13.21 9/9

PROPELLER NOTE BOOK

B SERIES PROPELLERS

Definition:

B	3.	35
Series	No. of Blades	Expanded Area Ratio, Percent

Notation:

$$K_T = \frac{T}{\rho n^2 D^4}$$

$$K_Q = \frac{Q}{\rho n^2 D^5}$$

$$J = \frac{V_A}{nD}$$

$$\eta_o = \frac{K_T J}{2\pi K_Q}$$

P/D = Pitch/Diameter

T = Thrust, lbf

Q = Torque, lbf ft.

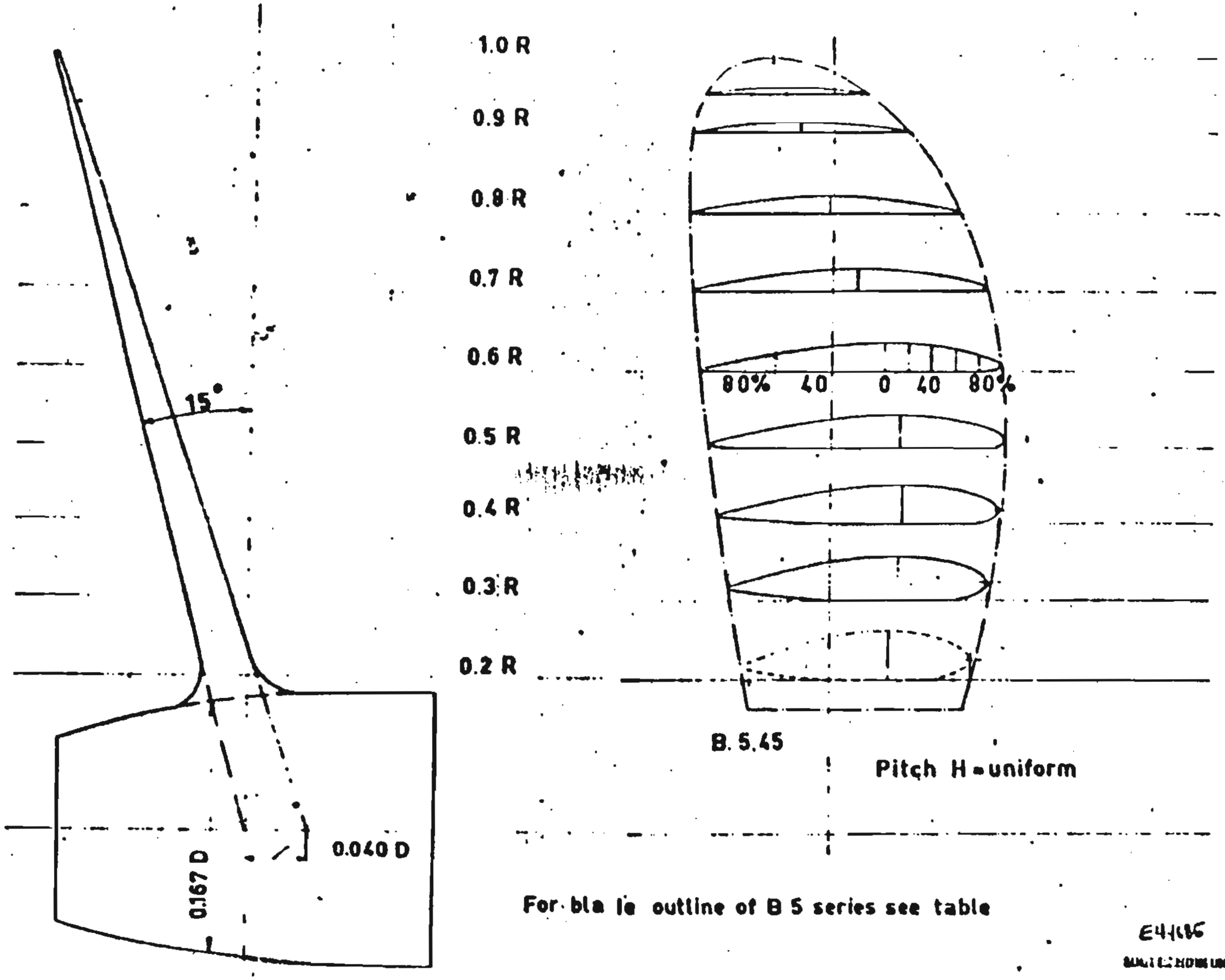
ρ = Mass density, 1.9905 lbf s^2/ft^4

n = Rotational speed, revs/s

D = Maximum diameter, ft.

