Brushless DC-Flat Motors

4 Pole Technology

0,5 mNm

1,5 W

Series 1509 ... B

Values at 22°C and nominal voltage		1509 T	006 B	012 B	
1	Nominal voltage	U_N	6	12	V
2	Terminal resistance, phase-phase	R	22	92,7	Ω
3	Efficiency, max.	$\eta_{max.}$	54	53	%
4	No-load speed	n_0	15 000	14 900	min^{-1}
5	No-load current, typ. (with shaft ø 1,5 mm)	I_0	0,019	0,009	A
6	Stall torque	M_H	0,953	0,904	mNm
7	Friction torque, static	C_0	0,019	0,019	mNm
8	Friction torque, dynamic	C_V	$3{,}42 \cdot 10^{-6}$	$3{,}42 \cdot 10^{-6}$	mNm/min^{-1}
9	Speed constant	k_n	2 682	1 339	min^{-1}/V
10	Back-EMF constant	k_E	0,373	0,747	mV/min^{-1}
11	Torque constant	k_M	3,56	7,13	mNm/A
12	Current constant	k_I	0,281	0,14	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$	16 577	17 423	min^{-1}/mNm
14	Terminal inductance, phase-phase	L	570	2 282	µH
15	Mechanical time constant	τ_m	120	126	ms
16	Rotor inertia	J	0,69	0,69	gcm^2
17	Angular acceleration	$\alpha_{max.}$	14	13	$\cdot 10^3 rad/s^2$
18	Thermal resistance	R_{th1} / R_{th2}	65 / 45		K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	12 / 133		s
20	Operating temperature range:				
	– motor		-25 ... +80		°C
	– winding, max. permissible		+80		°C
21	Shaft bearings		ball bearings, preloaded		
22	Shaft load max.:				
	– with shaft diameter		1,5		mm
	– radial at 3 000 min^{-1} (3 mm from mounting flange)		2		N
	– axial at 3 000 min^{-1} (push only)		2		N
	– axial at standstill (push only)		15		N
23	Shaft play:				
	– radial	≤	0,015		mm
	– axial	=	0		mm
24	Housing material		plastic		
25	Mass		6,9		g
26	Direction of rotation		electronically reversible		
27	Speed up to	$n_{max.}$	40 000		min^{-1}
28	Number of pole pairs		2		
29	Hall sensors		digital		
30	Magnet material		NdFeB		

Rated values for continuous operation					
31	Rated torque	M_N	0,45	0,44	mNm
32	Rated current (thermal limit)	I_N	0,147	0,071	A
33	Rated speed	n_N	5 860	5 550	min^{-1}

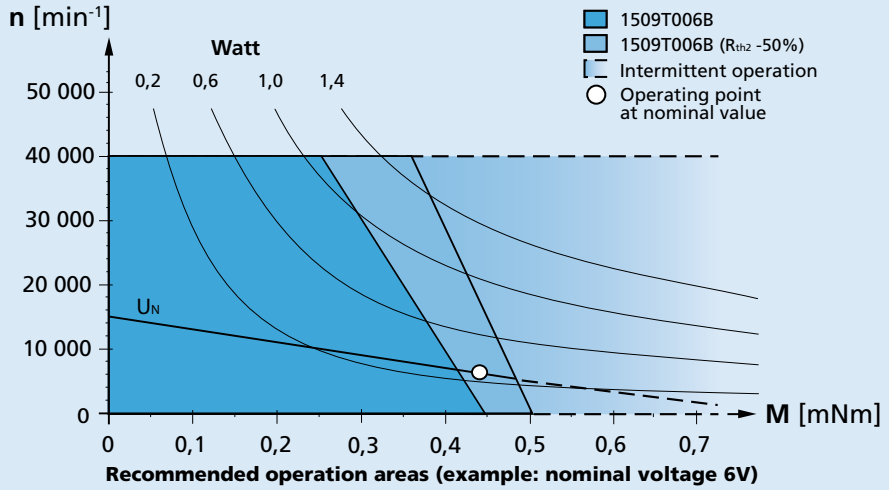
Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The R_{th2} value has been reduced by 25%.

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).

