of a puncture occurring in the thermostat first mentioned this adopts an open position. With a corresponding fault on the latter type (wax thermostat) this remains closed. On some installations there are twin thermostats with different opening degrees.

The figure shows the thermostat in the half-open position, i.e. the temperature of the engine coolant is within the control range of the thermostat. In this position some of the coolant will flow through a return line (6) direct to the coolant pump (2). The rest of the coolant flows through the half-open thermostat and on through the upper coolant hose (5) and into the radiator (4) where it is cooled down.

If the coolant temperature in the engine is lower than the opening setting of the thermostat, almost all the coolant will flow through the return line (4) straight to the coolant pump. However, a small quantity of coolant will still flow through a hole drilled in the thermostat housing and on through the upper coolant pipe to the radiator. This slight flow through the radiator prevents the coolant in the radiator from freezing when the vehicle is driven in low ambient temperatures.

Holes of this kind are also to be seen in the thermostat housing with wax thermostat, but are not shown in the figure.

If the coolant temperature in the engine is above the temperature at which the thermostat is fully open, all coolant will flow through the open thermostat out into the radiator for cooling.

Radiator

The radiator consists of an upper and a lower tank, connected by a large number of vertical, thin-walled pipes. To increase the heat-dissipating capacity of the radiator, the pipes are threaded through a large number of thin metal strips. The upper radiator tank is provided with a filler pipe with a cap and also with a coolant tailpiece which is connected by a rubber hose to the thermostat housing on the engine. On the lower tank there is an outlet which is connected to the suction side of the coolant pump.

Alternatively, it occurs that the radiator is completed with an expansion tank, which is connected to the radiator and sited on the top of the upper radiator tank. The expansion tank is provided with a filler tube and cover. Any overpressure arising in the system is limited by a special pressure valve.

By using the pressure cover or pressure valve the coolant boiling point is slightly raised at the same time and in addition prevents among other things coolant losses through evaporation.

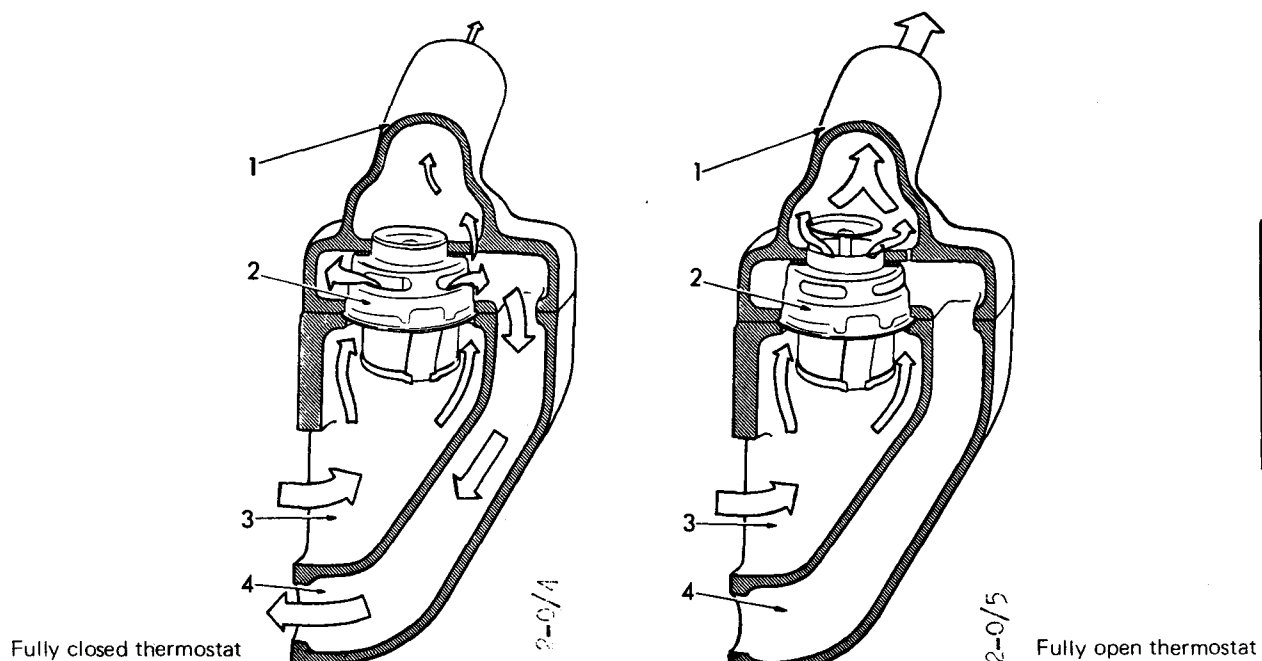
On more recent installations expansion tanks are always fitted. The coolant is filled via the expansion tank after which it is led down in a hose to the bottom edge of the radiator. The cooling system is thus filled from beneath whereby it is automatically vented.

On certain later type installations level indicators are fitted which warn against an insufficient quantity of coolant. The level indicator transmitter is connected to a warning lamp which lights up when the level of the coolant gets too low.

On its way down through the radiator the coolant is cooled by the air stream through the radiator. This air stream is created partly by the motion of the vehicle and partly by the fan. The quantity of air passing through can be controlled by means of a radiator blind.

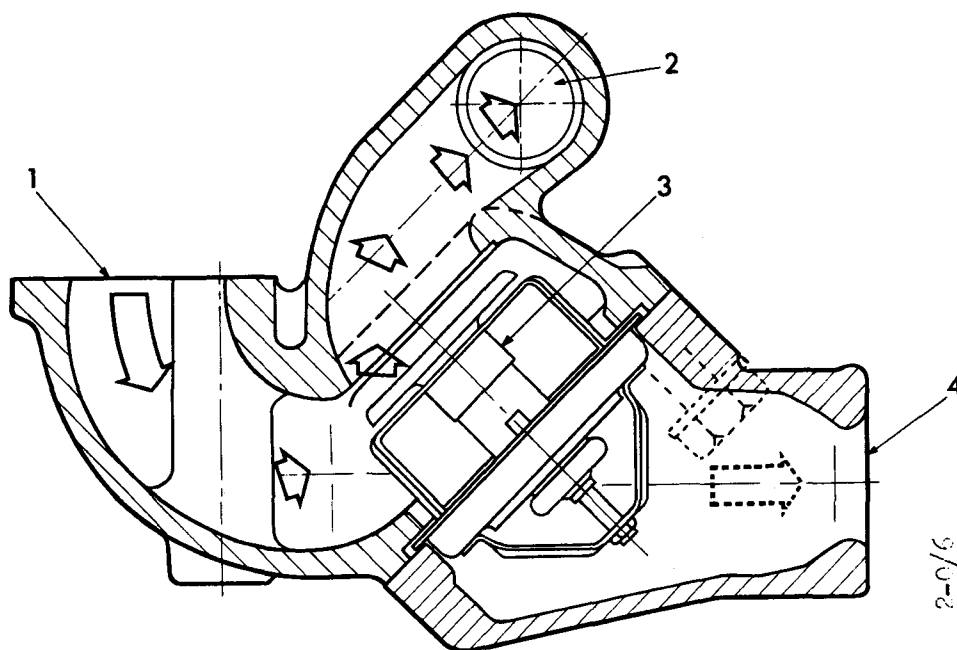
To indicate the temperature of the engine there is a **temperature gauge**. This gauge is a vapour-pressure thermometer giving a continuous reading of the coolant temperature. It consists of a dial instrument and a closed metal sleeve, joined by a connecting tube of very fine bore. The dial instrument is built into the combination instrument on the instrument panel while the detector is mounted in one of the communicating passages and is in direct contact with the coolant.

The metal sleeve contains a certain quantity of a volatile liquid, which vaporizes when the coolant in the engine warms up. The vapour pressure is communicated through the connecting tube to the pressure-gauge spring. The effect of this is that the spring attempts to straighten out. It is connected to the pointer by a lever, which transmits its movement to the pointer.



Thermostat housing and thermostat with coolant as working agent

1. Upper coolant pipe
2. Thermostat
3. Inlet passage
4. Return line to coolant pipe

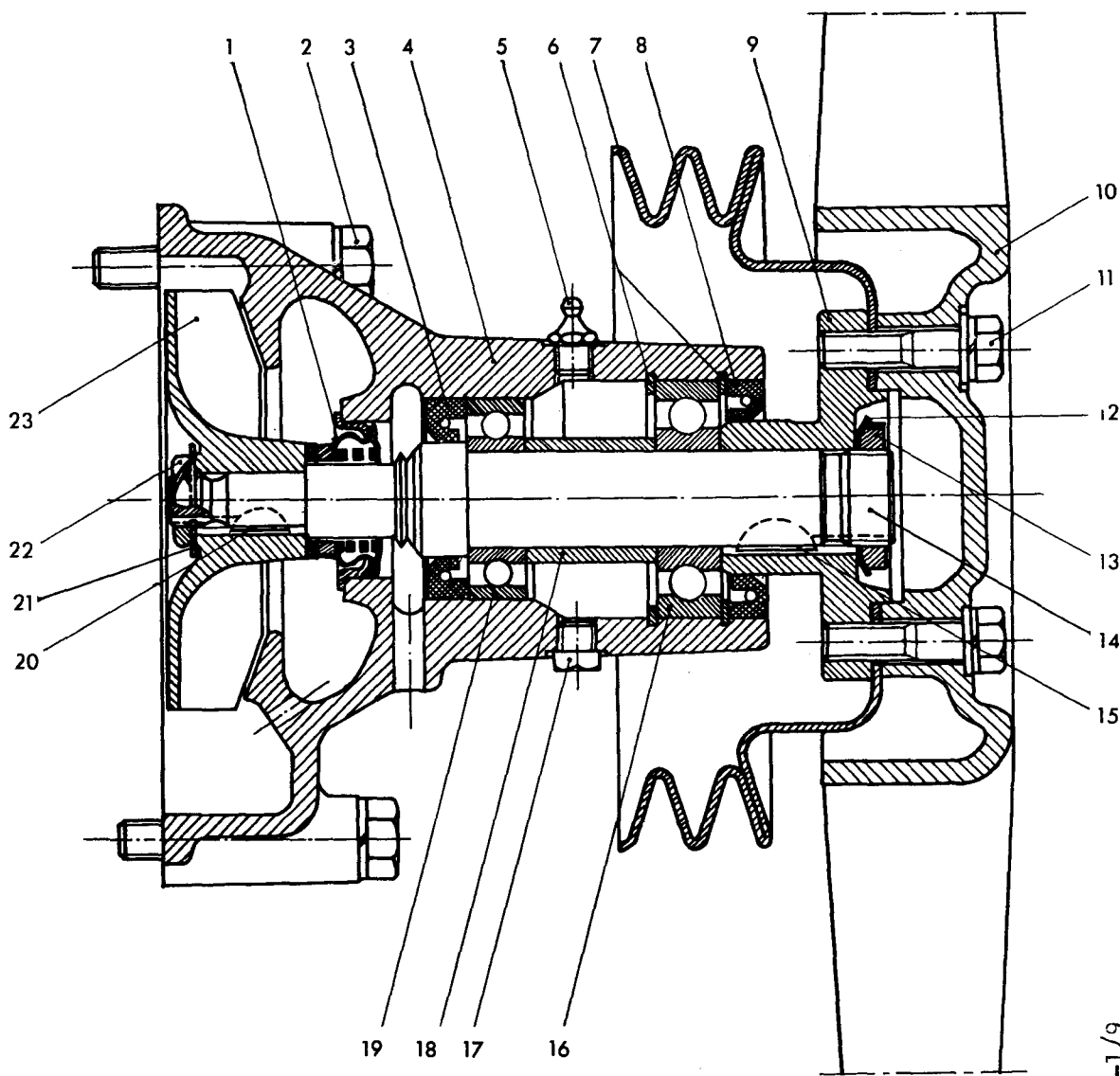


Thermostat housing and thermostat with wax as working agent

1. Inlet passage from cylinder head
2. Return passage to coolant pump
3. Thermostat (in closed position)
4. Outlet passage to radiator

FU

COOLANT PUMP



AR

Coolant pump, complete, with belt pulley and fan

- | | | |
|-----------------------------|------------------------------|--------------------|
| 1. Sealing ring for coolant | 9. Fan hub | 17. Relief valve |
| 2. Screw with spring washer | 10. Fan | 18. Spacer sleeve |
| 3. Sealing ring for grease | 11. Screw with spring washer | 19. Ball bearing |
| 4. Pump housing | 12. Lock washer | 20. Key |
| 5. Lubricating nipple | 13. Nut | 21. Lock washer |
| 6. Retaining rings | 14. Pump shaft | 22. Nut |
| 7. Belt pulley | 15. Key | 23. Impeller blade |
| 8. Sealing ring for grease | 16. Ball bearing | |

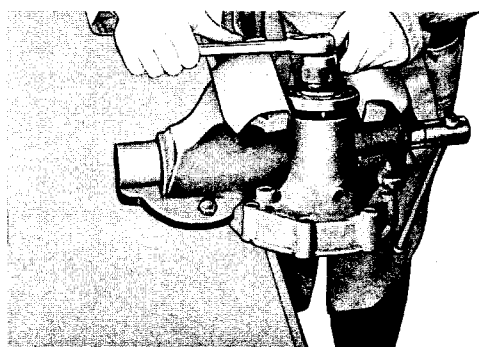
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In lubricating the pump it is impossible to know how much grease is already present in the bearing housing, but to eliminate the risk of burst sealing rings the pump is fitted with a relief valve (17). This valve opens when the bearing housing is full of grease. Lubricate with a hand grease gun until grease emerges through the relief valve. Apart from this the pump requires no attention.

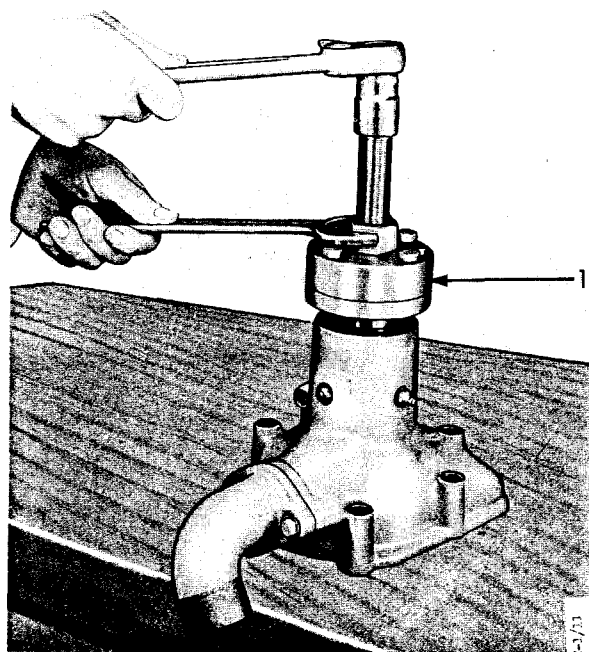
On later engines the water pump is fitted with permanently lubricated bearings. Therefore, the ruff sealing lubricating nipple and relief valve are no longer necessary.

Disassembly

1. Detach the fan and belt pulley by unscrewing the screws (11).



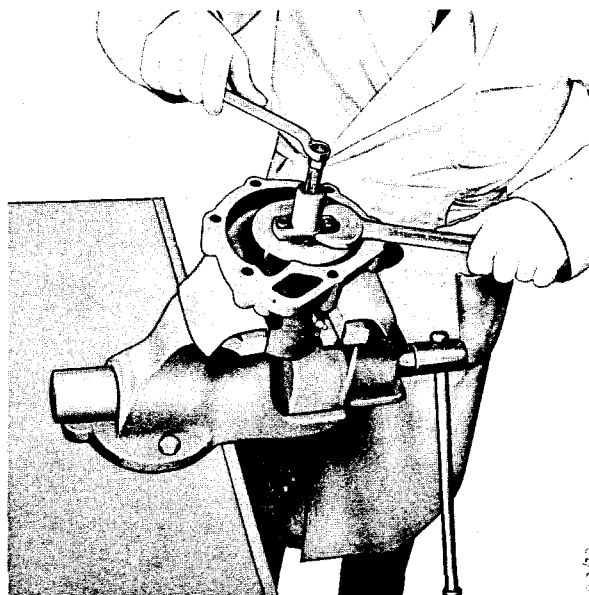
Remove the shaft nut



Remove the hub using the puller

1. Puller

2. Unscrew the shaft nut (22) of the impeller wheel, after first turning down the lock washer. While doing this job, have the hub clamped in a vice to prevent the pump shaft from rotating.
3. In the same way, detach the shaft nut (13) of the hub using the keyed socket.
4. Remove the hub using the puller. Make the screws of the puller thoroughly tight.
5. Remove the sealing ring inside the hub using a suitable tool.
6. Remove the outer retaining ring (6) with a pair of retaining-ring pliers.
7. Detach the impeller using the puller.



Detach the impeller using the puller

8. Press the shaft with bearings out of the pump housing, working towards the driving flange.
9. Remove the coolant sealing ring and the inner grease sealing ring.

Inspection

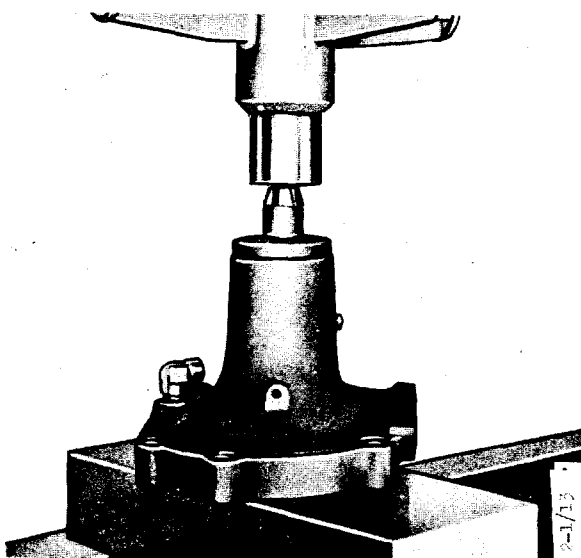
Clean all parts thoroughly in a cleaning liquid.

Examine the pump housing. Among other things, make sure that all bearing and contact surfaces are free of defects. If water leakage has occurred at the sealing surface against the engine block, this surface should be checked with a surface plate. Check that the drain hole of the pump housing is clear. Inspect the remaining parts of the pump. If the ceramic washer on the impeller is too badly worn or otherwise defective, the impeller must be changed. The pump shaft and hub should be changed if, for example, the contact surfaces for the sealing rings are appreciably worn. If necessary, the bearings of the pump shaft can be changed in the usual way using a press. In fitting the smaller bearing, check that it is made to bear against its shoulder on the pump shaft. The position of the larger bearing is then determined by the spacer sleeve between the bearings. If the bearings are incorrectly positioned, there will be a corresponding inaccuracy in the position of the impeller after assembly, which may make it necessary to take the pump shaft out again.

All sealing rings should be renewed, even if they do not appear to be worn or defective.

Assembly

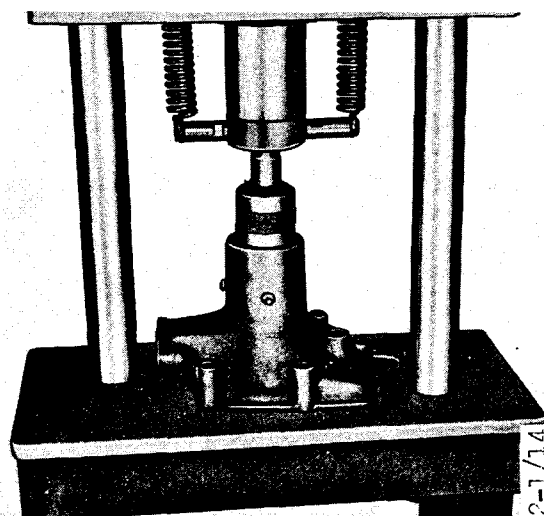
1. See that the inner retaining ring (6) of the outer bearing is firmly seated in its groove in the pump housing.
2. Press the inner sealing ring (3) into its position. Use the drift, which will prevent the sealing ring being pressed in too far.
3. Press in the coolant sealing ring. Use the drift.



Press the inner sealing ring into its position

4. Press the bearings and the spacer sleeve into place on the shaft.
5. Grease the bearings and the surface at which the sealing ring (3) contacts the shaft with rolling-bearing grease.
6. Then press the shaft, carrying the bearings, into the bearing housing. The press force should be applied to a tubular drift covering the outer and inner rings of the front bearing.

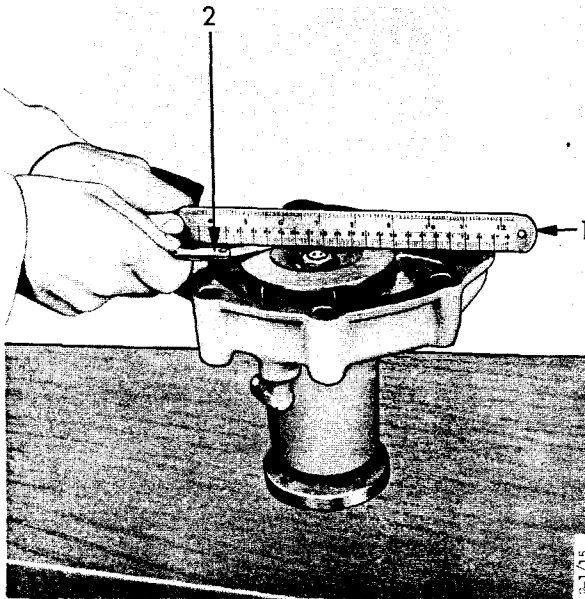
On coolant pumps with permanently lubricated bearings the front bearing is secured with Locktite type A.