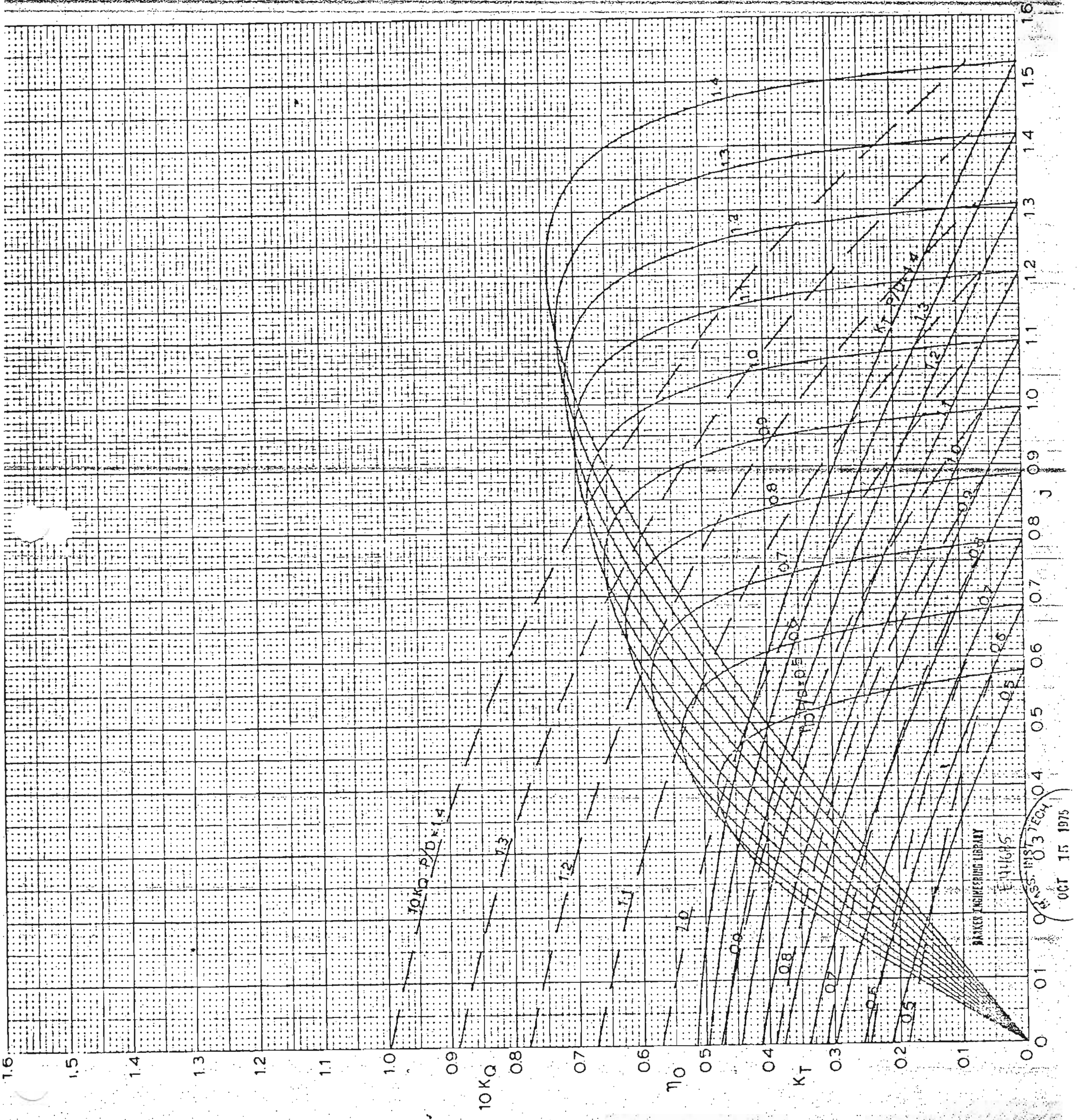
V_A = Velocity of advance, ft/s

