

**Technical Data**

Size / type	TT1300 KII CP
Installation No	T-8276
Drive motor power	535 KW
Drive motor revolutions	1800 RPM
Propeller revolutions	467 RPM
Propeller diameter	1300mm
Tunnel length	6750mm
Drive motor voltage / frequency	440V/60Hz
Classification society	LRS-ICE

Weights (approx.)

See drawing "Main Assy"

Hydraulic system

See hydraulic diagram – Assembly Drawing

Electronic Remote Control System

See control system – Assembly Drawing

Sense of Rotation

- Propeller: Right hand rotation (clockwise), seen from hub side.
- Pinion shaft: Right hand rotation (clockwise), seen from towards shaft end.
- Prime mover: Left hand rotation (anti-clockwise), seen towards its shaft end.

Turning Direction of Pitch Indicator Pin / Water Flow Direction

- Anti-clockwise: Water flow direction from the propeller towards the gear house
(gear house down-streams the propeller)
The ship moves towards the propeller side.
- Clockwise: Water flow direction from the gear house towards the propeller
(gear house up-streams the propeller)
The ship moves towards the pinion shaft side.



TUNNEL WITH PROPELLER UNIT

General

The propeller unit comprises a propeller tunnel in which a 1 – stay gear housing is bolted (including a welded support plate). A 4 – bladed propeller and shaft assembly are mounted in bearings in the gear housing.

Tunnel

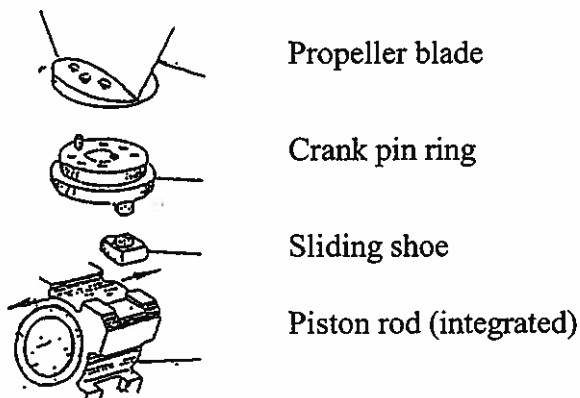
The tunnel is welded onto the ship's hull. For this reason only the gear housing can be dismantled off the ship, not the propeller tunnel.

Propeller

The main part of the tunnel thruster is the propeller hub with blades and the propeller shaft. One spherical roller bearing and two axial roller bearings support the shaft. The shaft seal prevents water from penetrating and oil leakage.

How the propeller operates

In the propeller hub, there is a servomotor, which turns the propeller blades. The servomotor consists of an integrated piston and an axially moving piston rod. The movement is obtained by leading pressure oil to one side or the other side of the piston. The piston rod has a crosshead with four transverse slots for sliding shoes, one for each of the blades. The eccentric crank pin fits into the hole of the sliding shoe. The crank pin ring is supported in a bearing lining, which is integrated with the hub body. When the piston rod moves, the crank pin rotates with the circular movement transmitted via the piston rod slot – sliding shoe and crank pin. Then the propeller blade, which is fixed on the crank pin ring by screws, will turn. Each blade is provided with a sealing ring to prevent water penetration to the hub or oil leakage.



Propeller blade

Crank pin ring

Sliding shoe

Piston rod (integrated)

How the movement of the piston rod is transmitted to the turning of blades
(principle sketch)

Pressure oil from the servomotor piston

The pressure oil is led to the required side of the piston in the hub servo through the hole-bored propeller shaft and the oil inlet pipe. The oil distribution box in the gear casing has two pressure chambers. One pressure chamber is connected to its side of the servomotor piston via the channel formed by the hole bored into the propeller shaft and the outside of the oil pipe. The second pressure chamber is connected to its side of the servomotor piston via the oil inlet pipe. The oil distribution box is not provided with low pressure seal and therefore there will always be a certain amount of leakage into the gear casing. In this way, the oil is automatically refilled in the tank. The four-way valve at the hydraulic unit (see under 'Hydraulic system') guides the pressure oil via pipes and hoses to the required chamber. At the same time, the return oil from the other chamber is draining. The oil inlet pipe is bolted to the piston rod and follows its movement. The oil inlet pipe is connected to the feedback device via linkage.

