Brushless DC-Servomotors

2 Pole Technology

8 mNm

58,5 W

Series 1645 ... BHS

Values at 22°C and nominal voltage		1645 S		024 BHS	036 BHS	048 BHS	
1	Nominal voltage	U_N		24	36	48	V
2	Terminal resistance, phase-phase	R		0,684	1,51	2,81	Ω
3	Efficiency, max.	$\eta_{max.}$		90	90	90	%
4	No-load speed	n_0		62 000	62 900	61 400	min⁻¹
5	No-load current, typ. (with shaft ø 3 mm)	I_0		0,0988	0,0674	0,0486	A
6	Stall torque	M_H		137	138	135	mNm
7	Friction torque, static	C_0		0,114	0,114	0,114	mNm
8	Friction torque, dynamic	C_V		$4{,}49 \cdot 10^{-6}$	$4{,}49 \cdot 10^{-6}$	$4{,}49 \cdot 10^{-6}$	mNm/min⁻¹
9	Speed constant	k_n		2 450	1 650	1 210	min⁻¹/V
10	Back-EMF constant	k_E		0,409	0,606	0,825	mV/min⁻¹
11	Torque constant	k_M		3,9	5,79	7,88	mNm/A
12	Current constant	k_I		0,256	0,173	0,127	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$		429	431	432	min⁻¹/mNm
14	Terminal inductance, phase-phase	L		46	103	190	µH
15	Mechanical time constant	τ_m		2,6	2,6	2,7	ms
16	Rotor inertia	J		0,59	0,59	0,59	gcm²
17	Angular acceleration	$\alpha_{max.}$		2 330	2 350	2 300	·10³rad/s²
18	Thermal resistance	R_{th1} / R_{th2}	3,1 / 22				K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	6,5 / 580				s
20	Operating temperature range:						
	– motor		-30 ... +125				°C
	– winding, max. permissible		+125				°C
21	Shaft bearings		ball bearings, preloaded				
22	Shaft load max.:						
	– with shaft diameter		3				mm
	– radial at 40 000 min⁻¹ (5 mm from mounting flange)		18				N
	– axial at 40 000 min⁻¹ (push only)		9				N
	– axial at standstill (push only)		44				N
23	Shaft play:						
	– radial	≤	0,01				mm
	– axial	=	0				mm
24	Housing material		stainless steel				
25	Mass		58,2				g
26	Direction of rotation		electronically reversible				
27	Speed up to	$n_{max.}$	100 000				min⁻¹
28	Number of pole pairs		1				
29	Hall sensors		digital				
30	Magnet material		NdFeB				
Rated values for continuous operation							
31	Rated torque	M_N		6,09	6,02	6,1	mNm
32	Rated current (thermal limit)	I_N		1,86	1,24	0,924	A
33	Rated speed	n_N		61 300	62 100	60 600	min⁻¹

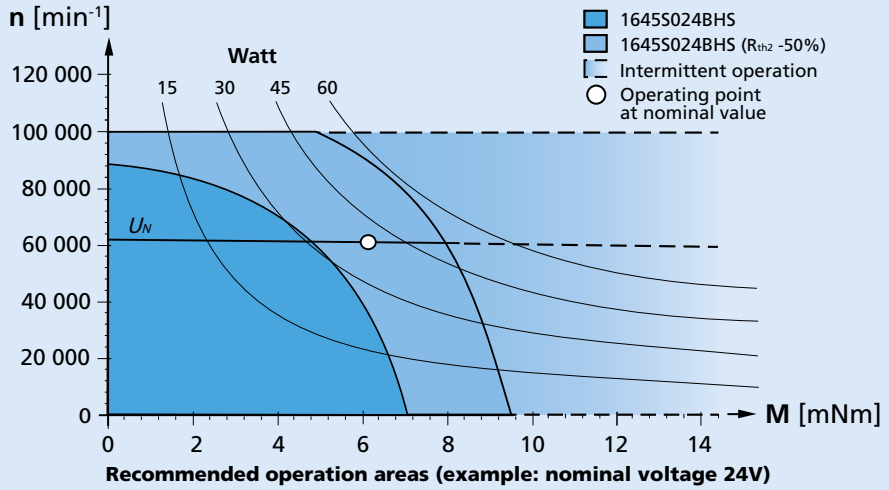
Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The R_{th2} value has been reduced by 25%.

Note:

The diagram indicates the recommended speed in relation to the available torque at the output shaft for a given ambient temperature of 22°C.

