

# Brushless DC-Servomotors

## with integrated Speed Controller

### 4 Pole Technology

# 15 mNm

For combination with  
Gearheads:  
22F, 22/7, 26A

## Series 2250 ... BX4 S SC

	2250 S		024 BX4 S	SC
1 Nominal voltage	$U_N$		24	Volt
2 Terminal resistance, phase-phase	R		5,9	$\Omega$
3 Output power <sup>1)</sup>	$P_{2 \text{ max.}}$		10,3	W
4 Efficiency	$\eta_{\text{ max.}}$		70,4	%
5 No-load speed	$n_0$		10 500	rpm
6 No-load current (with shaft $\varnothing$ 3,0 mm)	$I_0$		0,105	A
7 Stall torque	$M_H$		84,7	mNm
8 Friction torque, static	$C_0$		0,75	mNm
9 Friction torque, dynamic	$C_v$		$1,4 \cdot 10^{-4}$	mNm/rpm
10 Speed constant	$k_n$		451	rpm/V
11 Back-EMF constant	$k_E$		2,218	mV/rpm
12 Torque constant	$k_M$		21,1	mNm/A
13 Current constant	$k_I$		0,047	A/mNm
14 Slope of n-M curve	$\Delta n / \Delta M$		125,6	rpm/mNm
15 Terminal inductance, phase-phase	L		250	$\mu\text{H}$
16 Mechanical time constant	$\tau_m$		6,97	ms
17 Rotor inertia	J		5,3	$\text{gcm}^2$
18 Angular acceleration	$\alpha_{\text{ max.}}$		160	$\cdot 10^3 \text{rad/s}^2$
19 Thermal resistance	$R_{\text{th } 1} / R_{\text{th } 2}$	1,2 / 10,5		K/W
20 Thermal time constant	$\tau_{w1} / \tau_{w2}$	4,2 / 332		s
21 Operating temperature range		- 40 ... +85		$^{\circ}\text{C}$
22 Shaft bearings		ball bearings, preloaded		
23 Shaft load max.:				
– radial at 3 000 rpm (4 mm from mounting flange)		20		N
– axial at 3 000 rpm		2		N
– axial at standstill		20		N
24 Shaft play:				
– radial	$\leq$	0,015		mm
– axial	$\equiv$	0		mm
25 Housing material		stainless steel		
26 Weight		97		g
27 Direction of rotation		electronically reversible		
28 Number of pole pairs		2		
<b>Recommended values - mathematically independent of each other</b>				
29 Speed up to	$n_{e \text{ max.}}$		12 500	rpm
30 Torque up to <sup>1) 2)</sup>	$M_{e \text{ max.}}$		15	mNm
31 Current up to <sup>1) 2)</sup>	$I_{e \text{ max.}}$		0,84	A

<sup>1)</sup> at 5 000 rpm

<sup>2)</sup> thermal resistance  $R_{\text{th } 2}$  not reduced

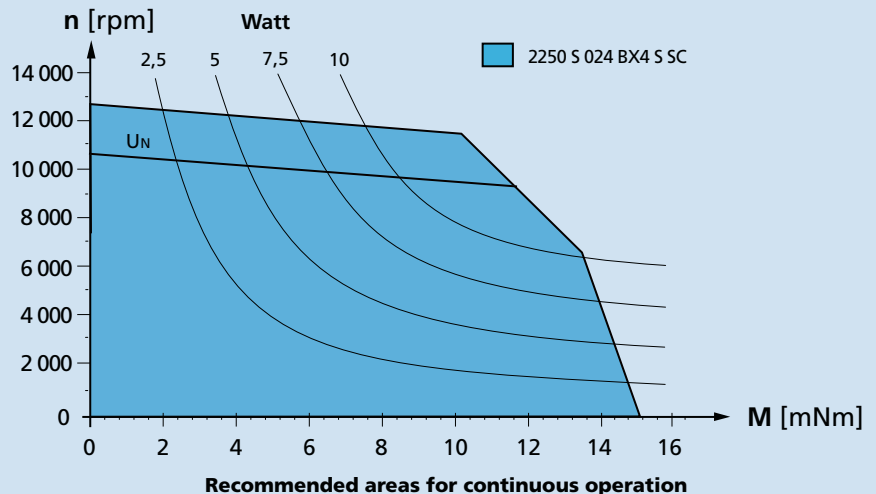
### Note:

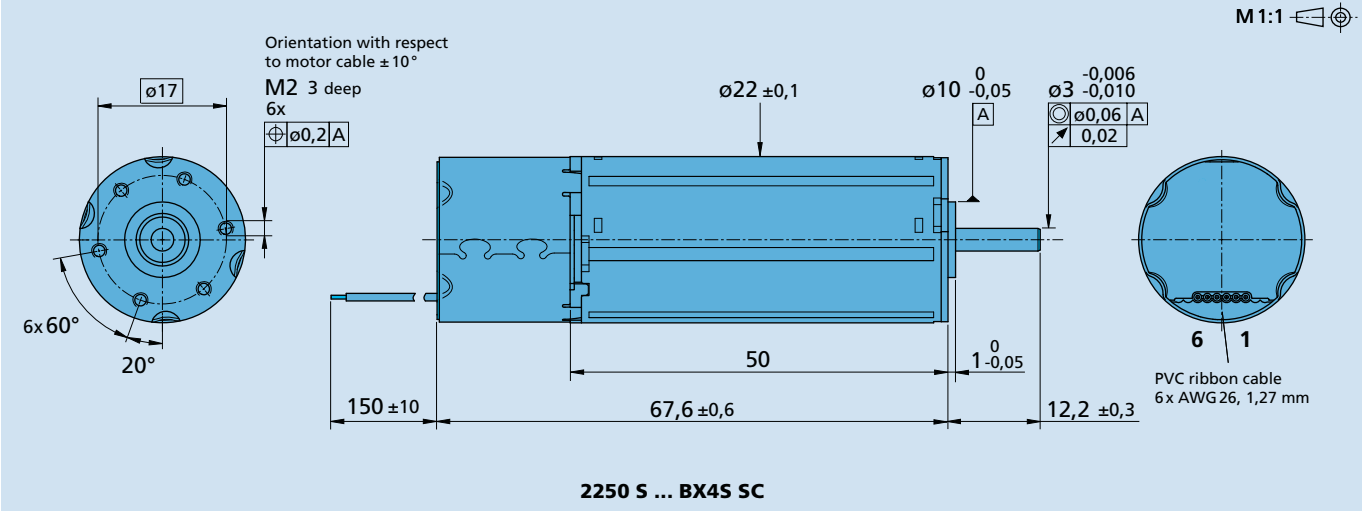
The diagram indicates the recommended speed in relation to the available torque at the output shaft for a given ambient temperature of 22°C.

The diagram shows the motor in a completely insulated condition.

The motor is factory pre-configured to a continuous current for the thermally insulated condition. The controller must be reconfigured with the easy to use Motion Manager Software for use with other parameter settings.

The nominal voltage ( $U_N$ ) curve shows the operating point at nominal voltage in the insulated 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.



**Dimensional drawing**


Speed Controller		024 BX4 S	SC
Power supply electronic	$U_p$	5 ... 28	V DC
Power supply motor	$U_{mot}$	6 ... 28	V DC
PWM switching frequency	$f_{PWM}$	96	kHz
Efficiency	$\eta$	95	%
Max. continuous output current <sup>1)</sup>	$I_{dauer}$	0,8	A
Max. peak output current	$I_{max}$	1,6	A
Total standby current	$I_{el}$	0,020	A
Speed range electronic		400 ... 50 000 <sup>2)</sup>	rpm
Scanning range		500	$\mu s$

<sup>1)</sup> at 22°C ambient temperature and max. 60°C motor temperature respectively

<sup>2)</sup> speed depend on motor operating voltage

Connection information		024 BX4 S	SC
Connection 1 "UP":	power supply electronic	$U_p$	
Connection 2 "U <sub>mot</sub> ":	power supply electronic coil	$U_{mot}$	
Connection 3 "GND":	ground	ground	
Connection 4 "U <sub>nsoll</sub> ":			
- analog input	input voltage	$U_{in} = 0 \dots 10V \mid > 10V \dots U_p$ » set speed value not defined	
	input resistance	$R_{in} \geq 5k\Omega$	
	set speed value	per 1V, 2 000	rpm
		$U_{in} < 0,15V$ » motor stops	
		$U_{in} > 0,3V$ » motor starts	
Connection 5 "DIR":			
- analog input	direction of rotation	to ground or level $< 0,5V$ » counterclockwise	
		open or level $> 3V$ » clockwise	
	input resistance	$R_{in} \geq 10k\Omega$	
Connection 6 "FG":			
- digital output	frequency output	max. $U_p$ ; $I_{max} = 15 \text{ mA}$ ; open collector with 22k $\Omega$ pull-up resistor	
		6 lines per revolution	

**Features**

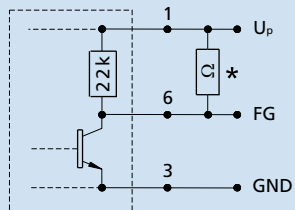
In this variant, the brushless DC servomotors have an integrated Speed Controller. The motor is commutated using Hall sensors integrated into the motor. Speed control is via a PI regulator.

The Speed Controller has a current limiting device which limits the maximum motor current if the thermal load is too high. Twice the continuous current is possible over a short time.

Using the "FAULHABER Motion Manager" software, the customer can modify the Speed Controller to special conditions of use. The following parameters can be changed: current limit and regulator parameters.

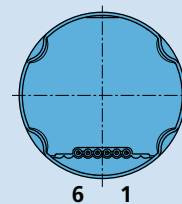
## Circuit diagram / Connection information

### Output circuit



\* An additional external pull-up resistor can be added to improve the rise time.  
 Caution:  $I_{OUT}$  max. 15 mA must not be exceeded!

### Cable connection



### Connection

No.	Function
1	U <sub>p</sub>
2	U <sub>mot</sub>
3	GND
4	U <sub>nsoll</sub>
5	DIR
6	FG

**Caution:**  
 Incorrect lead connection will damage the motor electronics!

### Options

- Connector variant (Option no.: 3809)  
 AWG 26 / PVC ribbon cable with connector Micro-Fit



### Accessories

- Programming board (Part No.: 6501.00088)

### Full product description

- Example:  
 2250S024BX4S SC