

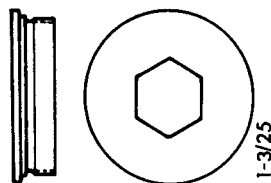
SERVICE SCANIA

PRODUCTS

grupp/group	Special Information	
	number/number	sida/page
1 a	3 - 1	1
datum/date 73-12-15		best. nr/order nr 6201a:3-1

LEAKING DRAIN PLUGS IN CYLINDER BLOCK AND CYLINDER HEAD

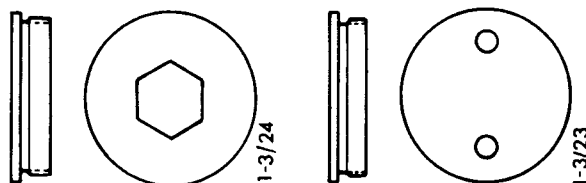
Drain Plug 207 191



This drain plug is fitted in our production. Sealing takes place by using a thin O-ring which is pressed together to the correct size when fitting.

On fitting this drain plug the O-ring shall first of all be slightly oiled with engine oil and put in position in the cylinder block (resp. cylinder head) after which the plug is screwed in and tightened.

Drain Plug 180 665 and 139 302



These drain plugs have either been fitted earlier on with a thick O-ring or an aluminium washer for sealing purposes. When fitting a drain plug with O-ring of this type the O-ring shall be put on the drain plug.

The drain plug must on no account be tightened up with excessive torque since the O-ring can then be damaged.

Measures against leakage

There is a convex sealing washer (part No. 204541). On fitting this item the sealing surface must first of all be degreased with trichlorethylene and afterwards smeared with thread sealing compound (No. 561019) or, on severe corrosion attack, plastic putty. The sealing washer is then put in its place and the washer peened inwards with a hammer or a large drift.

It is also possible to fit drain plugs with oversize. The hole must then be tapped to a suitable oversize, after which, the drain plug can be fitted together with a thick O-ring. Do not use too much torque when tightening as it is possible to damage the O-ring.

Material	Thread	Part No.	Sealing
Present drain plug	M44 x 1.5	207191 225598 ^x	207192 (rubber)
Earlier drain plug	M44 x 1.5	180665 139302 139303	152750 (aluminium)
Convex sealing washer		204541	561019 (loctite)
Drain plug, 1st oversize	M46 x 1.5	138279	151225 (rubber)
Drain plug, 2nd oversize	M52 x 1.0	152635	151223 (rubber)

^x With connection for water hose.

Special Information	
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best. nr/order nr	E 6201g: 3-7

MACHINING OF UPPER FACE OF CYLINDER BLOCK ON DS8 ENGINES

On those DS8 engines that did not have a liner with groove in the sealing face towards the cylinder head gasket, gas leakage was problematical and frequently resulted in corrosion damage to the upper face of the cylinder block. In order to allow machining of the upper face, we have decided to supply as a spare part a special, low piston, which is 0.4 mm lower than the standard piston. This piston, which may only be fitted when the cylinder block has been machined, will be fitted to a large extent in our replacement engines.

When carrying out machining in the field, our directions must be strictly followed in order for a good result to be obtained. After machining, the block must be marked with "L04" at two places - see Fig. 1 and 2. **Every time pistons are changed on DS8 engines it is necessary to check if the block has been machined.**

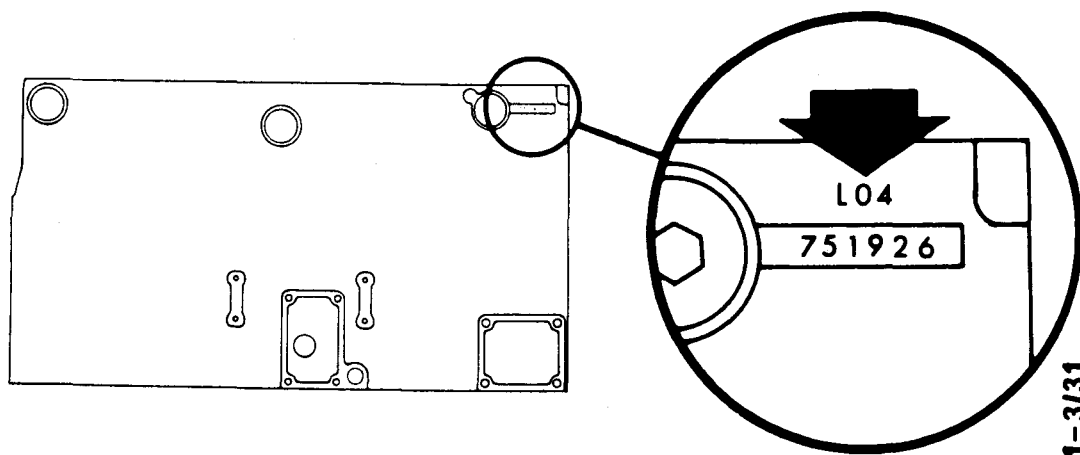


Fig. 1

The block is marked "L04" immediately above the engine number.

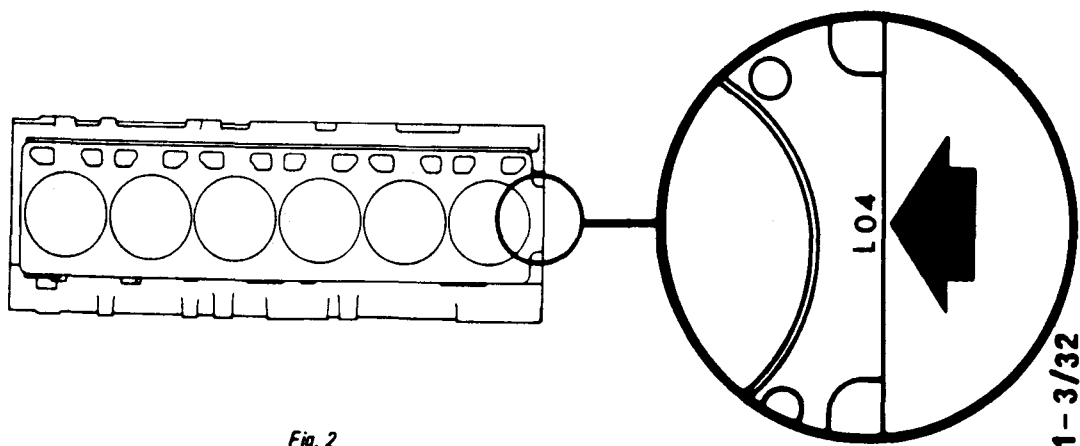


Fig. 2

The block is marked "L04" on the upper face of the block.

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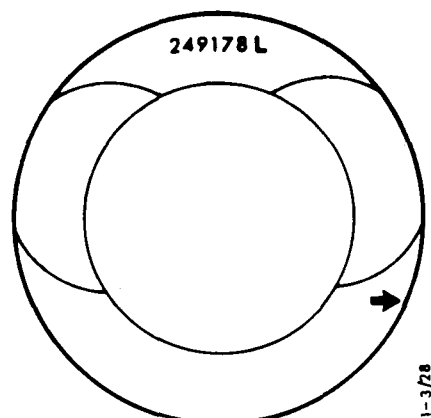


Fig. 3

Low piston. The piston is marked with the article No. followed by "L".

Replacement of pistons (applies to all DS8 engines)

1. Check if the marking "L04" or "L" respectively is to be found on the block or pistons. See Fig. 1, 2 and 3.
2. When new pistons have been fitted, check the piston height on one of the cylinders. To do this, press the liner down with the aid of tool 98318 - see group 1a, AR 3 page 2. Then measure dimensions A and B according to fig. 4. Note that both dimensions must be measured from the uppermost surface of the liner. Measurement B minus A must be between 0.070 and 0.500 mm.

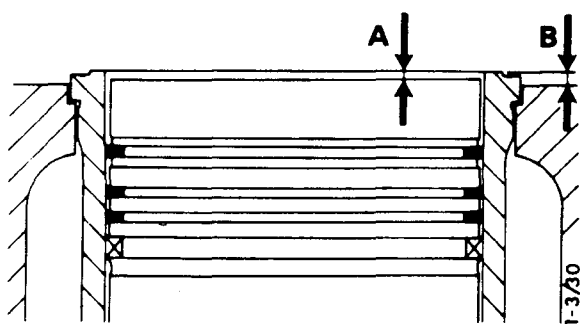


Fig. 4

Measurement of piston height. The piston must be in its uppermost position. The liner is pressed down with tool 98318. Measure dimensions A and B with a dial indicator attached to a straight edge. Note that the dimensions are measured from the uppermost surface of the liner.

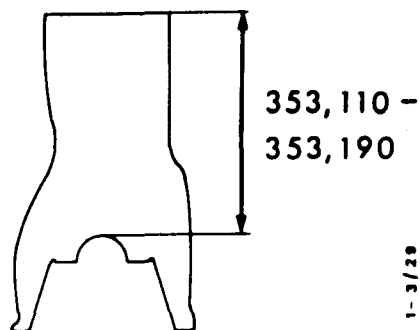


Fig. 5

Height of block after machining.

Machining of upper block face

1. Measure the distance between the periphery of the main bearing seat (with the bearing shell removed) and the upper face of the block with a measuring accuracy of ± 0.015 mm. Make sure that there are no burrs on the bearing seat. A drawing of a suitable measuring tool can be ordered from the Service Department, Scania division (VR 60194, VR 60195).
2. Set the block up in a milling or surface grinding machine. Make sure that there are no burrs on the surface of the sump and stand the block on this surface. Align the block on the basis of the measured distances.
3. Machine the block (fine milling or grinding) to the prescribed height - see fig. 5. The profile depth must be max. Ra 2.5.
4. Mark the block with 6-mm high figures at two places according to fig. 1 and 2.

Fitting of pistons after machining

1. Fit low pistons - see fig. 3.
2. Check the piston height on the two outermost cylinders
- see fig. 4. To do this, press the liner down with tool
98318 as described in AR 1a, No. 3, page 2. Measurement
B minus A must be between 0.070 and 0.500 mm.

Material

Engine type	Piston, complete Art. No.	Naked piston Punched Art. No.	Ring set Art. No.	Remarks
DS8 (milled down 0,4 mm)	249177	249178 L	550108	Must not be fitted together with other pistons

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REPLACEMENT OF CYLINDER BLOCK ON D/DS10 AND D/DS11

During the Autumn of 1973 and beginning from engine No. 880840 a modified cylinder block was introduced for the D/DS11. The most noticeable change in the cylinder block concerned the lubricating system, where among other things the injection nozzles for oil cooling of the pistons was introduced. The oil connections to the cylinder block were changed from inch threads (NPSF) to metrical threads with axial sealing cylinder block is marked "A" on the right-hand side at the front, top corner.

During the Autumn of 1974, starting from engine No. 888806 a further modified cylinder block marked "B" was introduced. The B-marked cylinder block has in comparison to the A-marked cylinder block altered dimensions for the cylinder head bolts.

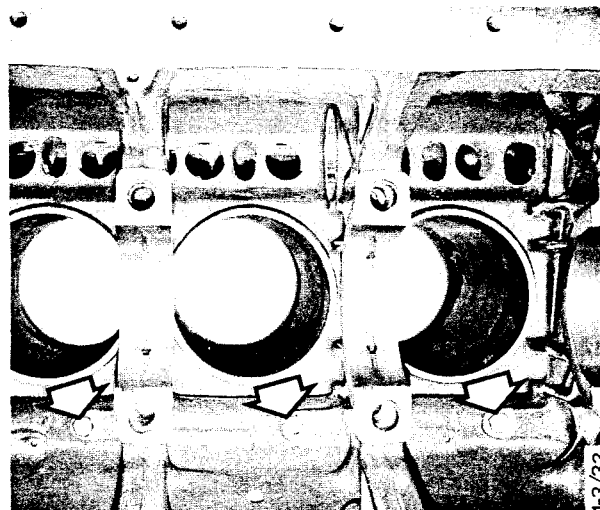
B-marked cylinder head blocks are now delivered starting from the beginning of 1975 as spare cylinder blocks for all D/DS10 and D/DS11.

When ordering reference is made to Spare Parts Bulletin Group 2 No. 229.

Depending on the type of engine, a number of parts must be ordered together with each cylinder block. Some parts are to be newly fitted and others replace earlier ones. Please see the spare parts bulletin.

A few points to observe when replacing the cylinder block

The holes in the longitudinal lubricating oilway for injection nozzles are to be sealed off with six plugs part No. 11017 and gasket No. 35456. Tightening Torque 23 Nm (2.3 kpm).



Plug part No. 11017 in the holes for injection nozzles for oil cooling of pistons.

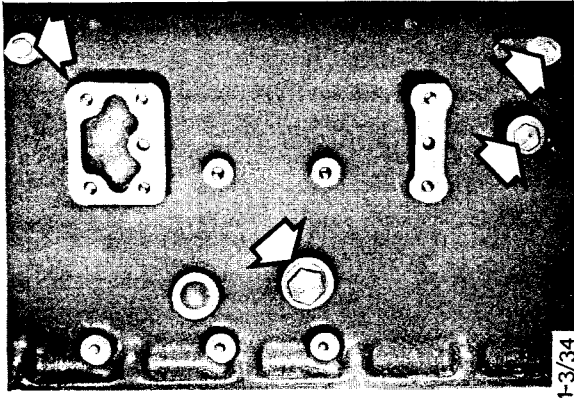
On the modified engine the return oil is led from the turbo-charger to the right-hand side of the cylinder block. This hole shall, on being replaced by older type cylinder block, be sealed off with plug part No. 15564 and gasket No. 35432.

By reason of the fact that the lubricating oil connections on the cylinder block have been changed to M-threads new pipes are now added for the oil supply to the injection pumps and the oil outlet from the injection pump. Thus to be able to keep the old oil filter for turbocharger, the existing nipple for the supply of lubricating oil must be exchanged for nipple part No. 251771.

The hole just above the attachment plane for the lubricating oil cleaner is to be sealed with plug part No. 228799 and gasket part No. 239457.

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On engines where the injection pump is not lubricated by the engine's usual lubricating system (centrally lubricated) the holes for the supply and discharge of the lubricating oil shall be sealed off with plug No. 11017 and gasket No. 35456 and plug No. 10491 and gasket part No. 237976 respectively.



Plug on the right-hand side of the cylinder block. (Does not apply on centrally lubricated injection pumps.)

The previous studs and nuts for the cylinder heads are replaced by hexagon screws. The A-marked cylinder block is intended for M16-bolts. The B-marked cylinder block is intended for six M18-bolts (under the injectors) and for remaining M16-bolts.

When the B-marked cylinder block is to be used for older engines (up to engine No. 888805) six special studs are used with M18-thread at the bottom and M16-dimension at the top (see Spare Parts Bulletin).

On fitting the lubricating oil cleaner, the O-rings are discontinued. Instead the O-rings have been replaced by a new gasket part No. 239105.

On a tandem-mounted compressor with long pump coupling and where the injection pump is centrally lubricated the lubricating oil is conveyed to the pump and compressor and out from the same hole in the cylinder block. The hole is situated just beneath the compressor and in this hole a T-fitting part No. 239913 is threaded. The usual oil supply hole to the injection pump is sealed off with plug part No. 11017 and gasket No. 35456.

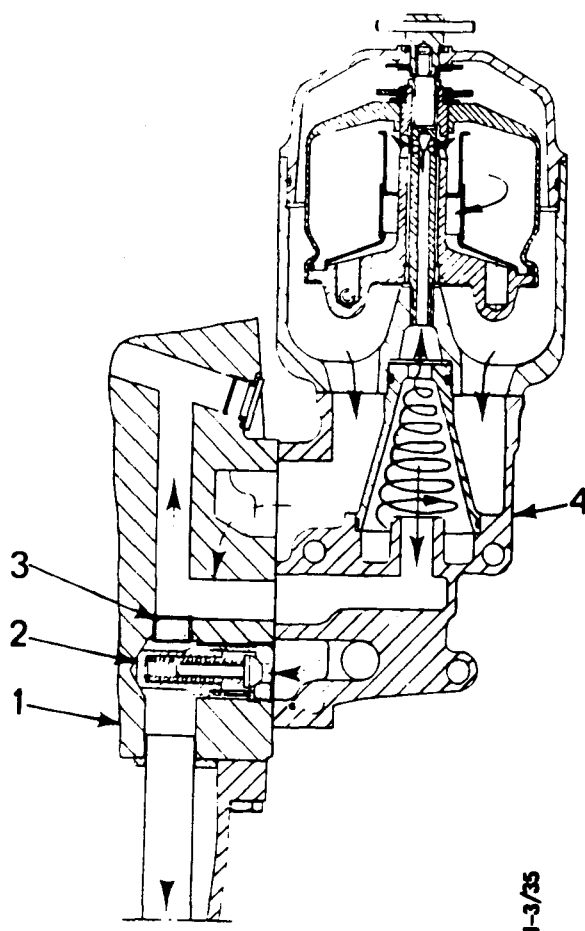
There is no hole behind the impellers of the water pump on the new cylinder block.

The new guide washers part No. 170692 for the axial movement of the crankshaft shall be fitted. The new guide washers have pins in the ends, which minimize the risk of them turning in the wrong direction.

Hexagon screws replace the studs and washers for the fastening of the main bearing caps and side covers.

REDUCTION VALVE IN OILWAY ON D/DS11 ENGINES

As from engine No. 880840 a modified cylinder block was introduced for D/DS11 engines, in which the reduction valve for the lubricating oil is located in the cylinder block. **Plug 136777 must be fitted** in the vertical oilway just above the reduction valve — see Fig. If this plug is not fitted no oil pressure will be obtained.



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Part of lubricating system on D/DS11 as from engine No. 880840

1. Cylinder block
2. Reduction valve
3. Plug 136777
4. Lubricating-oil cleaner

3200 6/75

Replacement of Cylinder Block, Newer Engines

The cylinder block stocked as a spare part for D/DS11 engines as from engine No. 880840 is fitted with plug 136777. Despite this, it is essential to check when changing cylinder blocks that this plug is actually fitted. If the plug is missing, a plug must be fitted and secured with locking fluid, article No. 561200.

Replacement of Cylinder Block, Older Engines

The same cylinder block is also stocked as a spare part for D/DS10 and D/DS11 with engine numbers up to 880839, the only difference being that **plug 136777 is not included** on these cylinder blocks. For these engines, the old lubricating-oil cleaner and the old oil sump with fitted reduction valve are used. If plug 136777 is fitted in this case the reduction valve will be disconnected. The oil pressure will then be injuriously high.

Cylinder blocks stocked with or without plug 136777 have different spare part numbers, but the above difference has been pointed out so as to completely eliminate the risk of fitting the wrong block.

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1a

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ETS 501a:3-12

VATTENLÄCKAGE FRÅN CYLINDERHUVUD-PACKNINGEN

Bakgrund

Fall av vattenläckage mellan cylinderfodrets ovre 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 var 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:

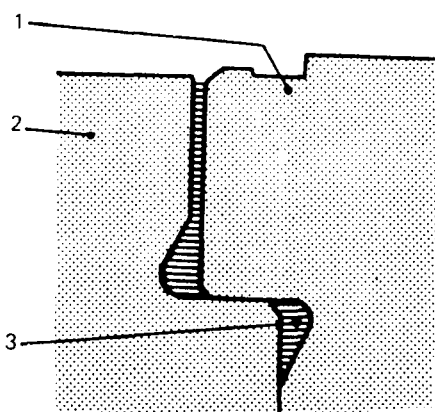
1. Rengör cylinderfodret noggrant.
2. Kontrollera, om nödvändigt justera, foderhöjden genom brotschning. Eventuella korrosionsskador måste brotschas bort innan tätningsmassan anbringas.
3. Sätt i tätningsringarna i blocket och anoljla ringar och nedre styrningsytan för cylinderfodret med motorolja.
4. Avfetta med avfettningsmedel, foderkragen och spåret under samt foderläget.
5. För påläggning av tätningsmassan används en sprutpistol i vilken tuben med munstycke placeras. Lagg på tätningsmassa i en obruten sträng (ø 3 mm) i spåret under foderkragen. Se fig. Lagg 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 spannklackar, 98515. Åtdragningsmoment: 50 Nm (5,0 kpm). Avlägsna överflödig 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



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140A

WATER LEAKAGE FROM CYLINDER HEAD GASKE

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:

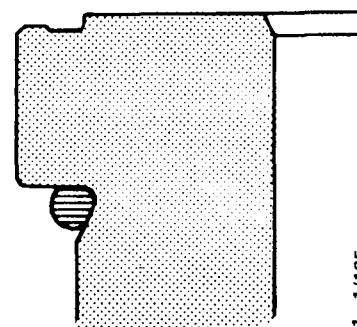
1. Carefully clean cylinder liner seats.
2. Check cylinder liner height and, if necessary, adjust by reaming. Any corrosion damage must be reamed away before sealing compound is applied.
3. Fit sealing rings into block and use engine oil to oil rings and lower guide surface for cylinder liner.
4. Degrease 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



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VASSERLECKAGE VON ZYLINDERKOPFDICHTUNGEN

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 Spannstützen, 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.

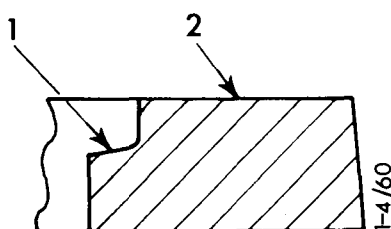
Al reparar un motor con daños de corrosión en el plano superior del bloque de cilindros, controlar que no haya daños en las superficies de cierre.

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.

NEW COMPRESSION RINGS FOR D/DS11

In conjunction with other modifications made to D/DS11 new bottom compression rings (ring 2 and 3) have also been introduced as from engine No. 888806. The new compression rings have the inner diameter divided up into steps (see fig.), which has a more favourable effect on oil consumption.



1 Inner diameter divided up into steps

2 Side which is marked "Top"

When replacing piston rings reference is made to Section 1a AR 4.

Material

Description	Discontd.	Part No.	Added	Quantity
Compression ring	170 477		247 573	2
Piston ring set ¹⁾	550 115		550 120	1
Piston ring set ²⁾	550 114		550 119	1

1) With molybdenum ring for the top compression ring.

2) With chromium ring for the top compression ring.

The new rings may also be fitted on older engines with low compression rings. Therefore, in cases of high lubricating oil consumption we recommend the replacement of the old type ring for the new compression rings. When calculating the oil consumption the recommended value for well run-in engine should not exceed 0,6 per cent of the fuel consumption (see diagram).

Consumed lubricating oil
dm³ (litres)

Lubricating oil consumption,
percent

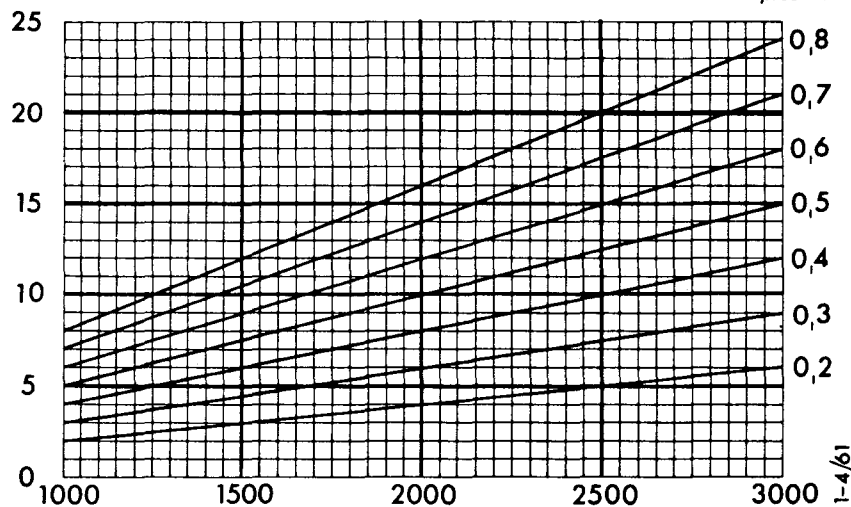


Diagram for calculating the lubricating oil consumption.

Fuel consumption
dm³ (litres)

Example: An engine has during a certain period of service consumed 2350 dm³ of fuel and 9,5 dm³ lubricating oil. The lubricating oil consumption will then be 0,4 per cent.

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SVÄNGHJULSKÅPA FÖR DS8 MED 420 MM KOPPLING

Bakgrund

Det har förekommit att svänghjulskåpan spricker.

Aktuell information

En förstärkt svänghjulskåpa finns nu tillgänglig som reservdel. Den kommer också att införas i vår produktion.

Benämning	Art. nr	
	Före ändring	Efter ändring
Svänghjulskåpa	252967 (252965)	268803 (268805)

Art. nr inom parentes anger svänghjulskåpans märkning för originalmonterad detalj på lastbil.

SCHWUNGRADGEHÄUSE FÜR DS8 MIT 420 MM KUPPLUNG

Anlaß

Es ist vorgekommen, daß das Schwungradgehäuse gerissen ist.

Aktuelle Information

Ein verstärktes Schwungradgehäuse ist jetzt als Ersatzteil verfügbar. Dies wird auch in unsere Produktion eingeführt.

Benennung	Teil Nr.	
	Alte Ausführung	Neue Ausführung
Schwungradgehäuse	252967 (252965)	268803 (268805)

Die eingeklammerten Teil-Nummern nennen die Markierung des Schwungradgehäuses für ein im Lkw originalmontiertes Teil.

FLYWHEEL HOUSING FOR DS8 WITH 420 MM CLUTCH

Background

It has been experienced that the flywheel housing cracks.

Current Information

A reinforced flywheel housing is now available as spare part. It will also be introduced in our production.

Description	Part No.	
	Before change	After change
Flywheel housing	252967 (252965)	268803 (268805)

Part Nos within brackets indicate the flywheel housings marking for part originally fitted on truck.

CUBIERTA DE VOLANTE PARA DS8 CON EMBRAGUE DE 420 MM

Antecedentes

Han habido ocasiones en que la cubierta del volante se ha agrietado.

Información actual

Actualmente se dispone de una cubierta de volante reforzada como pieza de recambio. También se introducirá en nuestra producción.

Denominación	No. de artículo	
	Antes de la modificación	Después de la modificación
Cubierta de volante	252967 (252965)	268803 (268805)

El No. de artículo situado entre paréntesis indica la marcación de la cubierta de volante para pieza original montada en camión.

3200.980

IS

SA, SB, SC, SD/SE, SF, SG, SH
SJ, SK, SL, SM/SN, SO, SP, SR

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VEVAXEL FÖR D/DS11-MOTORER

Bakgrund

I samband med modifieringen från motornummer 888806 infördes en förstärkt vevaxel.

