1. GENERAL

When installing main engines, the following general instructions should be observed. These instructions apply to mounting of engines on resin chocks only. For dimensions of below described parts, see drawing 1V69L0080.

For general instructions concerning the alignment of main engines, see 4V69L27.

2. BASE PLATE

Our recommendations for the construction of the base plate are shown on the drawing for the foundation and fastening of the engine. Regarding the surface roughness and straightness of the rider plate we refer to the requirements of the supplier of the resin chocks.

3. CHOCKS

The recommended size of the resin chocks is about 300 x 80 mm.

Regarding the dimensioning as well as the casting of the chocks we refer to the instructions of the supplier of the resin.

The clearance holes in the chock and the rider plate should have a diameter which is about 2 mm larger than the bolt diameter. For fitted bolts smaller holes are drilled and reamed to the right size.

Muutos ALTER.	Pvm. DATE	Tark. CHKD.	Ilmoitus no MEMO NO.	Selvitys EXPLANATION	Mikrof. MICROF.	Sivu PAGE
b	18.11.92			1V69L57 changed to 1V69L0080		
a	11.4.89					1/2

WÄRTSILÄ DIESEL		Suhde SCALE	INSTALLATION OF MAIN ENGINES ON RESIN CHOCKS
Tyyppi Type	VASA 22		
Oy WÄRTSILÄ Ab VAASAN TEHDAS VASA FACTORY VAASA · FINLAND		Painot WEIGHTS kg Mitat MEASURES mm	
Piirt. DRWN.	31.3.87 JW g/ML		
Tark. CHKD.		Kokoonp.piir. ASSEMBLY DRG.	Piir. no DRG NO. 4V69L0035-1b
Hyv. APPVD		Korvaa SUPERSEDES	

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4. LATERAL SUPPORTS

The design of the lateral supports appears from the foundation drawing. There should be three lateral supports on both sides of the engine.

The lateral supports are welded before aligning the engine and fitting the chocks. The lateral support wedges should be fitted in until a bearing surface of 40% is obtained.

After fitting-in, the lateral support wedges should be driven in by beating lightly with a small hammer, and then be locked with a suitable locking device.

5. FOUNDATION BOLTS

The foundation bolts are usually through-bolts with a castle nut at the lower end and a lock nut at the upper end. One fitted bolt is used on each side of the engine nearest to the flywheel. Other bolts are provided with clearance holes.

Due to the low permissible surface pressure of the resin chock, the tightening force of the bolt is low. Therefore the bolts are to be made as tensible bolts, with a reduced diameter, so that sufficient tension is obtained. When designing the bolts it should be noticed that they are to be tightened to about 60% of the yield point of the material.

To avoid a slow reduction of tightening tension, due to e.g. unevenness in threads, the threads should be machined to a finer tolerance than the normal threads.

In order to avoid extra bending stress in the bolts, the contact face of the nut underneath the rider plate should also be counterbored, because they usually bend owing to welding stresses.

6. TIGHTENING

Before tightening, all contact faces should be carefully cleaned and lubricated.

If the size of the chocks and the diameter of the tensile bolts are made as shown in the foundation drawing the yield point of the material shall be about 50 kN/cm^2 when using a tightening torque of 400 - 450 Nm.

Check also that the linear expansion of the engine, caused by changes in temperature, can take place freely in relation to the foundation.

The power is transmitted through the shafting arrangement as shown in drawing 2V62L50.

PART DESCRIPTION

The free end PTO-arrangement comprises the following parts:

- PTO-shaft (bolted to the crankshaft)
- SKF OK coupling
- Intermediate shaft
- Bearing

The PTO-shaft is bolted to the crankshaft inside the engine thus only the shaft end is protruding through the end cover.

The intermediate shaft is fixed to the PTO-shaft by an SKF OK coupling.

The intermediate shaft is supported by a bearing which is bolted to the foundation.

The power is normally transmitted from the intermediate shaft via a flexible coupling to the driven device e.g. a gearbox or alternator.