Press the front sealing ring into the bearing housing

7. Fit the retaining ring outside the front bearing and press the sealing ring (8) in with the drift. The open side must be turned to face the bearing.
8. Fit the key. Lubricate the sealing surface of the hub with rolling-bearing grease and fit the hub.
9. Fit the nut with a new lock washer. The conical side of the nut must be turned to face the hub washer. Tighten the nut and lock it.
10. Fit the key of the impeller and then the impeller itself. Lock the nut with a new lock washer.
11. Check the position of the impeller in relation to the face of the pump housing. Use a suitable straight-edge and feeler gauge. If assembly has been correctly performed the distance will be somewhere between the stated figures.

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Check the position of the impeller

1. Straight-edge
2. Feeler gauge

12. Fit the pump. Use a new gasket.
13. Lubricate the pump with rolling-bearing grease and check that the relief valve is in working order.
14. Fit the belt pulley and the fan. Use new lock washers.

SERVICE SCANIA

PRODUCTS

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COOLING SYSTEM

	Page
Water pump	2
Dismantling	2
Assembly	3

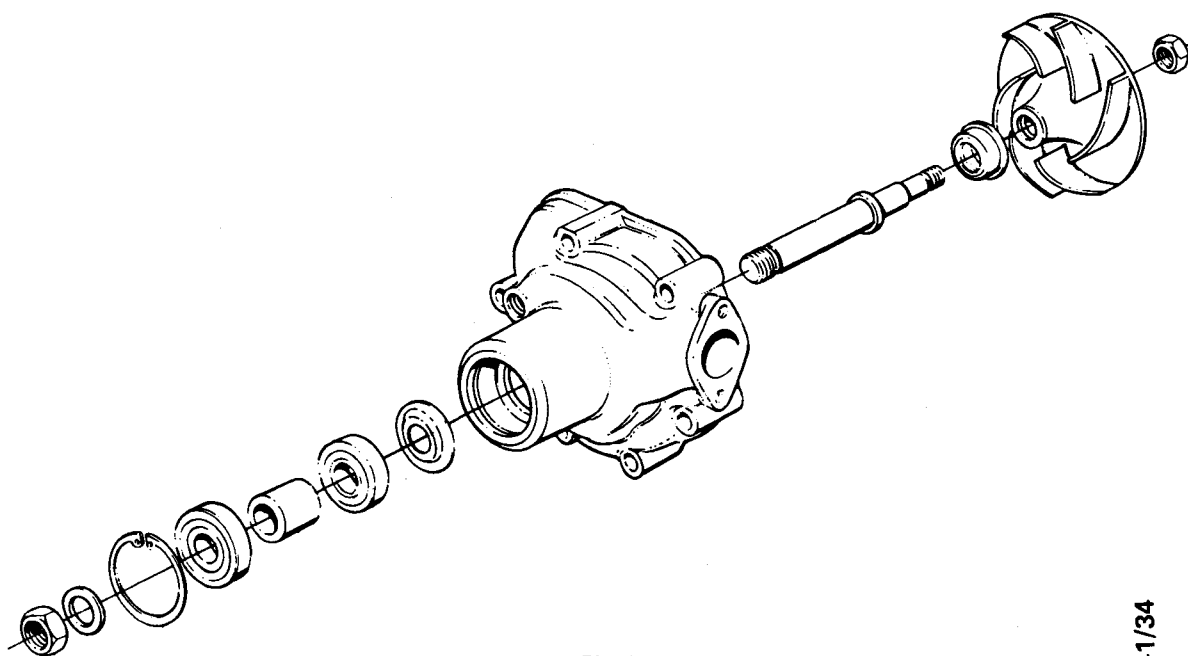


Fig. 1

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AR

CAUTION

This section is applicable to only Waukesha Models F476D and DS, and F674D, DS, and DSI. These models are designated by Scania as D and DS8A02, A04, A05, and A06; and D, DS, and DSI11A04, A05, A06, and A07, respectively.

grupp	sekt	nr	sida
2a	AR	1	2

Water pump

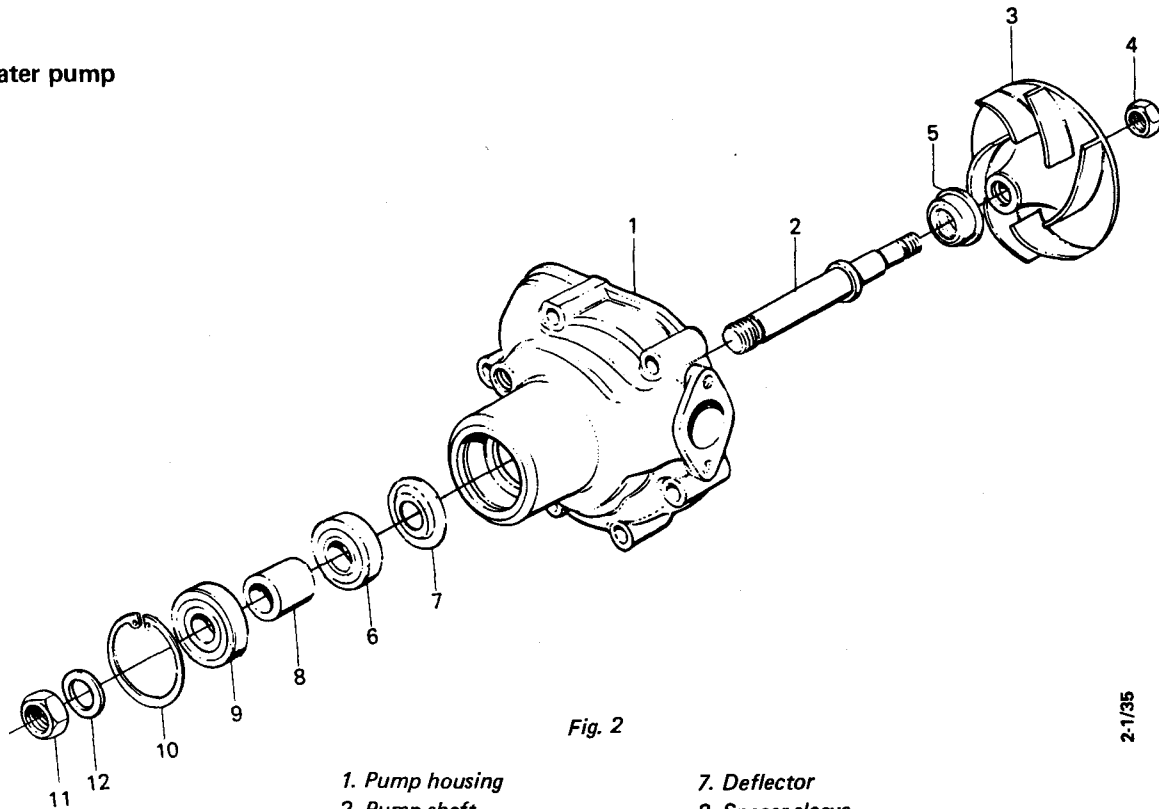


Fig. 2

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- | | |
|------------------------|------------------------|
| 1. Pump housing | 7. Deflector |
| 2. Pump shaft | 8. Spacer sleeve |
| 3. Impeller | 9. Ball bearing, outer |
| 4. Nut | 10. Lock ring |
| 5. Seal | 11. Nut |
| 6. Ball bearing, inner | 12. Lock washer |

Dismantling

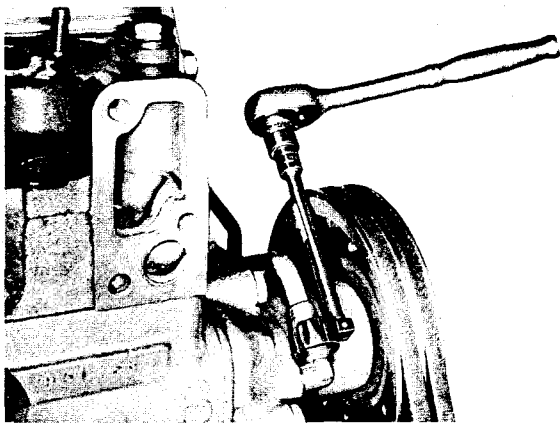


Fig. 3 Back off the nut with an open twelve-sided spanner

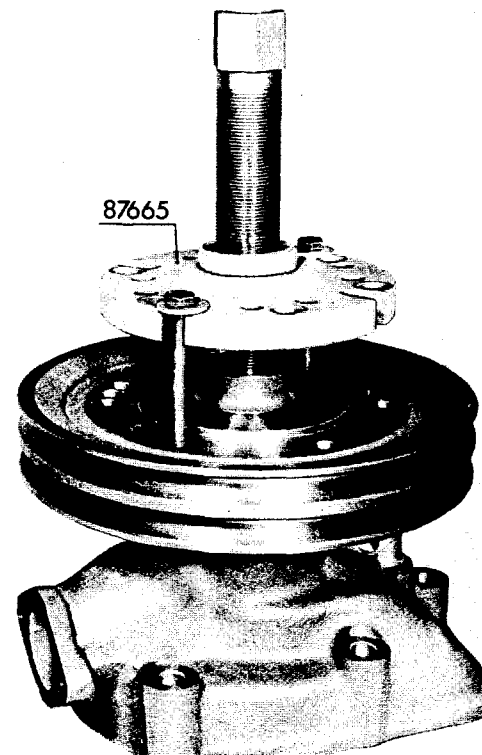


Fig. 4 Puller for water pump hub or belt pulley

1. Remove the nut and the washer and pull the fan hub (or belt pulley) off with puller 87665.

2. Remove the nut and pull the impeller off with puller 87501.

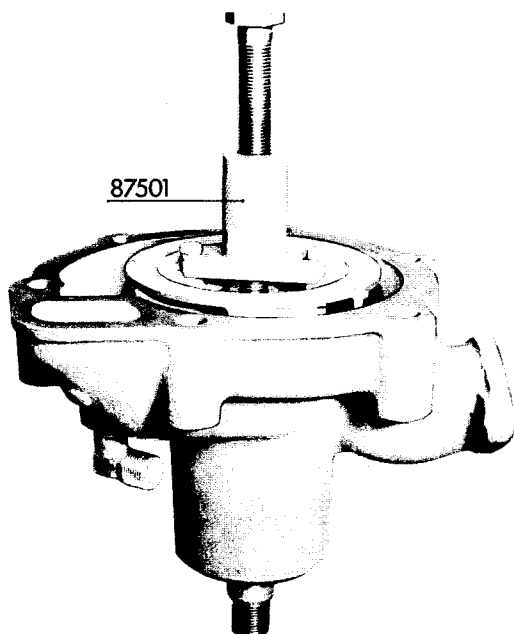


Fig. 5 Puller for impeller

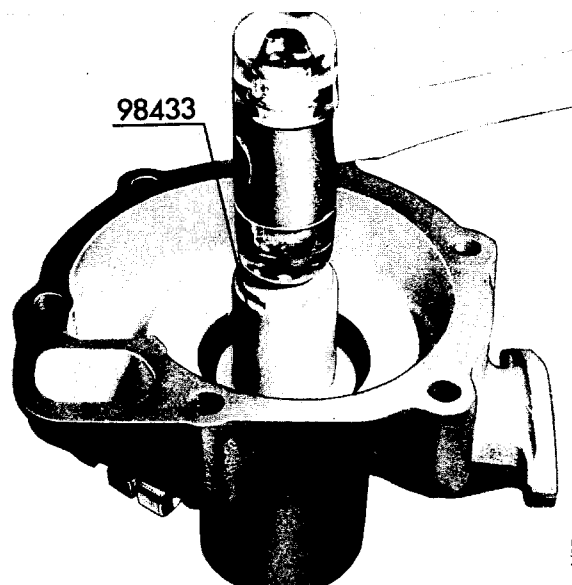


Fig. 6 Drift for seal

3. Pass the shaft with bearings into the pump housing and tap the bearings in with a drift. Fit the lock ring into the pump housing.

3. Remove the lock ring from in front of the front ball bearing and press the shaft out forwards.
4. Take the seal out of the housing.
5. Press the ball bearings off the shaft. NOTE that the deflector washer will be damaged in course of dismantling and must therefore be replaced by a new one.

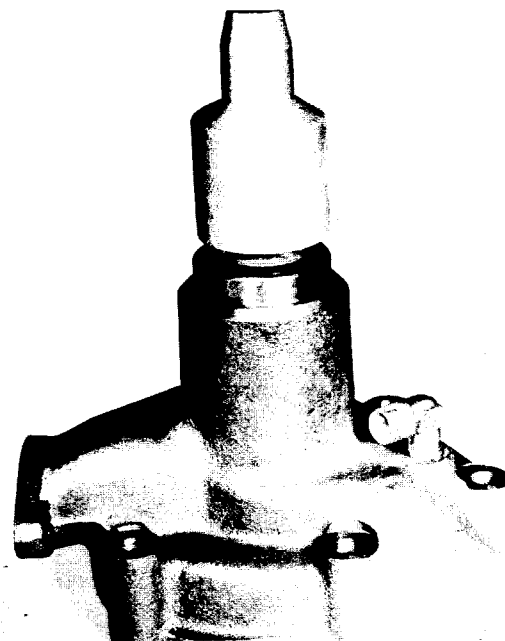


Fig. 7 Drift for bearings

Assembly

1. Fit a new deflector washer and press both bearings onto the shaft with the spacer sleeve between them.
2. Coat the brass sleeve of the seal with sealing compound and tap the seal into the pump housing with drift 98433. A suitable sealing compound has article number 561019.

4. Put the impeller on and tighten the nut with a torque of 40 Nm (4 kpm).
5. Fit the fan hub (or belt pulley) and the washer. Tighten the nut with a torque of 120 Nm (12 kpm).

COOLING SYSTEM MISC.

Thermostat

The thermostats have a very important function to fulfil in the cooling system. Therefore, it is extremely important to check that they are functioning satisfactorily.

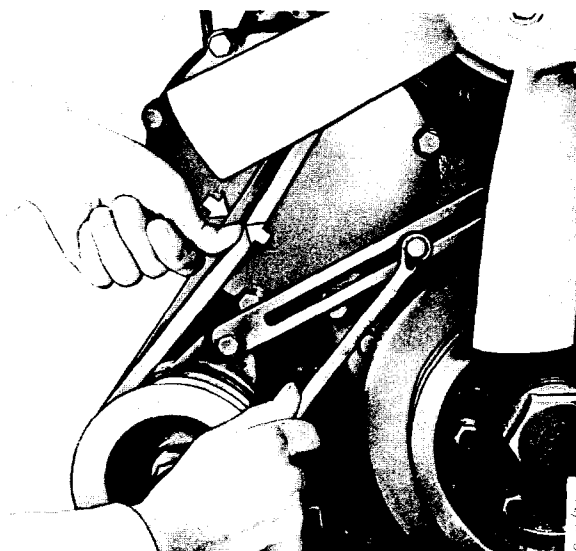
This check is carried out according to the instructions below:

1. Take the thermostat out of the thermostat housing, immerse it in a vessel of water and let it hang so that it does not touch the sides or bottom of the vessel.
2. Heat the water slowly and check the temperature with a thermometer. Stir the water and do not let the thermometer rest against the bottom of the vessel.
3. The thermostat must begin to open and must reach full opening at the indicated temperatures. If the thermostat valve sticks or if it begins to open at too high or too low a temperature, the thermostat must be changed.
4. Before the thermostat is fitted into the thermostat housing the latter must be cleaned in respect of sealing surfaces etc. and inspected to ensure that there is nothing to upset the function of the thermostat. Check the gasket round the thermostat.

Fan with Rigid Coupling and Fan Belts

The fan is made of light metal and is mounted on the shaft of the coolant pump. The fan, coolant pump and generator are driven by vee belts. It is of great importance for the operation of the vee belts that they are as nearly equal in length as possible. If a belt is damaged it is often good policy to change the whole set of which it is a part. After the change the belts that work together must have the same tension.

If the belts are correctly tensioned it should be possible to deflect them by the stated amount using moderate pressure on the longest unsupported part.



Check the tension of the vee belts

Coolant Temperature Gauge

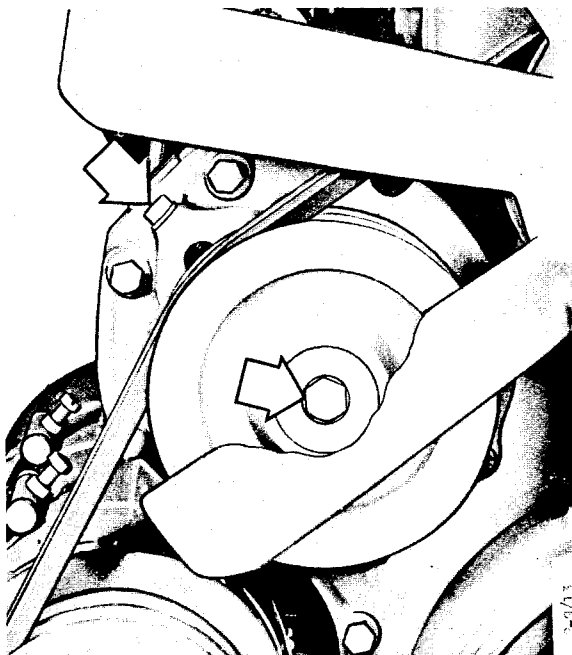
The coolant temperature gauge can easily be checked by screwing out the metal sleeve from the engine and immersing it in a vessel of water which is heated and stirred at the same time. Take the temperature of the water with an ordinary thermometer, and compare its reading with that of the dial instrument.

In taking out the metal sleeve, be careful to see that the tube does not accompany the nut.

Make quite sure that the thermostat tube is free from sharp bends and that it does not chafe against the engine. Nor must the tube be so tightly stretched that it can be pulled apart by the movements of the engine.

Adjust the belt tension as follows:

1. Slacken the retaining screws of the generator a few turns.
2. Shift the generator out until the belt tension is correct.
3. Tighten the retaining screws and check that the correct belt tension has been obtained.



Tensioning pulley

On engines equipped with a tensioning pulley, first slacken the nut in the centre of the pulley. Then adjust the belt tension by means of the setting screw (arrowed). Then make the nut in the centre of the pulley tight again.

Under winter conditions, when the air temperature is too low that the coolant does not reach normal working temperature, it may be advisable to remove the fan.

RADIATOR

Radiator for engine lubricating oil

See the section covering "Lubricating System", Work Description

Radiator for engine coolant

See the section covering "Cooling System", Work Description

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	nummer/number	sida/page
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COOLING SYSTEM

CAUTION

This section is applicable to only Waukesha Models F476D and DS, and F674D, DS, and DSI. These models are designated by Scania as D and DS8A02, A04, A05, and A06; and D, DS, and DSI11A04, A05, A06, and A07, respectively.

Thermostats

The thermostat housing contains two thermostats with different opening temperatures. The thermostat with the lowest opening temperature must be sited highest.

The thermostats are marked with the opening temperature — see fig. The recess (2) in the thermostat disc must be turned upwards on the upper thermostat and downwards on the lower thermostat.

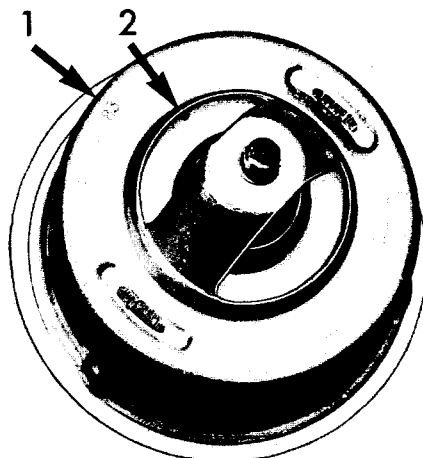


Fig. 1 Thermostat

Checking of thermostats

The thermostats have a very important function in the cooling system and should therefore be checked every now and then in order to be sure that they are functioning satisfactorily.

1. Take the thermostats out of the thermostat housing, submerge them in a vessel of water and let them hang so that they do not touch against the walls or bottom of the vessel.
2. Heat the water slowly and check the water temperature with a thermometer. Stir the water and do not allow the thermometer to rest against the bottom of the vessel.
3. The thermostats must begin to open and be fully open at the specified temperatures.

If the thermostat valve sticks or if the thermostat begins to open at too high or too low a temperature it must be replaced.

4. Before fitting the thermostats into the thermostat housing the latter must be cleaned and inspected to ensure that there is nothing to impede the function of the thermostats.

