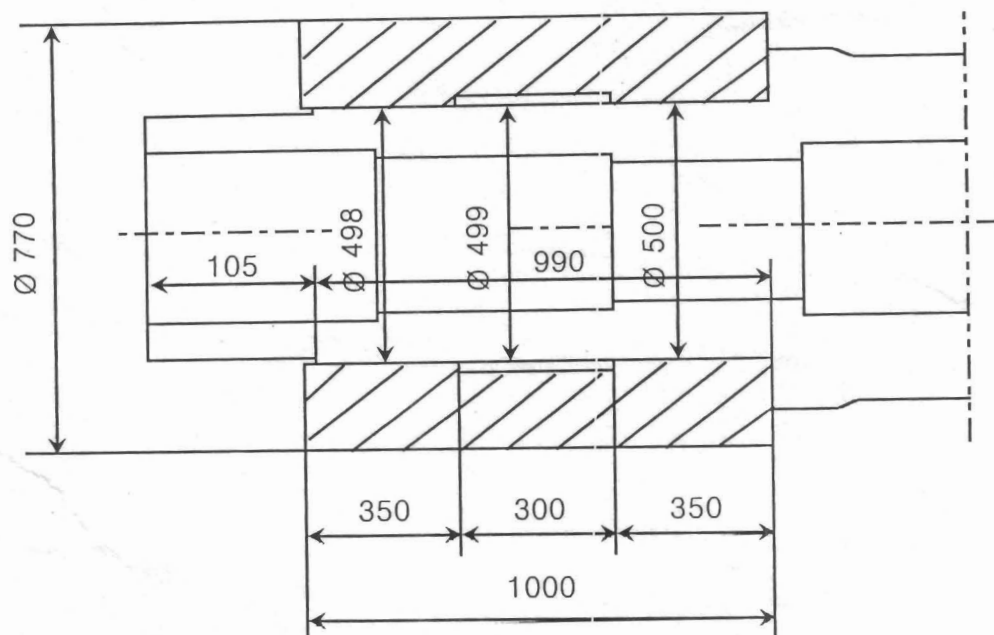


## CALCULATION FOR STERN TUBE FITTING

HULL NO. : WJZ-026

DATE : 2007.06.11

### 1. Dimention of stern tube fitting part



### 2. Pressure on contact surface (Pm)

The pressure on contact surface(Pm) can be determined according to the following formula.

$$P_m = \frac{\delta}{R_0 \left[ \left( \frac{R_1^2 + R_0^2}{R_1^2 - R_0^2} + \frac{1}{M_f} \right) \times \frac{1}{E_f} + \left( \frac{R_0^2 + R_2^2}{R_0^2 - R_2^2} - \frac{1}{m_t} \right) \times \frac{1}{E_t} \right]} \quad (\text{Kg/mm}^2)$$

Pm : Pressure on contact surface

δ : Interference on diameter (mm)

R0 : Inner diameter of stern boss or outer diameter of stern tube

R1 : Outer diameter of stern boss

R2 : Inner diameter of stern tube

Ef : Young's modulus of stern boss ( $2.1 \times 10^4 \text{ Kg/mm}^2$ )

Mf : Poisson's ratio of stern boss (3.6)

Et : Young's modulus of stern tube ( $1.0 \times 10^4 \text{ Kg/mm}^2$ )

mt : Poisson's ratio of stern tube (4.0)

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### 3. Pressing-in force (F)

The pressing-in force(F) can be determined according to the following formula.

$$F = \mu \cdot P_m \cdot A \text{ (Kg)}$$

$\mu$  : Coefficient of friction

A : Area of contact (mm<sup>2</sup>)

$P_m$  : Pressure on contact surface (Kg/mm<sup>2</sup>)

### 4. Calculation

#### 4-1. AFT side

1) Pressure on contact surface (Interference on diameter :  $2\delta = 0.03$ )

$$P_m = \frac{0.015}{249.0 \left[ \left( \frac{385.0^2 + 249.0^2}{385.0^2 - 249.0^2} + \frac{1}{3.6} \right) \times \frac{1}{2.1 \times 10^4} + \left( \frac{249.0^2 + 192.5^2}{249.0^2 - 192.5^2} - \frac{1}{4.0} \right) \times \frac{1}{1 \times 10^4} \right]}$$

$$= 0.1201 \text{ Kg/mm}^2$$

2) Pressing-in force (Coefficient of friction :  $\mu=0.18$ )

$$F = 0.18 \times 0.1201 \times 3.14 \times 498 \times 340$$

$$= 11493.5 \text{ Kg}$$

#### 4-2. FWD side

1) Pressure on contact surface (Interference on diameter :  $2\delta = 0.03$ )

$$P_m = \frac{0.015}{250.0 \left[ \left( \frac{385.0^2 + 250.0^2}{385.0^2 - 250.0^2} + \frac{1}{3.6} \right) \times \frac{1}{2.1 \times 10^4} + \left( \frac{250.0^2 + 192.0^2}{250.0^2 - 192.0^2} - \frac{1}{4.0} \right) \times \frac{1}{1 \times 10^4} \right]}$$

$$= 0.1217 \text{ Kg/mm}^2$$

2) Pressing-in force (Coefficient of friction :  $\mu=0.18$ )

$$F = 0.18 \times 0.1217 \times 3.14 \times 500 \times 350$$

$$= 12037.3 \text{ Kg}$$

5. Considering the machining tolerance, we recommend below data.

#### 5-1. AFT side

Interference on diameter ( $2\delta$ ) : 0.020 – 0.040 (mm)

Estimated pressing-in force : 7.7 – 15.3 Ton

#### 5-2. FWD side

Interference on diameter ( $2\delta$ ) : 0.020 – 0.040 (mm)

Estimated pressing-in force : 8.0 – 16.1 Ton