Aktuell information

Genom att minska på 4:e ramlagrets bredd kunde vevaxeln förstärkas i det omgivande partiet.

Att iakttaga

Användningsområde	Tidigare vevaxel	Förstärkt vevaxel
Art nr	156 001	245 256
Art nr för utbytesenhet	—*	570 320
D11 (utan turbokompressor)	x	x
DS11 t o m motornr 888805	x	x
DS11 fr o m motornr 888806		x

* Som utbytesvevaxel levereras endast 570 320. Som retur-enhet godkänns 156 001 och 245 256.

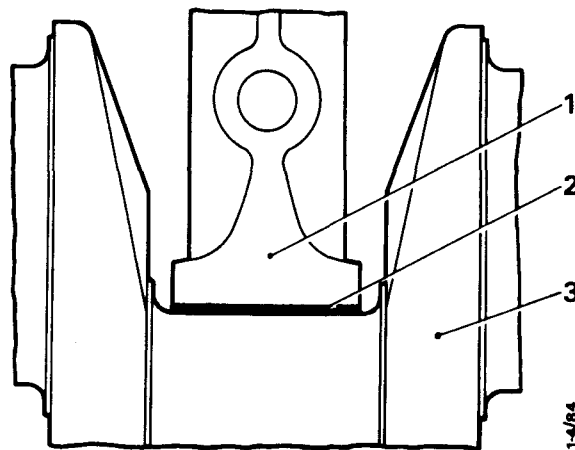


Fig. 1

Vevaxel av äldre utförande

1. Ramlagerläge 4 i cylinderblocket
2. Ramlager 4 kan vara 48 mm eller 44 mm brett
3. Vevaxel

Crankshaft of old design

1. Main bearing position 4 in cylinder block
2. Main bearing 4 can be 48 mm or 44 mm in width
3. Crankshaft

CRANKSHAFT FOR D/DS11-ENGINES

Background

A reinforced crankshaft was introduced in connection with the modification from engine No. 888806.

Current Information

By reducing the width of the 4th main bearing it was possible to reinforce the crankshaft in surrounding section.

Attention

Field of application	Previous crankshaft	Reinforced crankshaft
Part No.	156 001	245 256
Part No. for exchange unit	—*	570 320
D11 (without turbocharger)	x	x
DS11 up to engine No. 888805	x	x
DS11 as from engine No. 888806		x

* Only 570 320 is delivered as exchange crankshaft. 156 001 and 245 256 are accepted as return unit.

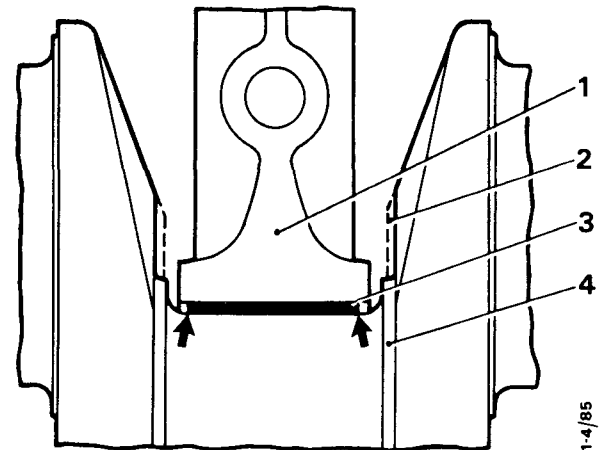


Fig. 2

Förstärkt vevaxel

1. Ramlagerläge 4 i cylinderblocket är oförändrat
2. Alternativt utförande av vevaxeln
3. Ramlager 4 skall vara 44 mm brett
4. Vevaxeln är förstärkt i detta område

Reinforced crankshaft

1. Main bearing position 4 in cylinder block is unchanged
2. Alternative design of crankshaft
3. Main bearing 4 shall be 44 mm in width
4. The crankshaft is reinforced in this area

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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/DS11

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	Design 4 Punched in Number		
Connecting rod bearings	12	131065	229672	261127		standard	84.25
		131066	229673	261128		undersize 1	84.00
		131067	229674	261129		undersize 2	83.75
		131068	229675	261130		undersize 3	83.50
		131069	229676	261131		undersize 4	83.25
		131070	229677	261132		undersize 5	83.00
		131071	229678	261133		undersize 6	82.75
		149684	229679	261134		undersize 8	82.25
Main bearings 1, 2, 3, 5, 6, 7	12	131021	229656	261101		standard	101.62
		131022	229657	261102		undersize 1	101.37
		131023	229658	261103		undersize 2	101.12
		131024	229659	261104		undersize 3	100.87
		131025	229660	261105		undersize 4	100.62
		131026	229661	261106		undersize 5	100.37
		131027	229662	261107		undersize 6	100.12

Description	Quantity/Engine (halves)	Design 1 Punched in Number	Design 2 Punched in Number	Design 3 Punched in Number	Design 4 Punched in Number	Size	mm
Main bearing 4 (4th main bearing from front of crankshaft)	2	131029	229664	245405	261109	standard	101.62
		131030	229665	245406	261110	undersize 1	101.37
		131031	229666	245407	261111	undersize 2	101.12
		131032	229667	245408	261112	undersize 3	100.87
		131033	229668	245409	261113	undersize 4	100.62
		131034	229669	245410	261114	undersize 5	100.37
		131035	229670	245411	261115	undersize 6	100.12


CAUTION

Main bearing 4 with width 48 mm must only be fitted in engine with crankshaft 156001. Main bearing 4 with width 44 mm can be fitted in all engines. Otherwise all 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 standardization in basic engine generations, used in Waukesha/Scania D317 (D5, DS5) and F673, F674 (D11, DS11, DSI11) 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 pistons"; and,
- "Spare parts".

Under the "Originally fitted piston" sections:

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 this 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.

Tables "D5 and D11 Contents of Current Ring Sets" furnish the part numbers, dimensions of rings and position installed on the piston.

Modifications of F673-674D (DS DSI11) Series Engines

During 1968, the output of the DS/DSI11 series engines was raised. This was accomplished by modifying the camshaft which resulted in altered timing. The altered timing made it necessary to introduce a valve recess in the top of the piston.



Always check to see that replacement piston contains valve recess if original piston does.

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1a	SI	4-12	2

These changes were introduced in production starting with engine number 842821 with the exception of the following:

DSI1R42 from 843182-843201
DSI11R82 from 842876-842878
DSI11R82 from 843229-843234
DSI11R82 from 843255-843270

The new design engines were indicated by a suffix letter "A" added to the serial number (i. e., DS11R01 became DS11R01A). This suffix letter, however, was not added until serial number 844691. This means that a number of engines between serial number 842821 and 844691 have been delivered without the "A" suffix designation; although, the engine may contain the new parts.

D5 PISTONS AND PISTON RINGS									
As from engine No.	Original Fitted Piston				Spare Parts				Remarks
	Design	Punched No.	Complete piston with chrome ring	Complete piston with molybdenum ring	Ring set for original fitted piston	Piston compl.	Piston Compl. consists of		
							Naked piston punched No.	Piston ring set	
	1	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	
605481	2	213150	213149	—	550068	235883	235882	550068	1
606660	3	223904	223904	225327	550068	235883	235882	550068	1
607543	4	235882	235881	235883	550068	235883	235883	550068	1

DS5 PISTONS AND PISTON RINGS									
As from engine No.	Original Fitted Piston				Spare Parts				Remarks
	Design	Punched No.	Complete piston with chrome ring	Complete piston with molybdenum ring	Ring set for original fitted piston	Piston compl.	Piston Compl. consists of		
							Naked piston punched No.	Piston ring set	
606400	1	168114	168112	—	550068	235886	235885	550068	
		169745	169743	—	550068	235886	235885	550068	
		173782	173780	—	550068	235886	235885	550068	
		189474	189472	—	550068	235886	235885	550068	
	2	223905	223897	225328	550068	235886	235885	550068	
	3	235885	235884	235886	550068	235886	235885	550068	

D5 CONTENTS OF CURRENT PISTON RING SETS									
	Upper Ring Part No. Height in mm			Ring No. 2-3 Part No. Height in mm			Ring No. 4-5 Part No. Height in mm		
Ø 115 550068	225330	3.0		149880	3.0		171930	6.0	

Remarks 1. Increased engine output.

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D11 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	
819001		153217 168108 168108	159774 168106 178825	— — 180529	550059 550059 550059	246737 246737 246737	246738 246738 246738	550066 550066 550066	4
873351	1	229140	—	229141	550064	246737	246738	550066	
	2	229463	—	229457	550064	246737	246738	550066	
874976	3	230051	229139	229464	550116	246737	246738	550066	
*880840	4	228430	228429	232613	550120	253137	228430	550120	1
	4	228430	253135	253137	550120	253137	228430	550120	8, 9

Piston complete, part no. 268392 replaces 246737. Use in all D11 engines to S/N 880839 excluding MARINE. MARINE ONLY: Use 268392 to S/N 888805 (see asterisk). From 888806 use 253137. From S/N 880840 use as shown (253137).

*For D11MO1 as from engine No. 888806

Note 1. Connecting rod with wedge shaped small end.

DS11 except PISTONS AND PISTON RINGS									
DS11 except		DS11 R42	DS11 R42A						
		DS11 R62	DS11 R62A						
		DS11 R82	DS11 R82A						
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	
819001		153217 168108 168108	159776 168109 178819	— — 180529	550059 550059 550059	268391 268391 268391	230051 230051 230051	550116 550116 550116	2, 4 2, 4 2, 4
842821	1	182546	182544	180532	550059	268394	235587	550116	3, 5
See exceptions in bulletin explanation	2	182546	203779	—	550059	268394	235587	550116	3, 5
		229143	229142	—	550064	268394	235587	550116	3, 5
		229143	229458	229144	550064	268394	235587	550116	3, 5
	4	229467	229466	229459	550064	268394	235587	550116	3, 5
	5	230054	230053	229468	550116	268394	235587	550116	3, 5
	6	235587	235589	235590	550116	268394	235587	550116	3, 5
*880840	7	228432	228431	232614	550120	253138	228432	550120	1, 4, 6, 8, 9
		228432	253136	253138	550120	253138	228432	550120	same

*For DS11MO1 and DS111MO1 as from engine No. 888806

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DS11 R42 DS11 R42A
DS11 R62 DS11 R62A
DS11 R82 DS11 R82A

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	
		161684	175743	—	550059	205668	161684	550059	2, 7
		161684	178822	—	550059	205668	161684	550059	2, 7
	1	180453	180454	—	550059	268396	235588	550116	3
		180453	204021	183391	550059	268396	235588	550116	
		229150	229149	229151	550059	268396	235588	550116	
		229465	229469	229461	550064	268396	235588	550116	
871906	3	230057	230056	229470	550116	268396	235588	550116	
876060	4	235588	235591	235592	550116	268396	235588	550116	

Notes 2: Pistons without valve pockets intended for non "A" engines. See "Modification of DS11 engines 1968".

Notes 3: Pistons with valve pockets intended for "A" engines. See "Modification of DS11 engines 1968".

Notes 4: 246737 Supersedes 180529 229464 } no
Older design can be 268392 232613 } pockets
used if stocked. 229141 253137

Note 7: 205668 Supersedes 183391
Older design can be used if stocked.

Notes 5: 268394 Supersedes 180532 229459
Older design can be 229174 224468
used if stocked. 229144

Note 8: Must not be fitted in engine number below 880840.

Notes 6: 253138 Supersedes 232614
Older design can be used if stocked.

Note 9: Must not be fitted in engine number below 888807.

D11									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 127 mm																	
550059		180531	3,1	149430	3,1	173741	6,3	173741	6,3								
550064		180531	3,1	149430	3,1	170482	6,3	—	—								
550066		170989	2,4	170477	2,4	170482	6,3	—	—								
550116		170989	2,4	247573	2,4	170482	6,3	—	—								
550120		170989	2,4	247573	2,4	232129	4,7	—	—								

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

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NEW INJECTION PUMP SHELF FOR DS8 AND D/DS11 ENGINES WITH BOSCH INJECTION PUMP

Too much axial clearance on the driving shaft for injection pump has in some instances led to a breakdown of the pump coupling. Therefore, to eliminate this a new pump shelf has been introduced in production.

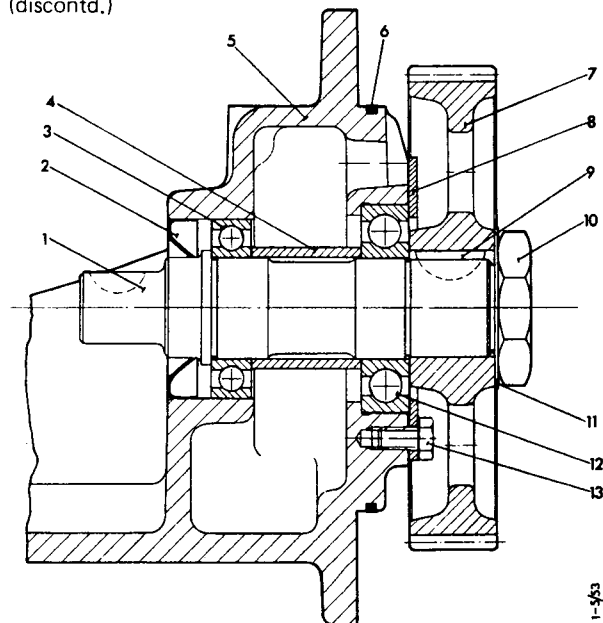
The introduction took place beginning from the following engine Nos.

D8	: 753697
DS8 except DS8L02	: 753216
DS8L02	: 753047
D/DS11	: 880840

The new pump shelf differs from the previous by reason of the fact that the front bearing is locked with a washer and consequently takes up both the radial and axial forces occurring. The rear bearing acts only as support bearing. The retaining ring for the driving shaft rear bearing is discontinued likewise the sealing ring holder.

The gearwheel has also been modified. The web is moved forwards in order to give space for the lock washer screws. To facilitate access to the screws two holes are added in the web. The discontinued gearwheel can be used for the new pump shelf provided special lock washer and screws are used in accordance with below.

Description	Part No.	Quantity
Gearwheel D/DS8 (discontd.)	139938	1
Lock washer	238188	1
Screw	805618	3
Gearwheel D/DS11 (discontd.)	131129	1



Replacement of Pump Shelf on Older Engines

The new pump shelf can also be fitted on older engines. The gearwheel, front ball bearing and driving shaft from the old pump drive can be used.

The following parts are used when changing over to the new pump shelf, which can be ordered from our Spare Parts Department:

Description	Part No.	Quantity	Pos. No.
Pump shelf:			
Trucks and buses	225903	1	5
Pump shelf:			
Separate engines	225907	1	5
Ball bearing	140180	1	3
Washer	238188	1	8
Screw	805618	3	13
Spacer sleeve	225904	1	4
Sealing ring	228109	1	2

INJECTION PUMP DRIVE

- | | |
|-------------------------------------|------------------|
| 1. Driving shaft for injection pump | 8. Washer |
| 2. Sealing ring | 9. Wedge |
| 3. Ball bearing | 10. Nut |
| 4. Spacer sleeve | 11. Lock washer |
| 5. Pump shelf | 12. Ball bearing |
| 6. O-ring | 13. Screw |
| 7. Pump gearwheel | |

WRONG SPACER SLEEVE IN THE PUMP DRIVE D/DS8 AND D/DS11, SEE THE NEXT PAGE

3200-693

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WRONG SPACER SLEEVE IN THE PUMP DRIVE D/DS8 AND D/DS11

On a smaller number of those engines provided with the new injection pump shelf the spacer sleeve (4, see fig. 1) can be too short. The driving shaft (1) may then come in contact with the cover in the timing gear housing. It occasionally happens that the spacer sleeve can be so short that the shaft is movable in a longitudinal direction.

Thus, in the event of difficulties arising with the pump drive a check should be made primarily to see that the spacer sleeve has the correct length, 39.12 – 39.28 mm.

In order to check this the angle drive for the tachometer (or plug if tachometer is missing) is removed. By peeping in the hole it is often possible to decide whether or not the clearance is sufficient. In cases of doubt a more accurate check can be made by using a narrow feeler gauge, thickness 0.10 mm.

If there are light metal particles in the hole, the shaft has probably come in contact with the cover, the cover should then be removed and the pump drive taken to pieces.

The spacer sleeve is measured and replaced if it has the wrong length.

This fault can occur between the following engine numbers:

D8	753697 – 755328
DS8 except DS8L02	753216 – 755328
DS8L02	753047 – 755328
D/DS11	880840 – 882021

This fault can also occur on spacer sleeves, which have been purchased as spares before November 1, 1973.

Description	Part No.	Length	Pos. No. Page 1
Spacer sleeve	225904	39.12 – 39.28	4

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TRANSMISSIONSKUGGHJUL AV SMITT UT-FÖRANDE FÖR D8/DS8 MOTORER

Aktuell information

Den i produktionen införda modifieringen av D8/DS8 i maj 1975 (fr o m motornummer 761785) omfattade bl a nya transmissionskugghjul, varvid de tidigare gjutna kugghjulen ersattes av smidda i kraftigare utförande.

De nya kugghjulen kan, om följande iakttas, också monteras i tidigare D8/DS8 motorserier (dvs före maj 1975 t o m motornummer 761784).

Att iakttä

Samtliga kugghjul av smitt utförande enligt nedan **ska monteras samtidigt**. (Kombination av gjutna och smidda hjul innebär risk för skador).

Distansbricka har införts för att fixera kamaxelhjulets märkta framsida i rätt axiellt läge, se fig. Detta medför att tidigare fläns, bricka och mutter utgått och ersatts av fläns och mutter av nya utföranden.

Utgående och tillkommande detaljer

Benamning	Utgår	Tillkommer
Distansbricka	—	270725
Bricka	131113	—
Mutter	131112	271393
Kugghjul (kamaxel)	131583	261187
Fläns	131586	131494
Kugghjul (pumpdrivning)	225908	225906
Kugghjul (mellanhjul)	131587	251600
Kugghjul (vevaxel)	431585	251599

TIMING GEARWHEELS OF FORGED DESIGN FOR D8/DS8 ENGINES

Current Information

The modification made to the D8/DS8, which was put into production in May 1975 (as from engine No. 761785) comprised, among other things, new timing gearwheels, of which the earlier cast gearwheels were replaced by forged ones of a more robust design.

The new gearwheels can, if the following is observed, also be fitted in the earlier D8/DS8 engine series (i.e. prior to May 1975 up to engine No. 761784).

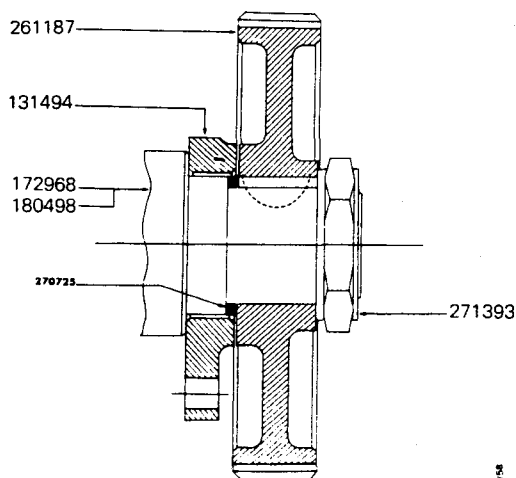
Attention

All gearwheels of forged design according to below **must be fitted together**. (The combination of cast and forged gearwheels implies risk of damage occurring).

A spacer washer has been introduced in order to fix the camshaft gearwheels marked front side in correct axial position, see fig. That means that the previous flange, washer and nut have been discontinued and replaced by a flange and nut of the new designs.

Discontinued and Added Parts

Description	Disc.	Added
Spacer washer	—	270725
Washer	131113	—
Nut	131112	271393
Gearwheel (camshaft)	131583	261187
Flange	131586	131494
Gearwheel (pump drive)	225908	225906
Gearwheel (idler gear)	131587	251600
Gearwheel (crankshaft)	131585	251599



3200-1091

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MONTERING AV KAMAXELNS MUTTER PÅ D/DS11 MOTORER

Bakgrund

Det har förekommit att kamaxelns mutter har lossnat.

Aktuell information

Vikbrickan för kamaxelmuttern har utgått. Mutterns åtdragningsmoment som hitills varit 300 Nm (30 kpm) har ökat till 400 Nm (40 kpm).

Ändringen är införd fr o m motor nr 958575.

Övriga vikbrickor i transmissionen har utgått efterhand.

Att iaktta

Vid arbete med transmissionen skall samtliga vikbrickor utgå.

MONTIERUNG DER NOCKENWELLENMUTTER BEI D/DS11-MOTOREN

Anlaß

Es ist vorgekommen, daß sich die Nockenwellenmutter gelöst hat.

Aktuelle Information

Die Faltscheibe für die Nockenwellenmutter wird nicht mehr montiert. Das bisherige Anziehdrehmoment der Mutter von 300 Nm (30 kpm) ist auf 400 Nm (40 kpm) erhöht worden.

Die Änderungen sind ab Motor Nr. 958575 eingeführt.

Die übrigen Faltscheiben in den Stirnrädern sind nach und nach wegfallen.

Zu beachten

Bei der Arbeit mit Stirnrädern sollen sämtliche Faltscheiben wegfallen.

FITTING OF CAMSHAFT NUT ON D/DS11 ENGINES

Background

It has occurred that the camshaft nut has come off at different times.

Current Information

The tab washer for the camshaft nut is now discontinued. Up till now the tightening torque of the nut has been 300 Nm (30 kpm) but has been increased to 400 Nm (40 kpm).

The change was introduced as from engine No. 958575.

The remaining tab washers in the timing gears have been gradually discontinued.

Attention

When carrying out work on timing gears all tab washers are to be discontinued.

MONTAJE DE LA TUERCA DEL ARBOL DE LEVAS EN LOS MOTORES D/DS11

Antecedentes

Se han dado casos en que la tuerca del árbol de levas se ha soltado.

Información actual

La arandela plegable para la tuerca del árbol de levas ha sido suprimida. El par de apriete de la tuerca que era de 300 Nm (30 kgm) es aumentado a 400 Nm (40 kgm).

Esta modificación es introducida en producción a partir del motor núm. 958575.

Las otras arandelas plegables de la distribución se han suprimido sucesivamente.

Se observará

Al trabajar con la distribución se suprimirán todas las arandelas plegables.

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E T S 6201a:6-4

Supersedes previous information
dated 72-08-15

Ersetzt frühere Mitteilung
vom 72-08-15

Substituye il informe anterior
fechado 72-08-15

Ersätter tidigare meddelande
daterat 72-08-15

OLJEFILTER FØR OVERLADNINGSAGGREGAT

På marknaden förekommer en typ av oljefilter, som är avsett för flera olika personbilmotorer. Denna typ av oljefilter överensstämmer utseendemässigt med Scania's oljefilter för överladdningsaggregat.

I alla oljefilter av denna typ finns en ventil, som vid en viss grad av igensättning förbikopplar filterelementet så att oljan passerar filtret utan att renas. Denna ventil är på Scania originalfilter inställd för ett ungefär dubbelt så högt tryck som på de andra filtren.

Användning av andra oljefilter än Scania original innebär i de flesta fall att oljan passerar filtret utan att renas och därmed att överladdningsaggregatets livslängd avsevärt förkortas.

Vi vill därför på det bestämdaste varna för användning av andra oljefilter än Scania original, märkt SCANIA 67 502 58 236, Scania detaljnummer 173 171.

OIL FILTER FOR TURBOCHARGER

There is on the market a type of oil filter, which is intended for several different car engines. This type of oil filter resembles in appearance the Scania oil filter for turbochargers.

In all oil filters of this type there is a built-in valve, which has the task to by-pass the filter at a certain degree of clogging-up, so that the oil passes the filter without being cleaned. This valve, on the Scania original filter, has been adjusted for about twice as much pressure as on the other filters.

The use of oil filters other than Scania original implies in the majority of cases that the oil passes the filter without being cleaned and that the service life of the turbocharger is considerably shortened as a result.

We would, therefore, emphatically warn against the use of oil filters other than Scania original, marked SCANIA 67 502 58 236, Scania part No. 173 171.

ÖLFILTER FÜR TURBOLADER

Auf dem Markt gibt es einen Ölfiltertyp, der für mehrere verschiedene Personenwagenmotoren vorgesehen ist. Dieser Ölfiltertyp stimmt dem Aussehen nach mit Scania's Ölfilter für Turbolader überein.

Alle Ölfilter von diesem Typ haben ein Ventil, das bei einem gewissen Verstopfungsgrad das Filterelement vorbeischiebt, so daß das Öl das Filter ohne Reinigung passiert. Dieses Ventil ist bei Scania's-Originalfilter für einen ungefähr doppelt so hohen Druck wie bei den anderen Filter eingestellt.

Die Benutzung anderer Filter als Scania-Originalfilter bedeutet in den meisten Fällen, daß das Öl ohne Reinigung passiert, und daß dadurch die Lebensdauer des Turboladers erheblich verkürzt wird.

Wir wollen daher eindringlich vor der Benutzung anderer Ölfilter als Scania-Originalfilter, gekennzeichnet SCANIA 67 502 58 236, Scania Teilnummer 173 171, warnen.

FILTRO DE ACEITE PARA EL TURBOCOMPRESOR

En el mercado existe un tipo de filtro de aceite que sirve para distintos motores de automóviles. Este tipo de filtro de aceite tiene el mismo aspecto exterior que el filtro de aceite de Scania para el turbocompresor.

En todos los filtros de aceite de este tipo hay una válvula que, al alcanzar se cierto grado de obturación, desconecta el elemento filtrante de modo que el aceite pasa por el filtro sin limpiarse. En el filtro original de Scania esta válvula está ajustada de tal forma que soporta aproximadamente el doble de presión que los otros filtros.

Si se emplean pues otros filtros de aceite en vez del modelo original de Scania, significa que en la mayoría de los casos el aceite pasa por el filtro sin ser limpiado, son lo que se reducen considerablemente las horas de vida del turbocompresor.

Por consiguiente, queremos advertirles enérgicamente que no utilicen ningún filtro de aceite que no sea el original de Scania, el cual va marcado de la siguiente forma: SCANIA 67 502 58 236, Número de pieza de Scania 173 171.

SA, SB, SC, SD
SE, SF, SG, SH
SJ, SK, SL, SM
SN, SO, SP, SR

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MODIFIED REDUCTION VALVE ON D/DS11

On D/DS11 a new reduction valve was introduced for the lubricating oil as from engine No. 880840. The new reduction valve is located in the cylinder block behind the intermediate piece of the lubricating oil cleaner.

The lubricating oil pressure has been altered at the same time. When the engine is warm and the engine speed 2200 r/min the pressure shall be 4.5-6.0 bar (kp/cm²).