1. The opening temperature is marked on the thermostat.
2. Recess in thermostat disc.

SERVICE **SCANIA**

PRODUCTS

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GENERAL

Specifications

Anti-freeze, corrosive preventive

D5, DS5 D8, DS8

See instructions
in the Operator's
Manual or Mainte-
nance Instructions
2-3 %

D11, DS11

See instructions in
the Operator's Manual
or Maintenance Instruc-
tions
2-3 %

SP

SERVICE SCANIA

PRODUCTS

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Values, Tools

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COOLANT PUMP

Setting Values

		D5, DS5 D8, DS8	D11, DS11
Water pump	The distance between impeller and the level plane behind it on the pump housing (new pump)	0.3–1.2 mm	0.3–1.2 mm

Tightening Torques

Water pump:	Impellor, nut	40 Nm (4 kpm)	40 Nm (4 kpm)
	Hub, nut	120 Nm (12 kpm)	120 Nm (12 kpm)

SP

Tools

Description	D5, DS5 D8, DS8 Part No.	D11, DS11 Part No.	C Class	See page Work Des- cription	Remarks
Slot sleeve for shaft nut	87531	87531	1	2	
Puller for fan hub	87527	87527	2		
Puller for impeller	87501	87501	1	2	
Drift for fitting inner sealing ring	87402	87402	1	3	
Drift for fitting ring for coolant	88248	88248	2		
Drift for fitting outer sealing ring	87526	87526	2	3	

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SERVICE SCANIA

PRODUCTS

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2 a

Specifications, setting values,
tools

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COOLING SYSTEM

CAUTION

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Specifications

Water pump

Distance between impeller and contact face of pump housing

0.22–1.15 mm

Tightening torques

Nut for impeller

40 Nm (4 kpm)

Nut for hub (belt pulley)

120 Nm (12 kpm)

Tools

Puller for hub (belt pulley)

Art. No. Class

87665 1

Puller for impeller

87501 1

Drift for fitting of axial sealing ring

98433 1

Sealing compound for axial sealing ring

87526 2

Drift for ball bearing

Drift for pipe nut:

1950 M21

E.g. Beltzer open twelve-sided wrench with
extension

7761

and reducer

8165

561019 —

SERVICE SCANIA

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COOLING SYSTEM MISC.

Specifications, Setting Values

		D5, DS5 D8, DS8		D11, DS11	
		Liquid Ther- mometer	Wax Ther- mometer	Liquid Ther- mometer	Wax Ther- mometer
Thermostat	Must be completely closed	74°C		74°C	
	Must begin to open at	77°C	79°C	77°C	79°C
	Must be wide open at	88°C	94°C	88°C	94°C
Fan Belts	If the belts have been correctly tensioned between the generator and the fan it should be possible by using moderate force to press them in	approx. 10 mm		approx. 10 mm	
Twin thermostats (applies to D/DS11 beginning from engine No. 880840)	The top thermostat marked green shall:				
	begin to open at			75°C	
	be fully open at			90°C	
	The bottom thermostat marked black shall				
	begin to open at			79°C	
	be fully open at			94°C	

SP

SERVICE SCANIA

PRODUCTS

grupp/group	Specifications, setting values, tools	
	number/number	sida/page
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COOLING SYSTEM

CAUTION

This section is applicable to only Waukesha Models F476D and DS, and F674D, DS, and DSI. These models are designated by Scania as D and DS8A02, A04, A05, and A06; and D, DS, and DSI11A04, A05, A06, and A07, respectively.

Specifications

Thermostats, number of	2
Opening temperature, upper (marked 79°C) starts opening at	$79^{\circ}\pm 2^{\circ}\text{C}$
fully open at	$90^{\circ}\pm 4^{\circ}\text{C}$
Opening temperature, lower (marked 83°C) starts opening at	$83^{\circ}\pm 3^{\circ}\text{C}$
fully open at	$91^{\circ}\pm 4^{\circ}\text{C}$

The recess in the thermostat disc must face upwards on the upper thermostat and downwards on the lower thermostat.

Other combinations than the above can occur on separate engines.

Alternative thermostat (marked 75°C) starts opening at	$75^{\circ}\pm 2^{\circ}\text{C}$
fully open at	$86^{\circ}\pm 4^{\circ}\text{C}$

The difference in opening temperature between the upper and the lower thermostat must not exceed 4°C.

If the thermostats have different opening temperatures the one with the lowest temperature must be fitted uppermost.

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2a**Special Information**

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2 Cooling System**a D5, DS5, D8, DS8, D11, DS11****Lift of Contents**

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Water pump	1
Temperature Controlled Fan	2
Miscellaneous	9

SERVICE SCANIA

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		1-1	1
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74-10-15		E T S 502a : 1-1	

ÄNDRAD VATTENPUMP PÅ D/DS8 OCH D/DS11

Det har förekommit att det större (främre) kullagrets ytterring roterat och orsakat skador på vattenpumphuset. För att undvika detta har lagerlägets diameter minskats. Det ökade greppet kräver ett lager med större spel och ett sådant införs därför samtidigt.

Tillkommande lager kan monteras i pumphus av både utgående och tillkommande utförande. Däremot får inte utgående lager monteras i tillkommande pumphus.

För att undvika skador på lagret vid monteringen skall ipressningskraften anbringas på lagrets ytterring. Monteringen underlättas av att lagerläget för det mindre lagret förlängts något i det tillkommande pumphuset.

Ändringen har införts fr.o.m. motor nr. 888806 resp. 759001.

Motor D/DS8	Tillkommer	Utgår	Antal
Pumphus	258264	235910	1
Lager	258267	168248	1

Motor D/DS11

Pumphus	258263	232964	1
Lager	258267	168248	1

MODIFIED WATER PUMP ON D/DS8 AND D/DS11

In certain cases the outer ring of the big (front) ball bearing has been rotating, occasioning damages to the water pump housing. In order to avoid this we have reduced the diameter of the bearing seat. The increased grip requires a bearing with a larger clearance, so such a bearing is introduced at the same time.

The new bearing can be fitted to pump housings of both the discontinued and the future designs. On the other hand, the discontinued bearing must not be fitted to the new pump housing.

In order to avoid damages to the bearing in the course of fitting, the outer ring of the bearing is to absorb the pressing force that is applied inwards.

Fitting will be facilitated as the bearing seat for the small bearing is somewhat extended in the new pump housing.

The modification will be introduced as from engine No. 888806 and 759001 respectively.

Engine D/DS8	New	Discontinued	Quantity
Pump housing	258264	235910	1
Bearing	258267	168248	1

Engine D/DS11

Pump housing	258263	232964	1
Bearing	258267	168248	1

grupp	sekt	nr	sida
2a	SI	1-1	2

GEÄNDERTE WASSERPUMPE BEI D/DS8 UND D/DS11

Es ist vorgekommen, daß der große (vordere) Außenring des Kugellagers rotiert und Schäden am Wasserpumpengehäuse verursacht hat. Um dies zu vermeiden, wurde der Durchmesser der Lagersitzfläche vermindert. Der erhöhte Griff verlangt ein Lager mit größerem Spiel, welches deshalb gleichzeitig eingeführt worden ist.

Das neue Lager kann in Pumpengehäuse der alten und der neuen Ausführung montiert werden. Das alte Lager darf dagegen nicht in ein neues Pumpengehäuse montiert werden.

Um Schäden am Lager bei der Montage zu vermeiden, muß man die Einpreßkraft auf dem Außenring des Lagers anbringen. Die Montage wird dadurch erleichtert, daß die Lagersitzfläche für das kleine Lager in dem neuen Pumpengehäuse etwas verlängert worden ist.

Die Änderung ist ab Motor Nr. 888806 bzw. 759001 eingeführt.

Motor D/DS8	Neue Nr.	Alte Nr.	Anzahl
Pumpengehäuse	258264	235910	1
Lager	258267	168248	1
Motor D/DS11			
Pumpengehäuse	258263	232964	1
Lager	258267	168248	1

MODIFICACION DE LA BOMBA DE AGUA EN D/DS8 Y D/DS11

Ha ocurrido que los anillos exteriores del cojinete mayor (delantero) han girado y han causado deterioros en la caja de la bomba de agua. Para evitar esto, se ha reducido el diámetro del alojamiento. Al incrementar el agarre se requiere un cojinete con mayor juego, de modo que se ha introducido al mismo tiempo este tipo de cojinete.

Este tipo de cojinete puede montarse en las cajas de bomba, tanto de versión antigua como de versión nueva. En cambio, los cojinetes en versión antigua no pueden ser montados en las cajas de bomba de versión nueva.

Para evitar deterioros en el cojinete durante montaje, deberá aplicarse la fuerza de presión al anillo exterior del cojinete. El montaje queda facilitado por el hecho de que el alojamiento de cojinete para el cojinete menor ha sido prolongado un poco en la caja de bomba de versión nueva.

La modificación se ha introducido a partir del motor n°. 888806 y 759001 respectivamente.

Motor D/DS8	Versión nueva	Versión antigua	Cantidad
Caja de bomba	258264	235910	1
Cojinete	258267	168248	1
Motor D/DS11			
Caja de bomba	258263	232964	1
Cojinete	258267	168248	1

SERVICE SCANIA

PRODUCTS

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THERMOSTATS

Background

New thermostats with higher opening temperatures have been introduced.

Current Information

D/DS8 Engines

As from engine number 761785 thermostat No. 228842 has been replaced by No. 251899 in all engine variants except marine engines.

In the LB80 and LB85 series this type of thermostat has been fitted on these vehicles ever since the start of production.

Attention

On D/DS8 up to engine No. 761784 originally provided with No. 228842 thermostat No. 251899 cannot be fitted.

On D/DS11 the new type thermostats can be fitted in all previous engines as from engine No. 880840, i.e. those that are provided with double thermostats. The current production combination 228842 and 255501 should now be fitted when replacing thermostats.

If for any reason other opening temperatures are required the following combinations can be fitted:

Bottom Thermostat	Top Thermostat
238156	238156
228842	238156
255501	255501

D/DS11 Engines Equipped with Double Thermostats

Earlier thermostats Nos. 238156 and 228842 have been replaced by Nos. 228842 and 255501 respectively. This implies in consequence that No. 228842 which was previously fitted as bottom thermostat will in the future be fitted on top. The change comes into force as from engine No. 891859.

D/DS8, D/DS11

Thus, the following thermostats are available in the future for the above-mentioned engine types:

Thermostat	Opening Temperature
251899	79°
238156	75°
228842	79°
255501	83°

3200-956

The opening temperature indicates the temperature at which the thermostat begins to open.

SERVICE SCANIA

PRODUKTER—PRODUCTS—PRODUKTE—PRODUCTOS

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Información especial

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LÅG MOTORTEMPERATUR PÅ D/DS11-MOTORER

Bakgrund

Vid körning i kallt klimat når vissa D/DS11-motorer inte normal arbetstemperatur (70 – 90°C) vid lätt belastning trots att termostaternas öppningstemperatur är riktig.

Aktuell information

Orsaken kan i så fall vara att vattenflödet genom kylaren ändå är för stort. Följande fel kan förekomma:

1. Otillräcklig tätning mellan gummipackningen (17589) och termostaten vid nitningen, se fig 1 sid. 2.

Åtgärd

Täta med packningsmassa mellan termostaten och gummipackningen. En packning med större ytterdiameter kommer att införas i vår produktion och som reservdel under mitten av 1976.

2. Termostaten sluter inte helt tätt p.g.a. att föroreningar stör termostatsens funktion.

Åtgärd

Öppna termostaten med handkraft och blås rent med tryckluft. Kontrollera att termostaten löper lätt och att den sluter tätt i stängt läge.

3. Vid mycket lätt körning i kallt klimat kan det vara lämpligt att ytterligare minska flödet genom kylaren.

Åtgärd

Plugga luft- och dräneringshål i termostathuset. Vid inmonteringen därefter skall urtaget i övre termostatsens tallrik vändas uppåt och urtaget i nedre termostatsens tallrik vändas nedåt, se fig 2.

Efter denna åtgärd tar påfyllning av kylvätska något längre tid och vid avtappning kan termostathuset inte helt tömmas.

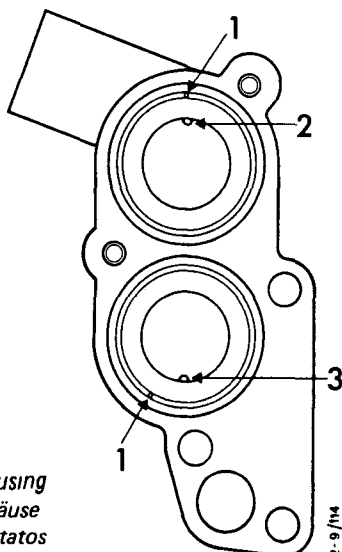


Fig. 2

Termostathus
Thermostat housing
Thermostatgehäuse
Caja de termostatos

3200-1028

LOW ENGINE TEMPERATURE ON D/DS11-ENGINES

Background

When driving with light load in cold climat certain D/DS11-engines do not reach normal operating temperature (70 – 90°C) despite the fact that the opening temperatures of the thermostats are correct.

Current Information

The reason can be, in such cases, that the flow of water through the radiator still is too great. The following faults may arise:

1. Inadequate sealing between the rubber gasket (17589) and the thermostat at the riveting, see fig 1 page 2.

Measure

Seal with sealing compound between the thermostat and the rubber gasket. A gasket with increased outer diameter will be introduced in production and as spare part in the middle of 1976.

2. The thermostat does not close completely due to impurities disturbing its function.

Measure

Open the thermostat by hand and clean it with compressed air. Check that the thermostat can move easily and that it closes tight.

3. When driving with very light load in cold climat, it may be practical to reduce still further the flow of water through the radiator.

Measure

Plug the air and drainage holes in the thermostat housing. When fitting, make certain that the cavity in the plate of the upper thermostat is turned upwards and, that the cavity in the plate of the lower thermostat is turned downwards, see fig 2.

After this measure, it will take a little longer to fill coolant and when draining it will not be possible to empty the thermostat housing completely.

- 1 Hål som kan pluggas

- 2 Urtaget i övre termostatsens tallrik vänds uppåt

- 3 Urtaget i nedre termostatsens tallrik vänds nedåt

- 1 Holes which can be plugged.

- 2 The cavity in the plate of the upper thermostat is turned upwards.

- 3 The cavity in the plate of the lower thermostat is turned downwards.

- 1 Loch, das zugestopft werden kann

- 2 Aussparung im Teller des oberen Thermostates nach oben wenden

- 3 Aussparung im Teller des unteren Thermostates nach unten wenden

- 1 Orificios que pueden taparse

- 2 Volver el corte del plato del termostato superior hacia arriba

- 3 Volver el corte del plato del termostato inferior hacia abajo

grupp	sekt	nr	sida
2a	SI	9-14	2

NIEDRIGE MOTORTEMPERATUR BEI D/DS11-MOTOREN

Anlaß

Beim Fahren im kalten Klima erreichen gewisse D/DS11-Motoren bei leichter Belastung nicht die normale Arbeitstemperatur (70 – 90°C), obwohl die Öffnungstemperatur der Thermostaten richtig ist.

Aktuelle Information

Obiges kann solchenfalls darauf beruhen, daß der Wasserdurchfluß durch den Kühler trotzdem zu groß ist. Folgende Fehler können vorkommen:

1. Unzureichende Dichtung zwischen Gummidichtung (17589) und Thermostat bei der Nietung, siehe Fig. 1.

Maßnahme

Mit Dichtungsmasse zwischen Thermostat und Gummidichtung abdichten. Eine Dichtung mit größerem Außendurchmesser wird Mitte 1976 in unsere Produktion und als Ersatzteil eingeführt.

2. Der Thermostat schließt nicht ganz dicht, weil Verunreinigungen die Funktion des Thermostates stören.

Maßnahme

Den Thermostat mit der Hand öffnen und mit Preßluft sauberblasen. Kontrollieren, daß der Thermostat leicht läuft und daß er in geschlossener Lage dicht schließt.

3. Beim Fahren mit sehr leichter Last im kalten Klima kann es zweckmäßig sein, den Wasserdurchfluß weiter zu vermindern.

Maßnahme

Luft- und Drainageloch im Thermostatgehäuse zustopfen. Beim Einbau muß dann die Aussparung im Teller des oberen Thermostates nach oben und die Aussparung im Teller des unteren Thermostates nach unten gewendet werden, siehe Fig. 2 Seite 1.

Nach dieser Maßnahme braucht man für das Einfüllen der Kühlflüssigkeit etwas mehr Zeit und beim Ablassen der Kühlflüssigkeit kann das Thermostatgehäuse nicht ganz entleert werden.

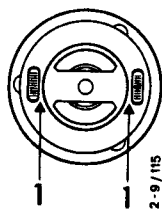


Fig. 1

Thermostat sedd uppifrån
1 Läckage vid nitningen

Thermostat viewed from above
1 Leakage at the riveting

Thermostat von oben gesehen
1 Leckage bei der Nietung

Termostato visto desde arriba
1 Fuga en el remachado

TEMPERATURA DE MOTOR BAJA EN LOS MOTORES D/DS11

Antecedentes

En tiempo frío, ciertos motores D/DS11 no alcanzan la temperatura normal de trabajo (70 a 90°C) con carga ligera, aunque la temperatura de abertura de los termostatos sea correcta.

Información actual

Eso puede ser causado por un flujo de agua demasiado grande a través del radiador, debido a una de las causas siguientes:

1. Cierre insuficiente entre la junta de goma (17589) y el termostato, en el remachado, ver fig. 1.

Medida

Recalcar con compuesto de cierre aplicado entre el termostato y la junta de goma. Una junta de mayor diámetro exterior será introducida en producción y recambios a mediados de 1976.

2. El termostato no cierra herméticamente: impurezas impiden su buen funcionamiento.

Medida

Abrir el termostato con las manos y limpiarlo con chorro de aire comprimido. Controlar el libre movimiento del termostato y su hermeticidad en posición cerrada.

3. En conducción muy ligera por tiempo frío, puede ser conveniente de disminuir aún más el paso de agua a través del radiador.

Medida

Tapar los orificios de aire y de drenaje de la caja de termostatos. Al montar los termostatos, volver el corte del plato del termostato superior hacia arriba, y el corte del plato del termostato inferior hacia abajo, ver fig. 2 página 1.

Después de este montaje, el relleno de líquido de enfriamiento será un poco más largo y la caja de termostatos no podrá vaciarse completamente.

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2. COOLING SYSTEM

c. Separate Engines

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KONTROLL VID MONTERING AV SJÖVATTEN-PUMP AV CENTRIFUGALTYP

Fall av skador på drivningen till sjövattpump av centrifugaltyp har förekommit på grund av att transmissionskåpan varit felaktigt centrerad.

Kontroll vid montering

Kontrollera att inte hålet i transmissionskåpan för vattenpumpen är skadat.

Skruva fast transmissionskåpan endast lätt med ett par skruvar.

Vid montering av medbringaren skall transmissionskåpan centreras så att frigången till medbringaren blir densamma runtom. Detta kontrolleras lämpligen med ett bladmått, som sticks in mellan transmissionskåpan och medbringaren. För att möjliggöra rätt centrerung kan det i enstaka fall vara nödvändigt att borra upp fästhål i transmissionskåpan till $\varnothing 10$ mm.

Medbringare med mindre ytterdiameter, $\varnothing 109 \pm 0,1$ mm har införts i vår produktion. Före montering bör därför medbringarens ytterdiameter kontrolleras och i de fall ytterdiametern överstiger ovan angivna bör medbringaren svaras av.

CHECKING WHEN FITTING SEA-WATER PUMP OF CENTRIFUGAL TYPE

Cases have been reported of damage to the drive on sea-water pump of centrifugal type because the timing gear housing has been wrongly centred.

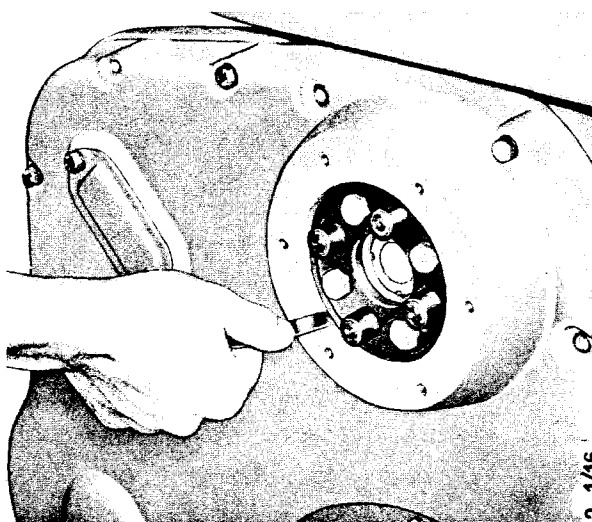
Check when Assembling

Check to see that the hole in the timing gear housing for the water pump is not damaged.

Tighten up securely the timing gear housing, very gently with two bolts.

When assembling the driver, the timing gear housing shall be centred so that the clearance to the driver will be the same all the way round. This is conveniently checked by using a feeler gauge, which is inserted inbetween the timing gear housing and the driver. In order to get the right centring it may be necessary, in exceptional cases, to drill fixing holes in the timing gear housing up to $\varnothing 10$ mm.

Drivers with smaller outer diameters, $\varnothing 109 \pm 0,1$ mm have been introduced in our production. Before assembly the outer diameter of the driver should, therefore, be checked and in those cases where the outer diameter exceeds the above mentioned, the driver should be turned off.



