

The following is a sample of the hand calculations that were performed for each motor model.

# Hand Calc's

## Single2 Model:

MotorkV = 4

MotorMVA = 0.4408

$Z_{\rm B} = \frac{\rm MotorkV^2}{\rm MotorMVA}$	$Z_{\rm B} = 36.29764$	$R_{2LR} = 0.0123 Z_B$	$R_{2LR} = 0.44646$
$R_1 = 0.0383 Z_B$		$R_{2FL} = 0.0152 Z_B$	$R_{2FL} = 0.55172$
$X_1 = 0.1029 Z_B$		$X_{2LR} = 0.093 Z_B$	$X_{2LR} = 3.37568$
$Xm = 3.652 Z_B$		$X_{2FL} = 0.1167 Z_B$	X <sub>2FL</sub> = 4.23593

### Find rated slip using trial and error until current (I1) is satisfied:

$$s_{rated} = 0.0155022$$

$$R_{2} = (R_{2FL} - R_{2LR}) (1 - s_{rated}) + R_{2LR}$$

$$R_{2} = 0.55009$$

$$X_{2} = (X_{2FL} - X_{2LR}) (1 - s_{rated}) + X_{2LR}$$

$$X_{2} = 4.2226$$

$$Zeq = R_{1} + X_{1}i + \frac{1}{Xmi} + \frac{1}{\frac{R_{2}}{s_{rated}}} + X_{2}i$$

$$Zeq = 32.61631 + 15.92816i$$

$$MotorkV 1000$$

$$I_1 = \frac{\sqrt{3}}{|Zeq|}$$
  $I_1 = 63.62373$ 

#### Calculate the relationship (K) between Pout and Pag to compensate for rotational losse

PF = cos(arg(Zeq))	PF = 0.89858
$P_{ag} = \sqrt{3} \text{ MotorkV I}_1 \text{ PF} - \frac{3I_1^2 R_1}{1000}$	P <sub>ag</sub> = 379.20791
$Pconv = (1 - s_{rated}) P_{ag}$	Pconv = 373.32935
Pout <sub>rated</sub> = 500 0.7457	Pout <sub>rated</sub> = $372.85$
$K_{ga} = \frac{P_{ag}}{Pout_{rated}}$	K <sub>ga</sub> = 1.01705

Copyright © 2005 to 2023 Operation Technology, Inc. All Rights Reserved.

Page 2 of 4

Under the copyright laws, this manual may not be copied, in whole or in part, without the written consent of Operation Technology, Inc. The Licensee may copy portions of this documentation only for the exclusive use of Licensee. Any reproduction shall include the copyright notice. This exception does not allow copies to be made for other persons or entities, whether or not sold. Under this law, copying includes translating into another language. Certain names and/or logos used in this document may constitute trademarks, service marks, or trade names of Operation Technology, Inc. or other entities.





#### Single1 Model:

o (nu)	t (a)	<b>Benchmark</b>		ETAP		<u>% Diff</u>	
s (pu)	t (s)	P (kW)	Q (kvar)	P (kW)	Q (kvar)	P (%)	Q (%)
0.900008	0.835	7.4564	1473.97	7.45092	1473.94	0.074	0.002
0.699987	2.252	32.1621					

Copyright © 2005 to 2023 Operation Technology, Inc. All Rights Reserved. Page 4 of 4 Under the copyright laws, this manual may not be copied, in whole or in part, without the written consent of Operation Technology, Inc. The Licensee may copy portions of this documentation only for the exclusive use of Licensee. Any reproduction shall include the copyright notice. This exception does not allow copies to be made for other persons or entities, whether or not sold. Under this law, copying includes translating into another language. Certain names and/or logos used in this document may constitute trademarks, service marks, or trade names of Operation Technology, Inc. or other entities.