![FAULHABER]

Brushless DC-Servomotors
with integrated Speed Controller
4 Pole Technology

16 mNm

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

Series 2232 … BX4 SC

		2232 S		012 BX4	024 BX4	SC
1	Nominal voltage	U_N		12	24	V DC
2	Terminal resistance, phase-phase	R		3,5	12,4	Ω
3	Efficiency	η max.		66,9	67,6	%
4	No-load speed	n_o		6 600	7 000	min^{-1}
5	No-load current (with shaft ø 3,0 mm)	I_0		0,112	0,061	A
6	Stall torque	M_H		55,7	59,9	mNm
7	Friction torque, static	C_0		0,85	0,85	mNm
8	Friction torque, dynamic	C_v		$1,5 \cdot 10^{-4}$	$1,5 \cdot 10^{-4}$	mNm/min^{-1}
9	Speed constant	k_n		579	304	min^{-1}/V
10	Back-EMF constant	k_E		1,728	3,288	mV/min^{-1}
11	Torque constant	k_M		16,50	31,40	mNm/A
12	Current constant	k_I		0,061	0,032	A/mNm
13	Slope of n-M curve	$\Delta n/\Delta M$		123	120	min^{-1}/mNm
14	Terminal inductance, phase-phase	L		120	440	µH
15	Mechanical time constant	τ m		6,7	6,5	ms
16	Rotor inertia	J		5,2	5,2	gcm^2
17	Angular acceleration	α max.		107	115	$\cdot 10^3$rad/s^2
18	Thermal resistance	$R_{th 1} / R_{th 2}$	2 / 13			K/W
19	Thermal time constant	τ_{w1} / τ_{w2}	4,1 / 283			s
20	Operating temperature range		– 40 … +85			°C
21	Shaft bearings		ball bearings, preloaded			
22	Shaft load max.:					
	– radial at 3 000 min^{-1} (4 mm from mounting flange)		20			N
	– axial at 3 000 min^{-1} (push / pull)		2			N
	– axial at standstill (push / pull)		20			N
23	Shaft play:					
	– radial	$\leq$	0,015			mm
	– axial	=	0			mm
24	Housing material		stainless steel			
25	Weight		77			g
26	Direction of rotation		electronically reversible			
27	Number of pole pairs		2			

	Recommended values - mathematically independent of each other					
28	Speed up to	n_e max.		14 500	8 500	min^{-1}
29	Torque up to [1] [2]	M_e max.		13 / 16	12 / 13	mNm
30	Current up to [1] [2]	I_e max.		1 / 1,4	0,5 / 0,8	A

[1] at 5 000 min^{-1}
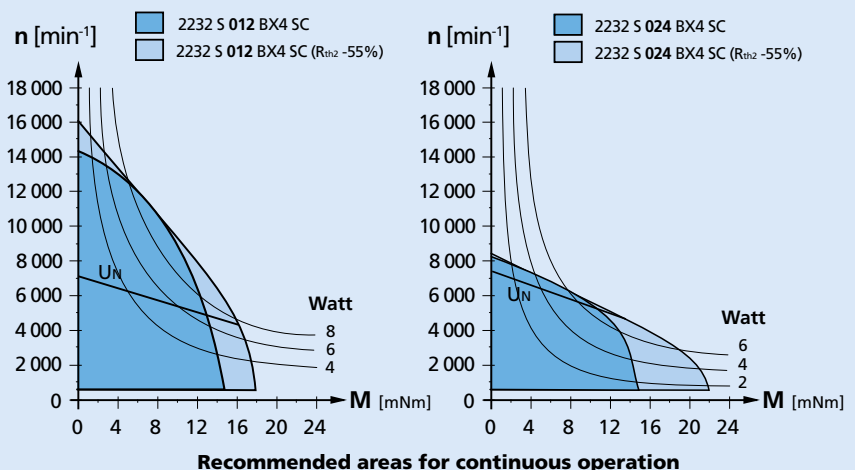[2] thermal resistance R_{th2} not reduced / thermal resistance R_{th2} by 55% reduced

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 as well as thermally coupled condition ($R_{th 2}$ 55% reduced).

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 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 areas for continuous operation

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

Dimensional drawing

Orientation with respect to motor cable ±5°

M2 3 deep
6x

⊕ ⌀0,2 A

⌀17

6x 60°

20°

150 ±10

⌀22 ±0,1

⌀10 0 -0,05
A

⌀3 -0,006 -0,010

⌀0,06 A

0,02

32

0 1 -0,05

49,6 ±0,6

12,2 ±0,3

PVC ribbon cable
6 x AWG 26, 1,27 mm

6 1

2232 S ... BX4 SC

Speed Controller			012 BX4	024 BX4	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	η	95			%
Max. continuous output current [1]	I_{dauer}		1,4	0,8	A
Max. peak output current [1]	I_{max}		2,8	1,6	A
Total standby current at U_N	I_{el}	0,020			A
Speed range:					
– standard » Hall sensors (digital)		400 ... 50 000 [2]			min^{-1}
– optional » Hall sensors (analog)		50 ... 50 000 [2]			min^{-1}
Scanning range		500			µs

[1] at 22°C ambient temperature and max. 60°C motor temperature at the nominal voltage of motor and electronics
[2] speed depend on motor operating voltage

Connection information

Connection 1 "U_P":   power supply electronic U_P

Connection 2 "U_{mot}":   power supply electronic coil U_{mot}

Connection 3 "GND":   ground   ground

Connection 4 "U_{nsoll}":
– analog input	input voltage	U_{in} = 0 ... 10 V | > 10 V ... U_P » set speed value not defined
	input resistance	$R_{in} \geq 5\,k\Omega$
	set speed value	per 1V, 1 000 min^{-1}
		$U_{in} < 0,15\,V$ » motor stops
		$U_{in} > 0,3\,V$ » motor starts

Connection 5 "DIR":
– digital input	direction of rotation	to ground or level < 0,5 V » counterclockwise
		open or level > 3 V » clockwise
	input resistance	$R_{in} \geq 10\,k\Omega$

Connection 6 "FG":
– digital output	frequency output	max. U_P; I_{max} = 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.
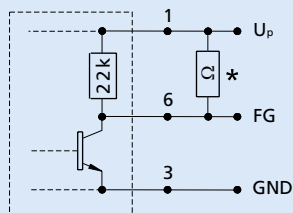
Using the **"FAULHABER Motion Manager"** software, the customer can modify the Speed Controller to special conditions of use. The following parameters can be changed: current limit and regulator parameters.
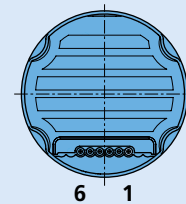
Circuit diagram / Connection information

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_P
2	U_{mot}
3	GND
4	U_{nsoll}
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

■ Analog Hall sensors (Option no.: 3692)

Accessories

■ To view our large range of accessory parts, please refer to the "Accessories" chapter.

Full product description

■ Example:

2232S024BX4 SC