Transmissionskåpans centrerung kontrolleras med bladmått.

The timing gear centring is checked with a feeler gauge.

KONTROLLE BEI DER MONTAGE DER SEE- WASSERPUMPE VOM ZENTRIFUGALTYP

Am Antrieb der Seewasserpumpe vom Zentrifugaltyp sind Schadensfälle vorgekommen, weil das Nockenwellenantriebsgehäuse falsch zentriert gewesen ist.

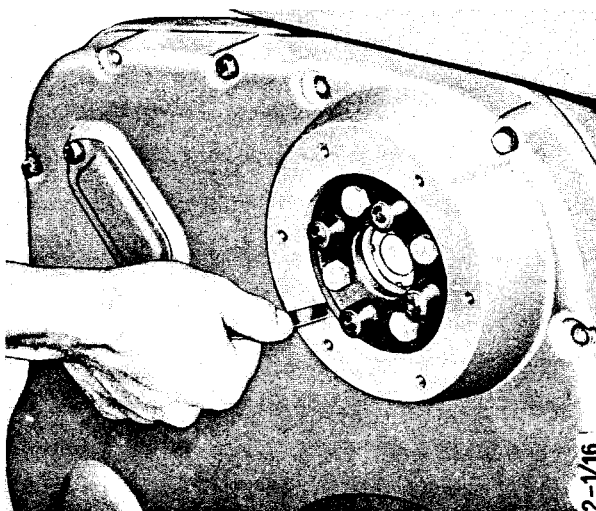
Kontrolle bei der Montage

Kontrollieren, daß die Bohrung im Nockenwellenantriebsgehäuse für die Wasserpumpe nicht beschädigt ist.

Das Nockenwellenantriebsgehäuse mit einigen Schrauben leicht befestigen.

Bei der Montage des Mitnehmers muß das Nockenwellenantriebsgehäuse so zentriert sein, daß der Freigang zum Mitnehmer rundum gleich ist. Dies kann zweckmäßig mit einer Fühllehre kontrolliert werden, die zwischen Nockenwellenantriebsgehäuse und Mitnehmer eingesteckt wird. Um richtige Zentrierung zu ermöglichen, kann es in einzelnen Fällen notwendig sein, daß die Befestigungslöcher im Nockenwellenantriebsgehäuse auf $\varnothing 10$ mm aufgebohrt werden.

Mitnehmer mit kleinerem Außendurchmesser, $\varnothing 109 \pm 0,1$ mm, sind in unsere Produktion eingeführt. Vor der Montage soll deshalb der Außendurchmesser des Mitnehmers kontrolliert werden. Wenn dieser das obige Maß überschreitet, soll der Mitnehmer abgedreht werden.



Kontrolle der Zentrierung des Nockenwellenantriebsgehäuse mit der Fühllehre.

CONTROL AL EFECTUAR EL MONTAJE DE LA BOMBA DE AGUA SALADA DEL TIPO CENTRIFUGO

Se han producido casos de deterioro en el accionamiento de la bomba de agua salada del tipo centrífugo, debido a que la cubierta de la transmisión ha estado centrada erróneamente.

Control al efectuar el montaje

Controlar que no esté deteriorado el agujero en la tapa de transmisión de la bomba de agua.

Sujetar con tornillos la tapa de transmisión de modo que se aguante con un par de tornillos.

Al montar la pieza de arrastre, la tapa de transmisión deberá centrarse de manera que el espacio libre a la pieza de arrastre sea el mismo todo alrededor de la misma. Esto se controlará de forma adecuada con un calibre de láminas, el cual se introducirá entre la tapa de transmisión y la pieza de arrastre. Para permitir un centraje adecuado, en casos aislados podrá ser necesario ensanchar los agujeros de fijación en la tapa de transmisión a $\varnothing 10$ mm.

En nuestra producción se han introducido piezas de arrastre con diámetro exterior menor, $\varnothing 109 \pm 0,1$ mm. Por lo tanto, antes del montaje deberá controlarse el diámetro exterior de la pieza de arrastre y en los casos en que el diámetro exterior sea superior al arriba mencionado, deberá tornearse la pieza de arrastre.

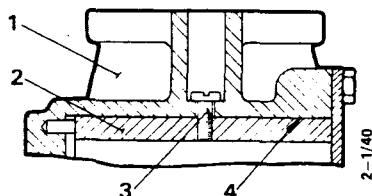
El centraje de la tapa de transmisión se controlará con un calibre de láminas.

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MODIFICATIONS TO SEA WATER PUMP TYPE JOHNSON F9B

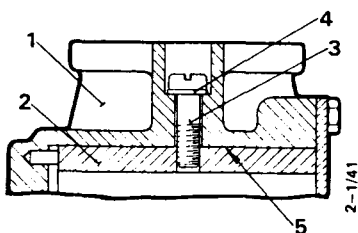
Background

Cases have been encountered where screw (see fig 1) which holds the cam in pump housing has been attacked by corrosion and broken



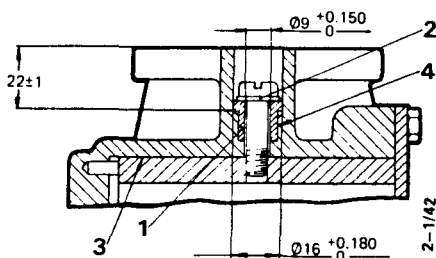
1. Pump housing 3. Screw
2. Cam 4. Sealed with Permatex

Fig. 1 Old style



1. Pump housing 4. Gasket
2. Cam 5. Sealed with Permatex
3. Screw

Fig. 2 New style



1. Spacing sleeve 3. Sealed with Permatex
2. Gasket 4. Loctite

Fig. 3 Modifications to old style pumps

Current information

A new style screw has been introduced in the pump housing. The following changes have been made (fig.2):

- A larger screw (M8 x 25) of aluminium bronze composition has been introduced.
- Threaded hole in cam has been enlarged to accommodate new screw.
- Corresponding hole in pump housing has been modified.
- A copper gasket has been introduced to improve the seal around the screw.

Part name	Quantity	Old style	New style
Sea water pump (DS11) classified 249 467 (unclassified 249 460)			
Pump housing	1	262 946	295 030
Cam	1	262 950	291 028
Screw	1	216 263	291 026
Gasket	1	—	291 027
Sea water pump (DS14) classified 270 242 (unclassified 269 340)			
Pump housing	1	262 946	295 030
Cam	1	288 728	291 029
Screw	1	216 263	291 026
Gasket	1	—	291 027

Sea water pump part numbers remain unchanged

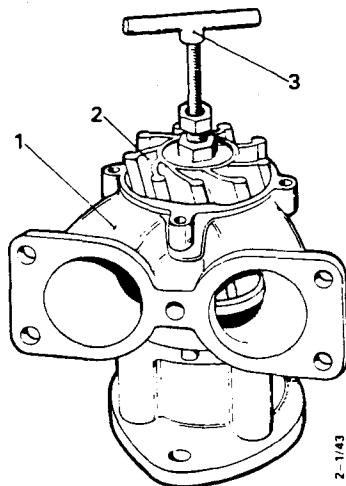
To be observed

Conversion kits 561 271 for DS11 and 561 272 for DS14 are available for retroactive pump modification. These kits contain cam, screw, gasket and spacing sleeve 291 025.

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Instructions for retroactive modification

1. Remove pump from engine.
2. Disassemble pump. Remove impeller with extractor tool 98482.

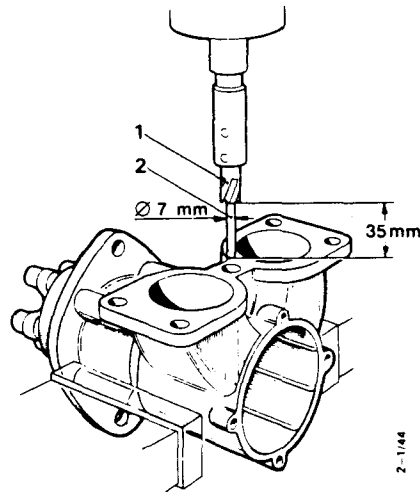


1. Pump housing
2. Impeller
3. Extractor tool 98482

Fig. 4

3. Drill hole in pump housing as follows:
Use plain cutter (16 mm) with centre pin (see fig. 5).
Drill hole to depth of 21–23 mm, see fig. 3.
Use 9 mm drill for lower section of hole.

4. Clean pump housing and cam before assembly.
5. Secure spacing sleeve with loctite.
6. Apply permatex No. 1 on surfaces of cam and replace cam with M8 screw 291 026 and one copper gasket 291 027.
Make sure that screw does not protrude outside cam, otherwise impeller may be damaged.
7. Install impeller, cover and hose connection.
8. Install pump in engine.



1. Plain cutter (16 mm)
2. Centre pin

Fig. 5

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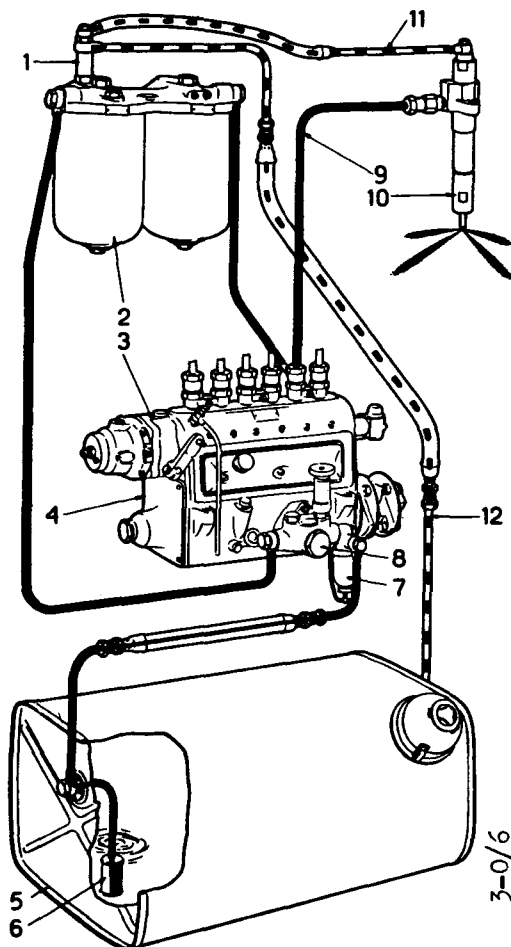
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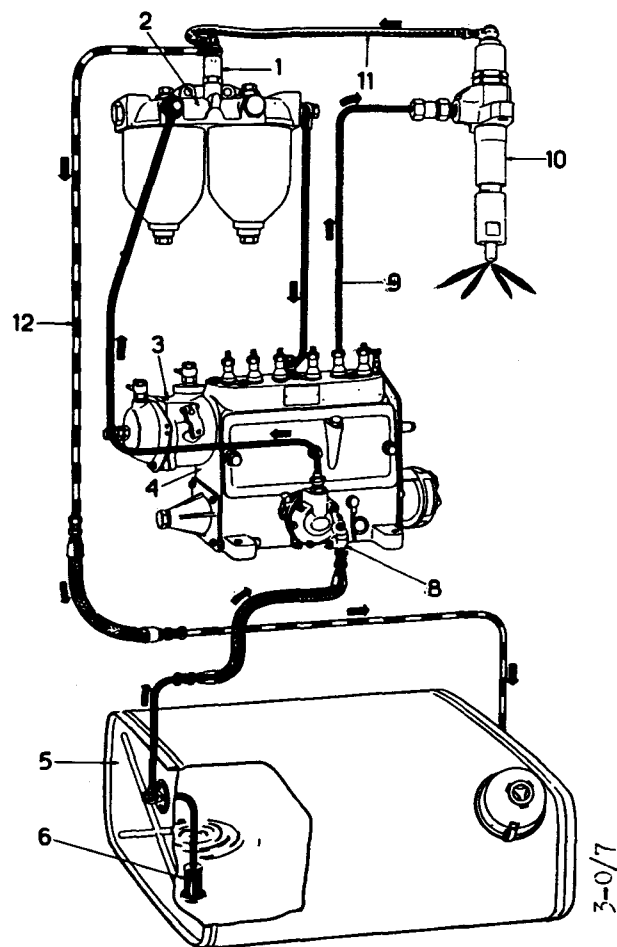
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FUEL SYSTEM



Fuel system, Bosch

1. Pressure relief valve
2. Main filter (one filter on D5-series engines)
3. Governor
4. Injection pump
5. Fuel tank
6. Tank filter



Fuel system, CAV

7. Prefilter
8. Feed pump
9. Pressure pipe
10. Injector
11. Leak-off pipe
12. Return line to fuel tank

The feed pump (8) draws fuel oil from the fuel tank (5) through the tank filter (6) and pumps fuel oil through the main filter into the fuel chamber of the injection pump at a certain overpressure in order to give effective filling of the pump elements. The Bosch injection equipment also has a prefilter (7) on the feed pump. Separate pump elements in the injection pump — one for each engine cylinder — then force the fuel on through the pressure pipes (9) into the injectors (10). From this point the fuel is sprayed through four holes into the engine cylinders in a finely divided state. The filter (6) consists of strainer gauze that takes the coar-

ser impurities out of the fuel before it passes on up to the main filter (2). This item consists of two filter elements which can be series or parallel-connected. The main filter takes out the remaining solid particles, so that the fuel is effectively purified when it enters the injection pump (4).

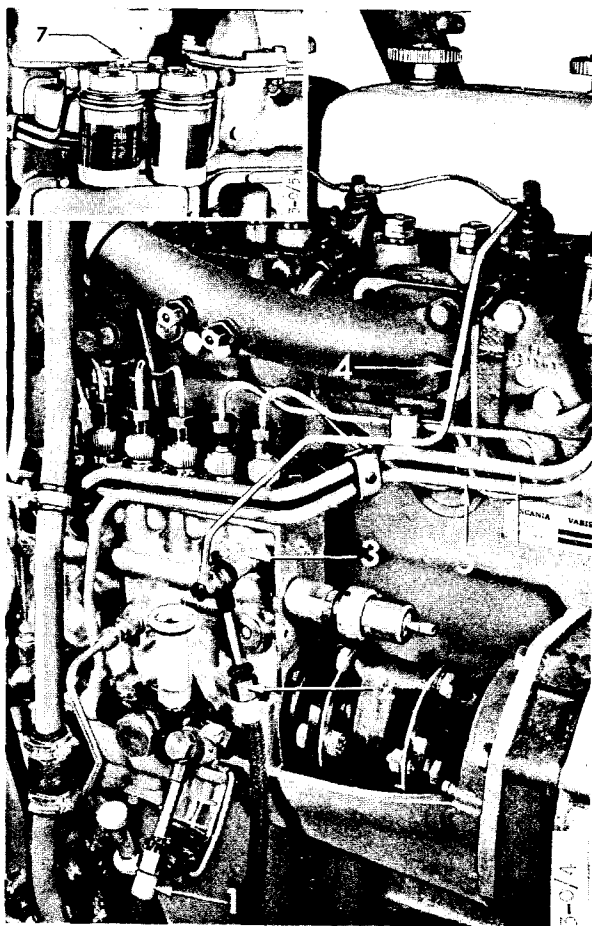
The pressure pipes are connected to the injectors (10) through connection studs that are provided with edge filters. These filters serve as a check filter for such impurities as may enter the pipes while they are disconnected from the engine.

The injectors spray the fuel, in a finely divided condition, into the engine cylinders. Leak-off oil from the injectors is collected in a special pipe which is connected to the main filter. The surplus fuel is taken back to the tank through the pressure relief valve (1), the purpose of which is to limit the overpressure produced by the feed pump. The main filter is continuously bled by the current of fuel oil passing through the pressure relief valve back to the tank.

On certain pump designs the relief valve is mounted on the injection pump. The excess fuel then passes the fuel chamber of the pump, which has favourable influence in some respects.

The parts in the injection pump camshaft housing and governor (mechanical governor) are lubricated via the engine lubricating system and do not need special attention in this respect.

The pump plunger is also provided with a special slot, which when the cold starting device of the pump is engaged improves the cold starting qualities of the engine.



The fuel system Bosch with relief valve mounted on the injection pump.

1. Feed line from fuel tank
2. Return line to fuel tank
3. Relief valve
4. Return line from injector
5. Line to fuel filter
6. Line from fuel filter
7. Fuel filter (inset fig.)

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INJECTION PUMP

The task of the injection pump is to distribute fuel to the various cylinders at the right time and in amounts corresponding to the load on the engine. For this purpose the injection pump is fitted with a camshaft driven from one of the timing gears at the front of the engine. The camshaft acts on the pump elements. The position of the cams, and with it the moment of injection, is always in a certain relation to the position of the crankshaft. Each pump element consists of a plunger and a barrel. These two components are very accurately mated together to form a single unit.

To permit regulation of the fuel charge the plunger is rotatable and has a control helix. The plunger is rotated in the pump barrel by means of a control rod, which derives its motion from the governor. During the upward movement of the pump plungers the fuel is forced out into the individual pressure pipes to the injectors.

The pump plunger is also provided with a special slot, which when the cold starting device of the pump is engaged improves the cold starting qualities of the engine.

Smoke limiter

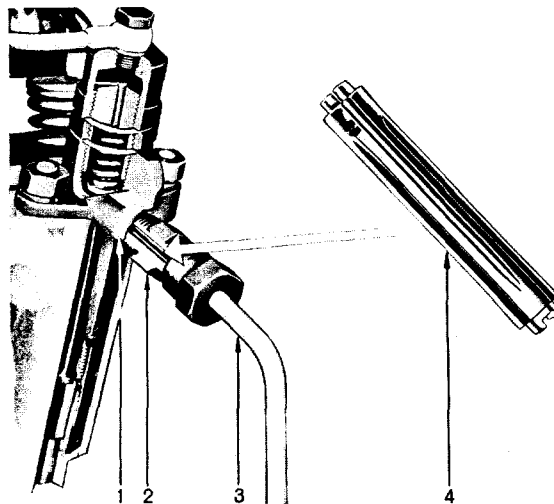
The smoke limiter prevents embarrassing exhaust smoke at low engine r.p.m. The injected fuel quantity is adapted automatically in relation to the available air quantity.

The diaphragm housing is connected through a pipe line to the intake manifold of the engine. When the engine is loaded, the r.p.m. of the turbocharger will increase. As a result, the pressure rises in the intake pipe and also in the chamber above the diaphragm. The latter is pressed down, influencing through the diaphragm rod and the cam disc the maximum opening of the control rod. As a result, an increasing quantity of fuel can be injected.

The maximum control rod opening is not obtained until a certain set loading pressure is reached. This loading pressure is attained at an engine speed of some 1,200 r.p.m.

INJECTORS

From the injection pump the fuel is fed through the pressure pipes to the injectors. The pipe connection on the injector is in the form of an edge filter. This is a safety filter that prevents any dirt which may have got into the pressure pipes, e.g. after disassembly, from accompanying the fuel into the injectors.



Injection and edge filter

1. Injector
2. Edge filter
3. Pressure pipe
4. Filter rod

The filter consists of a steel rod, with lengthwise grooves running from both ends. These grooves do not, however, run right through, the fuel is forced to pass through a narrow gap between the actual rod and the wall of the filter housing in which it is placed. Any solid particles will be trapped in this narrow passage.

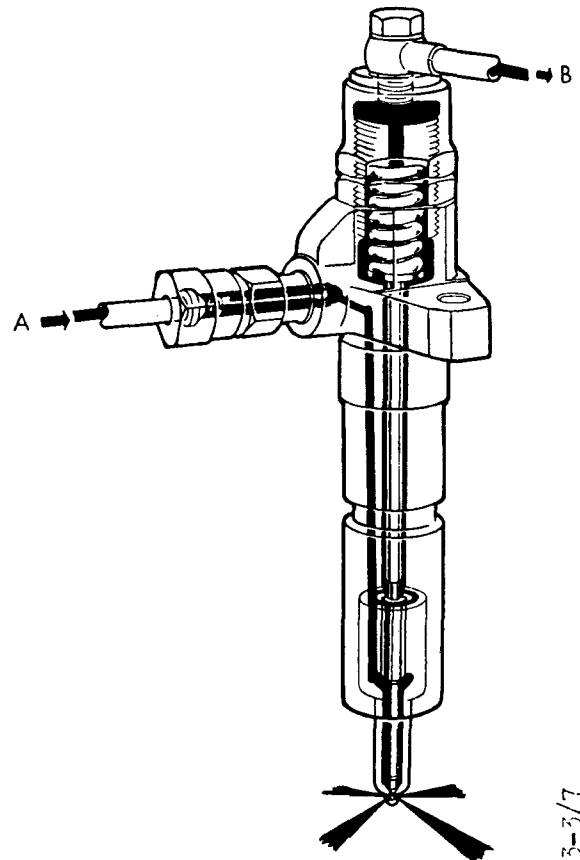
When the fuel passes the edge filter and enters the injector, it is led through a passage on the side of the valve spindle down to the nozzle, see the figure.

When the opening pressure for the particular type of injector has been reached, the opposition of the compression spring is overcome and the needle is lifted from its seat. The fuel then flows through four holes in the nozzle into the combustion chamber. The hole diameter is only a few tenths of a millimetre, and this, combined with the high pressure, causes the fuel to enter the chamber as a fine mist and mix with the swirling air in the combustion chamber.