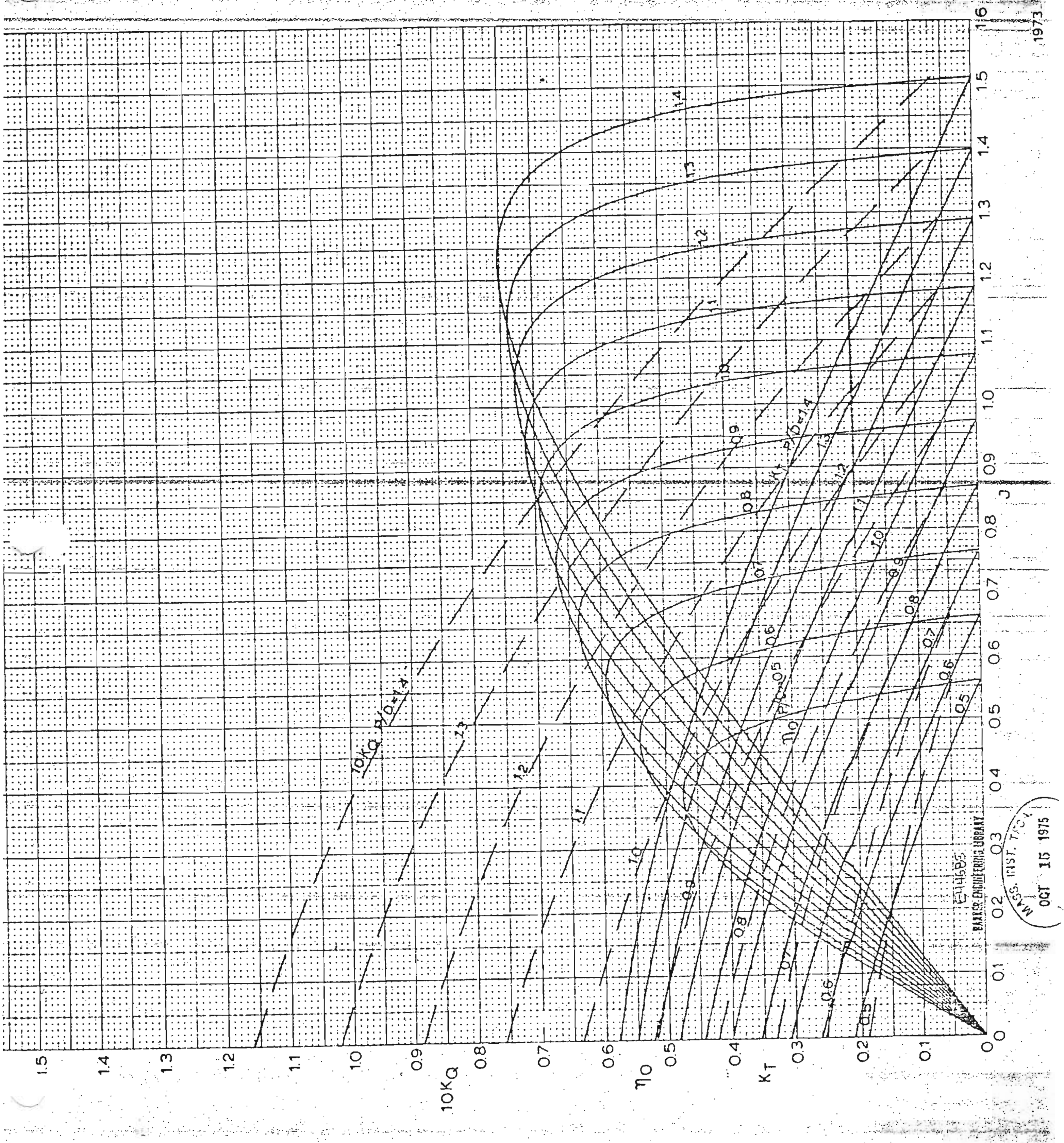
General arrangement plan of 5 bladed B series propellers