The diagram shows the motor in a completely insulated as well as thermally coupled condition (R_{th2} 50% reduced).

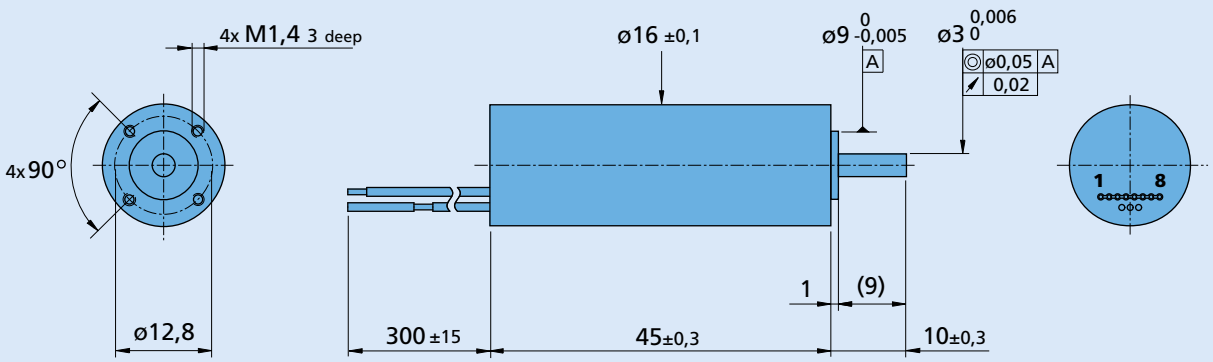
The nominal voltage (U_N) curve shows the operating point at nominal voltage in the insulated and thermally coupled condition. Any points of operation above the curve at nominal voltage will require a higher operating voltage. Any points below the nominal voltage curve will require less voltage.



Recommended operation areas (example: nominal voltage 24V)

For notes on technical data and lifetime performance refer to "Technical Information".

Dimensional drawing



1645 S ... BHS

Option, cable and connection information

Example product designation: **1645S024BHS**

Option	Type	Description

Connection

No.	Function	Colour
–	Phase C	yellow
–	Phase B	orange
–	Phase A	brown
1	GND	red
2	U_{DD} (4,5 ... 5,5V)	grey
3	Hall sensor C	grey
4	Hall sensor B	grey
5	Hall sensor A	grey
6	Reserved	grey
7	Reserved	grey
8	Reserved	grey

Standard cable

Single wires, material PTFE
AWG24, Phase A/B/C
Flat cable, material PVC
AWG28, Pitch 1,27 mm
Hall A,B,C, U_{DD}, GND

Product combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
15/10 16GPT 17/1 20GPT 20/1R	IEM3-1024	SC 5004 P SC 5008 S MC 3602 B MC 3603 S MC 5004 P MC 5005 S	To view our large range of accessory parts, please refer to the “Accessories” chapter.

Brushless DC-Servomotors

2 Pole Technology

15,9 mNm

96 W

Series 1660 ... BHS

Values at 22°C and nominal voltage		1660 S		024 BHS	036 BHS	048 BHS	
1	Nominal voltage	U_N		24	36	48	V
2	Terminal resistance, phase-phase	R		0,29	0,51	1,12	Ω
3	Efficiency, max.	$\eta_{max.}$		92	92	92	%
4	No-load speed	n_0		52 400	60 100	53 600	min⁻¹
5	No-load current, typ. (with shaft ø 3 mm)	I_0		0,147	0,123	0,076	A
6	Stall torque	M_H		385	442	394	mNm
7	Friction torque, static	C_0		0,16	0,16	0,16	mNm
8	Friction torque, dynamic	C_V		9,43·10⁻⁶	9,43·10⁻⁶	9,43·10⁻⁶	mNm/min⁻¹
9	Speed constant	k_n		2 038	1 527	1 037	min⁻¹/V
10	Back-EMF constant	k_E		0,491	0,655	0,964	mV/min⁻¹
11	Torque constant	k_M		4,69	6,26	9,21	mNm/A
12	Current constant	k_I		0,21	0,16	0,11	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$		127	124	127	min⁻¹/mNm
14	Terminal inductance, phase-phase	L		29	52	112	µH
15	Mechanical time constant	τ_m		1,2	1,2	1,2	ms
16	Rotor inertia	J		0,9	0,9	0,9	gcm²
17	Angular acceleration	$\alpha_{max.}$		4 278	4 914	4 372	·10³rad/s²
18	Thermal resistance	R_{th1} / R_{th2}	2,1 / 18,2				K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	6,3 / 638				s
20	Operating temperature range:						
	– motor		-30 ... +125				°C
	– winding, max. permissible		+125				°C
21	Shaft bearings		ball bearings, preloaded				
22	Shaft load max.:						
	– with shaft diameter		3				mm
	– radial at 40 000 min⁻¹ (5 mm from mounting flange)		19				N
	– axial at 40 000 min⁻¹ (push only)		9				N
	– axial at standstill (push only)		44				N
23	Shaft play:						
	– radial	≤	0,01				mm
	– axial	=	0				mm
24	Housing material		stainless steel				
25	Mass		78				g
26	Direction of rotation		electronically reversible				
27	Speed up to	$n_{max.}$	97 000				min⁻¹
28	Number of pole pairs		1				
29	Hall sensors		digital				
30	Magnet material		NdFeB				
Rated values for continuous operation							
31	Rated torque	M_N		11,6	10,3	11,4	mNm
32	Rated current (thermal limit)	I_N		2,94	1,98	1,48	A
33	Rated speed	n_N		52 370	59 530	53 400	min⁻¹