ALIGNMENT

The thermal expansion of the engine and concerned equipment must be noted. Enclosed drawing 4V62L0280 shows the movement of the crankshaft centre line because of temperature changes.

The height of the engine compared to the supporting bearing should be such that the last cylinder's indication value at TDC is 0 – +0.02 at operation temperature. This calls for an indication value of +0.04 – +0.07 in cold condition. See also enclosed drawing 3V62L0279.

Muutos ALTER.	Pvm. DATE	Tark. CHKD.	Ilmoitus no MEMO NO.	Selvitys EXPLANATION	Mikrof. MICROF.	Sivu PAGE
b	4.10.89					1 (2)

WÄRTSILÄ DIESEL		
Tyyppi Type VASA 22	Suhde SCALE	**ALIGNMENT OF PTO-ARRANGEMENT FOR DIESEL ENGINE WITH FIXED INTERMEDIATE SHAFT**
Oy WÄRTSILÄ Ab VAASAN TEHDAS VASA FACTORY VAASA · FINLAND	Painot WEIGHTS kg Mitat MEASURES mm	
Piirt. DRWN. 31.3.87 JWg/ACH		
Tark. CHKD.	Kokoonp.piir. ASSEMBLY DRG.	Piir. no DRG. NO. 4V69L0048-1 b
Hyv. APPVD.	Korvaa SUPERSEDES	

Muutos ALTER.

ATTENTION IS TO BE PAID TO THE FOLLOWING:

- The feet of the supporting bearing are suitable for fitting on steel chocks. If resin chocks are used the surface load will be too high unless the bearing is bolted to an intermediate plate which has a larger surface thus decreasing the surface load to an acceptable level.
- Instruction manuals for concerned equipment should be followed regarding mounting and installation procedures.
- When installing the flexible PTO-coupling it should be observed that the crankshaft is axially supported at the flywheel end. This means that the shaft is expanding towards the free end. Thus the coupling should be installed with the maximum allowable length.

When aligning the engine in relation to the reduction gear and flexible coupling the following procedure must be carried out:

1. **Clarification of what parameters to be observed**
2. **Determination of wanted result and readings**
3. **Checking of alignment**
4. **Correction of engine location in order to obtain wanted result**

1. PARAMETERS TO BE OBSERVED

1.1 DIESEL ENGINE

Neutral axial position of crankshaft

When the axial position is measured it is important that the crankshaft of the engine and the input shaft of the reduction gear both are in a neutral axial position.

This will be achieved as follows:

- The stand for a dial indicator is placed on the engine in such a way that the dial indicator is indicating on the "engine side" of the flywheel.
- The crankshaft is then to be pushed to its ultimate axial positions in both directions and the readings on the dial indicator to be noted.
- The correct position of the crankshaft is right between two readings.
- The correct position of the input shaft of the reduction gear is determined in a similar way.

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C	4.10.89					1 (4)

WÄRTSILÄ DIESEL			ALIGNMENT INSTRUCTIONS
Tyyppi Type VASA 22	Suhde SCALE		
Oy WÄRTSILÄ Ab VAASAN TEHDAS VASA FACTORY VAASA - FINLAND	Painot WEIGHTS kg		
Piirt. DRWN. 31.3.87 JWg/ACH	Mitat MEASURES mm		
Tark. CHKD.	Kokoonp.piir. ASSEMBLY DRG.	Piir. no DRG. NO.	4V69L0027-1c
Hyv. APPVD.	Korvaa SUPERSEDES		

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Muutos ALTER.

Thermal expansion

The thermal expansion of the engine must be considered. The enclosed drawing 4V62L0280 shows the movement of the flywheel centre because of temperature changes.

The entire crankshaft will rise becuase of the engine block expansion. however, the centre of the block will expand more than the block ends. This will lead to a bent block if it is fixed straight in cold condition. In order to avoid this the engine must be installed in a sagging position in cold condition, see enclosed sketch 3V62L0279. This can be achieved by following mounting procedure:

- Adjust the engine location on the foundation until correct position in relation to the reduction gear is obtained.
- The own weight of the engine is suitable to obtain the necessary sagging. Therefore the engine should only be supported by the jacking screws at the block ends when fitting the chocks under the feet.
- The chocks are to be knocked lightly into position.
- Ream the holes for the fitted screws to a diameter of 34H7.
- Tighten the foundation screws.