High Lubricating Oil Pressure

The first engines with the new reduction valve fitted were given an excessively high lubricating oil pressure. Gradually the reduction valve was adjusted so that it reduces at a pressure according to above.

Beginning from engine No. 882705 a modified reduction valve was introduced, which meant that the part number complete was changed from 233403 to 251062. On a number of engines, according to the engine number limit stated, the two valves were fitted alternately. The modification implied substantial drilling in the cylinder block and that the thread in the block and in the reduction valve was altered from M32 x 1.5 to M36 x 1.5. Engines with the first design cannot be changed to the later design. Both types of reduction valve, available as spare parts, are adjusted to the correct pressure.

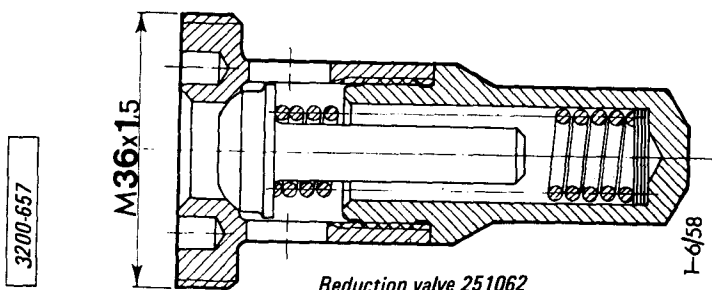
On engines with too much oil pressure this shall be reduced to max. 6.0 bar (kp/cm²) when engine is warm. The pressure is reduced by removing the washers under the valve spring. One washer gives a pressure reduction of approx. 0.12 bar (kp/cm²). If it is impossible to reduce the pressure sufficiently by adjustment, the reduction valve shall be replaced.

Low lubricating Oil Pressure

It has been experienced that a number of engines, after a period of operation, have insufficient oil pressure at low speed. What is meant by insufficient oil pressure is, when it is below 1.5 bar (kp/cm²) at 800 r/min.

The low oil pressure is owing to the fact that the valve seat is worn in the sealing surface against the valve so that it does not seal properly. The changed hardening method has, therefore, been introduced in our production as from engine No. 884677.

Reduction valves delivered from our Spare Parts Department as from Week 10, 1974 are of the modified design.



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MAINTENANCE OF LUBRICATING OIL CLEANER

The lubricating oil cleaner of centrifugal type, which is used for all Scania-engines, is extremely effective and has excellent capacity for separating the particles in the lubricating oil which can cause wear. However, one condition for this is that the lubricating oil cleaner is kept clean in accordance with our instructions. Obviously, this has not always shown itself to be the case. For instance during examination made in respect of damaged engines, it has been revealed that the damages sustained to the lubricating oil cleaner are sometimes on account of lack of maintenance. Thus on many of the engines arriving at the factory for reconditioning, the oil cleaner has been completely clogged up.

Consequently, an oil cleaner that is clogged up cannot clean the oil properly, instead of which the risk of wear to the engine increases appreciably. In the first place much greater damage is likely to occur to the crankshaft bearing. The turbocharger, if one is fitted, will be damaged, too, as its special filter under these conditions becomes clogged up and then allows impure oil to flow through.

Therefore, to avoid any damage to the function of the engine the lubricating oil cleaner shall be checked each time a vehicle is test driven during a visit to the workshop. Checking is undertaken by closely listening to the engine when it has stopped. A humming sound is then to be heard from the lubricating oil cleaner for approx. one minute (applies to a hot engine).

It shall also be made possible for both the truck owners and drivers to carry out checking.

When a purely routine clean out of the centrifugal cleaner is undertaken there shall be a certain coating of dirt in the rotor. **If that is not the case this means that the cleaner is not functioning properly.** The reason shall be investigated at once.

The max. thickness of dirt permitted is 15 mm (type GF 1) and 20 mm (type GF 5) respectively. If the coating of dirt is in excess then the cleaner shall be cleaned more often than our recommendation (10.000 km). It is then advisable to clean out the cleaner in connection with change of oil.

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SE, SF, SG, SH

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OLJETRYCKSVENTIL FÖR D/DS8 OCH D/DS11

En ny oljetrycksventil har införts för D/DS8 från motor nr 765974 och för D/DS11 från motor nr 953406. Den nya oljetrycksventilen är utbytbar med tidigare utförande.

Benämning	Utgår	Tillkommer
Oljetrycksventil (gänga 32 mm)	233403	259511
Oljetrycksventil (gänga 36 mm)	251062	259100
Justerbricka (\varnothing 12,0)	233410	259104 (\varnothing 11,4)

ÖLDRUCKVENTIL FÜR D/DS8 UND D/DS11

Ein neues Öldruckventil ist für D/DS8 ab Motor Nr. 765974 und für D/DS11 ab Motor Nr. 953406 eingeführt. Das neue Öldruckventil ist gegen die frühere Ausführung auswechselbar.

Benennung	Alte Nr.	Neue Nr.
Öldruckventil (Gewinde 32 mm)	233403	259511
Öldruckventil (Gewinde 36 mm)	251062	259100
Einstellscheibe (\varnothing 12,0)	233410	259104 (\varnothing 11,4)

OIL PRESSURE VALVE FOR D/DS8 AND D/DS11

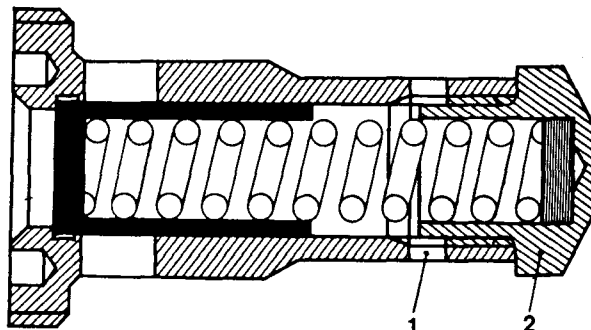
A new oil pressure valve has been introduced starting from engine No. 765974 on D/DS8 and from engine No. 953406 on D/DS11 respectively. The new oil pressure valve is interchangeable with the earlier design.

Description	Discontinued	Added
Oil pressure valve (thread 32 mm)	233403	259511
Oil pressure valve (thread 36 mm)	251062	259100
Shim (\varnothing 12,0)	233410	259104 (\varnothing 11,4)

VALVULA DE PRESION DE ACEITE PARA D/DS8 Y D/DS11

Se ha introducido una nueva válvula de presión de aceite, para D/DS8 a partir del motor no. 765974, y para D/DS11 a partir del motor no. 953406. La nueva válvula es compatible con la antigua.

Denominación	Saliente	Entrante
Válvula de presión de aceite (rosca 32 mm)	233403	259511
Válvula de presión de aceite (rosca 36 mm)	251062	259100
Arandela de ajuste (\varnothing 12,0)	233410	259104 (\varnothing 11,4)



Oljetrycksventil

Proppen (2) täcker större delen av hålen (1).

Oil pressure valve

The plug (2) is covering the main part of the holes (1)

Öldruckventil

Der Stopfen (2) deckt den größeren Teil der Löcher (1)

Válvula de presión de aceite

El tapón (2) cubre la mayor parte de los agujeros (1)

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MOTORUPPHÄNGNINGSGUMMIN PÅ D/DS11

Under vissa speciellt svåra körförhållanden kan motorupphängningsgummina på D/DS11 uppvisa otillfredsställande livslängd. I dessa fall kan istället de nya, förstärkta motorupphängningsgummina till DS14 användas. Artikelnumren för dessa gummi-element anges nedan.

Material

Benämning	Art.nr	Antal
Motorupphängningsgummi, främre	137207	2
Motorupphängningsgummi, bakre	242201	2

MOTORAUFHÄNGUNGSGUMMIS FÜR D/DS11

Unter gewissen besonders schwierigen Fahrverhältnissen können Motoraufhängungsgummis bei D/DS11 unbefriedigende Lebensdauer haben. In solchen Fällen können statt diesen die neuen, verstärkten Motoraufhängungsgummis für DS14 benutzt werden. Diese Gummis haben folgende Teilnummern:

Material

Benennung	Teil Nr.	Anzahl
Motoraufhängungsgummi, vorderes	137207	2
Motoraufhängungsgummi, hinteres	242201	2

ENGINE MOUNTING RUBBER ON D/DS11

During some particularly difficult driving conditions the engine mounting rubber on D/DS11 may show signs of unsatisfactory service life. In cases where this occurs, the new, reinforced engine mounting rubber can be used instead for the DS14. The part numbers for these rubber elements are given below.

Material

Description	Part No.	Quantity
Engine mounting rubber, front	137207	2
Engine mounting rubber, rear	242201	2

COJINES DE GOMA PARA LA SUSPENSION DEL MOTOR D/DS11

Durante condiciones de servicio excepcionalmente difíciles, los cojines de goma destinados a la suspensión del motor D/DS11 pueden tener una vida útil insatisfactoria. En estos casos se puede en vez de ello utilizar los nuevos cojines de goma, reforzados, destinados al DS14. Los números de artículo que corresponden a estas piezas de goma se indican a continuación.

Material

Denominación	No de art.	Cantidad
Cojín de goma, delantero	137207	2
Cojín de goma, trasero	242201	2

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	2	—	1	—	Intake and exhaust system Turbocharger, Wear limits and tightening torques Charging pressure	
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	8	—	83	—	— Installation instructions for DSI 14 MO 1 A — Intake system, Engine compartment ventilation B — Exhaust system C — Cooling system, sea water cooling D — Fuel system E — Electrical system F — Engine dimensions F — Engine alignment G — Control for engine speed H — Power transmission, Power take-off J — Multi-engine installations K — General classification regulations L — Engine installations from service aspect Hansa quick start	
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INSTRUMENTS FOR TESTING AND CHECKING OF ENGINE INSTALLATIONS

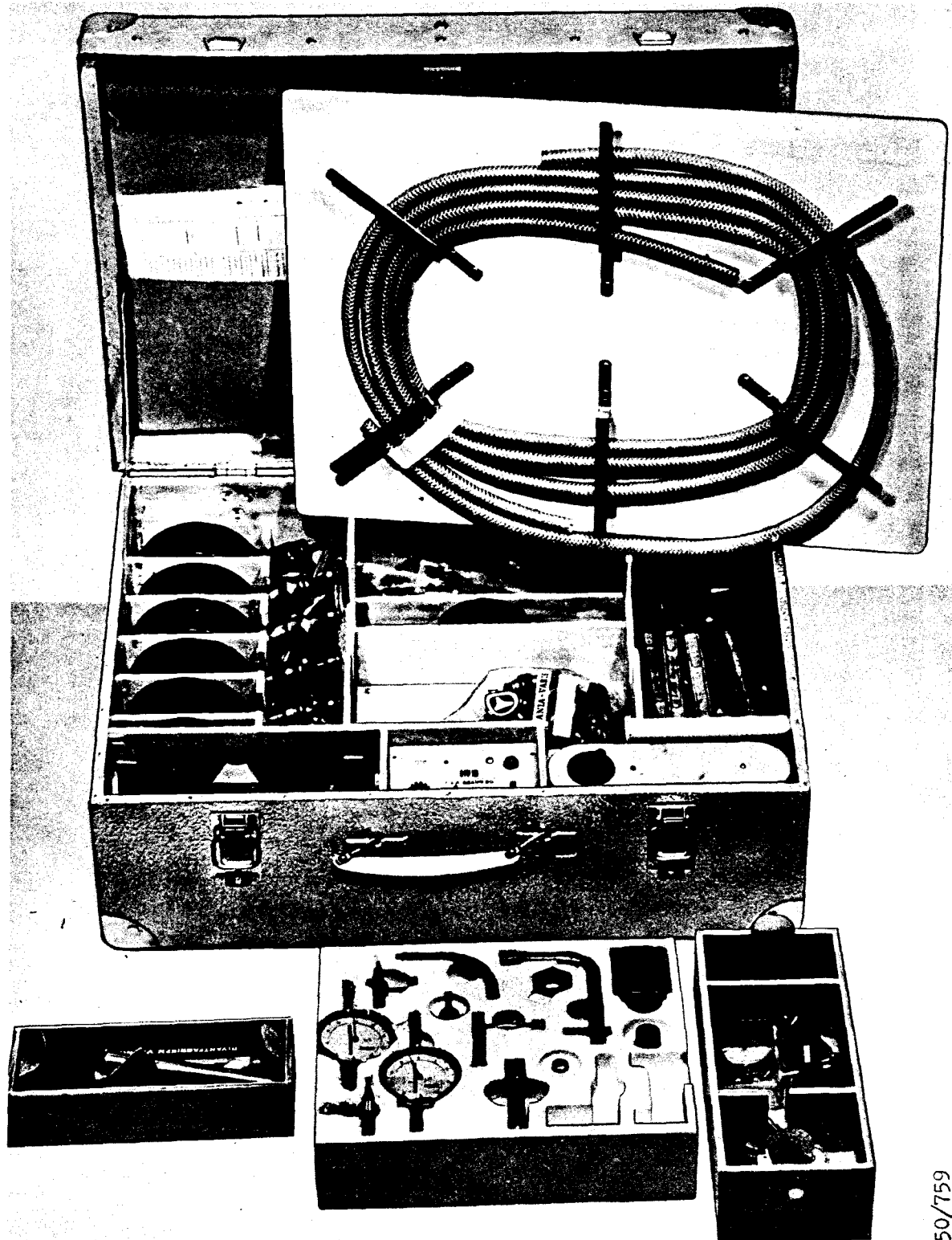


Fig. 1

Applies to: Separate Engines

SE, SH

For thorough inspection or checking of engines, both in vehicles and in other installations, it is always necessary to use certain instruments. The use of suitable instruments enables the operating conditions for as well as the actual state of the different engine components to be checked in the correct manner, and consequently unnecessary and very expensive functional trouble can be avoided. Service work such as trouble-shooting and repair jobs is carried out with greater efficiency, etc.

For this reason, an instrument kit has been put together. It contains the most important instruments needed for engine tests as well as the necessary connections for them. A special case has also been designed for these instruments, which are thus adequately and effectively protected. Moreover, the case is a practical container in which to keep the instruments when service work is done both in the workshop and elsewhere.

A list of the contents of the instrument kit, orders for separate instruments or complete instrument kits, or any other information required in this context can be obtained upon application to SAAB SCANIA AUTOMOTIVE GROUP: Marketing Division, Service, Södertälje, Sweden.

General considerations:

When reading a pressure gauge or vacuum gauge, the instrument should always be held vertically. On many occasions, it is appropriate to attach the instrument with a piece of tape, etc., in a clearly visible position so that readings can easily be taken while the engine is running. Before testing an installation, the instruments for every conceivable test should be connected, if possible, at one and the same time, since this will not only lead to a shorter overall testing time but will also give more reliable measuring results.

If an instrument reading seems to deviate from the anticipated value or if particular importance is attached to a measuring quantity for one reason or another, the measurement should be checked with two different instruments. In order to reduce the risk of appreciable measuring errors, the instruments should be checked at regular intervals.

By keeping the instruments in good order, both time and labour are saved, and an incidental advantage is that a neat and tidy workshop makes a good impression on visiting customers.

Some of the measuring procedures described in this bulletin are described in more detail elsewhere in our service literature. To some extent, however, these are also briefly included here for the sake of completeness.

Measuring r.p.m. with a "Moviport" tachometer

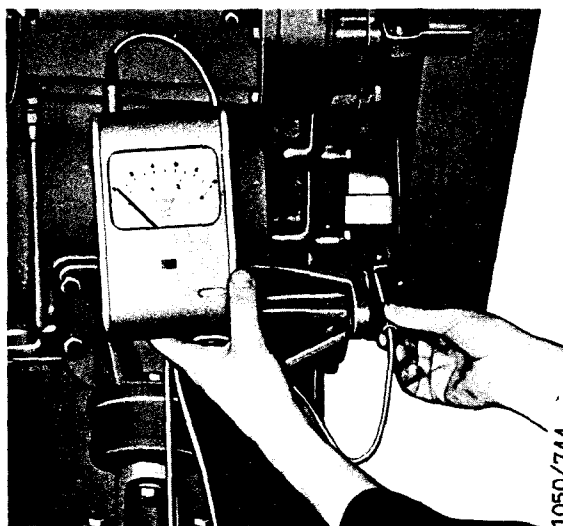


Fig. 2

Measuring range: 0—3.000 r.p.m.

Connection: Make a mark with a piece of chalk or a piece of suitable tape, for instance on the vibration damper as shown in the figure. If the surface is dark, mark a white mark, and if the surface is light make a black mark. On the left side of the instrument there is a knob that can be set for a light or dark indicating mark, as applicable. In measuring, bring the measuring sound closer to the measuring site until a constant reading is obtained on the instrument (at a distance of approx. 5—25 mm).

Reading: Make sure that the measuring site has only one indicating mark, as otherwise the instrument will show twice or a greater multiple of the true r.p.m., depending on the number of indications per revolution. See also the instructions provided together with the instrument.

Prescribed measuring value: The max. full-load r.p.m., as well as the high and low idling r.p.m., will be found on the engine data card or other valid instructions for the engine concerned.

Measuring r.p.m. with a "Hassler" tachometer

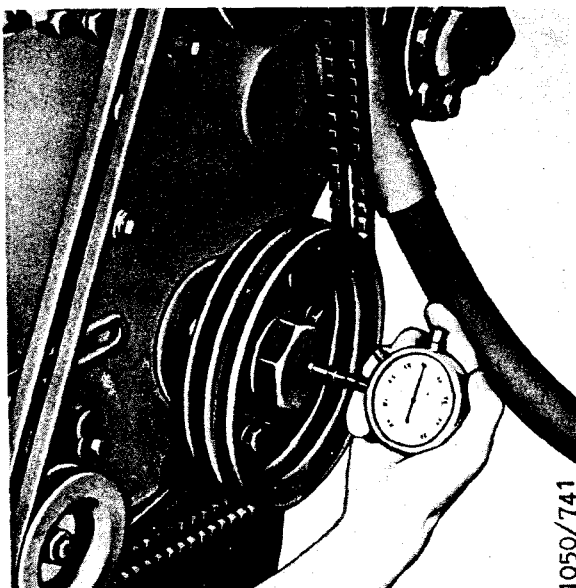


Fig. 3

Connection: A rubber measuring point is attached to the instrument. The measuring point is connected to the front end of the crankshaft as shown in the figure, which means that the engine r.p.m. can be read off directly on the instrument. On engines equipped with a guard over the transmission belts, the "Hassler" tachometer can be connected to the water pump drive shaft, but in this case the reading obtained will be only approximate. On engines of the D11 series, the water pump speed is 1.48 times the engine r.p.m. as standard and on engines with increased fan and water-pump speed the speed may be 1.63 or 1.86 times the engine r.p.m. On engines of the D5 and D8 series, the ratio is 1.125 times the engine r.p.m.

Reading: Check that the indicated engine r.p.m. remains stable during the measuring procedure. This can be done by repeating the measuring until two consecutive readings give the same result.

Prescribed measuring value: The max. full-load r.p.m., as well as the high and low idling r.p.m., will be found on the engine data card or other valid instructions for the engine concerned.

Applies to: Separate Engines

Measuring of control rod opening for maximum fuel delivery

Checking the control rod opening is done with the aid of different testing instruments, depending on the type of injection pump fitted to the engine.

1. a) Bosch B-design pump

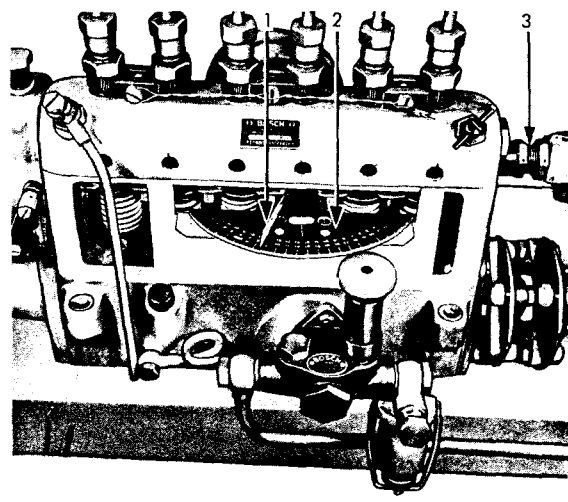


Fig. 4

b) CAV pump

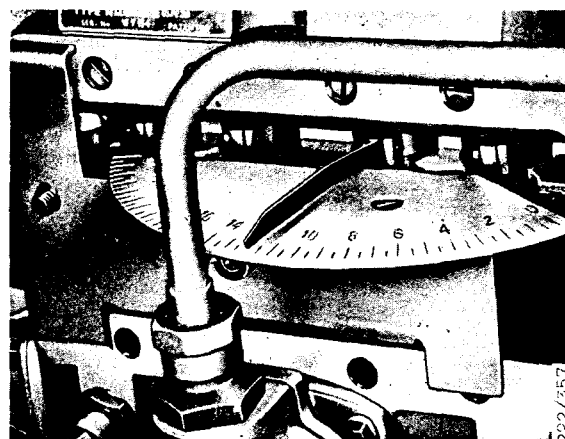


Fig. 5

Connection: Remove the side cover of the injection pump and screw on the measuring tool as shown in the figure. Attach the pointer and turn the scale to zero.

SE, SH

Reading: Check that the maximum control rod opening corresponds to the value punched onto the injection pump. Start the engine, let it warm up, and read off the control rod opening and r.p.m. at the full-load position.

2. Bosch P-design pump with smoke limiter of earlier design.

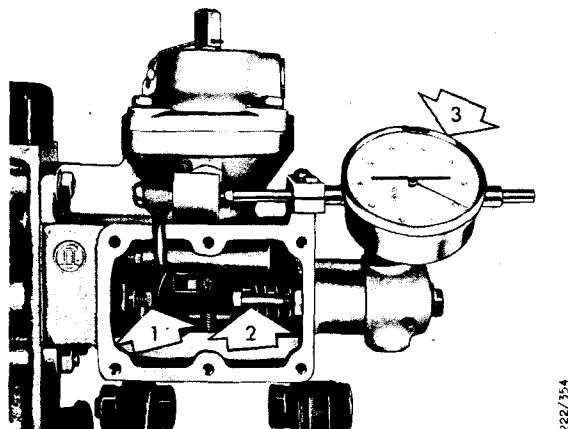


Fig. 6

Connection: Remove the side cover of the smoke limiter and the plug on the end of the smoke limiter, attach the measuring instrument as shown in the figure and zero the dial indicator.

Reading: Check that the maximum control rod opening corresponds to the value punched onto the injection pump. Start the engine, let it warm up, and read off the control rod opening and r.p.m. at the full-load position.

3. Bosch P-design pump without smoke limiter (RSV governor)

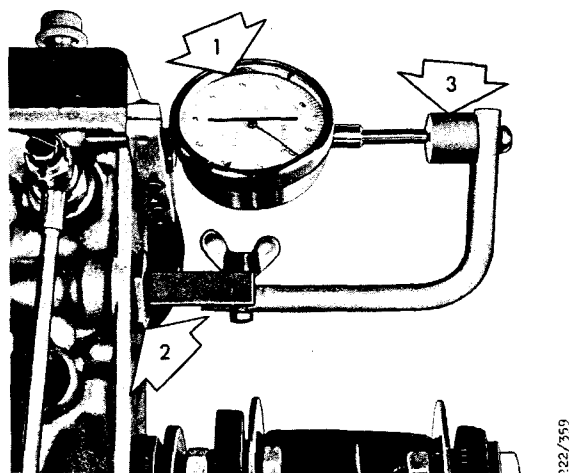


Fig. 7

Connection: Remove the sleeve over the control rod, attach the measuring instrument as shown in the figure and zero the dial indicator.

Reading: Start the engine, let it warm up, and read off the control rod opening and r.p.m. at the full-load position. When the load on the engine corresponds to the maximum out-put, check that the maximum control rod opening corresponds to the value punched onto the injection pump.

Note that the maximum control rod opening cannot be measured on a stationary engine if this is equipped with a governor of type EP/RSV 350–1100 P1/307R which features a so-called internal full-load stop.

4. Bosch P-design pump with smoke limiter of newer design.

See also the valid instructions for the fuel system and injection pump.

Measuring of feed pressure

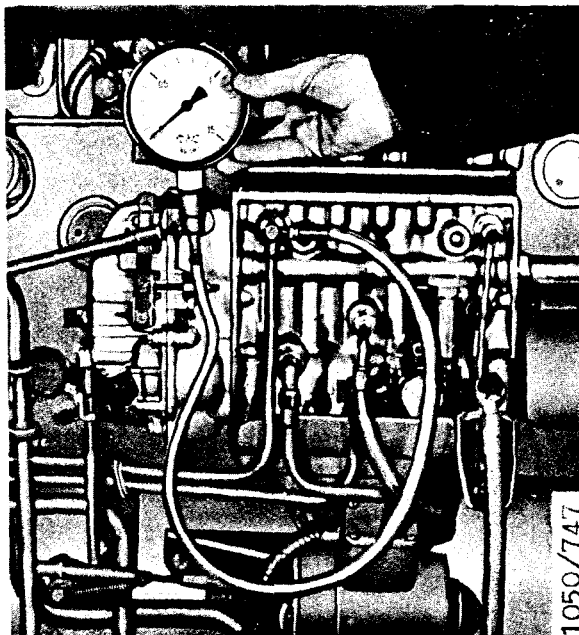


Fig. 8

Measuring range of instrument: 0–1.5 kg/cm².

Connection: The feed pressure in the injection-pump fuel chamber is measured by fitting a pressure gauge to the injection pump as shown in the figure. In doing this, remove the banjo screw for connection of the feed line to the injection pump and mount a banjo screw with a special measuring take-off, which is included in the instrument kit. Then connect the pressure gauge to the take-off on the banjo screw, using a suitable length of plastic hosing with a diameter of 6 mm.

Reading: Check with a tachometer and control rod opening indicator that the load on the engine corresponds to the maximum power take-off during measuring.

Prescribed measuring value: As stated in the relevant instructions.

Applies to: Separate Engines

Measuring of exhaust temperature

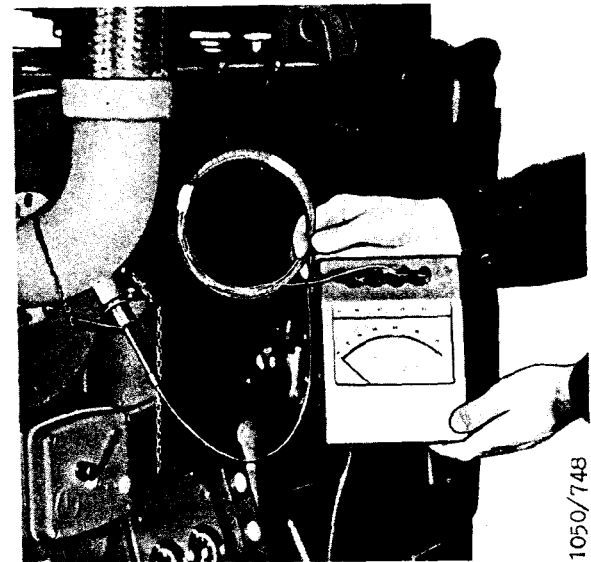


Fig. 9

Requisite measuring range: 300–700°C.