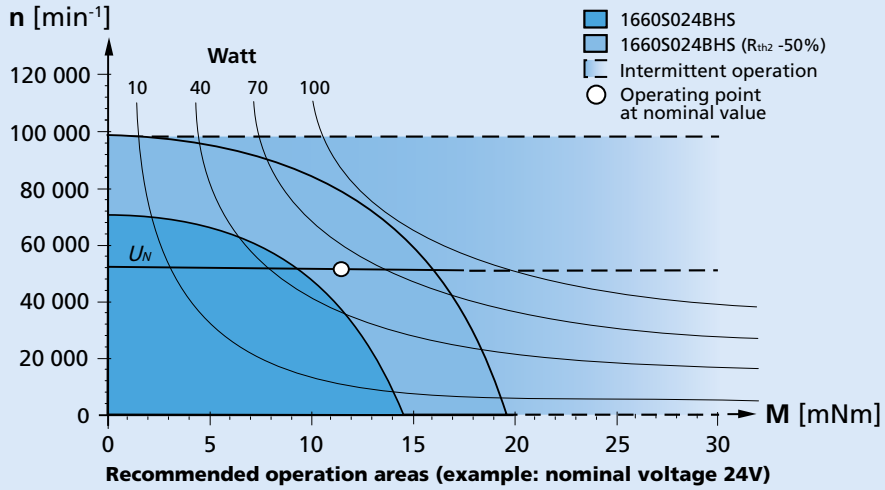
Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The R_{th2} value has been reduced by 25%.

Note:

The diagram indicates the recommended speed in relation to the available torque at the output shaft for a given ambient temperature of 22°C.

The diagram shows the motor in a completely insulated as well as thermally coupled condition (R_{th2} 50% reduced).

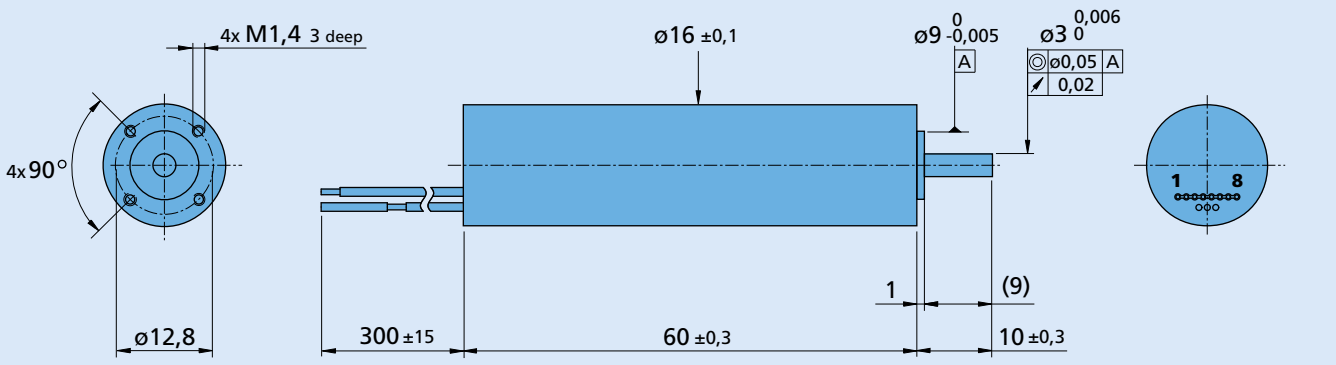
The nominal voltage (U_N) curve shows the operating point at nominal voltage in the insulated and thermally coupled condition. Any points of operation above the curve at nominal voltage will require a higher operating voltage. Any points below the nominal voltage curve will require less voltage.