1.2 FLEXIBLE COUPLINGS

Distance between flywheel and reduction gear input flange

The distance between the flywheel of the engine and the flange of the input shaft of the reduction gear shall correspond to the total length of the flexible coupling including the intermediate ring if fitted.

This distance is stated in the instruction manual of the flexible coupling.

The instruction manual should also be followed regarding special notes eg. should the flexible elements be mounted during alignment control or not.

1.3 REDUCTION GEAR

- The thermal expansion of the reducution gear must be considered.
- The neutral axial position of the input shaft must be determined in the same way as described for the crank shaft.

1.4 LUBE OIL SYSTEM TANK

If the engine is of dry type with the system tank located in the foundation below the engine, thermal expansion will occure when the oil temperature is rising during operation.

The influence on the alignment of the engine is difficult to estimate and is usually based on experience. Generally the centre of the tank will rise more than the periphery thus calling for a larger engine sagging in cold condition. However, if the systen tank length is the same or longer than the engine foundation, lengthening will compensate for above rise of tank centre.

2. DETERMINATION OF WANTED RESULTS

Based on the parameters influencing the alignment, wanted result should be determined. The main principle is that the centre lines of the shafts should be straight and in line during normal operation.

As the installation is carried out in cold condition the alignment checking values should be calculated for the ambient temperature during the checking procedure.

3. CHECKING PROCEDURE

3.1 FLEXIBLE COUPLING

The procedure of alignment checking differs depending on the type of flexible coupling. Therefore the instructions for the flexible coupling given by the manufacturer, should be followed. In priniple the procedure is the following:

Two dial indicators are used as shown in the drawing 4V62L0278. The bracket for the dial indicators is of simple design but has to be made rigid in order to avoid any deflection that may disturb the readings.

The bracket is fitted on the flange of the input shaft of the reduction gear.

The reduction gear and the engine are then turned and readings are made at preferably four but at least three different positions 90° apart.

As a general principle during the alignment the shafts shall be turned only in one direction because the shaft can slightly move axially due to the bearing clearance if the sense of rotation is changed.

The dial indicator "A" shows if the engine is out of center and the dial indicator "B" shows if the centre line of the engine is parallel with the centre line of the reduction gear.

3.2 DIESEL ENGINE

Check the alignment of the crankshaft according to the following:

Turn the crankshaft until the crank of the last cylinder arrives near the bottom dead centre position and apply the gauge indicator (a dial micrometer with width of 96 mm (R22), 150 mm (V22) between the feeler ends) between the both crank webs into the punch marks provided for this purpose. Check that the micrometer is as near to the connecting rod as possible and set the indicator at zero. Check the various readings after turning the crank to the rear side, top dead centre and service side.

The alignment of the crankshaft should first be checked at cold condition. If found acceptable the engine and power transmission line should be put in operation. As soon as the engine and gearbox have reached working temperature, i.e. after at minimum 5 hours the crankshaft should be checked.

See enclosed sketch 3V62L0279 for alignment values.

The difference between two diametral readings for the same crank must not exceed 0.04 mm at any cylinder at working temperature of the engine.