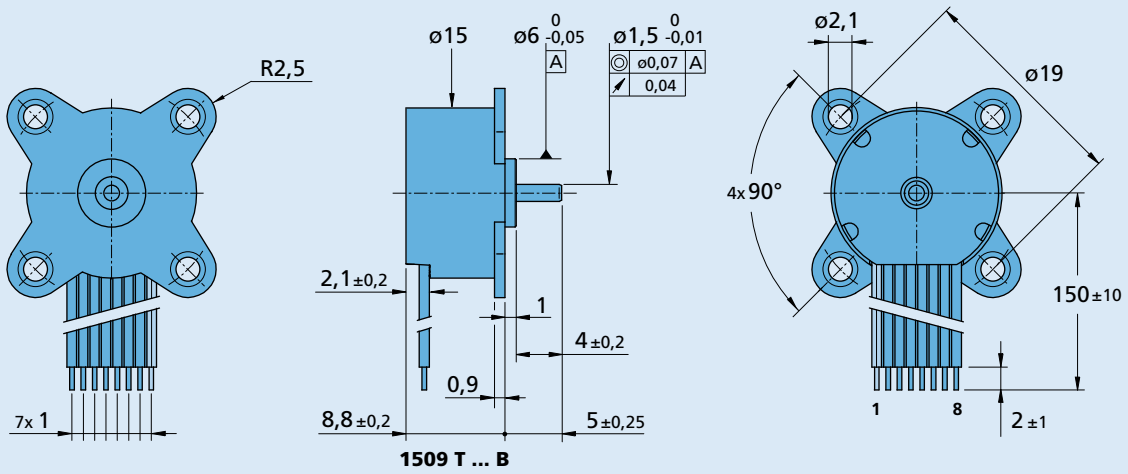
The nominal voltage (U_N) curve shows the operating point at nominal voltage in the insulated and thermally coupled condition. Any points of operation above the curve at nominal voltage will require a higher operating voltage. Any points below the nominal voltage curve will require less voltage.



Recommended operation areas (example: nominal voltage 6V)

Dimensional drawing

Scale enlarged



1509 T ... B

Option, cable and connection information

Example product designation: **1509T006B-X4192**

Option	Type	Description
X4192	Bearing lubrication	For vacuum of 10^{-5} Pa @ 22°C
4082	Temperature range	Extended temperature range (-40…+85°C)

Connection

No.	Function
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD} (+5V)
6	Hall sensor C
7	Hall sensor B
8	Hall sensor A

Standard cable

Insulation: PVC
8 conductors, AWG 28
pitch 1 mm, wires tinned

Product combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
		SC 1801 P SC 1801 S	

Brushless DC-Gearmotors 100 mNm

4 Pole Technology

Series 2622 ... B

Values at 22°C and nominal voltage		2622 S	006 B	012 B	
1	Nominal voltage	U_N	6	12	V
2	Terminal resistance, phase-phase	R	6,97	28,2	Ω
3	Efficiency, max.	$\eta_{max.}$	79	79	%
4	No-load speed	n_o	6 400	6 400	min^{-1}
5	No-load current, typ.	I_o	0,01	0,005	A
6	Stall torque	M_H	7,543	7,453	mNm
7	Friction torque, static	C_o	0,035	0,035	mNm
8	Friction torque, dynamic	C_v	$8,85 \cdot 10^{-6}$	$8,85 \cdot 10^{-6}$	mNm/min^{-1}
9	Speed constant	k_n	1 085	543	min^{-1}/V
10	Back-EMF constant	k_E	0,922	1,842	mV/min^{-1}
11	Torque constant	k_M	8,8	17,6	mNm/A
12	Current constant	k_I	0,114	0,057	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$	859	870	min^{-1}/mNm
14	Terminal inductance, phase-phase	L	486	1 945	µH
15	Mechanical time constant	τ_m	71	72	ms
16	Rotor inertia	J	7,9	7,9	gcm^2
17	Angular acceleration	$\alpha_{max.}$	9	9	$\cdot 10^3 rad/s^2$
18	Thermal resistance	R_{th1} / R_{th2}	33 / 27		K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	23,6 / 222		s