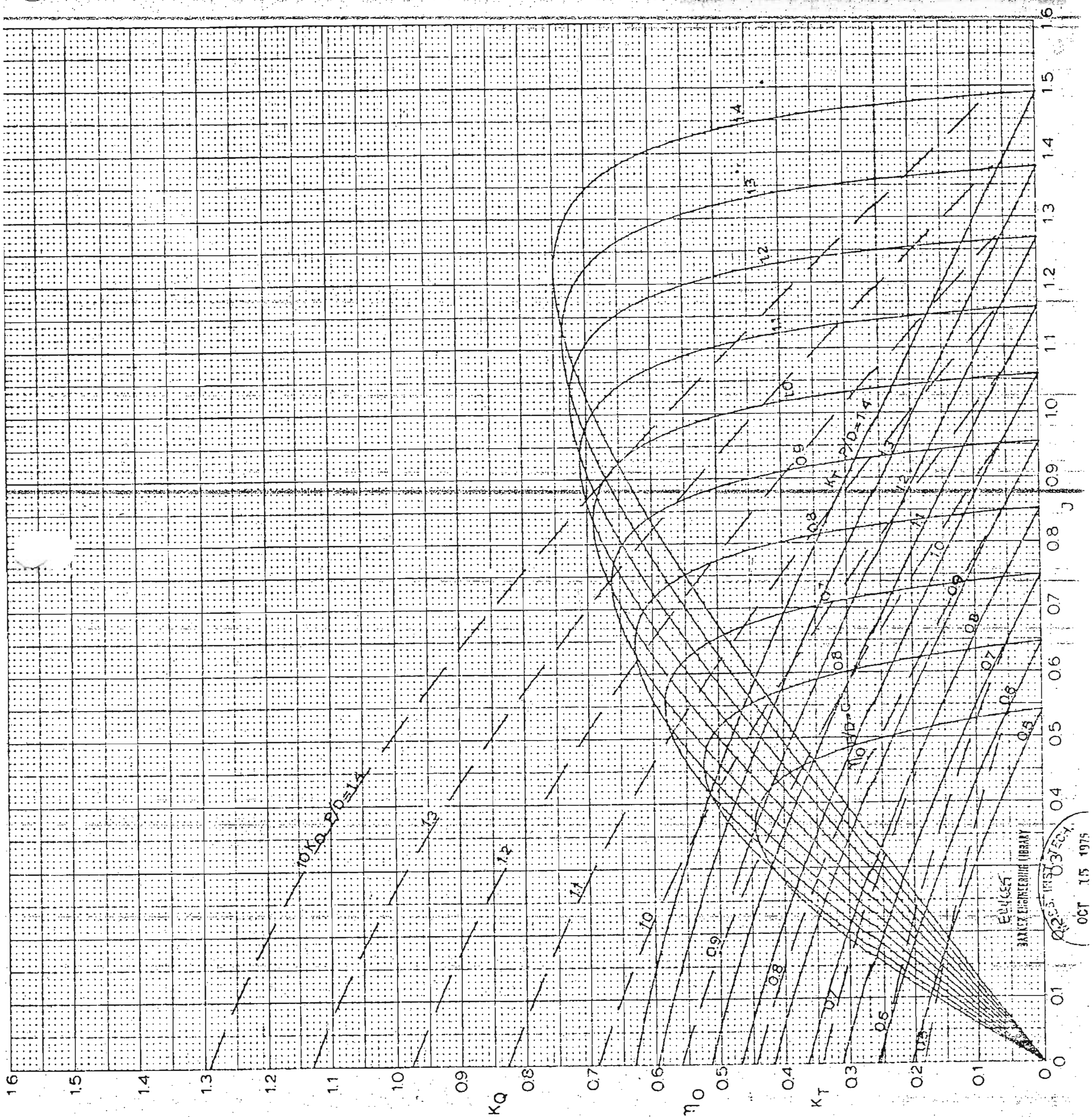


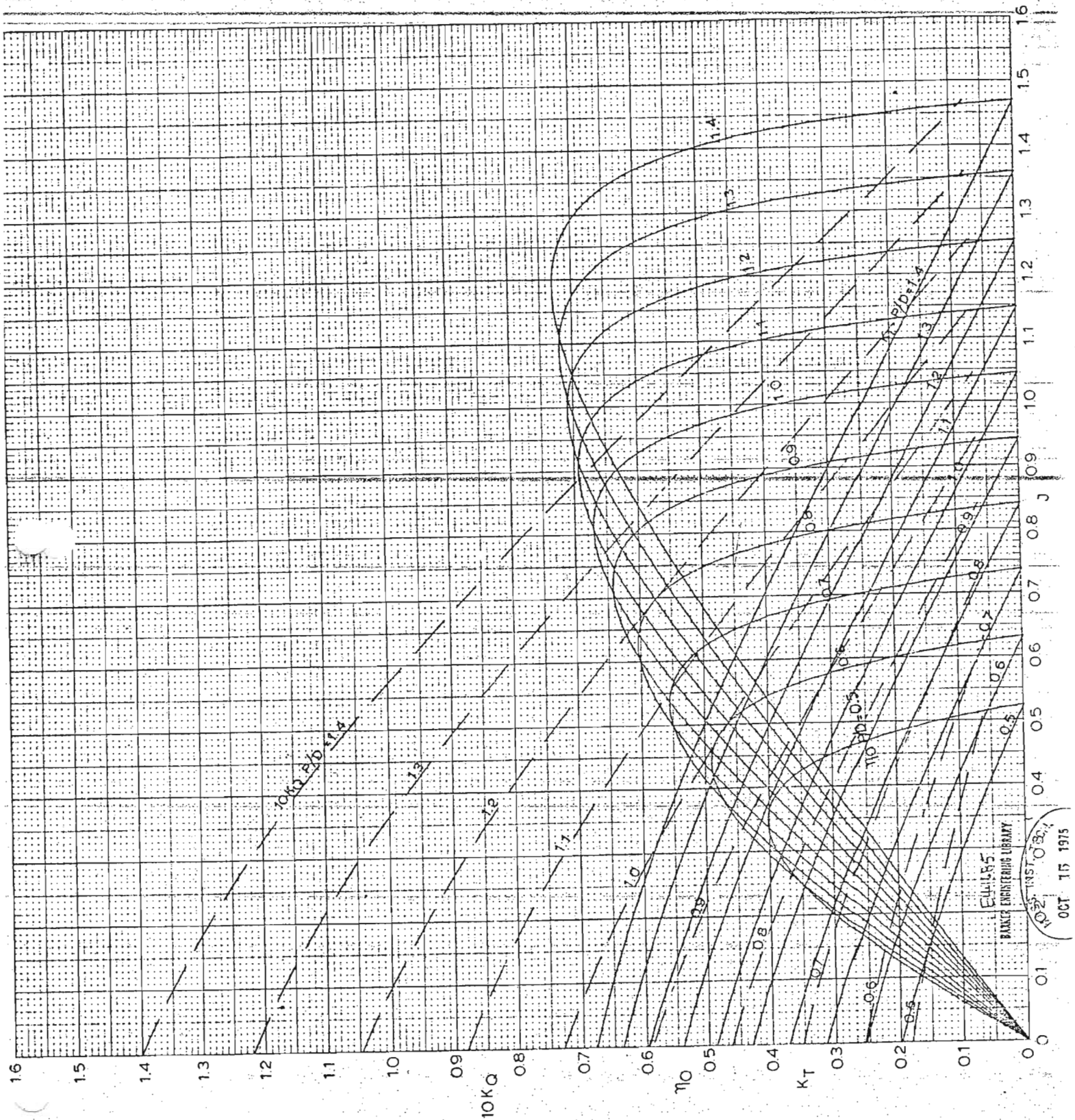
For bla le outline of B 5 series see table