Even though the fit of the nozzle needle in the nozzle is very fine, some fuel will still get past the needle and penetrate up into the passage in the centre of the injector. The amount of leak-off oil is very little, but it must be led away. Each injector is therefore provided with a special leak-off pipe.

The leak-off oil from all injectors is taken through a single pipe back to the tank.

The fuel enters at A and passes through the edge filter and on down to the nozzle, which distributes it in four jets. The leak-off comes out at B and is piped back to the tank.



The path of the fuel through the injector

Nozzles with 4 alternatively 5 orifices occur

FUEL SYSTEM

General

Maintenance work on the injection equipment should be carried out only by specially trained personnel with access to the necessary tools and testing equipment.

The settings of maximum output and maximum speed that are made at the factory have been carefully worked out and tested and must not be changed, since this would entail a risk of damage to the engine. For this reason, the injection equipment has lead seals at a number of points.

If the seals are broken by an unauthorized person the factory's guarantee on the engine, and in certain cases that on the drive line as well, will be wholly invalidated.

Otherwise, look at possible local regulations in respect of smoke limits and plugs.

Observe the greatest care and cleanliness in all work on the fuel system.

Store protective caps and plugs so that they do not get dirty.

Special tools for injection equipment such as cleaning tools for injectors, are available from the agent representing the maker of the injection equipment.

Trouble shooting

When the exhaust gases of a diesel engine become too dark, the reason is incomplete combustion of the fuel. The cause of this in its turn is either that the fuel is not sufficiently finely divided or that there is an excess of fuel in relation to the amount of air drawn in. Dark exhaust gases can also be due to high compression losses.

If the engine begins to smoke, action must be taken immediately. If the engine is correctly adjusted no appreciable exhaust smoke should be visible even on full throttle.

It is very uneconomical to run the engine with a smoky exhaust, for the following reasons:

1. The engine very quickly becomes covered with carbon.
2. The lubricating oil becomes dirty more quickly than normally.
3. Pistons and valves will more quickly coke up.
4. The engine may be overloaded, involving a risk of engine seizure.
5. The cooling losses increase and thereby the load on the cooling system.
6. The fuel consumption increases.
In other words:
The life of the engine is shortened and repair costs rise sharply.

Lower output and smoky exhaust

If the engine is not delivering full output, uses more fuel than normal and produces smoky exhaust gases, the reason may be:

1. The air cleaner is choked.
2. A fault in the injection pump or its setting.
3. Injector faults.

If a fault is suspected in any of the injectors it is often possible to find which injector is affected by undoing the pressure-pipe nut on each injector in turn. While the engine is running at low no-load speed, put your ear to each of the other cylinders; it will then often be possible to find out which injector is defective. If there is any reason to suspect functioning in the injectors, they should be removed and tested in a nozzle-testing outfit.

4. A fault in the turbocharger or leakage in the intake system.
5. Heated intake air.

Lower output

If the engine does not deliver full output, the reason may be:

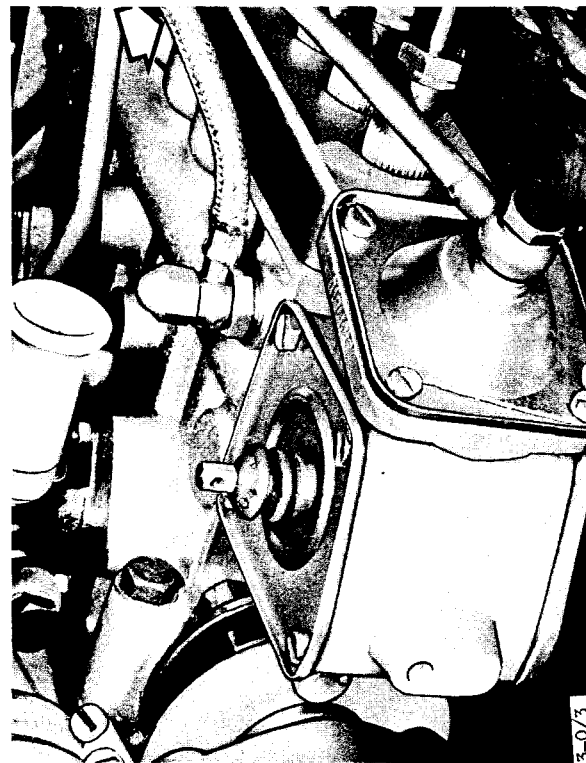
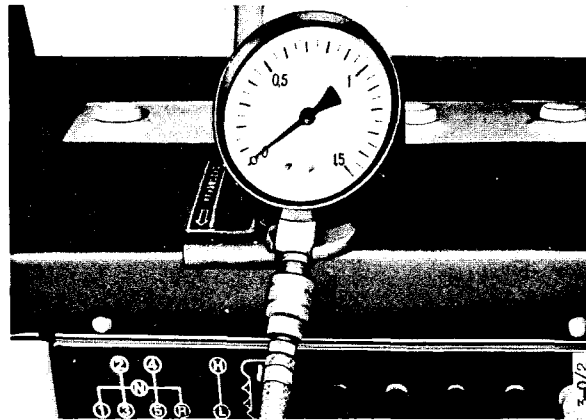
1. Leaky pressure pipes.
2. A fault in the injection pump or its setting.
3. Injector faults (see point 3 above).
4. Insufficient feed pressure.

Connect a low-pressure gauge to the vent screw of the injection pump and check the feed pressure in the fuel chamber of the injection pump. The feed pressure shall be read at maximum output, i.e. max. control rod opening at max. operating speed.

Insufficient Feed Pressure

If the feed pressure in the fuel chamber of the injection pump is lower than that stated, the cause may be:

1. Choked or leaky fuel lines and screwed joints.
2. A fault in the pressure relief valve.



A low-pressure gauge mounted on the vent screw of the injection pump.

In order to see the feed pressure at full engine load the gauge has been placed in the driver's cab.

3. The main filter is choked.
4. A fault in the feed pump.

These sources of trouble should be investigated in the order given according to the following directions.

A Checking the Pressure Relief valve

If the feed pressure has been checked as above and has been found to be too low, the opening pressure of the pressure relief valve should be investigated.

1. Work the pump by hand until the pressure relief valve opens. Read off the opening pressure.
2. If the valve is leaky it should be renewed.

B Checking the main filter

If the feed pressure is still too low after the pressure relief valve has been examined, the extent to which the main filter is choked should be investigated.

It is not possible to check for choking in the filters by measuring pressures while the engine is idling, since in this case the amount of fuel passing through the filters will be too small for the pressure drop to be measurable.

The extent to which the filters are choked must therefore be measured with the engine being driven on full load at maximum speed.

C Checking the feed pump

1. Undo the pipe connection at the pressure relief valve. Shut off the opening from the filter; a finger will do for this.
2. Have the engine started and then read off the pressure shown by the gauge at low no-load speed.
3. If the pressure is too low, check the suction line from the tank for leaks.
4. If the pressure is still too low, check the valves of the feed pump, and change them if they are damaged or leaky.

5. If the fault has still not been cured, the pump should be taken apart and thoroughly inspected.
6. Give the feed pump a pressure test. Plug it on the outlet side with a suitable screwed connection. Couple a supply of compressed air at about 2 kp/cm² to the suction side of the pump. Immerse the pump in a suitable liquid, e.g. fuel oil or lamp oil. Seal any leaks that are found.

Difficult starting

If the engine proves difficult to start after standing unused overnight for example, this may be due to a leaking pressure relief valve coupled with a slight leak in the injection pump or the line between the injection pump and the filters.

When starting the engine at ambient temperatures below approx. +5°C this is facilitated by engaging the cold start device of the injection pump. If the engine and its electrical equipment are in good condition it is possible to start up at a temperature down to -15°C without using any special equipment or power fuel.

Racing

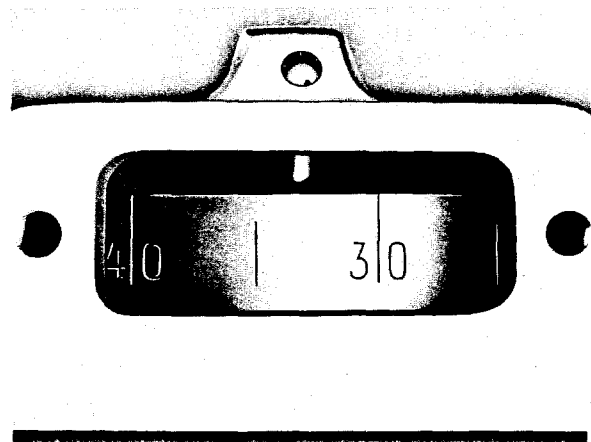
If the highest speed of the engine is higher than usual, the reason may be:

1. Stop-screw for throttle control lever incorrectly set.
2. Control rod binding.
3. Governor not functioning properly.

INJECTION PUMP

Removing the injection pump with steel disc coupling

1. Wash the injection pump and the adjacent engine surfaces as well as all the pipe connections to the pump. Do this thoroughly!
2. Undo all pipe connections and controls to the pump.
3. Fit protective caps on all uncovered connections.
Undo the bolts which hold the pump firmly on the shelf.
4. Undo and remove the bolt which keeps the pump coupling fixed to the drive shaft. Lift off the pump and pump coupling assembly, without dismantling the pump coupling. Take care of the key for the drive shaft.



Inspection cover

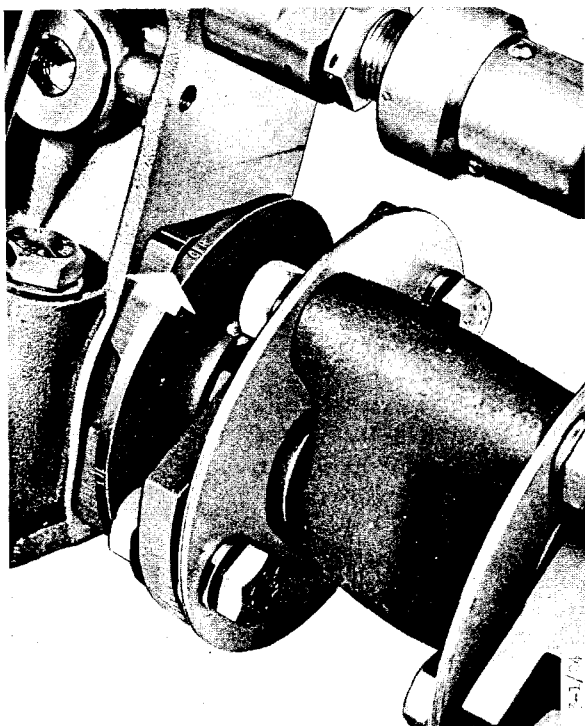
Fitting and setting the injection pump with steel disc coupling

1. Open the inspection cover on the flywheel housing so that a reading can be taken of the flywheel graduation.
2. Remove the front valve cover and turn the crankshaft in its rotation direction until both of the valves for cylinder 1 are closed (compression stroke). Turn clockwise as viewed from the front. Continue turning the crankshaft to the number of degrees prescribed on the flywheel. This number must be immediately opposite the index pin in the flywheel housing. If the pin is viewed from one side, an error of several degrees in the setting may be made.

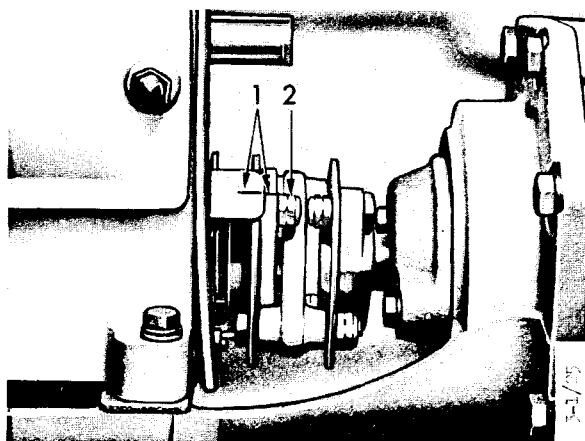
3. Fix the key firmly on the pump drive shaft. Check to see that the guide sleeves for the right-hand fixing screw hole in the pump housing (Bosch) are fitted.

Widen the slot in the clamp connection for the coupling slightly to facilitate mounting of the coupling on the drive shaft in due course. Wedge the coupling half open in this manner with aid of the tool recommended, leaving it in place while the injection pump is being fitted.

Put the injection pump on the shelf. Turn the drive coupling until the marking on the coupling boss coincides with the corresponding marking on the end cover of pump (Bosch) or on the plate which is fitted on the pump (CAV).



The coupling of the injection pump (Bosch) is set according to the index line marked R6 in case the coupling has two setting marks.



Setting the coupling of the injection pump (CAV)

1. Index marks
2. Adjusting screws

4. Push-lift pump with coupling until it comes in mesh with the pump drive shaft. Never apply force to the pump coupling in course of fitting.
5. Tighten the pump retaining screws and the coupling lock screw. Note! that the screw with special centring task is to be put into the right hole.

6. If the drive coupling on being fitted according to point 4 must be turned a little in order to get the key in the drive shaft and the V-groove in the coupling boss to remain facing each other, then the pump setting must be adjusted to a corresponding degree. This is done by undoing the adjusting screws upon which the pump coupling boss can be turned until the index marks coincide. Having done this, retighten the adjusting screws to the prescribed torque.

Compare "Checking the setting mark on the injection pump drive coupling".

7. Turn the crankshaft approx. 1/8 of a turn anti-clockwise. After that slowly turn back again to the number of degrees indicated. Having done this and with the flywheel in this position the marking on the pump coupling shall coincide with the marking on the pump end cover (Bosch) or marking on the plate (CAV). Otherwise adjust on the pump coupling.
8. Fill up with engine oil in the injection pump until the oil comes out at the connection for the oil outlet line, and then connect both the oil lines from the engine lubricating system.
9. Fit all pipe connections and controls that have been removed.
10. Bleed the fuel system.

Checking the setting mark on the injection-pump drive coupling

When a new pump coupling has been fitted and when a previously used one has been removed and refitted it is necessary to check the mark for commencement of injection.

In both cases, the check is carried out in accordance with the so-called overflow method. (Checking with a capillary tube is not recommended). One of the advantages of the overflow method is that there is no need to remove the pressure valves from the pump in order to carry out the check.

The overflow method assumes that a separately working high-pressure feed pump with a working pressure of at least 11 kp/cm² is used. Your Bosch distributor will be pleased to provide more detailed information about a suitable pump for this purpose.

The high-pressure feed pump should be of a construction that permits checking to be carried out both in a pump testing bench and on engine installations in the field. In view of this latter requirement, the pump should preferably be manually operated.

Preparations for checking of engine-mounted pump

1. Clean the surfaces around the connections for the fuel line from the fuel filter to the fuel pump thoroughly. Disconnect the fuel line both at the filter and at the pump housing for connection of the high-pressure feed pump.
2. Connect the suction side of the high-pressure feed pump to the fuel filter and the delivery side to the fuel pump. Make sure that dirt does not get into the line!
3. Disconnect the delivery pipe of cylinder No. 1 at the pump and connect a delivery pipe bend.
4. Where applicable, remove the pressure equalizer from the pump and fit a screw plug (Bosch order number 1 413 462 045) in its place.
5. During the checking procedure, the control rod must be in the maximum delivery position. N.B. The control rod must not be in the cold-start position.
6. Maintain a high fuel pressure with the high-pressure feed pump while turning the coupling half on the camshaft of the injection pump until the flow of fuel through the connected delivery pipe bend suddenly ceases. If fuel does not run out the pump is set for premature injection. In this case, it will thus be necessary to turn the pump shaft back 10° and start turning in the direction of rotation from that point. It is this limit position where the flow of fuel is »cut off» that represents »commencement of injection» and it is in this position of the pump shaft that the adjusting screws for the pump coupling must be tightened up.
7. Repeat the entire check after having tightened up the adjusting screws of the coupling. To rotate the pump camshaft at this juncture, turn the engine as per point 2 above.
8. Disconnect and remove the high-pressure feed pump. Reconnect the fuel line, observing conditions of scrupulous cleanliness so as to prevent the entry of dirt into the pump. Refit the pressure equalizer, if any, and connect the regular delivery pipe. Bleed the injection pump.

Checking

1. Turn the engine in its normal direction of rotation until the flywheel graduation shows that it is approx. 40° before the upper dead-centre position with piston 1 during the compression stroke.
2. Turn the engine in its direction of rotation until the number of degrees indicated on the flywheel is that prescribed for the engine.
3. Slacken the pump-coupling adjusting screws.
4. Pump up the fuel pressure with the high-pressure feed pump and bleed the fuel pump.
5. Upon »commencement of injection» the setting mark on the pump coupling must coincide with the corresponding mark on the flange of the pump housing. In the event of deviations, a new mark must be made on the flange of the pump housing. N.B. If a new setting mark has to be made, be sure to make it narrow so that it allows accurate setting without the aforesaid test in course of future fitting. The best way to make the new mark is to apply a sharp chisel and tap gently with a hammer. The earlier mark must be eradicated!

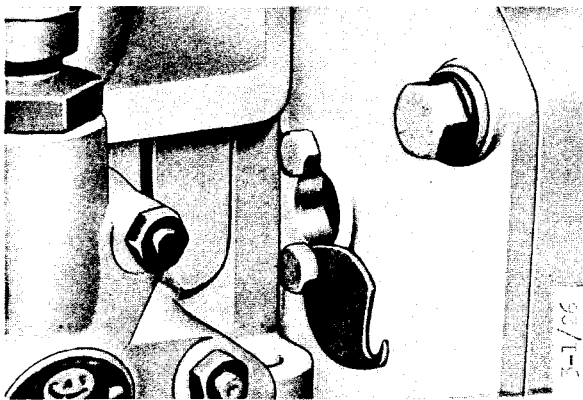
Removing the flange-mounted injection pump

1. See "Removal of injection pump with steel disc coupling", points 1-4.
2. Take off the cover which is located in front of the pump shaft gearwheel on the timing gear housing.
3. Undo the three bolts which securely retain the pump shaft gear on the pump boss. Take care to see that no washers fall down into the timing gears. If this should happen be sure to remove the washers before the engine is started up.
4. Undo the bolts which securely retain the pump end on the timing gear housing and lift off the pump.

Fitting and setting the flange-mounted injection pump

1. See "Fitting and setting of injection pump with steel disc coupling" points 1-2 in appropriate parts.
2. Put the pump back again on the engine. Check that the O-ring on the pump flange is faultless and smear it with engine oil.
3. Viewed from the front turn the pump boss clockwise until the marking on this comes opposite the marking on the pump end. The markings can easily be seen through an opening in the pump end with aid of a mirror.
4. Tighten up the pump in the timing gear housing.
5. Undo the bolts which retain the pump bracket on the engine block.

9. Turn the crankshaft approx. 1/8 turns anti-clockwise. After which turn slowly back again to the number of turns indicated. Then with the flywheel in this position the marking on the pump boss and pump end shall coincide. Otherwise, undo the screws of the pump shaft gearwheel and turn the boss so that the markings coincide. The adjustment possibilities are $\pm 10^\circ$ on the pump which corresponds to $\pm 20^\circ$ on the flywheel.
10. Fit all the pipe connections and controls that have been removed. Tighten the cover on the timing gear housing.
11. See "Fitting and setting of injection pump with steel disc coupling", points 8, 9 and 10. Also see appropriate parts in "checking of setting mark on injection pump drive coupling."



Inspection cover

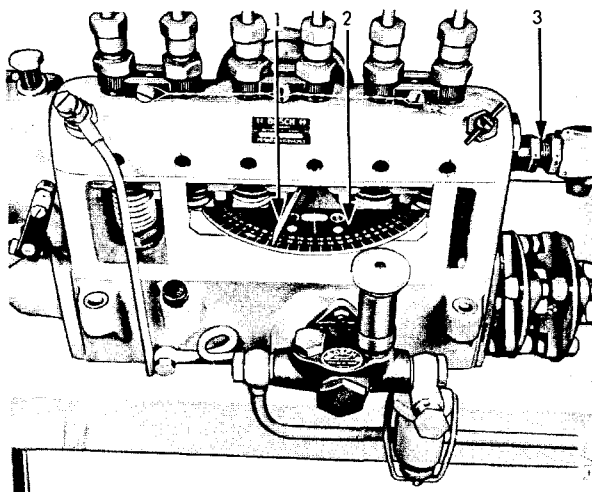
6. Tighten up the pump on the bracket.
7. Tighten up the pump bracket on the engine block. Points 5.6 and 7 are important and shall be followed very thoroughly. Otherwise stresses may occur in the pump housing.
8. Put the pump shaft gearwheel back again. Note! that the graduation between the oblong fixing holes is not alike. Be quite sure that the bolt holes in the pump boss come dead in the middle of the oblong fixing holes. If not the pump shaft gearwheel must be moved one or two gear teeth. Finally tighten up the pump shaft gearwheel.

Checking the Control Rod Opening for Maximum Fuel Delivery

Checking the control rod opening is carried out by using different checking tools and depends on the design of the pump.