Integrated Gearhead			
Housing material		plastic	
Geartrain material		metal	
Backlash, at no-load	≤	4	°
Bearings on output shaft		ball bearing	
Shaft load max.:			
– radial (5 mm from mounting face)	≤	15	N
– axial	≤	5	N
Shaft press fit force, max.	≤	10	N
Shaft play:			
– radial (5 mm from mounting face)	≤	0,03	mm
– axial	≤	0,25	mm
Operating temperature range		– 25 ... + 80	°C

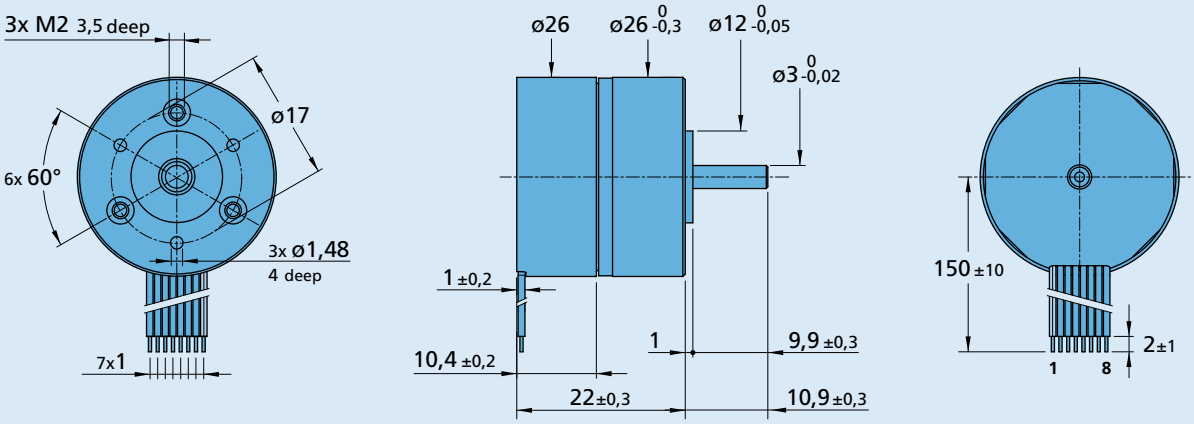
Specifications

reduction ratio (rounded)	output speed up to n_{max} min^{-1}	weight with motor g	output torque continuous operation M_{max} mNm	output torque intermittent operation M_{max} mNm	direction of rotation (reversible)	efficiency %
8 : 1	635	25	9	30	=	81
22 : 1	223	26	23	75	≠	73
33 : 1	151	26	30	100	=	60
112 : 1	44	27	93	180	≠	59
207 : 1	24	27	100	180	=	53
361 : 1	14	27	100	180	=	53
814 : 1	6	28	100	180	=	43
1 257 : 1	4	29	100	180	=	43

Note: output speed at 5000 min^{-1} input speed. Based on motor 2610 ... B.

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

Dimensional drawing



2622 S ... B

Option, cable and connection information

Example product designation: **2622S006B-4082**

Option	Type	Description
4082	Temperature range	Extended temperature range (-40…+85°C)

Connection

No.	Function
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD} (+5V)
6	Hall sensor C
7	Hall sensor B
8	Hall sensor A

Standard cable

Insulation: PVC
8 conductors, AWG 28
pitch 1 mm, wires tinned

Product Combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
		SC 1801 P SC 1801 S	To view our large range of accessory parts, please refer to the “Accessories” chapter.