B 5-45









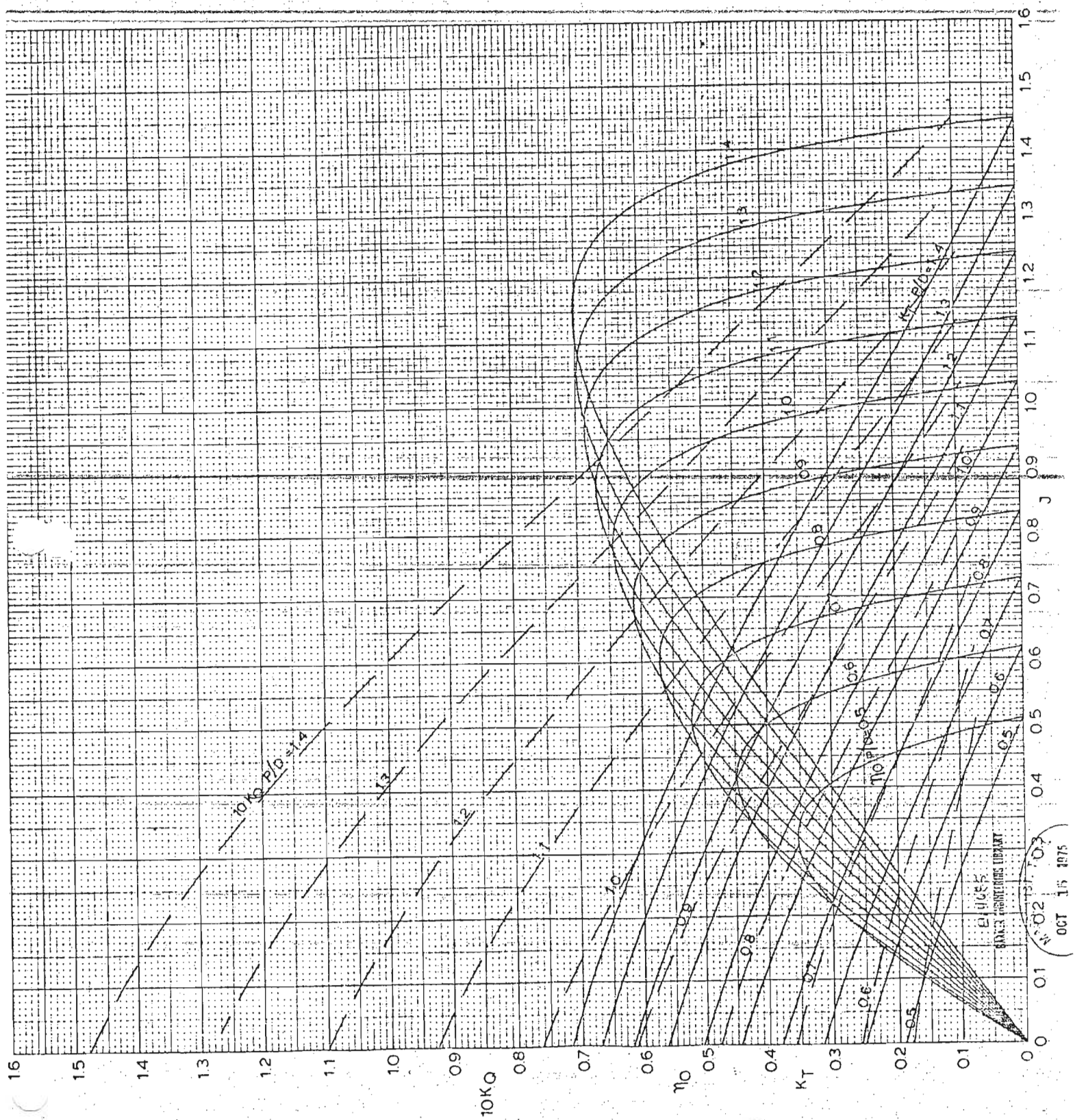


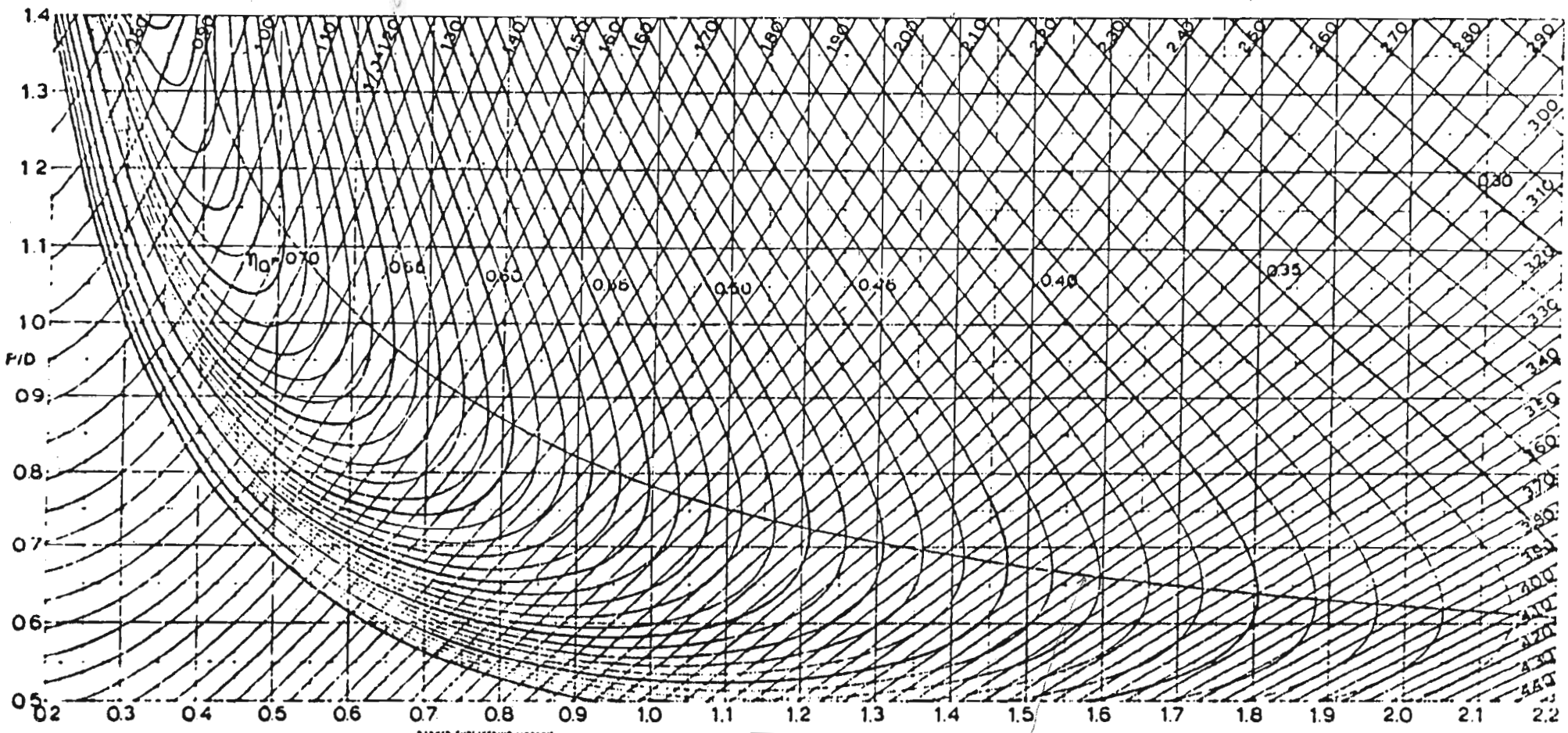
Table 17—Coefficients and Terms of the K_T and K_Q Polynomials for the Wageningen B-screw Series for Rn $= 2 \times 10^6$.

$$K_t - \sum_{s,t,u,v} \left[C_{s,t,u,v} \cdot (J)^s \cdot (P/D)^t \cdot (A_E/A_o)^u \cdot (z^v) \right]$$

$$K_q - \sum_{s,t,u,v} \left[C_{s,t,u,v} \cdot (J)^s \cdot (P/D)^t \cdot (A_E/A_o)^u \cdot (z^v) \right]$$

