From
https://www.maxongroup.com/medias/sys_master/root/8815460712478/DC-EC-Key-Information-14-EN-42-50.pdf?attachment=true

$1 \cdot rev = 6.283$

$n := 0..2$

$MotorDescr_n :=$

"Maxon EC90 36V"
"Maxon EC60 24V"
"Maxon EC60 48V"
"Maxon 353297 250W 48V Brushed 65mm"
"Maxon 353301 250W 70V Brushed 65mm"

Terminal Resistance

$R_n :=$

$0.522 \cdot ohm$
$.293 \cdot ohm$
$1.11 \cdot ohm$
$.365 \cdot ohm$
$1.41 \cdot ohm$

Torque Constant

$k_{M_n} :=$

$.109 \cdot \frac{N \cdot m}{A}$
$0.0525 \cdot \frac{N \cdot m}{A}$
$0.113 \cdot \frac{N \cdot m}{A}$
$.127 \cdot \frac{N \cdot m}{A}$
$0.253 \cdot \frac{N \cdot m}{A}$

Speed Constant

$k_{n_n} :=$

$88 \cdot \frac{rev}{min \cdot V}$
$182 \cdot \frac{rev}{min \cdot V}$
$84.8 \cdot \frac{rev}{min \cdot V}$
$75.4 \cdot \frac{rev}{min \cdot V}$
$37.7 \cdot \frac{rev}{min \cdot V}$

No Load Current

$I_{0_n} :=$

$.348 \cdot A$
$0.497 \cdot A$
$.224 \cdot A$
$.276 \cdot A$
$.120 \cdot A$

Stall Torque

$M_{H_n} :=$

$7.48 \cdot N \cdot m$
$4.3 \cdot N \cdot m$
$4.87 \cdot N \cdot m$
$16.6 \cdot N \cdot m$
$12.6 \cdot N \cdot m$

Gear Ratio

$gearRatio_n :=$

1
1
1
1
1

Gear efficiency

$gearEff_n :=$

1
1
1
1
1

$M_{load} := 0.3 \cdot N \cdot m$ $\quad Speed_{desired} := 2500 \cdot \frac{rev}{min}$ $\quad Speed_{desired} = 261.799 \cdot \frac{rad}{sec}$

$M_{motor_n} := \frac{M_{load}}{gearRatio_n \cdot gearEff_n}$ $\quad Speed_{motor_n} := Speed_{desired} \cdot gearRatio_n$

$Power_{out} := M_{load} \cdot Speed_{desired}$ $\quad Power_{out} = 78.54\,W$

$M_{motor} = \begin{pmatrix} 0.3 \\ 0.3 \\ 0.3 \end{pmatrix} \cdot N \cdot m$ $\quad Speed_{motor} = \begin{pmatrix} 2.5 \times 10^3 \\ 2.5 \times 10^3 \\ 2.5 \times 10^3 \end{pmatrix} \cdot \frac{rev}{min}$

Power in

$$Power_{in_n} := \left[\left(\frac{\overrightarrow{M_{motor_n}}}{k_{M_n}} \cdot R_n\right) + \frac{Speed_{motor_n}}{k_{n_n}}\right] \cdot \frac{M_{motor_n}}{k_{M_n}}$$

$$Power_{in} = \begin{pmatrix} 82.144 \\ 88.06 \\ 86.092 \end{pmatrix} W$$

Motor Terminal Voltage

$$U_n := \left(\frac{\overrightarrow{M_{motor_n}}}{k_{M_n}} \cdot R_n\right) + \frac{Speed_{motor_n}}{k_{n_n}}$$

$$U = \begin{pmatrix} 29.846 \\ 15.411 \\ 32.428 \end{pmatrix} V$$

Motor Terminal Voltage

$$U_{actual_n} := \frac{1}{k_{n_n}} \cdot \left[Speed_{motor_n} + \frac{R_n}{\left(k_{M_n}\right)^2} \cdot M_{motor_n}\right]$$