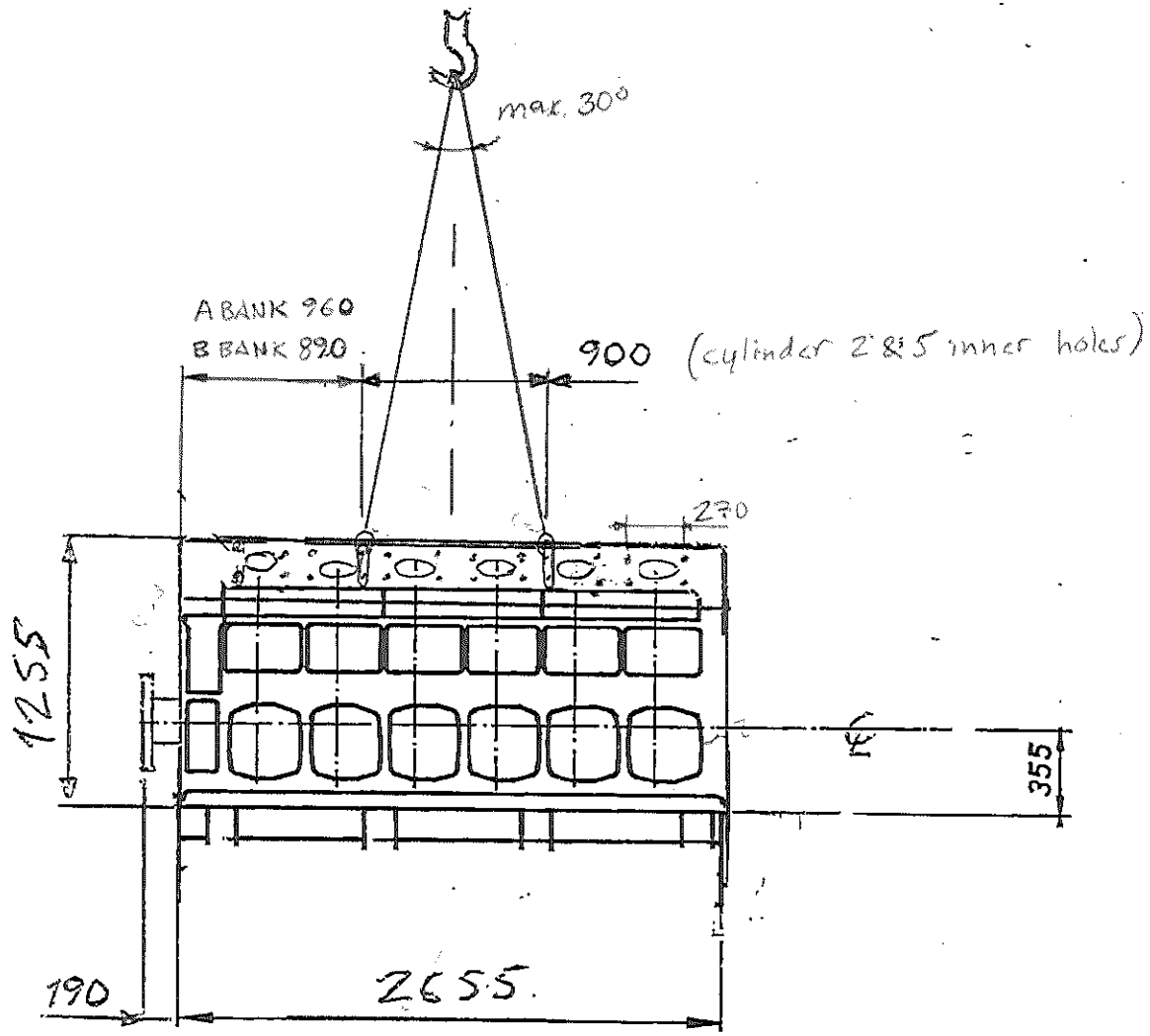
It should be noted that the reading at cylinder No. 1 will not change with engine position, this because the connection to the gearbox shaft is not fixed but flexible.