Recommended operation areas (example: nominal voltage 24V)

For notes on technical data and lifetime performance refer to "Technical Information".

Dimensional drawing



1660 S ... BHS

Option, cable and connection information

Example product designation: **1660S024BHS**

Option	Type	Description

Connection

No.	Function	Colour
–	Phase C	yellow
–	Phase B	orange
–	Phase A	brown
1	GND	red
2	U_{DD} (4,5 ... 5,5V)	grey
3	Hall sensor C	grey
4	Hall sensor B	grey
5	Hall sensor A	grey
6	Reserved	grey
7	Reserved	grey
8	Reserved	grey

Standard cable

Single wires, material PTFE
AWG24, Phase A/B/C
Flat cable, material PVC
AWG28, Pitch 1,27 mm
Hall A,B,C, U_{DD}, GND

Product combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
15/10 16GPT 17/1 20GPT 20/1R	IEM3-1024	SC 5004 P SC 5008 S MC 3602 B MC 3606 B	To view our large range of accessory parts, please refer to the "Accessories" chapter.

Brushless DC-Servomotors
2 Pole Technology

18,7 mNm
81 W

Series 1660 ... BHT

Values at 22°C and nominal voltage		1660 S	024 BHT	036 BHT	048 BHT	
1	Nominal voltage	U_N	24	36	48	V
2	Terminal resistance, phase-phase	R	0,49	1,1	1,93	Ω
3	Efficiency, max.	$\eta_{max.}$	90	90	90	%
4	No-load speed	n_0	34 900	35 200	35 500	min⁻¹
5	No-load current, typ. (with shaft ø 3 mm)	I_0	0,133	0,09	0,069	A
6	Stall torque	M_H	344	341	343	mNm
7	Friction torque, static	C_0	0,43	0,43	0,43	mNm
8	Friction torque, dynamic	C_V	$1{,}28 \cdot 10^{-5}$	$1{,}28 \cdot 10^{-5}$	$1{,}28 \cdot 10^{-5}$	mNm/min⁻¹
9	Speed constant	k_n	1 368	918	694	min⁻¹/V
10	Back-EMF constant	k_E	0,731	1,09	1,441	mV/min⁻¹
11	Torque constant	k_M	6,98	10,4	13,7	mNm/A
12	Current constant	k_I	0,143	0,096	0,073	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$	95	97	97	min⁻¹/mNm
14	Terminal inductance, phase-phase	L	52	114	203	µH
15	Mechanical time constant	τ_m	1,2	1,2	1,3	ms
16	Rotor inertia	J	1,2	1,2	1,2	gcm²
17	Angular acceleration	$\alpha_{max.}$	2 796	2 772	2 787	·10³rad/s²
18	Thermal resistance	R_{th1} / R_{th2}	2,1 / 18,2			K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	6,8 / 631			s
20	Operating temperature range:					
	– motor		-30 ... +125			°C
	– winding, max. permissible		+125			°C
21	Shaft bearings		ball bearings, preloaded			
22	Shaft load max.:					
	– with shaft diameter		3			mm
	– radial at 40 000 min⁻¹ (5 mm from mounting flange)		19			N
	– axial at 40 000 min⁻¹ (push only)		9			N
	– axial at standstill (push only)		44			N
23	Shaft play:					
	– radial	≤	0,01			mm
	– axial	=	0			mm
24	Housing material		stainless steel			
25	Mass		78			g
26	Direction of rotation		electronically reversible			
27	Speed up to	$n_{max.}$	76 000			min⁻¹
28	Number of pole pairs		1			
29	Hall sensors		digital			
30	Magnet material		NdFeB			
Rated values for continuous operation						
31	Rated torque	M_N	13,9	13,7	13,6	mNm
32	Rated current (thermal limit)	I_N	2,38	1,58	1,18	A
33	Rated speed	n_N	34 490	34 740	35 070	min⁻¹

