

**NEW**

**FAULHABER BX4**

# Brushless DC-Servomotors

6 / 10 mNm

with Speed Controller  
Electronic Commutation

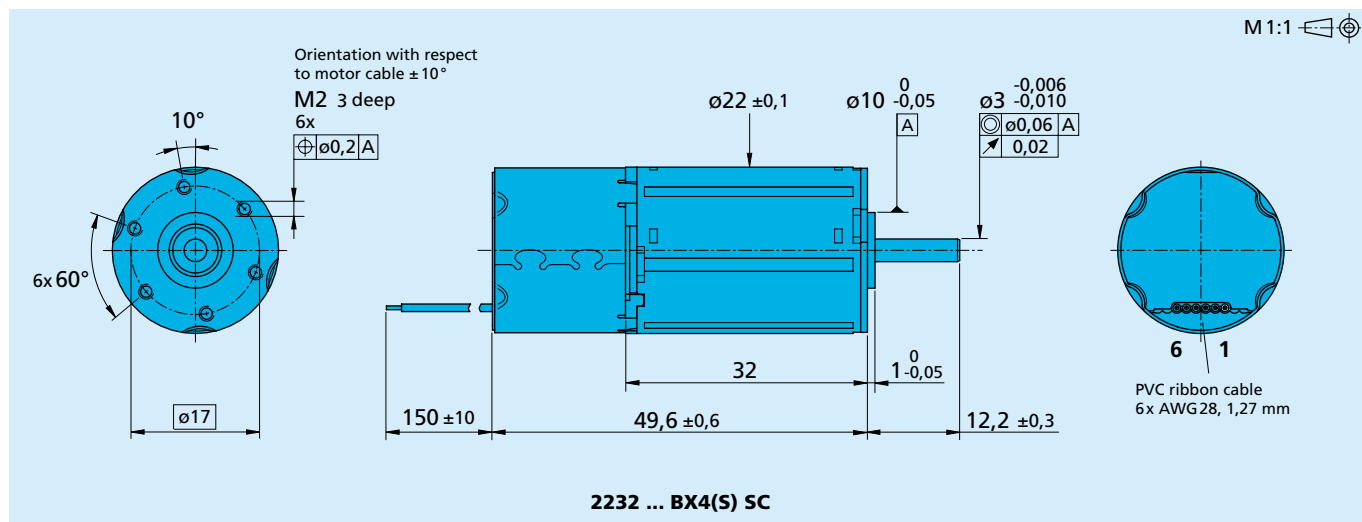
For combination with  
Gearheads:  
22F

## Series 2232 ... BX4 SC

	2232 S	012 BX4 S	024 BX4 S	012 BX4	024 BX4	SC
1 Nominal voltage	U <sub>N</sub>	12	24	12	24	Volt
2 Terminal resistance, phase-phase	R	3,5	12,4	3,5	12,4	Ω
3 Output power <sup>1)</sup>	P <sub>2 max.</sub>	3,1	3,1	5,7	5,8	W
4 Efficiency	η <sub>max.</sub>	60,9	61,7	66,1	66,8	%
5 No-load speed	n <sub>0</sub>	13 180	13 980	6 840	7 250	rpm
6 No-load current (with shaft ø 3,0 mm)	I <sub>0</sub>	0,163	0,088	0,118	0,064	A
7 Stall torque	M <sub>H</sub>	27,3	29,4	53,6	57,7	mNm
8 Friction torque, static	C <sub>0</sub>	0,6	0,6	0,85	0,85	mNm
9 Friction torque, dynamic	C <sub>v</sub>	5,5 · 10 <sup>-5</sup>	5,5 · 10 <sup>-5</sup>	1,5 · 10 <sup>-4</sup>	1,5 · 10 <sup>-4</sup>	mNm/rpm
10 Speed constant	k <sub>n</sub>	1 174	616	601	315	rpm/V
11 Back-EMF constant	k <sub>E</sub>	0,852	1,623	1,664	3,170	mV/rpm
12 Torque constant	k <sub>M</sub>	8,14	15,50	15,89	30,27	mNm/A
13 Current constant	k <sub>I</sub>	0,123	0,065	0,063	0,033	A/mNm
14 Slope of n-M curve	Δn/ΔM	505	493	132	129	rpm/mNm
15 Terminal inductance, phase-phase	L	130	470	120	440	μH
16 Mechanical time constant	τ <sub>m</sub>	22	22	7	7	ms
17 Rotor inertia	J	4,2	4,2	5,2	5,2	gcm <sup>2</sup>
18 Angular acceleration	α <sub>max.</sub>	65	70	103	111	· 10 <sup>3</sup> rad/s <sup>2</sup>
19 Thermal resistance	R <sub>th 1</sub> / R <sub>th 2</sub>	2 / 17		2 / 17		K/W
20 Thermal time constant	τ <sub>w1</sub> / τ <sub>w2</sub>	4 / 510		4 / 527		s
21 Operating temperature range		- 40 ... + 85		- 40 ... + 85		°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	≤	0,015				mm
– axial	=	0				mm
25 Housing material		stainless steel				
26 Weight		71				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 <sup>2)</sup>	n <sub>e max.</sub>	14 100	14 100	8 900	8 900	rpm
30 Torque up to <sup>1) 2)</sup>	M <sub>e max.</sub>	6,0	6,0	10	10	mNm