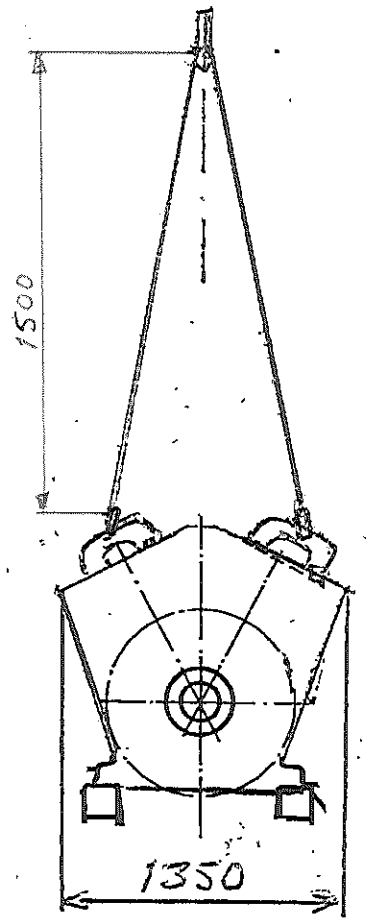
The thrust bearing axial clearance should be checked by moving the crankshaft by dial gauge pointing at the flywheel. The minimum allowed clearance is 0.05 mm. In case of clutch type coupling the above has to be checked with the clutch engaged.

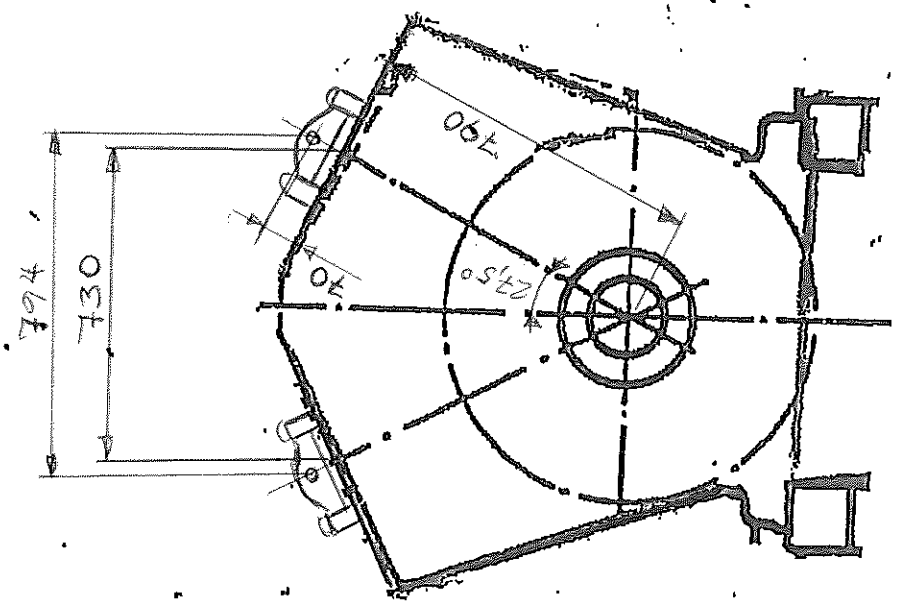
4. CORRECTIONS

The engine is to be moved and the procedure repeated until desired readings at cold conditions are obtained. The height of the engine can be adjusted by jacking screws in the engine feet. The screws, which are to be provided by the shipyard, can be made according to drawing 4V84G230.

