

12. SUMMARY OF ALLIED CT-22 WINCH CHARACTERISTICS.

SYSTEM PRESSURE $p_{\text{syst}} = 3000 \text{ psi}$

Winch pressure $p_{\text{winch}} = 2325 \text{ psi}$

SYSTEM FLOW $Q_{\text{pump}} = 30.768 \text{ gpm}$

POWER REQUIRED $HP = 53.844 \text{ hp}$

use 50 hp motor

Drum diameter $D = 17 \text{ in}$ **Drum length** $B = 14.7 \text{ in}$ **Flange diameter** $H = 29 \text{ in}$

Reducer ratio $i = 104.5$

wire rope diameter $d = 1 \text{ in}$

$$\frac{D_p}{d} = 18$$

LOAD WINCH:

Hydraulic motor displacement $q_{\text{load}} = 9.5 \frac{\text{in}^3}{2 \cdot \pi}$

cubic inches/rev.

Output torque(drum) $\text{Torque}_{\text{drive}} = 25944.392 \text{ lbf} \cdot \text{ft}$

Motor rotational speed $\omega_{\text{hydrot}} = 620.916 \text{ rpm}$

Flow at the winch $\text{Flow}_{\text{hydrot}} = 25.536 \text{ gpm}$

Hook speed

$$V_h = \begin{pmatrix} 27.356 \\ 29.988 \\ 32.621 \\ 35.253 \end{pmatrix} \text{ fpm}$$

Actual line pulls @ $\Delta p_{\text{winch}} = 2325 \text{ psi}$ **System pressure $p_{\text{syst}} = 3000 \text{ psi}$**

1st layer line pull $\text{Pull}_1 = 34592.522 \text{ lbf}$

2d layer line pull $\text{Pull}_2 = 31556.041 \text{ lbf}$

3d layer line pull $\text{Pull}_3 = 29009.619 \text{ lbf}$

4th layer line pull $\text{Pull}_4 = 26843.478 \text{ lbf}$

CONSTANT TENSION WINCH MOTOR

Hydraulic motor displacement $q_{\text{ct}} = 20 \frac{\text{in}^3}{2 \cdot \pi}$ cubic inches/rev.

Hyd. motor efficiency $\eta_{\text{ct}} = 0.94$

**Pressure to release
the clutch**

Output torque(drum) $T_{\text{ct}} = 795.775 \text{ lbf} \cdot \text{ft}$ $p_{\text{clutch}} = 651.557 \text{ psi}$

Motor rotational speed $\omega_{\text{ct}} = 169.765 \text{ rpm}$

Flow $Q_{\text{ct}} = 15.75 \text{ gal} \cdot \text{min}^{-1}$

Note: when line is on the 4th layer length of wire rope down from the tip of the boom is too short and will not be considered.

Hook speed all 4 layers

$$V_{\text{ct}} = \begin{pmatrix} 805.808 \\ 883.347 \\ 960.886 \\ 1038.425 \end{pmatrix} \text{ fpm}$$

**CT motor layer max pulls
(includes hook block**

$$W_{\text{block}} = 50 \text{ lbf}$$

and wire rope weight

$$\rho_{\text{wr}} \cdot L_{\text{tip}_1} = 460.69 \text{ lbf}$$

$$P_{\text{act}} = \begin{pmatrix} 741.097 \\ 696.897 \\ 652.697 \end{pmatrix} \text{ lbf}$$