Drive system

The propeller is driven via a bevel gear in the gear casing. The pinion shaft is mounted in the stay supporting the gear casing. The gear wheel is shrunk on the propeller shaft. One spherical roller bearing and two taper roller bearings support the pinion shaft.



STANDARD HEADER TANK

Hydraulic system

The pitch setting of the propeller is carried out by means of hydraulic oil pressure. For this purpose a hydraulic pump unit and a header tank belong to the propeller equipment.

Regarding the hydraulic system, see 'Hydraulic System Diagram'. The system is to be maintained in such a way that it is always in the best condition. The oil recommendations are to be followed, as well as the instructions given in the maintenance chapter.

The hydraulic pump unit consists of:

- a fixed displacement oil pump
- an electric motor
- a pressure relief valve
- a sequence valve
- a control valve
- counter balance valves
- a pressure maintaining valve
- check valves
- a return oil filter
- a set of pressure switches
- a pressure gauge

The header tank includes:

- oil tank
- a level switch
- (temperature switch)
- an air breather filter
- a sounding rod

Pump unit

Pump (P51)

The pump is vertically mounted on the pump unit and driven by an electric motor. The actual pump and motor data can be seen on 'Hydraulic System Diagram'.

Pressure relief valve (V64)

The pressure relief valve is to be set at start-up at a value of 120 bar (12 MPa)



Pressure maintaining valve (V67)

This valve maintains necessary pressure for lubricating the gear house. For setting value, see 'Hydraulic System Diagram'.

Pressure switches

The hydraulic pump unit is normally equipped with two pressure switches (PS52) for alarm at low oil pressure and one pressure switch (P553) for interlock stop drive motor. The contacts are both for open or closed electric connection. Regarding actual numbers of switches and pressure settings, see 'Hydraulic System'. (Normally pre-set before delivery)

Control valve V60

The control valve is a solenoid-operated directional control valve with two solenoids and spring centred. The solenoids are designed for 24 V DC and are actuated via the remote control system. The valves can also be controlled manually.

Counter balance valves (V61) and (V62)

The counter balance valves keep the propeller pitch in set position. The pressure valve is adjusted in a special test rig before delivery.

Return oil filter (F53)

The oil filter is mounted on the pump unit, equipped with a 10 micron element. A visual / electrical indicator provides a visual warning and an electrical signal, when an element change is necessary. It is not possible to clean the element; it must be placed with a new one. New elements are normally included in the standard spare part set.

The filter is also equipped with a by-pass valve (V55), which prevents element damage in cases of extreme clogging or at cold start. Furthermore, a check valve (V52) is installed after the filter to prevent oil leakage when changing the filter element. (Note! The pump must be stopped before changing the element!)

The indicator can show 'red' at operation with cold oil. This does not necessarily mean that the filter element is clogged.



Oil pressure

The system is designed for a maximum working pressure of 140 bar (14 MPa)

Necessary pressure for manoeuvring the pitch is to be checked during the sea trial and the relief valve is to be adjusted if necessary.

The pump pressure is about 20 bar (2.0 MPa) when the control valve is in its middle position. This pressure is set by the sequence valve (V51). The pressure can be higher at starting up, if the oil is cold.

Header tank

The oil tank will work both as a main oil tank and as a header tank. Because of this, it must be installed over the highest waterline as stated on the 'Hydraulic System Drawing', so that a hydraulic over-pressure is achieved in the gear house and propeller.

Level switch

The level switch for low oil level alarm is mounted in the tank top and can be easily dismantled at testing.

Alarm point is about 80% of maximum oil volume.

Temperature switch

If required, a temperature switch for alarm signal at high oil temperature is installed in the oil tank. Normal alarm point is 65°C.

Starting up procedure

Please see separate instruction.