$K_T =$ $C_{s,t,u,v}$	s (J)	t (P/D)	u (A_E/A_o)	v (z)	K_q $C_{s,t,u,v}$	s (J)	t (P/D)	u (A_E/A_o)	v (z)
+0.00880496	0	0	0	0	+0.00379368	0	0	0	0
−0.204554	1	0	0	0	+0.00886523	2	0	0	0
+0.166351	0	1	0	0	−0.032241	1	1	0	0
+0.158114	0	2	0	0	+0.00344778	0	2	0	0
−0.147581	2	0	1	0	−0.0408811	0	1	1	0
−0.481497	1	1	1	0	−0.108009	1	1	1	0
+0.415437	0	2	1	0	−0.0885381	2	1	1	0
+0.0144043	0	0	0	1	+0.188561	0	2	1	0
−0.0530054	2	0	0	1	−0.00370871	1	0	0	1
+0.0143481	0	1	0	1	+0.00513696	0	1	0	1
+0.0606826	1	1	0	1	+0.0209449	1	1	0	1
−0.0125894	0	0	1	1	+0.00474319	2	1	0	1
+0.0109689	1	0	1	1	−0.00723408	2	0	1	1
−0.133698	0	3	0	0	+0.00438388	1	1	1	1
+0.00638407	0	6	0	0	−0.0269403	0	2	1	1
−0.00132718	2	6	0	0	+0.0558082	3	0	1	0
+0.168496	3	0	1	0	+0.0161886	0	3	1	0
−0.0507214	0	0	2	0	+0.00318086	1	3	1	0
+0.0854559	2	0	2	0	+0.015896	0	0	2	0
−0.0504475	3	0	2	0	+0.0471729	1	0	2	0
+0.010465	1	6	2	0	+0.0196283	3	0	2	0
−0.00648272	2	6	2	0	−0.0502782	0	1	2	0
−0.00841728	0	3	0	1	−0.030055	3	1	2	0
+0.0168424	1	3	0	1	+0.0417122	2	2	2	0
−0.00102296	3	3	0	1	−0.0397722	0	3	2	0
−0.0317791	0	3	1	1	−0.00350024	0	6	2	0
+0.018604	1	0	2	1	−0.0106854	3	0	0	1
−0.00410798	0	2	2	1	+0.00110903	3	3	0	1
−0.000606848	0	0	0	2	−0.000313912	0	6	0	1
−0.0049819	1	0	0	2	+0.0035985	3	0	1	1
+0.0025983	2	0	0	2	−0.00142121	0	6	1	1
−0.000560528	3	0	0	2	−0.00383637	1	0	2	1
−0.00163652	1	2	0	2	+0.0126803	0	2	2	1
−0.000328787	1	6	0	2	−0.00318278	2	3	2	1
+0.000116502	2	6	0	2	+0.00334268	0	6	2	1
+0.000690904	0	0	1	2	−0.00183491	1	1	0	2
+0.00421749	0	3	1	2	+0.000112451	3	2	0	2
+0.0000565229	3	6	1	2	−0.0000297228	3	6	0	2
−0.00146564	0	3	2	2	+0.000269551	1	0	1	2
					+0.00083265	2	0	1	2
					+0.00155334	0	2	1	2
					+0.000302683	0	6	1	2
					−0.0001843	0	0	2	2
					−0.000425399	0	3	2	2
					+0.0000869243	3	3	2	2
					−0.0004659	0	6	2	2
					+0.0000554194	1	6	2	2

E4468S



$$0.1739\sqrt{B_{p_1}} = K_Q^{1/4} \cdot J^{-5/4}$$

B5 - 75

1975

max efficiency

$$B_{p_1} = NP^{1/2} \cdot V_A^{-5/2}$$

N = PROPELLER RPM
$V_A = V_S (1-w)$
V_S = SHIP SPEED IN KNOTS
w = WAKE FRACTION
P = SHAFT HORSEPOWER (BRITISH)

SI units

$$K_Q^{1/4} \cdot J^{-5/4} = \left[\frac{Qn^3}{\rho V_A^5}\right]^{1/4}$$

Q = PROPELLER TORQUE IN KGM
n = PROPELLER REVOLUTIONS PER SECOND
ρ = WATER DENSITY (TANK) = 101.94 $KGSEC^2 M^{-4}$
$V_A = V_S (1-w)$
V_S = SHIP SPEED IN M/SEC.
w = WAKE FRACTION