Brushless DC-Flat Motors

4 Pole Technology

3,1 mNm

9 W

Series 2610 ... B

Values at 22°C and nominal voltage		2610 T	006 B	012 B	
1	Nominal voltage	U_N	6	12	V
2	Terminal resistance, phase-phase	R	6,97	28,2	Ω
3	Efficiency, max.	$\eta_{max.}$	79	79	%
4	No-load speed	n_0	6 400	6 400	min^{-1}
5	No-load current, typ. (with shaft ø 1,5 mm)	I_0	0,01	0,005	A
6	Stall torque	M_H	7,543	7,453	mNm
7	Friction torque, static	C_0	0,035	0,035	mNm
8	Friction torque, dynamic	C_V	8,85·10^{-6}	8,85·10^{-6}	mNm/min^{-1}
9	Speed constant	k_n	1 085	543	min^{-1}/V
10	Back-EMF constant	k_E	0,922	1,842	mV/min^{-1}
11	Torque constant	k_M	8,8	17,6	mNm/A
12	Current constant	k_I	0,114	0,057	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$	859	870	min^{-1}/mNm
14	Terminal inductance, phase-phase	L	486	1 945	µH
15	Mechanical time constant	τ_m	71	72	ms
16	Rotor inertia	J	7,9	7,9	gcm²
17	Angular acceleration	$\alpha_{max.}$	9	9	·10³rad/s²
18	Thermal resistance	R_{th1} / R_{th2}	33 / 27		K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	23,6 / 222		s
20	Operating temperature range:				
	– motor		-25 ... +80		°C
	– winding, max. permissible		+80		°C
21	Shaft bearings		ball bearings, preloaded		
22	Shaft load max.:				
	– with shaft diameter		1,5		mm
	– radial at 3 000 min^{-1} (3 mm from mounting flange)		4		N
	– axial at 3 000 min^{-1} (push only)		3,5		N
	– axial at standstill (push only)		17,5		N
23	Shaft play:				
	– radial	≤	0,015		mm
	– axial	=	0		mm
24	Housing material		plastic		
25	Mass		20,1		g
26	Direction of rotation		electronically reversible		
27	Speed up to	$n_{max.}$	40 000		min^{-1}
28	Number of pole pairs		2		
29	Hall sensors		digital		
30	Magnet material		NdFeB		
Rated values for continuous operation					
31	Rated torque	M_N	2,87	2,85	mNm
32	Rated current (thermal limit)	I_N	0,356	0,177	A
33	Rated speed	n_N	3 430	3 410	min^{-1}

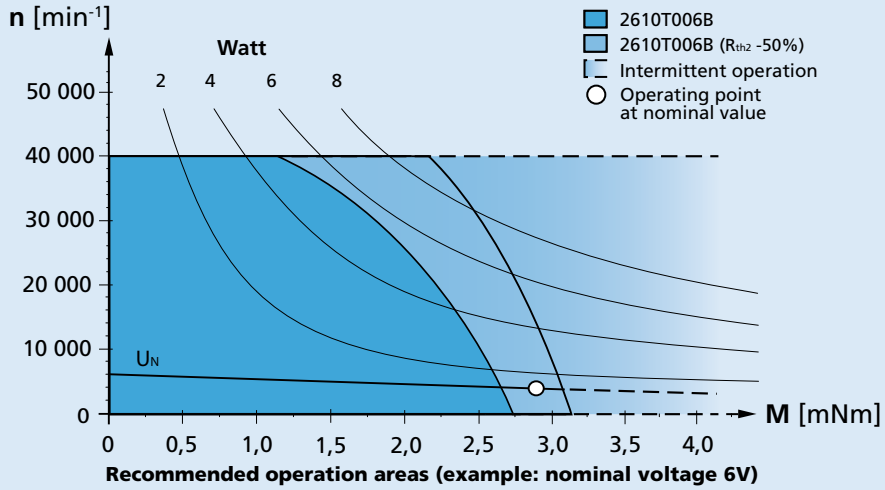
Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The R_{th2} value has been reduced by 25%.

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.

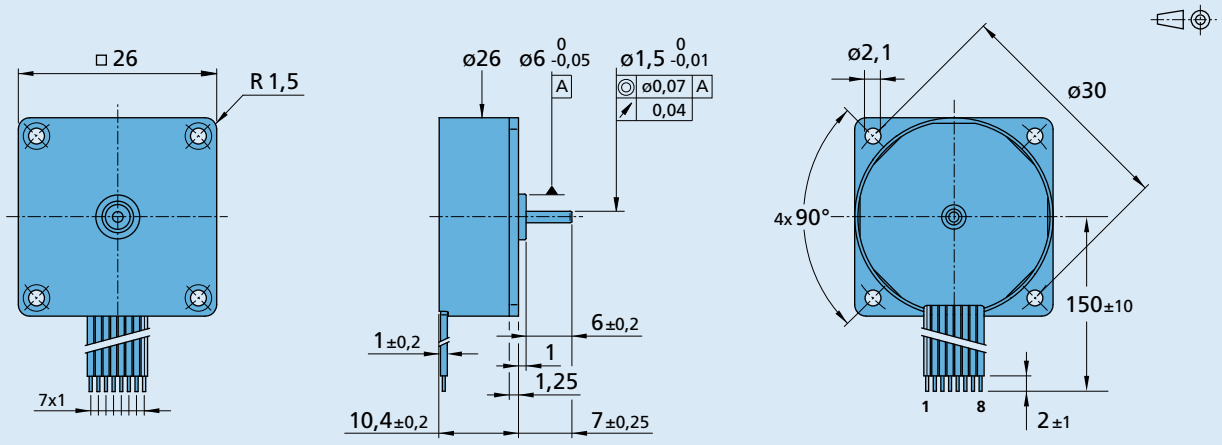
The diagram shows the motor in a completely insulated as well as thermally coupled condition (R_{th2} 50% reduced).