31 Current up to <sup>1) 2)</sup>	I <sub>e max.</sub>	0,85	0,45	0,80	0,43	A

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

<sup>2)</sup> thermal resistance R<sub>th 2</sub> not reduced



Speed Controller		012 BX4 S	024 BX4 S	012 BX4	024 BX4	SC
PWM switching frequency	$f_{PWM}$	96	96	96	96	kHz
Efficiency	$\eta$	95	95	95	95	%
Max. continuous output current <sup>1)</sup>	$I_{max}$	1	0,5	1	0,5	A
Max. peak output current	$I_{el}$	2	1	2	1	A
Total standby current		0,020				A
Speed range electronic	$n_{el}$	400 ... 50 000 <sup>2)</sup>				rpm
Scanning range	$T_A$	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		012 BX4 S	024 BX4 S	012 BX4	024 BX4	SC
Connection 1 "U <sub>P</sub> ":	power supply electronic	U <sub>P</sub> = 5 ... 28 V				
Connection 2 "U <sub>mot</sub> ":	power supply electronic coil	U <sub>mot</sub> = 6 ... 28 V				
Connection 3 "GND":	ground	ground				
Connection 4 "U <sub>nsoll</sub> ":						
- analog input	input voltage	U <sub>in</sub> = 0 ... 10 V				
	input resistance	R <sub>in</sub> ≥ 5 kΩ				
	set speed value	per 1 V	2 000	2 000	1 000	1 000 rpm
		U <sub>in</sub> < 0,15 V » motor stops				
		U <sub>in</sub> > 0,3 V » 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 <sub>in</sub> ≥ 10 kΩ				
Connection 6 "FG":						
- digital output	frequency output	with max. U <sub>P</sub> » I <sub>max</sub> = 15 mA; open collector with 22 kΩ 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

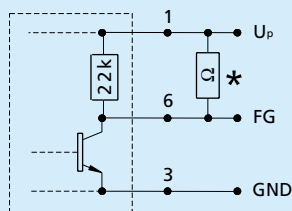
following parameters can be changed: current limit and regulator parameters.

## Order information

- Ordering examples:  
2232S024BX4 SC  
2232S012BX4S SC

## Circuit diagram / Connection information

### Output circuit



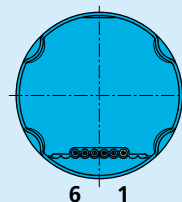
\* An additional external pull-up resistor can be added to improve the rise time.  
Caution: I<sub>OUT</sub> max. 15 mA must not be exceeded!

### Options

- connector variant  
AWG 26 / PVC ribbon cable with connector Molex Micro-Fit 3.0: 43025-0600  
connector pin assignment:



### 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!