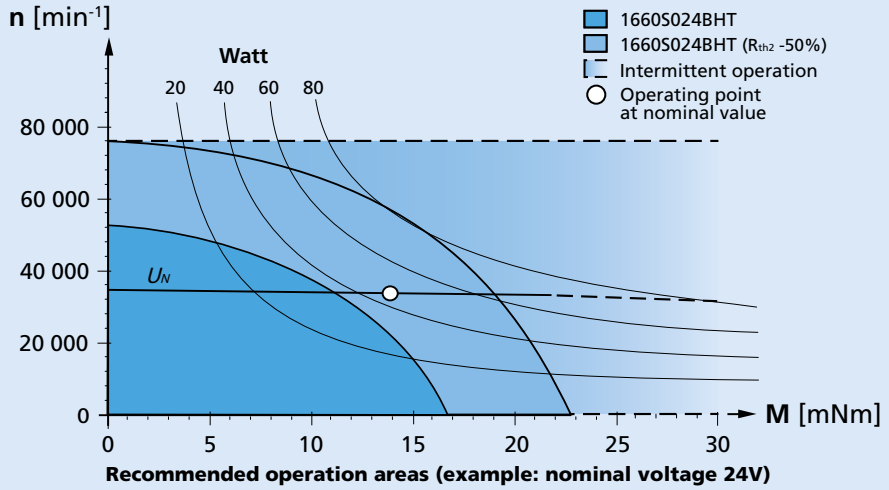
Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The R_{th2} value has been reduced by 25%.

Note:

The diagram indicates the recommended speed in relation to the available torque at the output shaft for a given ambient temperature of 22°C.

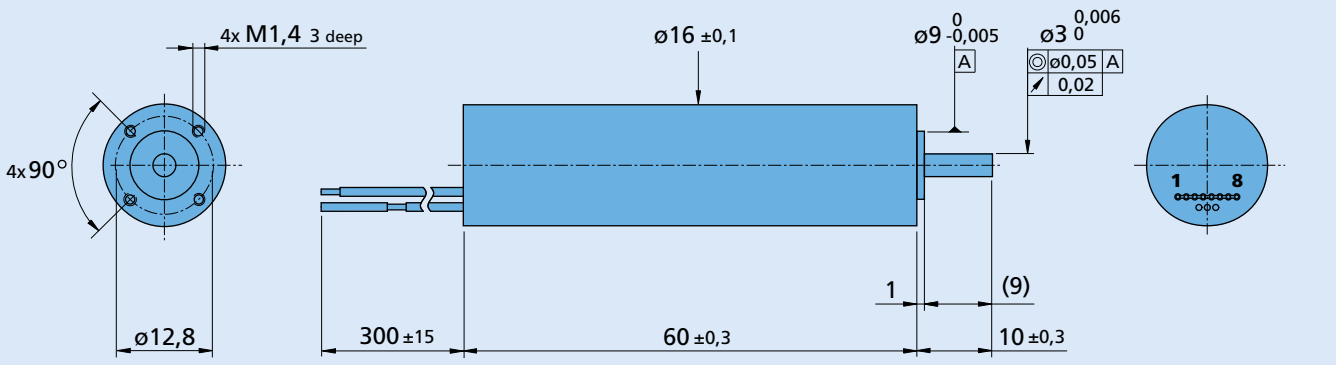
The diagram shows the motor in a completely insulated as well as thermally coupled condition (R_{th2} 50% reduced).

The nominal voltage (U_N) curve shows the operating point at nominal voltage in the insulated and thermally coupled condition. Any points of operation above the curve at nominal voltage will require a higher operating voltage. Any points below the nominal voltage curve will require less voltage.



Recommended operation areas (example: nominal voltage 24V)

Dimensional drawing



1660 S ... BHT

Option, cable and connection information

Example product designation: **1660S024BHT**

Option	Type	Description

Connection

No.	Function	Colour
–	Phase C	yellow
–	Phase B	orange
–	Phase A	brown
1	GND	red
2	U_{DD} (4,5 ... 5,5V)	grey
3	Hall sensor C	grey
4	Hall sensor B	grey
5	Hall sensor A	grey
6	Reserved	grey
7	Reserved	grey
8	Reserved	grey

Standard cable

Single wires, material PTFE
AWG24, Phase A/B/C
Flat cable, material PVC
AWG28, Pitch 1,27 mm
Hall A,B,C, U_{DD}, GND

Product combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
15/10 16GPT 17/1 20GPT 20/1R	IEM3-1024	SC 5004 P SC 5008 S MC 3602 B MC 3603 S MC 3606 B MC 5004 P MC 5005 S	To view our large range of accessory parts, please refer to the “Accessories” chapter.