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 6V)

Dimensional drawing



2610 T ... B

Option, cable and connection information

Example product designation: **2610T006B-Y4192**

Option	Type	Description
Y4192	Bearing lubrication	For vacuum of 10^{-5} Pa @ 22°C
4082	Temperature range	Extended temperature range (-40…+85°C)

Connection

No.	Function
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD} (+5V)
6	Hall sensor C
7	Hall sensor B
8	Hall sensor A

Standard cable

Insulation: PVC
8 conductors, AWG 28
pitch 1 mm, wires tinned

Product combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
		SC 1801 P SC 1801 S	

Brushless DC-Flat Motors

4 Pole Technology

3,1 mNm

9 W

Series 2610 ... B

Values at 22°C and nominal voltage		2610 T	006 B	012 B	
1	Nominal voltage	U_N	6	12	V
2	Terminal resistance, phase-phase	R	6,97	28,2	Ω
3	Efficiency, max.	$\eta_{max.}$	79	79	%
4	No-load speed	n_0	6 400	6 400	min^{-1}
5	No-load current, typ. (with shaft ø 1,5 mm)	I_0	0,01	0,005	A
6	Stall torque	M_H	7,543	7,453	mNm
7	Friction torque, static	C_0	0,035	0,035	mNm
8	Friction torque, dynamic	C_V	8,85·10^{-6}	8,85·10^{-6}	mNm/min^{-1}
9	Speed constant	k_n	1 085	543	min^{-1}/V
10	Back-EMF constant	k_E	0,922	1,842	mV/min^{-1}
11	Torque constant	k_M	8,8	17,6	mNm/A
12	Current constant	k_I	0,114	0,057	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$	859	870	min^{-1}/mNm
14	Terminal inductance, phase-phase	L	486	1 945	µH
15	Mechanical time constant	τ_m	71	72	ms
16	Rotor inertia	J	7,9	7,9	gcm²
17	Angular acceleration	$\alpha_{max.}$	9	9	·10³rad/s²
18	Thermal resistance	R_{th1} / R_{th2}	33 / 27		K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	23,6 / 222		s
20	Operating temperature range:				
	– motor		-25 ... +80		°C
	– winding, max. permissible		+80		°C
21	Shaft bearings		ball bearings, preloaded		
22	Shaft load max.:				
	– with shaft diameter		1,5		mm
	– radial at 3 000 min^{-1} (3 mm from mounting flange)		4		N
	– axial at 3 000 min^{-1} (push only)		3,5		N
	– axial at standstill (push only)		17,5		N
23	Shaft play:				
	– radial	≤	0,015		mm
	– axial	=	0		mm
24	Housing material		plastic		
25	Mass		20,1		g
26	Direction of rotation		electronically reversible		
27	Speed up to	$n_{max.}$	40 000		min^{-1}
28	Number of pole pairs		2		
29	Hall sensors		digital		
30	Magnet material		NdFeB		
Rated values for continuous operation					
31	Rated torque	M_N	2,87	2,85	mNm
32	Rated current (thermal limit)	I_N	0,356	0,177	A
33	Rated speed	n_N	3 430	3 410	min^{-1}