Connection: The detecting element (bulb) of the temperature gauge is inserted in the exhaust pipe as shown in the figure. Use the connection nipple and clamp included in the instrument kit and connect the detecting element as shown in the figure. Make sure that the bulb of the detecting element does not touch directly against the wall of the exhaust pipe, since this could lead to a misleading measuring result.

Reading: Check, possibly with a tachometer and control rod opening indicator, that the maximum is being extracted from the engine. Keep the engine loaded with the maximum power take-off until a steady state, i.e. a stable measuring value, is obtained. See also page 9.

Prescribed measuring value: See relevant instructions.

SE, SH

Measuring of exhaust back pressure

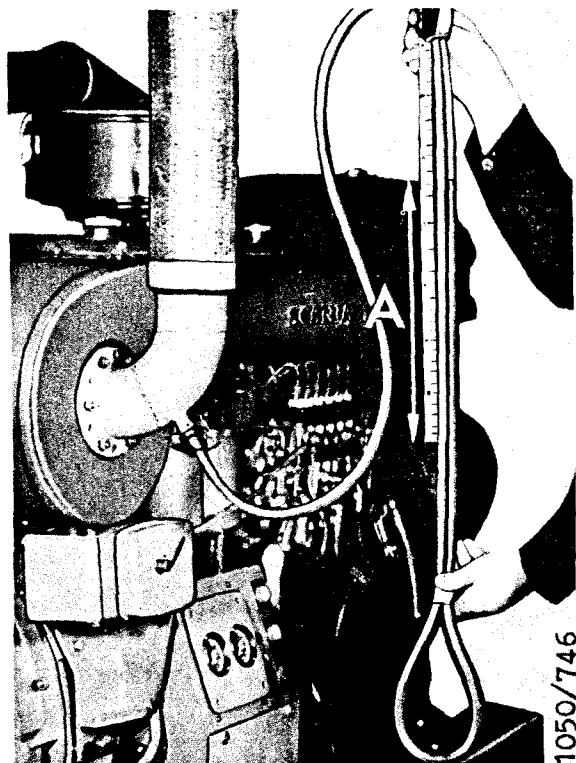


Fig. 10

Connection: Make a length of plastic hose with a diameter of 6 mm into a U-tube. Fill the U-tube half way with water and connect one of its legs to the pressure take-off on the exhaust line as shown in the figure. Adjust the length of the U-tube to suit the anticipated back pressure in the exhaust line. In attaching to the exhaust pipe, use an insertion tube, a connection nipple and clamping device, all these items are included in the instrument kit.

Reading: Check, possibly with a tachometer and control rod opening indicator, that the maximum output is being extracted from the engine. Keep the engine loaded with the maximum power take-off long enough for the pressure in the exhaust line to be built up and a steady state attained. Measure the vertical distance between the liquid levels in the two legs of the U-tube (dimension A in the figure) and note down the exhaust back pressure in mm water column.

Prescribed measuring value: See the relevant instructions (installation directions).

Measuring of turbocharging pressure in turbocharged engines

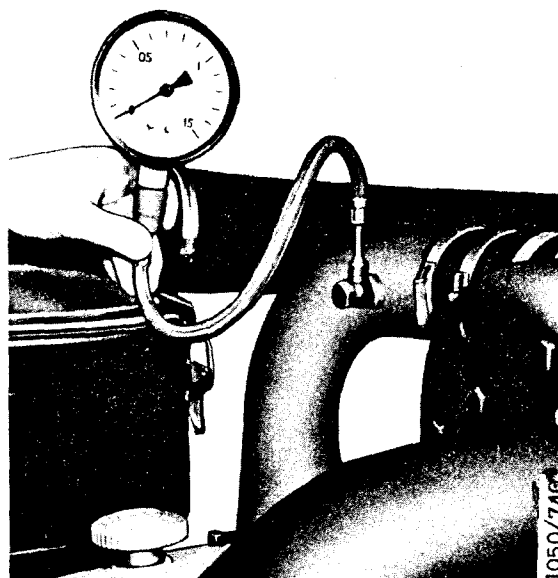


Fig. 11

Measuring range: Gauge pressure 0—1.5 kg/cm².

Connection: Connect a pressure gauge to the air pipe between the compressor outlet and the intake manifold as shown in the figure. Use a banjo connector (thread M14-1.5) and a plastic hose - these items are included in the instrument kit.

Reading: Check, possibly with a tachometer and control rod opening indicator, that the maximum output is being extracted from the engine. Keep the engine loaded with the maximum power take-off long enough for the pressure to be built up in the intake manifold and a steady state to be attained.

Prescribed measuring value: As stated in the relevant instructions.

Measuring of charging pressure and intake-air temperature on engines fitted with intercoolers

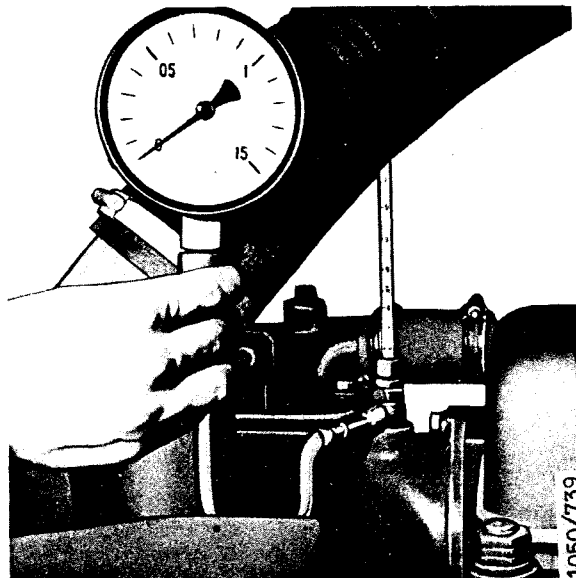


Fig. 12

Measuring range: Gauge pressure 0–1.5 kg/cm²
Temperature 0–100°C

Connection: A thermometer and a pressure gauge are connected to the pressure take-off on the intake manifold by means of the special banjo connector included in the instrument kit. See figure. Check that there is a clearance of a few millimeters between the thermometer bulb and the bottom of the connection.

Reading: Check, possibly with a tachometer and control rod opening indicator, that the maximum output is being extracted from the engine. Keep the engine loaded with the maximum power take-off long enough for the pressure to be built up in the intake manifold and for steady conditions of both pressure and temperature to be established.

Prescribed measuring values: Charging pressure as per the relevant instructions. The intake-air temperature after the intercooler will depend on the intake-air temperature, the sea-water temperature, the supercharging pressure and the condition of the sea-water system. In Scandinavian waters, the air temperature after the intercooler does not normally exceed about 40°C. If higher temperatures are experienced, our Service Department should be consulted for a closer examination and assessment of the test results.

Applies to: Separate Engines

Measuring the working pressure of the sea-water pump

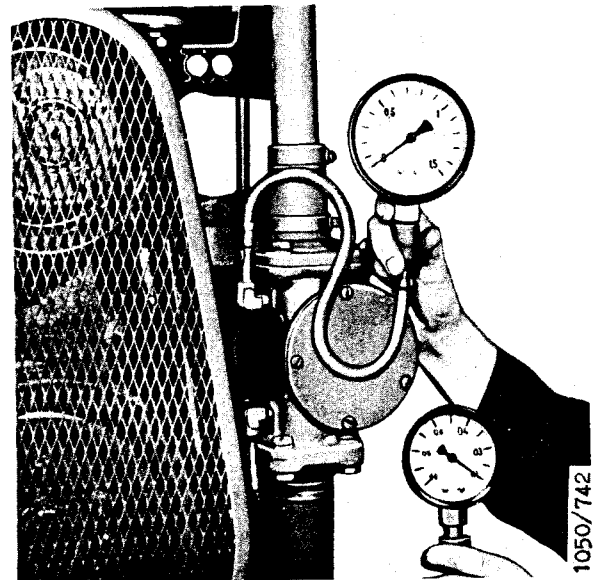


Fig. 13

Measuring range: Positive pressure 0–1.5 kg/cm²
Negative pressure 0–1.5 kg/cm²

Connection: Remove the nipples from the connection flanges of the sea-water pump and connect a pressure gauge and vacuum-meter to the delivery and suction sides of the pump respectively as shown in the figure. For this purpose, use a plastic hose of suitable length together with the special connection nipples included in the instrument kit.

Reading: Check with a tachometer that the engine is loaded at the maximum r.p.m. In marine installations, the speed of the vessel can influence the working pressure of the sea-water pump, and consequently the sea-water pressure should be measured when the vessel is running at full speed and the engine is running at full-load r.p.m.

Prescribed measuring values: As stated in the relevant instructions.

SE, SH

Measuring of lubricating-oil pressure in an engine

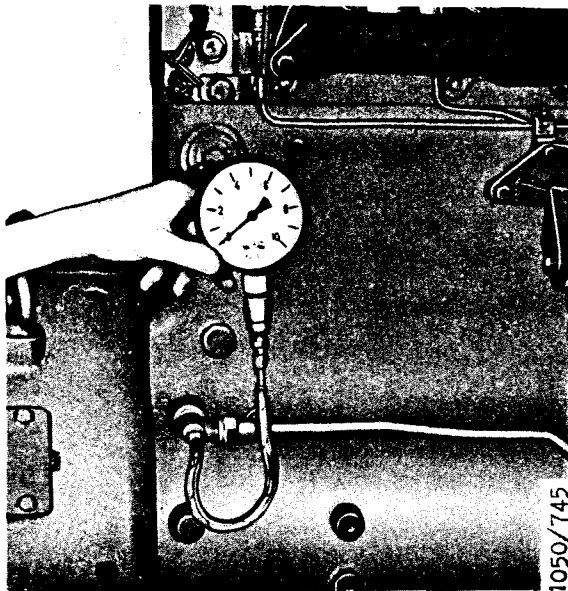


Fig. 14

Measuring range: Gauge pressure 0–10 kg/cm²

Connection: To check the engine oil-pressure gauge or when running an engine which does not feature an oil-pressure gauge, a pressure gauge can be connected to the take-off by the flywheel housing on the right side of the engine block as shown in the figure. The pressure gauge is connected by means of a flexible hose and a connection nipple, both of which items are included in the instrument kit.

Reading: Check the oil pressure at a coolant temperature of 80°C (thoroughly warm engine).

Prescribed measuring value: As stated in the relevant instructions.

Measuring of lubricating-oil temperature

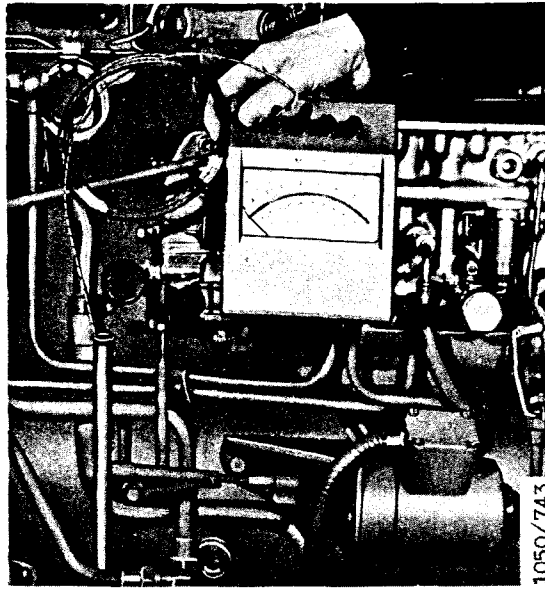


Fig. 15

Measuring range: 20–200°C

Connection: Insert the detecting element into the oil pan through the hole for the dipstick as shown in the figure. Make sure that the bulb of the detecting element goes below the surface of the oil and that it does not come into contact with the wall of the oil pan.

Reading: Check, possibly with a tachometer and control rod opening indicator, that the maximum output is being extracted from the engine. Run the engine at max. full-load r.p.m. and if possible with the maximum power take-off long enough for steady conditions to be established.

Prescribed measuring value: Approx. 110°C for continuous operation.

Additional Information regarding Exhaust Gas Temperatures

The temperature of the exhaust gases depends on numerous different factors, such as:

Engine loading, air pressure, intake-air temperature, air humidity, backpressure in the exhaust system, the point at which the temperature is measured in the exhaust system, etc. The exhaust-gas temperature is a measure of the thermic (heat) load on the engine.

A higher exhaust-gas temperature results from:

Larger power take-off, lower air temperature, higher intake-air temperature and moisture content. The converse conditions give a lower exhaust-gas temperature at otherwise unchanged operating conditions.

For turbocharged engines, the exhaust-gas temperature also varies with the turbo-charging pressure: a lower turbocharging pressure gives a higher exhaust-gas temperature and, conversely, a higher turbocharging pressure results in a lower exhaust-gas temperature.

For turbocharged engines featuring an intercooler, such as the DSI11R80, etc., an additional factor is that the exhaust-gas temperature will depend on the efficiency of the intercooler and on the sea-water temperature.

The exhaust-gas temperatures listed below are provided for the purpose of guidance, due allowance being made for normal differences in operating conditions.

The guide values assume normal atmospheric pressure (760 mm Hg), intake air with a temperature of +25°C and a negligible moisture content, a sea-water temperature of +20°C and an average turbocharging pressure value in accordance with our instructions.

If the temperature value found by measuring should appreciably exceed the corresponding temperature as listed below and cannot be attributed to an obvious fault, our Service Department should be contacted for consideration and closer evaluation of the result.

Guide values for exhaust-gas temperature in °C for engines with output settings for continuous operation:

Engine type**Exhaust temperature in °C**

	1500 r.p.m.	1800 r.p.m.
1 Non-turbocharged engines of series D5 and D8	500	550
2 Non-turbocharged engines of series D11	600	650
3 Supercharged engines except type DSI11	450	500
4 Engines of type DSI11 (at 195 and 230 h.p. setting respectively)	450	450

These values must be reduced by 50°C for engines fitted with water-cooled exhaust pipes (except for engines of type DSI11).

SERVICE SCANIA

PRODUCTS

grupp/group

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Work Description

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INSTALLATION INSTRUCTIONS FOR SEPARATE ENGINES AND ALTERNATOR UNITS WITH D8, DS8, D11 and DS11 ENGINES

- A Intake System — Engine Room Ventilation
- B Exhaust System
- C Cooling System
- D Fuel System
- E Electrical System
- F Monitoring System
- G Engine Suspension
- H Engine Alignment
- I Operating Controls for Engine Speed
- K Power Transmission — Power Take-Off
- L Multi-Engine Installations
- M General Classification Regulations
- N Engine Installation from the Standpoint of Service

A Intake System — Engine Room Ventilation

Air Intake for Engine

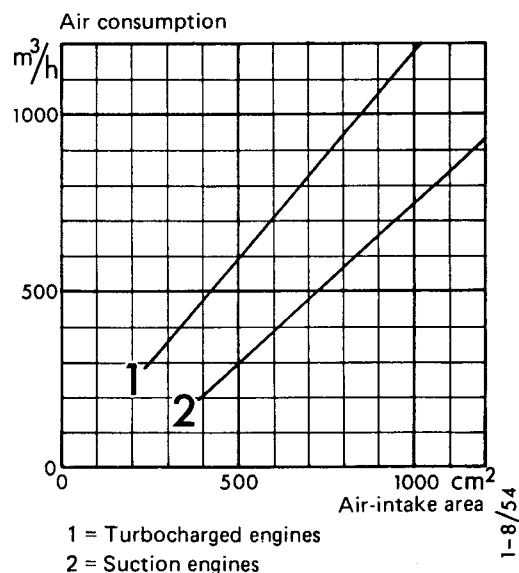
It is desirable for the engine to be provided with a fresh air intake, so that the intake air can be taken outside the engine room and conducted directly to the engine through a hose or the like. In this way, intake air at outdoor temperature is obtained, the implication being that the air temperature to the engine will automatically be the lowest possible. If the intake line is located in the vicinity of exhaust pipes or other warm parts of the engine, radiation protection should be provided so as to prevent unnecessary heating of the intake air.

In cases where a fresh air intake is not provided, an air intake must be located in the engine room wall, the opening being adapted to the volume of air consumed in the engine room so that no appreciable negative pressure develops in the engine room. The air intake should also be so elaborated that it cannot be shut off or blocked up inadvertently.

Engine air consumption in m^3/h at full output and different engine speeds:

Engine type	Engine speed, r/min					
	1500	1800	2000	2100	2200	2400
D8	300	360	400	—	—	480
DS8	480	610	720	—	—	890
D11	430	510	570	—	620	—
DS11	680	870	—	1050	1170	—

For the air consumption of the engine only, the area of the air intake can be found from the graph below.



If several engines or other oxygen-consuming units are installed in the same engine room the area of the air intake must be increased accordingly.

Air Temperature

The temperature of the engine intake air should not exceed $+35^\circ\text{C}$. The maximum permissible temperature is $+40^\circ\text{C}$.

As a rule, in installations where the intake air for the engine is taken directly from the engine room, this requirement implies that the engine room must be provided with a ventilation system (ventilation fan). The capacity of the ventilation fan can be calculated on the basis of the following data:

grupp	sekt	nr	sida
1c	AR	3	2

Radiation heat in kW at maximum output and an air temperature of +25°C (radiation heat in kcal/h in brackets). The values at 1500, 1800, 2000 and 2100 r/min are valid for continuous operation and those at 2200 and 2400 r/min for intermittent operation.

Engine type	Engine speed, r/min					
	1500	1800	2000	2100	2200	2400
D8	9 (8000)	11 (9000)	12 (10000)	—	—	14 (12000)
DS8 A02	14 (12000)	16 (14000)	17 (15000)	—	—	22 (19000)
D11 A04	—	—	—	—	19 (16000)	—
D11 A06	14 (12000)	15 (13000)	16 (14000)	—	19 (16000)	—
D11 A07	8 (7000)	9 (8000)	—	—	—	—
DS11 A05	—	—	—	—	34 (29000)	—
DS11 A06	23 (20000)	27 (23000)	—	29 (25000)	—	—
DS11 A07	12 (10000)	14 (12000)	—	15 (13000)	—	—

The radiation heat from the engine thus amounts to 13–16% of the useful power output in the case of an installation with a non-water-cooled exhaust pipe and without a heat exchanger.

Allowance must also be made for the radiation heat from the exhaust line extending from the engine. The amount of this heat depends on how large a part of the line is located within the engine room and on if it is insulated.

In addition to the above is the amount of heat on account of efficiency losses on the part of driven units and heat emission from the cooling water cooler if this is located in the engine room.

In an engine room with a fresh air intake for the engine, implying that the intake air for the latter is taken directly from outside the engine room in the manner described above, the engine room temperature can in contrast be permitted to rise to a maximum of 60°C without risk of damage to engine components. If the temperature exceeds this value, there is a risk in the first instance of functional disturbances on the part of the alternator, the charging regulator for the latter, and the magnetic cut-out. This means that a ventilation fan may be necessary also for engine installations provided with a fresh air intake.

Location of Air Intake and Air Filter

The air intake must be located so that engine exhaust gases cannot mix with the intake air and where the air otherwise is as clean as possible. The air intake should be so elaborated that water, snow and other impurities cannot enter it.

For D8, DS8 and D11 engines there is an air filter of oil-bath type. For D11 engines, a dry filter is available as an alternative. The DS11 engine has only a dry filter. These dry filters can be fitted either vertically or horizontally. When mounted horizontally, the filter must be turned so that the dust release slot in the filter dust collector faces upwards (see Fig. A1) and the removable part turned so that the marking "TOP" comes upwards.

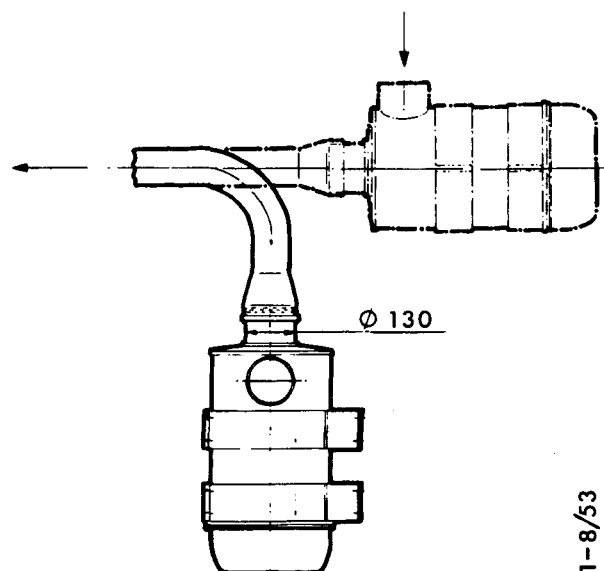


Fig. A1

Flow Resistance in Engine Intake Line

If the engine has a fresh air intake, i.e. a special line for the intake air, the pressure drop for this line has to be measured. The maximum permissible pressure drop is approx. 300 mm water column, which figure also includes the resistance of the air filter used in a clean condition. If the pressure drop is excessive, there is a risk that the amount of air supplied to the engine will be insufficient or that other disturbances will occur.

The above check can, however, be regarded as superfluous if the area of the line used amounts to at least 130 mm for DS11 and 100 mm for D8, DS8 and D11 and if the line is not more than 5 metres in length. This also presupposes that there are no sharp bends in the line.

If a hose is used as an air line it must be reinforced so that it cannot be sucked together.

Crankcase Ventilation

The gases from the engine crankcase should preferably be led out of the engine room via a separate line. On **non-turbocharged** engines, however, they can also be conducted to the engine intake system between the air filter and the engine.

When turbocharged engines are involved, every effort should always be made to lead the crankcase gases out of the engine room, as the condensate from the gases fouls the intake system (turbocharger etc.), which has a detrimental effect on its efficiency. In installation cases where this would imply a long ventilation line and a costly installation, the gases can, however, be led to the intake line between the air filter and turbocharger of the engine even on engines with a turbocharger. This, however, would necessitate regular cleaning of the turbocharger.

Crankcase gases should not be led to the engine air filter if this is of dryfilter type.

The crankcase ventilation line is appropriately made from a pipe or a plastic hose which is connected to the ventilation pipe on the engine. The inside diameter of this line should be at least 24 mm up to a length of 5 m. For longer lines, a comparatively bigger diameter should be chosen. A crankcase ventilation line that emanates outside the engine room should be protected so that impurities cannot penetrate down into the crankcase. If a pipe is used, a flexible hose must be provided between the engine and the pipe to take up the movements of the engine. If a plastic hose is used, it must be ensured that it is firmly clamped on and that there are no sharp kinks or bends in the hose. The line from the engine out of the machine room must rise the whole way in the direction from the engine. If the line is arranged so that a depression is formed oil condensate can remain in this and cause overpressure in the crankcase. An abnormally high overpressure in the crankcase can lead to leakage of lubricating oil.

B Exhaust System

Sound Damping

Mufflers are used in most engine installations.

The need for a silencer must, however, be judged from case to case in view of acceptable noise level, exhaust line length, position of exhaust line opening, etc. Thermal insulation of the exhaust line also influences the noise level in such a way that the exhaust noise will be louder with an insulated line than with an uninsulated one.

In those cases in which a muffler is to be fitted it should be installed as far away as possible from the engine. It should not, however, be sited in the end of the exhaust line but positioned roughly 1 metre from the opening. If space limitations prevent the muffler from being sited close to the exhaust opening it should be located as close as possible to the engine. It is then often advisable to fit a booster muffler close to the exhaust opening, whereby possible resonance vibrations in the exhaust line after the muffler will be absorbed.

The choice of muffler is suitably made in consultation with our Engine Sales Department.

When particularly exacting demands are made on a low noise level, for instance at hospitals, a sound-insulation cell for the exhaust gases can be built. More detailed instructions about this can be obtained from the Engine Sales Department.

Connection and Location of Exhaust Line

In view of engine movements when the engine is rubber suspended and of the changes in length occurring in the exhaust line in consequence of temperature changes in the line, some type of flexible connection should be provided between the exhaust line and the engine. The need for such a flexible connection is particularly great in the case of engines with a turbocharger in order to prevent damage to the latter. For this purpose, the exhaust line can be fitted with a so-called compensator.

grupp	sekt	nr	sida
1c	AR	3	4

The compensator consists of several layers of deep-pleated stainless plate and can absorb both lateral and longitudinal movements (Fig. B1).

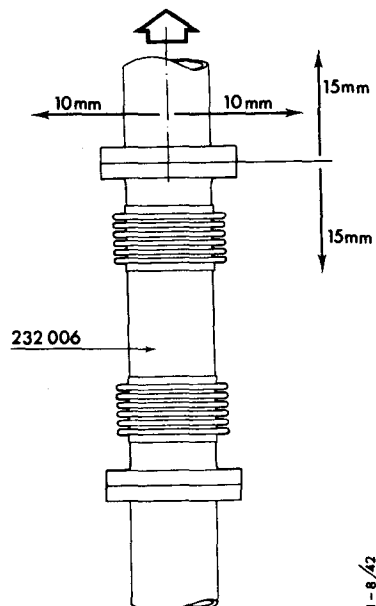


Fig. B1

Compensator 232006 intended for D8, DS8, D11 and DS11 engines permits at the same time a maximum lateral displacement of 10 mm and a maximum longitudinal displacement of ± 15 mm. If only longitudinal movements are involved, a displacement of $\begin{matrix} +15 \\ -50 \end{matrix}$ mm can be permitted. Allowance must

be made for changes in the length of the exhaust pipe between cold and hot states so that the limits given above for the longitudinal absorption capacity of the compensator are not exceeded.

A bracket or the like should be sited directly after the exhaust hose or compensator so that the weight of the exhaust line does not exert a load on the flexible connection and possible turbocharger.