$$U_{actual} = \begin{pmatrix} 29.839 \\ 15.41 \\ 32.418 \end{pmatrix} V$$

Moment of Friction

$$M_{R_n} := k_{M_n} \cdot I_{0_n}$$

M_{R_n} =

0.038
0.026
0.025

·N·m

Motor Current from Load

$$I_{motor_n} := \frac{M_{motor_n}}{k_{M_n}}$$

$$I_{motor} = \begin{pmatrix} 2.752 \\ 5.714 \\ 2.655 \end{pmatrix} A$$

Total Motor Current

$$I_{total_n} := I_{motor_n} + I_{0_n}$$

$$I_{total} = \begin{pmatrix} 3.1 \\ 6.211 \\ 2.879 \end{pmatrix} A$$

Power efficiency

$$eff_n := \frac{M_{load} \cdot Speed_{desired}}{Power_{in_n}}$$

$$eff = \begin{pmatrix} 0.956 \\ 0.892 \\ 0.912 \end{pmatrix}$$

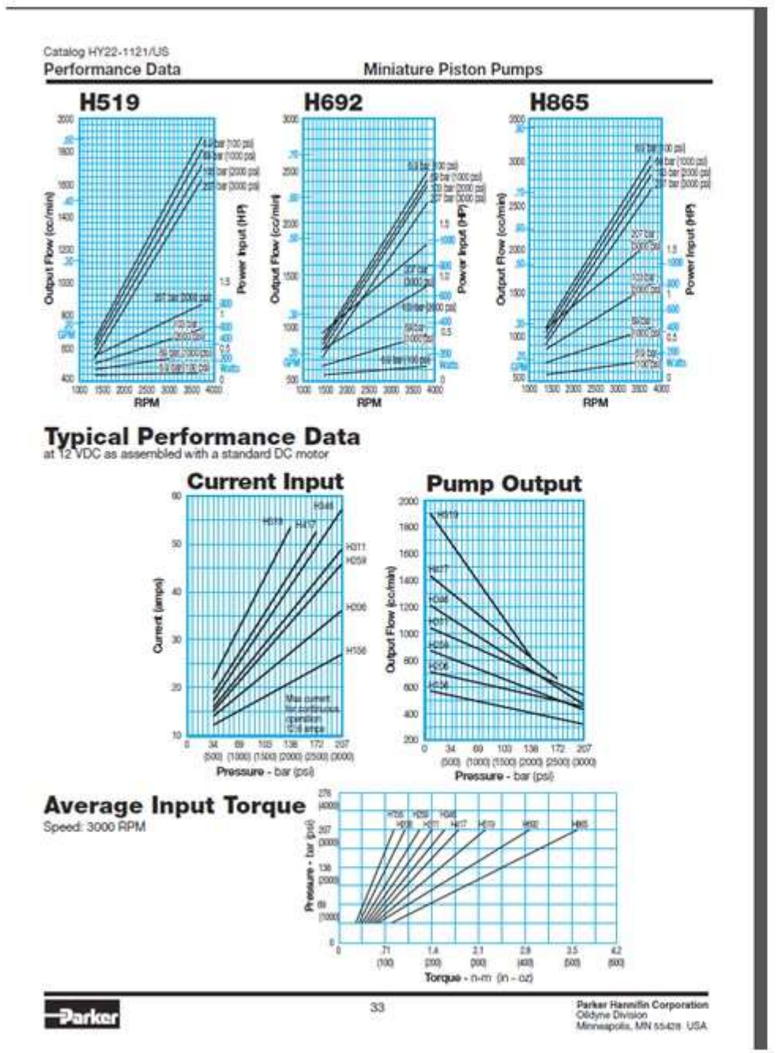
Maxon Efficiency

$$\eta_n := \frac{Speed_{desired} \cdot \left(M_{motor_n} - M_{R_n}\right)}{U_{actual_n} \cdot I_{motor_n}}$$

$$\eta = \begin{pmatrix} 0.835 \\ 0.814 \\ 0.836 \end{pmatrix}$$

$$MotorDescr_n = \begin{pmatrix} \text{"Maxon EC90 36V"} \\ \text{"Maxon EC60 24V"} \\ \text{"Maxon EC60 48V"} \end{pmatrix}$$

Physical variables		and their units	
		SI	Catalog
i	Gear reduction*		
I	Motor current	A	A, mA
I_A	Starting current*	A	A, mA
I_0	No-load current*	A	mA
I_{RMS}	RMS determined current	A	A, mA
I_N	Nominal current*	A	A, mA
J_R	Moment of inertia of the rotor*	kgm^2	gcm^2
J_L	Moment of inertia of the load	kgm^2	gcm^2
k_M	Torque constant*	Nm/A	mNm/A
k_n	Speed constant*		rpm/V
M	(Motor) torque	Nm	mNm
M_B	Operating torque	Nm	mNm
M_H	Stall torque*	Nm	mNm
M_{mot}	Motor torque	Nm	mNm
M_R	Moment of friction	Nm	mNm
M_{RMS}	RMS determined torque	Nm	mNm
M_N	Nominal torque	Nm	mNm
$M_{N,G}$	Max. torque of gear*	Nm	Nm
n	Speed		rpm
n_B	Operating speed		rpm
n_{max}	Limit speed of motor*		rpm
$n_{max,G}$	Limit speed of gear*		rpm
n_{mot}	Motor speed		rpm
n_0	No-load speed*		rpm
P_{el}	Electrical power	W	W
P_J	Joule power loss	W	W
P_{mech}	Mechanical power	W	W
R	Terminal resistance	Ω	Ω
R_{25}	Resistance at 25°C*	Ω	Ω
R_T	Resistance at temperature T	Ω	Ω
R_{th1}	Heat resistance winding housing*		K/W
R_{th2}	Heat resistance housing/air*		K/W
t	Time	s	s
T	Temperature	K	°C
T_{max}	Max. winding temperature*	K	°C
T_U	Ambient temperature	K	°C
T_W	Winding temperature	K	°C
U	Motor voltage	V	V
U_{ind}	Induced voltage (EMF)	V	V



U_{max}	Max. supplied voltage	V	V
U_N	Nominal voltage*	V	V
α_{Cu}	Resistance coefficient of Cu		
α_{max}	Maximum angle acceleration		rad/s²
$\Delta n/\Delta M$	Curve gradient*		rpm/mNm
ΔT_W	Temperature difference winding/ambient	K	K
Δt	Run up time	s	ms
η	(Motor) efficiency		%
η_G	(Gear) efficiency*		%
η_{max}	Maximum efficiency*		%
τ_m	Mechanical time constant*	s	ms
τ_S	Therm. time constant of the stator*	s	s
τ_W	Therm. time constant of the winding*	s	s

(*Specified in the motor or gear data)