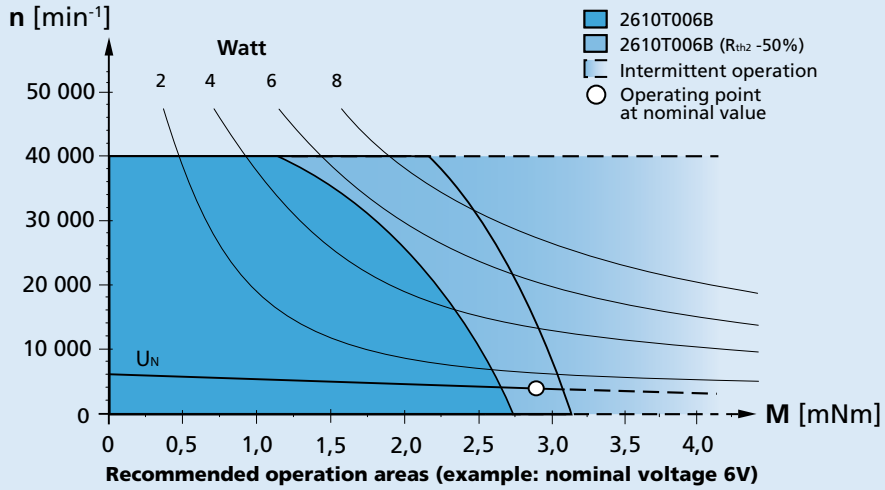
Note: Rated values are calculated with nominal voltage and at a 22°C ambient temperature. The R_{th2} value has been reduced by 25%.

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.

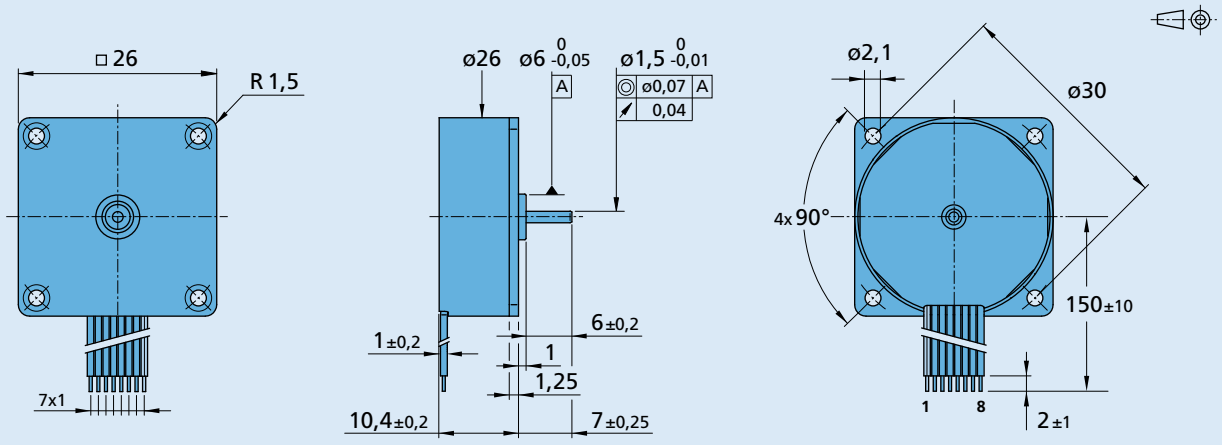
The diagram shows the motor in a completely insulated as well as thermally coupled condition (R_{th2} 50% reduced).

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 6V)

Dimensional drawing



2610 T ... B

Option, cable and connection information

Example product designation: **2610T006B-Y4192**

Option	Type	Description
Y4192	Bearing lubrication	For vacuum of 10^{-5} Pa @ 22°C
4082	Temperature range	Extended temperature range (-40…+85°C)

Connection

No.	Function
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD} (+5V)
6	Hall sensor C
7	Hall sensor B
8	Hall sensor A

Standard cable

Insulation: PVC
8 conductors, AWG 28
pitch 1 mm, wires tinned

Product combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
		SC 1801 P SC 1801 S	