Dimensioning the Exhaust Line

The diameter of an exhaust line should be calculated in the following manner:

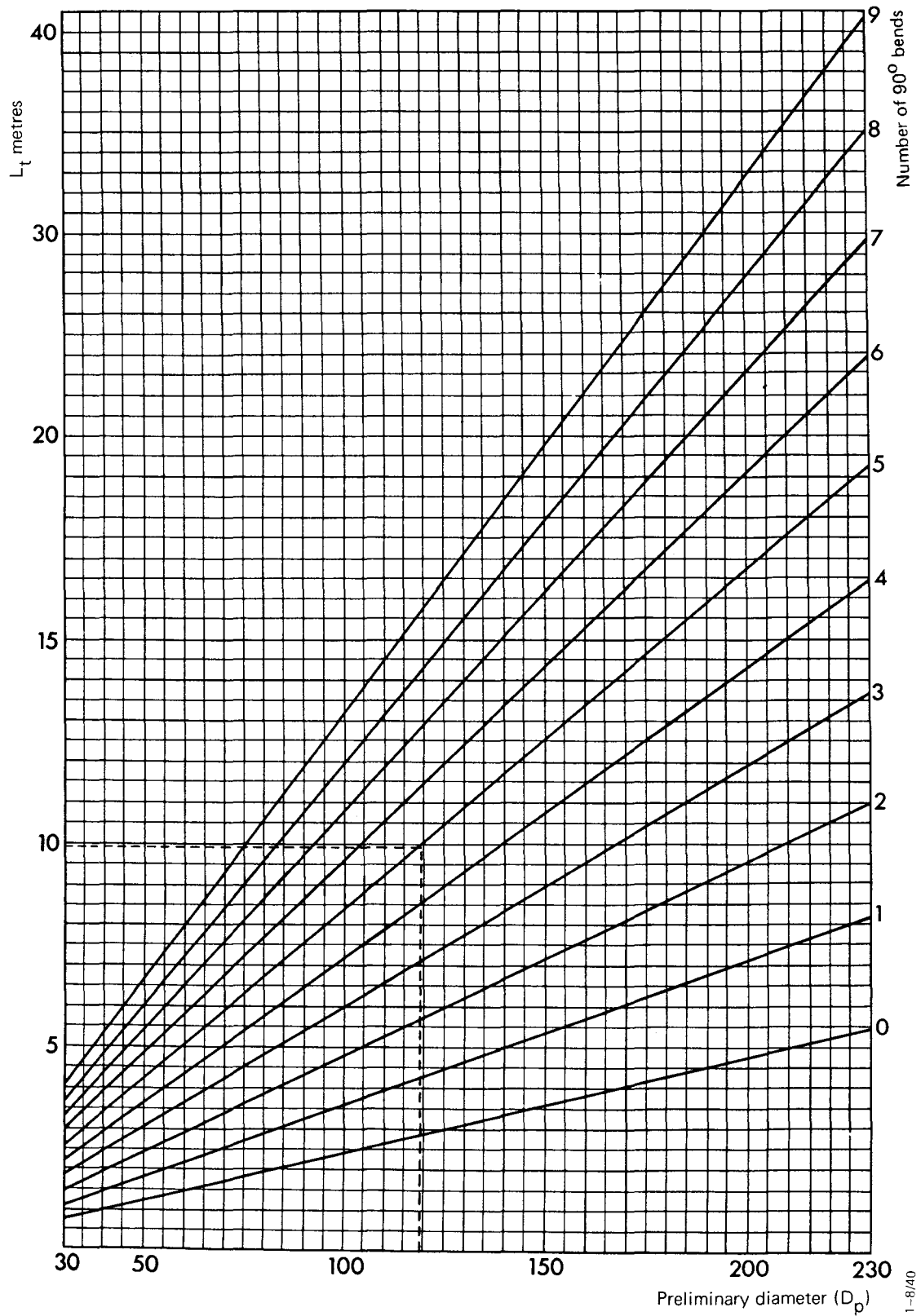
- Measure the length of the planned exhaust line.
- Determine a preliminary inside diameter (D_p) for the exhaust line from the table below.
- Calculate how many 90° elbows will be included in the exhaust line. Two 45° elbows are equivalent to one 90° elbow and so on.
- With the aid of the preliminary diameter D_p and the number of 90° elbows, which are converted into straight pipe with the same total resistance value, an additional length (L_t) is determined from the diagram (Fig. B2).

With the additional length, allowance is made for the resistance in pipe bends and the discharge resistance in the line opening. Note that an additional length must therefore be allowed for even if the exhaust line does not have any pipe elbows (line "0" in the diagram).

- Add the calculated additional length (L_t) to the measured length (L_u) and, with the obtained figure as a guide, read off the final inside diameter in the table. Choose the next bigger standard diameter.

Exhaust Line Inside Diameter, mm

Engine type	Speed r/min	Muffler Art. No.	Exhaust line length, m									
			5	10	15	20	25	30	35	40	45	50
D8	1500	242337 or 243740	66	66	66	66	66	71	73	75	77	79
	1800		66	66	68	72	75	78	80	83	85	86
	2000		66	67	72	77	80	83	85	88	90	92
DS8	1500		86	86	86	91	95	99	102	104	107	109
	1800		86	91	99	105	110	114	117	120	123	126
	2000		100	115	125	132	138	143	148	152	155	158
D11	1500		86	86	86	86	86	86	86	86	88	90
	1800		86	86	86	86	86	87	90	93	95	97
	2000		86	86	86	86	90	93	96	99	101	103
DS11	1500	188155	91	104	113	120	125	130	134	138	141	144
	1800		112	128	139	147	154	159	165	169	173	177
	2100		Resistance exceeds 500 mm w.c..									
	1500		86	95	103	109	114	118	122	125	128	131
	1800		91	104	113	120	125	130	134	138	141	144
	2100		98	113	122	130	136	141	145	149	152	156



AR

grupp	sekt	nr	sida
1c	AR	3	6

Example: Engine type DS11A06
Operating speed: 1500 r/min
Muffler: Part No. 188155

- 1) Measured length (L_U) = 30 m
- 2) Preliminary inside diameter (D_p) = 118 mm
- 3) Number of 90° elbows = 4
- 4) Additional length (L_t) = 10 m
- 5) Total length (L_{tot}) = $L_U + L_t$ = 40 m
- 6) Definite inside diameter = 125 mm

The pipe bends on the exhaust line must be of a construction with a large radius of bend.

The inside diameter calculated as above assumes that the exhaust line is insulated so that no increase in the inside diameter need be made on that account.

Back Pressure in the Exhaust Line

The back pressure in the exhaust line may reach a value equivalent to max. 500 mm water column for turbocharged engines and max. 1600 mm water column for non-turbocharged engines. The back pressure should be checked after installation and must be measured near the point where the exhaust line is connected to the engine. While measuring, the engine should be run at maximum load and max. r/min.

Exhaust Line Insulation

The need for insulation of the exhaust line must be judged from case to case. If there is an internal air intake for the engine, the exhaust line should be insulated particularly thoroughly in order to limit the engine temperature. Another reason for insulation is, for example, the risk of the machine personnel contracting burns and to reduce the cost of ventilation, etc. Be particularly careful about the insulation at bushings or in the vicinity of combustible material.

Protection against Penetrating Water

Rain or condensation water that penetrates into the engine can cause corrosion damage. For this reason, the exhaust line should be protected in order to prevent this.

Long exhaust lines should be provided with a condensation water separator to be sited after the flexible connection but not too far from the engine. A cleanable water trap should be attached to the condensation water separator. Even in the case of short exhaust lines, it can be appropriate to provide a condensation water separator if there is a risk of rainwater entry. This risk can also be eliminated by using a self-closing cover over the exhaust line opening (Fig. B3).

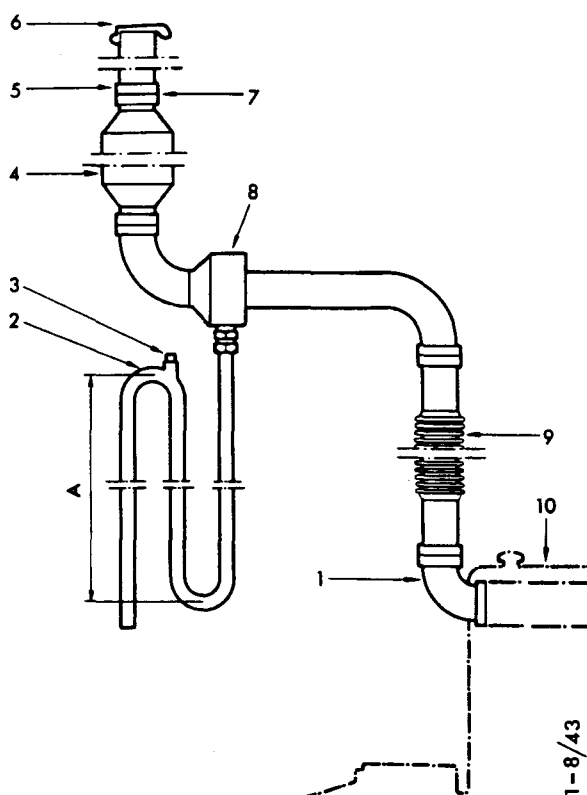


Fig. B3

Exhaust pipe with compensator, condensation water separator and protective cover

1. Elbow
2. Pipe 1"
3. Plug R 1/2"
4. Muffler
5. Flange
6. Protective cover (self-closing)
7. Gasket
8. Condensation water separator
9. Flexible connection
10. Engine

$A = 1700$ mm for non-turbocharged engines
600 mm for turbocharged engines

Multi-Engine Installations

In the case of multi-engine installations, a separate exhaust line should be provided for each engine wherever possible.

If the exhaust lines from several engines are joined to a common line, the same dimensioning principles apply for each branch line as for the exhaust line to the single-engine installation as described above. The area of the common exhaust line will finally be dependent on its length but it must at least correspond to the total area of the branch lines.

In those cases where several engines are connected to a common exhaust line there should be an easily operated and effective shut-off device in each branch line. This is very important, as otherwise the exhaust gases from the engines which are in operation can penetrate into an engine which is not in operation and cause corrosion damage and other damage. In the worst case, the exhaust gases can also penetrate into the machine room.

C Cooling System

The cooling needs of the engine depend on the amount of output, the execution of the engine installation and the operating environment. Experience shows that this matter should be carefully considered when ordering the engine unit.

Information in respect of available cooling equipment (fans and coolers) can be obtained from the Engine Sales Department.

If the engine is delivered without cooling equipment from the factory, it is necessary to make sure in the first instance that the cooler to be used for the operating conditions concerned is adequately dimensioned. If a driven unit is also cooled via the engine cooling system then this system must obviously have a margin for this additional heat.

Pressure Loss in the Cooling System

Cooling water pipes and hose connections between engine and cooler must have ample dimensions and be practically elaborated also in other respects, as otherwise the cooling capacity can be reduced. The inside diameter of the coolant lines should be at least 45 mm (2") for all engine types. If the total length of line exceeds 8 m, or if several elbows and valves are incorporated on coolant lines, the diameter should be increased so that the flow resistance will not be too great. The pressure loss in the cooling system connected to the engine may not exceed the values given in the table below.

Permissible pressure loss in bar (kp/cm²) in the cooling system connected to the engine to obtain sufficient cooling water circulation.

Engine type	Engine speed, r/min					
	1500	1800	2000	2100	2200	2400
D8	0,30	0,43	0,50	—	—	0,60
DS8	0,30	0,35	0,40	—	—	0,50
D11	0,40	0,60	0,65	—	0,70	—
DS11	0,30	0,40	—	0,50	0,55	—

In doubtful cases, the pressure loss in the cooling system connected to the engine and the quantity of coolant flowing through it should be measured. The thermostats must then be blocked in the open position. The pressure loss is measured at the inlet and outlet on the engine. Since it is the cooling capacity margin that is of interest in the final analysis, it is advisable in connection with the said test to measure the coolant temperature at the outlet from the thermostat housing when the engine is giving maximum output. Should the temperature in a faultless and clean cooling system approach 65° at the point mentioned, this implies that the cooling system can be insufficient under conditions which are more unfavourable than those prevailing during the test.

Requisite Water Throughput

Requisite water throughput in litres per minute at full load and in continuous operation

Engine type	Engine speed, r/min					
	1500	1800	2000	2100	2200	2400
D8	120	150	170	—	—	200
DS8	120	170	190	—	—	230
D11	170	190	220	—	250	—
DS11	180	220	—	260	270	—

The values given in the table above assume that the water pump speed is 1.09 times the engine speed on D8 and DS8 engines and 1.19 times the engine speed for D11 and DS11 engines. For D8 and DS8, ratios of 1.19:1 and 1.30:1 are also obtainable (the latter, however, not for engine speeds above 2100 r/min). For D11 and DS11 engines, the ratio of 1.30:1 can be obtained for operating cases where the engine speed does not exceed 2100 r/min.

The cooling system must always be arranged so that the coolant is able to expand. The connection between engine and expansion vessel must be made with a uniform rise so that the risk of air or steam packets is eliminated. Valves allowing coolant lines to be shut off should never be permitted. The expansion tank must be sited somewhat higher than the highest part in the rest of the cooling system.

A venting pipe should be connected between the cylinder heads and expansion tank if the engine slopes forwards in order to prevent air from being collected and deteriorating the cooling in the cylinder heads.

In order to reduce the cavitation risk in the water pump, the expansion tank can be connected to the suction side of the water pump. In such cases, provisions must be made for venting of the upper part of the cooler by fitting a venting line between cooler and expansion tank.

Venting lines should not have a larger inside diameter than approx. 5 mm so that the water flow through them will not be too great.

grupp	sekt	nr	sida
1c	AR	3	8

Removed Heat

The amount of heat to be removed from the engine by the cooling system is indicated in the table below. The amount of heat is stated in kW (kcal/h) and the values at 1500, 1800, 2000 and 2100 r/min are valid for maximum continuous load at these engine speeds. At engine speeds of 2200 and 2400 r/min, the values are valid for maximum load at intermittent operation and these speeds.

Thermostats

Thermostats are available for different opening temperatures (i.e. the temperature at which the thermostat starts to open). The thermostats available are the following:

Engine type	Thermostat	Opening temperature
D/DS8	251899	79°C
	255502	83°C
D/DS11	238156	75°C
	228842	79°C
	255501	83°C

Engine type	Engine speed, r/min					
	1500	1800	2000	2100	2200	2400
D8	54 (46000)	63 (54000)	70 (60000)	—	—	73 (63000)
DS8 A02	61 (53000)	73 (63000)	81 (70000)	—	—	100 (86000)
D11 A04	—	—	93 (80000)	—	105 (90000)	—
D11 A06	75 (64000)	87 (75000)	95 (82000)	—	116 (100000)	—
D11 A07	93 (80000)	109 (94000)	95 (82000)	—	—	—
DS11 A05	—	—	—	—	135 (116000)	—
DS11 A06	92 (79000)	106 (91000)	—	116 (100000)	133 (115000)	—
DS11 A07	115 (99000)	132 (114000)	—	145 (125000)	—	—

D. Fuel System

1 General

The negative pressure in the feed pump suction line, caused by the static suction head, the flow resistance in the fuel line and possible extra fuel filters, must not exceed 0.2 bar (0.2 kp/cm²), which must be checked while the engine is running at full output. On the other hand, if the fuel tank is sited higher than the engine's injection pump a shut-off valve should be installed in the fuel line to the feed pump and shut off when operation is interrupted. The highest fuel level in relation to the feed pump must not exceed 3.5 m. In cases in which a greater difference in level may possibly be required for technical installation reasons, the circumstances should first be discussed with the Engine Sales Department. If pos-

sible, fuel pipes should consist of steel pipes and be connected to the engine with flexible couplings so that they will not be exposed to breaking stresses. This is particularly important in the case of a soft engine suspension. Flexible hoses for this purpose can be obtained from Saab-Scania AB. Such hoses must not be bent more than 90° and the bending radius must not be less than 115 mm. The fuel line to the engine should have an inside diameter of at least 8 mm for lengths up to 8 m. If the suction line is longer, a proportionately bigger diameter will be required. The fuel line should be so located that the fuel is not heated up appreciably by sources of radiation possibly present in the engine room.

In cases of operation where there is a risk of water getting into the fuel a water-separating fuel filter should be fitted. In cases where the demand on operational safety is particularly great, it is also appropriate to fit extra fuel filters of reversible type.

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1c	AR	3	9

On engine installations liable to be subjected to low outdoor temperatures an extra filter should be fitted, if possible, in the vicinity of the engine so that radiation heat from the engine heats the filter slightly and prevents the risk of a freeze up in the filter. Note that the filters fitted as standard on the engine are not replaced by the above-mentioned extra fuel filters. The return line from the over-flow valve should be taken to the fuel tank and must not be connected to the suction line. The return line should have the same diameter as the suction line.

The fuel tanks should be manufactured of steel plate. The tanks must be welded and, if necessary, provided with baffle plates. In addition, they should be provided with sludge and water separators with drain cock, so as to allow any sludge and water that has sunk to the bottom of the fuel tank to be drained off. The fuel line from the tank should protrude roughly 5 cm above the bottom of the tank and in the uppermost part of the tank there should be a connection to the outer air, e.g. through a special ventilation hole in the cap of the filler pipe. Drainage should be arranged so that there will be no risk of fire occurring or of damage to ground-water if the tank should be overfilled.

After manufacturing, the tanks must be thoroughly cleaned and, if necessary, pressure-tested. After this, it is recommendable that the tanks be anti-rust treated on the inside with a water-repellent oil. Suitable grades of oil are supplied by most oil companies. Proceed in accordance with the regulations issued by the oil company when applying the oil. The tanks should be painted on the outside with a rust-protective paint. Note that the tanks must not be painted on the inside. Nor may they be galvanized.

E Electrical System

General

The nominal voltage of the system is 24 volts. The operating voltage can amount to 28 volts, which means that light bulbs intended for this latter voltage must be used.

Batteries

The batteries normally used are lead batteries of "storage battery" type (which are able to supply high current intensity for a short period of time). In some cases, Nife batteries (alkaline) are used.

When lead batteries are used, two 12-volt batteries must be connected in series.

In cases where lead batteries of standard type are used, a minimum capacity of 190 Ah (ampere-hours) is recommended. This normally allows starting even of an engine which has been exposed to severe cold.

N.B. If the engine is provided with an alternator, the master switch, if any, must not be turned off or the batteries removed while the engine is running, as peak voltages from the alternator can then damage charging regulator components.

Charging Regulator for Bosch Alternator

The ambient temperature for this regulator may not exceed +100°C. When installing, bear in mind that faulty connection of the regulator can damage it.

The regulator is set for charging of lead batteries.

In certain installations where the battery is used only for starting, instrument lighting, etc., the batteries can easily become overcharged. In such cases, two or more 35 W bulbs can be connected after the master switch. A suitable connection point is at position 10 in Fig. E1. The bulbs may not be connected on the lines between the regulator and alternator.

Cables

With the exception of the starter motor cables, all wiring on the engine is completed upon delivery if the customer so wishes. All cables from monitors and checkpoints are then drawn to a connection box fitted with a glove-type contact. An instrument cabinet is connected to this connection box with a special cable. This cable, which is permanently connected to the instrument cabinet, is 3 m long and has a special contact by means of which it is connected to the connection box on the engine. The cable can be lengthened, and for this purpose extension cables with lengths of 5 and 10 metres are available. They are fitted with contacts, one male and one female, at the ends.

The connection box for the alternator unit instrumentation (with marine cable quality) is sited at the back on the right-hand side of the engine. The connection box for the instrumentation of the separate engine is located at the rear end of the engine. As the connection box in the latter case is provided with a 1.5 metre long cable, it is possible to move it from engine to chassis or the like within 1.5 metres from the front end of the engine where the cable is clamped on.

grupp	sekt	nr	sida
1c	AR	3	10

In cases where other instrumentation is wanted and a connection box and wiring are not provided on the engine all cables on the engine, with the exception of starter motor and alternator cables should be gathered at a terminal block. From this terminal block, which should be located where it is protected from water and oil, the cables are led collected and marked. The cables must be firmly clamped. Moreover, the cables should be led away from the engine at the bottom where its movements are the least. This is particularly important in the case of soft rubber suspension.

The starter motor wire section in mm^2 is indicated in the table below. Note that it is the total length of positive and negative wires that must be used when determining the section. The minimum permissible wire section is 50 mm^2 .

Total length	Section
up to 2 metres	50 mm^2
up to 3.5 metres	70 mm^2
up to 5 metres	95 mm^2
up to 7 metres	120 mm^2
up to 9 metres	$2 \times 70 \text{ mm}^2$
up to 12 metres	$2 \times 95 \text{ mm}^2$
up to 17 metres	$2 \times 120 \text{ mm}^2$

Locate the wires so that they are not subjected to wear or damage of any other kind.

Master Switch and Fuses

It will often be desirable for the master switch to be connected between the batteries and the starter motor. For a unipolar system, **one** master switch is needed and this is appropriately connected to the negative line. For a two-pole system, **two** master switches are needed, one on the positive line and one on the negative line. In addition, the electrical system must be protected by fuses (compare the section on "Fusing Up Charging Circuits"). The master switches and main fuses, if any, should be placed as close as possible to the battery. Fig. E1 shows, in principle, how the wiring should be arranged. A detailed circuit diagram is provided with each separately delivered engine.

Starting Block Relay

In multi-engine installations where the engines are started from an operating station outside the machine room or where, for instance on account of other machine noise, it is difficult to decide whether or not an engine is running, a starting block relay should be connected into the circuit to provide additional safety. The starting block relay prevents connection of the starter motor for an engine that is already running.

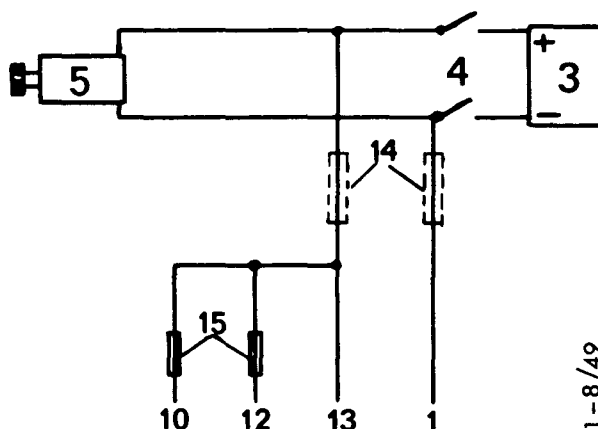


Fig. E1

- | | |
|---------------------------|---------------------------------|
| 1. Alternator | 9. Block diode |
| 2. Charging regulator | 10. To extra current consumers |
| 3. Battery | 11. Starting switch |
| 4. Master switch | 12. To instruments |
| 5. Starter motor | 13. To possible ammeter |
| 6. Relay | 14. Main fuses |
| 7. Discharge warning lamp | 15. Fuses |
| 8. Battery relay | 16. Operational selector switch |

Parallel Operation with Electrical Alternators

In multi-engine installations it is often desirable to allow the charging alternators on two or more engines to charge the same group of batteries. With the Bosch alternators and charging regulators supplied as standard connection can be made without any extra arrangements being necessary.

Protection Equipment for Bosch Alternators

As stated, the alternator may be operated only with charging regulator and battery connected, as otherwise damage can be incurred to the rectifiers and regulator. Involuntary interruptions in certain lines owing to cable fractures, loose cable terminals, etc., have the same detrimental effect and for this reason the alternator manufacturer has prepared protection equipment which can be used when deemed appropriate.

a) Protection against Excess Voltages and Connection to Alternator

The alternating current plant is sensitive to high excess voltages, which involve a risk of damage to transistors and rectifier diodes. Even in normal circumstances, e.g. when electrical consumers of inductive type (e.g. relays) are engaged or disengaged, inductive voltage peaks arise in the system and can result in damage to the diodes and transistors. For this reason, the Bosch alternator provided as standard is equipped with a condenser as protection against such voltage peaks. The condenser also serves to suppress radio interference.

The condenser capacity, however, is not sufficient for high voltage peaks which can occur if, for instance, the master switch should be turned off or a cable break so that the alternator is separated from the battery during operation. The same thing applies if consumers are engaged and disengaged at relatively high load and high alternator speed without the battery being connected to the circuit. Excess voltages of this magnitude are, however, damped down to a non-harmful level if a special excess voltage protector is used. If necessary, get in touch with the Engine Sales Department.

b) Protection against Disconnection of the Battery during Operation

(This protection is not needed if the plant is equipped with special excess voltage protection). To prevent disconnection of the battery during operation (e.g. if the master switch is accidentally switched off while the engine is running), an auxiliary relay (order No. 137691) can be connected up via the master switch as shown in diagram E2. The relay coil is energized as soon as the alternator charges, so that the circuit from 30/51 to 87 is closed and the battery is thus connected to the alternator even if the master switch is off. In a bipolar system with master switches in both the positive and the negative lines, a relay is connected via each master switch part, relay terminal 85 being connected to terminal B-/D- on the alternator. Instead of two relays of the type indicated, it is possible to use one relay with two closing contacts with a corresponding loading capacity.

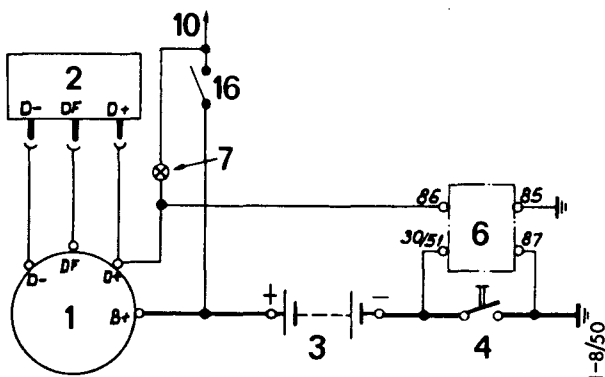


Fig. E2

- | | |
|---------------------------|---------------------------------|
| 1. Generator | 9. Block diode |
| 2. Charging regulator | 10. To extra current consumers |
| 3. Battery | 11. Starting switch |
| 4. Master switch | 12. To instruments |
| 5. Starter motor | 13. To possible ammeter |
| 6. Relay | 14. Main fuses |
| 7. Discharge warning lamp | 15. Fuses |
| 8. Battery relay | 16. Operational selector switch |

c) Protection against Polarity Faults

If, in conjunction with fitting, the battery is faultily connected so that the battery cables are confused there is also a risk of damage. This risk can, however, be precluded by installation of a polarity protector. In a plant with an ordinary battery isolator, a particularly fast-reacting fuse can be used, which is to be connected in series in the positive circuit in the vicinity of clamp B on the alternator and which is to be attached to an insulated base. See also under the heading "Electromagnetic Master Switch" below.

d) Electromagnetic Master Switch

Instead of battery master switches of conventional type a battery relay can be used. This, which can be termed an electromagnetic master switch, permits a blocking diode to be connected as polarity protection instead of a "polarity fuse". The battery relay is operated with the switch for instrumentation and monitoring so that the battery is disengaged as soon as the switch is put to the off position. In a unipolar system, the battery relay is connected as shown in diagram E3.

A relay has also been included here (order No. 137691), which prevents isolation of the battery while the alternator is still charging. The order number for the blocking diode is 197812.