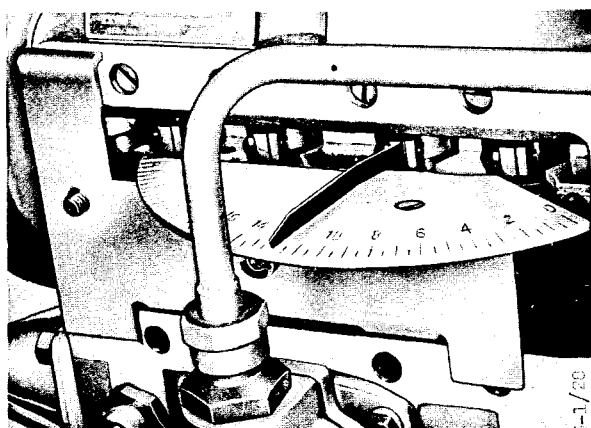
BOSCH-PUMP OF B-DESIGN AND CAV-PUMP

1. Remove the side cover of the injection pump and tighten up the dial according to the figure and so that it does not press against any pump element and impede its movement.
2. Fix the pointer on the pump element and zero the dial by turning this. By so doing the control rod will be pressed against the stop position. On a number of injection pumps it may occur that the casting of the pump housing will impede the turning of the dial so that the pointer cannot be put to zero. In cases like this the dial is fixed in front of one or other of the next subsequent following graduations.



Control rod opening on Bosch-pump of B-design

1. Pointer
2. Scale
3. Adjusting screw for control rod max. delivery position.

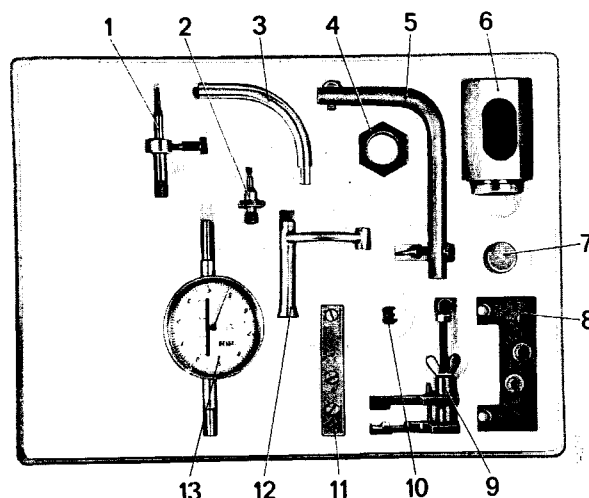


Checking the control rod opening on CAV-pump

BOSCH-PUMPS OF P-DESIGNS

For pumps with and without smoke limiters, which are available in different designs, somewhat different checking tools are required.

A combined check tool set covering all variants is supplied as special tools according to below.



Check tool set

Part No. Consists of Part

- | | |
|-------|---|
| 79000 | 4 and 55 |
| 79005 | 7, 10, 11, 12 and 13 |
| 79099 | 1, 2, 3, 6 and locker box |
| 98068 | 8 and 9 |
| 98087 | 1 (spare parts No. also incl. in 79099) |

3. The control rod is afterwards moved over to the full load position, after which the deflection in the number of graduations is read off the scale. Each graduation on the scale corresponds to a control rod movement of one millimeter.
4. On some CAV-injection pumps it is possible to correct the control rod opening with the adjusting device on the cold starter.

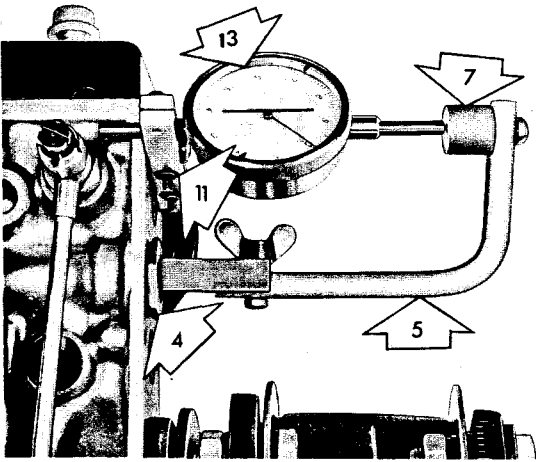
On other CAV-injection pumps the adjusting screw which limits the control rod opening is located under the protective cover on one of the pipe connections on the governor housing.

Seal once again after setting, see separate section about this.

BOSCH-PUMP OF P-DESIGN WITHOUT SMOKE LIMITER

1. Remove the sleeve over the control rod.
2. Screw in the bushing retainer 4 instead of the sleeve.
3. Tighten up the tool's magnet retainer 5 with magnet for control rod.
4. Remove the protective washer from the tool's magnet 7.
5. Screw up the retainer 11 for the dial indicator on the end of injection pump. Securely lock the dial indicator on the retainer so that the measuring points rest against the magnet.

6. Reset the dial indicator by turning the scale.



Checking the control rod opening (Bosch pump of P-design)

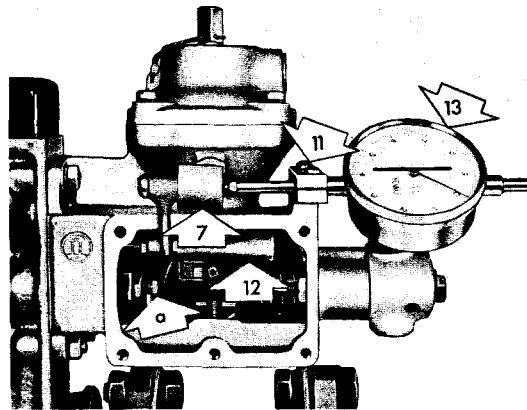
- 13. Dial indicator
- 4. Bushing retainer
- 7. Magnet
- 5. Magnet retainer
- 11. Dial indicator holder

- 7. Move the control rod over to max. delivery position and read off the deflection on the dial indicator.
- 8. The setting of the control rod opening is adjusted with the max. delivery stop screw. This is accessible once the sealed cover on the governor housing has been removed.

Seal the cover once more, see separate section covering this.

BOSCH-PUMP OF P-DESIGN WITH SMOKE LIMITER OF EARLIER DESIGN

- 1. Take off the side cover of the smoke limiter and the plug on the end of the smoke limiter.
- 2. Screw on the tool's magnet retainer 12 in the control rod.



Checking the control rod opening (with smoke limiter of earlier design)

- 11. Dial indicator holder
- 13. Dial indicator
- a. Max. delivery stop screw
- 12. Magnet retainer
- 7. Magnet

- 3. Remove the protective washer from the tool's magnet.
- 4. Securely fasten the retainer for the dial indicator on the smoke limiter housing. Make certain that the indicator dial is locked on the retainer so that the measuring point rests against the magnet.
- 5. Reset the indicator dial by turning the scale.
- 6. Move the control rod over to max. delivery position and read off the deflection on the dial indicator.
- 7. The setting of the control rod opening is adjusted with the max. delivery stop screw. Firmly hold the front end of the control rod with a special adjusting wrench, so that the control rod does not turn when the stop nut is undone or tightened up.

Seal once again the side cover of the smoke limiter, see separate section about this.

BOSCH-PUMP OF P-DESIGN WITH SMOKE LIMITER OF LATER DESIGN

- 1. Break the seal for the side cover of smoke limiter housing and remove the cover.

2. Fit the magnet 7 on the magnet retainer 9 and then mount the retainer on the end of the control rod. Move the control rod rearwards and check that the magnet retainer goes clear of the smoke-limiter housing.
3. Mount the dial-indicator holder 11 on its bracket 8 and screw the bracket onto the smoke-limiter housing.
4. Fit the dial indicator 13 in its holder, remove the protective washer from the magnet and move the measuring point so that it comes into contact with the magnet.
5. The setting of the control-rod opening is adjusted with the maximum-delivery stop screw on the inside of the smoke-limiter housing. Make sure that this is properly locked after any adjustment. Use a special adjusting wrench.

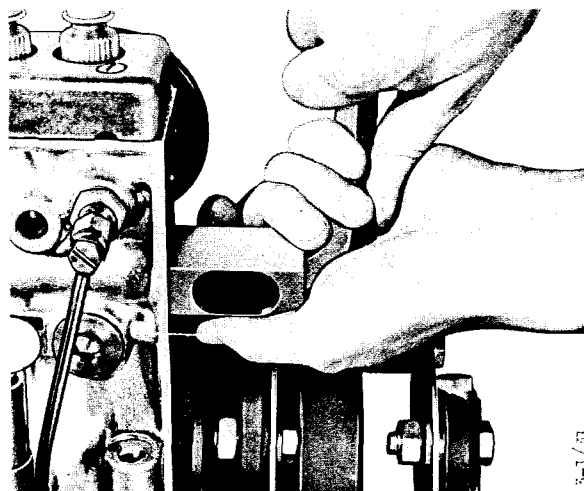
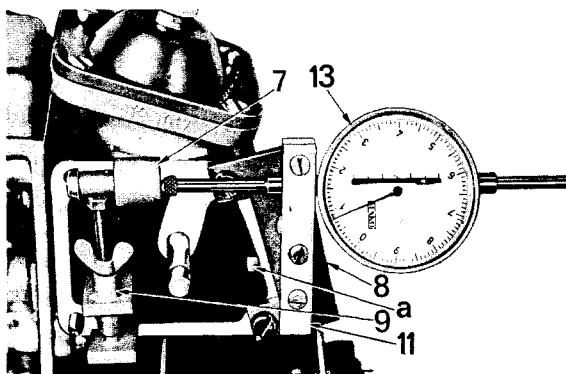


Fig.1

2. Screw the spacer pin in the control rod, fig. 2.



Checking the control rod opening (with smoke limiter of later design)

- 7. Magnet
- 13. Dial indicator
- 8. Bracket
- a. Max. delivery screw
- 9. Magnet retainer
- 11. Dial indicator holder

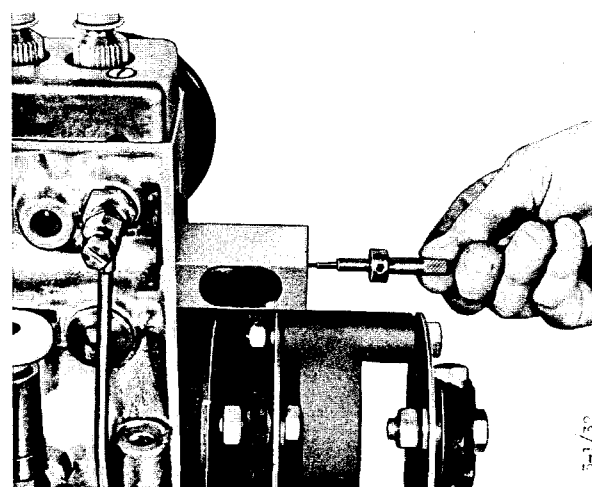


Fig.2

3. Screw the slot screw in the spacer pin bushing, fig. 3.

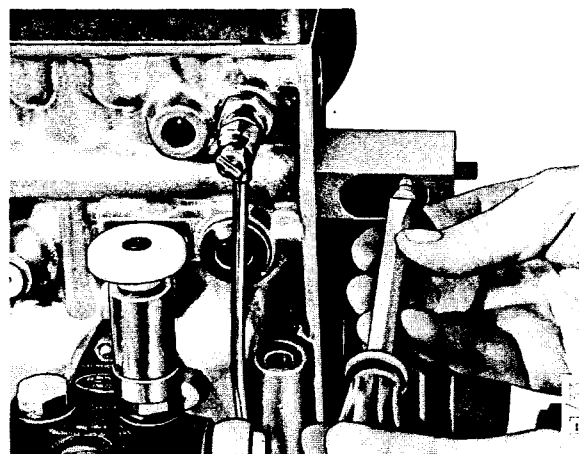


Fig.3

BOSCH-PUMP OF P-DESIGN WITHOUT SMOKE LIMITER AND WITH ROCKER ARM OPERATED COLD START DEVICE

1. Break the seal, undo the cold start device and fit the spacer sleeve 6 and the threaded plug with aid of a hexagon box wrench. The threaded end of the spacer sleeve shall be turned forward and the slot in the sleeve turned as fig. 1 shows.

4. Fit the cold start device and the copper gasket. The tightening torque is approx. 80 Nm or 8 kgm. However, tests have shown that the alteration of the measuring value on account of moderate variations in the tightening torque is so fractional that it will not give a readable deflection on the dial indicator, fig. 4.

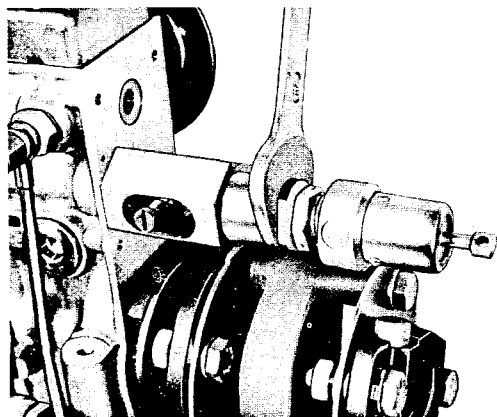


Fig.4

5. Fit the dial indicator holder 11, fig. 5.

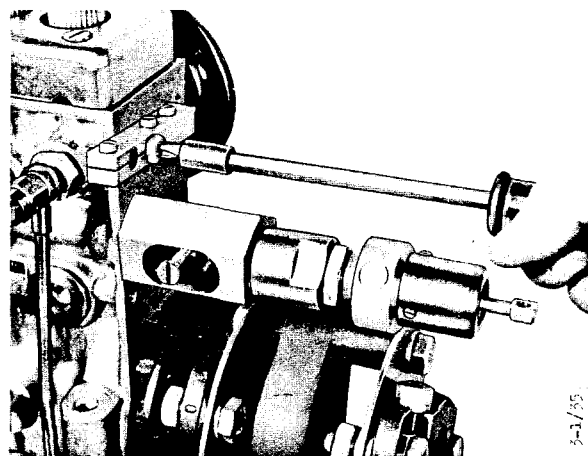


Fig.5

6. Fit the dial indicator 13, screw off the measuring point. Screw up the magnet 7 on the clamp 3 and then fit the clamp on the dial indicator with retaining screw 2, fig. 6.

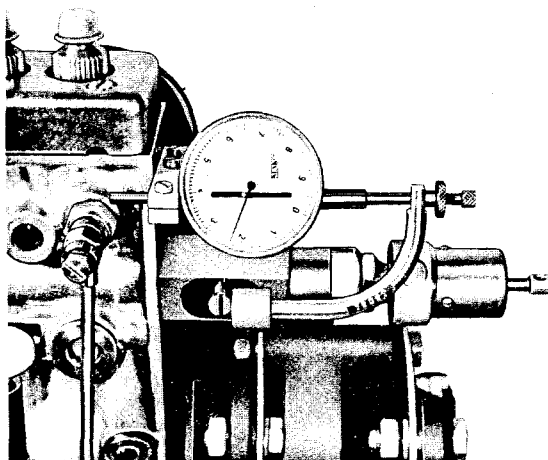


Fig.6

7. Put the dial indicator in initial position with the control rod in non-feed position.
8. Move the control rod to max. delivery position and read off the deflection on the indicator dial.
9. The setting of the control rod opening is adjusted by turning the outer section of the cold start device once the lock nut has been undone.
10. Remove the measuring gauge and fit the cold start device with the same gasket as that used during measuring.
11. Seal the cold start device.

Sealing the Pump Settings

The lead seals must be affixed so that a sealed part cannot be moved out of its set position without the sealing wire being broken off first.

The sealing wires should correspond to the type used at the factory.

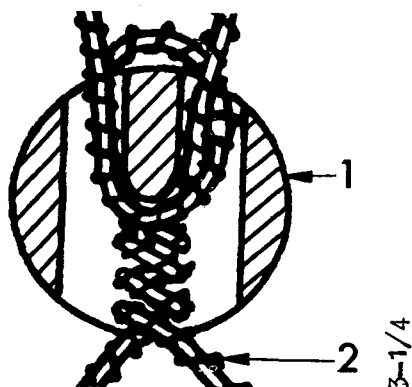
The wire must be arranged in a double coil inside the lead seal as shown in the recessed illustration below.

All applied seals must be provided with an identification number so that the person who did the sealing can be identified.

Otherwise see possible special regulations for that country where the engine is used.

The following settings on the injection pump with governor shall be protected by sealing.

1. Max.control rod deflection - max. delivery stop.
2. Pressure valve fittings
3. Smoke limiter
4. Side cover of pump housing
5. Highest max.delivery speed
6. Governor cover
7. Cut-out



Cut through seal

1. Seal
2. Sealing wire arranged in a double coil inside the seal.

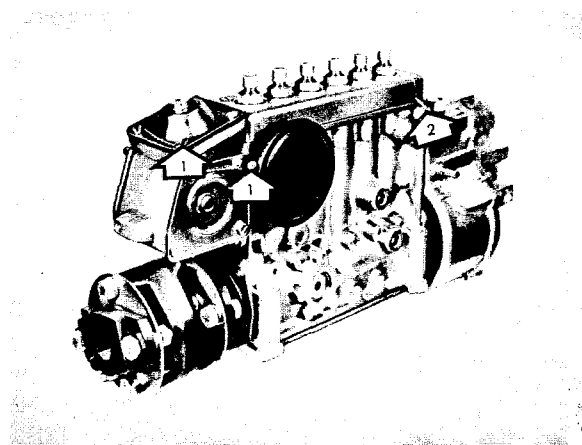
Example of seal design.

The marking arrow number refers to seal for

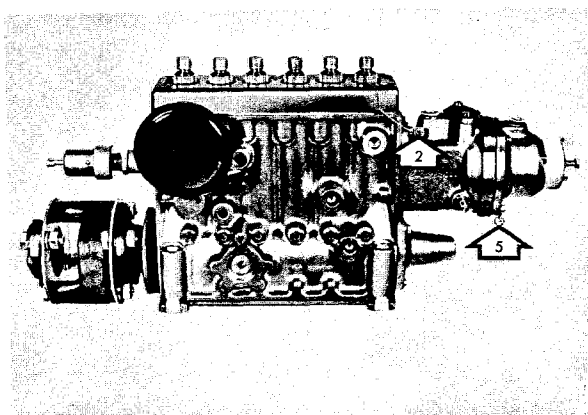
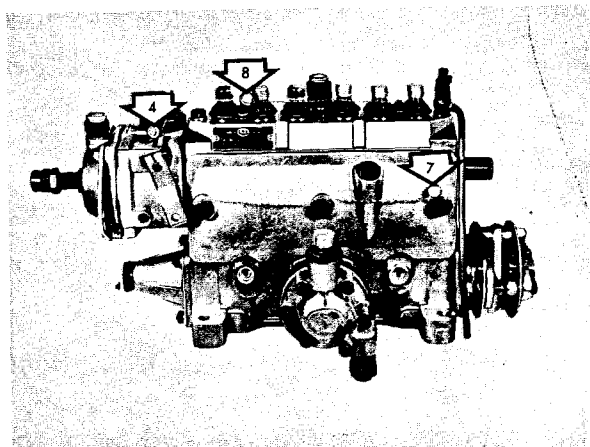
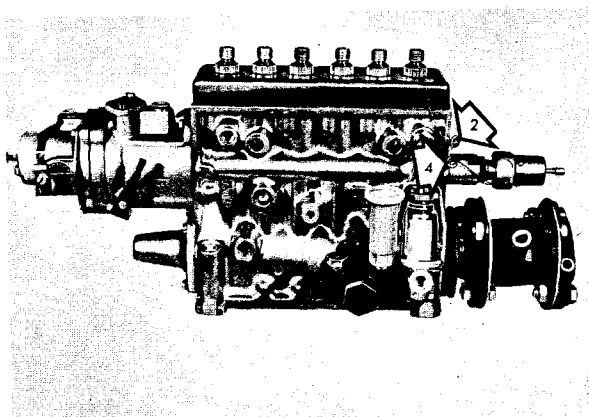
1. Cover and side covers on smoke limiter.
2. Cover over pressure valve holder
3. Adjusting screw for max.speed and governor cover.
4. Adjusting screw for max.control rod opening.
5. Governor cover
6. Adjusting screw for max.speed
7. Retaining screws. side cover.
8. Pressure valve retainer.
9. Retaining screws for casing of cut-out
10. Cover over full load stop
11. Screws for magnets of cold start and cut-out switches

The above concerns guarantee sealing. Possible smoke seal (prescribed by law for vehicle engines in Sweden) is fitted after the guarantee seal according to a special instruction.

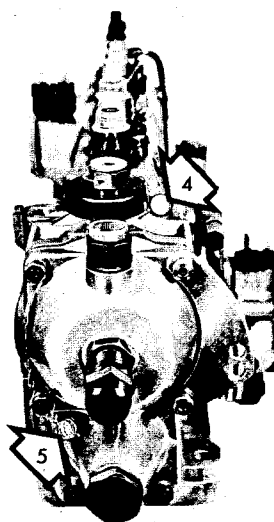
Note! The protective cover 2 for the delivery-valve holders and cover over governor springs has colour-sealed retaining screws upon delivery from the factory. When seals are to be renewed in the field, however, sealing wire and lead seals shall be used as shown above.