Brushless DC-Gearmotors 30 mNm

4 Pole Technology

Series 1515 ... B

Values at 22°C and nominal voltage		1515 U	006 B	012 B	
1	Nominal voltage	U_N	6	12	V
2	Terminal resistance, phase-phase	R	22	92,7	Ω
3	Efficiency, max.	$\eta_{max.}$	54	53	%
4	No-load speed	n_o	15 000	14 900	min^{-1}
5	No-load current, typ.	I_o	0,019	0,009	A
6	Stall torque	M_H	0,953	0,904	mNm
7	Friction torque, static	C_o	0,019	0,019	mNm
8	Friction torque, dynamic	C_v	$3{,}42 \cdot 10^{-6}$	$3{,}42 \cdot 10^{-6}$	mNm/min^{-1}
9	Speed constant	k_n	2 682	1 339	min^{-1}/V
10	Back-EMF constant	k_E	0,373	0,747	mV/min^{-1}
11	Torque constant	k_M	3,56	7,13	mNm/A
12	Current constant	k_I	0,281	0,14	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$	16 577	17 423	min^{-1}/mNm
14	Terminal inductance, phase-phase	L	570	2 282	µH
15	Mechanical time constant	τ_m	120	126	ms
16	Rotor inertia	J	0,69	0,69	gcm^2
17	Angular acceleration	$\alpha_{max.}$	14	13	$\cdot 10^3 rad/s^2$
18	Thermal resistance	R_{th1} / R_{th2}	65 / 45		K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	12 / 130		s

Integrated Gearhead			
Housing material		plastic	
Geartrain material		metal	
Backlash, at no-load	≤	4	°
Bearings on output shaft		plastic / brass bearing	
Shaft load max.:			
– radial (5 mm from mounting face)	≤	1,4	N
– axial	≤	0,3	N
Shaft press fit force, max.	≤	5	N
Shaft play:			
– radial (5 mm from mounting face)	≤	0,08	mm
– axial	≤	0,25	mm
Operating temperature range		– 25 ... + 80	°C

Specifications

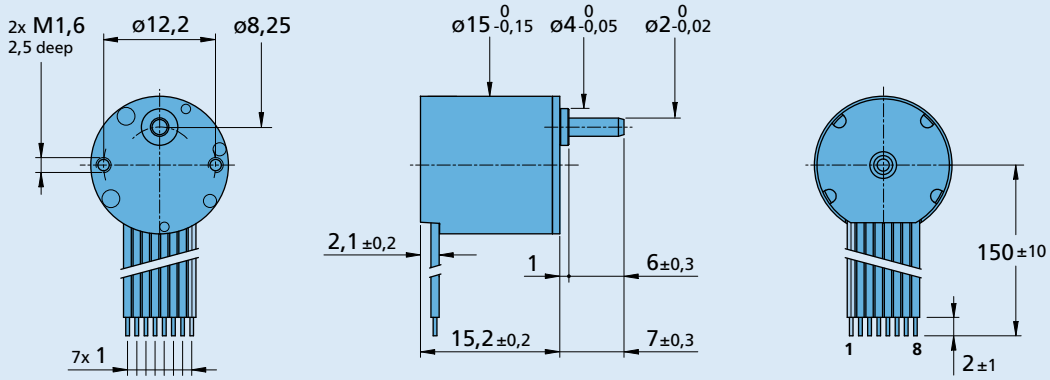
reduction ratio (rounded)	output speed up to n_{max} min^{-1}	weight with motor g	output torque continuous operation M_{max} mNm	output torque intermittent operation M_{max} mNm	direction of rotation (reversible)	efficiency %
6 : 1	779	6,9	1,4	3	=	81
13 : 1	372	7,0	2,8	5	≠	73
39 : 1	129	7,2	7,0	10	=	60
112 : 1	45	7,4	19,8	30	≠	59
324 : 1	15	7,7	30,0	50	=	53

Note: output speed at 5000 min^{-1} input speed. Based on motor 1509 ... B.

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

Dimensional drawing

Scale enlarged



1515 U ... B

Option, cable and connection information

Example product designation: **1515U006B-4082**

Option	Type	Description
4082	Temperature range	Extended temperature range (-40…+85°C)

Connection

No.	Function
1	Phase C
2	Phase B
3	Phase A
4	GND
5	U_{DD} (+5V)
6	Hall sensor C
7	Hall sensor B
8	Hall sensor A

Standard cable

Insulation: PVC
8 conductors, AWG 28
pitch 1 mm, wires tinned

Product Combination

Precision Gearheads / Lead Screws	Encoders	Drive Electronics	Cables / Accessories
		SC 1801 P SC 1801 S	To view our large range of accessory parts, please refer to the “Accessories” chapter.