In a bipolar system, where there is a demand for both positive and negative connections on the battery to be disengaged, duplication of the equipment will be necessary, i.e. two battery relays (order No. 197811), two diodes (order No. 197812) and two relays (order No. 237722) will be required. The latter can be replaced by a relay with two closing contacts, in which case the wiring will be as shown in diagram E4.

In the coil of the battery relay, the intensity of the working current is 4.5A and that of the holding current 0.3A. The main contacts can be loaded with 200 A continuously and with 2.500 A during one second.

In the operating circuit to terminal 86 on the battery relay, the voltage drop must not exceed 0.5 V and consequently the cable section must be at least 0.16 L mm² when the cable lengths is L metres.

Fusing up Charging Circuits

For fusing up circuits in which an interruption would lead to such consequences as dealt with above, Bosch advise against the use of ordinary fuses of motor vehicle type, which are secured with spring force. Instead, Bosch have produced special fuse boxes containing two fuses of leaf type which are screwed on. Other fuse types where the fuse is screwed on, e.g. Diazed fuses, can of course also be used.

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Bosch fuse box with two 50 A fuses, which are suitable for a 35 A alternator has order number 197813, inclusive of fuses. The corresponding box intended for two 100 A fuses for a 80 A alternator has order number 273286 (without fuses). Reserve fuses have order number 193538 for 50 A and 269933 for 100 A.

Radio Interference Suppression of Electrical Equipment

As standard, the Bosch alternator is fitted with an interference suppression condenser and consequently additional precau-

tionary measures will have to be adopted only in exceptional cases. If necessary, get in touch with the Engine Sales Department.

Electric Welding

When carrying out electric welding in the vicinity of an engine equipped with an alternator the wires between the alternator and the battery and between the alternator and the charging regulator should be disconnected.

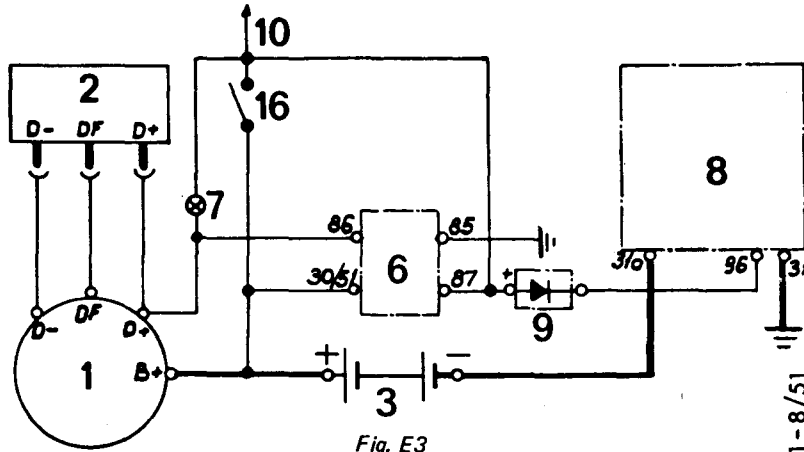


Fig. E3

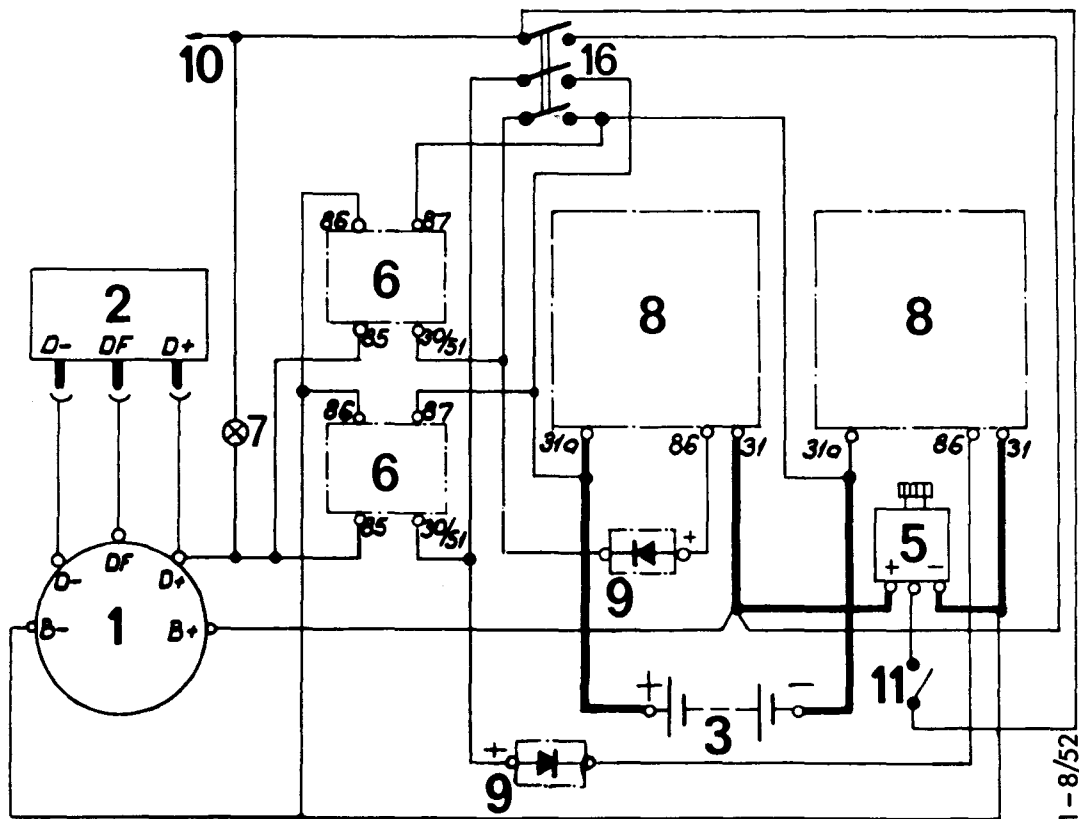


Fig. E4

- | | | | |
|-----------------------|---------------------------|------------------------|---------------------------------|
| 1. Generator | 5. Starter motor | 9. Block diode | 13. To possible ammeter |
| 2. Charging regulator | 6. Relay | 10. To extra consumers | 14. Main fuses |
| 3. Battery | 7. Discharge warning lamp | 11. Starting switch | 15. Fuses |
| 4. Master switch | 8. Battery relay | 12. To instruments | 16. Operational selector switch |

F Monitoring System

The following description deals with the normally occurring needs of visual or acoustic monitoring and measuring quantities on the engine. In the event of additional needs, our Engine Sales Department should be contacted.

Monitors and Sensors

Monitors and sensors for the instruments are available in both a unipolar and a bipolar electrical version. In addition, there are also sensors of mechanical type.

In certain cases it is desirable to have monitors which both issue an alarm if the cooling water temperature is too high or the oil pressure too low and stop the engine altogether in the event of a further rise in cooling water temperature or lowering of the oil pressure. In such cases dual monitors are installed, one of which emits a signal to a warning lamp on the instrument panel and also an acoustic alarm at a suitable point. The other monitor, which is actuated in response to a higher water temperature or lower oil pressure, as applicable, excites the stop magnet so that the engine is stopped automatically.

The locations of sensors and monitors are indicated in Fig. F1 for D/DS8 engines and in Fig. F2 for D/DS11 engines.

Temperature monitors are available with both a breaking and a making function. They are also designed for different temperatures. On D/DS8 engines, the monitors are sited in the thermostat housing (see Fig. F1). On D/DS11 engines, both breaking and making coolant temperature monitors are sited in the blind cover on the rear cylinder head (see Fig. 2).

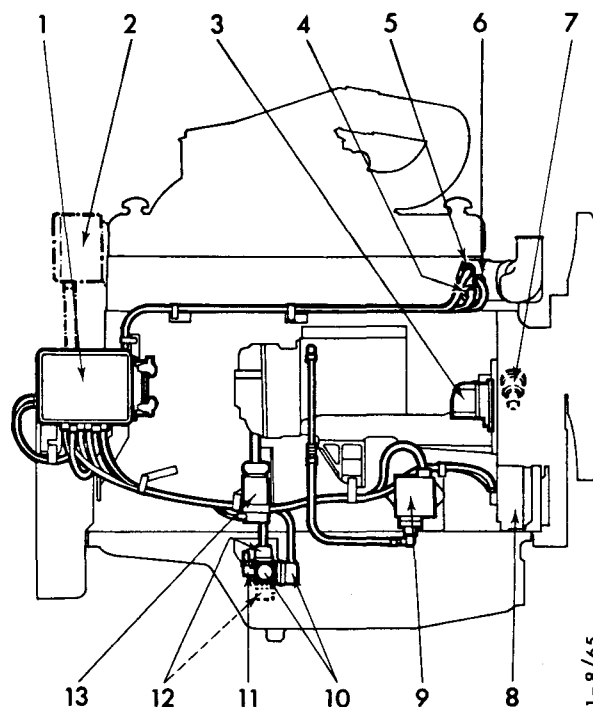


Fig. 1

Locations of monitors and sensors on DS8 engines

1) Oil Pressure

From the rear outlet on the right-hand side of the engine block, oil is conducted to a distribution piece placed below the injection pump. Oil pressure sensors and oil pressure monitors of bipolar electrical design are placed in this distribution piece, where there is also a hose connection for a mechanical oil pressure monitor (see Fig. F1 and F2). When sensors and monitors of unipolar electrical design are used, the oil pressure sensor is mounted directly in the outlet at the rear on the right-hand side of the block. Oil pressure monitors are then sited on the left-hand side of the engine in outlets on the intermediate piece of the lubricating oil cleaner.

2) Coolant Temperature

A coolant temperature sensor is placed in the thermostat housing on D/DS8 engines (see Fig. F1). On D/DS11 engines, the sensor is placed in the blind cover of the cylinder head or alternatively in the thermostat housing (see Fig. F2). The mechanical type of sensor is obtainable in two versions, one with a 1.5 m and one with a 3 m capillary tube.

On engines with a water-cooled exhaust pipe, monitors and sensors are placed in the exhaust pipe.

1. Connection box, location on alternator unit engine
2. Connection box, location on separate engine
3. Charging regulator
4. Coolant temperature monitor
5. Coolant temperature monitor
6. Coolant temperature sensor
7. Engine speed sensor
8. Alternator
9. Fuel pressure monitor
10. Oil pressure monitor
11. Outlet for oil pressure gauge
12. Oil pressure sensor
13. Magnetic cut-out

3) Fuel Pressure

The location of the fuel pressure monitor is shown in Fig. F1 for D/DS8 engines and in Fig. F2 for D/DS11 engines.

4) Engine speed

Unipolar system

In installations with a unipolar alternator and an electric tachometer of standard motor vehicle type this is connected to terminal "W" on the alternator.

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1c	AR	3	14

Bipolar system

The sensor for the tachometer is mounted on an angle gear on the front end of the fuel pump drive shaft (on the front of the transmission hood) in the case of installations with an engine revolution counter gauge. In the case of installations with two tachometers, a drive cable is run from this point to a gear designed for two sensors which is sited on the left-hand side of the engine.

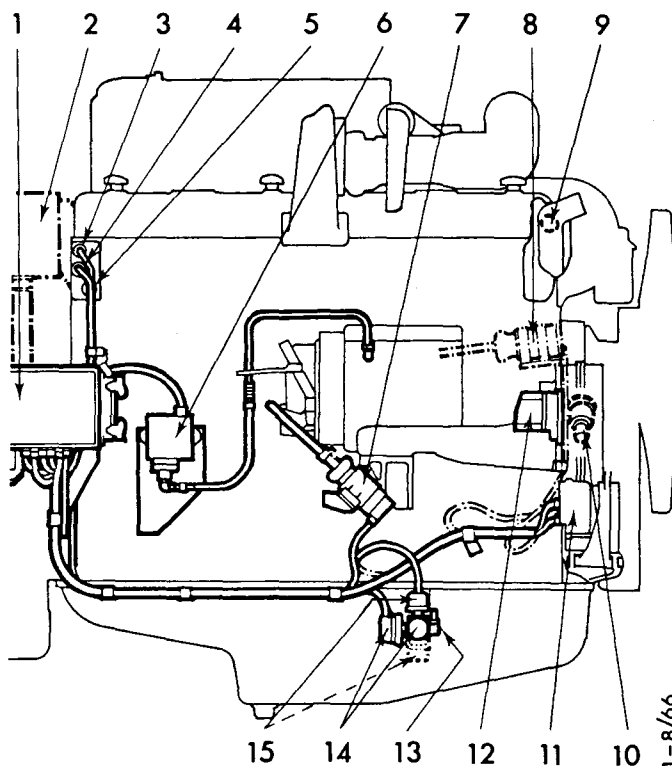


Fig. F2

Locations of monitors and sensors on DS11 engines

1. Connection box, location on alternator unit engine
2. Connection box, location for separate engines
3. Sensor for coolant temperature
4. Coolant temperature monitor
5. Coolant temperature monitor
6. Fuel pressure monitor
7. Magnetic cut-out, RSV regulator
8. Magnetic cut-out, RQV regulator
9. Sensor for coolant temperature, alternative location
10. Engine speed sensor
11. Alternator
12. Charging regulator
13. Outlet for oil pressure gauge
14. Oil pressure monitors
15. Oil pressure sensors

Instruments

The instruments normally needed are a tachometer, coolant temperature gauge and oil pressure gauge. Depending on the installation, it may also be advisable to also have additional functions, for instance an ammeter, compressed air gauge and hour recorder.

In our bipolar instrument systems, there are different combinations mounted in complete instrument cabinets to choose from.

The instrument cabinets are intended to be either mounted recessed in a wall or an instrument table or to be mounted outside on a wall. To facilitate mounting of the instrument cabinet without dismantling it, two threaded M4 holes are provided in each corner of the bottom. Upon delivery, the cable gland is placed on the left-hand side of the cabinet but can easily be altered so that it comes in the bottom of the instrument cabinet. This is done by slackening the four screws which hold the corner plate (with the cable gland) and the socket nut in the cable union. When this has been done, the corner plate can be turned so that the cable gland comes to the bottom of the cabinet. The four screws are then refitted and the cable union tightened. When installing, make sure that it is always possible to get at and slacken the cable union and also to get at the adapters on the corner plate in order to connect additional external consumers if this should be desirable.

The instrument cabinet should be fitted so that the front of the instrument panel is located between the vertical and horizontal position and can be read off from above. If the instruments are mounted upside down (e.g. above a wind-screen), the specified reading accuracy tolerances do not apply.

1-8/66 If the instrument panel is mounted on the engine or engine frame suspension rubbers must be fitted between the instrument panel and the stand which is made.

If the operation site is located far away from the engine it may be desirable in certain cases to have an instrument panel near the engine in order to check the most important functions (e.g. coolant temperature and oil pressure). For this purpose, we supply supplementary instruments of different designs for fitting on the engine.

Magnetic Cut-out

Through the electrical magnetic cut-out which is connected to the stop arm of the injection pump sufficient control force is obtained to stop the engine after having turned the 6-position switch on the instrument cabinet to the stop position or automatically in the event of a fault sensed by a temperature or oil pressure monitor. In the event of a fault in the electrical system, the magnetic cut-out can be actuated manually.

There are two designs of magnetic cut-out: one with a pulling function and one with a holding function. In the former case, the cut-out comes into operation when current is connected. In the latter case, holding current is fed to the cut-out when the engine is running and the current is cut off when the engine is to be stopped, whereupon a return spring overcomes the requisite control forces. The magnetic cut-out must not be fed with current directly via the above described monitors, but via a relay: otherwise there is a risk that the monitors will be burnt out by the high current intensity. The stop relay is mounted in the connection box on the engine, where also the start and alarm relays are located.

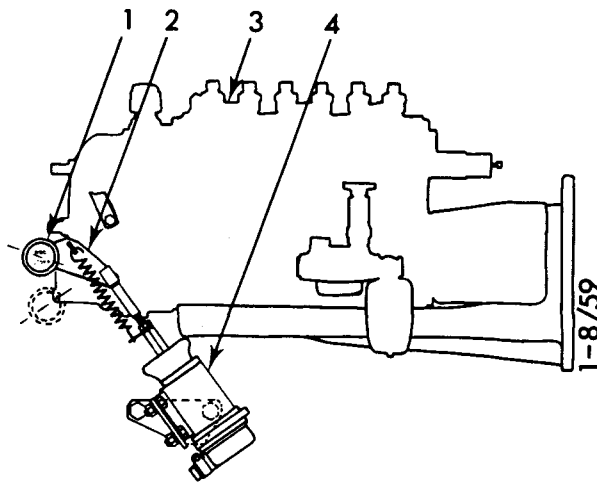


Fig. F3

Magnetic cut-out for D/DS11 engines with RSV regulator

- | | |
|---------------------------|---------------------|
| 1. Handle for manual stop | 3. Injection pump |
| 2. Stop arm | 4. Magnetic cut-out |

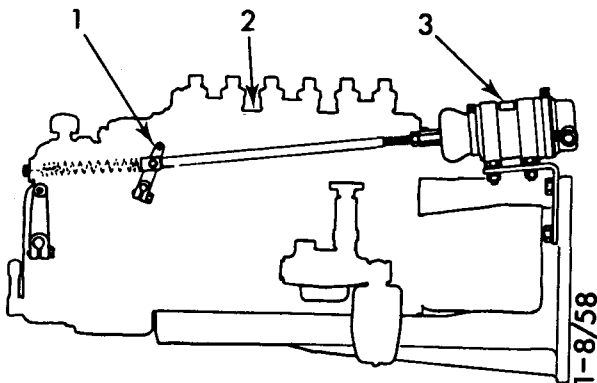


Fig. F4

Magnetic cutout for D/DS11 engines with RQV regulator

- | |
|---------------------|
| 1. Stop arm |
| 2. Injection pump |
| 3. Magnetic cut-out |

G Engine Suspension

The appropriate design of engine suspension varies for different engine installations. Generally speaking, however, the following requirements must be satisfied:

1. The engine suspension shall be designed for the forces to which it is subjected both continuously and instantaneously during operation, i.e. reaction forces from the transmitted torque, in some cases acceleration and retardation forces, and reaction forces in the longitudinal direction of the engine.
2. The engine suspension in combination with the engine bed must be so designed that resonance vibrations do not occur within the speed range of the engine. They must also be so elaborated that troublesome vibrations from the engine are not transmitted to the surroundings.
3. The engine suspension must be adjustable where exacting demands are made on centring between the engine and the driven unit connected to it.
4. The engine suspension and engine bed must be elaborated in view of permissible engine slope angles. The max. permissible slope angles forwards and rearwards are 10°. D11 and DS11 engines with special equipment can, however, be allowed to slope more. Directions in respect of this can be obtained from the Engine Sales Department.
5. The engine suspension and engine bed must be elaborated with due regard to accessibility for future service work (clear space for such tasks as oil sump removal must be available). See the section headed "Engine Installation from the Standpoint of Service".

AR

Three different versions of engines are supplied as standard. These are designated:

- a) Soft rubber suspension
- b) Hard rubber suspension
- c) Rigid suspension

a) **Soft rubber suspension** gives effective vibration damping. To a lesser extent, it can absorb the forces in the longitudinal and transverse direction of the engine but does not permit accurate engine alignment. With these characteristics this suspension is widely used in vehicle installations, generating sets and similar load applications. See Fig. G1.

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1c	AR	3	16

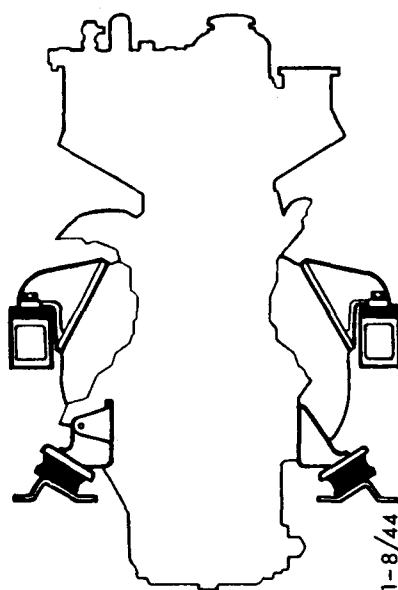
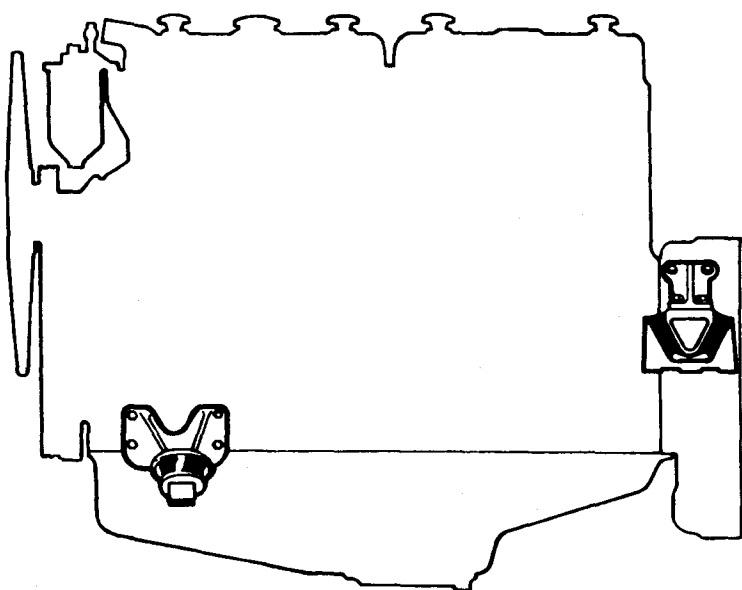


Fig. G1

Soft rubber suspension

b) **Hard rubber suspension** dampers the vibrations to a lesser extent than the soft suspension, but can in contrast absorb greater forces in the longitudinal and transverse direction of the engine. See Fig. G2.

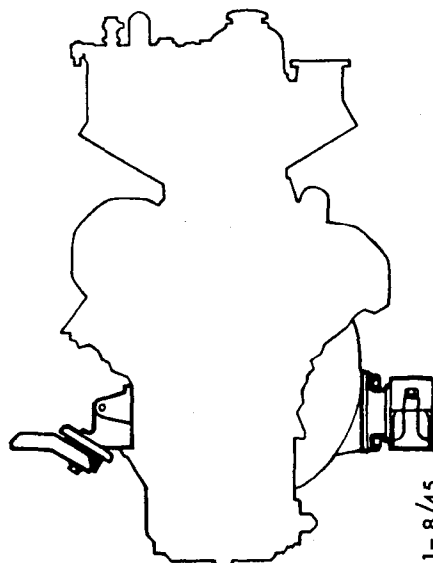
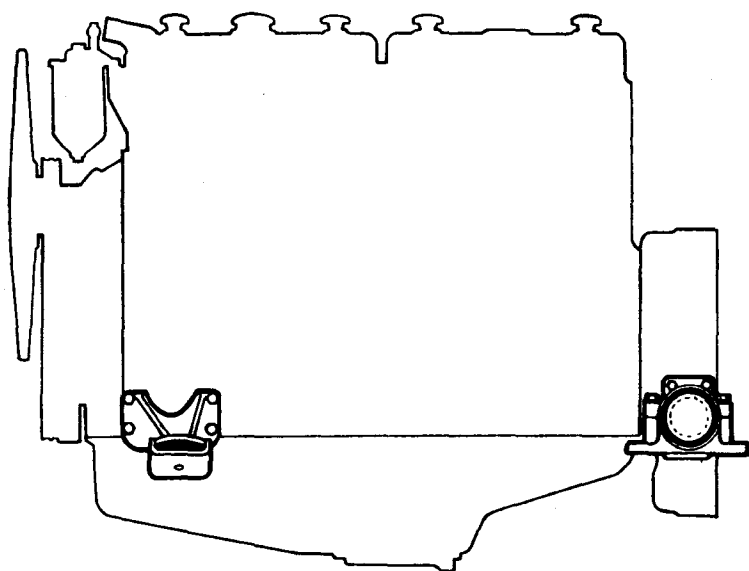


Fig. G2

Hard rubber suspension

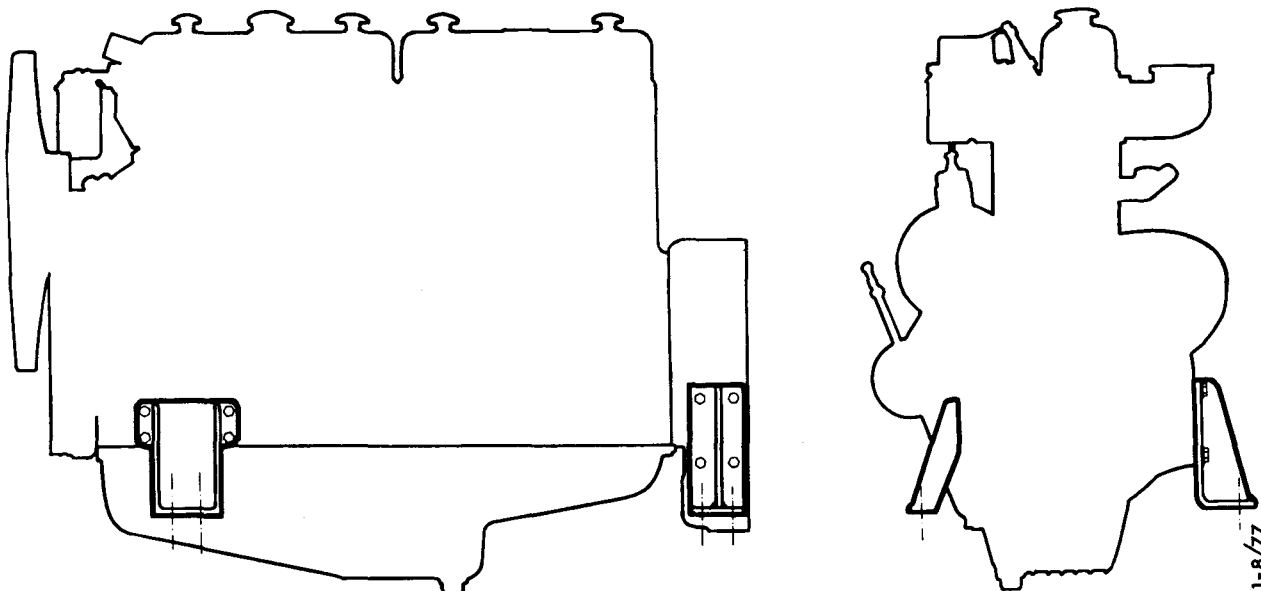


Fig. G3

Rigid engine suspension

c) Rigid suspension can absorb greater forces in all directions. It requires highly accurate alignment of the engine but makes no appreciable demands on the flexibility of lines and controls connected to the engine. It should only be used when the circumstances make such suspension desirable and the vibrations do not cause any major inconvenience. Even with rigid suspension, however, the vibrations can be relatively small if the mass represented by the engine bed and directly connecting parts is large in relation to that of the engine (ratio 20:1 and above). See Fig. G3.