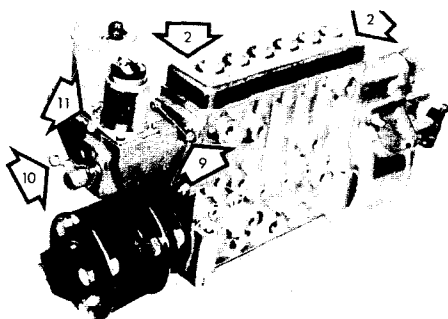
Bosch-pump with smoke limiter and centrifugal governor.



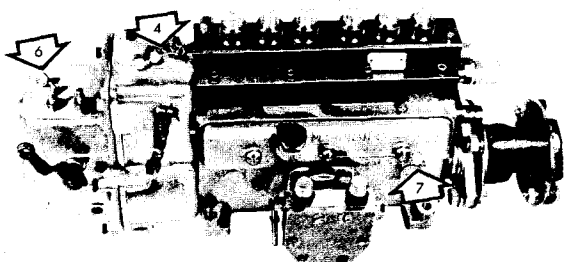
Bosch-pump with rocker arm operated cold start device and vacuum governor



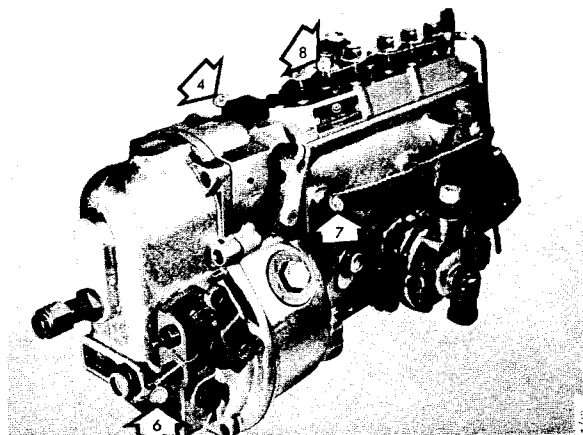
CAV-pump with vacuum governor



Bosch-pump with cut-out coil



CAV-pump of type Majormec



CAV-pump with centrifugal governor

SERVICE SCANIA

PRODUCTS

grupp/group	Work description	
	nummer/number	sida/page
3a	1	1
datum/date	best. nr/order nr	
77-02-28	E503a	

FUEL SYSTEM

	Page
Injection pump.	1
Removal.	2
Fitting and setting of injection time	2

CAUTION

This section is applicable to only Waukesha Models F476D and DS, and F674D, DS, and DSI. These models are designated by Scania as D and DS8A02, A04, A05, and A06; and D, DS, and DSI11A04, A05, A06, and A07, respectively.

Injection pump

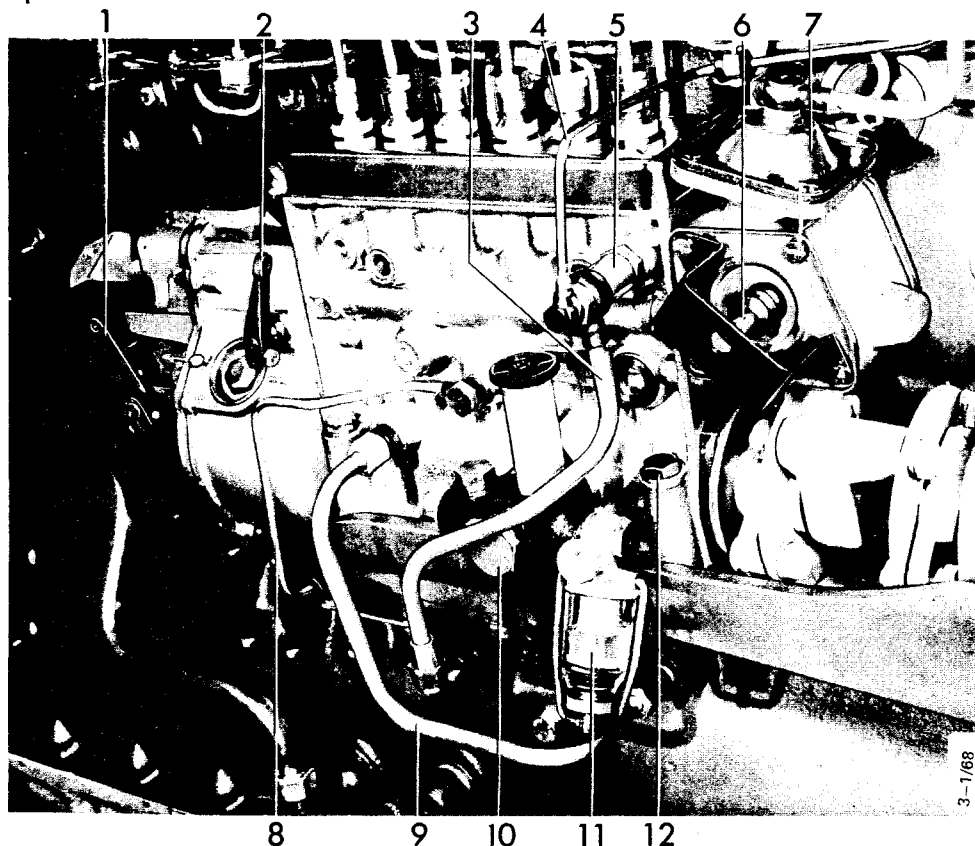


Fig. 1 Injection pump on engine type DS11

1. Throttle lever
2. Stop lever
3. Return pipe to fuel tank
4. Leak oil pipe from nozzle

5. Overflow valve
6. Cold start
7. Pressure governor
8. Oil pressure pipe

9. Return oil pipe
10. Feed pump with hand pump
11. Prefilter
12. Guide screw

Removal

1. Remove the throttle and stop control from the throttle lever and stop lever.
2. Remove the pressure pipes and fit protective plugs on the pump and pressure pipes.
3. Remove the lubricating oil pipe, fuel pipe and pipe to the pressure governor.
4. Remove the screws between the pump and pump shelf.
NOTE! The front right-hand screw is a guide screw.
5. Remove the clamping screw for the front coupling half. Turn the crankshaft round and tap key 98435 in so that the slot in the coupling half is widened. Slide the injection pump rearwards and lift it out.

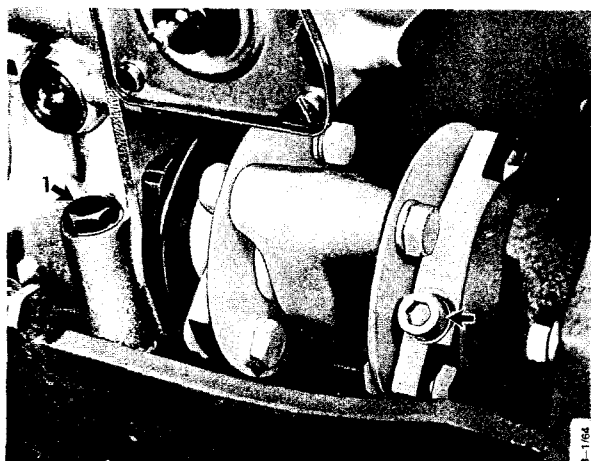


Fig. 2 Pump coupling

1. Guide screw against pump shelf
2. Screw for front coupling half

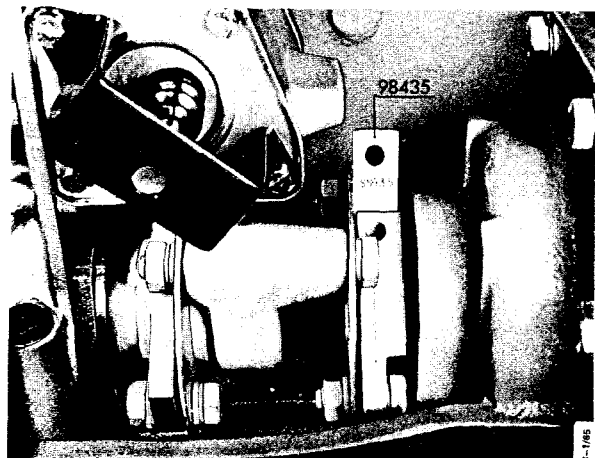


Fig. 3 Key tapped into front coupling half

Fitting and setting of injection time

1. The flywheel is graduated at the top dead centre according to the following figures:

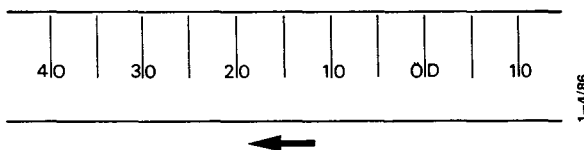


Fig. 4 Flywheel graduations. Earlier version.

The arrow indicates the direction of flywheel rotation

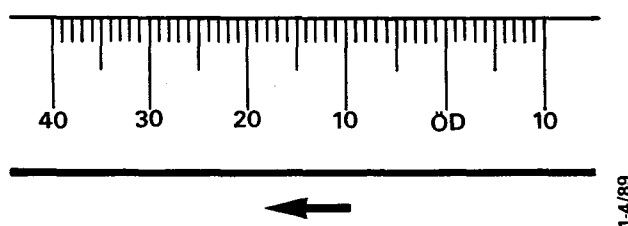


Fig. 5 Flywheel graduations. New version.

The arrow indicates the direction of flywheel rotation

The graduations on the flywheel can be read off through inspection doors in the flywheel casing.

Truck engines L and LB are read off through the lower door.

Bus engines B are read off through the upper door.

Buss engines C are read off through the door on the right-hand side.

Marine and industrial engines M and A are read off through a door at the top or on the right-hand side. DS11A08 is marked on the vibration damper and provided with marking on the timing-gear housing.

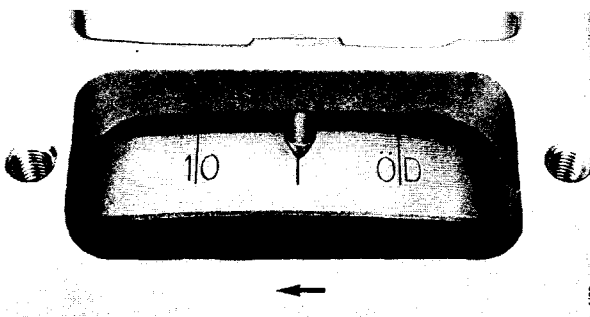


Fig. 6 Flywheel graduations, visible through the inspection door

2. Turn the crankshaft so that the piston of the first cylinder comes at the end of the compression stroke where injection commences. The number of degrees is stated on a sign plate on one of the valve covers.

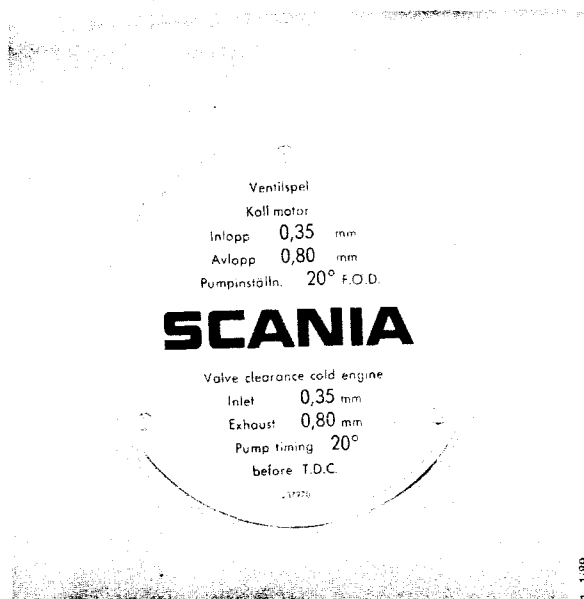


Fig. 7 Sign plate on valve cover

When the crankshaft is set at the correct angle (number of degrees) both of the valves for the first cylinder are closed and there is a clearance between the rocker arms and the valves. The key on the drive shaft for the injection pump is then in the upwards-rightwards position.

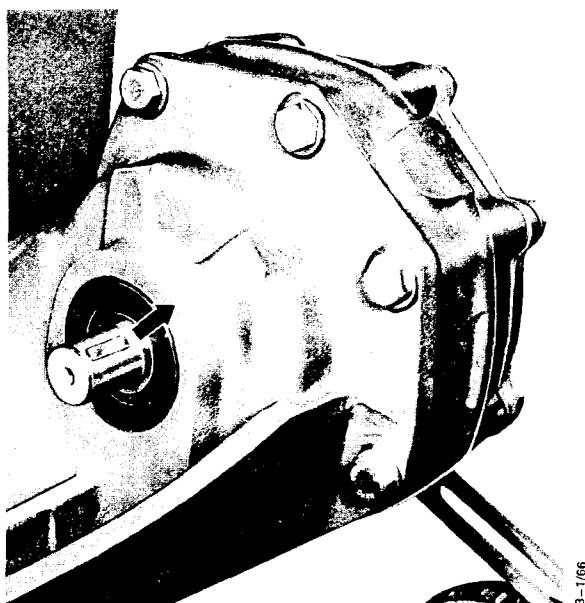


Fig. 8 The key on the injection pump drive shaft is in the upwards-rightwards position when injection commences for the first cylinder

3. Turn the shaft of the injection pump so that the mark on the coupling half coincides with the mark on the injection pump. Widen the slot in the front coupling half with key 98435. Lift the pump up on the shelf and push it forward so that the coupling half engages with the shaft.

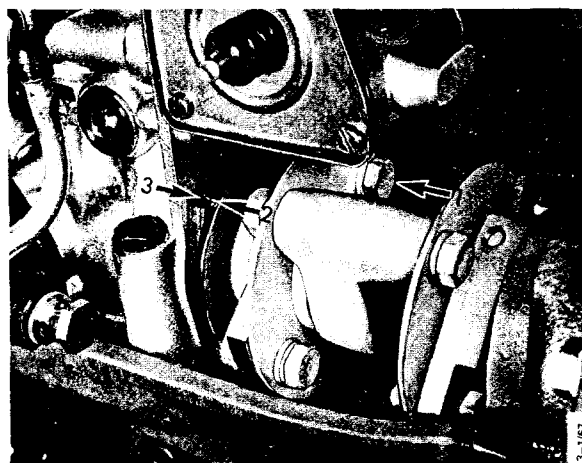


Fig. 9 Setting marks on Bosch pump coupling

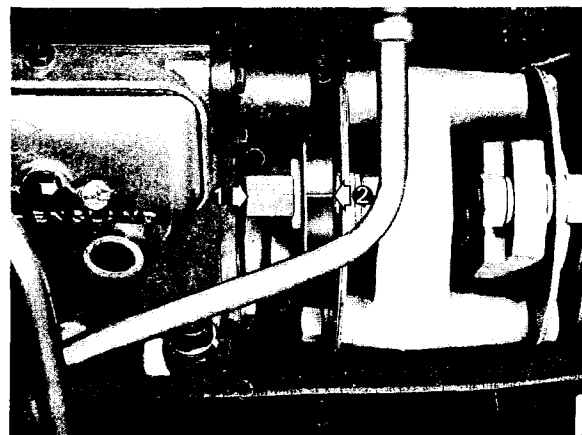


Fig. 10 Setting marks on CAV pump coupling

4. Screw the injection pump to the shelf. Start with the front right-hand screw which serves as a guide screw. See fig. on page 2. Tighten the screws with a torque of 39 Nm (3.9 kpm).

5. Remove the key which was inserted in the front coupling half according to point 3.

Check that the markings on pump and flywheel coincide and adjust if necessary as follows:

grupp	sekt	nr	sida
3a	AR	1	4

6. Slacken the two screws in the rear coupling half — rear discs. Tap the coupling half gently so that the mark on the coupling half coincides with the mark on the injection pump. Tighten both screws with a torque of 65 Nm (6.5 kpm).

7. Turn the crankshaft round about one revolution and tighten the clamping screw in the front coupling half with a torque of 65 Nm (6.5 kpm).

8. Fill the injection pump with engine lubricating oil as follows:

Bosch pumps are filled through the level hole in the governor housing up to the edge of the level hole.

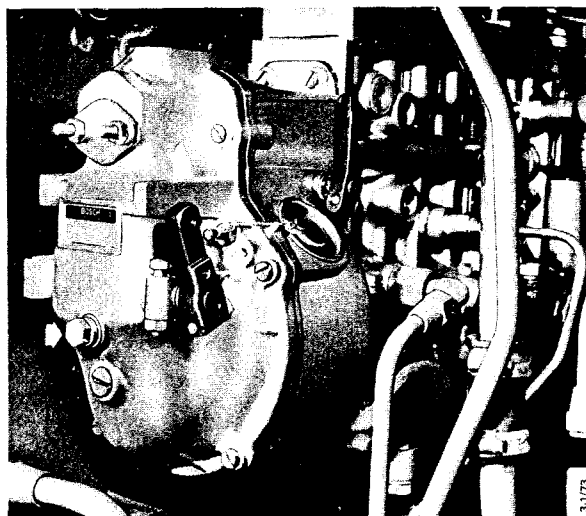


Fig. 11 Level plug on Bosch injection pump with RQV governor

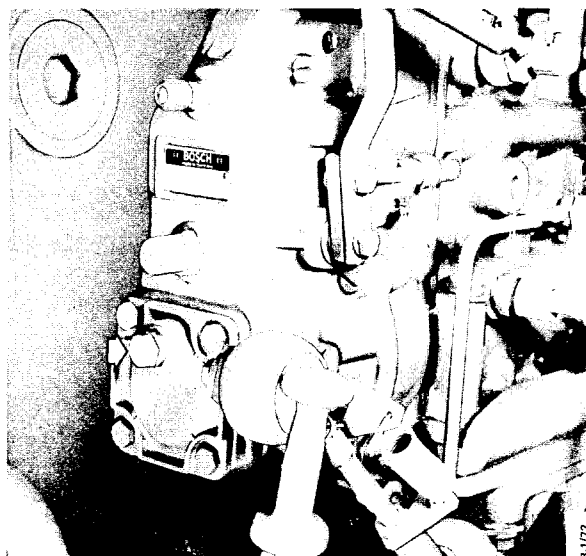


Fig. 12 Level plug on Bosch injection pump with RSV governor

CAV pumps are filled through the hole for the banjo screw for the return pipe on the governor housing up to the edge of the hole.

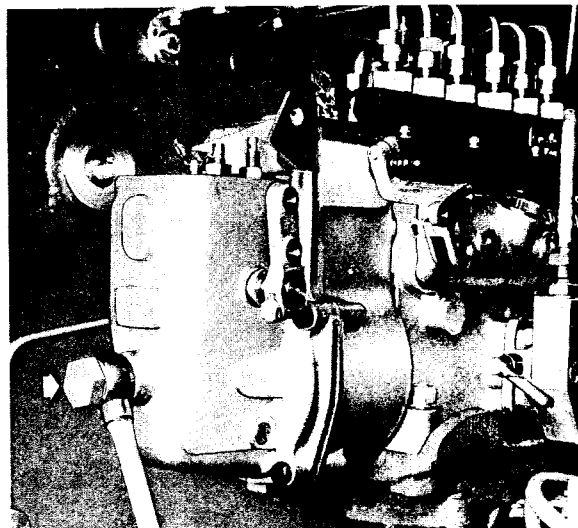


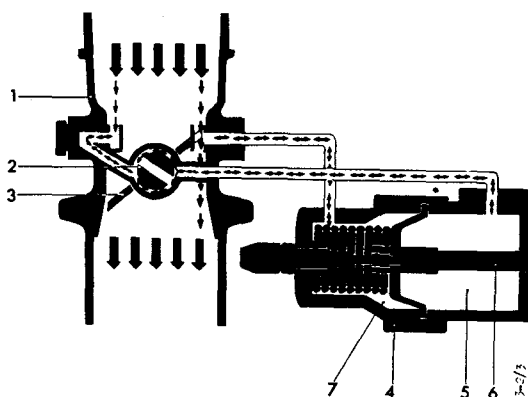
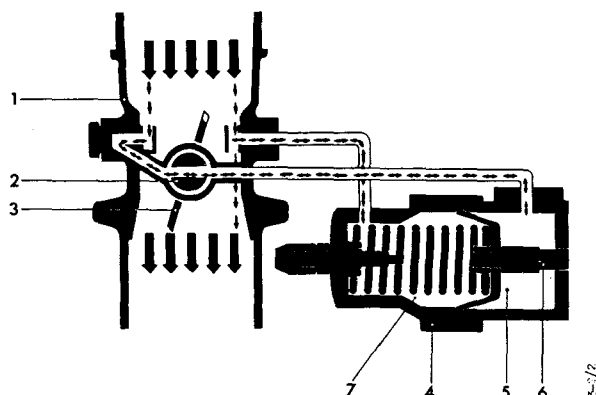
Fig. 13 CAV injection pump

Remove the banjo screw and fill oil up to the edge of the hole

9. Screw on all pipes and controls.

SPEED GOVERNORS

Checking the Vacuum Governor



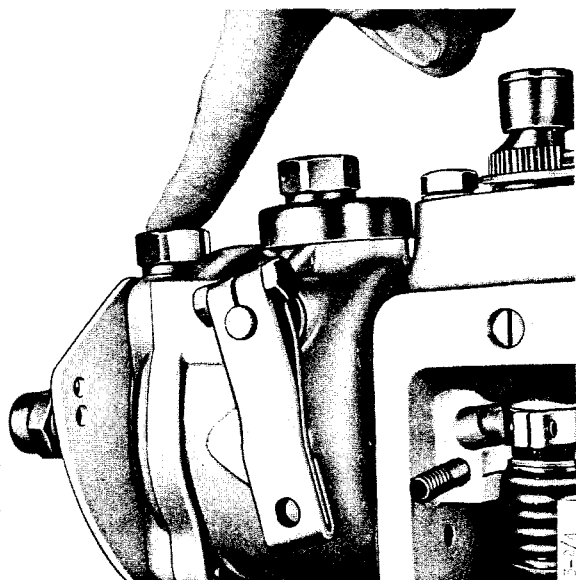
Idling stabilizer with open and closed throttle.