12V22 SHORTBLOCK LIFTING



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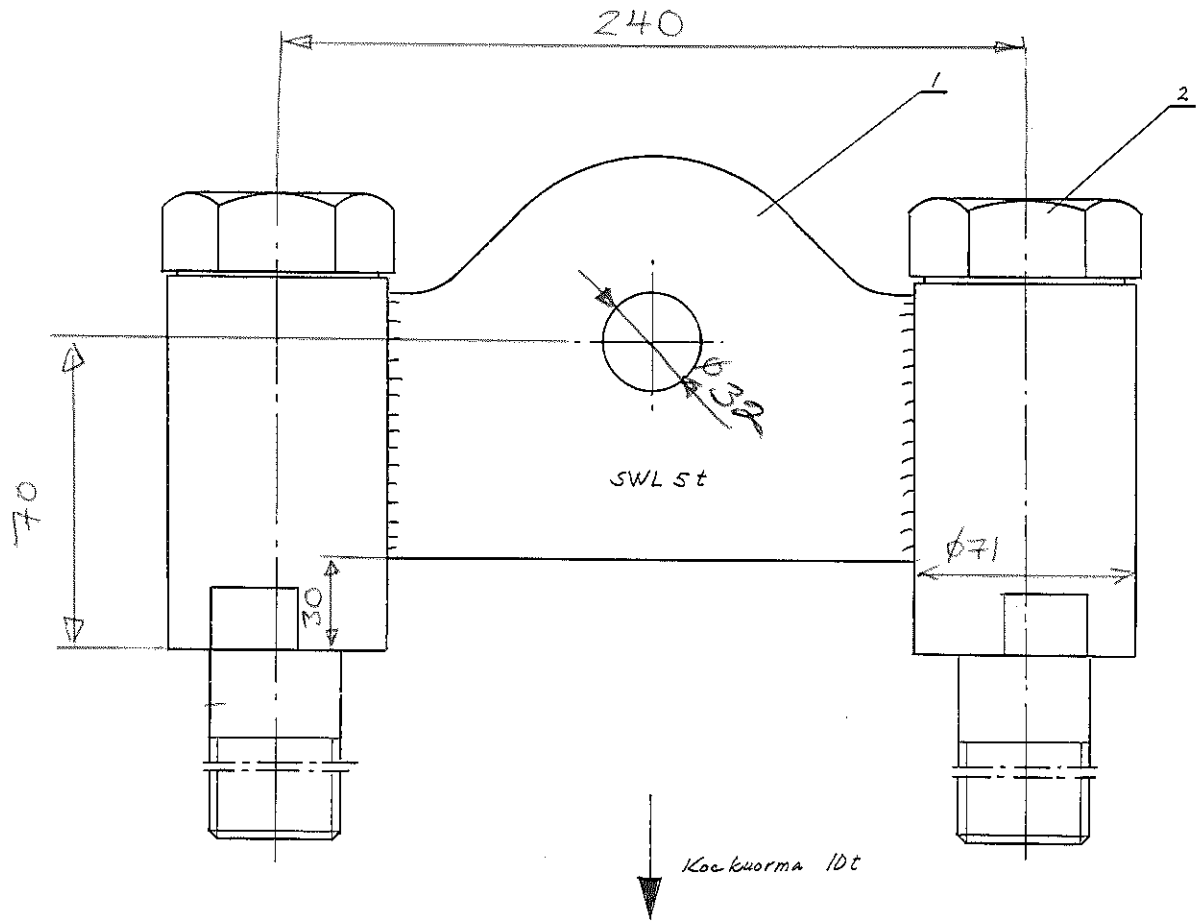

Käytetään nostotyökalun 22-460:n kanssa.
Nostokorva IV83D103:n tilalle

Koeajossa 5mm

Yleistoleranssit työstetyille mitoille GENERAL TOLERANCES FOR MACHINED MEASURES DIN 7168		
Nimellismitta NOMINAL MEASURE yli OVER	enint. MAX.	Toleranssi TOLERANCES
0,5	3	±
3	6	±
6	30	±
30	120	±
120	315	±
315	1000	±

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8	2		Ruuvi	2V-T22069	
4	1		1es	2V-T22068	

Kpl: PCS.	Osa ITEM NO.	Aineen koodi MATERIAL CODE	Osa tai aine PART OR MATERIAL	Normi tai piirustus STANDARD OR DRAWING	Aineen laatu / aihiomitta MATERIAL QUALITY / MATERIAL STAND.	Raaka-paino GROSS WEIGHT	Valmis-paino NET WEIGHT

WÄRTSILÄ VASA DIESEL
Oy Wärtsilä Ab FINLAND

Suhde SCALE 1:1
Tyyppi TYPE V 22 HF
Paino WEIGHTS kg
Mitat MEASURES mm

Piirt. DRWN. 19.8.82 HB
Tark. CHKD. 19.8.82
Hyv. APPVD.

Nostoväline
N10A305
Moottorilohko

Kokoonpanopiir. ASSEMBLY DRG.
Korvaa SUPERSEDES
Piir.no DRG NO: 2V-T22067

Muutos ALTER

15/A2/85