H Engine Alignment

Great care and attention should be devoted to alignment of the engine in order to avoid costly operational disturbances. In more special operating cases, it may be advisable to check the alignment every now and then even in the future.

Where no special reasons exist, some type of flexible coupling (e.g. Layrub) should be fitted between the engine (friction clutch) and the driven unit. This is beneficial for several reasons: for one thing the flexible coupling has an equalising influence on irregularities in the torque and thus reduces the tendency to torsional oscillations (see point K), and for another the flexible coupling can absorb imperfections in the alignment between the drive and the driven units.

The requisite alignment accuracy varies, depending on the execution of the installation. As a general rule, however, the greatest possible accuracy should be aspired to.

Permissible deviations for a single flexible coupling of type Layrun "two four series":

Maximum permanent angle between drive and driven shaft	3.5°
Maximum instantaneous angle between drive and driven shaft	8.0°
Maximum permanent axial displacement at maximum permanent angle	3.17 mm
Maximum instantaneous axial displacement at maximum instantaneous angle	7.90 mm
Maximum permanent radial displacement	0.38 mm

When the above-mentioned coupling is used in a double version the limit values given above apply multiplied by two.

N.B. Although relatively large deviations are permitted according to the above, it is nevertheless advisable to aspire to as great an alignment accuracy as is reasonable. This has a favourable influence on the life of the coupling.

In aligning, the driven shaft should be started with as a rule. First of all, however, it should be checked that this shaft is straight, which is usually done best with the aid of a dial indicator.

Checking the Relative Positions of the Drive and Driven Shafts

The check is performed with the Layrub coupling fitted (but without the bolts being tightened hard).

Checking of the shafts in respect of possible displacement in the lateral and height directions is carried out in such a way that a magnetic stand with dial indicator is attached to the engine flywheel. The measuring point of the dial indicator is applied to the driven shaft at right angles to its longitudinal direction (see Fig. H1). The engine and the driven unit are rotated and the total indicator deflection is read off.

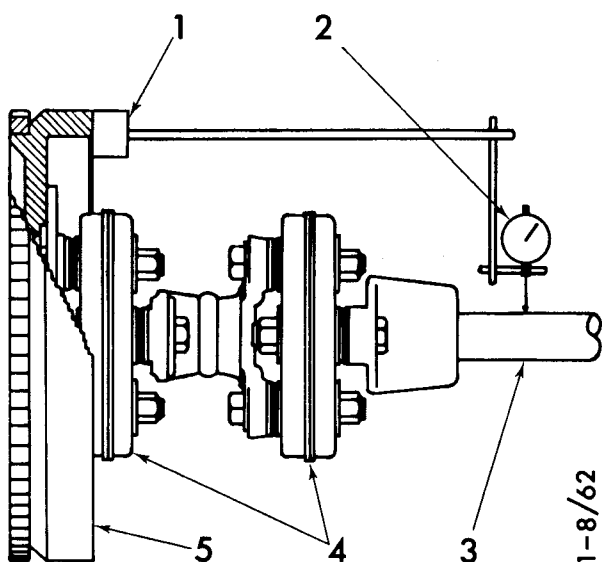


Fig. H1

- | | |
|-------------------|--------------------|
| 1. Magnetic stand | 4. Layrub coupling |
| 2. Dial indicator | 5. Flywheel |
| 3. Driven shaft | |

the 3.5° line for a single and the 7° line for a double Layrub coupling. As mentioned earlier, the smallest possible angular deviations should nevertheless be aspired to, and the 3.5° and 7° lines correspond respectively to the maximum permissible deviation which must not be exceeded.

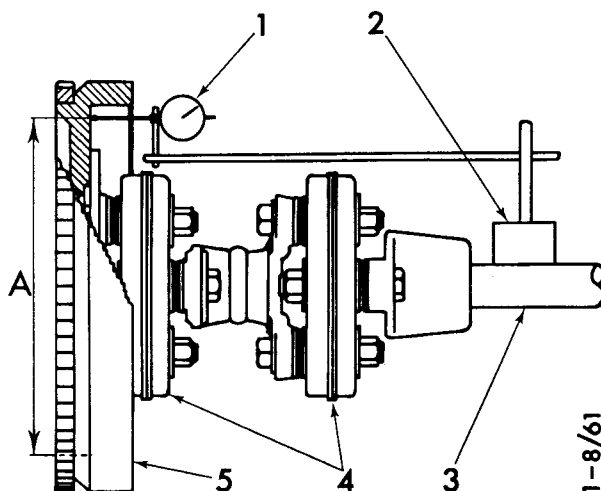
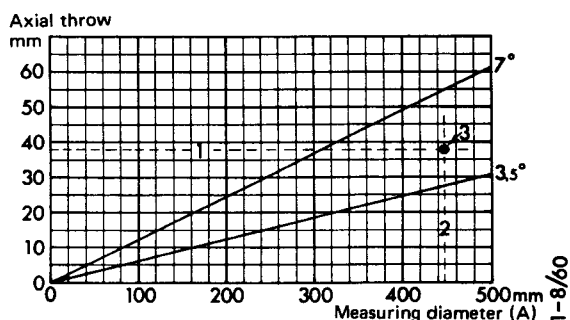


Fig. H2

- | | |
|-------------------|--------------------|
| 1. Dial indicator | 4. Layrub coupling |
| 2. Magnetic stand | 5. Flywheel |
| 3. Driven shaft | |

Checking of the shafts in respect of possible angular deviation is carried out according to Fig. H2. The magnetic stand is attached to the driven shaft and the measuring point of the dial indicator is applied to the flywheel at right angles to its surface. The engine and driven shaft are rotated and a reading is taken of the total indicator needle deflection. In order to check if the total indicator needle deflection obtained is too large use is made of the diagram below. The obtained measuring value is marked in and line "1" is drawn. Measurement of the diameter (A in Fig. H2) on which the measurement was made is carried out and the value is marked in on the diagram and line "2" is drawn. The point of intersection ("3") between lines "1" and "2" must not lie above

After the engine has been aligned, we recommend that its position be locked by means of locating pins. Holes for the locating pins are drilled through to diametrically opposite engine brackets and suspension brackets. A suitable diameter for the locating pins is approx. 9 mm.

J Operating Controls for Engine Speed

The operating and engine speed controls should be of a reliable and simple design and allow accurate operation so that the set position of the control arm is not changed by play, wear or possible engine movements in the suspension. The movement stroke of the control level should be somewhat greater than that of the control arm and the surplus movement thus obtained should be absorbed by a link yoke which is spring-loaded in both directions. The link yoke and possible other yokes should be adjustable in both directions.

The angle between link yoke and control arm in the centre position of the movement stroke of the latter should be roughly 90° . Where conditions do not permit such an angle with the control arm fitted as standard, the latter can be provided with a plate as shown in Fig. J1 and the link connected to an appropriate hole in the plate.

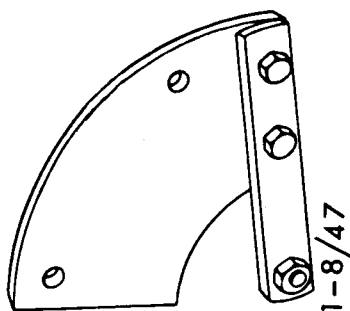


Fig. J1

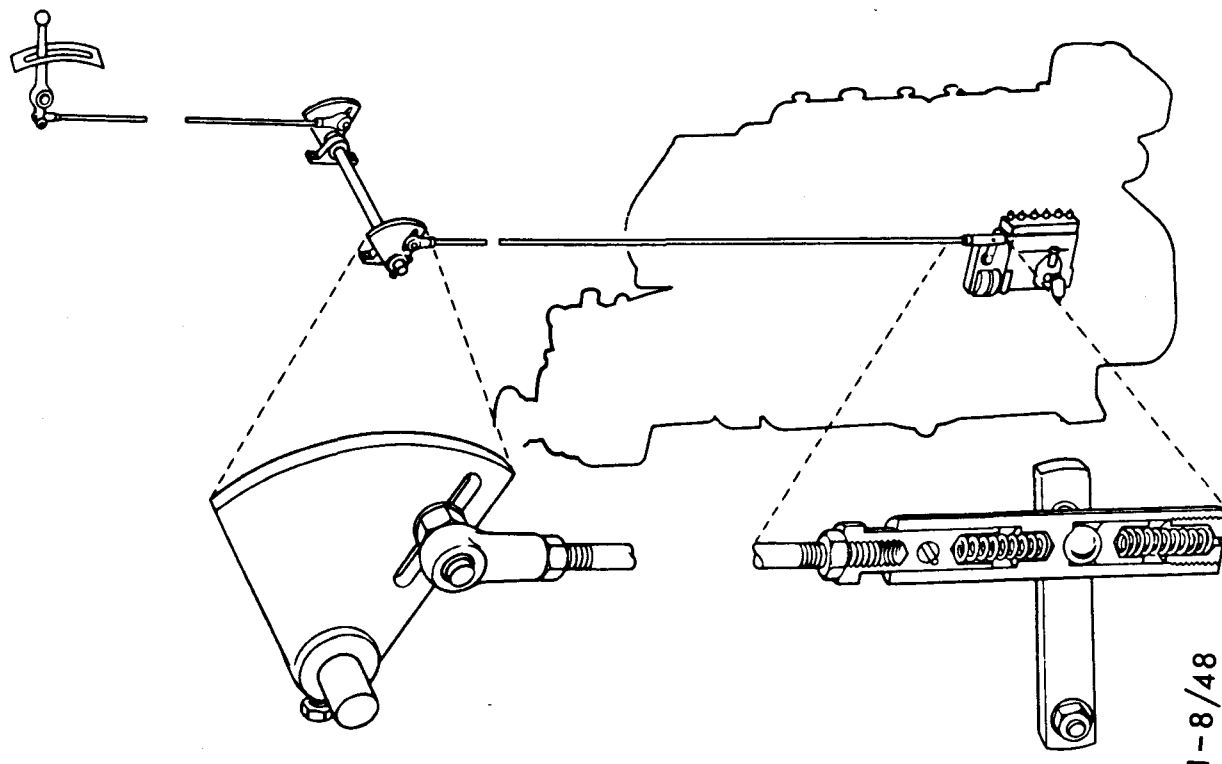


Fig. J2

The control versions normally used are:

- a) Mechanical linkage system
- b) Teleflex control
- c) Electro-mechanical control (control motor)
- d) Pneumatic control

a) Mechanical linkage system. The operating links must not be bent and should be made free of vibrations with the aid of bearing points. These should preferably be lubricatable and should not be too close to exhaust pipes and other sources of radiation so that seizing occurs. In order to make the movement stroke of the control lever somewhat larger than that of the control arm the angle arms can be made with adjustable radii (see Fig. J2). These angle arms also allow synchronization of the control settings on e.g. installations with more than one engine.

b) Teleflex control can be used for all kinds of engine suspensions and is particularly suitable in the case of soft rubber suspension. A suitable dimension is 5/16" and with this dimension the length of the installation can amount to 40 metres. Detailed fitting instructions are provided with every Teleflex control delivered.

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c) **Electro-mechanical control (control motor)** is sometimes used on generating set installations for remote control of the speed (frequency) and synchronization respectively of generating sets in parallel operation. The control motor is operated by electrical means and actuates the control arm on the injection pump via a rack and link rod. The control motor is intended for an operating voltage of 24V and a frequency of 50 or 60 Hz.

d) **Pneumatic control** can be suitable in certain cases for operating at long distances.

creased flexibility in the power transmission is desirable in order to even out variations in the engine torque. A flexible coupling will often also be justified simply as an aid in compensating torsional vibrations in the power transmission. For this reason, a flexible clutch design recommended on the basis of torsional vibration calculations completed must not be replaced by a clutch with a different torsion spring constant.

A further advantage of this clutch is that the demand for alignment accuracy between the drive and driven shafts is not equally stringent.

K Power Transmission — Power Take-Off

1 Power Transmission

Transmission of the engine torque normally takes place via a friction clutch which is mounted on the engine (with the exception of generating sets). Different types of transmissions can then be connected to this clutch, depending on the need in the operating conditions concerned.

Friction clutches

Two different designs of friction clutch are available as standard: a so-called vehicle clutch and an industrial clutch. They differ from each other primarily in that the industrial clutch has a larger capacity (is dimensioned to convert more friction work) than the vehicle clutch. Calls for larger clutch capacity arise in the case of large starting torque for the transmission (transmission shafts and V-belt pulleys with large moments of inertia). In conjunction with such installations the ratio between clutch capacity and starting work for the driven components connected in the transmission system must be judged in the light of clutch operation frequency, clutch life, etc.

The vehicle clutch is normally used on separate engines and where a stepped-gear transmission of conventional type is used. The industrial clutch is usually used on industrial engines.

In installations where clutch designs other than those mentioned above are used, e.g. a hydrodynamic clutch (fluid clutch), possible supplementary installation instructions should be obtained from the clutch supplier.

Flexible Drive Coupling

The use of a flexible coupling at the coupling flange on the output drive shaft should be considered in cases where in-

Transmission Types

Mechanical transmissions such as stepped-gear transmissions, reduction gears, etc. are the most widely used for single-engine installations. The choice of such transmission is dictated in the first instance in the light of the maximum engine torque and type of operation. For multi-engine installations, in which two or more engines are to drive a common propeller shaft, V-belt transmissions can be practicable.

The advantages of V-belt transmission are that it is easily adapted to a suitable gear ratio, it functions to some extent as a flexible coupling, it runs quietly, it has a long service life and requires no special care or maintenance apart from checking of belt tension and alignment.

For V-belt transmission, there are different types of V-belts such as single V-belts and power bands consisting of 2, 3 or more V-belts interconnected by a cord band. The choice of V-belt type will depend on numerous factors. Further information about this and assistance in calculating can be obtained upon application to the Engine Sales Department. Enquiries about V-belt transmissions should be accompanied by the following particulars:

- Required output
- Nature of operation and speed (e.g. centrifugal pump with 3500 r/min, 2 cyl. reciprocating compressor with 1250 r/min. etc.)
- Operational time in hours per day
- Wanted centre distance between shafts
- Limits for centre distance between shafts
- Type and size of existing pulleys, if any
- Maximum permissible size of the large pulley
- Drive shaft journal diameter, length and V-groove dimensions
- Driven shaft journal diameter, length and V-groove dimensions
- Circumstances which can influence the V-belt life, e.g. oil, dirt and dust, high temperatures, etc.

When manufacturing V-belt pulleys, the V-belt supplier's requirements in respect of roundness and V-groove tolerances must be complied with.

In addition to V-belts of the type mentioned above, there are also V-belts of notched type. A counterpart to V-belt transmission is flat-belt drive and chain drive.

Torsional Vibrations

The power transmission should in cases of doubt be made the subject of vibration calculation as to whether torsional vibrations can occur with the power transmission used.

When a hydrodynamic clutch is used the engine vibrations are not usually transmitted through it to the power transmission, causing torsional vibrations.

Assistance with calculation of vibrations can be obtained upon application to the Engine Sales Department. The following basic calculation data should then be submitted:

- Moment of inertia or vibration for large oscillating masses included in the power transmission.
- Torsional spring constant for shafts between large oscillating masses (e.g. V-belt pulleys).

Remarks: If answers to questions 1 and 2 are not available, the dimensions and material of the power transmission components should be stated.

- Ratio in the event of gearing the engine speed up or down.
- A short description of the driven unit. When this consists of, for example, a compressor or the like, the number of cylinders should also be stated.

Cooling the Transmission Oil

Where there is a need to dispose of the surplus heat from the transmission, this must not be done via the engine cooling system without this having been adapted for this purpose. For certain operation conditions, this quantity of heat can in point of fact be relatively large and justify being taken into consideration both when choosing cooling components for the engine cooling system and when connecting the transmission cooling system to the engine cooling system.

Fitting and Engine with Built-on Transmission

In cases when, for example, a heavy hydraulic transmission is built onto the engine prior to installation, the hoisting equipment should be coupled to both the engine and the hydraulic transmission simultaneously when hoisting the unit into position. Otherwise, the engine flywheel housing can be subjected to harmful breaking stresses and consequently the alignment of the engine and transmission in the engine bed can easily be faulty.

2 Power Take-offs

The engines can be delivered with three different types of power take-off for driving subsidiary or auxiliary units:

Crankshaft belt pulley with two additional V-grooves at the front end of the engine.

Side-fitted power take-off with two connection possibilities.

Direct connection to the front end of the crankshaft.

Crankshaft Belt Pulley with Two Additional V-grooves

In order to fit this belt pulley, the attachment of the cooling fan must be moved forwards. The V-grooves in the said belt pulley are designed for a 12.5 mm (0.5") narrow V-belt, but V-belts of A section can also be used. With the V-belt types currently available, the power transmission capacity of the V-belts will be decisive for how much power can be taken off. Proceed in accordance with the V-belt manufacturers' instructions when calculating the transmittable power.

Side-fitted Power Take-off

This power take-off is sited on the lefthand side of the engine at the front. A hydraulic pump of standard design, for example, or a component with a corresponding power requirement (1.5 h.p.) can be fitted there on the **front side** of the transmission case, the drive from the transmission taking place via a rubber bushing coupling. On the **rear side** of the transmission case, it is possible to fit a power take-off shaft if the engine is not equipped with an air compressor of standard design. The ratio is such that the speed is 0.865 times the engine speed. The total transmittable torques forwards and backwards amount to 98 Nm (10 kpm) in continuous operation and 147 Nm (15 kpm) in intermittent operation. This corresponds to the following outputs at different engine speeds:

Engine speed r/min	Output kw (hp)	
	Continuous operation	Intermittent operation
1500	13 (18)	21 (28)
1800	16 (22)	25 (34)
2000	18 (25)	27 (37)
2100	19 (26)	28 (38)
2200	20 (27)	29 (40)
2400	21 (29)	32 (43)

Direct connection to the front end of the crankshaft. The transmittable torque and output respectively in the case of direct connection to the front end of the crankshaft depend in the first instance on the type of engine used and on the type of joint between crankshaft and the V-belt pulley to which the driven shaft is to be connected.

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A design with a clamping taper joint allows transmission of a torque of 200 Nm (20 kpm) for D/DS8 engines and 150 Nm (15 kpm) for D/DS11 engines. Engines of type D/DS11 can be fitted with a special crankshaft with a polygonal profile in the front end which permits transmission of a torque of 640 Nm (65 kpm). The transmittable outputs are indicated in the following table:

Engine speed r/min	Transmittable power in kw (hp)		
	Clamping taper joint		Polygonal joint
	D8 – DS8	D11 – DS11	D11 – DS11
1500	31 (42)	23 (31)	100 (136)
1800	37 (50)	27 (37)	120 (163)
2000	41 (56)	30 (42)	133 (183)
2100	–	32 (44)	140 (190)
2200	–	34 (46)	147 (200)
2400	49 (67)	–	–

The above limit values assume that what is concerned is drive of machines with relatively uniform drive torque, e.g. generators, centrifugal, gear or wing pumps, etc. For machines with highly pulsating torques, e.g. piston pumps or reciprocating compressors with one or two cylinders, the permissible torque values should be reduced largely in accordance with the corresponding reductions specified by manufacturers of V-belts and flexible couplings.

Furthermore, it should always be considered to what extent the connected up machines will affect the torsional vibration characteristics of the crankshaft and the entire shaft system. Please see the previous section dealing with torsional vibration characteristics.

L Multi-Engine Installations

The need for a larger amount of power is often satisfied by the use of several engines combined in the same installation, which gives advantages in respect of operational safety, service preparedness, etc.

When installing the engines, particularly in cases where high operational safety is required, it is important for connection of the various engine components to be made as independently of each other as is possible, so that any functional faults in one engine do not interfere with operation of the others. The instructions given for single-engine installations are also applicable where relevant to multi-engine installations. In addition, the following points should be observed:

Engine Bed

In the case of V-belt transmission, the engines should be placed on guides fitted with adjusting screws so that they can be moved both longitudinally and transversely for alignment and adjustment of belt tension.

The connection of controls, exhaust lines, coolant lines, fuel lines, etc., must be made so that they allow the displacement called for by adjustment of the V-belt tension.

Alternatively, an intermediate shaft with shaft joints in both ends can be mounted between friction clutch and V-belt pulley. In order to be able to tension the V-belts, the V-belt pulley must then be laterally adjustable, whereas the engine, on the other hand, need not be interfered with.

Power Transmission

On multi-engine installations, a clutch must be provided on each engine so that individual engines can be operated independently of each other.

Fuel Lines

Separate fuel lines to the engines should be installed. An extra fuel filter should be fitted between the fuel tank and engine and a separate filter used for each engine. In certain cases a monitoring facility for the fuel pressure is recommendable.

Exhaust Lines

Separate exhaust lines for each engine should be installed if possible. If this is not possible, and the exhaust lines from several engines are taken to a joint line, the same recommendations are applicable with regard to dimensioning of each branch line as have been given for the exhaust line for single-engine installations. The area of the joint exhaust line will be finally dependent on its length but obviously it should correspond to at least the total area of the branch lines. A joint exhaust line presupposes provision of an easily actuated and effective shut-off device in each branch line. This is important in order to prevent exhaust gases from one engine in operation from penetrating into a shut-down engine and causing corrosion and other damage.

Checking The Engine Loads

Any loss of power on the part of an engine operated together with other engines is revealed in the form of a lowering of the speed of that engine in relation to that of other engines. A check on the degree of load can, however, be obtained through the installation of an exhaust gas temperature gauge or the like. Such a monitoring facility can, however, be superfluous in the gas of generating sets in which the electrical power for each engine is registered separately.

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Automatic Monitoring

An automatic monitoring device for oil pressure and possibly for coolant temperature should be connected not only to the stop magnet of the engine but also to the clutch cut-in and cut-out device if the design thereof so permits.

Operating controls

Operating controls for engine speed should be so designed that the speeds of the engines can be synchronized. See section J "Operating Controls for Engine speed".

Classification Regulations

In installations for which classification is required a classification certificate must be issued for each engine. Such a certificate is also required for all components included in the power transmission, such as V-belt pulleys, shafts, couplings, etc. See also "General Classification Regulations".

M General Classification Regulations

If the engine installation is to be classified, the classification society or institution which will inspect the plant before the installation work is commenced must be contacted. By so doing, the risk of costly reconstruction work will be avoided.

Classified engines are delivered from the factory, the engine type designation on the engine type plate being provided with two letters indicating the classification society in which the engine is classified. The following abbreviations are used:

LR = Lloyds Register of Shipping
 NV = Det Norske Veritas
 BV = Bureau Veritas
 GL = Germanischer Lloyd

In addition there is the National Swedish Inspection Authority (Statens Fartygsinspektion, SF) which, as the name implies, is a Swedish official inspection body in matters concerning safety at sea. In marine installations for which classification is required, such classification shall be performed by a classification society whose inspection of the ship has been approved by the National Swedish Inspection Authority.

Technically speaking, the classification implies that a representative of the classification society examines vital parts of the engine in more detail. For instance, with regard to crankshaft and connecting rods, these are inspected first at the semi-finished stage and subsequently in the finally manufactured condition. Parts such as cylinder blocks, water pump housings, cylinder liners, exhaust pipes, etc., will be subjected to pressure tests and so on.

A representative of the classification society will be present during the test run of the engine both at the factory and after installation in the plant.

The classification implies that the classification society draws up a kind of quality certificate for the installation, on which the insurance of the plant is subsequently based. It is up to the owner of the plant to choose a classification society and order classification.

For classified installations the classification societies usually require torsional vibrations for the power transmission to be calculated. Assistance with such calculations can be obtained from the Engine Sales Department — see the section headed "Power Transmission".

N Engine Installation from the Standpoint of Service

The engine installation must be inspected in accordance with special instructions by specially appointed service personnel.

In order for the engine and its components to be repairable and maintainable in a satisfactory manner after installation certain accessibility requirements must be observed.

Particular attention must be paid to the following points:

In order for the engine to be removed and refitted without unnecessary waste of time the superstructure and other components obstructive to this work should be so designed that they can easily be removed to the necessary extent.

The injection pump, injectors and filters should be readily accessible for replacement and for bleeding of the fuel system. The flywheel graduations should be readable in connection with setting of the injection pump.

It should be possible to remove and replace cylinder heads, valve covers and pushrods without having to remove the engine. In order for this to be possible, a free space of at least 420 mm in height must be available, counted from the face of the cylinder block.

In order for cylinder lines or pistons to be replaced with the engine in place there must be sufficient space below the engine for removal of the oil sump. The minimum free space for removal of the oil sump is 210 mm for D/DS11 engines and 110 mm for D/DS8 engines.

Make sure that oil filling and draining can be carried out in a simple manner and that the dipstick is readily accessible. These points also apply to coolant filling and draining.