1. Throttle housing
 2. Throttle shaft
 3. Throttle
 4. Governor housing on injection pump
 5. Front chamber in governor housing, secondary chamber
 6. Control rod
 7. Rear chamber in governor housing, primary chamber
1. Any possible drawing-in of oil to front and rear governor housing chamber is caused in general by unsatisfactory tightness of the diaphragm. With the diaphragm fitted a check for tightness is made by supplying compressed air in accordance with the prescribed pressure value to the chamber 5 above with the connection hole of chamber 7 open.

A hyper-sensitive pressure gauge is afterwards connected to this hole (=a transparent plastic hose shaped as a U-pipe and half filled with water with which possible leakage, i.e. rise in pressure, can be observed. However, if in spite of a tight diaphragm considerable quantities of oil should get inside the diaphragm housing the sealing between the control rod and diaphragm chamber 6 and existing restriction in the idling stabilizer of throttle housing should be checked. Furthermore, possible faults which cause excessively high oil level in the injection pump (pump lubricated by the engine lubricating system) may increase the risk of oil draw-in as mentioned.

2. Usually, the checking of governors can be limited to the undermentioned measures in those cases where there is a tendency to draw-in oil.
 - a) Remove the inspection cover on the pump, if there is one, the stop control and the two pipe connections on the vacuum governor.
 - b) Press the stop arm towards the stop position and then block the hole in the primary chamber with one finger.
 - c) Release the stop arm. If the diaphragm and vacuum chamber seal the control rod will not go completely back again, and if they do not seal the rod will be completely forced back again by the spring.

There must not be any leakage on the primary side (underpressure outlet). On the secondary side (air pressure outlet) a leakage time of seven seconds is permissible.
 - d) Check that the nuts, which hold together the governor housing are sealed.

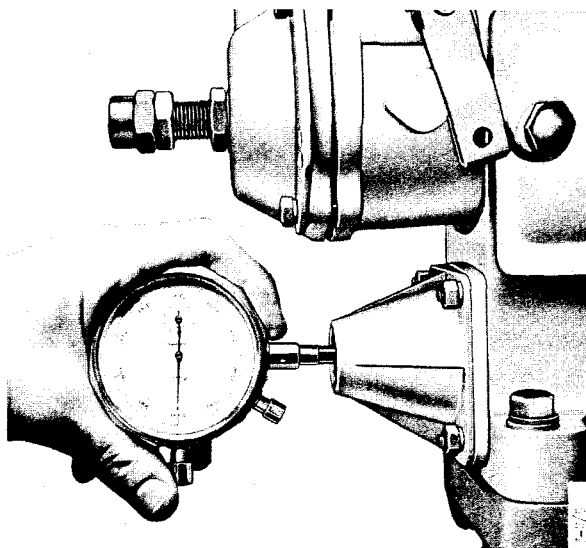


Testing the diaphragm

Setting the Engine Idling Speed

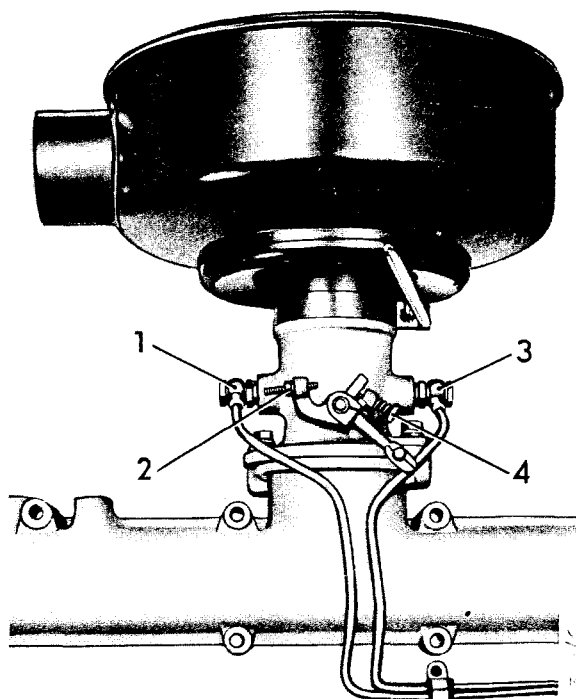
SETTING THE MAX.IDLING SPEED OF THE ENGINE

The engine should be well warmed up before setting. The speed can be checked with aid of a tachometer, which is connected to the rear shaft end of the injection pump. This will be accessible once the plug on the protective cover has been screwed off. Remember that the engine speed is twice that of the injection pump.



Checking the engine speed

Note! The pump shaft rotates at half the speed of the engine.



1. Pressure outlet
2. Stop screw for the low idling speed and max.full load speed respectively.
3. Pressure outlet
4. Adjusting screw for the high idling speed

The difference between the max. permissible speed on an unloaded engine (high idling speed) and on fully loaded engine, i.e. high full load speed constitutes the speed range within which the vacuum governor functions at constant max. throttle position.

Before the engine speed is to be adjusted the damping device of the control rod shall be put out of function. This is done by screwing out the damping device completely and afterwards screwing it in 3—4 turns so that it seals, but is still out of function. Note that on the vacuum governor of type Bosch EP/M2 80 BA104 the adjusting screw is to be turned clockwise in order to put the damping device out of function. On remaining types the adjusting screw is turned anti-clockwise so as to obtain the same result.

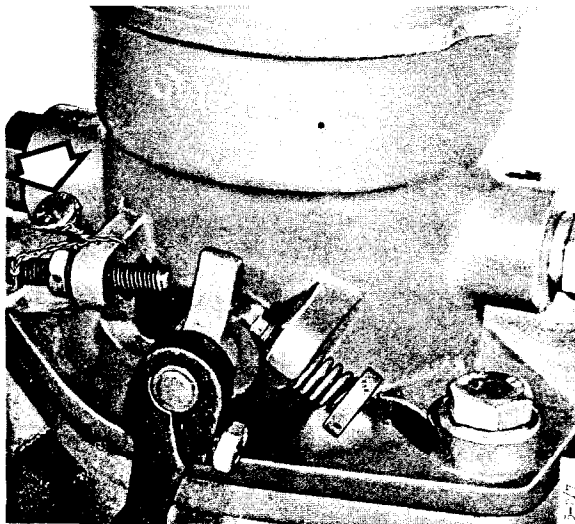
Afterwards adjust the high idling speed to the prescribed value by turning the stop screw on the throttle housing. When this adjustment is finished the screw shall be sealed again. Then adjust the low idling speed of the engine.

SETTING THE LOW IDLING SPEED OF THE ENGINE

Check and possibly adjust the low idling speed to the prescribed value. This adjustment shall be made with the adjusting screw on the throttle housing. Then screw in the damping device so that it effectively and smoothly activates the control rod and counteracts possible hunting. Do not screw the damping device in too far. The high idling speed can be dangerously high. When the damping device is in function the engine must not be run in an unloaded state at high idling speed.

Sealing the Throttle Housing and Vacuum Governor

The sealing shall in principle be carried out according to the instruction for "Sealing the Pump Setting". It will be noticed in this section how to seal the governor.



The adjusting screw for high idling speed and max. full load speed must be sealed.

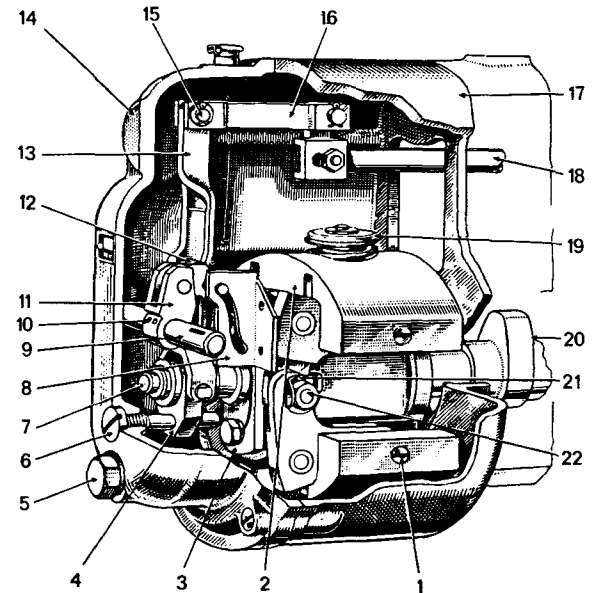
Mechanical Governor

There are several different designs and these depend on the appropriate engine installation. The governor designs can however, be divided up into two main types according to their functional principle.

Mechanical governor so-called centrifugal governor

The governing power is obtained from the two governor weights 1 and 2 obtained from the centrifugal force during rotation. Against each governor weight there is a spring set bedded in.

The governor can, by changing the governor springs, be given different control characteristics in order to cover varying demands during different cases of operation.



Bosch governor type RQV

1. Governor weight
2. Governor weight
3. Guide ring
4. Pressure ring
5. Oil level plug (does not apply to pumps connected to the engine lubricating system where the oil level is controlled automatically)
6. Guide bolt
7. Governor sleeve
8. Curve plate
9. Governor shaft
10. Locking pins
11. Link arm
12. Guide plunger
13. Governor arm
14. Governor cover
15. Bearing journal for fork arm
16. Fork arm
17. Governor housing
18. Control rod opening
19. Governor springs (corresponding springs are fitted in governor weight 1)
20. Camshaft
21. Lock washer
22. Coupling bolt

The governor design shown for trucks is of make Bosch. The corresponding CAV type governor functions in principle similarly. For more complete and detailed descriptions and service instructions, reference is made to the relevant service publications issued by the governor manufacturer.

SETTING AND ADJUSTMENT

The Bosch and CAV governor type designations vary and depend on the relevant kind of operation and the demands for control characteristics.

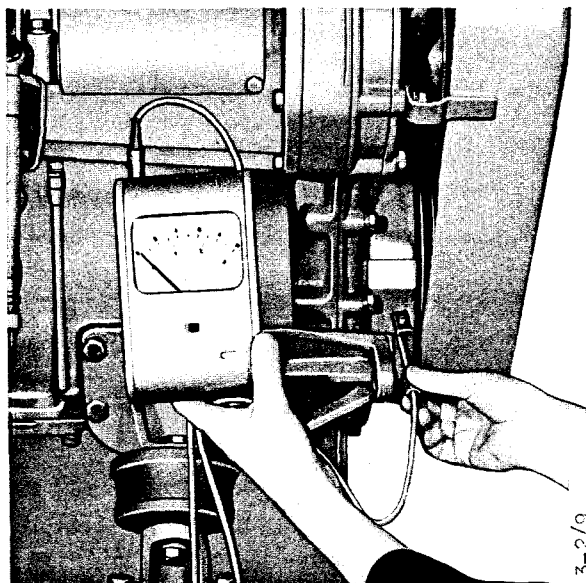
Particulars about the governor weight sets for different full load speed and control characteristics are issued in separate service publications. By full load speed is meant the speed of the engine where the engine power utilized is developed. The governor begins above this speed to regulate, i.e. to reduce the quantity of fuel injected.

By high idling speed is meant the max. speed the engine can attain when the control lever value is limited by the full speed stop screw and the engine becomes unloaded. The engine must be thoroughly warm when the speed is being adjusted.

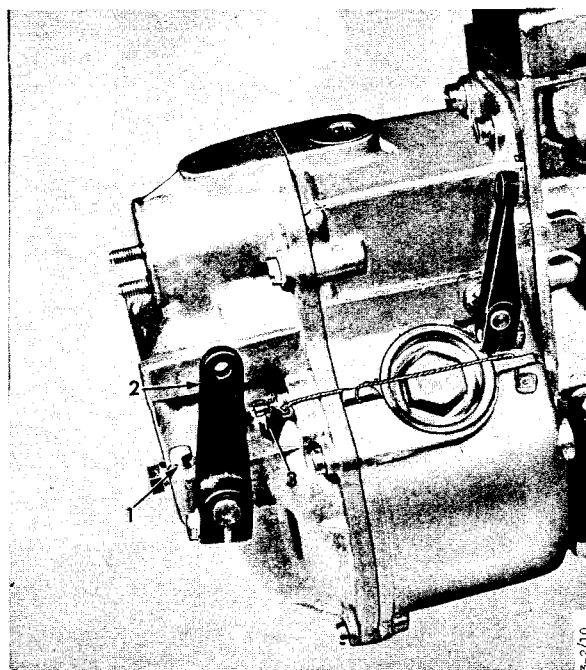
On CAV mechanical governors the control rod damping device shall be put out of function, before measuring the speed, by screwing it back a few turns. After checking and possible adjustment of the high and low idling speed, screw in the damping device towards its stop in the governor with the engine running at low idling speed until this begins to increase.

Then screw back the damping device and secure it in this position. Afterwards, check that the high idling speed has not altered.

Measuring the speed of the engine, when using a mechanical governor, is suitably done with an electronic tachometer, according to a separate service instruction, in case the tachometer is not fitted as a standard item and, where it is impossible to uncover the shaft end in order to apply the mechanical tachometer.



Measuring the speed with an electronic tachometer



Centrifugal governor

1. Adjusting screw for idling speed
2. Control lever
3. Adjusting screw for max. full load speed

Note! Adjustment of the stop screw for maximum full load speed and high idling speed is to be carried out in a pump testing bench and the screw must be sealed afterwards, see "Sealing of Pump Settings".

Mechanical governor known as torsion spring governor

The control force of this type governor is obtained via centrifugal forces from a weight set and the following types exist. For a full description of the function and service instruction, see Bosch service publications.

The following two governor types exist on the D11-series:

EP/RSV – 1100 P1/307R

- a) This governor type has internal full load stop, i.e. the screw with which the max. control rod opening is set is located inside the governor, see 12 in fig. 1.

This implies that the control rod always goes towards the cold start position when the engine has stopped,

see fig. 2. If the "spill cut off" method (Wilbär) is then used for setting the pump degrees on the engine an erroneous setting will be obtained on account of the cold start grooves in the pump element. This can be avoided if the stop lever is moved halfway towards the stop position and by keeping it there during the setting.

EP/RSV 350 – 110 P1/310R

- b) This governor type does not have the internal full load stop as described above, but has instead what is known as external full load stop. The cold start device on the front edge of pump acts as a full load stop. Thus, during cold weather it is necessary to operate the cold start device.

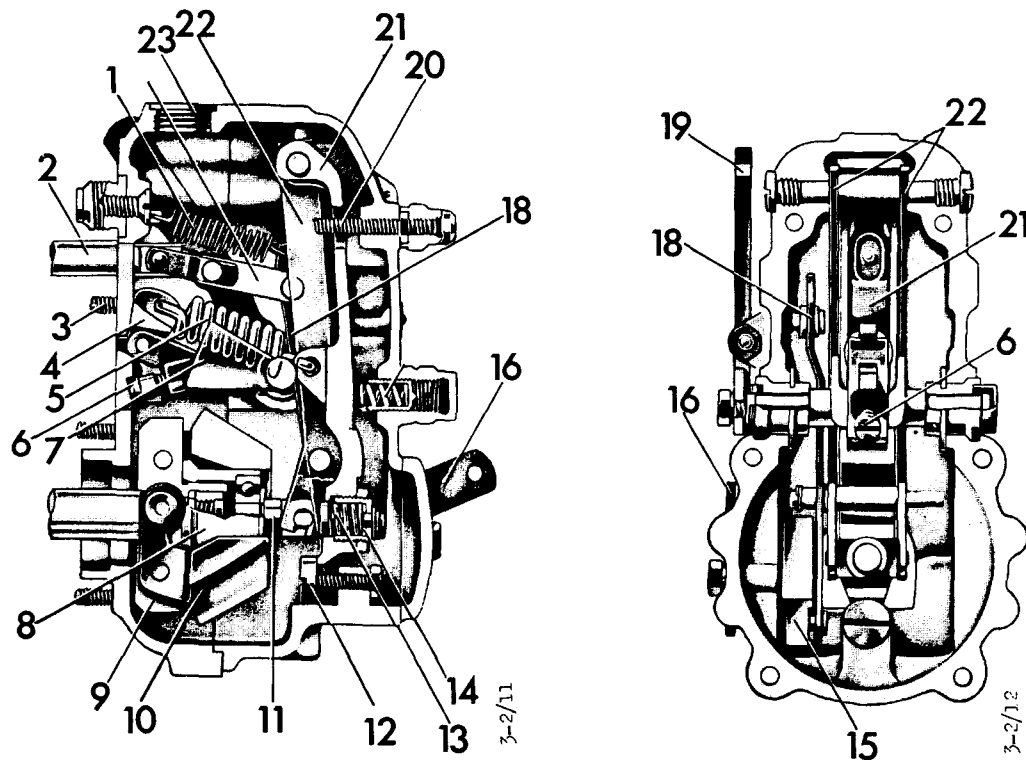
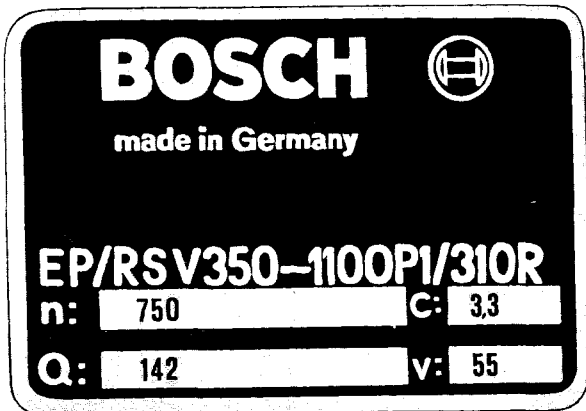


Fig. 1 EP/RSV – 350 – 220 P1/307R

- | | | |
|---------------------|------------------------------|--------------------------|
| 1. Starting spring | 9. Governor hub | 16. Stop lever |
| 2. Control rod | 10. Governor weight | 17. Idling damper spring |
| 3. Max. speed screw | 11. Driver pin | 18. Governor arm |
| 4. Rocker arm | 12. Internal full load stop, | 19. Control arm |
| 5. Governor spring | 'compare above description) | 20. Idling stop |
| 6. Set screw | 13. Equalizer spring | 21. Tension arm |
| 7. Balance arm | 14. Adjusting washers | 22. Guide arm |
| 8. Governor sleeve | 15. Stop device | 23. Screw plug |

SETTING AND ADJUSTING

Each governor is provided with a type plate on which, in addition to the type, the setting values are given. The measuring of among other things the low and high engine speed is made in exactly the same manner as that described for engine with centrifugal governor.



On the governor casing is to be found the above plate, which, in addition to the type, indicates the values which the injection pump has been set at in conjunction with engine testing.

The below mentioned example will make it quite clear what the values refer to:

n:750 Max. load speed of injection pump on bench test.

Q:142 Fuel delivery in mm³/stroke on bench test at a certain max. load speed.

c:3.3 Specific speed increase of injection pump, defined as:

The speed difference between the max. load speed of the injection pump and the speed at which the control rod opening has decreased by 6 mm from the control rod opening at max. load, in per cent of the max. load speed. The control arm shall bear on the max. speed stop.

Example

The max. load speed of the pump = 750 rev/min.

max. load position = 13 mm

Speed at 7 mm (= 13-6) control rod opening = 775 Rev/min.

V:55 Maximum control arm angle, defined as $V = 40^\circ$ when the control arm is parallel with the parting line between the governor housing and the pump housing.

Note that the specific speed increase indicates the regulation characteristics and has no definite connection with the engine speed increase, i.e. max. full load speed and high idling speed.

Particulars for calibrating the pump and setting the max. delivery are also indicated by us in separate service information.

Adjustment of the maximum load speed is effected with the max. speed screw on the outside of the governor housing. The high idling speed which is always higher than the max. full load speed varies with value C and existing full load speed. High idling speed is affected foremost by the governor spring preload. The tensioning is performed by the set screw (fig. 1). It is possible to adjust this screw through the hole for the screw plug (23, fig. 1), if the control arm is moved backwards. In certain cases, it will also be necessary to screw out the idling stop (20, fig. 1).

Turning clockwise results in higher tension and smaller speed increase. The control arm angle must then be diminished to maintain the same maximum load speed. Inversely, a re-setting of the control arm position will also modify somewhat the preload of the governor spring.

The procedure when re-setting the max. fuel delivery or maximum control rod opening is shown in the above section about different type designs. Resetting the max. fuel delivery also influences somewhat the max. load speed and speed increase.

The idling speed is set with screw (20, fig. 1). The idling damper spring (17, fig. 1) prevents engine stalling and permits an even transition to low no-load speed. It must not be screwed in so far that it increases the high no-load speed.