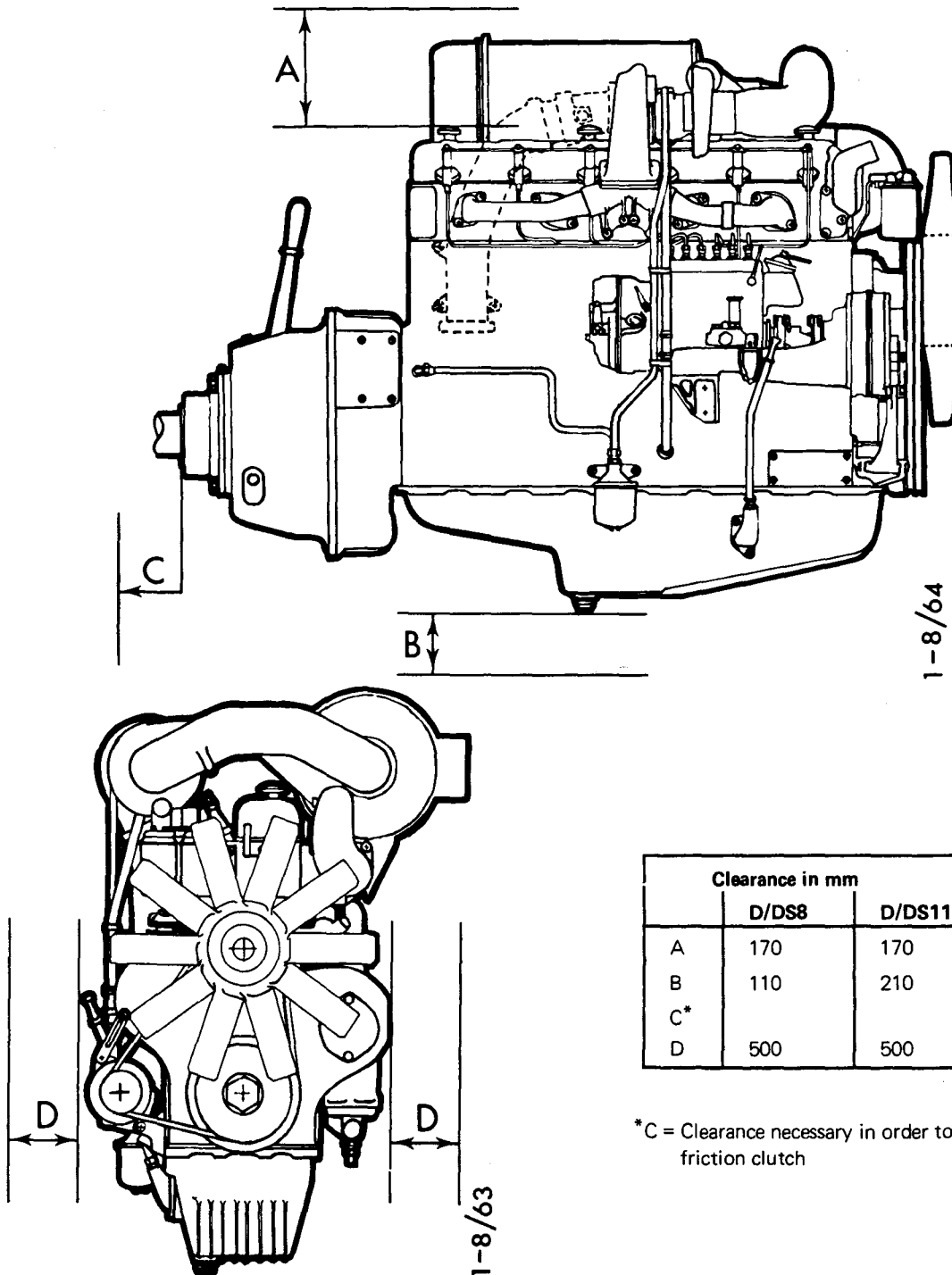
The engine air filter and the anti-freeze jar of the compressed air compressor should be so located that they are readily accessible for changing oil and topping up with anti-freeze.

Good accessibility is also required for the following engine components:

Lubricating oil filter for the turbocharger
 Turbocharger
 Starter motor
 Alternator
 Water pump and cooling fan

Hydraulic pump
 Cooler (radiator)
 Disengagement device at the engine flywheel
 Batteries

Certain clearances are indicated in Fig. N1 which should be considered from the standpoint of service when installing the engine.



Clearance in mm		
	D/DS8	D/DS11
A	170	170
B	110	210
C*		
D	500	500

*C = Clearance necessary in order to remove the friction clutch

Fig. N1

INTAKE AND EXHAUST SYSTEM

TURBOCHARGER

Wear limits and tightening torque

For turbocharger models 3LD and 4LE(K) (engines DS5 DS8 and DS11), consult Group 1a, Specifications, number 2 page 1.

For turbocharger model 4HD (engine DS14), consult Group 1b, Specifications, number 2 page 1.

Charging pressures

The charging pressures indicated in the table below are to be regarded as approximate guide values, since the charging pressure depends to a high degree on the intake and exhaust system.

Charging pressure graphs for engines in intermittent operation are to be found under Group 1a, Specifications, number 2 (engines DS5, DS8 and DS11) and Group 1b, Specifications, number 2 (engine DS14). These graphs are valid if the engine has an intake and exhaust system similar to that of the truck (engines DS11RO1A are installed in cowl-built trucks and engines DS11RO6A in cab-over-engine trucks).

Correction table for measured charging pressure in view of intake air temperature in °C.
(Corrected values refer to an intake-air temperature of +25°C and are to be compared with the relevant charging pressure chart).

Measured charging pressure kg/cm ² (bar) below		Intake air temperature, °C (ambient temperature)											
		−20	−15	−10	−5	0	+ 5	+ 10	+ 15	+ 20	+ 25	+ 30	+ 35
		Corrected values											
0,30	(0,29)	0,23	0,24	0,25	0,26	0,27	0,27	0,28	0,29	0,30	0,30	0,31	0,32
0,40	(0,39)	0,31	0,32	0,33	0,34	0,35	0,36	0,37	0,38	0,39	0,40	0,41	0,42
0,50	(0,49)	0,39	0,40	0,41	0,42	0,44	0,45	0,46	0,47	0,49	0,50	0,51	0,52
0,60	(0,59)	0,46	0,48	0,50	0,51	0,52	0,54	0,55	0,57	0,58	0,60	0,62	0,63
0,70	(0,69)	0,54	0,56	0,58	0,59	0,61	0,63	0,65	0,66	0,68	0,70	0,72	0,73
0,80	(0,78)	0,62	0,64	0,66	0,68	0,70	0,72	0,74	0,76	0,78	0,80	0,82	0,84
0,90	(0,88)	0,70	0,72	0,74	0,76	0,79	0,81	0,83	0,85	0,88	0,90	0,92	0,94
1,00	(0,98)	0,77	0,80	0,82	0,85	0,87	0,90	0,92	0,95	0,97	1,00	1,02	1,05
1,10	(1,08)	0,85	0,88	0,91	0,94	0,96	0,99	1,02	1,05	1,07	1,10	1,13	1,16
1,20	(1,17)	0,93	0,96	0,99	1,02	1,05	1,08	1,11	1,14	1,17	1,20	1,23	1,26

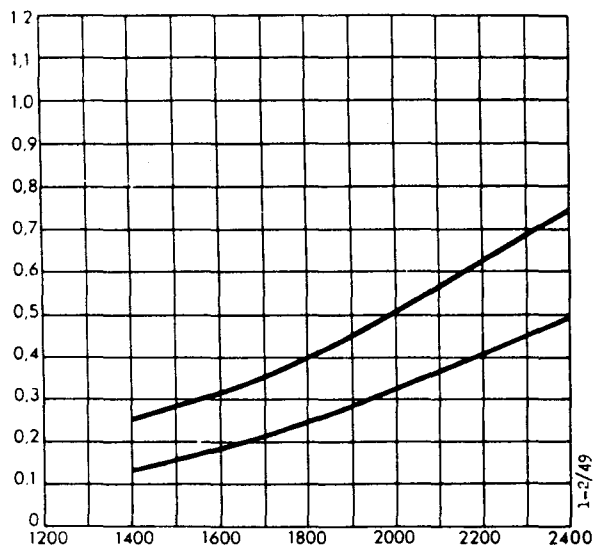
Example: A measured charging pressure of 1.0 bar (1.02 kg/cm²) at −15°C corresponds to 0.80 bar at +25°C.
A measured charging pressure of 0.50 bar (0.51 kg/cm²) at +35°C would have been 0.52 kg/cm² at +25°C.

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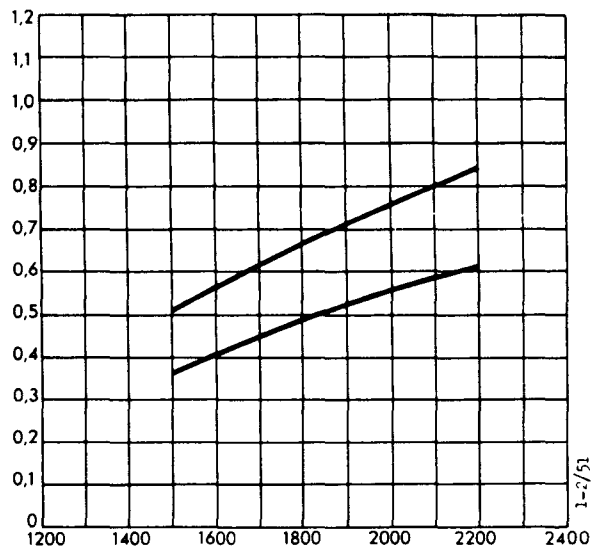
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2.

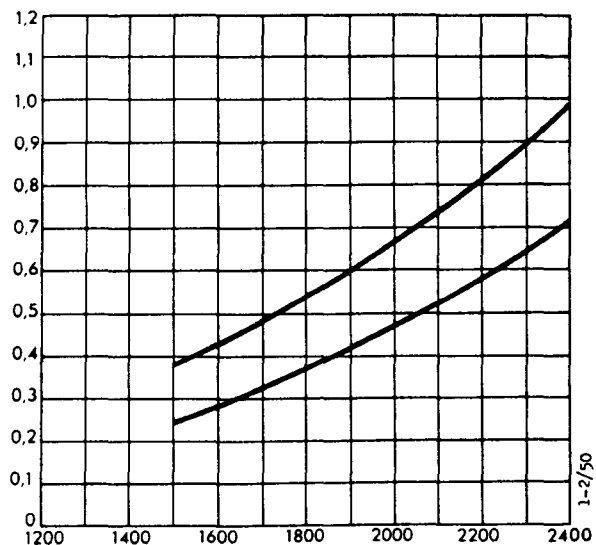
Charts showing limits for corrected charging pressure for engines in continuous service (90% output setting) with air-cooled exhaust pipe:



Engines DS5



DS11A, 260 h.p., SMMT



Engines DS8

Engine output h.p. SMMT	Engine speed r.p.m.		
	1400	1800	
250	max 0.55	0.60	Corrected charging pressure in bar (kg/cm ²)
	min 0.46	0.56	
230	max 0.49	0.64	
	min 0.36	0.46	

DS111R82A

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1 Engines

c Separate engines

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PRODUCTS

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MODIFICATIONS ON D11, DS11 AND DSI11 MARINE ENGINES

A large number of modifications have been introduced on D11, DS11 and DSI11 marine engines. In connection with these modifications, the engines have been given new type designations. The old type designations D11R81, DS11R82 and DSI11R82 are discontinued and replaced by D11M01, DS11M01 and DSI11M01, engine with intercooler.

A good many of the modifications have already been introduced earlier on for the basic engine and are described elsewhere in the Service Handbook. The modifications concerned are only mentioned in summarized form here and for closer details reference is made to Section 0c3 and 1a SI 0-5.

Cylinder head (hexagon bolts, new cylinder head gasket, cast position for injector)

Cylinder liner (new gas sealing)

Cylinder block (sprinkler for piston cooling, new axial washers for crankshaft, hexagon bolt for main bearing caps, adaptation to new lubricating system)

Valve mechanism (exhaust valves, valve seats, valve springs, valve levers etc.)

Timing gear housing (sealing ring)

Flywheel housing (sealing ring)

Pistons (shorter pistons, adapted to new connecting rod, new bottom compression ring, valve pockets on D11 as well)

Connecting rods (trapezoid small end)

Crankshaft (narrower centre main bearings)

Camshaft (cam shape and valve timing altered)

Injection pump shelf (new bearing for the pump drive)

Air cleaner (dry filter replaces oil bath filter)

Lubricating oil pump (gear pump replaces rotor pump)

Lubricating oil cleaner (same type as D/DS14)

Turbocharger (adapted to the higher output)

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Besides the modifications that have already been introduced on vehicle engines a good many changes have also been made on the marine engines, which in the first place affect the cooling system (both the sea-water and fresh-water circuit). The general appearance of the new DS11-engine will be noticed in fig. 1. Also shown in the figure will be seen the number of parts which are new or have been modified.

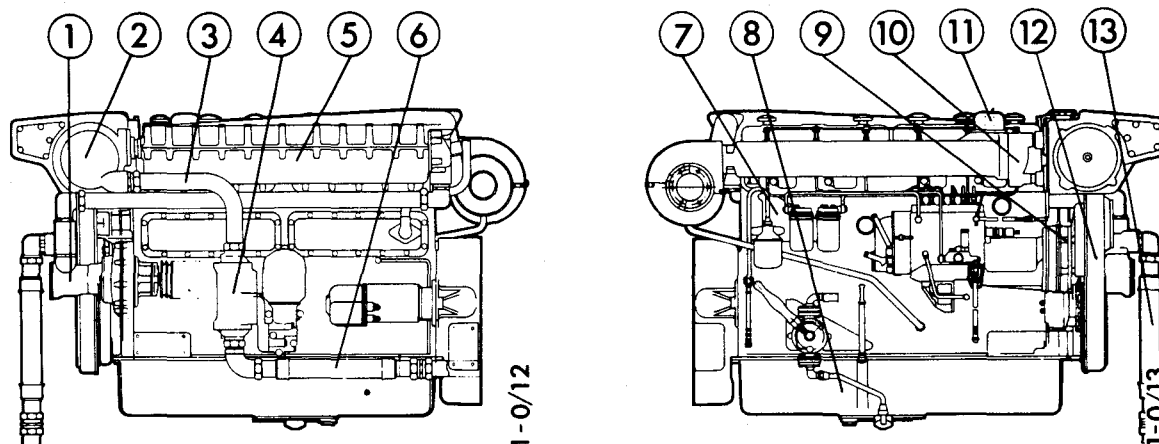


Fig. 1

DS11M01

1. Sea-water pump
2. Heat exchanger
3. Sea-water line
4. Lubricating oil cooler
5. Intake manifold with intercooler
6. Flexible steel hose for sea-water circuit outlet

7. Bracket for fuel filter and lubricating oil cleaner for Turbocharger
8. Oil sump
9. Fresh-water pump
10. Thermostat housing with thermostats
11. Monitors and transmitters for sea-water temperature
12. Protective covers
13. Flexible steel hose for sea-water circuit feed

Sea-water circuit

The sea-water circuit has been modified and has now been given the following cycle of operation. The water flows from the sea-water pump to the rear end (DS11) of the intercooler (5) and after that through the intercooler to the heat exchanger (2). From the heat exchanger the water flows via a pipe (3) to the lubricating oil cooler (4) and then away from the engine in its rear edge via a flexible steel hose (6).

On engine D11M01 and DS11M01 the water flows straight to the heat exchanger from the sea-water pump.

Intake manifold and intercooler

The same type intake manifold is introduced on the D11 and DS11 marine engine as for the D11 and DS11 vehicle engine. On the other hand a completely new intake manifold has been introduced on the DS11 because of a new type intercooler.

The intercooler, which was previously located behind the intake manifold is now incorporated in this (see pos. 5 fig. 1). This means that the length of the engine build-in is much less. In addition the new intercooler has better capacity than the older type.

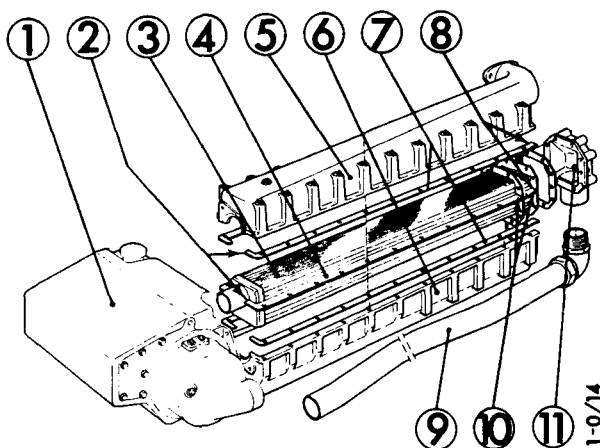


Fig. 2

Intake manifold with intercooler, DSI11

1. Heat exchanger
2. Sealing to be checked
3. Intercooler element
4. Flange
5. Intake manifold, upper part
6. Intake manifold, lower part
7. Gasket
8. Sealing to be checked
9. Feed for sea-water
10. Sealing to be checked
11. Back end

When fitting together the upper and lower part of the intercooler and intake manifold the following must be observed. The gaskets (7) in fig. 2 lying between the intake manifolds' upper (5) and lower (6) parts and, which seal against the flange (4) on the intercooler element (3) must be pushed inwards and backwards very carefully so that they seal properly in their short ends at (2) and (8). The same applies to the gaskets between the rear flange of the intercooler and the intake manifold at (10). It may be to some advantage to use a sealing agent at these points.

When assembling, the following working procedure should be adhered to:

- Fit the manifolds' upper and lower parts, the intercooler element and gaskets, but only tighten the bolts up fractionally.
- Fit the rear cover (11) with gasket attached and tighten up the bolts.
- Tighten up the bolts between the manifolds' upper and lower parts.
- Tighten the front flange.

By carrying out this method of assembly the correct localization of the manifolds' upper and lower parts and the intercooler element is attained.

The intake manifold has been provided with a tiny hole, in the bottom of the lower half, almost at the rear. **Beneath this hole a small cup has been placed to collect up water from and thereby reveal a possible leaking intercooler element.**

Lubricating oil cooler

Previously the lubricating oil cooler had been located in the fresh-water circuit and was there connected, so that only a small part of the fresh-water flowed through the cooler (bypass-connected).

The new oil cooler is connected to the sea-water circuit and in such a way that all the sea-water flows through the cooler (bypass-connected). The flange is fitted on the intermediate piece of the lubricating oil cleaner. This means that the oil cooler has been moved upwards and that the present bracket, strap and oil hoses are discontinued as a result. Thus, there are now no hoses and pipes for the oil connections.

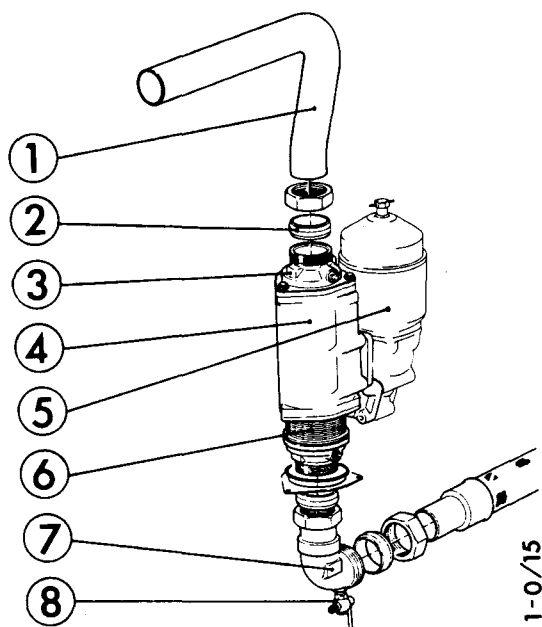


Fig. 3

Lubricating oil cooler

- | | |
|-----------------------------------|--------------------------------|
| 1. Feed sea-water | 5. Lubricating oil cleaner |
| 2. Clamp cone | 6. Oil cooler element |
| 3. Inlet flange with wrench grip | 7. Outlet bend with key grip |
| 4. Lubricating oil cooler housing | 8. Drainage cock for sea-water |

The water connections consist of pipes with clamp cone joints. When tightening these joints remember to hold the oil cooler assembly firmly so that it does not rotate at the same time. Thus, bearing this in mind the ends of the oil cooler have been shaped in the form of a wrench grip (pos. 3 in fig. 3).

Therefore, to effectively drain out the sea-water circuit, the pipe bend (7) has been provided with a drainage cock (8).

Sea-water pipe

In the sea-water circuit, the hoses used earlier on, have been replaced by pipes with connections of type clamp cone. For the sea-water circuits' feed and discharge a flexible steel hose (pos. 6 and fig. 1) has been introduced which is able to absorb the engine vibrations.

Heat exchanger with expansion tank

The new heat exchanger has been given a lower profile than the old in order to give a reduced build-in height for the engine. The element of the heat exchanger is of type Tubrör and has improved capacity compared with the old one. The heat exchanger housing has a built-in expansion tank, which is connected to the suction side of the water pump. Thus, there is less risk of cavitation in the water pump.

The expansion tank is provided with pressure cover and a level monitor for the coolant.

Sea-water pump

The new Johnson type F9B sea-water pump is of identical type to the earlier Johnson F8B-3, but has a longer rubber impeller and thereby greater capacity.

The old alternative pump of make Desmi is now replaced by a pump of make Gilkes, which is of type tyre pump. The pump made by Gilkes drives via a rubber claw coupling from the fresh-water pump.

Fresh-water pump

The new fresh-water pump introduced for the marine engines is of identical type to that found on vehicle engines. The pump is, however, geared up to a higher pump speed (max. 3250 rev/min) in the marine engine installation. The ratio is 1.48:1, which means that compared with the old marine engine pump (1.86:1) the new one functions more slowly with a slightly less flow of fresh-water as a result. The new pump housing has been designed so that it serves as a bracket for the new heat exchanger. The suction side of the pump is in direct communication with the fresh-water systems' expansion tank. This means less risk of cavitation in the pump.

Thermostat housing and thermostats

To increase the area of percolation and thereby reduce the flow resistance a new thermostat housing with two thermostats has been introduced.

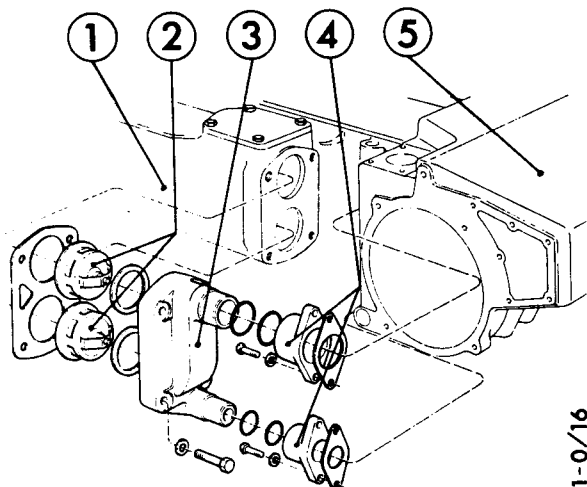


Fig. 4

Thermostat housing

1. Exhaust collector pipe
2. Thermostats
3. Thermostat housing
4. Connection flanges
5. Heat exchanger

The thermostat housing (pos. 3 in fig. 4) is located in the front end of the water-cooled exhaust collector pipe (1) and is connected to the heat exchanger housing (5) with O-ring sealed flanges (4).

To dismantle, it is necessary to undo the flanges (4) from the heat exchanger housing (5) and, for the thermostat housing (3) to be undone from the exhaust collector pipe (1), after which the flanges (4) can be pushed farther in on the thermostat housing whereby the entire unit will be shorter and can be lifted away from the engine.

The thermostat housing has been provided with two thermostats in order to reduce the flow resistance. The two thermostats have different opening temperatures (75 and 70°C respectively) in order to reduce the risk of vibrations occurring in the system.

Monitors and transmitters for fresh-water temperatures

Monitors and transmitters for fresh-water temperature have been located beneath one cover in the front section of the exhaust collector pipe (pos. 11 fig. 1).

Pistons

In addition to the modifications mentioned under Oc3, it should be pointed out that DS111 now has the same pistons as DS11, i.e. the compression ratio has been raised from 14.5 to 15.

Fuel system

A new injection pump has been introduced with larger size element and altered shape cam on the camshaft, thus giving increased injection speed.

By reason of the modified cylinder head, injectors with smaller outer diameter have been introduced.

The studs for fixing the injectors are also changed to give improved material.

On engine DS111M01 the angle of injection (α) is now lowered to 18°.

Fuel filter

A new bracket for the fuel filter has been introduced (see pos. 7 fig. 1). On this bracket, the oil cleaner for the turbo-charger shall also be located. The oil cleaner has been moved in order to make it possible to fit twin starter motors.

grupp	sekt	nr	sida
1c	SI	0-6	6

Pulleys

In order to increase the service life of the V-belts, the number has been raised to three for driving the generator and water pump. This means that pulleys with three grooves are now introduced for generator, water pump and crankshaft.

The 5-groove crankshaft pulley used earlier (intended for the power take-off in the front end of the engine) has been replaced by a 6-groove pulley so that there is still a possibility of being able to use three extra V-belts if required.

Protection plates

New protection covers, which are adapted to the new water pump and heat exchanger have been introduced.

Oil sump

A new oil sump with outlet for the new oil pump is introduced. The pump has also been modified on account of the pressure reducing valve being moved from the oil sump to the cylinder block (inside the lubricating oil cleaner).

Specifications, setting values, tightening torques

	D11M01	DS11M01	DSI11M01
Compression ratios	16:1	15:1	15:1
Injection angle (α)	23° T.D.C.	20° T.D.C.	18° T.D.C.
Fresh water capacity	50 dm ³	50 dm ³	50 dm ³

For other particulars reference is made to Section 1a SI 0—5 and 1a SP.

SERVICE SCANIA

PRODUKTER—PRODUCTS—PRODUKTE—PRODUCTOS

grupp/group

1c

Special Information
Información especial

number/number

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side/page

1

datum/date

77-04-15

best. nr/order nr

ETS 501c:0-7

SMÖRJOLJEREKOMMENDATIONER

Bakgrund

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

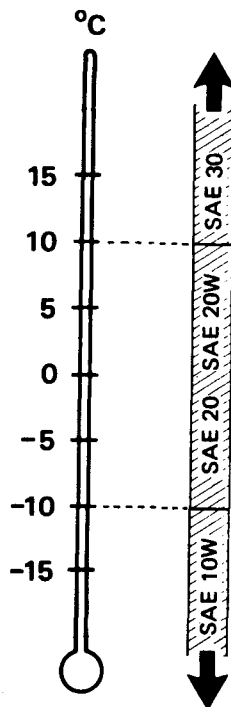
Aktuell information

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

Single grade



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.

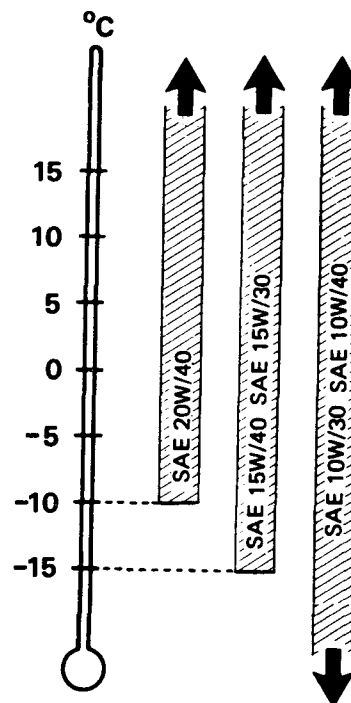
Current information

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

Multigrade



3200-1197

SI

grupp	sekt	nr	sida
1c	SI	0-7	2

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.

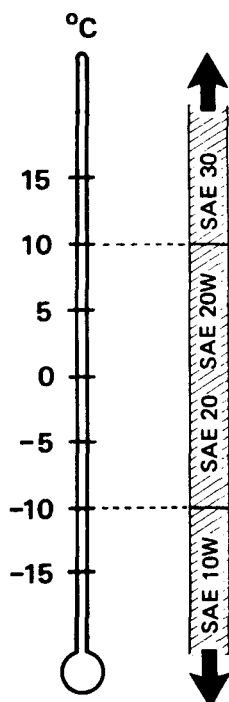
Aktuelle Information

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

